



Arch Capital Group Ltd.
2018 Annual Report

<i>Amounts in millions, except percentages and per share amounts</i>			
	<u>2018</u>	<u>2017</u>	<u>Change</u>
Book value per common share at year-end	\$21.52	\$20.30	6.0%
Net income available to common shareholders*	\$713.6	\$566.5	26.0%
Per share	\$ 1.73	\$ 1.36	27.2%
Net income return on average common equity	8.4%	7.2%	
After-tax operating income*	\$909.2	\$447.2	103.3%
Per share	\$ 2.20	\$ 1.07	105.6%
Operating return on average common equity	10.7%	5.7%	
<i>Table excludes amounts related to the “other” segment. All per share amounts are on a diluted basis.</i>			

To Our Shareholders:

Arch’s business model is aimed at growing book value per share. The Company’s diversification across three segments—property casualty insurance, property casualty reinsurance and mortgage insurance and reinsurance—supports that model by giving us opportunities to invest in the sectors and product lines that offer the best potential risk-adjusted returns at any given time. At the same time, we are underweight in those sectors and product lines in which we perceive the risk-adjusted returns to be inadequate. Our allocation of capital across segments is dynamic—we increase or reduce our allocation among and within segments as opportunities emerge or diminish.

The soundness of our model proved itself again in 2018 as we performed well financially, despite a second consecutive year of unusually high industry-wide property casualty catastrophe losses. We fared well in 2018 compared to the property casualty industry because we were relatively underweight in property catastrophe coverages, where we felt pricing was inadequate, while we allocated a significant portion of our capital to mortgage insurance and other sectors that provided favorable expected returns.

Book Value per Share and Operating Return on Equity

Book value per share is a key measure used to evaluate the Company’s performance, since we believe increases in this metric over time are what ensure the creation of long-term value for shareholders. The Company’s book value per share rose to \$21.52 at the end of 2018, up 6.0% from year-end 2017, the 10th consecutive annual increase. Book value per share has now grown at an average annual rate of 14.2% over the past decade.

**Please refer to “Net Income, Operating Income, Underwriting Results and Cash” for a discussion of the components of net income available to common shareholder and after-tax operating income. After-tax operating income, which is a non-GAAP measure of financial performance, is defined as net income available to common shareholders, excluding net realized gains or losses, net impairment losses included in earnings, equity in net income or loss of investment funds accounted for using the equity method, net foreign exchange gains or losses, transaction costs and other and loss on redemption of preferred shares, net of income taxes. The reconciliation of net income available to common shareholders to after-tax operating income can be found in the Company’s Annual Report on Form 10-K, filed with the SEC on February 28, 2019, under the caption “Management’s Discussion and Analysis of Financial Condition and Results of Operations.” A copy of the Form 10-K is available on the Company’s web site and accompanies this letter.*

Operating return on equity (“ROE”) is a key driver of book value growth. The Company’s operating ROE was 10.7% in 2018, up from 5.7% in 2017, and has averaged 10.3% during the past decade. Operating ROE consists primarily of underwriting income and net investment income and excludes net realized gains and losses, equity in net income and losses of investment funds accounted for using the equity method, net foreign exchange gains and losses and other “non-operating” items.

All financial results in this letter are presented on a core basis, which excludes amounts related to the “other” segment, *i.e.*, Watford Holdings Ltd. (“Watford”). In accordance with GAAP, 100% of the results of Watford are included in the Company’s consolidated financial statements even though the Company owns only about an 11% equity interest in Watford. We believe core results offer a more meaningful way for investors, analysts, rating agencies and others to evaluate the Company’s performance. Results for the “other” segment can be found on pages 110 to 116 of the Company’s Form 10-K for 2018.

Core Principles, Earnings and Underwriting Results

The Company writes specialty lines of insurance and reinsurance in which we seek to employ our knowledge, skills and strong capital base to competitive advantage. We are deeply committed in all our lines to our operating principles of innovation, sound risk selection, underwriting discipline, diversification and deploying our capital only when we believe the risk-adjusted return opportunities available to us meet our objectives.

The Company’s net income reached \$713.6 million, or \$1.73 per share, in 2018, rising 27.2% from 2017 on a per-share basis. After-tax operating income increased to \$909.2 million, or \$2.20 per share, up 105.6% on a per-share basis.

Underwriting income advanced 75.6%, to \$897.1 million, as we continued to benefit from our diverse portfolio of insurance and reinsurance businesses. The Company’s combined ratio—a measure of underwriting profitability—improved to 81.0% in 2018 from 88.8% in 2017. A combined ratio below 100% indicates an underwriting profit. All three business segments contributed to the 2018 improvement, led by our mortgage insurance group.

Results for 2018 included \$193.3 million of catastrophe losses, down from \$385.8 million in 2017. We have scaled back our participation in the property catastrophe insurance and reinsurance markets over the last several years, reflecting the lack of attractiveness in the risk-reward characteristics of these markets. Property catastrophe coverage represented 5.8% of our net reinsurance premiums written in 2018, down from 6.0% in 2017 and 25.9% in 2011. Major natural disasters in 2018 included Hurricane Michael in the southeastern United States and wildfires in California, amid ongoing public concern about the impact of climate change. It is uncertain whether climate change will lead to an increased pattern of natural disasters and persistently high catastrophe losses, but we remain alert to the issue and continue to factor it into our assessment of pricing adequacy.

Net favorable reserve development was \$270.5 million in 2018, essentially unchanged from 2017, as earlier-year reserves proved to be more than adequate, resulting in the release of a portion of these reserves to earnings. While 2018 represented our 16th consecutive year of favorable reserve development, we review the adequacy of our reserves quarterly and there is no guarantee that favorable reserve development will continue in the future.

We continued to generate a healthy level of cash flow. Net cash provided by operating activities was \$1.3 billion in 2018, up from \$0.8 billion in 2017, reflecting a variety of factors, including the solid performance of our business units.

Investment Results

Total investable assets were \$19.6 billion at the end of 2018, down slightly from year-end 2017, as we repaid debt and returned capital to shareholders through share repurchases. Net investment income was \$438.0 million, or \$1.06 per share, in 2018, advancing 16.5% from 2017 on a per-share basis.

The year was challenging for investors, as both the fixed income and equity markets provided meager or negative returns. The benchmark 10-year U.S. Treasury note had a total return of -0.03%, while the U.S. stock market returned -4.38%, as measured by the S&P 500 Index. We maintained a defensive posture through our investments in high-quality fixed income securities and the relatively short average duration of our fixed income holdings. At year-end 2018, approximately 81% of the portfolio was invested in fixed maturity and short-term securities, with an average credit quality of “AA/Aa2.” The average effective duration of the portfolio was 3.38 years at December 31, 2018, and 2.83 years at the end of 2017. In addition, we allocate a portion of the portfolio to alternative investments and equities, which provide diversification and offer the potential for higher returns. Such investments accounted for approximately 16% of the portfolio at the end of 2018.

Our investment approach stresses preservation of capital, market liquidity and diversification of risk. We also focus on maximizing total return, which contributes to increases in book value per common share but may not be entirely reflected in operating income or net income. Total return (consisting of net investment income, net realized gains and losses, changes in unrealized gains and losses and equity in the net income or losses of investment funds accounted for using the equity method) was 0.33% in 2018 compared to 5.87% in 2017. All components of total return, except for changes in unrealized gains and losses, are included in the Company’s net income, while only net investment income is included in operating income.

Market values for many types of fixed income securities declined in 2018 as interest rates rose—hence our low total return for the year. Even though higher interest rates negatively affected the market value of many of our fixed income holdings, they provided opportunities to invest new money at higher yields, which could benefit the Company going forward. The pre-tax investment income yield of the portfolio was 2.36% for 2018 and 2.06% for 2017, while the embedded book yield, before investment expenses, increased to 2.89% at the end of 2018 from 2.32% a year earlier.

As discussed in prior letters, we divide the portfolio for investment purposes into three main categories: investments generated from our insurance, reinsurance and mortgage operations cash flows; investments supported by our debt and hybrid securities; and investments supported by common shareholders’ equity. For our insurance, reinsurance and mortgage liabilities, we generally attempt to match, within a reasonable range, the duration of our investments to the duration of the underlying claim obligations. We manage the portfolio conservatively to protect our reserves on an economic basis and ensure our ongoing ability to pay claims. For our debt and hybrid securities

and common shareholders' equity, we vary the duration of the portfolio based on our view of potential returns and the outlook for investments and the economy in general.

Market Segments

Arch writes property casualty insurance and reinsurance for commercial accounts primarily from operations in Bermuda, the United States, Canada and Europe. We write mortgage insurance and reinsurance in the United States, Bermuda, Europe, Australia and Hong Kong. Companywide, net premiums written were \$4.7 billion in 2018, a 7.6% increase over 2017.

Technology continues to be an increasingly powerful tool in all our segments, helping us reduce costs, make more informed underwriting decisions and deliver better service to our customers. Our use of data analytics to assess risk more accurately and enable risk-based pricing is an example: we pioneered risk-based pricing in the mortgage insurance business with RateStar, which tailors pricing to a homebuyer's individual risk characteristics, rather than using a standardized rate card. RateStar allows us to provide more granular pricing on each loan, based on its risk characteristics. We continue to expand the use of data analytics in other parts of our business.

Property casualty insurance: Based on premiums written, this is our largest segment, accounting for 47% of the Company's premium volume in 2018. Net premiums written were \$2.21 billion in 2018, up 4.2% from 2017. Insurance pricing has been under pressure for several years and competition is especially fierce in the insurance purchases of the largest corporations. Consequently, our underwriting results have not met our return hurdles for the past two years, although they improved significantly in 2018.

Over the past several years, we have responded to an extended soft market by carving out positions in those specialty areas where we see attractive, long-term opportunities. For example, in 2018, we continued to build our position in travel and accident insurance. This product line accounted for 13.1% of the segment's net premiums written in 2018, up from 11.7% in 2017 and 4.2% in 2011. In addition, we continued to migrate toward serving smaller and mid-sized corporate clients, where insurance is less commoditized and we can get closer to the insured and provide added value. We announced the acquisition of two companies in 2018 in support of this objective. McNeil & Co., which provides risk management services and insurance programs to businesses in the United States, was acquired in December. On January 1, 2019, we completed the acquisition of the commercial lines business of The Ardonagh Group in the U.K., including commercial property, casualty, motor, professional liability, personal accident and travel insurance.

Property casualty reinsurance: This segment represented 29% of the Company's premium volume in 2018 as net premiums written increased 16.9% to \$1.37 billion for the year. In 2018, as in 2017, our growth reflected increased writings of motor business in Europe and non-catastrophe exposed property coverages.

The profitability of our reinsurance segment improved in 2018, despite industry-wide overcapacity in most product lines and continued weak pricing in many lines. Average rate increases for property catastrophe reinsurance were positive, but below expectations during the January 2019 renewals. We remain agile in our approach to the reinsurance market, allowing us to deliver more solutions to our clients, more quickly than our competitors. We reduced our participation in large, commoditized risks and continue to seek attractive opportunities.

Mortgage insurance and reinsurance: Mortgage insurance and reinsurance was our most profitable segment in 2018 and represented 24% of the Company's premium volume. Net premiums written were \$1.16 billion for the year, increasing 4.2% from 2017, as we continued to allocate additional capital to this segment. The mortgage business remains very attractive because of desirable market conditions, the visibility and sustainability of its earnings and the low historical correlation of returns in mortgage insurance to returns in property casualty insurance and reinsurance. As a result, we continued to grow our mortgage insurance in force (the aggregate dollar amount of each insured mortgage loan's current principal balance) to \$384 billion at the end of 2018, from \$352 billion a year earlier. Insurance in force represents a source of future income as insurance premiums are typically paid monthly over the period of coverage.

We are an innovator in mortgage credit risk, as demonstrated by our 2018 launch of Arch Mortgage Risk Transfer. This unit is engaged in pilot programs to accept mortgage-related risks from both Fannie Mae and Freddie Mac and arrange the transfer of that risk to a panel of approved reinsurance capital providers. The goal is to attract a diversified and robust capital base to the U.S. housing market and, in doing so, support market stability through economic cycles.

Managing Third-Party Capital

We have been intentionally building a third-party management capability—that is, using our underwriting platform to generate income by managing risk for others. Insurers and reinsurers are evolving from being risk takers exclusively toward newer models where they manage risk for others or utilize pass-through entities to keep some risk on their balance sheets and pass along the rest to the capital markets.

We have had great success in our mortgage insurance segment by sharing risk with the capital markets through a series of mortgage insurance-linked securities transactions issued through the Bellemeade special purpose vehicle, including three transactions in 2018. Since the inception of the program, these Bellemeade transactions have raised nearly \$2.5 billion of reinsurance protection for loans representing over \$220 billion of unpaid principal balance.

Other examples include our ownership position in Premia Holdings Ltd., formed in 2017 to provide runoff solutions for property casualty insurance and reinsurance companies, and our multi-year agreement in 2018 with a major European reinsurer to provide mortgage credit assessment and underwriting advisory services related to that company's involvement in credit risk transfer programs offered by Fannie Mae and Freddie Mac.

Strong Balance Sheet

The Company has a healthy, liquid balance sheet with a 22.5% ratio of debt and hybrids to total capital at the end of 2018, down from 26.4% a year earlier, as we repaid the remaining balance of our revolving line of credit. A strong capital position underpins our ability to write insurance, serve clients and quickly adapt to business opportunities as they arise.

We have consistently maintained that we are stewards of the capital entrusted to us and seek to create value for shareholders by deploying this capital profitably in the business. Whenever the Company has excess capital not needed in the business, we look to return the excess to Arch shareholders, its rightful owners. One way we do so is by repurchasing Arch common shares in the open market. In 2018, we repurchased 10.6 million shares for a total of \$282.8 million, or an average price of \$26.78 per share. At year-end, \$163.7 million was available for share repurchases under the Board of Directors' authorization.

Arch People

Our success in the highly competitive world of insurance and reinsurance depends on an ability to attract and retain talented people who fit well with our culture of teamwork, accountability and innovation; provide opportunities for them to develop their skills and advance in their careers; and reward them well for long-term performance. We pride ourselves on our deep pool of skilled, motivated people and our track record of promoting from within.

Corporate

In May 2018, François Morin was named Executive Vice President and Chief Financial Officer. François has nearly 30 years of experience in the insurance industry and joined Arch in 2011, serving most recently as Senior Vice President, Chief Risk Officer and Chief Actuary.

More recently, Janice Englesbe joined Arch as Senior Vice President, Chief Risk Officer, succeeding François in that position. She has more than 25 years of experience in risk management in the property casualty industry.

Mortgage Insurance

In March 2019, we announced strategic leadership changes to the Global Mortgage Group. Andrew Rippert was named Arch's first Chief Innovation and Strategic Investment Officer. Andrew joined Arch in 2010 and most recently served as Chief Executive Officer of the Global Mortgage Group. In this newly created role, he will be responsible for pursuing innovative business models and developing a pipeline of creative products, services and untapped markets to deliver future revenue streams across all business lines.

David Gansberg succeeds Andrew as Chief Executive Officer, Global Mortgage Group. David joined Arch in 2001 and held several roles in the Reinsurance Group before becoming the President and Chief Executive Officer of Arch Mortgage Insurance Company ("Arch MI") in 2014.

Michael Schmeiser was named President and Chief Executive Officer of Arch MI, reporting to David Gansberg. Michael joined Arch in 2017 following Arch's acquisition of United Guaranty. Most recently, he has served as Chief Strategy Officer of the Global Mortgage Group, reporting to Andrew Rippert.

Insurance

During the year, we announced several leadership team promotions in our Insurance Group. Matt Shulman assumed the newly created role of Chief Executive Officer, Arch Insurance North America, heading our property casualty insurance operations in the United States and Canada. Matt joined Arch in 2009 and had served as President and Chief Executive Officer of Arch Insurance Europe since 2016.

Additionally, Arch Insurance North America established a new organizational structure with three Chief Underwriting Officers ("CUOs") reporting to Matt Shulman. These CUOs provide strategic, dedicated oversight of their business units, allowing Arch to provide more flexible, comprehensive solutions. The three CUOs are:

Brian First as CUO—Programs, Property and Specialty. This encompasses A&H/Travel, Alternative Markets, Contract Binding, E&S Casualty, Property & Casualty Programs and Property. Brian joined Arch in 2014 and most recently served as Executive Vice President, Property & Casualty Programs and Alternative Markets.

John Rafferty as CUO—Financial and Professional Lines. This includes Executive Assurance, Professional Liability and Healthcare. John joined Arch in 2009 and was previously Executive Vice President, Executive Assurance and Business Unit Management.

Rich Stock as CUO—Large Account Casualty and Surety. This encompasses Casualty, Construction, High Excess Workers' Compensation, Lenders, National Accounts and Surety. Rich joined Arch in 2005 and served as Executive Vice President, Construction, National Accounts and Excess Workers' Compensation prior to assuming the CUO role.

Mark Lange was promoted to Executive Vice President, Strategy and Distribution, for Arch Insurance Group's North American operations. He joined Arch in 2015 as Senior Vice President of the Property & Casualty Programs business.

Hugh Sturgess was promoted to Chief Executive Officer, Arch Insurance International, leading our property casualty insurance operations in Europe, Bermuda and Australia. He has been with the Company since 2005, serving most recently as President and Chief Executive Officer of Arch Insurance Canada Ltd.

John Mentz, President of Arch Insurance North America, took on additional responsibilities as Arch Insurance Worldwide Chief Operating Officer. He oversees various corporate functions including finance, actuarial, operations and ceded reinsurance and, in his expanded role, is extending our best practices to our property casualty insurance operations globally. John has been with Arch since 2002.

Board of Directors

We are pleased to note the election of Laurie S. Goodman to the Arch Board of Directors at the Annual Meeting of Shareholders in May. Laurie is the founder and Co-Director of the nonprofit Housing Finance Policy Center at the Urban Institute. She brings a wealth of insight and experience to our Board, not only in her current work at the Urban Institute, which she joined in 2013, but also in three prior decades at Wall Street firms.

Yiorgos Lillikas, a member of our Board since 2010, has elected not to stand for re-election at the 2019 annual meeting because of new professional responsibilities. We appreciate his involvement as a member of our Board and thank him for his contributions to the Company.

Summary

Taken together, 2017 and 2018 produced extreme property casualty insured losses. Despite these challenging market conditions, we grew our book value per share for the 10th consecutive year and generated increased earnings in 2018 through the diversity of our product lines and our ability to allocate capital to the best opportunities.

Five values help distinguish what Arch is and what it stands for: work hard and smart to serve all of our stakeholders; embrace the power of teamwork; continually pursue innovation and improvement; exhibit honesty and integrity in all we do; and strive to make a difference in our communities. With our culture of innovation and excellence, and our proven history of underwriting discipline across a diverse portfolio of businesses, we remain confident in the Company's future.

We thank Arch employees for their dedication to the Company and their indispensable contributions to its success. We thank our agents and brokers for their ongoing support, and our customers for choosing to do business with us. We recognize that our customers have other choices and it is incumbent upon us to continue to serve their needs with the highest quality decisions, products and experiences. And we thank you, our investors, for the trust you have placed in us through your ownership of our stock.



Constantine "Dinos" Iordanou
Chairman



Marc Grandisson
President and Chief Executive Officer

March 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

- ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
OR
 TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the Fiscal Year Ended December 31, 2018 Commission File No. 001-16209



ARCH CAPITAL GROUP LTD.
(Exact name of registrant as specified in its charter)

Bermuda **Not applicable**
(State or other jurisdiction of incorporation or organization) (I.R.S. Employer Identification No.)

Waterloo House, Ground Floor
100 Pitts Bay Road, Pembroke HM 08, Bermuda **(441) 278-9250**
(Address of principal executive offices) (Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Exchange Act:

<u>Title of each class</u>	<u>Name of each exchange on which registered</u>
Common Shares, \$0.0011 par value per share	NASDAQ Stock Market (Common Shares)
5.25% Non-Cumulative Preferred Shares, Series E, \$0.01 par value per share	NASDAQ Stock Market
5.45% Non-Cumulative Preferred Shares, Series F, \$0.01 par value per share	NASDAQ Stock Market

Securities registered pursuant to Section 12(g) of the Exchange Act: **None**

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act.
Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Exchange Act during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated Filer Accelerated Filer Non-accelerated Filer Smaller reporting company Emerging Growth Company

If an emerging growth company, indicate by check mark if the Registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

The aggregate market value of the voting and non-voting common equity held by non-affiliates, computed by reference to the closing price as reported by the NASDAQ Stock Market as of the last business day of the Registrant's most recently completed second fiscal quarter, was approximately \$10.3 billion.

As of February 25, 2019, there were 402,529,670 of the registrant's common shares outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of Part III and Part IV incorporate by reference our definitive proxy statement for the 2019 annual meeting of shareholders to be filed with the Securities and Exchange Commission pursuant to Regulation 14A before May 1, 2019.

ARCH CAPITAL GROUP LTD.
TABLE OF CONTENTS

<u>Item</u>		<u>Page</u>
PART I		
ITEM 1.	BUSINESS	4
ITEM 1A.	RISK FACTORS	32
ITEM 1B.	UNRESOLVED STAFF COMMENTS	51
ITEM 2.	PROPERTIES	51
ITEM 3.	LEGAL PROCEEDINGS	52
ITEM 4.	MINE SAFETY DISCLOSURES	52
PART II		
ITEM 5.	MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES	52
ITEM 6.	SELECTED FINANCIAL DATA	54
ITEM 7.	MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS	56
ITEM 7A.	QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK	92
ITEM 8.	FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA	93
ITEM 9.	CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE	176
ITEM 9A.	CONTROLS AND PROCEDURES	176
ITEM 9B.	OTHER INFORMATION	177
PART III		
ITEM 10.	DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE	177
ITEM 11.	EXECUTIVE COMPENSATION	178
ITEM 12.	SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS	178
ITEM 13.	CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE	179
ITEM 14.	PRINCIPAL ACCOUNTANT FEES AND SERVICES	179
PART IV		
ITEM 15.	EXHIBITS AND FINANCIAL STATEMENT SCHEDULES	179
ITEM 16.	FORM 10-K SUMMARY	188

Cautionary Note Regarding Forward-Looking Statements

The Private Securities Litigation Reform Act of 1995 (“PSLRA”) provides a “safe harbor” for forward-looking statements. This report or any other written or oral statements made by or on behalf of us may include forward-looking statements, which reflect our current views with respect to future events and financial performance. All statements other than statements of historical fact included in or incorporated by reference in this report are forward-looking statements. Forward-looking statements, for purposes of the PSLRA or otherwise, can generally be identified by the use of forward-looking terminology such as “may,” “will,” “expect,” “intend,” “estimate,” “anticipate,” “believe” or “continue” and similar statements of a future or forward-looking nature or their negative or variations or similar terminology.

Forward-looking statements involve our current assessment of risks and uncertainties. Actual events and results may differ materially from those expressed or implied in these statements. Important factors that could cause actual events or results to differ materially from those indicated in such statements are discussed below, elsewhere in this report and in our periodic reports filed with the Securities and Exchange Commission (“SEC”), and include:

- our ability to successfully implement our business strategy during “soft” as well as “hard” markets;
- acceptance of our business strategy, security and financial condition by rating agencies and regulators, as well as by brokers and our insureds and reinsureds;
- the integration of any businesses we have acquired or may acquire into our existing operations;
- our ability to maintain or improve our ratings, which may be affected by our ability to raise additional equity or debt financings, by ratings agencies’ existing or new policies and practices, as well as other factors described herein;
- general economic and market conditions (including inflation, interest rates, unemployment, housing prices, foreign currency exchange rates, prevailing credit terms and the depth and duration of a recession) and conditions specific to the reinsurance and insurance markets (including the length and magnitude of the current “soft” market) in which we operate;
- competition, including increased competition, on the basis of pricing, capacity (including alternative sources of capital), coverage terms, or other factors;
- developments in the world’s financial and capital markets and our access to such markets;
- our ability to successfully enhance, integrate and maintain operating procedures (including information technology) to effectively support our current and new business;
- the loss of key personnel;
- accuracy of those estimates and judgments utilized in the preparation of our financial statements, including those related to revenue recognition, insurance and other reserves, reinsurance recoverables, investment valuations, intangible assets, bad debts, income taxes, contingencies and litigation, and any determination to use the deposit method of accounting, which for a relatively new insurance and reinsurance company, like our company, are even more difficult to make than those made in a mature company since relatively limited historical information has been reported to us through December 31, 2018;
- greater than expected loss ratios on business written by us and adverse development on claim and/or claim expense liabilities related to business written by our insurance and reinsurance subsidiaries;
- severity and/or frequency of losses;
- claims for natural or man-made catastrophic events or severe economic events in our insurance, reinsurance and mortgage businesses could cause large losses and substantial volatility in our results of operations;
- the effect of climate change on our business;
- acts of terrorism, political unrest and other hostilities or other unforecasted and unpredictable events;
- availability to us of reinsurance to manage our gross and net exposures and the cost of such reinsurance;
- the failure of reinsurers, managing general agents, third party administrators or others to meet their obligations to us;
- the timing of loss payments being faster or the receipt of reinsurance recoverables being slower than anticipated by us;
- our investment performance, including legislative or regulatory developments that may adversely affect the fair value of our investments;

- changes in general economic conditions, including new or continued sovereign debt concerns in Eurozone countries or downgrades of U.S. securities by credit rating agencies, which could affect our business, financial condition and results of operations;
- the volatility of our shareholders' equity from foreign currency fluctuations, which could increase due to us not matching portions of our projected liabilities in foreign currencies with investments in the same currencies;
- changes in accounting principles or policies or in our application of such accounting principles or policies;
- changes in the political environment of certain countries in which we operate or underwrite business;
- a disruption caused by cyber-attacks or other technology breaches or failures on us or our business partners and service providers, which could negatively impact our business and/or expose us to litigation;
- statutory or regulatory developments, including as to tax matters and insurance and other regulatory matters such as the adoption of proposed legislation that would affect Bermuda-headquartered companies and/or Bermuda-based insurers or reinsurers and/or changes in regulations or tax laws applicable to us, our subsidiaries, brokers or customers, including the recently enacted Tax Cuts and Jobs Act of 2017; and
- the other matters set forth under Item 1A "Risk Factors," Item 7 "Management's Discussion and Analysis of Financial Condition and Results of Operations" and other sections of this Annual Report on Form 10-K, as well as the other factors set forth in Arch Capital Group Ltd.'s other documents on file with the SEC, and management's response to any of the aforementioned factors.

All subsequent written and oral forward-looking statements attributable to us or persons acting on our behalf are expressly qualified in their entirety by these cautionary statements. The foregoing review of important factors should not be construed as exhaustive and should be read in conjunction with other cautionary statements that are included herein or elsewhere. We undertake no obligation to publicly update or revise any forward-looking statement, whether as a result of new information, future events or otherwise.

PART I

ITEM 1. BUSINESS

As used in this report, references to “we,” “us,” “our,” “Arch” or the “Company” refer to the consolidated operations of Arch Capital Group Ltd. (“Arch Capital”) and its subsidiaries. Tabular amounts are in U.S. Dollars in thousands, except share amounts, unless otherwise noted. We refer you to Item 1A “Risk Factors” for a discussion of risk factors relating to our business.

OUR COMPANY

General

Arch Capital, a Bermuda public limited liability company with \$11.17 billion in capital at December 31, 2018, provides insurance, reinsurance and mortgage insurance on a worldwide basis through its wholly owned subsidiaries. While we are positioned to provide a full range of property, casualty and mortgage insurance and reinsurance lines, we focus on writing specialty lines of insurance and reinsurance. For 2018, we wrote \$5.35 billion of net premiums and reported net income available to Arch common shareholders of \$713.6 million. Book value per share was \$21.52 at December 31, 2018, compared to \$20.30 per share at December 31, 2017.

Arch Capital’s registered office is located at Clarendon House, 2 Church Street, Hamilton HM 11, Bermuda (telephone number: (441) 295-1422), and its principal executive offices are located at Waterloo House, Ground Floor, 100 Pitts Bay Road, Pembroke HM 08, Bermuda (telephone number: (441) 278-9250). Arch Capital makes available free of charge through its website, located at www.archcapgroup.com, its annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and all amendments to those reports as soon as reasonably practicable after such material is electronically filed with, or furnished to, the SEC. The SEC maintains an Internet site that contains reports, proxy and information statements, and other information regarding issuers that file electronically with the SEC (such as Arch Capital) and the address of that site is www.sec.gov.

Our History

Arch Capital was formed in September 2000 and became the sole shareholder of Arch Capital Group (U.S.) Inc. (“Arch-U.S.”) pursuant to an internal reorganization transaction completed in November 2000. In October 2001, Arch Capital launched an underwriting initiative to meet current and future demand in the global insurance and reinsurance markets that included the recruitment of new management teams and an equity capital infusion of \$763.2 million. Since that time, we

have attracted a proven management team with extensive industry experience and enhanced our existing global underwriting platform for our insurance and reinsurance businesses. It is our belief that our underwriting platform, our experienced management team and our strong capital base that is unencumbered by significant pre-2002 risks have enabled us to establish a strong presence in the global insurance and reinsurance markets.

Prior to the 2001 underwriting initiative, our insurance underwriting platform consisted of Arch Insurance (Bermuda), a division of Arch Reinsurance Ltd. (“Arch Re Bermuda”), our Bermuda-based reinsurer and insurer, and our U.S.-licensed insurers, Arch Insurance Company (“Arch Insurance”), Arch Excess & Surplus Insurance Company (“Arch E&S”), Arch Specialty Insurance Company (“Arch Specialty”) and Arch Indemnity Insurance Company (“Arch Indemnity”). We established Arch Insurance Company (Europe) Limited (“Arch Insurance Company Europe”), our United Kingdom-based subsidiary, in 2004, and we expanded our North American presence when Arch Insurance opened a branch office in Canada in 2005. In 2013, Arch Insurance Canada Ltd. (“Arch Insurance Canada”), a Canada domestic company, commenced operations and replaced the branch office. In 2009, we established a managing agent and syndicate 2012 (“Arch Syndicate 2012”) at Lloyd’s of London (“Lloyd’s”). In December 2018, we completed the acquisition of McNeil & Company, Inc. (“McNeil”), a U.S. nationwide leader in specialized risk management and program administration headquartered in Cortland, New York. In addition, we acquired U.K. commercial lines business from Ardonagh Group in January 2019. See “Operations—Insurance Operations” for further details on our insurance operations.

Prior to the 2001 underwriting initiative, our reinsurance underwriting platform consisted of Arch Re Bermuda and Arch Reinsurance Company (“Arch Re U.S.”), our U.S.-licensed reinsurer. Our reinsurance operations in Europe began in 2006 with the formation of a Swiss branch of Arch Re Bermuda, and the formation of a Danish underwriting agency in 2007. In addition to the U.S. reinsurance treaty activities of Arch Re U.S., we launched our property facultative reinsurance underwriting operations in 2007, which underwrite in the U.S., Canada and Europe. In 2008, we formed Arch Reinsurance Europe Designated Activity Company (“Arch Re Europe”), our Ireland-based reinsurance company, which replaced the Swiss branch. We launched treaty operations in Canada in 2011 and the following year we acquired the credit and surety reinsurance operations of Ariel Reinsurance Company Ltd. In 2015, we

obtained complete ownership and effective control of Gulf Reinsurance Limited (“Gulf Re”), previously a joint venture. See “Operations—Reinsurance Operations” for further details on our reinsurance operations.

Our mortgage operations include U.S. and international mortgage insurance and reinsurance operations as well as participation in government sponsored enterprise (“GSE”) credit risk sharing transactions. Our mortgage platform was built through the acquisition of CMG Mortgage Insurance Company in 2014 (subsequently renamed Arch Mortgage Insurance Company) and further expanded through the acquisition of United Guaranty Corporation (“UGC”) (including United Guaranty Residential Insurance Company), from American International Group, Inc. (“AIG”), which closed at the end of 2016. In 2017, we completed the acquisition of AIG United Guaranty Insurance (Asia) Limited (renamed “Arch MI Asia Limited”) from AIG.

Our U.S. primary mortgage operations provide mortgage insurance products and services to the U.S. market. These operations include providers that are also approved as eligible mortgage insurers by Federal National Mortgage Association (“Fannie Mae”) and Federal Home Loan Mortgage Corporation (“Freddie Mac”), each a GSE. Arch Mortgage Insurance Designated Activity Company (“Arch MI Europe”), provides mortgage insurance products and services to the European market. In January 2019, Arch LMI Pty Ltd (“Arch LMI”) was authorized by the Australian Prudential Regulation Authority (“APRA”) to write lenders’ mortgage insurance on a direct basis in Australia.

The mortgage operations also include participation in GSE credit risk-sharing transactions and direct mortgage insurance to U.S. mortgage lenders with respect to mortgages that lenders intend to retain in portfolio or include in non-agency securitizations along with mortgage reinsurance for the U.S. and Australian markets. See “Operations—Mortgage Operations” for further details on our mortgage operations.

In 2014 we acquired approximately 11% of Watford Holdings Ltd. Watford Holdings Ltd. is the parent of Watford Re Ltd., a multi-line Bermuda reinsurance company (together with Watford Holdings Ltd., “Watford Re”). In 2017, we acquired approximately 25% of Premia Holdings Ltd. Premia Holdings Ltd. is the parent of Premia Reinsurance Ltd., a multi-line Bermuda reinsurance company (together with Premia Holdings Ltd., “Premia Re”). See “Operations—Other Operations” for further details on Watford Re and Premia Re.

The board of directors of Arch Capital (the “Board”) has authorized the investment in Arch Capital’s common shares through a share repurchase program. Repurchases under the share repurchase program may be effected from time to time in open market or privately negotiated transactions through December 31, 2019. Since the inception of the share repurchase

program in February 2007 through December 31, 2018, Arch Capital has repurchased 386.2 million common shares for an aggregate purchase price of \$3.97 billion. At December 31, 2018, the total remaining authorization under the share repurchase program was \$163.7 million.

OPERATIONS

We classify our businesses into three underwriting segments — insurance, reinsurance and mortgage — and two other operating segments — ‘other’ and corporate (non-underwriting). For an analysis of our underwriting results by segment, see note 4, “Segment Information,” to our consolidated financial statements in Item 8 and “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Results of Operations.”

Insurance Operations

Our insurance operations are conducted in Bermuda, the United States, Europe, Canada, and Australia. Our insurance operations in Bermuda are conducted through Arch Insurance (Bermuda), a division of Arch Re Bermuda, and Alternative Re Limited.

In the U.S., our insurance group’s principal insurance subsidiaries are Arch Insurance, Arch Specialty, Arch Indemnity and Arch E&S. Arch Insurance is an admitted insurer in 50 states, the District of Columbia, Puerto Rico, the U.S. Virgin Islands and Guam. Arch Specialty is an approved excess and surplus lines insurer in 49 states, the District of Columbia, Puerto Rico and the U.S. Virgin Islands and an authorized insurer in one state. Arch Indemnity is an admitted insurer in 49 states and the District of Columbia. Arch E&S, which is not currently writing business, is an approved excess and surplus lines insurer in 47 states and the District of Columbia and an authorized insurer in one state. The headquarters for our insurance group’s U.S. support operations (excluding underwriting units) is in Jersey City, New Jersey. The insurance group has offices throughout the U.S., including five regional offices located in Alpharetta, Georgia, Chicago, Illinois, New York, New York, San Francisco, California and Dallas, Texas and additional branch offices. In December 2018, the U.S. insurance operations acquired McNeil, based in Cortland, New York, which provides specialized risk management and program administration.

Our insurance operations in Canada are conducted through Arch Insurance Canada, a Canada domestic company which is authorized in all Canadian provinces and territories. Arch Insurance Canada is headquartered in Toronto, Ontario. Our insurance operations in Europe are conducted on two platforms, Arch Insurance Company Europe and Arch Syndicate 2012 (the U.K. insurance operations are collectively referred to as “Arch Insurance Europe”). Arch Insurance Europe conducts its

operations from London, England. Arch Insurance Company Europe is eligible by virtue of the U.S. Nonadmitted and Reinsurance Reform Act of 2010 (“NRRA”) as an excess and surplus lines insurer in 50 states, the District of Columbia, the U.S. Virgin Islands, Guam, the Northern Mariana Islands and American Samoa. Arch Insurance Company Europe also has branches in Germany, Italy, Spain and Denmark. In January 2019, Arch Insurance Europe operations expanded to include the Arch U.K. Regional Division, which underwrites the U.K. commercial lines acquired from the Ardonagh Group.

Arch Underwriting at Lloyd’s Ltd (“AUAL”) is the managing agent of Arch Syndicate 2012 and is responsible for the daily management of Arch Syndicate 2012. Arch Syndicate 2012 provides access to Lloyd’s extensive distribution network and worldwide licenses. Arch Underwriting at Lloyd’s (Australia) Pty Ltd, based in Sydney, Australia, is a Lloyd’s services company which underwrites exclusively for Arch Syndicate 2012. Arch Underwriting Agency (Australia) Pty. Ltd. is an Australian agency which also underwrites for Arch Syndicate 2012 and third parties.

Strategy. Our insurance group’s strategy is to operate in lines of business in which underwriting expertise can make a meaningful difference in operating results. The insurance group focuses on talent-intensive rather than labor-intensive business and seeks to operate profitably (on both a gross and net basis) across all of its product lines. To achieve these objectives, our insurance group’s operating principles are to:

- *Capitalize on profitable underwriting opportunities.* Our insurance group believes that its experienced management and underwriting teams are positioned to locate and identify business with attractive risk/reward characteristics. As profitable underwriting opportunities are identified, our insurance group will continue to seek to make additions to its product portfolio in order to take advantage of market trends. This includes adding underwriting and other professionals with specific expertise in specialty lines of insurance.
- *Centralize responsibility for underwriting.* Our insurance group consists of a range of product lines. The underwriting executive in charge of each product line oversees all aspects of the underwriting product development process within such product line. Our insurance group believes that centralizing the control of such product line with the respective underwriting executive allows for close management of underwriting and creates clear accountability for results. Our U.S. insurance group has four regional offices, and the executive in charge of each region is primarily responsible for all aspects of the marketing and distribution of our insurance group’s products, including the management of broker and other producer relationships in such executive’s respective region. In our non-U.S. offices, a similar philosophy is

observed, with responsibility for the management of each product line residing with the senior underwriting executive in charge of such product line.

- *Maintain a disciplined underwriting philosophy.* Our insurance group’s underwriting philosophy is to generate an underwriting profit through prudent risk selection and proper pricing. Our insurance group believes that the key to this approach is adherence to uniform underwriting standards across all types of business. Our insurance group’s senior management closely monitors the underwriting process.
- *Focus on providing superior claims management.* Our insurance group believes that claims handling is an integral component of credibility in the market for insurance products. Therefore, our insurance group believes that its ability to handle claims expeditiously and satisfactorily is a key to its success. Our insurance group employs experienced claims professionals and also utilizes experienced external claims managers (third party administrators) where appropriate.
- *Promote and utilize an efficient distribution system.* Our insurance group believes that promoting and utilizing a multi-channel distribution system, provides efficient access to its broad customer base. Our insurance group works with select international, national and regional retail and wholesale brokers and leading managing general agencies, including McNeil, to distribute our insurance products.
- *Grow strategic partnerships in stable and niche areas.* Our insurance group aims to build more integrated long-term alignment with strategic partners offering superior access to niche opportunities, quality scalable businesses, or lines with reliable defensive qualities.

Our insurance group writes business on both an admitted and non-admitted basis. Our insurance group focuses on the following areas:

- *Construction and national accounts:* primary and excess casualty coverages to middle and large accounts in the construction industry and a wide range of products for middle and large national accounts, specializing in loss sensitive primary casualty insurance programs (including large deductible, self-insured retention and retrospectively rated programs).
- *Excess and surplus casualty:* primary and excess casualty insurance coverages, including middle market energy business, and contract binding, which primarily provides casualty coverage through a network of appointed agents to small and medium risks.
- *Lenders products:* collateral protection, debt cancellation and service contract reimbursement products to banks,

credit unions, automotive dealerships and original equipment manufacturers and other specialty programs that pertain to automotive lending and leasing.

- *Professional lines:* directors' and officers' liability, errors and omissions liability, employment practices liability, fiduciary liability, crime, professional indemnity and other financial related coverages for corporate, private equity, venture capital, real estate investment trust, limited partnership, financial institution and not-for-profit clients of all sizes and medical professional and general liability insurance coverages for the healthcare industry. The business is predominately written on a claims-made basis.
- *Programs:* primarily package policies, underwriting workers' compensation and umbrella liability business in support of desirable package programs, targeting program managers with unique expertise and niche products offering general liability, commercial automobile, inland marine and property business with minimal catastrophe exposure.
- *Property, energy, marine and aviation:* primary and excess general property insurance coverages, including catastrophe-exposed property coverage, for commercial clients. Coverages for marine include hull, war, specie and liability. Aviation and stand-alone terrorism are also offered.
- *Travel, accident and health:* specialty travel and accident and related insurance products for individual, group travelers, travel agents and suppliers, as well as accident and health, which provides accident, disability and medical plan insurance coverages for employer groups, medical plan members, students and other participant groups.
- *Other:* includes alternative market risks (including captive insurance programs), excess workers' compensation and employer's liability insurance coverages for qualified self-insured groups, associations and trusts, statutory Defense Base Act workers compensation and employers liability, and contract and commercial surety coverages, including contract bonds (payment and performance bonds) primarily for medium and large contractors and commercial surety bonds for Fortune 1000 companies and smaller transaction business programs.

Underwriting Philosophy. Our insurance group's underwriting philosophy is to generate an underwriting profit (on both a gross and net basis) through prudent risk selection and proper pricing across all types of business. One key to this philosophy is the adherence to uniform underwriting standards across each product line that focuses on the following:

- risk selection;
- desired attachment point;
- limits and retention management;

- due diligence, including financial condition, claims history, management, and product, class and territorial exposure;
- underwriting authority and appropriate approvals; and
- collaborative decision making.

Marketing. Our insurance group's products are marketed principally through a group of licensed independent retail and wholesale brokers. Clients (insureds) are referred to our insurance group through a large number of international, national and regional brokers and captive managers who receive from the insured or insurer a set fee or brokerage commission usually equal to a percentage of gross premiums. In the past, our insurance group also entered into contingent commission arrangements with some brokers that provided for the payment of additional commissions based on volume or profitability of business. Currently, some of our contracts with brokers provide for additional commissions based on volume. We have also entered into service agreements with select international brokers that provide access to their proprietary industry analytics. In general, our insurance group has no implied or explicit commitments to accept business from any particular broker and neither brokers nor any other third parties have the authority to bind our insurance group, except in the case where underwriting authority may be delegated contractually to select program administrators. Such administrators are subject to a due diligence financial and operational review prior to any such delegation of authority and ongoing reviews and audits are carried out as deemed necessary by our insurance group to assure the continuing integrity of underwriting and related business operations. See "Risk Factors—Risks Relating to Our Company—We could be materially adversely affected to the extent that managing general agents, general agents and other producers exceed their underwriting authorities or if our agents, our insureds or other third parties commit fraud or otherwise breach obligations owed to us." For information on major brokers, see note 16, "Commitments and Contingencies—Concentrations of Credit Risk," to our consolidated financial statements in Item 8.

Risk Management and Reinsurance. In the normal course of business, our insurance group may cede a portion of its premium on a quota share or excess of loss basis through treaty or facultative reinsurance agreements. Reinsurance arrangements do not relieve our insurance group from its primary obligations to insureds. Reinsurance recoverables are recorded as assets, predicated on the reinsurers' ability to meet their obligations under the reinsurance agreements. If the reinsurers are unable to satisfy their obligations under the agreements, our insurance subsidiaries would be liable for such defaulted amounts. Our principal insurance subsidiaries, with oversight by a group-wide reinsurance steering committee ("RSC"), are selective with regard to reinsurers, seeking to place reinsurance with only those reinsurers which meet and maintain specific standards of established criteria for financial strength. The RSC evaluates

the financial viability of its reinsurers through financial analysis, research and review of rating agencies' reports and also monitors reinsurance recoverables and collateral with unauthorized reinsurers. The financial analysis includes ongoing qualitative and quantitative assessments of reinsurers, including a review of the financial stability, appropriate licensing, reputation, claims paying ability and underwriting philosophy of each reinsurer. Our insurance group will continue to evaluate its reinsurance requirements. See note 7, "Reinsurance," to our consolidated financial statements in Item 8.

For catastrophe-exposed insurance business, our insurance group seeks to limit the amount of exposure to catastrophic losses it assumes through a combination of managing aggregate limits, underwriting guidelines and reinsurance. For a discussion of our risk management policies, see "Management's Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Ceded Reinsurance" and "Risk Factors—Risks Relating to Our Industry—The failure of any of the loss limitation methods we employ could have a material adverse effect on our financial condition or results of operations."

Claims Management. Our insurance group's claims management function is performed by claims professionals, as well as experienced external claims managers (third party administrators), where appropriate. In addition to investigating, evaluating and resolving claims, members of our insurance group's claims departments work with underwriting professionals as functional teams in order to develop products and services desired by the group's clients.

Reinsurance Operations

Our reinsurance operations are conducted on a worldwide basis through our reinsurance subsidiaries, Arch Re Bermuda, Arch Re U.S. and Arch Re Europe. Arch Re Bermuda is a registered Class 4 insurer and long-term insurer and is headquartered in Hamilton, Bermuda. Arch Re U.S. is licensed or is an accredited or otherwise approved reinsurer in 50 states, the District of Columbia and Puerto Rico, the provinces of Ontario and Quebec in Canada with its principal U.S. offices in Morristown, New Jersey. Treaty operations in Canada are conducted through the Canadian branch of Arch Re U.S. ("Arch Re Canada"). Arch Re U.S. is also an admitted insurer in Guam. Our property facultative reinsurance operations are conducted primarily through Arch Re U.S. The property facultative reinsurance operations have offices throughout the U.S., Canada and in Europe. Arch Re Europe, licensed and authorized as a non-life reinsurer and a life reinsurer, is headquartered in Dublin, Ireland with branch offices in Zurich and London.

In February 2017, Arch Underwriters (Gulf) Limited ("Arch Underwriters Gulf") was licensed as an Insurance Manager by

the Dubai Financial Services Authority. Arch Underwriters Gulf is based in the Dubai International Financial Centre and provides underwriting, administrative and support services to Arch Re Bermuda and certain employees and certain administrative support services to Gulf Re.

Strategy. Our reinsurance group's strategy is to capitalize on our financial capacity, experienced management and operational flexibility to offer multiple products through our operations. The reinsurance group's operating principles are to:

- *Actively select and manage risks.* Our reinsurance group only underwrites business that meets certain profitability criteria, and it emphasizes disciplined underwriting over premium growth. To this end, our reinsurance group maintains centralized control over reinsurance underwriting guidelines and authorities.
- *Maintain flexibility and respond to changing market conditions.* Our reinsurance group's organizational structure and philosophy allows it to take advantage of increases or changes in demand or favorable pricing trends. Our reinsurance group believes that its existing platforms in Bermuda, the U.S., Europe, Dubai and Canada, broad underwriting expertise and substantial capital facilitate adjustments to its mix of business geographically and by line and type of coverage. Our reinsurance group believes that this flexibility allows it to participate in those market opportunities that provide the greatest potential for underwriting profitability.
- *Maintain a low cost structure.* Our reinsurance group believes that maintaining tight control over its staffing level and operating primarily as a broker market reinsurer permits it to maintain low operating costs relative to its capital and premiums.

Our reinsurance group writes business on both a proportional and non-proportional basis and writes both treaty and facultative business. In a proportional reinsurance arrangement (also known as pro rata reinsurance, quota share reinsurance or participating reinsurance), the reinsurer shares a proportional part of the original premiums and losses of the reinsured. The reinsurer pays the cedent a commission which is generally based on the cedent's cost of acquiring the business being reinsured (including commissions, premium taxes, assessments and miscellaneous administrative expenses) and may also include a profit factor. Non-proportional (or excess of loss) reinsurance indemnifies the reinsured against all or a specified portion of losses on underlying insurance policies in excess of a specified amount, which is called a "retention." Non-proportional business is written in layers and a reinsurer or group of reinsurers accepts a band of coverage up to a specified amount. The total coverage purchased by the cedent is referred to as a "program." Any liability exceeding the upper limit of the program reverts to the cedent.

The reinsurance group's treaty operations generally seek to write significant lines on less commoditized classes of coverage, such as specialty property and casualty reinsurance treaties. However, with respect to other classes of coverage, such as property catastrophe and casualty clash, the reinsurance group's treaty operations participate in a relatively large number of treaties where they believe that they can underwrite and process the business efficiently. The reinsurance group's property facultative operations write reinsurance on a facultative basis whereby they assume part of the risk under primarily single insurance contracts. Facultative reinsurance is typically purchased by ceding companies for individual risks not covered by their reinsurance treaties, for unusual risks or for amounts in excess of the limits on their reinsurance treaties.

Our reinsurance group focuses on the following areas:

- *Casualty*: provides coverage to ceding company clients on third party liability and workers' compensation exposures from ceding company clients, primarily on a treaty basis. Exposures include, among others, executive assurance, professional liability, workers' compensation, excess and umbrella liability, excess motor and healthcare business.
- *Marine and aviation*: provides coverage for energy, hull, cargo, specie, liability and transit, and aviation business, including airline and general aviation risks. Business written may also include space business, which includes coverages for satellite assembly, launch and operation for commercial space programs.
- *Other specialty*: provides coverage to ceding company clients for proportional motor and other lines, including surety, accident and health, workers' compensation catastrophe, agriculture, trade credit and political risk.
- *Property catastrophe*: provides protection for most catastrophic losses that are covered in the underlying policies written by reinsureds, including hurricane, earthquake, flood, tornado, hail and fire, and coverage for other perils on a case-by-case basis. Property catastrophe reinsurance provides coverage on an excess of loss basis when aggregate losses and loss adjustment expense from a single occurrence or aggregation of losses from a covered peril exceed the retention specified in the contract.
- *Property excluding property catastrophe*: provides coverage for both personal lines and commercial property exposures and principally covers buildings, structures, equipment and contents. The primary perils in this business include fire, explosion, collapse, riot, vandalism, wind, tornado, flood and earthquake. Business is assumed on both a proportional and excess of loss basis. In addition, facultative business is written which focuses on individual commercial property risks on an excess of loss basis.
- *Other*: includes life reinsurance business on both a proportional and non-proportional basis, casualty clash

business and, in limited instances, non-traditional business which is intended to provide insurers with risk management solutions that complement traditional reinsurance.

Underwriting Philosophy. Our reinsurance group employs a disciplined, analytical approach to underwriting reinsurance risks that is designed to specify an adequate premium for a given exposure commensurate with the amount of capital it anticipates placing at risk. A number of our reinsurance group's underwriters are also actuaries. It is our reinsurance group's belief that employing actuaries on the front-end of the underwriting process gives it an advantage in evaluating risks and constructing a high quality book of business.

As part of the underwriting process, our reinsurance group typically assesses a variety of factors, including:

- adequacy of underlying rates for a specific class of business and territory;
- the reputation of the proposed cedent and the likelihood of establishing a long-term relationship with the cedent, the geographic area in which the cedent does business, together with its catastrophe exposures, and our aggregate exposures in that area;
- historical loss data for the cedent and, where available, for the industry as a whole in the relevant regions, in order to compare the cedent's historical loss experience to industry averages;
- projections of future loss frequency and severity; and
- the perceived financial strength of the cedent.

Marketing. Our reinsurance group generally markets its reinsurance products through brokers, except our property facultative reinsurance group, which generally deals directly with the ceding companies. Brokers do not have the authority to bind our reinsurance group with respect to reinsurance agreements, nor does our reinsurance group commit in advance to accept any portion of the business that brokers submit to them. Our reinsurance group generally pays brokerage fees to brokers based on negotiated percentages of the premiums written through such brokers. For information on major brokers, see note 16, "Commitments and Contingencies—Concentrations of Credit Risk," to our consolidated financial statements in Item 8.

Risk Management and Retrocession. Our reinsurance group currently purchases a combination of per event excess of loss, per risk excess of loss, proportional retrocessional agreements and other structures that are available in the market. Such arrangements reduce the effect of individual or aggregate losses on, and in certain cases may also increase the underwriting capacity of, our reinsurance group. Our reinsurance group will continue to evaluate its retrocessional requirements based on

its net appetite for risk. See note 7, “Reinsurance,” to our consolidated financial statements in Item 8.

For catastrophe exposed reinsurance business, our reinsurance group seeks to limit the amount of exposure it assumes from any one reinsured and the amount of the aggregate exposure to catastrophe losses from a single event in any one geographic zone. For a discussion of our risk management policies, see “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Ceded Reinsurance” and “Risk Factors—Risks Relating to Our Industry—The failure of any of the loss limitation methods we employ could have a material adverse effect on our financial condition or results of operations.”

Claims Management. Claims management includes the receipt of initial loss reports, creation of claim files, determination of whether further investigation is required, establishment and adjustment of case reserves and payment of claims. Additionally, audits are conducted for both specific claims and overall claims procedures at the offices of selected ceding companies. Our reinsurance group makes use of outside consultants for claims work from time to time.

Mortgage Operations

Our mortgage operations provide U.S. and international mortgage insurance and reinsurance operations as well as participation in GSE credit risk-sharing transactions. Our mortgage group includes direct mortgage insurance in the U.S. primarily through Arch Mortgage Insurance Company and United Guaranty Residential Insurance Company (together, “Arch MI U.S.”); mortgage reinsurance primarily through Arch Re Bermuda to mortgage insurers on both a proportional and non-proportional basis globally; direct mortgage insurance in Europe through Arch MI Europe and in Hong Kong through Arch MI Asia Limited (“Arch MI Asia”); and participation in various GSE credit risk-sharing products primarily through Arch Re Bermuda.

In 2014 we completed the acquisition of CMG Mortgage Insurance Company from its owners, PMI Mortgage Insurance Co., (“PMI”) and CMFG Life Insurance Company (“CUNA Mutual”) and acquired PMI’s mortgage insurance platform and related assets. CMG Mortgage Insurance Company was renamed “Arch Mortgage Insurance Company” and entered the U.S. mortgage insurance marketplace. Arch Mortgage Insurance Company is licensed and operates in all 50 states, the District of Columbia and Puerto Rico.

On December 31, 2016, we completed the acquisition of UGC and its primary operating subsidiary, United Guaranty Residential Insurance Company, which is licensed and operates in all 50 states and the District of Columbia.

Arch Mortgage Insurance Company and United Guaranty Residential Insurance Company have each been approved as an eligible mortgage insurer by Fannie Mae and Freddie Mac, subject to maintaining certain ongoing requirements (“eligible mortgage insurer”). Arch Mortgage Guaranty Company offers direct mortgage insurance to U.S. mortgage lenders with respect to mortgages that lenders intend to retain in portfolio or include in non-agency securitizations. Arch Mortgage Guaranty Company, which is licensed in all 50 states and the District of Columbia, insures mortgages that are not intended to be sold to the GSEs, and it is therefore not approved by either GSE as an eligible mortgage insurer.

Arch MI Europe was licensed and authorized by the Central Bank of Ireland (“CBOI”) in 2011 to operate on a pan-European basis under the European Freedom of Services Act. Arch MI Europe is headquartered in Dublin, Ireland. Arch Underwriters Europe Limited (“Arch Underwriters Europe”), an Irish company authorized as an insurance and reinsurance intermediary by the CBOI, acts on behalf of Arch MI Europe and Arch Re Europe with branch offices in Italy, Switzerland, the U.K., and Finland. In 2017 we completed the acquisition of Arch MI Asia from AIG. On January 17, 2019, Arch LMI was authorized by APRA to write lenders’ mortgage insurance. Arch LMI is headquartered in Sydney, Australia and will focus on providing direct lenders’ mortgage insurance to the Australian market.

Strategy. The mortgage insurance market operates on a distinct underwriting cycle, with demand driven mainly by the housing market and general economic conditions. As a result, the creation of the mortgage group provides us with a more diverse revenue stream. Our mortgage group’s strategy is to capitalize on its financial capacity, mortgage insurance technology platform, operational flexibility and experienced management to offer mortgage insurance, reinsurance and other risk-sharing products in the U.S. and around the world.

Our mortgage group’s operating principles and goals are to:

- *Capitalize on profitable underwriting opportunities.* Our mortgage group believes that its experienced management, analytics and underwriting teams are positioned to identify and evaluate business with attractive risk/reward characteristics.
- *Maintain a disciplined credit risk philosophy.* Our mortgage group’s credit risk philosophy is to generate underwriting profit through disciplined credit risk analysis and proper pricing. Our mortgage group believes that the key to this approach is maintaining discipline across all phases of the applicable housing and mortgage lending cycles.
- *Provide superior and innovative mortgage products and services.* Our mortgage group believes that it can leverage

its financial capacity, experience across insurance product lines, and its analytics and technology to provide innovative products and superior service. The mortgage group believes that its delivery of tailored products that meet the specific, evolving needs of its customers will be a key to the group's success.

- *Maintain our position as a leading provider of U.S. mortgage insurance business.* Prior to our 2014 acquisition, Arch Mortgage Insurance Company was the leading provider of mortgage insurance products and services to credit unions in the U.S. We broadened our customer base into national and regional banks and mortgage originators while maintaining and increasing its share of the mortgage insurance credit union market. With the acquisition of UGC, a leading provider of mortgage insurance products and services to national and regional banks and mortgage originators, we are the leading provider of U.S. mortgage insurance.

Our mortgage group focuses on the following areas:

- *Direct mortgage insurance in the United States.* Under their monoline insurance licenses, each of Arch's eligible mortgage insurers may only offer private mortgage insurance covering first lien, one-to-four family residential mortgages. Nearly all of our mortgage insurance written provides first loss protection on loans originated by mortgage lenders and sold to the GSEs. Each GSE's Congressional charter generally prohibits it from purchasing a mortgage where the principal balance of the mortgage is in excess of 80% of the value of the property securing the mortgage unless the excess portion of the mortgage is protected against default by lender recourse, participation or by a qualified insurer. As a result, such "high loan-to-value mortgages" purchased by Fannie Mae or Freddie Mac generally are insured with private mortgage insurance.

Mortgage insurance protects the insured lender, investor or GSE against loss in the event of a borrower's default. If a borrower defaults on mortgage payments, private mortgage insurance reduces, and may eliminate, losses to the insured. Private mortgage insurance may also facilitate the sale of mortgage loans in the secondary mortgage market because of the credit enhancement it provides. Our primary U.S. mortgage insurance policies predominantly cover individual loans and are effective at the time the loan is originated. We also may enter into insurance transactions with lenders and investors, under which we insure a portfolio of loans at or after origination. Although not currently a significant product, we may offer mortgage insurance on a "pool" basis in the future. Under pool insurance, the mortgage insurer provides coverage on a group of specified loans, typically for 100% of all contractual or policy-defined losses on every loan in the

portfolio, subject to an agreed aggregate loss limit. Pool insurance may be in a first loss position with respect to loans that do not have primary mortgage insurance policies, or it may be in a second loss position, covering losses in excess of those covered by the primary mortgage insurance policy.

- *Direct mortgage insurance in Europe and other countries where we identify profitable underwriting opportunities.* Since 2011, Arch MI Europe has offered mortgage insurance to European mortgage lenders. Arch MI Europe's mortgage insurance is primarily purchased by European mortgage lenders in order to reduce lenders' credit risk and regulatory capital requirements associated with the insured mortgages. In certain European countries, lenders purchase mortgage insurance to facilitate regulatory compliance with respect to high loan-to-value residential lending. Arch MI Europe offers mortgage insurance on both a "flow" basis to cover new originations and through structured transactions to cover one or more portfolios of previously originated residential loans. In addition, with our acquisition of Arch MI Asia in 2017 and regulatory approval of Arch LMI in January 2019, we are focused on expanding origination opportunities for lenders in Hong Kong and throughout Asia and Australia.
- *Reinsurance.* Arch Re Bermuda provides quota share reinsurance covering U.S. and international mortgages. Such amounts include a quota share reinsurance agreement with PMI pursuant to which it agreed to provide 100% quota share indemnity reinsurance to PMI for all certificates of insurance that were issued by PMI from January 1, 2009 through December 31, 2011 that were not in default as of an agreed upon effective date. Other than this quota share, no PMI legacy mortgage insurance exposures were assumed.
- *Other credit risk-sharing products.* In addition to providing traditional mortgage insurance and reinsurance, we offer various credit risk-sharing products to government agencies and mortgage lenders. The GSEs have reduced their exposure to mortgage risk and continue to shift more of it to the private sector, creating opportunities for insurers to assume additional mortgage risk. In 2013, Arch Re Bermuda became the first (re)insurance company to participate in Freddie Mac's program to transfer certain credit risk in its single-family portfolio to the private sector. Since that time, Arch Re Bermuda and its affiliates have regularly participated in both Fannie Mae and Freddie Mac risk sharing programs.

In 2017, we established Arch Mortgage Risk Transfer PCC Inc. ("Arch MRT") a District of Columbia based protected cell captive insurer, licensed by District of Columbia Department of Insurance, Securities and Banking as a mortgage insurer. Arch MRT issues direct mortgage insurance to the GSEs

through incorporated protected cells and cedes 100% of the risk to GSE approved reinsurers, including Arch Re U.S. Arch MRT entered into one pilot transaction with each of the GSEs in 2018.

In 2018 we established Arch Credit Risk Services Inc. (“ACRS”) and licensed it as a reinsurance intermediary in several states. ACRS offers mortgage credit assessment and underwriting advisory services with respect to participation in GSE credit risk transfer transactions.

Underwriting Philosophy. Our mortgage group believes in a disciplined, analytical approach to underwriting mortgage risks by utilizing proprietary and third party models, including forecasting delinquency and future home price movements with the goal of ensuring that premiums are adequate for the risk being insured. Experienced actuaries and statistical modelers are engaged in analytics to inform the underwriting process. As part of the underwriting process, our mortgage group typically assesses a variety of factors, including the:

- ability and willingness of the mortgage borrower to pay its obligations under the mortgage loan being insured;
- characteristics of the mortgage loan being insured and value of the collateral securing the mortgage loan;
- financial strength, quality of operations and reputation of the lender originating the mortgage loan;
- expected future home price movements which vary by geography;
- projections of future loss frequency and severity; and
- adequacy of premium rates.

Sales and Distribution. We employ a sales force located throughout the U.S. to directly sell mortgage insurance products and services to our customers, which include mortgage originators such as mortgage bankers, mortgage brokers, commercial banks, savings institutions, credit unions and community banks. Our largest single mortgage insurance customer (including branches and affiliates) accounted for 6.9% of our primary new insurance written during 2018 with no other customer accounting for greater than 3.4%. The percentage of our primary new insurance written generated by our top 10 customers was 25.2% in 2018. In Europe, Asia, Bermuda and Australia, our products and services are/or will be distributed on a direct basis and through brokers. Each country represents a unique set of opportunities and challenges that require knowledge of market conditions and client needs to develop effective solutions.

Risk Management. Exposure to mortgage risk is monitored globally and managed through underwriting guidelines, pricing, reinsurance, utilization of proprietary risk models, concentration limits and limits on net probable loss resulting from a severe economic downturn in the housing market. For

a discussion of our risk management policies, see “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Ceded Reinsurance” and “Risk Factors—Risks Relating to Our Industry—The failure of any of the loss limitation methods we employ could have a material adverse effect on our financial condition or results of operations.”

Our mortgage group has ceded a portion of its premium on a quota share basis through certain reinsurance agreements and through aggregate excess of loss reinsurance agreements which provide reinsurance coverage for delinquencies on portfolios of in-force policies issued between certain periods. See note 7, “Reinsurance,” to our consolidated financial statements in Item 8 for further details.

Reinsurance arrangements do not relieve our mortgage group from its primary obligations to insured parties. Reinsurance recoverables are recorded as assets, predicated on the reinsurers’ ability to meet their obligations under the reinsurance agreements. If the reinsurers are unable to satisfy their obligations under the agreements, our mortgage subsidiaries would be liable for such defaulted amounts. For our U.S. mortgage insurance business, in addition to utilizing reinsurance, we have developed a proprietary risk model that simulates the maximum loss resulting from severe economic events impacting the housing market. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Catastrophic Events and Severe Economic Events.”

Claims Management. With respect to our direct mortgage insurance business, the claims process generally begins with notification by the insured or servicer to us of a default on an insured loan. The insured is generally required to notify us of a default after the borrower becomes two consecutive monthly payments in default. Borrowers default for a variety of reasons, including a reduction of income, unemployment, divorce, illness, inability to manage credit, rising interest rate levels and declining home prices. Upon notice of a default, in certain cases we may coordinate with loan servicers to facilitate and enhance retention workouts on insured loans. Retention workouts include loan modifications and other loan repayment options, which may enable borrowers to cure mortgage defaults and retain ownership of their homes. If a retention workout is not viable for a borrower, our loss on a loan may be mitigated through a liquidation workout option, including a pre-foreclosure sale or a deed-in-lieu of foreclosure.

In the U.S., our master policies generally provide that within 60 days of the perfection of a primary insurance claim, we have the option of:

- paying the insurance coverage percentage specified in the certificate of insurance multiplied by the loss amount;

- in the event the property is sold pursuant to an approved prearranged sale, paying the lesser of (i) 100% of the loss amount less the proceeds of sale of the property, or (ii) the specified coverage percentage multiplied by the loss amount; or
- paying 100% of the loss amount in exchange for the insured's conveyance to us of good and marketable title to the property, with us then selling the property for our own account.

While we select the claim settlement option that best mitigates the amount of our claim payment, in the U.S. we generally pay the coverage percentage multiplied by the loss amount.

Other Operations

In 2014 we and HPS Investment Partners, LLC (formerly Highbridge Principal Strategies, LLC) ("HPS"), sponsored the formation of Watford Re. Arch Re Bermuda invested \$100.0 million and acquired 2,500,000 common shares, approximately 11%, of Watford Re and a warrant to purchase up to 975,503 additional common shares. Watford Re's strategy is to combine a diversified reinsurance and insurance business with a disciplined investment strategy comprised primarily of non-investment grade credit assets. Watford Re has its own management and board of directors and is responsible for the overall profitability of its results. Arch Re Bermuda has appointed two directors to serve on the nine person board of directors of Watford Re. We performed an analysis of Watford Re and concluded that Watford Re is a variable interest entity and that we are the primary beneficiary of Watford Re. As such, 100% of the results of Watford Re are included in our consolidated financial statements.

In 2017 we and Kelso & Company ("Kelso") sponsored the formation of Premia Re. Premia Re's strategy is to reinsure or acquire companies or reserve portfolios in the non-life property and casualty insurance and reinsurance run-off market. Arch Re Bermuda and certain Arch co-investors invested \$100.0 million and acquired approximately 25% of Premia Re as well as warrants to purchase additional common equity. Affiliates of Kelso invested \$300.0 million and acquired the balance of Premia Re as well as warrants to purchase additional common equity. Arch Re Bermuda is providing a 25% whole account quota share reinsurance treaty on business written by Premia Re, and subsidiaries of Arch Capital are providing certain administrative and support services to Premia Re, in each case pursuant to separate multi-year agreements. Arch Re Bermuda has appointed two directors to serve on the seven person board of directors of Premia Re.

Employees

As of February 15, 2019, Arch Capital and its subsidiaries employed approximately 3,642 full-time employees.

RESERVES

Reserve estimates are derived after extensive consultation with individual underwriters and claims professionals, actuarial analysis of the loss reserve development and comparison with industry benchmarks. Our reserves are established and reviewed by experienced internal actuaries. Generally, reserves are established without regard to whether we may subsequently contest the claim. We do not currently discount our loss reserves except for excess workers' compensation and employers' liability loss reserves in our insurance operations.

Reserves for losses and loss adjustment expenses ("Loss Reserves") represent estimates of what the insurer or reinsurer ultimately expects to pay on claims at a given time, based on facts and circumstances then known, and it is probable that the ultimate liability may exceed or be less than such estimates. Even actuarially sound methods can lead to subsequent adjustments to reserves that are both significant and irregular due to the nature of the risks written. Loss Reserves are inherently subject to uncertainty.

In establishing Loss Reserves, including loss adjustment expenses ("LAE"), we have made various assumptions relating to the pricing of our reinsurance contracts and insurance policies and have also considered available historical industry experience and current industry conditions. The timing and amounts of actual claim payments related to recorded reserves vary based on many factors including large individual losses and changes in the legal environment, as well as general market conditions. The ultimate amount of the claim payments could differ materially from our estimated amounts. Certain lines of business written by us, such as excess casualty, have loss experience characterized as low frequency and high severity. This may result in significant variability in loss payment patterns and, therefore, may impact the related asset/liability investment management process in order to be in a position, if necessary, to make these payments. See "Management's Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Reserves for Losses and Loss Adjustment Expenses."

Our initial reserving method to date has to a large extent been the expected loss method, which is commonly applied when limited loss experience exists. We select the initial expected loss and loss adjustment expense ratios based on information derived by our underwriters and actuaries during the initial pricing of the business, supplemented by industry data where appropriate. These ratios consider, among other things, rate changes and changes in terms and conditions that have been observed in the market. Any estimates and assumptions made as part of the reserving process could prove to be inaccurate due to several factors, including the fact that relatively limited historical information has been reported to us through

December 31, 2018. We employ a number of different reserving methods depending on the segment, the line of business, the availability of historical loss experience and the stability of that loss experience. Over time, we have given additional weight to our historical loss experience in our reserving process due to the continuing maturation of our reserves, and the increased availability and credibility of the historical experience.

For additional information regarding the key underlying movements in our losses and loss adjustment expenses by segment, see “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Results of Operations.”

The following table represents an analysis of consolidated losses and loss adjustment expenses and a reconciliation of the beginning and ending reserve for losses and loss adjustment expenses:

	Year Ended December 31,		
	2018	2017	2016
Loss Reserves at beginning of year	\$11,383,792	\$10,200,960	\$ 9,125,250
Unpaid losses and LAE recoverable	2,464,910	2,083,575	1,828,837
Net Loss Reserves at beginning of year	8,918,882	8,117,385	7,296,413
Net incurred losses and LAE relating to losses occurring in:			
Current year	3,162,818	3,205,428	2,455,563
Prior years	(272,712)	(237,982)	(269,964)
Total net incurred losses and LAE	2,890,106	2,967,446	2,185,599
Net Loss Reserves of acquired business (1)	—	—	551,096
Retroactive reinsurance transaction (2)	(420,404)	—	—
Foreign exchange losses (gains)	(143,414)	186,963	(102,367)
Net paid losses and LAE relating to losses occurring in:			
Current year	(524,048)	(505,424)	(445,700)
Prior years	(1,682,116)	(1,847,488)	(1,367,656)
Total net paid losses and LAE	(2,206,164)	(2,352,912)	(1,813,356)
Net Loss Reserves at end of year	9,039,006	8,918,882	8,117,385
Unpaid losses and LAE recoverable	2,814,291	2,464,910	2,083,575
Loss Reserves at end of year	<u>\$11,853,297</u>	<u>\$11,383,792</u>	<u>\$10,200,960</u>

(1) 2016 amount relates to our acquisition of UGC.

(2) During the 2018 second quarter a subsidiary of the Company entered into a retroactive reinsurance transaction with a third party reinsurer to reinsure runoff liabilities associated with certain discontinued U.S. specialty casualty and program exposures.

Unpaid and paid losses and loss adjustment expenses recoverable were approximately \$2.92 billion at December 31, 2018. We are subject to credit risk with respect to our reinsurance and retrocessions because the ceding of risk to reinsurers and retrocessionaires does not relieve us of our liability to the clients or companies we insure or reinsure. Our failure to establish adequate reinsurance or retrocessional arrangements or the failure of our existing reinsurance or retrocessional arrangements to protect us from overly

concentrated risk exposure could materially adversely affect our financial condition and results of operations. Although we monitor the financial condition of our reinsurers and retrocessionaires and attempt to place coverages only with substantial, financially sound carriers, we may not be successful in doing so.

INVESTMENTS

At December 31, 2018, total investable assets held by Arch were \$19.57 billion, excluding the \$2.76 billion included in the ‘other’ segment (*i.e.*, attributable to Watford Re). Our current investment guidelines and approach stress preservation of capital, market liquidity and diversification of risk. Our investments are subject to market-wide risks and fluctuations, as well as to risks inherent in particular securities. While maintaining our emphasis on preservation of capital and liquidity, we expect our portfolio to become more diversified and, as a result, we may in the future expand into areas which are not part of our current investment strategy.

The following table summarizes the fair value of investable assets held by Arch (*i.e.*, excluding the ‘other’ segment):

Investable assets (1):	Estimated Fair Value	% of Total
December 31, 2018		
Fixed maturities (2)	\$ 14,881,902	76.1
Short-term investments (2)	995,926	5.1
Cash	583,027	3.0
Equity securities (2)	368,843	1.9
Other investments (2)	1,261,525	6.4
Investments accounted for using the equity method	1,493,791	7.6
Securities transactions entered into but not settled at the balance sheet date	(18,153)	(0.1)
Total investable assets held by Arch	\$ 19,566,861	100.0
Average effective duration (in years)	3.38	
Average S&P/Moody’s credit ratings (3)	AA/Aa2	
Embedded book yield (4)	2.89%	
December 31, 2017		
Fixed maturities (2)	\$ 14,798,213	75.1
Short-term investments (2)	1,509,713	7.7
Cash	551,696	2.8
Equity securities (2)	576,040	2.9
Other investments (2)	1,476,960	7.5
Investments accounted for using the equity method	1,041,322	5.3
Securities transactions entered into but not settled at the balance sheet date	(237,523)	(1.2)
Total investable assets held by Arch	\$ 19,716,421	100.0
Average effective duration (in years)	2.83	
Average S&P/Moody’s credit ratings (3)	AA-/Aa2	
Embedded book yield (4)	2.32%	

- (1) In securities lending transactions, we receive collateral in excess of the fair value of the securities pledged. For purposes of this table, we have excluded the collateral received under securities lending, at fair value and included the securities pledged under securities lending, at fair value.
- (2) Includes investments carried as available for sale, at fair value and at fair value under the fair value option.
- (3) Average credit ratings on our investment portfolio on securities with ratings by Standard & Poor’s Rating Services (“S&P”) and Moody’s Investors Service (“Moody’s”).
- (4) Before investment expenses.

The credit quality distribution of our fixed maturities and fixed maturities pledged under securities lending agreements are shown below:

Rating (1)	December 31, 2018		December 31, 2017	
	Fair Value	%	Fair Value	%
U.S. government and government agencies (2)	\$ 4,194,676	28.2	\$ 3,771,835	25.5
AAA	3,551,039	23.9	4,080,808	27.6
AA	2,129,336	14.3	2,440,864	16.5
A	3,069,656	20.6	2,470,936	16.7
BBB	1,251,205	8.4	1,157,136	7.8
BB	275,201	1.8	313,286	2.1
B	183,614	1.2	254,011	1.7
Lower than B	61,271	0.4	77,543	0.5
Not rated	165,904	1.1	231,794	1.6
Total	\$ 14,881,902	100.0	\$ 14,798,213	100.0

- (1) For individual fixed maturities, S&P ratings are used. In the absence of an S&P rating, ratings from Moody’s are used, followed by ratings from Fitch Ratings.
- (2) Includes U.S. government-sponsored agency mortgage backed securities and agency commercial mortgage backed securities.

See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Financial Condition, Liquidity and Capital Resources—Financial Condition—Investable Assets” and note 8, “Investment Information,” to our consolidated financial statements in Item 8.

The following table summarizes the pre-tax total return (before investment expenses) of investment held by Arch compared to the benchmark return (both based in U.S. Dollars) against which we measured our portfolio during the periods:

	Arch Portfolio (1)	Benchmark Return
Pre-tax total return (before investment expenses):		
Year Ended December 31, 2018	0.33%	(0.60)%
Year Ended December 31, 2017	5.87%	4.74 %
Year Ended December 31, 2016	2.07%	2.13 %

- (1) Our investment expenses were approximately 0.36%, 0.30% and 0.34%, respectively, of average invested assets in 2018, 2017 and 2016.

The benchmark return index is a customized combination of indices intended to approximate a target portfolio by asset mix and average credit quality while also matching the approximate estimated duration and currency mix of our insurance and reinsurance liabilities. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—General—Financial Measures—Total Return on Investments”.

RATINGS

Our ability to underwrite business is affected by the quality of our claims paying ability and financial strength ratings as evaluated by independent agencies. Such ratings from third party internationally recognized statistical rating organizations or agencies are instrumental in establishing the financial security of companies in our industry. We believe that the primary users of such ratings include commercial and investment banks, policyholders, brokers, ceding companies and investors. Insurance ratings are also used by insurance and reinsurance intermediaries as an important means of assessing the financial strength and quality of insurers and reinsurers, and are often an important factor in the decision by an insured or intermediary of whether to place business with a particular insurance or reinsurance provider. Periodically, rating agencies evaluate us to confirm that we continue to meet their criteria for the ratings assigned to us by them. A.M. Best Company (“A.M. Best”), Fitch Ratings (“Fitch”), Moody’s and S&P are ratings agencies which have assigned financial strength and/or issuer ratings to Arch Capital and/or one or more of its subsidiaries. The ratings issued on our companies by these agencies are announced publicly and are available directly from the agencies. For further information on our financial strength and/or issuer ratings, see “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Liquidity and Capital Resources.”

COMPETITION

The worldwide reinsurance and insurance businesses are highly competitive. We compete, and will continue to compete, with major U.S. and non-U.S. insurers and reinsurers, some of which have greater financial, marketing and management resources than we have and longer-term relationships with insureds and brokers than we have had. We compete with other insurers and reinsurers primarily on the basis of overall financial strength, ratings assigned by independent rating agencies, geographic scope of business, strength of client relationships, premiums charged, contract terms and conditions, products and services offered, speed of claims payment, reputation, employee experience, and qualifications and local presence.

In our insurance business, we compete with insurers that provide specialty property and casualty lines of insurance, including Alleghany Corporation, American Financial Group, Inc., American International Group, Inc., AXA XL, AXIS Capital Holdings Limited, Berkshire Hathaway, Inc., Chubb Limited, CNA Financial Corp., Fairfax Financial Holdings Limited, The Hartford Financial Services Group, Inc., Liberty Mutual Insurance, Lloyd’s, Markel Insurance Company, RLI Corp., Sompo International, Tokio Marine HCC, The Travelers Companies, W.R. Berkley Corp. and Zurich Insurance Group. In our reinsurance business, we compete with reinsurers that provide property and casualty lines of reinsurance, including

Alleghany Corporation, Argo International Holdings, Ltd., AXA XL, AXIS Capital Holdings Limited, Berkshire Hathaway, Inc., Chubb Limited, Everest Re Group Ltd., Hannover Rückversicherung AG, Lloyd’s, Markel Global Reinsurance, Munich Re Group, PartnerRe Ltd., RenaissanceRe Holdings Ltd., SCOR Global P&C, SCOR Global Life, Sompo International, Swiss Reinsurance Company and Validus Re.

In our U.S. mortgage business, we compete with five active U.S. mortgage insurers, which include the mortgage insurance subsidiaries of Essent Group Ltd., Genworth Financial Inc., MGIC Investment Corporation, NMI Holdings Inc. and Radian Group Inc. The private mortgage insurance industry is highly competitive. Private mortgage insurers generally compete on the basis of underwriting guidelines, pricing, terms and conditions, financial strength, product and service offerings, customer relationships, reputation, the strength of management, technology, and innovation in the delivery and servicing of insurance products. Arch MI U.S. and other private mortgage insurers compete with federal and state government agencies that sponsor their own mortgage insurance programs. The private mortgage insurers’ principal government competitor is the Federal Housing Administration (“FHA”) and, to a lesser degree, the U.S. Department of Veterans Affairs (“VA”). Future changes to the FHA program may impact the demand for private mortgage insurance.

Arch MI U.S. and other private mortgage insurers increasingly compete with multi-line reinsurers and capital markets alternatives to private mortgage insurance. The GSEs continued their respective mortgage credit risk transfer (“CRT”) programs including the use of front and back-end transactions with multiline reinsurers. These transactions continue to create opportunities for multiline property casualty reinsurance groups and capital markets participants. The ongoing expansion of the GSEs risk transfer programs continue to attract additional reinsurers into the market with approximately 40 reinsurers now competing for business.

For other U.S. risk sharing products and non-U.S. mortgage insurance opportunities, we have also seen increased competition from well capitalized and highly rated multiline reinsurers. It is our expectation that the depth and capacity of competitors from this segment will continue to increase over the next several years as more residential mortgage credit risk is borne by private capital.

ENTERPRISE RISK MANAGEMENT

General. Enterprise Risk Management (“ERM”) is a key element in our philosophy, strategy and culture. We employ an ERM framework that includes underwriting, reserving, investment, credit and operational risks. Risk appetite and exposure limits are set by our executive management team, reviewed with the Board and its committees and routinely discussed with business unit management. These limits are articulated in our risk appetite statement, which details risk appetite, tolerances and limits for each major risk category, and are integrated into our operating guidelines. Exposures are aggregated and monitored periodically by our corporate risk management team. The reporting, review and approval of risk management information is integrated into our annual planning process, capital modeling and allocation, reinsurance purchasing strategy and reviewed at insurance business reviews, reinsurance underwriting meetings and board level committees.

Risk Management Process and Procedures. The following narrative provides an overview of our risk management framework and our methodology for identifying, measuring, managing and reporting on the key risks affecting us. It outlines our approach to risk identification and assessment and provides an overview of our risk appetite and tolerance for each of the following major risks: underwriting (insurance) risk including pricing, reserving and catastrophe; investment including market and liquidity risks; strategic risk; group risk including governance and capital market risk; credit risk; and operational risk, including regulatory, investor relations (reputational risk), rating agency and outsourcing risks.

The framework includes details of our risk philosophy and policies to address the material risks confronting us; and compliance, approach and procedures to control and or mitigate these risks. The actions and policies implemented to meet our business management and regulatory obligations form the core of this framework. We have adopted a holistic approach to risk management by analyzing risk from both a top-down and bottom-up perspective.

Risk Identification and Assessment. The Finance, Investment and Risk Committee (“FIR Committee”), Audit Committee and Underwriting Oversight Committee of the Board oversee the top-down and bottom-up review of our risks. Given the nature and scale of our operations, these committees consider all aforementioned risks within the scope of the assessment. Arch Capital’s Chief Risk Officer (“CRO”) assists these committees in the identification and assessment of all key risks. The CRO is responsible for maintaining Arch Capital’s risk register and continually reviewing and challenging risk assessments, including the impact of emerging risks and significant business developments. Board approval is required for any new high level risks or change in inherent or residual designations.

Risk Monitoring and Control. Arch Capital’s risk management framework requires risk owners to monitor key risks on a continuous basis. The highest residual risks are actively managed by the FIR Committee. The remaining risks are managed and monitored at a process level by the risk owners and/or the CRO. Risk owners have ultimate responsibility for the day-to-day management of each designated risk, reporting to the CRO on the satisfactory management and control of the risk and timely escalation of significant issues that may arise in relation to that risk. The CRO is responsible for overseeing the monitoring of all risks across the business and for communicating to the relevant risk owners if he becomes aware of issues, or potential and actual breaches of risk appetite, relevant to the assigned risks. A key element of these monitoring activities is the evaluation of our position relative to risk tolerances and limits approved by the Board.

Risk Reporting. Quarterly, the CRO compiles the results of the key risk review process into a report to the FIR Committee for review and discussion at their quarterly meeting. The report includes an overview of selected key risks; changes in the rating of high level risks in the Arch Capital risk register; a risk dashboard that depicts the status of risk limit and tolerance metrics; a summary of largest exposures and concentration risks; and our reinsurance arrangements, including outstanding and uncollectible recoveries. If necessary, risk management matters reviewed at the FIR Committee meeting are presented for discussion by the Board. The CRO is responsible for immediately escalating any significant risk matters to executive management, the FIR Committee and/or the Board for approval of the required remediation. As part of our corporate governance, the Board and certain of its committees hold regular executive sessions with members of our management team. These sessions are intended to ensure an open and frank dialogue exists about various forms of risk across the organization.

Implementation and Integration. We believe that an integrated approach to developing, measuring and reporting our Own Risk and Solvency Assessment (“ORSA”) is an integral part of the risk management framework. The ORSA process provides the link between Arch Capital’s risk profile, its board-approved risk appetite including approved risk tolerances and limits, its business strategy and its overall solvency requirements. The ORSA is the entirety of the processes and procedures employed to identify, assess, monitor, manage, and report the short- and long-term risks we face or may face and to determine the capital necessary to ensure that our overall solvency needs are met at all times. The ORSA also makes the link between actual reported results and the capital assessment.

The ORSA is the basis for risk reporting to the Board and its committees and acts as a mechanism to embed the risk management framework within our decision making processes and operations. The Board has delegated responsibility for supervision and oversight of the ORSA to the FIR Committee.

This oversight includes regular reviews of the ORSA process and output. An ORSA report is produced at least annually and the results of each assessment are reported to the Board. The Board actively participates in the ORSA process by steering how the assessment is performed and challenging its results. This assessment is also taken into account when formulating strategic decisions.

The ORSA process and reporting are integral parts of our business strategy, tailored specifically to fit into our organizational structure and risk management system with the appropriate techniques in place to assess our overall solvency needs, taking into consideration the nature, scale and complexity of the risks inherent in the business.

We also take the results of the ORSA into account for our system of governance, including long-term capital management, business planning and new product development. The results of the ORSA also contributes to various strategic decision-making including how best to optimize capital management, establishing the most appropriate premium levels and deciding whether to retain or transfer risks.

For further discussion of our risk management policies, see “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Ceded Reinsurance” and “Risk Factors—Risks Relating to Our Industry—The failure of any of the loss limitation methods we employ could have a material adverse effect on our financial condition or results of operations.”

REGULATION

General

Our insurance and reinsurance subsidiaries are subject to varying degrees of regulation and supervision in the various jurisdictions in which they operate. We are subject to extensive regulation under applicable statutes in these countries and any other jurisdictions in which we operate. The current material regulations under which we operate are described below. We may become subject in the future to regulation in new jurisdictions or to additional regulations in existing jurisdictions.

Bermuda

General. Our Bermuda insurance operating subsidiary, Arch Re Bermuda, is a Class 4 general business insurer and a Class C long-term insurer, and is subject to the Insurance Act 1978 of Bermuda and related regulations, as amended (“Insurance Act”). The Insurance Act imposes certain solvency and liquidity standards and auditing and reporting requirements and grants the Bermuda Monetary Authority (the “BMA”) powers to supervise, investigate, require information and demand the

production of documents and intervene in the affairs of insurance companies. Significant requirements include the appointment of an independent auditor, the appointment of a loss reserve specialist, the appointment of a principal representative in Bermuda, the filing of annual Statutory Financial Returns, the filing of annual financial statements in accordance with U.S. generally accepted accounting principles (“GAAP”), the filing of an annual capital and solvency return, compliance with minimum and enhanced capital requirements, compliance with certain restrictions on reductions of capital and the payment of dividends and distributions, compliance with group solvency and supervision rules, if applicable, and compliance with the Insurance Code of Conduct (relating to corporate governance, risk management and internal controls).

Arch Re Bermuda must also comply with a minimum liquidity ratio and minimum solvency margin in respect of its general business. The minimum liquidity ratio requires that the value of relevant assets must not be less than 75% of the amount of relevant liabilities. The minimum solvency margin, which varies depending on the class of the insurer, is determined as a percentage of either net reserves for losses and LAE or premiums or pursuant to a risk-based capital measure. Arch Re Bermuda is also subject to an enhanced capital requirement (“ECR”) which is established by reference to either the Bermuda Solvency Capital Requirement model (“BSCR”) or an approved internal capital model. The BSCR model is a risk-based capital model which provides a method for determining an insurer’s capital requirements (statutory capital and surplus) by taking into account the risk characteristics of different aspects of the insurer’s business. The BMA has established a target capital level for each Class 4 insurer equal to 120% of its enhanced capital requirement. While a Class 4 insurer is not currently required to maintain its available statutory economic capital and surplus at this level, the target capital level serves as an early warning tool for the BMA, and failure to maintain statutory capital at least equal to the target capital level will likely result in increased regulatory oversight. As a Class C insurer, Arch Re Bermuda is also required to maintain available statutory economic capital and surplus in respect of its long-term business at a level equal to or in excess of its long-term enhanced capital requirement which is established by reference to either the Class C BSCR model or an approved internal capital model.

Arch Re Bermuda is prohibited from declaring or paying any dividends during any financial year if it is in breach of its general business or long-term business enhanced capital requirements, minimum solvency margins or its general business minimum liquidity ratio or if the declaration or payment of such dividends would cause such a breach. If it has failed to meet its minimum solvency margins or minimum liquidity ratio on the last day of any financial year, Arch Re Bermuda will be prohibited, without the approval of the BMA, from declaring or paying any dividends during the next financial year. In addition, Arch Re Bermuda is prohibited from declaring or paying in any financial

year dividends of more than 25% of its total statutory capital and surplus (as shown on its previous financial year's statutory balance sheet) unless it files (at least seven days before payment of such dividends) with the BMA an affidavit stating that it will continue to meet the required margins. Without the approval of the BMA, Arch Re Bermuda is prohibited from reducing by 15% or more its total statutory capital as set out in its previous year's financial statements and any application for such approval must include an affidavit stating that it will continue to meet the required margins.

On July 30, 2018 the Insurance Amendment (No. 2) Act 2018 amended the Insurance Act to provide for the prior payment of policyholders' liabilities ahead of general unsecured creditors in the event of the liquidation or winding up of an insurer. The amendments provide inter alia that, subject to certain statutorily preferred debts, the insurance debts of an insurer must be paid in priority to all other unsecured debts of the insurer. Insurance debt is defined as a debt to which an insurer is or may become liable pursuant to an insurance contract excluding debts owed to an insurer under an insurance contract where the insurer is the person insured.

Group Supervision. The BMA acts as group supervisor of our group of insurance and reinsurance companies ("Group") and has designated Arch Re Bermuda as the designated insurer ("Designated Insurer"). As our Group supervisor, the BMA performs a number of functions including: (i) coordinating the gathering and dissemination of information for other regulatory authorities; (ii) carrying out supervisory reviews and assessments of our Group; (iii) carrying out assessments of our Group's compliance with the rules on solvency, risk concentration, intra-group transactions and good governance procedures; (iv) planning and coordinating, through regular meetings with other authorities, supervisory activities in respect of our Group; (v) coordinating any enforcement action that may need to be taken against our Group or any Group members; and (vi) coordinating meetings of colleges of supervisors in order to facilitate the carrying out of these functions. As Designated Insurer, Arch Re Bermuda is required to facilitate compliance by our Group with the group insurance solvency and supervision rules.

On an annual basis, the Group is required to file Group statutory financial statements, a Group statutory financial return, a Group capital and solvency return, audited Group financial statements, a Group Solvency Self-Assessment ("GSSA"), and a financial condition report with the BMA. The GSSA is designed to document our perspective on the capital resources necessary to achieve our business strategies and remain solvent, and to provide the BMA with insights on our risk management, governance procedures and documentation related to this process. In addition, the Designated Insurer is required to file quarterly group financial returns with the BMA. The Group is also required to maintain available Group statutory economic capital and surplus in an amount that is at least equal to the

group enhanced capital requirement ("Group ECR") and the BMA has established a group target capital level equal to 120% of the Group ECR.

The BMA maintains supervision over the controllers of all Bermuda registered insurers, and accordingly, any person who, directly or indirectly, becomes a holder of at least 10%, 20%, 33% or 50% of our ordinary shares must notify the BMA in writing within 45 days of becoming such a holder (or ceasing to be such a holder). The BMA may object to such a person and require the holder to reduce its holding of ordinary shares and direct, among other things, that voting rights attaching to the ordinary shares shall not be exercisable

United States

General. Our U.S. based insurance operating subsidiaries are subject to extensive governmental regulation and supervision by the states and jurisdictions in which they are domiciled, licensed and/or approved to conduct business. The insurance laws and regulations of the state of domicile have the most significant impact on operations. We currently have U.S. insurance and/or reinsurance subsidiaries domiciled in Delaware, North Carolina, Missouri, Wisconsin and the District of Columbia. State insurance regulation and supervision is designed to protect policyholders rather than investors. Generally, state regulatory authorities have broad regulatory powers over such matters as licenses, standards of solvency, premium rates, policy forms, marketing practices, claims practices, investments, methods of accounting, form and content of financial statements, certain aspects of governance, enterprise risk management, amounts we are required to hold as reserves for future payments, minimum capital and surplus requirements, annual and other report filings and transactions among affiliates. Our U.S. based subsidiaries are required to file detailed quarterly statutory financial statements with state insurance regulators. In addition, regulatory authorities conduct periodic financial, claims and market conduct examinations. Certain insurance regulatory requirements are highlighted below. In addition to regulation applicable generally to U.S. insurance and reinsurance companies, our U.S. mortgage insurance operations are affected by federal and state regulation relating to mortgage insurers, mortgage lenders, and the origination, purchase and sale of residential mortgages. Arch Insurance Company Europe is also subject to certain governmental regulation and supervision in the states where it writes excess and surplus lines insurance.

Holding Company Regulation. All states have enacted legislation that regulates insurance holding company systems. These regulations generally provide that each insurance company in the system is required to register with the insurance department of its state of domicile and furnish information concerning the operations of companies within the holding company system which may materially affect the operations, management or financial condition of the insurers within the

system. Notice to the state insurance departments is required prior to the consummation of certain material transactions between an insurer and any entity in its holding company system and certain transactions may not be consummated without the applicable insurance department's prior approval or non-disapproval after receiving notice. The holding company acts also prohibit any person from directly or indirectly acquiring control of a U.S. insurance or reinsurance company unless that person has filed an application with specified information with such company's domiciliary commissioner and has obtained the commissioner's prior approval. Under most states' statutes acquiring 10% or more of the voting securities of an insurance company or its parent company is presumptively considered an acquisition of control of the insurance company, although such presumption may be rebutted.

The National Association of Insurance Commissioners ("NAIC") has adopted amendments to the Insurance Holding Company System Regulatory Act and Regulation, which, among other changes, introduce the concept of "enterprise risk" within an insurance holding company system. When the amendments are adopted by a particular state, the amended Insurance Holding Company System Regulatory Act and Regulation impose more extensive informational requirements on parents and other affiliates of licensed insurers or reinsurers with the purpose of protecting them from enterprise risk, including requiring an annual enterprise risk report by the ultimate controlling person identifying the material risks within the insurance holding company system that could pose enterprise risk to the licensed companies and requiring a person divesting its controlling interest to make a confidential advance notice filing.

Regulation of Dividends and Other Payments from Insurance Subsidiaries. The ability of an insurer to pay dividends or make other distributions is subject to insurance regulatory limitations of the insurer's state of domicile. Such laws generally limit the payment of dividends or other distributions above a specified level. Dividends or other distributions in excess of such thresholds are "extraordinary" and are subject to prior notice and approval, or non-disapproval after receiving notice.

Credit for Reinsurance. Arch Re U.S. is subject to insurance regulation and supervision that is similar to the regulation of licensed primary insurers. However, except for certain mandated provisions that must be included in order for a ceding company to obtain credit for reinsurance ceded, the terms and conditions of reinsurance agreements generally are not subject to regulation by any governmental authority.

A primary insurer ordinarily will enter into a reinsurance agreement only if it can obtain credit for the reinsurance ceded on its U.S. statutory-basis financial statements. As a result of the requirements relating to the provision of credit for reinsurance, and Arch Re U.S. and Arch Re Bermuda are

indirectly subject to certain regulatory requirements imposed by jurisdictions in which ceding companies are domiciled.

In general, credit for reinsurance is allowed if the reinsurer is licensed or "accredited" in the state in which the primary insurer is domiciled; or if none of the above applies, to the extent that the reinsurance obligations of the reinsurer are collateralized appropriately, typically through the posting of a letter of credit for the benefit of the primary insurer or the deposit of assets into a trust fund established for the benefit of the primary insurer. Most states have adopted provisions of the NAIC Credit for Reinsurance Model Law and Regulation that allow full credit to U.S. ceding insurers for reinsurance ceded to reinsurers that have been approved as "certified reinsurers" based upon less than 100% collateralization. Arch Re Bermuda is approved as a "certified reinsurer" in 33 states.

On April 4, 2018 the U.S. and the European Union ("EU") entered into the Bilateral Agreement between the United States of America and the European Union on Prudential Matters Regarding Insurance and Reinsurance (the "EU-US Covered Agreement") that, among other things, would eliminate reinsurance collateral requirements for qualified U.S. reinsurers operating in the EU insurance market, and eliminate reinsurance collateral requirements for qualified EU reinsurers operating in the U.S. insurance market. In December 2018, the U.S. Secretary of the Treasury and the U.S. Trade Representative announced that they had reached agreement with the U.K. on a covered agreement ("UK Covered Agreement") that would extend terms nearly identical to the EU Covered Agreement to insurers and reinsurers operating in the U.K. should the United Kingdom ultimately leave the EU. The NAIC is finalizing amendments to the Credit for Reinsurance Model Law and Regulation that would implement the EU-US Covered Agreement and the UK Covered Agreement and eliminate reinsurance collateral requirements for qualified reinsurers domiciled in other jurisdictions deemed "Reciprocal Jurisdictions".

Risk Management and ORSA. In 2012, the NAIC adopted the Risk Management and Own Risk and Solvency Assessment Model Act, which requires domestic insurers to maintain a risk management framework and establishes a legal requirement for domestic insurers to conduct an ORSA in accordance with the NAIC's ORSA Guidance Manual. The ORSA Model Act provides that domestic insurers, or their insurance group, must regularly conduct an ORSA consistent with a process comparable to the ORSA Guidance Manual process. The ORSA Model Act also provides that, no more than once a year, an insurer's domiciliary regulator may request that an insurer submit an ORSA summary report, or any combination of reports that together contain the information described in the ORSA Guidance Manual, with respect to the insurer and/or the insurance group of which it is a member. If and when the ORSA Model Act is adopted by an individual state, the state may

impose additional internal review and regulatory filing requirements on licensed insurers and their parent companies.

Cybersecurity. The NAIC has adopted an Insurance Data Security Model Law, which, when adopted by the states, will require insurers, insurance producers and other entities required to be licensed under state insurance laws to comply with certain requirements under state insurance laws, such as developing and maintaining a written information security program, conducting risk assessments and overseeing the data security practices of third-party vendors. In addition, certain state insurance regulators are developing or have developed regulations that may impose regulatory requirements relating to cybersecurity on insurance and reinsurance companies (potentially including insurance and reinsurance companies that are not domiciled, but are licensed, in the relevant state). For example, the New York State Department of Financial Services has adopted a regulation pertaining to cybersecurity for all banking and insurance entities under its jurisdiction, effective as of March 1, 2017, and the California legislature passed the California Consumer Privacy Act of 2018, which takes effect January 1, 2020, both of which apply to us. We cannot predict the impact these evolving laws and regulations may have on our business, financial condition or results of operations, but we could incur additional costs resulting from compliance with such laws and regulations.

Risk-Based Capital Requirements. Licensed U.S. property and casualty insurance and reinsurance companies are subject to risk-based capital requirements that are designed to assess capital adequacy and to raise the level of protection that statutory surplus provides for policyholder obligations. The risk-based capital model for property and casualty insurance companies measures three major areas of risk facing property and casualty insurers: underwriting, which encompasses the risk of adverse loss developments and inadequate pricing; declines in asset values arising from credit risk; and declines in asset values arising from investment risks. An insurer will be subject to varying degrees of regulatory action depending on how its statutory surplus compares to its risk-based capital calculation. Under the approved formula, an insurer's total adjusted capital is compared to its authorized control level risk-based capital. If this ratio is above a minimum threshold, no company or regulatory action is necessary. Below this threshold are four distinct action levels at which an insurer's domiciliary state regulator can intervene with increasing degrees of authority over an insurer as the ratio of surplus to risk-based capital requirement decreases. The mildest regulatory action requires an insurer to submit a plan for corrective action; the most severe requires an insurer to be rehabilitated or liquidated.

Our mortgage insurance operations are not currently subject to state risk-based capital requirements, but rather are subject to state risk to capital or minimum policyholder position requirements. The NAIC has established a Mortgage Guaranty Insurance Working Group which is engaged in developing

changes to the Mortgage Guaranty Insurers Model Act, including the development of a risk based capital model unique to mortgage guaranty insurers.

Guaranty Funds. Most states require all admitted insurance companies to participate in their respective guaranty funds which cover certain claims against insolvent insurers. Solvent insurers licensed in these states are required to cover the losses paid on behalf of insolvent insurers by the guaranty funds and are generally subject to annual assessments in the states by the guaranty funds to cover these losses. Mortgage guaranty insurance, among other lines of business, is typically exempt from participation in guaranty funds.

Federal Regulation. Although state regulation is the dominant form of regulation for insurance and reinsurance business, a number of federal laws affect and apply to the insurance industry. The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 ("Dodd-Frank") created the Federal Insurance Office ("FIO") within the Department of Treasury, which is not a federal regulator or supervisor of insurance, but monitors the insurance industry for systemic risk, administers the Terrorism Risk Insurance Program Reauthorization Act of 2015 ("TRIPRA"), consults with the states regarding insurance matters and develops federal policy on aspects of international insurance matters. See "Risk Factors-Risks Related to Our Industry-We could face unanticipated losses from war, terrorism and political instability, and these or other unanticipated losses could have a material adverse effect on our financial condition and results of operations" for more information on TRIPRA. In addition, FIO is authorized to assist the U.S. Secretary of the Treasury in negotiating "covered agreements" between the U.S. and one or more foreign governments or regulatory authorities that address insurance prudential measures.

Certain other federal laws also directly or indirectly impact mortgage insurers, including the Real Estate Settlement Procedures Act of 1974 ("RESPA"), the Homeowners Protection Act of 1998 ("HOPA"), the Equal Credit Opportunity Act, the Fair Housing Act, the Truth In Lending Act ("TILA"), the Fair Credit Reporting Act of 1970 ("FCRA"), and the Fair Debt Collection Practices Act. Among other things, these laws and their implementing regulations prohibit payments for referrals of settlement service business, require fairness and non-discrimination in granting or facilitating the granting of credit, govern the circumstances under which companies may obtain and use consumer credit information, define the manner in which companies may pursue collection activities, and require disclosures of the cost of credit and provide for other consumer protections.

GSE Eligible Mortgage Insurer Requirements. GSEs impose requirements on private mortgage insurers so that they may be eligible to insure loans sold to the GSEs, known as the Private Mortgage Insurer Eligibility Requirements or "PMIERS." The

PMIERS apply to our eligible mortgage insurers, but do not apply to Arch Mortgage Guaranty Company, which is not GSE-approved. The PMIERS impose limitations on the type of risk insured, the forms and insurance policies issued, standards for the geographic and customer diversification of risk, procedures for claims handling, acceptable underwriting practices, standards for certain reinsurance cessions and financial requirements, among other things. The financial requirements require an eligible mortgage insurer's available assets, which generally include only the most liquid assets of an insurer, to meet or exceed "minimum required assets" as of each quarter end. Minimum required assets are calculated from PMIERS tables with several risk dimensions (including origination year, original loan-to-value and original credit score of performing loans, and the delinquency status of non-performing loans). Our eligible mortgage insurers satisfied the PMIERS' financial requirements as of December 31, 2018.

On September 27, 2018, the GSEs released revised Private Mortgage Insurer Eligibility Requirements or "revised PMIERS". The revised PMIERS become effective on March 31, 2019 and are not expected to have a significant impact on our eligible mortgage insurers operations or have a material impact on their capital position. While not yet effective, our eligible mortgage insurers satisfied the revised PMIERS' financial requirements as of December 31, 2018.

United Kingdom

General. The Prudential Regulation Authority ("PRA") and the Financial Conduct Authority ("FCA") regulate insurance and reinsurance companies and the FCA regulates firms carrying on insurance mediation activities operating in the U.K. both under the Financial Services and Markets Act 2000 (the "FSMA"). In May 2004, Arch Insurance Company Europe was granted the relevant permissions for the classes of insurance business which it underwrites in the U.K. In 2009, AUAL was licensed and authorized by the relevant U.K. regulator and the Lloyd's Franchise Board and holds the relevant permissions for the classes of insurance business which are underwritten in the U.K. by Arch Syndicate 2012. Arch Syndicate 2012 has one member, Arch Syndicate Investments Ltd. ("ASIL"). All U.K. companies are also subject to a range of statutory provisions, including the laws and regulations of the Companies Act 2006 (as amended) (the "U.K. Companies Act").

The objectives of the PRA are to promote the safety and soundness of all firms it supervises and to secure an appropriate degree of protection for policyholders. The objectives of the FCA are to ensure customers receive financial services and products that meet their needs, to promote sound financial systems and markets and to ensure that firms are stable and resilient with transparent pricing information and which compete effectively and have the interests of their customers and the integrity of the market at the heart of how they run their business. The PRA has responsibility for the prudential

regulation of banks and insurers, while the FCA has responsibility for the conduct of business regulation in the wholesale and retail markets. The PRA and the FCA adopt separate methods of assessing regulated firms on a periodic basis. Arch Insurance Europe and AUAL are subject to periodic assessment by the PRA along with all regulated firms. Arch Insurance Company Europe and AUAL are subject to regulation by both the PRA and FCA.

Lloyd's Supervision. The operations of AUAL and related Arch Syndicate 2012 and its corporate member, ASIL, are subject to the byelaws and regulations made by (or on behalf of) the Council of Lloyd's, and requirements made under those byelaws. The Council of Lloyd's, established in 1982 by Lloyd's Act 1982, has overall responsibility and control of Lloyd's. Those byelaws, regulations and requirements provide a framework for the regulation of the Lloyd's market, including specifying conditions in relation to underwriting and claims operations of Lloyd's participants. Lloyd's is also subject to the provisions of the FSMA. Lloyd's is authorized by the PRA and regulated by the PRA and FCA. Those entities acting within the Lloyd's market are required to comply with the requirements of the FSMA and provisions of the PRA's or FCA's rules, although the PRA has delegated certain of its powers, including some of those relating to prudential requirements, to Lloyd's. ASIL, as a member of Lloyd's, is required to contribute 0.5% of Arch Syndicate 2012's premium income limit for each year of account to the Lloyd's central fund. The Lloyd's central fund is available if members of Lloyd's assets are not sufficient to meet claims for which the member is liable. As a member of Lloyd's, ASIL may also be required to contribute to the central fund by way of a supplement to a callable layer of up to 3% of Arch Syndicate 2012's premium income limit for the relevant year of account. In addition, AUAL, on behalf of Arch Syndicate 2012, is approved to underwrite excess and surplus lines insurance in most states in the U.S. through Lloyd's licenses. Such activities must be in compliance with the Lloyd's requirements.

Financial Resources. The European solvency framework and prudential regime for insurers and reinsurers, the Solvency II Directive 2009/138/EC "Solvency II", took effect in full on January 1, 2016. See "European Union Insurance and Reinsurance Regulation—Insurance and Reinsurance Regulatory Regime" below for additional details.

Arch Insurance Company Europe and AUAL (on behalf of Syndicate 2012) are required to meet economic risk-based solvency requirements imposed under Solvency II. Solvency II, together with European Commission "delegated acts" and guidance issued by the European Insurance and Occupational Pensions Authority ("EIOPA") sets out classification and eligibility requirements, including the features which capital must display in order to qualify as regulatory capital.

Financial Services Compensation Scheme. The Financial Services Compensation Scheme (“FSCS”) is a scheme established under FSMA to compensate eligible policyholders of insurance companies who may become insolvent. The FSCS is funded by the levies that it has the power to impose on all insurers. Arch Insurance Europe could be required to pay levies to the FSCS.

Restrictions on Acquisition of Control. Under FSMA, the prior consent of the PRA or FCA, as applicable, is required, before any person can become a controller or increase its control over any regulated company, including Arch Insurance Company Europe and AUAL, or over the parent undertaking of any regulated company. Therefore, the PRA's or FCA's prior consent, as applicable, is required before any person can become a controller of Arch Capital. Prior consent is also required from Lloyd's before any person can become a controller or increase its control over a corporate member or a managing agent or a parent undertaking of a corporate member or managing agent. A controller is defined for these purposes as a person who holds (either alone or in concert with others) 10% or more of the shares or voting power in the relevant company or its parent undertaking.

Restrictions on Payment of Dividends. Under English law, all companies are restricted from declaring a dividend to their shareholders unless they have “profits available for distribution.” The calculation as to whether a company has sufficient profits is based on its accumulated realized profits minus its accumulated realized losses. U.K. insurance regulatory laws do not prohibit the payment of dividends, but the PRA or FCA, as applicable, requires that insurance companies and insurance intermediaries maintain certain solvency margins and may restrict the payment of a dividend by Arch Insurance Company Europe, AUAL or ASIL.

European Union Considerations. Through their respective authorizations in the U.K., a Member State of the EU, Arch Insurance Company Europe's and AUAL's authorizations are recognized throughout the European Economic Area (“EEA”), subject only to certain notification and application requirements. This authorization enables Arch Insurance Company Europe and AUAL to exercise “passporting” rights which allows Arch Insurance Company Europe and AUAL to establish a branch in any other Member State of the EU, where such entity will be subject to the insurance regulations of each such Member State with respect to the conduct of its business in such Member State, but remain subject only to the financial and operational supervision by the PRA or FCA (as applicable). The conditions for the establishment of branches in Member States of the EU are set out in Solvency II. Arch Insurance Company Europe currently has branches in Germany, Italy, Spain and Denmark and may establish branches in other Member States of the EU in the future. Further, through its passporting rights, Arch Insurance Company Europe and AUAL have the freedom to provide insurance services

anywhere in the EEA subject to compliance with certain rules governing such provision, including notification to the PRA or FCA, as applicable.

Following the referendum in June 2016 in which a majority of voting U.K. citizens voted in favor of the U.K. leaving the EU (“Brexit”), the U.K. withdrawal from the EU will lead to a loss of passporting rights for financial institutions in the U.K., except to the extent that any aspect of the regime is preserved in a separate agreement between the EU and the U.K. See “Risk Factors—Risks Related to Our Industry—The United Kingdom's referendum vote in favor of leaving the EU could adversely affect us.”

Canada

Arch Insurance Canada and Arch Re Canada are subject to federal, as well as provincial and territorial, regulation in Canada in the provinces and territories in which they underwrite insurance/reinsurance. The Office of the Superintendent of Financial Institutions (“OSFI”) is the federal regulatory body that, under the Insurance Companies Act (Canada), prudentially regulates federal Canadian and non-Canadian insurance and reinsurance companies operating in Canada. Arch Insurance Canada is licensed to carry on insurance business by OSFI and in each province and territory. Arch Re Canada is licensed to carry on reinsurance business by OSFI and in the provinces of Ontario and Quebec.

Under the Insurance Companies Act (Canada), Arch Insurance Canada is required to maintain an adequate amount of capital in Canada, calculated in accordance with a test promulgated by OSFI called the Minimum Capital Test, and Arch Re Canada is required to maintain an adequate margin of assets over liabilities in Canada, calculated in accordance with a test promulgated by OSFI called the Branch Adequacy of Assets Test. OSFI has implemented a risk-based methodology for assessing insurance/reinsurance companies operating in Canada known as its “Supervisory Framework.” In applying the Supervisory Framework, OSFI considers the inherent risks of the business and the quality of risk management for each significant activity of each operating entity. Under the Insurance Companies Act (Canada), approval of the Minister of Finance (Canada) is required in connection with certain acquisitions of shares of, or control of, Canadian insurance companies such as Arch Insurance Canada, and notice to and/or approval of OSFI is required in connection with the payment of dividends by or redemption of shares by Canadian insurance companies such as Arch Insurance Canada.

Ireland

General. The CBOI regulates insurance and reinsurance companies and intermediaries authorized in Ireland. Our three Irish operating subsidiaries are Arch Re Europe, Arch MI Europe and Arch Underwriters Europe. Arch Re Europe was

licensed and authorized by the CBOI as a non-life reinsurer in October 2008 and as a life reinsurer in November 2009. Arch MI Europe was licensed and authorized by the CBOI as a non-life insurer in December 2011. Arch Underwriters Europe was registered by the CBOI as an insurance and reinsurance intermediary in July 2014. Arch Re Europe, Arch MI Europe and Arch Underwriters Europe are subject to the supervision of the CBOI and must comply with Irish insurance acts and regulations as well as with directions and guidance issued by the CBOI.

Arch Re Europe and Arch MI Europe are required to comply with Solvency II requirements. See “European Union Insurance and Reinsurance Regulation—Insurance and Reinsurance Regulatory Regime” below for additional details. As an intermediary, Arch Underwriters Europe is subject to a different regulatory regime and is not subject to solvency capital rules, but must comply with requirements such as to maintain professional indemnity insurance and to have directors that are fit and proper. Our Irish subsidiaries are also subject to the general body of Irish company laws and regulations including the provisions of the Companies Act 2014.

Financial Resources. Arch Re Europe and Arch MI Europe are required to meet economic risk-based solvency requirements imposed under Solvency II. Solvency II, together with European Commission “delegated acts” and guidance issued by EIOPA sets out classification and eligibility requirements, including the features which capital must display in order to qualify as regulatory capital.

Restrictions on Acquisitions. Under Irish law, the prior consent of the CBOI is required before any person can acquire or increase a qualifying holding in an Irish insurer or reinsurer, including Arch MI Europe and Arch Re Europe, or their parent undertakings. A qualifying holding is defined for these purposes as a direct or indirect holding that represents 10% or more of the capital of, or voting rights, in the undertaking or makes it possible to exercise a significant influence over the management of the undertaking.

Restrictions on Payment of Dividends. Under Irish company law, Arch Re Europe, Arch MI Europe and Arch Underwriters Europe are permitted to make distributions only out of profits available for distribution. A company’s profits available for distribution are its accumulated, realized profits, so far as not previously utilized by distribution or capitalization, less its accumulated, realized losses, so far as not previously written off in a reduction or reorganization of capital duly made. Further, the CBOI has powers to intervene if a dividend payment were to lead to a breach of regulatory capital requirements.

European Union Considerations. As Arch Re Europe, Arch MI Europe and Arch Underwriters Europe are authorized by the CBOI in Ireland, a Member State of the EU, those authorizations are recognized throughout the EEA. Subject only to certain

notification and application requirements, Arch Re Europe, Arch MI Europe and Arch Underwriters Europe can provide services, or establish a branch, in any other Member State of the EEA. Although, in doing so, they may be subject to the laws of such Member States with respect to the conduct of business in such Member State, company law registrations and other matters, they will remain subject to financial and operational supervision by the CBOI only. Arch Re Accident & Health ApS (“Arch Re Denmark”) is an underwriting agency underwriting accident and health business for Arch Re Europe in Denmark. Arch Re Europe also has a branch in the U.K., which underwrites non-life reinsurance risk for Arch Re Europe. Arch Re Europe also has a branch outside the EEA, Arch Reinsurance Europe Designated Activity Company, Dublin (Ireland), Zurich Branch (“Arch Re Europe Swiss Branch”).

As part of its application for registration, Arch Underwriters Europe requested the CBOI to make the necessary notifications to permit it to provide insurance and reinsurance intermediary services in all EEA Member States. Arch Underwriters Europe currently has branches in the following EU countries: the U.K., Italy and Finland.

Following Brexit, the U.K.'s withdrawal from the EU will lead to a loss of passporting rights for EEA financial institutions (including our Irish operating subsidiaries) into the U.K., except to the extent that any aspect of the regime is preserved in a separate agreement between the EU and the U.K. Absent such agreement, the post-Brexit status and rules applicable to U.K. branches of EEA financial institutions will be primarily driven by U.K. law and regulation. See “Risks Relating to Our Industry—The United Kingdom’s referendum vote in favor of leaving the EU could adversely affect us.”

Switzerland

In December 2008, Arch Re Europe opened Arch Re Europe Swiss Branch as a branch office. As Arch Re Europe is domiciled outside of Switzerland and its activities are limited to reinsurance, the Arch Re Europe Swiss Branch in Switzerland is not required to be licensed by the Swiss insurance regulatory authorities.

In August 2014, Arch Underwriters Europe opened a branch office in Zurich (“Arch Underwriters Europe Swiss Branch”) to render reinsurance advisory services to certain group companies. Arch Underwriters Europe Swiss Branch is registered with the commercial register of the Canton of Zurich. Since its activities are limited to advisory services for reinsurance matters, the Arch Underwriters Europe Swiss Branch is not required to be licensed by the Swiss insurance regulatory authorities.

European Union

Insurance and Reinsurance Regulatory Regime. Solvency II took effect in full on January 1, 2016. Solvency II imposes economic risk-based solvency requirements across all EU Member States and consists of three pillars: Pillar I-quantitative capital requirements, based on a valuation of the entire balance sheet; Pillar II-qualitative regulatory review, which includes governance, internal controls, enterprise risk management and supervisory review process; and Pillar III-market discipline, which is accomplished through reporting of the insurer's financial condition to regulators and the public. Solvency II is supplemented by European Commission Delegated Regulation (EU) 2015/35 (the "Delegated Regulation"), other European Commission "delegated acts" and binding technical standards, and guidelines issued by EIOPA. The Delegated Regulation sets out more detailed requirements for individual insurance and reinsurance undertakings, as well as for groups, based on the overarching provisions of Solvency II, which together make up the core of the single prudential rulebook for insurance and reinsurance undertakings in the EU.

Insurers and reinsurers established in a Member State of the EU have the freedom to establish branches in and provide services to all EEA states. Arch Insurance Company Europe and AUAL, being established in the U.K. and regulated by the PRA and FCA, are able, subject to regulatory notifications and there being no objection from the relevant U.K. regulator and the Member States concerned, to establish branches and provide insurance and reinsurance services in all EEA Member States.

Following Brexit, the U.K.'s withdrawal from the EU will lead to a loss of passporting rights from U.K. financial institutions into the EU, except to the extent that any aspect of the regime is preserved in a separate agreement between the U.K. and the U.K. See "Risks Relating to Our Industry –The United Kingdom's referendum vote in favor of leaving the EU could adversely affect us."

Arch Re Europe and Arch MI Europe, being established in Ireland and authorized by the CBOI are able, subject to similar regulatory notifications and there being no objection from the CBOI and the Member States concerned, to establish branches and provide reinsurance services, and, in respect of Arch MI Europe, insurance services in all EEA states.

Solvency II does not prohibit EEA insurers from obtaining reinsurance from reinsurers licensed outside the EEA, such as Arch Re Bermuda. As such, and subject to the specific rules in each Member State, Arch Re Bermuda may do business from Bermuda with insurers in EEA Member States, but it may not directly operate its reinsurance business within the EEA. Article 172 of Solvency II provides that reinsurance contracts concluded by insurance undertakings in the EEA with reinsurers having their head office in a country whose solvency regime has been determined to be equivalent to Solvency II shall be

treated in the same manner as reinsurance contracts with undertakings in the EEA authorized under Solvency II. In this regard, with effect from January 1, 2016, the supervisory regime, including the solvency regime, in Bermuda has been determined to be equivalent to that laid down in Solvency II, except in relation to captives and special purpose insurers. Solvency II also includes specific measures providing for the supervision of insurance and reinsurance groups. However, as a consequence of the above determination of equivalence, pursuant to Article 260 of Solvency II, regulators within the EEA are required to rely on the worldwide group supervision exercised by the BMA. EIOPA has also indicated that, on a case by case basis, groups subject to this worldwide supervision may be exempted from any EEA sub-group supervision, where this results in more efficient supervision of the group and does not impair EEA supervisors in respect of their individual responsibilities.

The Insurance Distribution Directive ("IDD") was published in February 2016. EEA Member States were required to transpose the IDD by October 1, 2018. It replaces the existing Insurance Mediation Directive. The IDD applies to all distributors of insurance and reinsurance products (including insurers and reinsurers selling directly to customers) and strengthens the regulatory regime applicable to distribution activities through increased transparency, information and conduct requirements. The principal impact of the IDD is on the insurance market, however, requirements that apply across insurance and reinsurance include more specific conditions regarding knowledge and continuing professional development requirements for those involved in distribution of (re)insurance products. The IDD continues the existing ability for intermediaries established in a Member State of the EU to establish branches and provide services to all EEA states. Arch Underwriters Europe, being established in Ireland and authorized by the CBOI, is able, subject to regulatory notifications and there being no objection from the CBOI, to establish branches and provide services in all EEA states.

Privacy. The European General Data Protection Regulation (the "GDPR") came into effect on May 25, 2018. The GDPR aims to introduce consistent data protection rules across the EU and EEA, and its scope extends to certain entities not established in the EEA if they process personal data or offer goods or services to, or monitor the behavior of, EEA data subjects. The GDPR contains a number of new requirements regarding the processing of personal data about individuals, including mandatory security breach reporting, new and strengthened individual rights, evidenced data controller accountability for compliance with the GDPR principles (including fairness and transparency), maintenance of data processing activity records and the implementation of "privacy by design," including through the completion of mandatory Data Protection Impact Assessments in connection with higher risk data processing activities.

Australia

APRA is an independent statutory authority that supervises institutions across banking, insurance and superannuation and promotes financial stability in Australia. Arch LMI was authorized by APRA in January 2019 to conduct monoline lenders' mortgage insurance business in Australia. Major regulatory requirements that are applicable to Arch LMI as an insurance provider in Australia include requirements on minimum capital levels and compliance with corporate governance standards, including the risk management strategy for our Australian mortgage insurance business.

Hong Kong

The Hong Kong insurance industry is regulated by the Insurance Authority, the regulatory authority established pursuant to the Insurance Ordinance (Cap. 41), whose principal function is to regulate and supervise the insurance industry for the promotion of the general stability of the insurance industry and for the protection of existing and potential policyholders. Arch MI Asia is authorized to carry on general business Class 14 (Credit) and Class 16 (Miscellaneous Financial Loss), in or from Hong Kong.

Major regulatory requirements that are applicable to Arch MI Asia as a general business insurer include requirements on minimum paid-up capital, minimum solvency margin and maintenance of assets in Hong Kong.

TAX MATTERS

The following summary of the taxation of Arch Capital and the taxation of our shareholders is based upon current law and is for general information only. Legislative, judicial or administrative changes may be forthcoming that could affect this summary.

The following legal discussion (including and subject to the matters and qualifications set forth in such summary) of certain tax considerations (a) under “—Taxation of Arch Capital—Bermuda” and “—Taxation of Shareholders—Bermuda” is based upon the advice of Conyers Dill & Pearman Limited, Hamilton, Bermuda and (b) under “—Taxation of Arch Capital—United States,” “—Taxation of Shareholders—United States Taxation,” “—Taxation of Our U.S. Shareholders” and “—United States Taxation of Non-U.S. Shareholders” is based upon the advice of Cahill Gordon & Reindel LLP, New York, New York (the advice of such firms does not include accounting matters, determinations or conclusions relating to the business or activities of Arch Capital). The summary is based upon current law and is for general information only. The tax treatment of a holder of our common or preferred shares, or of a person treated as a holder of our shares for U.S. federal income, state, local or non-U.S. tax purposes, may vary depending on the holder's particular tax situation. Legislative, judicial or

administrative changes or interpretations may be forthcoming that could be retroactive and could affect the tax consequences to us or to holders of our shares.

Taxation of Arch Capital

Bermuda. Under current Bermuda law, Arch Capital is not subject to tax on income or profits, withholding, capital gains or capital transfers. Arch Capital has obtained from the Minister of Finance under the Exempted Undertakings Tax Protection Act 1966 of Bermuda an assurance that, in the event that Bermuda enacts legislation imposing tax computed on profits, income, any capital asset, gain or appreciation, or any tax in the nature of estate duty or inheritance, the imposition of any such tax shall not be applicable to Arch Capital or to any of our operations or our shares, debentures or other obligations until March 31, 2035. We could be subject to taxes in Bermuda after that date. This assurance will be subject to the proviso that it is not to be construed so as to prevent the application of any tax or duty to such persons as are ordinarily resident in Bermuda (we are not so currently affected) or to prevent the application of any tax payable in accordance with the provisions of the Land Tax Act 1967 of Bermuda or otherwise payable in relation to any property leased to us or our insurance subsidiary. We pay annual Bermuda government fees, and our Bermuda insurance and reinsurance subsidiary pays annual insurance license fees. In addition, all entities employing individuals in Bermuda are required to pay a payroll tax and other sundry taxes payable, directly or indirectly, to the Bermuda government.

United States. Arch Capital and its non-U.S. subsidiaries intend to conduct their operations in a manner that will not cause them to be treated as engaged in a trade or business in the U.S. and, therefore, will not be required to pay U.S. federal income taxes (other than U.S. excise taxes on insurance and reinsurance premium and withholding taxes on dividends and certain other U.S. source investment income). However, because definitive identification of activities which constitute being engaged in a trade or business in the U.S. is not provided by the Internal Revenue Code of 1986, as amended (the “Code”), or regulations or court decisions, there can be no assurance that the U.S. Internal Revenue Service (“IRS”) will not contend successfully that Arch Capital or its non-U.S. subsidiaries are or have been engaged in a trade or business in the U.S. A foreign corporation deemed to be so engaged would be subject to U.S. income tax, as well as the branch profits tax, on its income, which is treated as effectively connected with the conduct of that trade or business unless the corporation is entitled to relief under the permanent establishment provisions of a tax treaty. Such income tax, if imposed, would be based on effectively connected income computed in a manner generally analogous to that applied to the income of a domestic corporation, except that deductions and credits generally are not permitted unless the foreign corporation has timely filed a U.S. federal income tax return in accordance with applicable regulations. Penalties may be assessed for failure to file tax returns. The 30% branch

profits tax is imposed on net income after subtracting the regular corporate tax and making certain other adjustments.

Under the income tax treaty between Bermuda and the U.S. (the “Treaty”), Arch Capital's Bermuda insurance subsidiaries will be subject to U.S. income tax on any insurance premium income found to be effectively connected with a U.S. trade or business only if that trade or business is conducted through a permanent establishment in the U.S. No regulations interpreting the Treaty have been issued. While there can be no assurances, Arch Capital does not believe that any of its Bermuda insurance subsidiaries has a permanent establishment in the U.S. Such subsidiaries would not be entitled to the benefits of the Treaty if (i) 50% or less of Arch Capital's shares were beneficially owned, directly or indirectly, by Bermuda residents or U.S. citizens or residents, or (ii) any such subsidiary's income were used in substantial part to make disproportionate distributions to, or to meet certain liabilities to, persons who are not Bermuda residents or U.S. citizens or residents. While there can be no assurances, Arch Capital believes that its Bermuda insurance subsidiaries are eligible for Treaty benefits.

The Treaty clearly applies to premium income, but may be construed as not protecting investment income. If Arch Capital's Bermuda insurance subsidiaries were considered to be engaged in a U.S. trade or business and were entitled to the benefits of the Treaty in general, but the Treaty were not found to protect investment income, a portion of such subsidiaries' investment income could be subject to U.S. federal income tax.

Non-U.S. insurance companies carrying on an insurance business within the U.S. have a certain minimum amount of effectively connected net investment income, determined in accordance with a formula that depends, in part, on the amount of U.S. risk insured or reinsured by such companies. If any of Arch Capital's non-U.S. insurance subsidiaries is considered to be engaged in the conduct of an insurance business in the U.S., a significant portion of such company's investment income could be subject to U.S. income tax.

Non-U.S. corporations not engaged in a trade or business in the U.S. are nonetheless subject to U.S. income tax on certain “fixed or determinable annual or periodic gains, profits and income” derived from sources within the U.S. as enumerated in Section 881(a) of the Code (such as dividends and certain interest on investments), subject to exemption under the Code or reduction by applicable treaties.

The U.S. also imposes an excise tax on insurance and reinsurance premiums paid to non-U.S. insurers or reinsurers with respect to risks located in the U.S. The rates of tax, unless reduced by an applicable U.S. tax treaty, are 4% for non-life insurance premiums and 1% for life insurance and all reinsurance premiums.

The Tax Cuts and Jobs Act of 2017 (the “Tax Cuts Act”) was signed into law by the President of the United States in 2017. For taxable years beginning after 2017, the Tax Cuts Act imposes a 10% minimum tax (reduced to 5% for the 2018 taxable year and increased to 12.5% for the 2026 taxable year and the subsequent taxable years) on the “modified taxable income” of a U.S. corporation (or a non-U.S. corporation engaged in a U.S. trade or business) over such corporation's regular U.S. federal income tax, reduced by certain tax credits. The “modified taxable income” of a corporation is determined without deduction for certain payments by such corporation to its non-U.S. affiliates (including reinsurance premiums).

United Kingdom. Our U.K. subsidiaries are companies incorporated and have their central management and control in the U.K., and are therefore resident in the U.K. for corporation tax purposes. As a result, they will be subject to U.K. corporation tax on their respective profits. The U.K. branches of Arch Re Europe and Arch Underwriters Europe will be subject to U.K. corporation tax on the profits (both income profits and chargeable gains) attributable to each branch. The main rate of U.K. corporation tax for the financial year starting April 1, 2018 is 19% on profits. It has been announced that the U.K. corporation tax rate will remain at 19% on profits for the financial year starting April 1, 2019, and will reduce to 17% on profits for the financial year starting April 1, 2020.

Canada. Arch Insurance Canada, a Canadian federal insurance company, commenced underwriting in 2013. Arch Re U.S., through a branch, commenced underwriting reinsurance in Canada in January 2015. Arch Insurance Canada is taxed on its worldwide income. Arch Re U.S. is taxed on its net business income earned in Canada. The general federal corporate income tax rate in Canada is currently 15%. Provincial and territorial corporate income tax rates are added to the general federal corporate income tax rate and generally vary between 11% and 16%.

Ireland. Each of Arch Re Europe, Arch MI Europe and Arch Underwriters Europe is incorporated and resident in Ireland for corporation tax purposes and will be subject to Irish corporate tax on its worldwide profits, including the profits of the branches of Arch Re Europe and Arch Underwriters Europe. Any creditable foreign tax payable will be creditable against Arch Re Europe's Irish corporate tax liability on the results of Arch Re Europe's branches with the same principle applied to Arch Underwriters Europe's branches. The current rate of Irish corporation tax applicable to such trading profits is 12.5%.

Switzerland. Arch Re Europe Swiss Branch and Arch Underwriters Europe Swiss Branch are subject to Swiss corporation tax on the profit which is allocated to the branch. The effective tax rate is approximately 21.15% for Swiss federal, cantonal and communal corporation taxes on the profit. The effective tax rate of the annual cantonal and communal capital taxes on the equity which is allocated to Arch Re Europe

Swiss Branch and Arch Underwriters Europe Swiss Branch is approximately 0.17%.

Denmark. Arch Re Denmark, established as a subsidiary of Arch Re Bermuda, is subject to Danish corporation taxes on its profits at a rate of 22% for 2016 and onwards.

Hong Kong. Arch MI Asia is subject to Hong Kong corporate tax on its assessable profits at a rate of 16.5%. Assessable profits are the net profits for the basis period, arising in or derived from Hong Kong.

Australia. Arch LMI, an Australian incorporated and tax resident company, is subject to Australian corporate tax on its worldwide profits. The current rate of Australian corporation tax applicable to such profits is 30%.

Taxation of Shareholders

Bermuda. Currently, there is no Bermuda withholding tax on dividends paid by us.

United States—General. The following summary sets forth certain U.S. federal income tax considerations related to the purchase, ownership and disposition of our common shares and our non-cumulative preferred shares (“preferred shares”). Unless otherwise stated, this summary deals only with shareholders (“U.S. holders”) that are U.S. Persons (as defined below) who hold their common shares and preferred shares as capital assets and as beneficial owners. The following discussion is only a general summary of the U.S. federal income tax matters described herein and does not purport to address all of the U.S. federal income tax consequences that may be relevant to a particular shareholder in light of such shareholder’s specific circumstances. In addition, the following summary does not describe the U.S. federal income tax consequences that may be relevant to certain types of shareholders, such as banks, insurance companies, regulated investment companies, real estate investment trusts, financial asset securitization investment trusts, dealers in securities or traders that adopt a mark-to-market method of tax accounting, tax exempt entities, expatriates, U.S. holders that hold our common shares or preferred shares through a non-U.S. broker or other non-U.S. intermediary, persons who hold the common shares or preferred shares as part of a hedging or conversion transaction or as part of a straddle, who may be subject to special rules or treatment under the Code or persons required for U.S. federal income tax purposes to recognize income no later than such income is reported on such persons’ applicable financial statements. This discussion is based upon the Code, the Treasury regulations promulgated there under and any relevant administrative rulings or pronouncements or judicial decisions, all as in effect on the date of this annual report and as currently interpreted, and does not take into account possible changes in such tax laws or interpretations thereof, which may apply retroactively. This discussion does not include any description of the tax laws of

any state or local governments within the U.S., or of any foreign government, that may be applicable to our common shares or preferred shares or the shareholders. Persons considering making an investment in the common shares or preferred shares should consult their own tax advisors concerning the application of the U.S. federal tax laws to their particular situations as well as any tax consequences arising under the laws of any state, local or foreign taxing jurisdiction prior to making such investment.

If an entity that is treated as a partnership holds our common shares or preferred shares, the tax treatment of a partner will generally depend upon the status of the partner and the activities of the partnership. If you are a partner of a partnership holding our common shares or preferred shares, you should consult your tax advisor.

For purposes of this discussion, the term “U.S. Person” means:

- an individual who is a citizen or resident of the U.S.;
- a corporation or entity treated as a corporation created or organized under the laws of the U.S., any state thereof, or the District of Columbia;
- an estate the income of which is subject to U.S. federal income taxation regardless of its source;
- a trust if either (i) a court within the U.S. is able to exercise primary supervision over the administration of such trust and one or more U.S. persons have the authority to control all substantial decisions of such trust or (ii) the trust has a valid election in effect to be treated as a U.S. person for U.S. federal income tax purposes; or
- any other person or entity that is treated for U.S. federal income tax purposes as if it were one of the foregoing.

United States—Taxation of Dividends. The preferred shares should be properly classified as equity rather than debt for U.S. federal income tax purposes. Subject to the discussions below relating to the potential application of the controlled foreign corporation (“CFC”), “related person insurance income” (“RPII”) and passive foreign investment companies (“PFIC”) rules, as defined below, cash distributions, if any, made with respect to our common shares or preferred shares will constitute dividends for U.S. federal income tax purposes to the extent paid out of our current or accumulated earnings and profits (as computed using U.S. tax principles). If a U.S. holder of our common shares or our preferred shares is an individual or other non-corporate holder, dividends paid, if any, to that holder that constitute qualified dividend income generally will be taxable at the rate applicable for long-term capital gains (generally up to 20%), provided that such person meets a holding period requirement. Generally in order to meet the holding period requirement, the U.S. Person must hold the common shares for more than 60 days during the 121-day period beginning 60 days before the ex-dividend date and must hold preferred shares for more than 90 days during the 181-day period beginning 90 days before the ex-dividend date.

Dividends paid, if any, with respect to common shares or preferred shares generally will be qualified dividend income, provided the common shares or preferred shares are readily tradable on an established securities market in the U.S. in the year in which the shareholder receives the dividend (which should be the case for shares that are listed on the NASDAQ Stock Market or the New York Stock Exchange) and Arch Capital is not considered to be a passive foreign investment company in either the year of the distribution or the preceding taxable year. No assurance can be given that the preferred shares will be considered readily tradable on an established securities market in the U.S. See “—Taxation of Our U.S. Shareholders” below.

A U.S. holder that is an individual, estate or a trust that does not fall into a special class of trusts that is exempt from such tax, will be subject to a 3.8% tax on the lesser of (1) the U.S. holder’s “net investment income” for the relevant taxable year and (2) the excess of the U.S. holder’s modified adjusted gross income for the taxable year over a certain threshold (which in the case of individual will be between \$125,000 and \$250,000, depending on the individual’s circumstances). A U.S. holder’s net investment income will generally include its dividend income and its net gains from the disposition of our common shares and preferred shares, unless such dividend income or net gains are derived in the ordinary course of the conduct of a trade or business (other than a trade or business that consists of certain passive or trading activities).

Distributions with respect to the common shares and the preferred shares will not be eligible for the dividends received deduction allowed to U.S. corporations under the Code. To the extent distributions on our common shares and preferred shares exceed our earnings and profits, they will be treated first as a return of the U.S. holder’s basis in our common shares and our preferred shares to the extent thereof, and then as gain from the sale of a capital asset.

United States—Sale, Exchange or Other Disposition. Subject to the discussions below relating to the potential application of the CFC, RPII and PFIC rules, holders of common shares and preferred shares generally will recognize capital gain or loss for U.S. federal income tax purposes on the sale, exchange or disposition of common shares or preferred shares, as applicable.

United States—Redemption of Preferred Shares. A redemption of the preferred shares will be treated under section 302 of the Code as a dividend if we have sufficient earnings and profits, unless the redemption satisfies one of the tests set forth in section 302(b) of the Code enabling the redemption to be treated as a sale or exchange, subject to the discussion herein relating to the potential application of the CFC, RPII and PFIC rules. Under the relevant Code section 302(b) tests, the redemption should be treated as a sale or exchange only if it (1) is substantially disproportionate, (2) constitutes a complete termination of the holder’s stock interest in us or (3) is “not

essentially equivalent to a dividend.” In determining whether any of these tests are met, shares considered to be owned by the holder by reason of certain constructive ownership rules set forth in the Code, as well as shares actually owned, must generally be taken into account. It may be more difficult for a U.S. Person who owns, actually or constructively by operation of the attribution rules, any of our other shares to satisfy any of the above requirements. The determination as to whether any of the alternative tests of section 302(b) of the Code is satisfied with respect to a particular holder of the preference shares depends on the facts and circumstances as of the time the determination is made.

Taxation of Our U.S. Shareholders

Controlled Foreign Corporation Rules. We or any of our non-U.S. subsidiaries will be treated as a CFC with respect to any taxable year if at any time during such taxable year, one or more “10% Shareholders” (as defined below) collectively own more than 50% of us or such non-U.S. subsidiary (as applicable) by vote or value (taking into account shares actually owned by such U.S. holder as well as shares attributed to such U.S. holder under the Code or the regulations thereunder). For taxable years beginning on or before December 31, 2017, a 10% Shareholder means any shareholder who was considered to own, actually or constructively, 10% or more of the total combined voting power of our shares or those of our non-U.S. subsidiaries (as applicable). Under the Tax Cuts Act, for taxable years beginning after December 31, 2017, a 10% Shareholder also includes any shareholder who is considered to own, actually or constructively, 10% or more of the value of our shares or those of our non-U.S. subsidiaries (as applicable). As a result, for taxable years beginning after December 31, 2017, the voting cut-back limitation contained in our by-laws that limits the votes conferred by the Controlled Shares (as defined in our by-laws) of any U.S. Person to 9.9% of the total voting power of all our shares entitled to vote will not prevent any U.S. holder from being treated as a 10% Shareholder.

Status as a CFC would not cause us or any of our non-U.S. subsidiaries to be subject to U.S. federal income tax. Such status also would have no adverse U.S. federal income tax consequences for any U.S. holder that is not a 10% Shareholder with respect to us or any of such non-U.S. subsidiaries (as applicable). If we are or were a CFC with respect to any taxable year, a U.S. holder that is considered a 10% U.S. Shareholder would be subject to current U.S. federal income taxation (at ordinary income tax rates) to the extent of all or a portion of the undistributed earnings and profits of Arch Capital and our subsidiaries attributable to “subpart F income” (including certain insurance premium income and investment income) and may be taxable at ordinary income tax rates on any gain recognized on a sale or other disposition (including by way of repurchase or liquidation) of our common shares or preferred shares to the extent of the current and accumulated earnings and profits attributable to such common shares or preferred

shares. For taxable years beginning after December 31, 2017, a helpful limitation, which provides that a U.S. shareholder would not be subject to the current inclusion rules of Subpart F for a taxable year unless the non-U.S. corporation was a CFC for an uninterrupted period of 30 days or more during such taxable year, will no longer apply.

Related Person Insurance Income Rules. Generally, we do not expect the gross RPII of any of our non-U.S. subsidiaries to equal or exceed 20% of its gross insurance income in any taxable year for the foreseeable future (the “RPII 20% gross income exception”). Consequently, we do not expect any U.S. person owning common shares or preferred shares to be required to include in gross income for U.S. federal income tax purposes RPII income, but there can be no assurance that this will be the case.

Section 953(c)(7) of the Code generally provides that Section 1248 of the Code (which generally would require a U.S. holder to treat certain gains attributable to the sale, exchange or disposition of common shares or preferred shares as a dividend) will apply to the sale or exchange by a U.S. shareholder of shares in a foreign corporation that is characterized as a CFC under the RPII rules if the foreign corporation would be taxed as an insurance company if it were a domestic corporation, regardless of whether the U.S. shareholder is a 10% U.S. Shareholder or whether the corporation qualifies for the RPII 20% gross income exception. Although existing U.S. Treasury Department (“Treasury”) regulations do not address the question, proposed Treasury regulations issued in April 1991 create some ambiguity as to whether Section 1248 and the requirement to file Form 5471 would apply when the foreign corporation has a foreign insurance subsidiary that is a CFC for RPII purposes and that would be taxed as an insurance company if it were a domestic corporation. We believe that Section 1248 and the requirement to file Form 5471 will not apply to a less than 10% U.S. Shareholder because Arch Capital is not directly engaged in the insurance business. There can be no assurance, however, that the IRS will interpret the proposed regulations in this manner or that the Treasury will not take the position that Section 1248 and the requirement to file Form 5471 will apply to dispositions of our common shares or our preferred shares.

If the IRS or Treasury were to make Section 1248 and the Form 5471 filing requirement applicable to the sale of our shares, we would notify shareholders that Section 1248 of the Code and the requirement to file Form 5471 will apply to dispositions of our shares. Thereafter, we would send a notice after the end of each calendar year to all persons who were shareholders during the year notifying them that Section 1248 and the requirement to file Form 5471 apply to dispositions of our shares by U.S. holders. We would attach to this notice a copy of Form 5471 completed with all our information and instructions for completing the shareholder information.

Tax-Exempt Shareholders. Tax-exempt entities may be required to treat certain Subpart F insurance income, including RPII, that is includible in income by the tax-exempt entity as unrelated business taxable income. Prospective investors that are tax exempt entities are urged to consult their own tax advisors as to the potential impact of the unrelated business taxable income provisions of the Code.

Passive Foreign Investment Companies. Sections 1291 through 1298 of the Code contain special rules applicable with respect to foreign corporations that are PFICs. In general, a foreign corporation will be a PFIC if 75% or more of its income constitutes “passive income” or 50% or more of its assets produce passive income. If we were to be characterized as a PFIC, U.S. holders would be subject to a penalty tax at the time of their sale of (or receipt of an “excess distribution” with respect to) their common shares or preferred shares. In general, a shareholder receives an “excess distribution” if the amount of the distribution is more than 125% of the average distribution with respect to the shares during the three preceding taxable years (or shorter period during which the taxpayer held the stock). In general, the penalty tax is equivalent to an interest charge on taxes that are deemed due during the period the shareholder owned the shares, computed by assuming that the excess distribution or gain (in the case of a sale) with respect to the shares was taxable in equal portions throughout the holder’s period of ownership. The interest charge is equal to the applicable rate imposed on underpayments of U.S. federal income tax for such period. A U.S. shareholder may avoid some of the adverse tax consequences of owning shares in a PFIC by making a qualified electing fund (“QEF”) election. A QEF election is revocable only with the consent of the IRS and has the following consequences to a shareholder:

- For any year in which Arch Capital is not a PFIC, no income tax consequences would result.
- For any year in which Arch Capital is a PFIC, the shareholder would include in its taxable income a proportionate share of the net ordinary income and net capital gains of Arch Capital and certain of its non-U.S. subsidiaries.

For taxable years beginning on or before December 31, 2017, the determination of whether the active insurance company exception applies to an insurance company was made on a case-by-case basis and the analysis was inherently subjective. Under the Tax Cuts Act, for taxable years beginning after December 31, 2017, the active insurance company exception applies only if (i) the company would be taxed as an insurance company were it a U.S. corporation and (ii) either (A) loss and loss adjustment expense and certain reserves constitute more than 25% of the company’s gross assets for the relevant year or (B) loss and loss adjustment expenses and certain reserves constitute more than 10% of the company’s gross assets for the relevant year and, based on the applicable facts and circumstances, the company is predominantly engaged in an

insurance business and the failure of the company to satisfy the preceding 25% test is due solely to run-off related or other specified circumstances involving the insurance business. The PFIC statutory provisions contain a look-through rule that states that, for purposes of determining whether a foreign corporation is a PFIC, such foreign corporation shall be treated as if it “received directly its proportionate share of the income” and as if it “held its proportionate share of the assets” of any other corporation in which it owns at least 25% of the stock. We believe that we were not a PFIC for any taxable year beginning on or before December 31, 2017 and we are not expecting to become a PFIC for any taxable year beginning after December 31, 2017 and we will use reasonable best efforts to cause us and each of our majority owned non-U.S. insurance subsidiaries not to constitute a PFIC.

In April 2015, the IRS issued proposed regulations in an attempt to define the foreign insurance company exception to the PFIC rules (the “proposed PFIC insurance regulations”). The proposed PFIC insurance regulations are likely to be revised in light of the modified active insurance company exception contained in the Tax Cuts Act (as described above).

No regulations interpreting the substantive PFIC provisions have yet been finalized. It is possible that the regulations interpreting the PFIC provisions will be issued in the future and contain rules different from those in the proposed PFIC insurance regulations. Each U.S. holder should consult its own tax advisor as to the effects of these rules.

United States Taxation of Non-U.S. Shareholders

Taxation of Dividends. Cash distributions, if any, made with respect to common shares or preferred shares held by shareholders who are not U.S. Persons (“Non-U.S. holders”) generally will not be subject to U.S. withholding tax.

Sale, Exchange or Other Disposition. Non-U.S. holders of common shares or preferred shares generally will not be subject to U.S. federal income tax with respect to gain realized upon the sale, exchange or other disposition of such shares unless such gain is effectively connected with a U.S. trade or business of the Non-U.S. holder in the U.S. or such person is present in the U.S. for 183 days or more in the taxable year the gain is realized and certain other requirements are satisfied.

Information Reporting and Backup Withholding. Non-U.S. holders of common shares or preferred shares will not be subject to U.S. information reporting or backup withholding with respect to dispositions of common shares effected through a non-U.S. office of a broker, unless the broker has certain connections to the U.S. or is a U.S. person. No U.S. backup withholding will apply to payments of dividends, if any, on our common shares or our preferred shares.

FATCA Withholding. Sections 1471 through 1474 to the Code, known as the Foreign Account Tax Compliance Act (“FATCA”), impose a withholding tax of 30% on U.S.-source interest, dividends and certain other types of income, which is received by a foreign financial institution (“FFI”), unless such FFI enters into an agreement with the IRS to obtain certain information as to the identity of the direct and indirect owners of accounts in such institution. In addition, a 30% withholding tax may be imposed on the above payments to certain non-financial foreign entities which do not (i) certify to each respective withholding agent that they have no “substantial U.S. owners” (*i.e.*, a U.S. 10% direct or indirect shareholder), or (ii) provide such withholding agent with the certain information as to the identity of such substantial U.S. owners. The U.S. has entered into intergovernmental agreements to implement FATCA (“IGAs”) with a number of jurisdictions. Bermuda has signed an IGA with the U.S. Different rules than those described above may apply under such an IGA.

Although dividends with respect to our common shares or preferred shares will generally be treated as foreign source for U.S. federal withholding tax purposes, it is unclear whether, for FATCA purposes, some or all of our dividends may be recharacterized as U.S. source dividends. Treasury regulations addressing this topic have not yet been issued.

Prospective investors are urged to consult their own tax advisors as to the filing and information requirements that may be imposed on them in respect of their ownership of our common share or preferred shares.

Other Tax Laws. Shareholders should consult their own tax advisors with respect to the applicability to them of the tax laws of other jurisdictions.

ITEM 1A. RISK FACTORS

Set forth below are risk factors relating to our business. These risks and uncertainties are not the only ones we face. There may be additional risks that we currently consider not to be material or of which we are not currently aware, and any of these risks could cause our actual results to differ materially from historical or anticipated results. You should carefully consider these risks along with the other information provided in this report, including our “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and our accompanying consolidated financial statements, as well as the information under the heading “Cautionary Note Regarding Forward-Looking Statements” before investing in any of our securities. We may amend, supplement or add to the risk factors described below from time to time in future reports filed with the SEC.

Risks Relating to Our Industry

We operate in a highly competitive environment, and we may not be able to compete successfully in our industry.

The insurance and reinsurance industry is highly competitive. We compete on an international and regional basis with major U.S. and non-U.S. insurers and reinsurers, many of which have greater financial, marketing and management resources than we do. We also compete with new companies that continue to be formed to enter the insurance and reinsurance markets, as well as with other capital market participants that create alternative products intended to compete with reinsurance products. Certain new companies entering the insurance and reinsurance markets are pursuing more aggressive investment strategies than do we and other traditional reinsurers, which may result in downward pressure on premium rates. In our U.S. mortgage business, we compete with other private mortgage insurers, with the Federal Housing Administration, and, increasingly, with well capitalized multiline reinsurers and capital markets alternatives to private mortgage insurance. Competition within the private mortgage insurance industry could result in the loss of customers, lower premiums, riskier credit guidelines and other changes that could lower our revenues or increase our expenses.

In addition, there has been significant consolidation in the insurance and reinsurance sector in recent years and we may experience increased competition as a result of that consolidation, with consolidated entities having enhanced market power. These consolidated entities may use their enhanced market power and broader capital base to negotiate price reductions for products and services that compete with ours, and we may experience rate declines and possibly write less business. Any failure by us to effectively compete could

adversely affect our financial condition and results of operations.

The insurance and reinsurance industry is highly cyclical, and we expect to continue to experience periods characterized by excess underwriting capacity and unfavorable premium rates.

Historically, insurers and reinsurers have experienced significant fluctuations in operating results due to competition, frequency of occurrence or severity of catastrophic events, levels of capacity, general economic conditions, changes in equity, debt and other investment markets, changes in legislation, case law and prevailing concepts of liability and other factors. In particular, demand for reinsurance is influenced significantly by the underwriting results of primary insurers and prevailing general economic conditions. The supply of insurance and reinsurance is related to prevailing prices and levels of surplus capacity that, in turn, may fluctuate in response to changes in rates of return being realized in the insurance and reinsurance industry on both underwriting and investment sides. As a result, the insurance and reinsurance business historically has been a cyclical industry characterized by periods of intense price competition due to excessive underwriting capacity as well as periods when shortages of capacity permitted favorable premium levels and changes in terms and conditions. The supply of insurance and reinsurance has increased over the past several years and may increase further, either as a result of capital provided by new entrants or by the commitment of additional capital by existing insurers or reinsurers. Continued increases in the supply of insurance and reinsurance may have consequences for us, including fewer contracts written, lower premium rates, increased expenses for customer acquisition and retention, and less favorable policy terms and conditions.

Claims for catastrophic events could cause large losses and substantial volatility in our results of operations and could have a material adverse effect on our financial position and results of operations.

We have large aggregate exposures to natural and man-made catastrophic events. Catastrophes can be caused by various events, including hurricanes, floods, tsunamis, windstorms, earthquakes, hailstorms, tornadoes, explosions, severe winter weather, fires, droughts and other natural disasters. Catastrophes can also cause losses in non-property business such as workers’ compensation or general liability. In addition to the nature of the property business, we believe that economic and geographic trends affecting insured property, including inflation, property value appreciation and geographic concentration tend to generally increase the size of losses from catastrophic events over time. Actual losses from future

catastrophic events may vary materially from estimates due to the inherent uncertainties in making such determinations resulting from several factors, including the potential inaccuracies and inadequacies in the data provided by clients, brokers and ceding companies, the modeling techniques and the application of such techniques, the contingent nature of business interruption exposures, the effects of any resultant demand surge on claims activity and attendant coverage issues.

In addition, over the past several years, changing weather patterns and climatic conditions, such as global warming, have added to the unpredictability and frequency of natural disasters in certain parts of the world and created additional uncertainty as to future trends and exposures. Although the loss experience of catastrophe insurers and reinsurers has historically been characterized as low frequency, there is a growing consensus today that climate change increases the frequency and severity of extreme weather events and, in recent years, the frequency of major catastrophes appears to have increased. Claims for catastrophic events, or an unusual frequency of smaller losses in a particular period, could expose us to large losses, cause substantial volatility in our results of operations and could have a material adverse effect on our ability to write new business.

Additionally, we cannot predict how legal, regulatory and/or social responses to concerns around global climate change may impact our business. Although we attempt to manage our exposure to such events through the use of underwriting controls, risk models, and the purchase of third-party reinsurance, catastrophic events are inherently unpredictable and the actual nature of such events when they occur could be more frequent or severe than contemplated in our pricing and risk management expectations. As a result, the occurrence of one or more catastrophic events could have an adverse effect on our results of operations and financial condition.

We could face unanticipated losses from war, terrorism, cyber-attacks and political instability, and these or other unanticipated losses could have a material adverse effect on our financial condition and results of operations.

We have substantial exposure to unexpected, large losses resulting from future man-made catastrophic events, such as acts of war, acts of terrorism and political instability. These risks are inherently unpredictable. It is difficult to predict the timing of such events with statistical certainty or estimate the amount of loss any given occurrence will generate. In certain instances, we specifically insure and reinsure risks resulting from acts of terrorism. We may also insure against risk related to cybersecurity and cyber-attacks. In addition, our exposure to cyber-attacks includes exposure to 'silent cyber' risks, meaning risks and potential losses associated with policies where cyber risk is not specifically included nor excluded in the policies. Even in cases where we attempt to exclude losses from terrorism, cybersecurity and certain other similar risks from

some coverages written by us, we may not be successful in doing so. Moreover, irrespective of the clarity and inclusiveness of policy language, there can be no assurance that a court or arbitration panel will not limit enforceability of policy language or otherwise issue a ruling adverse to us. Accordingly, while we believe our reinsurance programs, together with the coverage provided under the Terrorism Risk Insurance Act of 2002, as amended under the Terrorism Risk Insurance Extension Act of 2005 and the Terrorism Risk Insurance Program Reauthorization Act of 2007, and amended and extended again by TRIPRA, are sufficient to reasonably limit our net losses relating to potential future terrorist attacks, we can offer no assurance that our available capital will be adequate to cover losses when they materialize. To the extent that an act of terrorism is certified by the Secretary of the Treasury and aggregate industry insured losses resulting from the act of terrorism exceeds the prescribed program trigger, our U.S. insurance operations may be covered under TRIPRA for up to 81% for 2019 and 80% for 2020, in each case subject to a mandatory deductible of 20% of our prior year's direct earned premium for covered property and liability coverages. The program trigger for calendar year 2019 is \$180 million and \$200 million in 2020. If an act (or acts) of terrorism result in covered losses exceeding the \$100 billion annual limit, insurers with losses exceeding their deductibles will not be responsible for additional losses. It is not possible to completely eliminate our exposure to unforecasted or unpredictable events, and to the extent that losses from such risks occur, our financial condition and results of operations could be materially adversely affected.

Political, regulatory, legislative and industry initiatives could adversely affect our business.

Governmental authorities in the U.S. and worldwide have become increasingly interested in potential risks posed by the insurance industry as a whole, and to commercial and financial systems in general and there may be increased regulatory intervention in our industry in the future. For example, in the U.S., the federal government (including federal consumer protection authorities) has increased its scrutiny of the insurance regulatory framework in recent years, and various state legislators are considering or have enacted laws that will alter and likely increase state regulation of insurance and reinsurance companies and holding companies. The U.S. mortgage insurance industry has also been subject to increased federal and state regulatory scrutiny (including by state insurance regulatory authorities), which could generate new regulations, regulatory actions or investigations.

In the EU, Solvency II imposed economic risk-based solvency requirements across all EU Member States covering quantitative capital requirements, qualitative regulatory reviews and market discipline. In addition, Solvency II imposes significant requirements for our EU-based regulated companies

which require substantial documentation and implementation effort.

The BMA has also implemented and imposed additional requirements on the commercial insurance companies it regulates, driven, in large part, by Solvency II. The European Commission has adopted a decision concluding that Bermuda meets the full equivalence criteria under Solvency II.

While we cannot predict the exact nature, timing or scope of any possible governmental initiatives, such proposals could adversely affect our business by, among other things: providing reinsurance capacity in markets and to consumers that we target; requiring our further participation in industry pools and guaranty associations; expanding the scope of coverage under existing policies (e.g., following large disasters); further regulating the terms of insurance or reinsurance contracts; or disproportionately benefiting the companies of one country over those of another.

In addition, increased scrutiny by insurance regulators of investments in or acquisitions of insurers or insurance holding companies by private equity firms or hedge funds may result in imposition of additional regulatory requirements and restrictions. We have in the past partnered with private equity firms in making investments and may do so in the future. This increased scrutiny may make it difficult to complete investments with private equity or hedge funds should we seek to do so.

Underwriting risks and reserving for losses are based on probabilities and related modeling, which are subject to inherent uncertainties.

Our success is dependent upon our ability to assess accurately the risks associated with the businesses that we insure and reinsure. We establish reserves for losses and loss adjustment expenses which represent estimates involving actuarial and statistical projections, at a given point in time, of our expectations of the ultimate settlement and administration costs of losses incurred. We utilize actuarial models as well as available historical insurance industry loss ratio experience and loss development patterns to assist in the establishment of loss reserves. Most or all of these factors are not directly quantifiable, particularly on a prospective basis, and the effects of these and unforeseen factors could negatively impact our ability to accurately assess the risks of the policies that we write. Changes in the assumptions used by these models or by management could lead to an increase in our estimate of ultimate losses in the future. In addition, there may be significant reporting lags between the occurrence of the insured event and the time it is actually reported to the insurer and additional lags between the time of reporting and final settlement of claims. Unfavorable development in any of these factors could cause the level of reserves to be inadequate. In addition, the estimation of loss reserves is also more difficult during times of adverse economic and market conditions due

to unexpected changes in behavior of claimants and policyholders, including an increase in fraudulent reporting of exposures and/or losses, reduced maintenance of insured properties or increased frequency of small claims. Changes in the level of inflation also result in an increased level of uncertainty in our estimation of loss reserves. As a result, actual losses and loss adjustment expenses paid will deviate, perhaps substantially, from the reserve estimates reflected in our financial statements.

If our loss reserves are determined to be inadequate, we will be required to increase loss reserves at the time of such determination with a corresponding reduction in our net income in the period in which the deficiency becomes known. It is possible that claims in respect of events that have occurred could exceed our claim reserves and have a material adverse effect on our results of operations, in a particular period, or our financial condition in general. As a compounding factor, although most insurance contracts have policy limits, the nature of property and casualty insurance and reinsurance is such that losses can exceed policy limits for a variety of reasons and could significantly exceed the premiums received on the underlying policies, thereby further adversely affecting our financial condition.

In accordance with mortgage insurance industry practice, we establish loss reserves only for loans in our existing delinquency inventory. Because our mortgage insurance reserving process does not take account of the impact of future losses from loans that are not delinquent, mortgage insurance loss reserves are not intended to be an estimate of total future losses. Our expectation of total future losses under our mortgage insurance policies in force at any period end is not reflected in our financial statements. In addition to establishing loss reserves for delinquent loans, under GAAP, we are required to establish a premium deficiency reserve for our mortgage insurance products if the amount of expected future losses for a particular product and maintenance costs for such product exceeds expected future premiums, existing reserves and the anticipated investment income. We evaluate whether a premium deficiency exists quarterly. There can be no assurance that premium deficiency reserves will not be required in future periods. If this were to occur, our results of operations and financial condition could be adversely affected.

As of December 31, 2018, our consolidated reserves for unpaid losses and loss adjustment expenses, net of unpaid losses and loss adjustment expenses recoverable, were approximately \$9.04 billion. Such reserves were established in accordance with applicable insurance laws and GAAP. Loss reserves are inherently subject to uncertainty. In establishing the reserves for losses and loss adjustment expenses, we have made various assumptions relating to the pricing of our reinsurance contracts and insurance policies and have also considered available historical industry experience and current industry conditions.

Any estimates and assumptions made as part of the reserving process could prove to be inaccurate due to several factors, including the fact that relatively limited historical information has been reported to us through December 31, 2018.

The failure of any of the loss limitation methods we employ could have a material adverse effect on our financial condition or results of operations.

We seek to limit our loss exposure by writing a number of our reinsurance contracts on an excess of loss basis, adhering to maximum limitations on reinsurance written in defined geographical zones, limiting program size for each client and prudent underwriting of each program written. In the case of proportional treaties, we may seek per occurrence limitations or loss ratio caps to limit the impact of losses from any one or series of events. In our insurance operations, we seek to limit our exposure through the purchase of reinsurance. For our U.S. mortgage insurance business, in addition to utilizing reinsurance, we have developed a proprietary risk model that simulates the maximum loss resulting from a severe economic event impacting the housing market. We cannot be certain that any of these loss limitation methods will be effective. We also seek to limit our loss exposure by geographic diversification. Geographic zone limitations involve significant underwriting judgments, including the determination of the area of the zones and the inclusion of a particular policy within a particular zone's limits. Various provisions of our policies, negotiated to limit our risk, such as limitations or exclusions from coverage or choice of forum, may not be enforceable in the manner we intend, as it is possible that a court or regulatory authority could nullify or void an exclusion or limitation, or legislation could be enacted modifying or barring the use of these exclusions and limitations. Disputes relating to coverage and choice of legal forum may also arise. Underwriting is inherently a matter of judgment, involving important assumptions about matters that are inherently unpredictable and beyond our control, and for which historical experience and probability analysis may not provide sufficient guidance. No assurances can be made that these loss limitation methods will be effective and mitigate our loss exposure. One or more catastrophic events or severe economic events could result in claims that substantially exceed our expectations, or the protections set forth in our policies could be voided, which, in either case, could have a material adverse effect on our financial condition or our results of operations, possibly to the extent of eliminating our shareholders' equity. See "Management's Discussion and Analysis of Financial Condition and Results of Operations—Catastrophic Events and Severe Economic Events." Depending on business opportunities and the mix of business that may comprise our insurance, reinsurance and mortgage insurance portfolio, we may seek to adjust our self-imposed limitations on probable maximum pre-tax loss for catastrophe exposed business and mortgage default exposed business.

Adverse developments in the financial markets could have a material adverse effect on our results of operations, financial position and our businesses, and may also limit our access to capital; our policyholders, reinsurers and retrocessionaires may also be affected by such developments, which could adversely affect their ability to meet their obligations to us.

Adverse developments in the financial markets, such as disruptions, uncertainty or volatility in the capital and credit markets, may result in realized and unrealized capital losses that could have a material adverse effect on our results of operations, financial position and our businesses, and may also limit our access to capital required to operate our business. Depending on market conditions, we could incur additional realized and unrealized losses on our investment portfolio in future periods, which could have a material adverse effect on our results of operations, financial condition and business. Economic conditions could also have a material impact on the frequency and severity of claims and therefore could negatively impact our underwriting returns. In addition, our policyholders, reinsurers and retrocessionaires may be affected by developments in the financial markets, which could adversely affect their ability to meet their obligations to us. The volatility in the financial markets could continue to significantly affect our investment returns, reported results and shareholders' equity.

The United Kingdom's referendum vote in favor of leaving the EU could adversely affect us.

In a referendum in June 2016, a majority of voting U.K. citizens voted in favor of Brexit, whereby the U.K. will leave the EU. The U.K. government invoked Article 50 of the Treaty on European Union ("Article 50") in 2017 and will have to withdraw from the EU on March 29, 2019, unless an extension to this deadline is agreed between the U.K. government and the EU. There remains considerable uncertainty as to exactly when Brexit will take effect; the extent of any transitional period allowing a continuation of passporting; and the ultimate structure of the U.K.'s future relationship with the EU. During this period and beyond, the impact of the U.K.'s withdrawal on the U.K. and European economies and the broader global economy could be significant, resulting in negative consequences, such as increased volatility and illiquidity, and potentially lower economic growth in various markets in the U.K., Europe and globally and could continue to contribute to instability in global financial and foreign exchange markets. Brexit could also have the effect of disrupting the free movement of goods, services and people between the U.K. and the EU. We anticipate that Brexit may disrupt our U.K. domiciled entities, including our Lloyd's syndicate, and their ability to "passport" within the EU. Similarly, Brexit may disrupt the ability of our EU domiciled entities to access the U.K. markets although the U.K. is attempting to mitigate this by introducing a temporary permissions regime which, in the event of there being no transitional period, will allow firms that

wish to continue carrying out regulated activities in the U.K. in the longer term to operate in the U.K. for a limited period after withdrawal, while they seek authorization from the U.K. regulators. The full effects of Brexit are uncertain and will depend on any agreements the U.K. may make to retain access to EU markets.

The negative impact of these events on economic conditions and global markets could have an adverse effect on our business, financial condition and liquidity. For example, this crisis may cause the value of the European currencies, including the Euro and the British Pound Sterling, to further depreciate against the U.S. Dollar, which in turn could materially adversely impact assets denominated in such currencies held in our investment portfolio or results of our European book of business. In addition, the applicable legal framework and the terms of our Euro-denominated insurance policies and reinsurance agreements generally do not address withdrawal by a member state from the Eurozone or a break-up of the EU, which could create uncertainty in our payment obligations and rights under those policies and agreements in the event that such a withdrawal or break-up does occur.

Additionally, a contagion effect of a possible default of one or more EU Member States and/or their withdrawal from the Eurozone, or the failure of financial institutions, on the global economy, including other EU Member States and our counterparties located in those countries, or a break-up of the EU could have a material adverse effect on our business, financial condition, results of operations and liquidity. As a result of Brexit, other European countries may seek to conduct referenda with respect to their continuing membership with the EU. Given these possibilities and others we may not anticipate, as well as the lack of comparable precedent, the full extent to which our business, results of operations and financial condition could be adversely affected by Brexit is uncertain.

The risk associated with underwriting treaty reinsurance business could adversely affect us.

Like other reinsurers, our reinsurance group does not separately evaluate each of the individual risks assumed under reinsurance treaties. Therefore, we are largely dependent on the original underwriting decisions made by ceding companies. We are subject to the risk that the ceding companies may not have adequately evaluated the risks to be reinsured and that the premiums ceded may not adequately compensate us for the risks we assume.

The availability of reinsurance, retrocessional coverage and capital market transactions to limit our exposure to risks may be limited, and counterparty credit and other risks associated with our reinsurance arrangements may result in losses which could adversely affect our financial condition and results of operations.

For the purposes of managing risk, we use reinsurance, retrocessional coverage and capital markets transactions. In the normal course of business, our insurance subsidiaries cede a portion of their premiums through pro rata, excess of loss and facultative reinsurance agreements. Our reinsurance subsidiaries purchase a limited amount of retrocessional coverage as part of their aggregate risk management program. In addition, our reinsurance subsidiaries participate in “common account” retrocessional arrangements for certain pro rata treaties. Such arrangements reduce the effect of individual or aggregate losses to all companies participating on such treaties, including the reinsurers, such as our reinsurance subsidiaries, and the ceding company. Economic conditions could also have a material impact on our ability to manage our risk aggregations through reinsurance or capital markets transactions. The availability and cost of reinsurance and retrocessional protection is subject to market conditions, which are beyond our control. As a result of such market conditions and other factors, we may not be able to successfully mitigate risk through reinsurance and retrocessional arrangements.

Further, we are subject to credit risk with respect to our reinsurance and retrocessions because the ceding of risk to reinsurers and retrocessionaires does not relieve us of our liability to the clients or companies we insure or reinsure. We monitor the financial condition of our reinsurers and attempt to place coverages only with carriers we view as substantial and financially sound. Although we have not experienced any material credit losses to date, an inability of our reinsurers or retrocessionaires to meet their obligations to us could have a material adverse effect on our financial condition and results of operations. Our losses for a given event or occurrence may increase if our reinsurers or retrocessionaires dispute or fail to meet their obligations to us or the reinsurance or retrocessional protections purchased by us are exhausted or are otherwise unavailable for any reason. Our failure to establish adequate reinsurance or retrocessional arrangements or the failure of our existing reinsurance or retrocessional arrangements to protect us from overly concentrated risk exposure could adversely affect our financial condition and results of operations.

Our reliance on brokers subjects us to their credit risk.

In accordance with industry practice, we generally pay amounts owed on claims under our insurance and reinsurance contracts to brokers, and these brokers, in turn, pay these amounts to the clients that have purchased insurance or reinsurance from us. In some jurisdictions, if a broker fails to make such payment, we may remain liable to the insured or ceding insurer for the

deficiency. Likewise, in certain jurisdictions, when the insured or ceding company pays the premiums for these contracts to brokers for payment to us, these premiums are considered to have been paid and the insured or ceding company will no longer be liable to us for those amounts, whether or not we have actually received the premiums from the broker. Consequently, we assume a degree of credit risk associated with our brokers. To date, we have not experienced any losses related to this credit risk.

Emerging claim and coverage issues may adversely affect our business.

As industry practices and legal, judicial, social and other environmental conditions change, unexpected and unintended issues related to claims and coverage may emerge, including new or expanded theories of liability. These or other changes could impose new financial obligations on us by extending coverage beyond our underwriting intent or otherwise require us to make unplanned modifications to the products and services that we provide, or cause the delay or cancellation of products and services that we provide. In some instances, these changes may not become apparent until sometime after we have issued insurance or reinsurance contracts that are affected by the changes. As a result, the full extent of liability under our insurance or reinsurance contracts may not be known for many years after a contract is issued. The effects of unforeseen developments or substantial government intervention could adversely impact our ability to achieve our goals.

Changes in current accounting principles and practices and financial reporting requirements may materially affect our reported financial results and our reported financial condition.

Our financial statements are prepared in accordance with GAAP, which is periodically revised by the Financial Accounting Standards Board (“FASB”), and they are subject to the accounting-related rules and interpretations of the SEC. We are required to adopt new and revised accounting standards implemented by the FASB. Unanticipated developments in accounting practices may require us to incur considerable additional expenses to comply with such developments, particularly if we are required to prepare information relating to prior periods for comparative purposes or to apply the new requirements retroactively. The impact of changes in accounting principles, practices and standards, particularly those that apply to insurance companies, cannot be predicted but may affect the calculation of net earnings, shareholders' equity and other relevant financial statement line items. In addition, such changes may cause additional volatility in reported earnings, decrease the understandability of our financial results and affect the comparability of our reported results with the results of others.

Risks Relating to Our Company

Acquisitions, the addition of new lines of insurance or reinsurance business, expansion into new geographic regions and/or entering into joint ventures or partnerships expose us to risks.

We may seek, from time to time, to acquire other companies, acquire selected blocks of business, expand our business lines, expand into new geographic regions and/or enter into joint ventures or partnerships. Such activities expose us to challenges and risks, including: integrating financial and operational reporting systems; establishing satisfactory budgetary and other financial controls; funding increased capital needs, overhead expenses or cash flow shortages that may occur if anticipated sales and revenues are not realized or are delayed, whether by general economic or market conditions or unforeseen internal difficulties; obtaining management personnel required for expanded operations; obtaining necessary regulatory permissions; and establishing adequate reserves for any acquired book of business. In addition, the value of assets acquired may be lower than expected or may diminish due to credit defaults or changes in interest rates; the liabilities assumed may be greater than expected; and assets and liabilities acquired may be subject to foreign currency exchange rate fluctuation. We may also be subject to financial exposures in the event that the sellers of the entities or business we acquire are unable or unwilling to meet their indemnification, reinsurance and other contractual obligations to us.

Our failure to manage successfully any of the foregoing challenges and risks may adversely impact our results of operations.

The ultimate performance of the Arch MI U.S. mortgage insurance portfolio remains uncertain.

Arch MI U.S. had risk in force of approximately \$71.0 billion, before external reinsurance, as of December 31, 2018, including \$4.7 billion of risk in force originated in 2008 and prior. The presence of multiple higher-risk characteristics in a loan materially increases the likelihood of a claim on such a loan unless there are other characteristics to mitigate the risk. The mix of business in our insured loan portfolio may affect losses and remain uncertain.

The frequency and severity of claims we incur will be uncertain and will depend largely on general economic factors outside of our control, including, among others, changes in unemployment, home prices and interest rates in the U.S. Deteriorating economic conditions in the U.S. could adversely affect the performance of our acquired U.S. mortgage insurance portfolio and could adversely affect our results of operations and financial condition.

Generally, we cannot cancel mortgage insurance coverage or adjust renewal premiums during the life of a mortgage insurance

policy. As a result, higher than anticipated claims generally cannot be offset by premium increases on policies in force or mitigated by our non-renewal or cancellation of insurance coverage. The premiums charged on the acquired UGC insured loan portfolio, and the associated investment income, may not be adequate to compensate us for the risks and costs associated with the insurance coverage provided to customers.

A downgrade in our ratings or our inability to obtain a rating for our operating insurance and reinsurance subsidiaries may adversely affect our relationships with clients and brokers and negatively impact sales of our products.

Third-party rating agencies, such as A.M. Best, assess and rate the financial strength of insurers and reinsurers based upon criteria established by the rating agencies, which criteria are subject to change. Ratings are an important factor in establishing the competitive position of insurance and reinsurance companies. Insureds, ceding insurers, brokers and reinsurance intermediaries use these ratings as one measure by which to assess the financial strength and quality of insurers and reinsurers. These ratings are often an important factor in the decision by an insured, ceding insurer, broker or intermediary of whether to place business with a particular insurance or reinsurance provider.

The financial strength ratings of our operating insurance and reinsurance subsidiaries are subject to periodic review as rating agencies evaluate us to confirm that we continue to meet their criteria for ratings assigned to us by them. Such ratings may be revised downward or revoked at the sole discretion of such ratings agencies in response to a variety of factors, including a minimum capital adequacy ratio, management, earnings, capitalization and risk profile. For further information on our financial strength and/or issuer ratings, see “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Liquidity and Capital Resources.” We can offer no assurances that our ratings will remain at their current levels or that any of our ratings which under review or watch by ratings agencies will remain unchanged. We believe it is possible that rating agencies may heighten the level of scrutiny they apply when analyzing companies in our industry, may increase the frequency and scope of their reviews, may request additional information from the companies that they rate (including additional information regarding the valuation of investment securities held), and may adjust upward the capital and other requirements employed in their models for maintenance of certain rating levels.

A ratings downgrade or the potential for such a downgrade, or failure to obtain a necessary rating, could adversely affect our relationships with agents, brokers, wholesalers, intermediaries, clients and other distributors of our existing products and services, as well as new sales of our products and services. In addition, under certain of the reinsurance agreements assumed by our reinsurance operations, upon the occurrence of a ratings

downgrade or other specified triggering event with respect to our reinsurance operations, such as a reduction in surplus by specified amounts during specified periods, our ceding company clients may be provided with certain rights, including, among other things, the right to terminate the subject reinsurance agreement and/or to require that our reinsurance operations post additional collateral. Any ratings downgrade or failure to obtain a necessary rating could adversely affect our ability to compete in our markets, could cause our premiums and earnings to decrease and could have a material adverse impact on our financial condition and results of operations. In addition, a downgrade in ratings of certain of our operating subsidiaries would in certain cases constitute an event of default under our credit facilities. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Contractual Obligations and Commercial Commitments—Letter of Credit and Revolving Credit Facilities” for a discussion of our credit facilities.

We can offer no assurances that our ratings will remain at their current levels or that any of our ratings under review or watch by rating agencies will remain unchanged.

Our success will depend on our ability to maintain and enhance effective operating procedures and internal controls and our enterprise risk management (“ERM”) program.

Operational risk and losses can result from, among other things, fraud, errors, failure to document transactions properly or to obtain proper internal authorization, failure to comply with regulatory requirements, information technology failures, failure to appropriately transition new hires or external events. We continue to enhance our operating procedures and internal controls (including information technology initiatives and controls over financial reporting) to effectively support our business and our regulatory and reporting requirements. Our management does not expect that our disclosure controls or our internal controls will prevent all errors and all fraud. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. As a result of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the company have been detected. These inherent limitations include the realities that judgments in decision making can be faulty, and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons or by collusion of two or more people. The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become

inadequate because of changes in conditions, or the degree of compliance with the policies or procedures may deteriorate. As a result of the inherent limitations in a cost-effective control system, misstatement due to error or fraud may occur and not be detected. Accordingly, our disclosure controls and procedures are designed to provide reasonable, not absolute, assurance that our goals are met. Any ineffectiveness in our controls or procedures could have a material adverse effect on our business.

We operate within an ERM framework designed to assess and monitor our risks. However, there can be no assurance that we can effectively review and monitor all risks or that all of our employees will operate within the ERM framework. There can be no assurance that our ERM framework will result in us accurately identifying all risks and accurately limiting our exposures based on our assessments.

Our business is dependent upon insurance and reinsurance brokers and intermediaries, and the loss of important broker relationships could materially adversely affect our ability to market our products and services.

We market our insurance and reinsurance products primarily through brokers and intermediaries. We derive a significant portion of our business from a limited number of brokers. During 2018, approximately 11.4% and 9.3% of our gross premiums written were generated from or placed by Aon Corporation and its subsidiaries and Marsh & McLennan Companies and its subsidiaries, respectively. No other broker and no one insured or reinsured accounted for more than 10% of gross premiums written for 2018. Some of our competitors have higher financial strength ratings, offer a larger variety of products, set lower prices for insurance coverage, offer higher commissions and/or have had longer term relationships with the brokers we use than we have. This may adversely impact our ability to attract and retain brokers to sell our insurance products or brokers may increasingly promote products offered by other companies. The failure or inability of brokers to market our insurance products successfully, or loss of all or a substantial portion of the business provided by these brokers could have a material adverse impact on our business, financial condition and results of operations.

We could be materially adversely affected to the extent that managing general agents, general agents and other producers exceed their underwriting authorities or if our agents, our insureds or other third parties commit fraud or otherwise breach obligations owed to us.

For certain business conducted by our insurance group, following our underwriting, financial, claims and information technology due diligence reviews, we authorize managing general agents, general agents and other producers to write business on our behalf within underwriting authorities prescribed by us. In addition, our mortgage group delegates the

underwriting of a significant percentage of its primary new insurance written to certain mortgage lenders. Under this delegated underwriting program, the approved customer may determine whether mortgage loans meet our mortgage insurance program guidelines and commit us to issue mortgage insurance. We rely on the underwriting controls of these agents to write business within the underwriting authorities provided by us. Although we have contractual protections in some instances and we monitor such business on an ongoing basis, our monitoring efforts may not be adequate or our agents may exceed their underwriting authorities or otherwise breach obligations owed to us. In addition, our agents, our insureds or other third parties may commit fraud or otherwise breach their obligations to us. To the extent that our agents, our insureds or other third parties exceed their underwriting authorities, commit fraud or otherwise breach obligations owed to us in the future, our financial condition and results of operations could be materially adversely affected.

We are exposed to credit risk in certain of our business operations.

In addition to exposure to credit risk related to our investment portfolio, reinsurance recoverables and reliance on brokers and other agents (each discussed elsewhere in this section), we are exposed to credit risk in other areas of our business related to policyholders. We are exposed to credit risk in our insurance group's surety unit where we guarantee to a third party that our policyholder will satisfy certain performance or financial obligations. If our policyholder defaults, we may suffer losses and be unable to be reimbursed by our policyholder. We are exposed to credit risk in our insurance group's construction and national accounts units where we write large deductible insurance policies. Under these policies, we are typically obligated to pay the claimant the full amount of the claim (shown as "contractholder payables" on our consolidated balance sheets). We are subsequently reimbursed by the policyholder for the deductible amount (shown as "contractholder receivables" on our consolidated balance sheets), which can be a set amount per claim and/or an aggregate amount for all covered claims. As such, we are exposed to credit risk from the policyholder. We are also exposed to credit risk from policyholders on smaller deductibles in other insurance group lines, such as healthcare and excess and surplus casualty. Additionally, we write retrospectively rated policies (*i.e.*, policies in which premiums are adjusted after the policy period based on the actual loss experience of the policyholder during the policy period). In this instance, we are exposed to credit risk to the extent the adjusted premium is greater than the original premium. While we generally seek to mitigate this risk through collateral agreements that require the posting of collateral in such forms as cash and letters of credit from banks, our efforts to mitigate the credit risk that we have to our policyholders may not be successful. Although we have not experienced any material credit losses to date, an increased inability of our policyholders to meet their obligations to us could have a

material adverse effect on our financial condition and results of operations.

Our investment performance may affect our financial results and ability to conduct business.

Our operating results depend in part on the performance of our investment portfolio. A significant portion of cash and invested assets held by Arch consists of fixed maturities (76.1% as of December 31, 2018). Although our current investment guidelines and approach stress preservation of capital, market liquidity and diversification of risk, our investments are subject to market-wide risks and fluctuations. In addition, we are subject to risks inherent in particular securities or types of securities, as well as sector concentrations. Changing market conditions could materially affect the future valuation of securities in our investment portfolio, which could cause us to impair some portion of those securities. We may not be able to realize our investment objectives, which could have a material adverse effect on our financial results. In the event that we are unsuccessful in correlating our investment portfolio with our expected insurance and reinsurance liabilities, we may be forced to liquidate our investments at times and prices that are not optimal, which could have a material adverse effect on our financial results and ability to conduct our business.

Foreign currency exchange rate fluctuation may adversely affect our financial results.

We write business on a worldwide basis, and our results of operations may be affected by fluctuations in the value of currencies other than the U.S. Dollar. The primary foreign currencies in which we operate are the Euro, the British Pound Sterling, the Australian Dollar and the Canadian Dollar. Changes in foreign currency exchange rates can reduce our revenues, increase our liabilities and costs and cause fluctuations in the valuation of our investment portfolio. We may therefore suffer losses solely as a result of exchange rate fluctuations. In order to mitigate our exposure to foreign currency fluctuations in our net insurance liabilities, we have invested and expect to continue to invest in securities denominated in currencies other than the U.S. Dollar. In addition, we may replicate investment positions in foreign currencies using derivative financial instruments. Net foreign exchange gains, excluding amounts reflected in the 'other' segment, were \$58.7 million for 2018, compared to losses of \$113.3 million for 2017 and gains of \$31.4 million for 2016. Changes in the value of investments due to foreign currency rate movements are reflected as a direct increase or decrease to shareholders' equity and are not included in the statement of income. We have chosen not to hedge certain currency risks on capital contributed to certain subsidiaries, including to Arch Insurance Europe held in British Pound Sterling, and may continue to choose not to hedge our currency risks. There can be no assurances that arrangements to match projected liabilities in foreign currencies with investments in the same

currencies or derivative financial instruments will mitigate the negative impact of exchange rate fluctuations, and we may suffer losses solely as a result of exchange rate fluctuations.

We may be adversely affected by changes in economic conditions, including interest rate changes.

Our operating results are affected by, and we are exposed to, significant financial and capital markets risk, including changes in interest rates, real estate values, foreign currency exchange rates, market volatility, the performance of the economy in general, the performance of our investment portfolio and other factors outside our control. Interest rates are highly sensitive to many factors, including the fiscal and monetary policies of the U.S. and other major economies, inflation, economic and political conditions and other factors beyond our control. Although we attempt to take measures to manage the risks of investing in changing interest rate environments, we may not be able to mitigate interest rate sensitivity effectively. Despite our mitigation efforts, an increase in interest rates could have a material adverse effect on our book value.

Our investment portfolio includes residential mortgage backed securities ("RMBS"). As of December 31, 2018, RMBS constituted approximately 2.7% of cash and invested assets held by Arch. As with other fixed income investments, the fair value of these securities fluctuates depending on market and other general economic conditions and interest rate trends. In periods of declining interest rates, mortgage prepayments generally increase and RMBS are prepaid more quickly, requiring us to reinvest the proceeds at the then current market rates. Conversely, in periods of rising rates, mortgage prepayments generally fall, preventing us from taking full advantage of the higher level of rates. The residential mortgage market in the U.S. has experienced a variety of difficulties in certain underwriting periods. A decline or an extended flattening in residential property values may result in additional increases in delinquencies and losses on residential mortgage loans generally, especially with respect to any residential mortgage loans where the aggregate loan amounts (including any subordinate loans) are close to or greater than the related property values. These developments may have a significant adverse effect on the prices of loans and securities, including those in our investment portfolio and may have other wide ranging consequences, including downward pressure on economic growth and the potential for increased insurance and reinsurance exposures, which could have an adverse impact on our results of operations, financial condition, business and operations.

Mortgage insurance losses result when a borrower becomes unable to continue to make mortgage payments and the home of such borrower cannot be sold for an amount that covers unpaid principal and interest and the expenses of the sale. Deteriorating economic conditions increase the likelihood that borrowers will have insufficient income to pay their mortgages

and can adversely affect housing values. In addition, natural disasters or other catastrophic events could result in increased claims if such events adversely affected the employment and income of borrowers and the value of homes. Any of these events or deteriorating economic conditions could cause our mortgage insurance losses to increase and adversely affect our results of operations and financial condition. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Catastrophic Events and Severe Economic Events.”

Our portfolio includes commercial mortgage backed securities (“CMBS”). At December 31, 2018, CMBS constituted approximately 3.7% of cash and invested assets held by Arch. The commercial real estate market may experience price deterioration, which could lead to delinquencies and losses on commercial real estate mortgages.

In addition, in each year, a significant portion of our mortgage insurance premiums will be from mortgage insurance written in prior years. The length of time insurance remains in force, referred to as persistency, is a significant driver of mortgage insurance revenues. Factors affecting persistency include: current mortgage interest rates compared to those rates on mortgages in our insurance in force, which affects the likelihood of the insurance in force to be subject to cancellation due to borrower refinancing; the amount of home equity, as homeowners with more equity in their homes can generally more readily move to a new residence or refinance their existing mortgage; and mortgage insurance cancellation policies and practices of mortgage investors and mortgage services and the cancellation of borrower-paid mortgage insurance, either upon request of the borrower or as required by law based upon the amortization of the loan. In 2018, the GSEs announced changes to various mortgage insurance termination requirements that are intended to further simplify the process of evaluating borrower-initiated requests for mortgage insurance termination. Among other things, these changes update evidence of value requirements for borrower requested cancellation based on the original value of the property and the current value of the property, raise Fannie Mae’s loan-to-value ratio for cancellation based on substantial improvements from 75% or less to 80% or less, provide clarification regarding what constitutes substantial improvements to the property, allow servicers to respond to either verbal or written requests for mortgage insurance cancellation by a borrower, and provide servicers flexibility in evaluating the payment history of borrowers that have been impacted by certain disaster events. Fannie Mae’s changes in this area must be implemented by March 1, 2019, although certain requirements have been implemented as early as January 1, 2019. Freddie Mac’s new requirements became effective October 1, 2018. If these or other factors cause the length of time our mortgage insurance policies remain in force to decline, our mortgage insurance revenues could be adversely affected.

Significant, continued volatility in financial markets, changes in interest rates, a lack of pricing transparency, decreased market liquidity, declines in equity prices and the strengthening or weakening of foreign currencies against the U.S. Dollar, individually or in tandem, could have a material adverse effect on our results of operations, financial condition or cash flows through realized losses, impairments and changes in unrealized positions.

Uncertainty Relating to the Determination of LIBOR and the Potential Phasing out of LIBOR after 2021 may Adversely Affect our Cost of Capital, Net Investment Income and Mortgage Reinsurance Costs.

On July 27, 2017, the U.K. Financial Conduct Authority announced that it intends to stop persuading or compelling banks to submit LIBOR rates after 2021. Accordingly, it is uncertain whether ICE, the entity responsible for administering LIBOR, will continue to quote LIBOR after 2021. In addition, in early 2018, the ICE stated its intention to continue to administer and quote LIBOR after 2021, possibly employing an alternative methodology. Therefore, no assurance can be given that LIBOR on any date accurately represents the London interbank rate or the rate applicable to actual loans in U.S. dollars for the relevant period between leading European banks, or that the underlying methodology for LIBOR will not change. Efforts to identify a set of alternative U.S. dollar reference interest rates include proposals by the Alternative Reference Rates Committee of the Federal Reserve Board and the Federal Reserve Bank of New York. There is currently no definitive information regarding the future of LIBOR or of any particular replacement rate that may be established or any other reforms to LIBOR that may be adopted in the United Kingdom, in the U.S. or elsewhere.

Uncertainty as to the nature of such potential changes, alternative reference rates or other reforms may adversely affect the value of and trading market for LIBOR-based securities. Moreover, any future reform, replacement or disappearance of LIBOR may adversely affect the value of and return of our investment portfolio, our cost of capital and our cost of issuing Bellemeade mortgage risk transfer securities.

The determination of the amount of allowances and impairments taken on our investments is highly subjective and could materially impact our results of operations or financial position.

On a quarterly basis, we perform reviews of our investments to determine whether declines in fair value below the cost basis are considered other-than-temporary in accordance with applicable accounting guidance regarding the recognition and presentation of other-than-temporary impairments. The process of determining whether a security is other-than-temporarily impaired requires judgment and involves analyzing many factors. These factors include: an analysis of the liquidity, business prospects and overall financial condition of the issuer;

the time period in which there was a significant decline in value; the significance of the decline; and the analysis of specific credit events. There can be no assurance that our management has accurately assessed the level of impairments taken and allowances reflected in our financial statements. Furthermore, additional impairments may need to be taken or allowances provided for in the future. Historical trends may not be indicative of future impairments or allowances. Further, rapidly changing and unpredictable credit and equity market conditions could materially affect the valuation of securities carried at fair value as reported within our consolidated financial statements and the period-to-period changes in value could vary significantly. Decreases in value could have a material adverse effect on our financial condition and results of operations.

Certain of our investments are illiquid and are difficult to sell, or to sell in significant amounts at acceptable prices, to generate cash to meet our needs.

Our investments in certain securities, including certain fixed income and structured securities, investments in funds accounted for using the equity method, other alternative investments and strategic investments in joint ventures such as Watford Re, Premia Re and others, may be illiquid due to contractual provisions or investment market conditions. If we require significant amounts of cash on short notice in excess of anticipated cash requirements, then we may have difficulty selling these investments in a timely manner or may be forced to sell or terminate them at unfavorable values.

We may require additional capital or credit in the future, which may not be available or may only be available on unfavorable terms.

The capital requirements of our businesses depend on many factors, including regulatory and rating agency requirements, the performance of our investment portfolio, our ability to write new business successfully, the frequency and severity of catastrophe events and our ability to establish premium rates and reserves at levels sufficient to cover losses. We may need to raise additional funds through equity or debt financings. Any equity or debt financing, if available at all, may be on terms that are unfavorable to us. Equity financings could be dilutive to our existing shareholders and could result in the issuance of securities that have rights, preferences and privileges that are senior to those of our outstanding securities. If we are not able to obtain adequate capital, our business, results of operations and financial condition could be adversely affected. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Financial Condition, Liquidity and Capital Resources—Liquidity and Capital Resources.”

The loss of our key employees or our inability to retain them could negatively impact our business.

Our success has been, and will continue to be, dependent on our ability to retain the services of our existing key executive officers and to attract and retain additional qualified personnel in the future. The pool of talent from which we actively recruit is limited. Although, to date, we have not experienced difficulties in attracting and retaining key personnel, the inability to attract and retain qualified personnel could have a material adverse effect on our financial condition and results of operations. In addition, our underwriting staff is critical to our success in the production of business. While we do not consider any of our key executive officers or underwriters to be irreplaceable, the loss of the services of our key executive officers or underwriters or the inability to hire and retain other highly qualified personnel in the future could delay or prevent us from fully implementing our business strategy which could affect our financial performance.

Our information technology systems may be unable to meet the demands of customers.

Our information technology systems service our insurance portfolios. Accordingly, we are highly dependent on the effective operation of these systems. While we believe that the systems are adequate to service our insurance portfolios, there can be no assurance that they will operate in all manners in which we intend or possess all of the functionality required by customers currently or in the future.

Our customers, especially our mortgage insurance customers, require that we conduct our business in a secure manner, electronically via the Internet or via electronic data transmission. We must continually invest significant resources in establishing and maintaining electronic connectivity with customers. In order to integrate electronically with customers in the mortgage insurance industry, we require electronic connections between our systems and those of the industry's largest mortgage servicing systems and leading loan origination systems. Our mortgage group currently possesses connectivity with certain of these external systems, but there is no assurance that such connectivity is sufficient and we are continually undertaking new electronic integration efforts with third-party loan servicing and origination systems. Our business, financial condition and operating results may be adversely affected if we do not possess or timely acquire the requisite set of electronic integrations necessary to keep pace with the technological demands of customers.

Technology breaches or failures, including, but not limited to, those resulting from a malicious cyber attack on us or our business partners and service providers, could disrupt or otherwise negatively impact our business and/or expose us to litigation.

We rely on information technology systems to process, transmit, store and protect the electronic information, financial data and proprietary models that are critical to our business. Furthermore, a significant portion of the communications between our employees and our business partners and service providers depends on information technology and electronic information exchange. Like all companies, our information technology systems are vulnerable to data breaches, interruptions or failures due to events that may be beyond our control, including, but not limited to, natural disasters, power outages, theft, terrorist attacks, computer viruses, hackers, errors in usage and general technology failures. Additionally, our employees and vendors may use portable computers or mobile devices which may contain duplicate or similar information to that in our computer systems, and these devices can be stolen, lost or damaged. Security breaches could expose us to the loss or misuse of our information, litigation and potential liability. In addition, cyber incidents that impact the availability, reliability, speed, accuracy or other proper functioning of these systems could have a significant negative impact on our operations and possibly our results. A cyber incident could also result in a violation of applicable privacy and other laws, damage our reputation, cause a loss of customers, adversely affect our stock price, cause us to incur remediation costs, increased cybersecurity protection costs and/or increased insurance premiums, and/or give rise to monetary fines and other penalties, any of which could be significant and could adversely affect our business.

We have outsourced certain technology and business process functions to third parties and may continue do so in the future. Our outsourcing of certain technology and business process functions to third parties may expose us to increased risk related to data security, service disruptions or the effectiveness of our control system, which could result in monetary and reputational damage or harm to competitive position. These risks could increase as vendors increasingly offer cloud-based software services rather than software services which can be run within our data centers.

We believe that we have established and implemented appropriate security measures to provide reasonable assurance that our information technology systems are secure and appropriate controls and procedures to enable us to identify and respond to unauthorized access to such systems. We regularly engage third parties to evaluate and test the adequacy of our most critical security measures, controls and procedures. Despite these security measures, controls and procedures, disruptions to and breaches of our information technology

systems are possible. Because we rely on our technology systems for many critical functions, including connecting with our customers, if such systems were to fail or be attacked or breached, we may experience a significant disruption in our operations and in the business we receive and process, which could adversely affect our results of operations and financial condition.

In addition, the regulatory environment surrounding information security and privacy is increasingly changing. We are subject to EU, U.S. federal, state and other foreign laws and regulations regarding the protection of personal data and information. These laws and regulations are complex and sometimes conflict. We could be subject to fines, penalties and/or regulatory enforcement actions in one or more jurisdictions if any person, including any employee, disregards or breaches, whether intentionally or negligently, controls intended to protect the confidential information of our employees or clients. As an example, the New York State Department of Financial Services adopted a regulation pertaining to cybersecurity for all banking and insurance entities under its jurisdiction that came into effect March 1, 2017. Additionally, GDPR came into effect on May 25, 2018, and requires businesses offering goods and services to, or monitoring the behavior of, customers in the EU to comply with onerous accountability obligations and significantly enhanced conditions to processing personal data. Non-compliance with the GDPR could result in a fine of up to 4% of a firm's global annual revenue per violation. As a result, our ability to conduct our business and our results of operations might be materially and adversely affected.

If the volume of low down payment mortgage originations declines, the amount of mortgage insurance we write in the U.S. could decline, which would reduce our mortgage insurance revenues.

The size of the U.S. mortgage insurance market depends in large part upon the volume of low down payment home mortgage originations. Factors affecting the volume of low down payment mortgage originations include, among others: restrictions on mortgage credit due to stringent underwriting standards and liquidity issues affecting lenders; changes in mortgage interest rates and home prices, and other economic conditions in the U.S. and regional economies; population trends, including the rate of household formation; and U.S. government housing policy. A decline in the volume of low down payment home mortgage originations could decrease demand for mortgage insurance, decrease our U.S. new insurance written and reduce mortgage insurance revenues.

If the role of the GSEs in the U.S. housing market changes, or if the GSEs change other policies or practices, the amount of mortgage insurance that we write could decline, which would reduce our mortgage insurance revenues.

The GSEs are the beneficiaries of the significant majority of the insurance policies we issue as a result of their purchases, statutorily required or otherwise, of qualifying mortgage loans from lenders or investors. The charters of the GSEs require credit enhancement for low down payment mortgages in order for such loans to be eligible for purchase or guarantee by the GSEs. If the charters of the GSEs were amended to change or eliminate the acceptability of private mortgage insurance, our mortgage insurance business could decline significantly.

The premiums we charge for mortgage insurance on insured loans and the associated investment income may not be adequate to compensate for future losses from these loans.

We set premiums at the time a policy is issued based upon our expectations regarding likely performance over the life of insurance coverage. We generally cannot cancel mortgage insurance coverage or adjust renewal premiums during the life of a mortgage insurance policy. As a result, losses from higher than anticipated claims generally cannot be offset by premium increases on policies in force or mitigated by non-renewal or cancellation of insurance coverage. The premiums we charge on our insurance in force and the associated investment income may not be adequate to compensate us for the risks and costs associated with the insurance coverage provided to customers. An increase in the number or size of claims, compared to what we anticipate, could adversely affect Arch MI U.S.'s results of operations and financial condition.

New GSE eligibility requirements for mortgage insurers could require us to contribute additional capital to Arch MI U.S. in the future, and could negatively impact our results of operations and financial condition, or reduce our operating flexibility.

Substantially all of Arch MI U.S.'s insurance written has been for loans sold to the GSEs. The PMIERS apply to Arch Mortgage Insurance Company and United Guaranty Residential Insurance Company, which are GSE-approved mortgage insurers ("eligible mortgage insurers"). The PMIERS impose limitations on the type of risk insured, the forms and insurance policies issued, standards for the geographic and customer diversification of risk, procedures for claims handling, acceptable underwriting practices, standards for certain reinsurance cessions and financial requirements, among other things. The financial requirements require a mortgage insurer's available assets, which generally include only the most liquid assets of an insurer, to meet or exceed "minimum required assets" as of each quarter end. Our eligible mortgage insurers each satisfied the PMIERS' financial requirements as of December 31, 2018.

The revised PMIERS also impose additional operational requirements in areas such as claim processing, loss mitigation, underwriting, quality control, and reporting. The revised requirements have caused us to make changes to our business practices and incur additional costs in order to achieve and maintain compliance with the PMIERS. While we do not expect the revised PMIERS to have a significant impact on our operations or a material impact on our capital position the increase in capital required to satisfy the revised PMIERS may decrease our return on capital.

While we intend to continue to comply with these requirements, there can be no assurance that the GSEs will continue to treat Arch Mortgage Insurance Company or United Guaranty Residential Insurance Company as eligible mortgage insurers. If either or both of the GSEs were to cease to consider Arch Mortgage Insurance Company or United Guaranty Residential Insurance Company as eligible mortgage insurers and, therefore, cease accepting our mortgage insurance products, our results of operations and financial condition would be adversely affected.

The mix of business we write affects Arch MI U.S.'s losses and will affect the minimum required assets Arch MI U.S. is required to maintain in order to comply with PMIERS financial requirements.

Our mortgage insurance portfolio includes loans with loan-to-value ratios exceeding 95%, loans with FICO scores below 620, adjustable rate mortgages, ("ARMs"), and less-than A quality loans. Even when housing values are stable or rising, we expect higher default and claim rates for high loan-to-value loans, loans with lower FICO scores, ARMs and less-than A quality loans. Although we attempt to incorporate the higher default and claim rates associated with these loans into our underwriting and pricing models, there can be no assurance that the premiums earned and the associated investment income will adequately compensate us for future losses from these loans. From time to time, we change the types of loans that we insure and the requirements under which we insure them. In 2017 and 2018, we modestly expanded our underwriting guidelines and we may further expand such guidelines in the future.

The geographic mix of Arch MI U.S.'s business could increase losses and harm our financial performance. We are affected by economic downturns and other events in specific regions of the United States where a large portion of our U.S. mortgage insurance business is concentrated. As of December 31, 2018, 7.7% of Arch MI U.S.'s primary risk-in-force was located in Texas, 6.3% was located in California and 5.0% was located in Florida. See "Management's Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Mortgage Operations Supplemental Information."

Arch MI U.S.'s minimum required assets under the PMIERS will be determined, in part, by the particular risk profiles of the loans it insures. If, absent other changes, Arch MI U.S.'s mix of business changes to include more loans with higher loan-to-value ratios or lower credit scores, it will have a higher minimum required asset amount under the PMIERS and, accordingly, be required to hold more capital in order to maintain GSE eligibility.

Potential changes to state mortgage insurance regulations could reduce Arch MI U.S.'s profitability and its ability to compete with credit enhancement alternatives to mortgage insurance.

The NAIC, which reviews state insurance laws and regulations, has established a Mortgage Guaranty Insurance Working Group ("Working Group") to make recommendations to the NAIC's Financial Condition Committee regarding changes to the NAIC's Mortgage Guaranty Insurance Model Act. The Working Group has released a drafts of the Model Act which includes proposed changes to minimum statutory capital requirements.

If the NAIC revises the Model Act, some state legislatures are likely to enact and implement part or all of the revised provisions. While we cannot predict the effect that any NAIC recommendations or future legislation may have on Arch MI U.S., such changes could reduce Arch MI U.S.'s profitability and its ability to compete with credit enhancement alternatives to mortgage insurance, which could adversely affect our financial condition or results of operations.

If servicers fail to adhere to appropriate servicing standards or experience disruptions to their businesses, our mortgage insurance operations could be adversely affected.

We depend on reliable, consistent third-party servicing of the loans that we insure. Among other things, our mortgage insurance policies require our customers and their servicers to timely submit premium and reports and utilize commercially reasonable efforts to limit and mitigate loss when a loan is in default. Without reliable, consistent third-party servicing, our insurance subsidiaries may be unable to correctly record new loans as they are underwritten, receive and process payments on insured loans and/or properly recognize and establish reserves on loans when a default exists or occurs but is not reported to us. In addition, if these servicers fail to limit and mitigate losses when appropriate, our losses may unexpectedly increase. If one or more servicers failed to adhere to these requirements, our financial results could be adversely affected.

The implementation of the Basel III Capital Accord may adversely affect the use of mortgage insurance by certain banks.

With certain exceptions, the Basel III Rules became effective on January 1, 2014. If further implementation of the Basel III

Rules increases the capital requirements of banking organizations with respect to the residential mortgages we insure or does not provide sufficiently favorable treatment for the use of mortgage insurance, it could adversely affect the demand for mortgage insurance. In December 2017, the Basel Committee published final revisions to the Basel Capital Accord that will be implemented by each participating country by January 1, 2022. Under these revised rules, banks using the standardized approach for credit risk management will determine the risk-weight for residential mortgages based on the loan-to-value ratio at loan origination, without consideration of mortgage insurance. Under the standardized approach, after the appropriate risk-weight is determined, the existence of mortgage insurance could be considered, but only if the company issuing the insurance has a lower risk-weight than the underlying exposure. Mortgage insurance issued by private companies would not meet this test. Therefore, under the latest Basel Capital Accord, mortgage insurance could not mitigate credit and lower the capital charge under the standardized approach. If the Basel Capital Accord is implemented in the United States in this form, mortgage insurance would not lower the loan-to-value ratio of residential loans for capital purposes, and therefore may decrease the demand for this product. It is possible that the U.S. regulatory agencies could determine that their current capital rules are at least as stringent as the Basel Committee's 2017 revisions, in which case no change would be mandated. However, if the U.S. agencies decide to implement the new standards as specifically drafted by the Basel Committee, mortgage insurance would not lower the loan-to-value ratio of residential loans for capital purposes, and therefore may decrease the demand for this product.

Further, it is possible (but not mandated by the Basel Capital Accord) that the banking agencies and the GSEs might likewise discontinue taking mortgage insurance into account when determining a mortgage's loan-to-value ratio for prudential (non-capital) purposes. Additionally, a new riskbased capital proposal for the GSEs was published for comment by the FHFA in 2018. Under this proposal the capital requirements of these GSEs would take into account the existence of credit mitigants, such as mortgage insurance. However, as proposed, mortgage insurance issued by monoline companies would result in less capital relief than the capital relief afforded by other forms of credit mitigation, such as the issuance of credit-linked notes. The final form of the rule is likely to change based on comments received from industry participants and the views of the new director of the FHFA. However, if adopted as proposed, these capital regulations might incent the GSEs to favor these forms of credit risk mitigation when they have the option to use these instruments. If these developments should occur, they would adversely affect the demand for mortgage insurance in the U.S. which would adversely affect our U.S. mortgage insurance operations.

Some of the provisions of our bye-laws and our shareholders agreement may have the effect of hindering, delaying or preventing third party takeovers or changes in management initiated by shareholders. These provisions may also prevent our shareholders from receiving premium prices for their shares in an unsolicited takeover.

Some provisions of our bye-laws could have the effect of discouraging unsolicited takeover bids from third parties or changes in management initiated by shareholders. These provisions may encourage companies interested in acquiring us to negotiate in advance with our board of directors, since the board has the authority to overrule the operation of several of the limitations.

Among other things, our bye-laws provide: for a classified board of directors, in which the directors of the class elected at each annual general meeting holds office for a term of three years, with the term of each class expiring at successive annual general meetings of shareholders; that the number of directors is determined by the board from time to time by a vote of the majority of our board; that directors may only be removed for cause, and cause removal shall be deemed to exist only if the director whose removal is proposed has been convicted of a felony or been found by a court to be liable for gross negligence or misconduct in the performance of his or her duties; that our board has the right to fill vacancies, including vacancies created by an expansion of the board; and for limitations on a shareholder's right to raise proposals or nominate directors at general meetings. Our bye-laws provide that certain provisions which may have anti-takeover effects may be repealed or altered only with prior board approval and upon the affirmative vote of holders of shares representing at least 65% of the total voting power of our shares entitled generally to vote at an election of directors.

The bye-laws also contain a provision limiting the rights of any U.S. person (as defined in section 7701(a)(30) of the Internal Revenue Code of 1986, as amended (the "Code")) that owns shares of Arch Capital, directly, indirectly or constructively (within the meaning of section 958 of the Code), representing more than 9.9% of the voting power of all shares entitled to vote generally at an election of directors. The votes conferred by such shares of such U.S. person will be reduced by whatever amount is necessary so that after any such reduction the votes conferred by the shares of such person will constitute 9.9% of the total voting power of all shares entitled to vote generally at an election of directors. Notwithstanding this provision, the board may make such final adjustments to the aggregate number of votes conferred by the shares of any U.S. person that the board considers fair and reasonable in all circumstances to ensure that such votes represent 9.9% of the aggregate voting power of the votes conferred by all shares of Arch Capital entitled to vote generally at an election of directors. Arch Capital will assume that all shareholders (other than specified persons)

are U.S. persons unless we receive assurance satisfactory to us that they are not U.S. persons.

The bye-laws also provide that the affirmative vote of at least 66 2/3% of the outstanding voting power of our shares (excluding shares owned by any person (and such person's affiliates and associates) that is the owner of 15% or more (a "15% Holder") of our outstanding voting shares) shall be required for various corporate actions, including: merger or consolidation of the company into a 15% Holder; sale of any or all of our assets to a 15% Holder; the issuance of voting securities to a 15% Holder; or amendment of these provisions; *provided, however*, the supermajority vote will not apply to any transaction approved by the board.

The provisions described above may have the effect of making more difficult or discouraging unsolicited takeover bids from third parties. To the extent that these effects occur, shareholders could be deprived of opportunities to realize takeover premiums for their shares and the market price of their shares could be depressed. In addition, these provisions could also result in the entrenchment of incumbent management.

There are regulatory limitations on the ownership and transfer of our common shares.

The jurisdictions in which our insurance and reinsurance subsidiaries operate have laws and regulations that require regulatory approval of a change in control of an insurer or an insurer's holding company. Where such laws apply to us and our subsidiaries, there can be no effective change in our control unless the person seeking to acquire control has filed a statement with the regulators and has obtained prior approval for the proposed change from such regulators. The usual measure for a presumptive change in control pursuant to these laws is the acquisition of 10% or more of the voting power of the insurance company or its parent, although this presumption is rebuttable. Consequently, a person may not acquire 10% or more of our common shares without the prior approval of the applicable insurance regulators. These laws may discourage potential acquisition proposals and may delay, deter or prevent a change in control of us, including transactions that some shareholders might consider to be desirable.

Our insurance and reinsurance subsidiaries are subject to regulation in various jurisdictions, and failure to comply with existing regulations or material changes in the regulation of their operations, or any investigations, inquiries or demands by government authorities, could adversely affect us.

Our insurance and reinsurance subsidiaries are subject to the laws and regulations of a number of jurisdictions worldwide, including Bermuda, the states in the U.S. in which such subsidiaries conduct business, the U.K., certain EU Member States, Canada, Switzerland, Australia and Hong Kong. Existing laws and regulations, among other things, limit the

amount of dividends that can be paid to us by our insurance and reinsurance subsidiaries, prescribe solvency and capital adequacy standards, impose restrictions on the amount and type of investments that can be held to meet solvency and capital adequacy requirements, require the maintenance of reserve liabilities, and require pre-approval of acquisitions and certain affiliate transactions. Failure to comply with these laws and regulations or to maintain appropriate authorizations, licenses, and/or exemptions under applicable laws and regulations may cause governmental authorities to preclude or suspend our insurance or reinsurance subsidiaries from carrying on some or all of their activities, place one or more of them into rehabilitation or liquidation proceedings, impose monetary penalties or other sanctions on them or our affiliates, or commence insurance company delinquency proceedings against our insurance or reinsurance subsidiaries. The application of these laws and regulations by various governmental authorities, including authorities outside the U.S., may affect our liquidity and restrict our ability to expand our business operations through acquisitions or to pay dividends on our ordinary shares. Furthermore, compliance with legal and regulatory requirements may result in significant expenses, which could have a negative impact on our profitability.

In addition to legal and regulatory requirements, the insurance and reinsurance industry has experienced substantial volatility as a result of investigations, litigation and regulatory activity by various insurance, governmental and enforcement authorities, including the SEC, concerning certain practices within the insurance and reinsurance industry. Our involvement in any investigations, litigations or regulatory activity, including any related lawsuits, would cause us to incur legal costs and, if we or any of our insurance or reinsurance subsidiaries were found to have violated any laws or regulations, we could be required to pay fines and damages and incur other sanctions, perhaps in material amounts, which could have a material negative impact on our profitability.

Any such litigation or failure to comply with applicable laws could result in the imposition of significant restrictions on our ability to do business, and could also result in suspensions, injunctions, monetary damages, fines or other sanctions, any or all of which could adversely affect our financial condition and results of operations.

Our reinsurance subsidiaries may be required to provide collateral to ceding companies, by applicable regulators, their contracts or other commercial considerations. Their ability to conduct business could be significantly and negatively affected if they are unable to do so.

Arch Re Bermuda is a registered Bermuda insurance company and is not licensed or admitted as an insurer in any jurisdiction in the U.S., although Arch Re Bermuda has been approved as a “certified reinsurer” in certain U.S. states that allow reduced collateral for reinsurance ceded to such reinsurers. Arch Re

Bermuda’s contracts generally require it to post a letter of credit or provide other security, even in U.S. states where it has been approved for reduced collateral. State credit for reinsurance rules also generally provide that certified reinsurers such as Arch Re Bermuda must provide 100% collateral in the event their certified status is “terminated” or upon the entry of an order of rehabilitation, liquidation or conservation against a ceding insurer.

Although, to date, Arch Re Bermuda has not experienced any difficulties in providing collateral when required, if we are unable to post security in the form of letters of credit or trust funds when required, the operations of Arch Re Bermuda could be significantly and negatively affected.

Arch Capital is a holding company and is dependent on dividends and other distributions from its operating subsidiaries.

Arch Capital is a holding company whose assets primarily consist of the shares in our subsidiaries. Generally, Arch Capital depends on its available cash resources, liquid investments and dividends or other distributions from subsidiaries to make payments, including the payment of debt service obligations and operating expenses it may incur and any payments of dividends, redemption amounts or liquidation amounts with respect to our preferred shares and common shares, and to fund the share repurchase program. The ability of our regulated insurance and reinsurance subsidiaries to pay dividends or make distributions is dependent on their ability to meet applicable regulatory standards. In addition, the ability of our insurance and reinsurance subsidiaries to pay dividends to Arch Capital and to intermediate parent companies owned by Arch Capital could be constrained by our dependence on financial strength ratings from independent rating agencies. Our ratings from these agencies depend to a large extent on the capitalization levels of our insurance and reinsurance subsidiaries. We believe that Arch Capital has sufficient cash resources and available dividend capacity to service its indebtedness and other current outstanding obligations. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Financial Condition, Liquidity and Capital Resources—Liquidity and Capital Resources.”

The service of process and enforcement of judgments against us or our directors or officers may be difficult.

We are a Bermuda company and some of our officers and directors are residents of various jurisdictions outside the U.S. All or a substantial portion of our assets and the assets of those persons may be located outside the U.S. As a result, it may be difficult for investors to effect service of process within the U.S. upon those persons or to recover against us or those persons on judgments of U.S. courts based on civil liabilities provisions of the U.S. federal securities laws even though we have appointed National Registered Agents, Inc., New York, New York, as our

agent for service of process with respect to actions based on offers and sales of securities made in the U.S. Because there is no treaty in effect between the U.S. and Bermuda providing for reciprocal recognition and enforcement of judgments of U.S. courts in civil and commercial matters, a final judgment for the payment of money rendered by a court in the U.S. based on civil liability, whether or not predicated solely upon the U.S. federal securities laws, would not be automatically enforceable in Bermuda, and there are grounds upon which Bermuda courts may not enforce judgments of U.S. courts. Further, no claim may be brought in Bermuda against us or our directors and officers for violation of U.S. federal securities laws, as such laws do not have force of law in Bermuda. A Bermuda court may, however, impose civil liability on us or our directors and officers in a suit brought in the Supreme Court of Bermuda if the facts alleged in the complaint constitute or give rise to a cause of action under Bermuda law.

Our international business is subject to applicable laws and regulations relating to sanctions and foreign corrupt practices, the violation of which could adversely affect our operations.

We must comply with all applicable economic sanctions and anti-bribery laws and regulations of the U.S. and other foreign jurisdictions where we operate, including the U.K. and the European Community. U.S. laws and regulations applicable to us include the economic trade sanctions laws and regulations administered by the Treasury's Office of Foreign Assets Control as well as certain laws administered by the U.S. Department of State. New sanction regimes may be initiated, or existing sanctions expanded, at any time, which can immediately impact our business activities. In addition, we are subject to the Foreign Corrupt Practices Act and other anti-bribery laws such as the U.K. Bribery Act that generally bar corrupt payments or unreasonable gifts to foreign governments or officials. Although we have policies and controls in place that are designed to ensure compliance with these laws and regulations, it is possible that an employee or intermediary could fail to comply with applicable laws and regulations. In such event, we could be exposed to civil penalties, criminal penalties and other sanctions, including fines or other punitive actions. In addition, such violations could damage our business and/or our reputation. Such criminal or civil sanctions, penalties, other sanctions, and damage to our business and/or reputation could have a material adverse effect on our financial condition and results of operations.

Risk Relating to Our Shares

The market price of our common shares may experience volatility, thereby causing a potential loss of value to our investors.

The market price for our common shares may fluctuate substantially and could cause investment losses. The price of our common shares may not remain at or exceed current levels.

In addition to the risk factors described herein, the following factors may have an adverse impact on the market price for our common shares: announcements by us or our competitors of acquisitions, investments or strategic alliances; changes in the value of our assets; our actual or anticipated quarterly and annual operating results; changes in expectations of future financial performance or changes in estimates of securities analysts; issuances by us of shares or other securities; sales, or the possibility or perception of future sales, by our existing shareholders; our share repurchase program; changes in general conditions in the economy, the insurance industry or the financial markets; changes in market valuation of companies in the insurance and reinsurance industry; fluctuations in stock market processes and volumes; the addition or departure of key personnel; changes in tax law; and adverse press or news announcements affecting us or the industry.

General market conditions and unpredictable factors could adversely affect market prices for our outstanding preferred shares.

There can be no assurance about the market prices for our series of preferred shares that are traded publicly. Several factors, many of which are beyond our control, will influence the fair value of our preferred shares, including, but not limited to:

- whether dividends have been declared and are likely to be declared on any series of our preferred shares from time to time;
- our creditworthiness, financial condition, performance and prospects;
- whether the ratings on any series of our preferred shares provided by any ratings agency have changed;
- the market for similar securities; and
- economic, financial, geopolitical, regulatory or judicial events that affect us and/or the insurance or financial markets generally.

Dividends on our preferred shares are non-cumulative.

Dividends on our preferred shares are non-cumulative and payable only out of lawfully available funds of Arch Capital under Bermuda law. Consequently, if Arch Capital's board of directors (or a duly authorized committee of the board) does not authorize and declare a dividend for any dividend period with respect to any series of our preferred shares, holders of such preferred shares would not be entitled to receive any such dividend, and such unpaid dividend will not accrue and will never be payable. Arch Capital will have no obligation to pay dividends for a dividend period on or after the dividend payment date for such period if its board of directors (or a duly authorized committee of the board) has not declared such dividend before the related dividend payment date; if dividends on our series E or series F preferred shares are authorized and declared with respect to any subsequent dividend period, Arch Capital will be

free to pay dividends on any other series of preferred shares and/or our common shares. In the past, we have not paid dividends on our common shares.

Our preferred shares are equity and are subordinate to our existing and future indebtedness.

Our preferred shares are equity interests and do not constitute indebtedness. As such, these preferred shares will rank junior to all of our indebtedness and other non-equity claims with respect to assets available to satisfy our claims, including in our liquidation. As of December 31, 2018, our total long-term debt was \$1.73 billion, excluding the ‘other’ segment. We may incur additional debt in the future. Our existing and future indebtedness may restrict payments of dividends on our preferred shares. Additionally, unlike indebtedness, where principal and interest would customarily be payable on specified due dates, in the case of preferred shares, (1) dividends are payable only if declared by the board of directors of Arch Capital (or a duly authorized committee of the board) and (2) as described under “Risks Relating to Our Company—Arch Capital is a holding company and is dependent on dividends and other distributions from its operating subsidiaries,” we are subject to certain regulatory and other constraints affecting our ability to pay dividends and make other payments.

The voting rights of holders of our preferred shares are limited.

Holders of our preferred shares have no voting rights with respect to matters that generally require the approval of voting shareholders. The limited voting rights of holders of our preferred shares include the right to vote as a class on certain fundamental matters that affect the preference or special rights of our preferred shares as set forth in the certificate of designations relating to each series of preferred shares. In addition, if dividends on our series E or series F preferred shares have not been declared or paid for the equivalent of six dividend payments, whether or not for consecutive dividend periods, holders of the outstanding series E or series F preferred shares will be entitled to vote for the election of two additional directors to our board of directors subject to the terms and to the limited extent as set forth in the certificate of designations relating to such series of preferred shares.

There is no limitation on our issuance of securities that rank equally with or senior to our preferred shares.

We may issue additional securities that rank equally with or senior to our series E and series F preferred shares without limitation. The issuance of securities ranking equally with or senior to our preferred shares may reduce the amount available for dividends and the amount recoverable by holders of such series in the event of a liquidation, dissolution or winding-up of Arch Capital.

Risks Relating to Taxation

We and our non-U.S. subsidiaries may become subject to U.S. federal income taxation and/or the U.S. federal income tax liabilities of our U.S. subsidiaries may increase, including as a result of changes in tax law.

Arch Capital and its non-U.S. subsidiaries intend to operate their business in a manner that will not cause them to be treated as engaged in a trade or business in the U.S. and, thus, will not be required to pay U.S. federal income taxes (other than U.S. excise taxes on insurance and reinsurance premium and withholding taxes on certain U.S. source investment income) on their income. However, because there is uncertainty as to the activities which constitute being engaged in a trade or business in the U.S., there can be no assurances that the IRS will not contend successfully that Arch Capital or its non-U.S. subsidiaries are engaged in a trade or business in the U.S. If Arch Capital or any of its non-U.S. subsidiaries were subject to U.S. income tax, our shareholders' equity and earnings could be adversely affected.

Congress has been considering several legislative proposals intended to eliminate certain perceived tax advantages of Bermuda and other non-U.S. insurance companies. There is no assurance that any such legislative proposal will not be enacted into law and any such enacted law would not adversely affect income tax liabilities of us or any of our subsidiaries.

The newly enacted U.S. tax law and its implementation may have a material and adverse impact on our operations and financial condition.

The Tax Cuts Act includes significant changes to the taxation of business entities. These changes include, among others, a permanent reduction to the corporate income tax rate. Notwithstanding the reduction in the corporate income tax rate, the overall impact of this tax reform is uncertain, and our business and financial condition could be materially and adversely affected.

Certain provisions in the Tax Cuts Act could have a material and adverse impact on our financial condition and business operation. One such provision imposes a 10% minimum tax (reduced to 5% for the 2018 taxable year and increased to 12.5% for the 2026 taxable year and the subsequent taxable years) on the “modified taxable income” of a U.S. corporation (or a non-U.S. corporation engaged in a U.S. trade or business) over such corporation’s regular U.S. federal income tax, reduced by certain tax credits. The “modified taxable income” of a corporation is determined without deduction for certain payments by such corporation to its non-U.S. affiliates (including reinsurance premiums). The reinsurance agreements between our U.S.-based property casualty insurance and reinsurance subsidiaries and Arch Re Bermuda were canceled on a cutoff basis as of January 1, 2018. As such, the level of

subject business ceded to Arch Re Bermuda was substantially lower in 2018 than in prior periods. Other provisions of the Tax Cuts Act that could have a material and adverse impact on us include a provision that defers or disallows a U.S. corporation's deduction of interest expense to the extent such interest expense exceeds a specified percentage of such U.S. corporation's "adjusted taxable income" and a provision that adjusts the manner in which a U.S. property and casualty insurance company computes its loss reserve. There is no assurance that subsequent change in tax laws will materially and adversely affect our operations and financial condition.

Our non-U.K. companies may be subject to U.K. tax that may have a material adverse effect on our results of operations.

We intend to operate in such a manner so that none of our companies, other than our U.K. subsidiaries and branch operations (the "U.K. Group"), should be resident in the U.K. for tax purposes or carry on a trade, whether or not through a permanent establishment, in the U.K. Accordingly, we do not expect that any of our other subsidiaries, other than the U.K. Group, should be subject to U.K. tax. Case law has held that whether or not a trade is being carried on in the U.K. is a matter of fact and emphasis is placed on where the operations take place from which the profits in substance arise. HM Revenue and Customs might contend successfully that one or more of our subsidiaries, in addition to the U.K. Group, is carrying on a trade in the U.K. For U.K. tax purposes, a non-U.K. tax resident company will be subject to U.K. corporation tax only if it carries on a trade through a permanent establishment in the U.K. However, that subsidiary may still be subject to U.K. income tax if it carries on a trade in the U.K., without a permanent establishment, unless it is entitled to the protection afforded by a double tax treaty between the U.K. and the jurisdiction in which that company is resident. If any of our subsidiaries is treated as resident, or carrying on a trade, in the U.K., whether or not through a permanent establishment, and, therefore, subject to U.K. tax, our results of operations could be materially adversely affected.

We may become subject to taxes in Bermuda after March 31, 2035, which may have a material adverse effect on our results of operations.

Under current Bermuda law, we are not subject to tax on income, profits, withholding, capital gains or capital transfers. Furthermore, we have obtained from the Minister of Finance of Bermuda under the Exempted Undertakings Tax Protection Act 1966 of Bermuda, an assurance that, in the event that Bermuda enacts legislation imposing tax computed on profits, income, any capital asset, gain or appreciation, or any tax in the nature of estate duty or inheritance tax, then the imposition of the tax will not be applicable to us or our operations until March 31, 2035. We could be subject to taxes in Bermuda after that date. This assurance does not, however, prevent the imposition of taxes on any person ordinarily resident in

Bermuda or any company in respect of its ownership of real property or leasehold interests in Bermuda.

The impact of Bermuda's letter of commitment to the OECD to eliminate harmful tax practices is uncertain and could adversely affect our tax status in Bermuda.

The Organization for Economic Cooperation and Development ("OECD") has published reports and launched a global initiative among member and non-member countries on measures to limit harmful tax competition. These measures are largely directed at counteracting the effects of tax havens and preferential tax regimes in countries around the world. Bermuda was not listed in the most recent report as an uncooperative tax haven jurisdiction because it had previously committed to eliminate harmful tax practices, to embrace international tax standards for transparency, to exchange information and to eliminate an environment that attracts business with no substantial domestic activity. We are not able predict what changes will arise from the commitment or whether such changes will subject us to additional taxes.

The impact of commitments made by the government of Bermuda in order to avoid being named on the EU's list of non-cooperative tax jurisdictions is uncertain and could have an adverse effect on our results of operations.

Following a year-long screening process, on December 5, 2017 the Council of the European Union published its list of non-cooperative jurisdictions for tax purposes (the "EU Blacklist"). Bermuda was not named on the EU Blacklist due to commitments made by its government to improve certain "substance requirement" deficiencies that were identified by the EU during the screening process. This commitment led to

the passing of the Economic Substance Act 2018 (the "Substance Act") in December 2018. The Substance Act requires certain entities resident in Bermuda to demonstrate that they have adequate economic substance in Bermuda. Broadly, this is expected to be the case where an entity can demonstrate it has adequate income generating activities, employees, premises, and expenditure incurred in Bermuda, although the meaning of "adequate" in this context remains unclear. Further, the speed with which the Substance Act was implemented, and the uncertainties in its interpretation, make it difficult to predict its future impact. Any entity found to be lacking adequate economic substance may be fined or ordered by a court to take action to remedy such failure (or face being struck off the companies register). The EU is expected to announce whether the Substance Act is sufficient to keep Bermuda off the EU Blacklist in February 2018. The nature and scope of the sanctions that may be applied as a result of Bermuda being included in the EU Blacklist is still being considered. Sanctions that the EU has recommended Member States adopt include, inter alia, increased auditing of taxpayers using structures or arrangements involving listed jurisdictions and the imposition

of withholding taxes on payments made to such jurisdictions. As a result, there is a risk that both the adoption of the Substance Act, possible further legislative changes, and the imposition of sanctions in circumstances where Bermuda is ultimately included on the EU Blacklist, could result in increased tax liabilities and/or compliance costs for Arch.

We may become subject to increased taxation in Bermuda and other countries as a result of the OECD's plan on "Base erosion and profit shifting."

The OECD, with the support of the G20, initiated the "base erosion and profit shifting" ("BEPS") project in 2013 in response to concerns that international tax standards have not kept pace with changes in global business practices and that changes are needed to international tax laws to address situations where multinationals may pay little or no tax in certain jurisdictions by shifting profits away from jurisdictions where the activities creating those profits may take place. In October 2015, the OECD issued "final reports" in connection with the BEPS project. The final reports were approved for adoption by the G20 finance ministers in November 2015. The final reports provide the basis for international standards for corporate taxation that are designed to prevent, among other things, the artificial shifting of income to tax havens and low-tax jurisdictions, the erosion of the tax base through interest deductions on intercompany debt and the artificial avoidance of permanent establishments (*i.e.*, tax nexus with a jurisdiction).

Legislation to adopt these standards has been enacted or is currently under consideration in a number of jurisdictions to implement these standards, including country by country reporting. As a result, our income may be taxed in jurisdictions where it is not currently taxed and at higher rates of tax than currently taxed, which may substantially increase our effective tax rate. Also, the adoption of these standards may increase the complexity and costs associated with tax compliance and adversely affect our financial position and results of operations.

The EU's review of harmful tax competition could adversely affect our business, financial condition and results of operations.

During 2017, the EU Economic and Financial Affairs Council ("ECOFIN") released a list of noncooperative jurisdictions for tax purposes. The stated aim of this list, and accompanying report, was to promote good governance worldwide in order to maximize efforts to prevent tax fraud and tax evasion. Bermuda was not on the list of non-cooperative jurisdictions, but did feature in the report (along with approximately 40 other jurisdictions) as having committed to address concerns relating to economic substance by December 31, 2018. In accordance with that commitment, Bermuda has enacted legislation that requires certain entities in Bermuda engaged in "relevant activities" to maintain a substantial economic presence in Bermuda and to satisfy economic substance requirements. The list of "relevant activities" includes carrying on as a business any one or more of: banking, insurance, fund management, financing, leasing, headquarters, shipping, distribution and service center, intellectual property and holding entities. Any entity that must satisfy economic substance requirements but fails to do so could face automatic disclosure to competent authorities in the EU of the information filed by the entity with the Bermuda Registrar of Companies in connection with the economic substance requirements and may also face financial penalties, restriction or regulation of its business activities and/or may be struck off as a registered entity in Bermuda.

At present, the impact of these new economic substance requirements is unclear, and it is impossible to predict the nature and effect of these requirements on us. The new economic substance requirements may increase the complexity and costs of carrying on our business and adversely affect our financial condition and results of operations.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

We lease office space in Bermuda where our principal offices are located. Our insurance group leases space for offices in the U.S., Canada, Bermuda, Europe and Australia. Our reinsurance group leases space for offices in the U.S., Bermuda, Europe, Canada and Dubai. Our mortgage group leases space for offices

in the U.S., Hong Kong and Australia. We believe that the above described office space is adequate for our needs. However, as we continue to develop our business, we may open additional office locations in 2019.

ITEM 3. LEGAL PROCEEDINGS

We, in common with the insurance industry in general, are subject to litigation and arbitration in the normal course of our business. As of December 31, 2018, we were not a party to any

litigation or arbitration which is expected by management to have a material adverse effect on our results of operations and financial condition and liquidity.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

HOLDERS

As of February 20, 2019, and based on information provided to us by our transfer agent and proxy solicitor, there were 860 holders of record of our common shares (NASDAQ: AGL) and approximately 43,000 beneficial holders of our common shares.

ISSUER PURCHASES OF EQUITY SECURITIES

The following table summarizes our purchases of common shares for the 2018 fourth quarter:

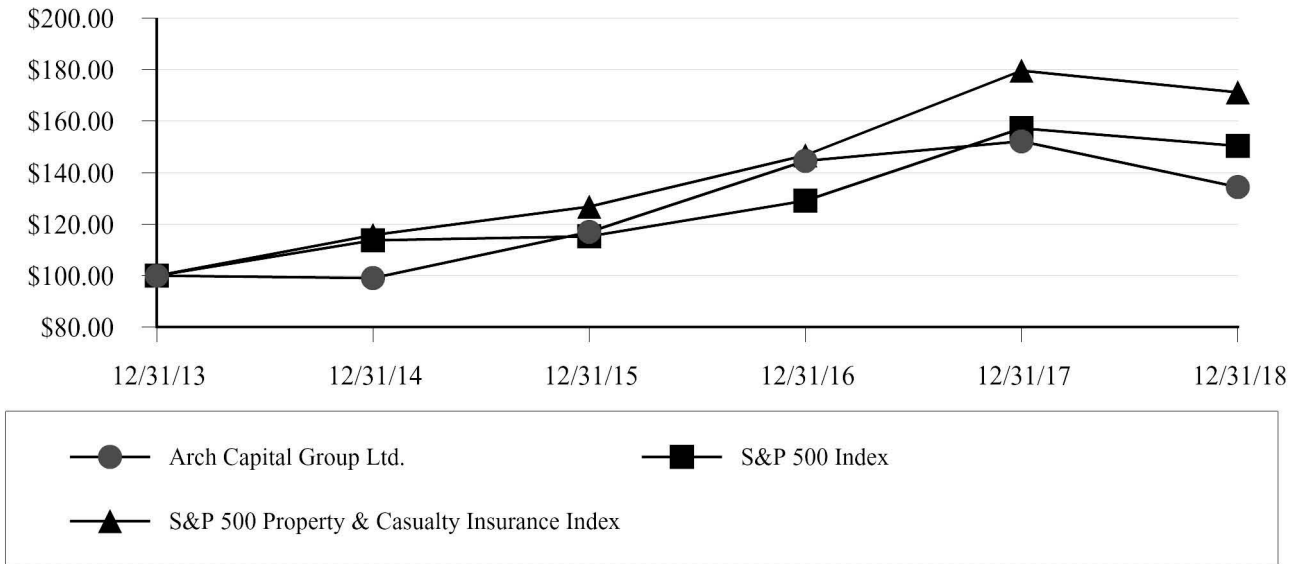
Period	Issuer Purchases of Common Shares			
	Total Number of Shares Purchased (1)	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares that May Yet be Purchased Under the Plan or Programs (2)
10/1/2018-10/31/2018	559,024	\$ 26.69	549,043	\$ 247,339
11/1/2018-11/30/2018	1,042,896	\$ 27.99	922,344	\$ 221,529
12/1/2018-12/31/2018	2,156,733	\$ 26.85	2,152,147	\$ 163,739
Total	<u>3,758,653</u>	\$ 27.14	<u>3,623,534</u>	\$ 163,739

- (1) Includes repurchases by Arch Capital of shares, from time to time, from employees in order to facilitate the payment of withholding taxes on restricted shares granted and the exercise of stock appreciation rights. We purchased these shares at their fair market value, as determined by reference to the closing price of our common shares on the day the restricted shares vested or the stock appreciation rights were exercised.
- (2) Remaining amount available at December 31, 2018 under Arch Capital's share repurchase authorization, under which repurchases may be effected from time to time in open market or privately negotiated transactions through December 31, 2019.

PERFORMANCE GRAPH

The following graph compares the cumulative total shareholder return on our common shares for each of the last five years through December 31, 2018 to the cumulative total return, assuming reinvestment of dividends, of (1) S&P 500 Composite Stock Index (“S&P 500 Index”) and (2) the S&P 500 Property & Casualty Insurance Index. The share price performance presented below is not necessarily indicative of future results.

CUMULATIVE TOTAL SHAREHOLDER RETURN (1)(2)(3)



Company Name/Index	Base Period					
	12/31/13	12/31/14	12/31/15	12/31/16	12/31/17	12/31/18
● Arch Capital Group Ltd.	\$100.00	\$99.01	\$116.85	\$144.56	\$152.07	\$134.29
■ S&P 500 Index	\$100.00	\$113.69	\$115.26	\$129.05	\$157.22	\$150.33
▲ S&P 500 Property & Casualty Insurance Index	\$100.00	\$115.74	\$126.77	\$146.68	\$179.52	\$171.10

- (1) Stock price appreciation plus dividends.
- (2) The above graph assumes that the value of the investment was \$100 on December 31, 2013.
- (3) This graph is not “soliciting material,” is not deemed filed with the SEC and is not to be incorporated by reference in any filing by us under the Securities Act of 1933 or the Securities and Exchange Act of 1934, whether made before or after the date hereof and irrespective of any general incorporation language in any such filing.

ITEM 6. SELECTED FINANCIAL DATA

The following tables set forth summary historical consolidated financial and operating data (including the results of the ‘other’ segment) and should be read in conjunction with “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and our financial statements and the related notes.

(U.S. dollars in thousands except share data)	Year Ended December 31,				
	2018	2017	2016	2015	2014
Statement of Income Data:					
Net premiums written	\$ 5,346,747	\$ 4,961,373	\$ 4,031,391	\$ 3,817,531	\$ 3,891,938
Net premiums earned	5,231,975	4,844,532	3,884,822	3,733,905	3,593,748
Net investment income	563,633	470,872	366,742	348,090	302,585
Equity in net income (loss) of investments accounted for using the equity method	45,641	142,286	48,475	25,455	19,883
Net realized gains (losses)	(405,344)	149,141	137,586	(185,842)	102,917
Total revenues	5,450,568	5,627,375	4,463,556	3,936,590	3,988,873
Income before income taxes	841,772	757,277	855,552	567,194	844,247
Net income	\$ 727,821	\$ 629,709	\$ 824,178	\$ 526,582	\$ 821,260
Net (income) loss attributable to noncontrolling interests	30,150	(10,431)	(131,440)	11,156	13,095
Net income available to Arch	757,971	619,278	692,738	537,738	834,355
Preferred dividends	(41,645)	(46,041)	(28,070)	(21,938)	(21,938)
Loss on redemption of preferred shares	(2,710)	(6,735)	—	—	—
Net income available to Arch common shareholders	\$ 713,616	\$ 566,502	\$ 664,668	\$ 515,800	\$ 812,417
Diluted net income per share	\$ 1.73	\$ 1.36	\$ 1.78	\$ 1.36	\$ 2.01
Cash dividends per share	—	—	—	—	—
After-tax operating income available to Arch common shareholders (1)	\$ 909,190	\$ 447,155	\$ 577,444	\$ 565,199	\$ 617,312
After-tax operating income available to Arch common shareholders per share — diluted (1)	\$ 2.20	\$ 1.07	\$ 1.54	\$ 1.49	\$ 1.53
After-tax return on average common equity (2)	8.4%	7.2%	10.9%	8.9%	14.7%
After-tax operating return on average common equity (2)	10.7%	5.7%	9.4%	9.7%	11.2%
Weighted average common shares and common share equivalents outstanding — diluted (2)	412,906,478	417,785,025	374,152,479	378,116,229	404,766,966

- (1) After-tax operating income available to Arch common shareholders is defined as net income available to Arch common shareholders, excluding net realized gains or losses, net impairment losses included in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses, transaction costs and other and loss on redemption of preferred shares, net of income taxes. The presentation of after-tax operating income available to Arch common shareholders is a “non-GAAP financial measure” as defined in Regulation G. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—General—Comment on Non-GAAP Financial Measures” for further details.
- (2) Equals after-tax operating income available to Arch common shareholders divided by the average of beginning and ending common shareholders’ equity for each period presented. For the 2016 period, the return on average common shareholders’ equity reflects the weighted impact of the \$1.10 billion of convertible non-voting common equivalent preferred shares, which were issued on December 31, 2016 as part of the UGC acquisition.

(U.S. dollars in thousands except share data)	December 31,				
	2018	2017	2016	2015	2014
Balance Sheet Data:					
Total investable assets (1)	\$ 22,324,524	\$ 22,156,488	\$ 20,493,952	\$ 16,340,938	\$ 15,762,730
Premiums receivable	1,299,150	1,135,249	1,072,435	983,443	948,695
Reinsurance recoverables on unpaid and paid losses and loss adjustment expenses	2,919,372	2,540,143	2,114,138	1,867,373	1,812,845
Total assets	32,218,329	32,051,658	29,372,109	23,138,931	21,967,742
Reserves for losses and loss adjustment expenses:					
Before unpaid losses and loss adjustment expenses recoverable	11,853,297	11,383,792	10,200,960	9,125,250	9,036,448
Net of unpaid losses and loss adjustment expenses recoverable	9,039,006	8,918,882	8,117,385	7,296,413	7,258,145
Unearned premiums:					
Before ceded unearned premiums	3,753,636	3,622,314	3,406,870	2,333,932	2,231,578
Net of ceded unearned premiums	2,778,167	2,695,703	2,547,303	1,906,323	1,854,500
Senior notes	1,733,528	1,732,884	1,732,258	791,306	791,141
Revolving credit agreement borrowings	455,682	816,132	756,650	530,434	100,000
Total liabilities	21,780,650	21,805,723	20,060,984	16,028,376	14,887,435
Total shareholders' equity	10,231,387	10,040,013	9,105,572	6,905,373	6,860,795
Total shareholders' equity available to Arch	9,439,827	9,196,602	8,253,718	6,166,542	6,091,714
Preferred shareholders' equity	780,000	872,555	772,555	325,000	325,000
Common shareholders' equity available to Arch	<u>\$ 8,659,827</u>	<u>\$ 8,324,047</u>	<u>\$ 7,481,163</u>	<u>\$ 5,841,542</u>	<u>\$ 5,766,714</u>
Common shares and common share equivalents outstanding, net of treasury shares (2)	402,454,834	409,956,417	406,651,011	367,883,349	382,103,802
Book value per share (2) (3)	\$ 21.52	\$ 20.30	\$ 18.40	\$ 15.88	\$ 15.09

- (1) This table excludes the collateral received and reinvested and includes the securities pledged under securities lending agreements, at fair value.
- (2) Reflects the impact of outstanding convertible non-voting common equivalent preferred shares which were issued on December 31, 2016 as part of the UGC acquisition.
- (3) Excludes the effects of stock options and restricted stock units.

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

The following discussion and analysis contains forward-looking statements which involve inherent risks and uncertainties. All statements other than statements of historical fact are forward-looking statements. These statements are based on our current assessment of risks and uncertainties. Actual results may differ materially from those expressed or implied in these statements and, therefore, undue reliance should not be placed on them. Important factors that could cause actual events or results to differ materially from those indicated in such statements are discussed in this report, including the sections entitled "Cautionary Note Regarding Forward-Looking Statements," and "Risk Factors."

This discussion and analysis should be read in conjunction with our audited consolidated financial statements and notes thereto presented under Item 8. Tabular amounts are in U.S. Dollars in thousands, except share amounts, unless otherwise noted.

GENERAL

Overview

Arch Capital Group Ltd. ("Arch Capital" and, together with its subsidiaries, "we" or "us") is a Bermuda public limited liability company with approximately \$11.17 billion in capital at December 31, 2018 and, through operations in Bermuda, the United States, Europe and Canada, writes specialty lines of property and casualty insurance and reinsurance, as well as mortgage insurance and reinsurance, on a worldwide basis. It is our belief that our underwriting platform, our experienced management team and our strong capital base have enabled us to establish a strong presence in the insurance and reinsurance markets.

The worldwide property casualty insurance and reinsurance industry is highly competitive and has traditionally been subject to an underwriting cycle in which a hard market (high premium rates, restrictive underwriting standards, as well as terms and conditions, and underwriting gains) is eventually followed by a soft market (low premium rates, relaxed underwriting standards, as well as broader terms and conditions, and underwriting losses). Property casualty market conditions may affect, among other things, the demand for our products, our ability to increase premium rates, the terms and conditions of the insurance policies we write, changes in the products offered by us or changes in our business strategy.

The financial results of the property casualty insurance and reinsurance industry are influenced by factors such as the frequency and/or severity of claims and losses, including natural disasters or other catastrophic events, variations in

interest rates and financial markets, changes in the legal, regulatory and judicial environments, inflationary pressures and general economic conditions. These factors influence, among other things, the demand for insurance or reinsurance, the supply of which is generally related to the total capital of competitors in the market.

Mortgage insurance and reinsurance is subject to similar cycles to property casualty except that they have historically been more dependent on macroeconomic conditions.

Current Outlook

Our objective is to achieve an average operating return on average equity of 15% or greater over the insurance cycle, which we believe to be an attractive return to our common shareholders given the risks we assume. We continue to look for opportunities to find acceptable books of business to underwrite without sacrificing underwriting discipline and continue to write a portion of our overall book in catastrophe-exposed business which has the potential to increase the volatility of our operating results.

The broad property casualty insurance market environment continues to be competitive, with only a few specialty areas providing opportunities to deploy capital at returns which meet our risk-adjusted return requirements. In most of our insurance lines of business, rate increases appear to be in excess of loss cost trends. However, the spread between rate changes and loss trend is a key variable in assessing expected returns and, in specialty lines, is volatile by nature. Our underwriting teams continue to execute a disciplined strategy by emphasizing small and medium-sized accounts over large accounts, shrinking premiums in more commoditized lines such as general liability and directors and officers, and by utilizing reinsurance purchases to reduce volatility on large account, high capacity business. Writings in property catastrophe-exposed business continued to remain low in 2018.

Our mortgage segment continues to experience generally favorable market conditions, with pricing in the U.S. stabilizing in the third quarter following the rate changes announced in the first half of 2018. Our results continue to reflect our success in making high quality credit underwriting risk decisions and building customer relationships.

Arch remains committed to providing solutions across many offerings as the marketplace evolves, including new mortgage credit risk transfer programs initiated by government sponsored enterprises, or "GSEs," in 2018. Such programs have begun generating business with banks developing new systems to handle the programs and momentum beginning to build. In

addition, we completed multiple Bellemeade risk transfers to the capital markets throughout 2018, increasing our protection for mortgage tail risk.

FINANCIAL MEASURES

Management uses the following three key financial indicators in evaluating our performance and measuring the overall growth in value generated for Arch Capital's common shareholders:

Book Value per Share

Book value per share represents total common shareholders' equity available to Arch divided by the number of common shares and common share equivalents outstanding. Management uses growth in book value per share as a key measure of the value generated for our common shareholders each period and believes that book value per share is the key driver of Arch Capital's share price over time. Book value per share is impacted by, among other factors, our underwriting results, investment returns and share repurchase activity, which has an accretive or dilutive impact on book value per share depending on the purchase price. Book value per share was \$21.52 at December 31, 2018, a 6.0% increase from \$20.30 at December 31, 2017. The growth in 2018 reflected strong underwriting results, partially offset by the impact of an increase in interest rates on our fixed income securities.

Operating Return on Average Common Equity

Operating return on average common equity ("Operating ROAE") represents annualized after-tax operating income available to Arch common shareholders divided by average common shareholders' equity available to Arch during the period. After-tax operating income available to Arch common shareholders, a "non-GAAP measure" as defined in the SEC rules, represents net income available to Arch common shareholders, excluding net realized gains or losses, net impairment losses recognized in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses and transaction costs and other, net of income taxes. Management uses Operating ROAE as a key measure of the return generated to Arch common shareholders. See "Comment on Non-GAAP Financial Measures." Our Operating ROAE was 10.7% for 2018, compared to 5.7% for 2017 and 9.4% for 2016. The higher Operating ROAE for 2018 reflected strong mortgage insurance underwriting performance, while 2017 returns reflected a higher level of catastrophic loss activity.

Total Return on Investments

Total return on investments includes investment income, equity in net income or loss of investments accounted for using the equity method, net realized gains and losses and the change in

unrealized gains and losses generated by Arch's investment portfolio. Total return is calculated on a pre-tax basis and before investment expenses excluding amounts reflected in the 'other' segment, and reflects the effect of financial market conditions along with foreign currency fluctuations. Management uses total return on investments as a key measure of the return generated to Arch common shareholders on the capital held in the business, and compares the return generated by our investment portfolio against benchmark returns which we measured our portfolio against during the periods.

The following table summarizes the pre-tax total return (before investment expenses) of investment held by Arch compared to the benchmark return (both based in U.S. Dollars) against which we measured our portfolio during the periods:

	Arch Portfolio (1)	Benchmark Return
Pre-tax total return (before investment expenses):		
Year Ended December 31, 2018	0.33%	-0.60%
Year Ended December 31, 2017	5.87%	4.74%
Year Ended December 31, 2016	2.07%	2.13%

- (1) Our investment expenses were approximately 0.36%, 0.30% and 0.34%, respectively, of average invested assets in 2018, 2017 and 2016.

Total return for our investment portfolio outperformed that of the benchmark return index in 2018, reflecting strong performance from our alternative investments. Excluding foreign exchange, total return was 1.13% for 2018, compared to 4.98% for 2017 and 2.35% for 2016. Total return for 2018 reflected the impact of rising interest rates and widening credit spreads, which dampened the total return on our investment grade fixed income portfolio, and negative returns on equities.

The benchmark return index is a customized combination of indices intended to approximate a target portfolio by asset mix and average credit quality while also matching the approximate estimated duration and currency mix of our insurance and reinsurance liabilities. Although the estimated duration and average credit quality of this index will move as the duration and rating of its constituent securities change, generally we do not adjust the composition of the benchmark return index except to incorporate changes to the mix of liability currencies and durations noted above. The benchmark return index should not be interpreted as expressing a preference for or aversion to any particular sector or sector weight. The index is intended solely to provide, unlike many master indices that change based on the size of their constituent indices, a relatively stable basket of investable indices. At December 31, 2018, the benchmark return index had an average credit quality of "Aa2" by Moody's, an estimated duration of 3.23 years.

The benchmark return index included weightings to the following indices:

	%
ICE BoAML 1-10 Year U.S. Corporate & All Yankees, A - AAA Rated Index	20.00%
ICE BoAML 1-5 Year U.S. Treasury Index	15.00
ICE BoAML 1-10 Year U.S. Municipal Securities Index	14.50
ICE BoAML 3-5 Year Fixed Rate Asset Backed Securities Index	7.00
Bloomberg Barclays CMBS Invest Grade Aaa Total Return Index	5.00
MSCI ACWI Net Total Return USD Index	5.00
ICE BoAML German Government 1-10 Year Index	5.00
ICE BoAML U.S. Mortgage Backed Securities Index	4.00
Hedge Fund Research HFRX Fixed Income Credit Index	3.50
Hedge Fund Research HFRX Equal Weighted Strategies	3.50
ICE BoAML 5-10 Year U.S. Treasury Index	3.00
ICE BoAML 1-5 Year U.K. Gilt Index	3.00
ICE BoAML U.S. High Yield Constrained Index	2.50
ICE BoAML 1-5 Year Australian Governments Index	2.50
S&P Leveraged Loan Total Return Index	2.50
ICE BoAML 0-3 Month U.S. Treasury Bill Index	2.00
ICE BoAML 1-5 Year Canada Government Index	1.50
ICE BoAML 20+ Year Canada Government Index	0.50
Total	100.00%

COMMENT ON NON-GAAP FINANCIAL MEASURES

Throughout this filing, we present our operations in the way we believe will be the most meaningful and useful to investors, analysts, rating agencies and others who use our financial information in evaluating the performance of our company. This presentation includes the use of after-tax operating income available to Arch common shareholders, which is defined as net income available to Arch common shareholders, excluding net realized gains or losses, net impairment losses recognized in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses, transaction costs and other, loss on redemption of preferred shares and income taxes, and the use of annualized operating return on average common equity. The presentation of after-tax operating income available to Arch common shareholders and annualized operating return on average common equity are non-GAAP financial measures as defined in Regulation G. The reconciliation of such measures to net income available to Arch common shareholders and annualized return on average common equity (the most directly comparable GAAP financial measures) in accordance with Regulation G is included under “Results of Operations” below.

We believe that net realized gains or losses, net impairment losses recognized in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign

exchange gains or losses, transaction costs and other and loss on redemption of preferred shares in any particular period are not indicative of the performance of, or trends in, our business. Although net realized gains or losses, net impairment losses recognized in earnings, equity in net income or loss of investments accounted for using the equity method and net foreign exchange gains or losses are an integral part of our operations, the decision to realize investment gains or losses, the recognition of the change in the carrying value of investments accounted for using the fair value option in net realized gains or losses, the recognition of net impairment losses, the recognition of equity in net income or loss of investments accounted for using the equity method and the recognition of foreign exchange gains or losses are independent of the insurance underwriting process and result, in large part, from general economic and financial market conditions. Furthermore, certain users of our financial information believe that, for many companies, the timing of the realization of investment gains or losses is largely opportunistic. In addition, net impairment losses recognized in earnings on our investments represent other-than-temporary declines in expected recovery values on securities without actual realization. The use of the equity method on certain of our investments in certain funds that invest in fixed maturity securities is driven by the ownership structure of such funds (either limited partnerships or limited liability companies). In applying the equity method, these investments are initially recorded at cost and are subsequently adjusted based on our proportionate share of the net income or loss of the funds (which include changes in the market value of the underlying securities in the funds). This method of accounting is different from the way we account for our other fixed maturity securities and the timing of the recognition of equity in net income or loss of investments accounted for using the equity method may differ from gains or losses in the future upon sale or maturity of such investments. Transaction costs and other include advisory, financing, legal, severance, incentive compensation and other transaction costs related to acquisitions, including UGC. During the 2016 fourth quarter, transaction costs and other included non-recurring expenses related to a change in the our approach on the deferral of certain internal underwriting costs which are no longer being deferred. We believe that transaction costs and other, due to their non-recurring nature, are not indicative of the performance of, or trends in, our business performance. The loss on redemption of preferred shares related to the redemption of our Series C preferred shares in September 2017 and January 2018 and had no impact on shareholders' equity or cash flows. Due to these reasons, we exclude net realized gains or losses, net impairment losses recognized in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses, transaction costs and other and loss on redemption of preferred shares from the calculation of after-tax operating income available to Arch common shareholders. In addition, income tax expense for 2017 included a \$21.5 million charge

due to the revaluation of the Company's net deferred tax asset resulting from the reduction in the U.S. corporate income tax rate from 35% to 21% effective January 1, 2018. Due to the non-recurring nature of this item, we excluded it from after-tax operating income available to Arch common shareholders.

We believe that showing net income available to Arch common shareholders exclusive of the items referred to above reflects the underlying fundamentals of our business since we evaluate the performance of and manage our business to produce an underwriting profit. In addition to presenting net income available to Arch common shareholders, we believe that this presentation enables investors and other users of our financial information to analyze our performance in a manner similar to how management analyzes performance. We also believe that this measure follows industry practice and, therefore, allows the users of financial information to compare our performance with our industry peer group. We believe that the equity analysts and certain rating agencies which follow us and the insurance industry as a whole generally exclude these items from their analyses for the same reasons.

Our segment information includes the presentation of consolidated underwriting income or loss and a subtotal of underwriting income or loss before the contribution from the 'other' segment. Such measures represent the pre-tax profitability of our underwriting operations and include net premiums earned plus other underwriting income, less losses and loss adjustment expenses, acquisition expenses and other operating expenses. Other operating expenses include those operating expenses that are incremental and/or directly attributable to our individual underwriting operations. Underwriting income or loss does not incorporate items included in our corporate (non-underwriting) segment. While these measures are presented in note 4, "Segment Information," to our consolidated financial statements in Item 8, they are considered non-GAAP financial measures when presented elsewhere on a consolidated basis. The reconciliations of underwriting income or loss to income before income taxes (the most directly comparable GAAP financial measure) on a consolidated basis and a subtotal before the contribution from the 'other' segment, in accordance with Regulation G, is shown in note 4, "Segment Information," to our consolidated financial statements in Item 8.

We measure segment performance for our three underwriting segments based on underwriting income or loss. We do not manage our assets by underwriting segment, with the exception of goodwill and intangible assets, and, accordingly, investment income and other non-underwriting related items are not allocated to each underwriting segment. For the 'other' segment, performance is measured based on net income or loss.

Along with consolidated underwriting income, we provide a subtotal of underwriting income or loss before the contribution from the 'other' segment. Pursuant to generally accepted accounting principles, Watford Re is considered a variable interest entity and we concluded that we are the primary beneficiary of Watford Re. As such, we consolidate the results of Watford Re in our consolidated financial statements, although we only own approximately 11% of Watford Re's common equity. Watford Re has its own management and board of directors that is responsible for its overall profitability. In addition, we do not guarantee or provide credit support for Watford Re. Since Watford Re is an independent company, the assets of Watford Re can be used only to settle obligations of Watford Re and Watford Re is solely responsible for its own liabilities and commitments. Our financial exposure to Watford Re is limited to our investment in Watford Re's common and preferred shares and counterparty credit risk (mitigated by collateral) arising from the reinsurance transactions. We believe that presenting certain information excluding the 'other' segment enables investors and other users of our financial information to analyze our performance in a manner similar to how our management analyzes performance.

Our presentation of segment information includes the use of a current year loss ratio which excludes favorable or adverse development in prior year loss reserves. This ratio is a non-GAAP financial measure as defined in Regulation G. The reconciliation of such measure to the loss ratio (the most directly comparable GAAP financial measure) in accordance with Regulation G is shown on the individual segment pages. Management utilizes the current year loss ratio in its analysis of the underwriting performance of each of our underwriting segments.

Total return on investments includes investment income, equity in net income or loss of investments accounted for using the equity method, net realized gains and losses and the change in unrealized gains and losses generated by Arch's investment portfolio. Total return is calculated on a pre-tax basis and before investment expenses, excludes amounts reflected in the 'other' segment, and reflects the effect of financial market conditions along with foreign currency fluctuations. In addition, total return incorporates the timing of investment returns during the periods. There is no directly comparable GAAP financial measure for total return. Management uses total return on investments as a key measure of the return generated to Arch common shareholders on the capital held in the business, and compares the return generated by our investment portfolio against benchmark returns which we measured our portfolio against during the periods.

RESULTS OF OPERATIONS

The following table summarizes our consolidated financial data, including a reconciliation of net income available to Arch common shareholders to after-tax operating income available to Arch common shareholders. Each line item reflects the impact of our approximate 11% ownership of Watford Re's common equity.

	Year Ended December 31,		
	2018	2017	2016
Net income available to Arch common shareholders	\$ 713,616	\$ 566,502	\$ 664,668
Net realized (gains) losses	297,755	(148,836)	(77,081)
Net impairment losses recognized in earnings	2,829	7,138	30,442
Equity in net (income) loss of investments accounted for using the equity method	(45,641)	(142,286)	(48,475)
Net foreign exchange (gains) losses	(59,890)	113,613	(31,987)
Transaction costs and other	12,377	22,150	41,729
Loss on redemption of preferred shares	2,710	6,735	—
Income tax expense (benefit) (1)	(14,566)	22,139	(1,852)
After-tax operating income available to Arch common shareholders	<u>\$ 909,190</u>	<u>\$ 447,155</u>	<u>\$ 577,444</u>
Beginning common shareholders' equity	\$ 8,324,047	\$ 7,481,163	\$ 5,841,542
Ending common shareholders' equity	<u>8,659,827</u>	<u>8,324,047</u>	<u>7,481,163</u>
Average common shareholders' equity (2)	<u>\$ 8,491,937</u>	<u>\$ 7,902,605</u>	<u>\$ 6,113,718</u>
Annualized return on average common equity % (2)	8.4	7.2	10.9
Annualized operating return on average common equity % (2)	10.7	5.7	9.4

- (1) Income tax on net realized gains or losses, net impairment losses recognized in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses, transaction costs and other and loss on redemption of preferred shares reflects the relative mix reported by jurisdiction and the varying tax rates in each jurisdiction.
- (2) 2016 period reflects the weighted impact of the \$1.10 billion of convertible non-voting common equivalent preferred shares issued on December 31, 2016 as part of the UGC acquisition.

Results in all periods presented reflected the impact of current insurance and reinsurance market conditions and the impact of low interest yields on our investment portfolio.

Segment Information

We classify our businesses into three underwriting segments — insurance, reinsurance and mortgage — and two other operating segments — corporate (non-underwriting) and 'other.' Our insurance, reinsurance and mortgage segments each have managers who are responsible for the overall profitability of

their respective segments and who are directly accountable to our chief operating decision makers, the President and Chief Executive Officer of Arch Capital and the Chief Financial Officer of Arch Capital. The chief operating decision makers do not assess performance, measure return on equity or make resource allocation decisions on a line of business basis. Management measures segment performance for our three underwriting segments based on underwriting income or loss. We do not manage our assets by underwriting segment, with the exception of goodwill and intangible assets, and, accordingly, investment income is not allocated to each underwriting segment.

We determined our reportable segments using the management approach described in accounting guidance regarding disclosures about segments of an enterprise and related information. The accounting policies of the segments are the same as those used for the preparation of our consolidated financial statements. Intersegment business is allocated to the segment accountable for the underwriting results.

Insurance Segment

The following tables set forth our insurance segment's underwriting results:

	Year Ended December 31,		
	2018	2017	% Change
Gross premiums written	\$ 3,262,332	\$ 3,081,086	5.9
Premiums ceded	(1,050,207)	(958,646)	
Net premiums written	<u>2,212,125</u>	<u>2,122,440</u>	4.2
Change in unearned premiums	(6,464)	(9,422)	
Net premiums earned	<u>2,205,661</u>	<u>2,113,018</u>	4.4
Losses and loss adjustment expenses	(1,520,680)	(1,622,444)	
Acquisition expenses	(349,702)	(323,639)	
Other operating expenses	(364,138)	(359,524)	
Underwriting income (loss)	<u>\$ (28,859)</u>	<u>\$ (192,589)</u>	n/m

Underwriting Ratios			% Point Change
Loss ratio	68.9%	76.8%	(7.9)
Acquisition expense ratio	15.9%	15.3%	0.6
Other operating expense ratio	16.5%	17.0%	(0.5)
Combined ratio	<u>101.3%</u>	<u>109.1%</u>	<u>(7.8)</u>

	Year Ended December 31,		
	2017	2016	% Change
Gross premiums written	\$ 3,081,086	\$ 3,027,049	1.8
Premiums ceded	(958,646)	(954,768)	
Net premiums written	2,122,440	2,072,281	2.4
Change in unearned premiums	(9,422)	1,623	
Net premiums earned	2,113,018	2,073,904	1.9
Losses and loss adjustment expenses	(1,622,444)	(1,359,313)	
Acquisition expenses	(323,639)	(304,050)	
Other operating expenses	(359,524)	(350,260)	
Underwriting income	\$ (192,589)	\$ 60,281	(419.5)

Underwriting Ratios			% Point Change
Loss ratio	76.8%	65.5%	11.3
Acquisition expense ratio	15.3%	14.7%	0.6
Other operating expense ratio	17.0%	16.9%	0.1
Combined ratio	109.1%	97.1%	12.0

The insurance segment consists of our insurance underwriting units which offer specialty product lines on a worldwide basis. Product lines include:

- *Construction and national accounts*: primary and excess casualty coverages to middle and large accounts in the construction industry and a wide range of products for middle and large national accounts, specializing in loss sensitive primary casualty insurance programs (including large deductible, self-insured retention and retrospectively rated programs).
- *Excess and surplus casualty*: primary and excess casualty insurance coverages, including middle market energy business, and contract binding, which primarily provides casualty coverage through a network of appointed agents to small and medium risks.
- *Lenders products*: collateral protection, debt cancellation and service contract reimbursement products to banks, credit unions, automotive dealerships and original equipment manufacturers and other specialty programs that pertain to automotive lending and leasing.
- *Professional lines*: directors' and officers' liability, errors and omissions liability, employment practices liability, fiduciary liability, crime, professional indemnity and other financial related coverages for corporate, private equity, venture capital, real estate investment trust, limited partnership, financial institution and not-for-profit clients of all sizes and medical professional and general liability insurance coverages for the healthcare industry. The business is predominately written on a claims-made basis.
- *Programs*: primarily package policies, underwriting workers' compensation and umbrella liability business in support of desirable package programs, targeting program managers with unique expertise and niche products offering

general liability, commercial automobile, inland marine and property business with minimal catastrophe exposure.

- *Property, energy, marine and aviation*: primary and excess general property insurance coverages, including catastrophe-exposed property coverage, for commercial clients. Coverages for marine include hull, war, specie and liability. Aviation and stand-alone terrorism are also offered.
- *Travel, accident and health*: specialty travel and accident and related insurance products for individual, group travelers, travel agents and suppliers, as well as accident and health, which provides accident, disability and medical plan insurance coverages for employer groups, medical plan members, students and other participant groups.
- *Other*: includes alternative market risks (including captive insurance programs), excess workers' compensation and employer's liability insurance coverages for qualified self-insured groups, associations and trusts, and contract and commercial surety coverages, including contract bonds (payment and performance bonds) primarily for medium and large contractors and commercial surety bonds for Fortune 1000 companies and smaller transaction business programs.

Premiums Written.

The following tables set forth our insurance segment's net premiums written by major line of business:

	Year Ended December 31,			
	2018		2017	
	Amount	%	Amount	%
Professional lines	\$ 450,406	20.4	\$ 452,748	21.3
Programs	393,263	17.8	386,618	18.2
Construction and national accounts	320,937	14.5	327,648	15.4
Travel, accident and health	290,401	13.1	247,738	11.7
Property, energy, marine and aviation	219,174	9.9	172,240	8.1
Excess and surplus casualty	168,467	7.6	179,511	8.5
Lenders products	96,094	4.3	96,867	4.6
Other	273,383	12.4	259,070	12.2
Total	\$2,212,125	100.0	\$2,122,440	100.0

2018 versus 2017: Net premiums written by the insurance segment were 4.2% higher in 2018 than in 2017. The increase in net premiums written reflected growth in travel, due to both new business and growth in existing accounts, and in property, primarily due to new business and rate increases. These increases were partially offset by a reduction in contract binding and accident and health in response to market conditions.

	Year Ended December 31,			
	2017		2016	
	Amount	%	Amount	%
Professional lines	\$ 452,748	21.3	\$ 440,149	21.2
Programs	386,618	18.2	330,322	15.9
Construction and national accounts	327,648	15.4	328,997	15.9
Travel, accident and health	247,738	11.7	224,380	10.8
Property, energy, marine and aviation	172,240	8.1	175,376	8.5
Excess and surplus casualty	179,511	8.5	214,863	10.4
Lenders products	96,867	4.6	105,650	5.1
Other	259,070	12.2	252,544	12.2
Total	<u>\$2,122,440</u>	<u>100.0</u>	<u>\$2,072,281</u>	<u>100.0</u>

2017 versus 2016: Net premiums written by the insurance segment were 2.4% higher in 2017 than in 2016. The increase in net premiums written reflected growth in programs, due to the continued effects of two newer programs, in travel, accident and health, reflecting both new travel business and continued expansion in existing travel accounts, and in professional lines, reflecting increases in small and medium sized accounts. Such amounts were partially offset by a reduction in excess and surplus casualty in response to market conditions.

Net Premiums Earned.

The following tables set forth our insurance segment's net premiums earned by major line of business:

	Year Ended December 31,			
	2018		2017	
	Amount	%	Amount	%
Professional lines	\$ 458,425	20.8	\$ 444,137	21.0
Programs	389,186	17.6	364,639	17.3
Construction and national accounts	322,440	14.6	324,517	15.4
Travel, accident and health	297,147	13.5	257,358	12.2
Property, energy, marine and aviation	205,069	9.3	173,779	8.2
Excess and surplus casualty	172,424	7.8	195,154	9.2
Lenders products	94,248	4.3	97,043	4.6
Other	266,722	12.1	256,391	12.1
Total	<u>\$2,205,661</u>	<u>100.0</u>	<u>\$2,113,018</u>	<u>100.0</u>

	Year Ended December 31,			
	2017		2016	
	Amount	%	Amount	%
Professional lines	\$ 444,137	21.0	\$ 431,391	20.8
Programs	364,639	17.3	357,715	17.2
Construction and national accounts	324,517	15.4	322,072	15.5
Travel, accident and health	257,358	12.2	219,169	10.6
Property, energy, marine and aviation	173,779	8.2	188,938	9.1
Excess and surplus casualty	195,154	9.2	219,046	10.6
Lenders products	97,043	4.6	98,517	4.8
Other	256,391	12.1	237,056	11.4
Total	<u>\$2,113,018</u>	<u>100.0</u>	<u>\$2,073,904</u>	<u>100.0</u>

Net premiums earned by the insurance segment were 4.4% higher in 2018 than in 2017, reflecting changes in net premiums written over the previous five quarters. Net premiums earned by the insurance segment were 1.9% higher in 2017 than in 2016.

Losses and Loss Adjustment Expenses.

The table below shows the components of the insurance segment's loss ratio:

	Year Ended December 31,		
	2018	2017	2016
Current year	70.0 %	77.2 %	67.1 %
Prior period reserve development	(1.1)%	(0.4)%	(1.6)%
Loss ratio	<u>68.9 %</u>	<u>76.8 %</u>	<u>65.5 %</u>

Current Year Loss Ratio.

2018 versus 2017: The insurance segment's current year loss ratio was 7.2 points lower in 2018 than in 2017. The 2018 loss ratio included 3.4 points of current year catastrophic event activity, primarily related to Hurricanes Florence and Michael and the California wildfires, compared to 10.3 points in 2017, primarily related to Hurricanes Harvey, Irma and Maria and California wildfires. The balance of the change in the 2018 loss ratio resulted, in part, from changes in mix of business and the level of large attritional losses.

2017 versus 2016: The insurance segment's current year loss ratio was 10.1 points higher in 2017 than in 2016. The 2017 loss ratio included 10.3 points of current year catastrophic event activity, primarily related to Hurricanes Harvey, Irma and Maria and the California wildfires, compared to 2.2 points in 2016. The 2017 loss ratio also reflected changes in the level of attritional large losses and changes in the mix of business.

Prior Period Reserve Development.

The insurance segment's net favorable development was \$24.4 million, or 1.1 points, for 2018, compared to \$8.6 million, or

flood and earthquake. Business is assumed on both a proportional and excess of loss basis. In addition, facultative business is written which focuses on individual commercial property risks on an excess of loss basis.

- *Other*: includes life reinsurance business on both a proportional and non-proportional basis, casualty clash business and, in limited instances, non-traditional business which is intended to provide insurers with risk management solutions that complement traditional reinsurance.

Premiums Written.

The following tables set forth our reinsurance segment's net premiums written by major line of business:

	Year Ended December 31,			
	2018		2017	
	Amount	%	Amount	%
Other specialty	\$ 507,971	37.0	\$ 459,213	39.1
Casualty	400,178	29.2	340,429	29.0
Property excluding property catastrophe	310,293	22.6	243,693	20.7
Property catastrophe	79,624	5.8	70,155	6.0
Marine and aviation	38,013	2.8	32,759	2.8
Other	36,493	2.7	28,225	2.4
Total	\$1,372,572	100.0	\$1,174,474	100.0
Pro rata	\$ 782,268	57.0	\$ 708,694	60.3
Excess of loss	590,304	43.0	465,780	39.7
Total	\$1,372,572	100.0	\$1,174,474	100.0

2018 versus 2017: Gross premiums written by the reinsurance segment in 2018 were 16.6% higher than in 2017, while net premiums written were 16.9% higher than in 2017. The increase in net premiums written reflected growth in casualty lines and property lines, primarily due to new business and rate increases, and in other specialty, primarily due to new international motor contracts. Net premiums written in 2018 also included reinstatement premiums of \$4.0 million, primarily for Hurricanes Florence and Michael, Typhoon Jebi, California wildfires and adjustments for other events, compared to \$15.9 million in 2017 for Hurricanes Harvey, Irma, Maria, as well as adjustments for other events.

	Year Ended December 31,			
	2017		2016	
	Amount	%	Amount	%
Other specialty	\$ 459,213	39.1	\$ 348,852	33.1
Casualty	340,429	29.0	305,252	29.0
Property excluding property catastrophe	243,693	20.7	267,548	25.4
Property catastrophe	70,155	6.0	75,789	7.2
Marine and aviation	32,759	2.8	37,790	3.6
Other	28,225	2.4	18,625	1.8
Total	\$1,174,474	100.0	\$1,053,856	100.0
Pro rata	\$ 708,694	60.3	\$ 558,671	53.0
Excess of loss	465,780	39.7	495,185	47.0
Total	\$1,174,474	100.0	\$1,053,856	100.0

2017 versus 2016: Gross premiums written by the reinsurance segment in 2017 were 9.8% higher than in 2016, while net premiums written were 11.4% higher than in 2016. Premiums written reflected growth in other specialty business, primarily in international motor quota share contracts, and in casualty business, primarily due to a \$45.4 million retroactive reinsurance contract which was substantially earned in the period and resulted in a corresponding increase to losses and loss adjustment expenses. Net premiums written in 2017 included reinstatement premiums of \$15.9 million for Hurricanes Harvey, Irma and Maria. Such amounts were partially offset by a reduction in property excluding property catastrophe business, primarily related to a targeted reduction in onshore energy writings.

Net Premiums Earned.

The following tables set forth our reinsurance segment's net premiums earned by major line of business:

	Year Ended December 31,			
	2018		2017	
	Amount	%	Amount	%
Other specialty	\$ 474,568	37.6	\$ 408,566	35.8
Casualty	347,034	27.5	341,122	29.9
Property excluding property catastrophe	287,788	22.8	255,453	22.4
Property catastrophe	75,249	6.0	73,300	6.4
Marine and aviation	39,238	3.1	36,214	3.2
Other	37,339	3.0	27,966	2.4
Total	\$1,261,216	100.0	\$1,142,621	100.0
Pro rata	\$ 719,860	57.1	\$ 657,490	57.5
Excess of loss	541,356	42.9	485,131	42.5
Total	\$1,261,216	100.0	\$1,142,621	100.0

	Year Ended December 31,			
	2017		2016	
	Amount	%	Amount	%
Other specialty	\$ 408,566	35.8	\$ 329,994	31.2
Casualty	341,122	29.9	300,160	28.4
Property excluding property catastrophe	255,453	22.4	282,018	26.7
Property catastrophe	73,300	6.4	73,803	7.0
Marine and aviation	36,214	3.2	52,579	5.0
Other	27,966	2.4	17,678	1.7
Total	<u>\$ 1,142,621</u>	<u>100.0</u>	<u>\$ 1,056,232</u>	<u>100.0</u>
Pro rata	\$ 657,490	57.5	\$ 561,986	53.2
Excess of loss	485,131	42.5	494,246	46.8
Total	<u>\$ 1,142,621</u>	<u>100.0</u>	<u>\$ 1,056,232</u>	<u>100.0</u>

Net premiums earned in 2018 were 10.4% higher than in 2017, reflecting changes in net premiums written over the previous five quarters, including the mix and type of business written. Net premiums earned in 2017 were 8.2% higher than in 2016.

Other Underwriting Income (Loss).

Other underwriting loss in 2018 was \$0.7 million, compared to other underwriting income of \$11.3 million in 2017 and \$36.4 million in 2016. The 2016 period included \$19.1 million related to a contract which was commuted during the 2016 second quarter. This contract had been reflected as a deposit accounting liability (*i.e.*, a contract that, in accordance with GAAP, does not pass risk transfer) prior to the commutation.

Losses and Loss Adjustment Expenses.

The table below shows the components of the reinsurance segment's loss ratio:

	Year Ended December 31,		
	2018	2017	2016
Current year	78.1 %	82.2 %	65.7 %
Prior period reserve development	(11.0)%	(14.5)%	(20.7)%
Loss ratio	<u>67.1 %</u>	<u>67.7 %</u>	<u>45.0 %</u>

Current Year Loss Ratio.

2018 versus 2017: The reinsurance segment's current year loss ratio was 4.1 points lower in 2018 than in 2017. The 2018 loss ratio included 10.1 points for current year catastrophic event activity, primarily related to Hurricanes Florence and Michael, Typhoon Jebi and the California wildfires, compared to 16.0 points in 2017, primarily related to Hurricanes Harvey, Irma and Maria and the California wildfires. The 2018 loss ratio includes the impact of a large attritional casualty loss arising from the California wildfires that increased the loss ratio by 1.7 points. The balance of the change in the 2018 current year loss ratio resulted, in part, from the effects of market conditions and changes in the mix of business.

2017 versus 2016: The reinsurance segment's current year loss ratio was 16.5 points higher in 2017 than in 2016. The 2017 loss ratio included 16.0 points for current year catastrophic event activity, primarily related to Hurricanes Harvey, Irma and Maria and the California wildfires, compared to 4.1 points in 2016. In addition, the loss ratio for 2017 reflects the impact of the retroactive reinsurance contract noted above (net premiums earned at a high loss ratio), which increased the current year loss ratio by 1.3 points. The balance of the change in the 2017 current year loss ratio resulted, in part, from the effects of market conditions and changes in the mix of business.

Prior Period Reserve Development.

The reinsurance segment's net favorable development was \$138.5 million, or 11.0 points, for 2018, compared to \$165.4 million, or 14.5 points, for 2017, and \$218.8 million, or 20.7 points, for 2016. See note 5, "Reserve for Losses and Loss Adjustment Expenses," to our consolidated financial statements in Item 8 for information about the reinsurance segment's prior year reserve development.

Underwriting Expenses.

2018 versus 2017: The underwriting expense ratio for the reinsurance segment was 27.4% in 2018, compared to 32.2% in 2017, reflecting lower operating expenses of \$13.3 million due to lower performance based compensation costs, a reduction of 1.1 points in the expense ratio. In addition, federal excise taxes decreased by \$19.7 million, a reduction of 1.6 points in the expense ratio, due to the non-renewal of certain reinsurance agreements between our U.S. based insurance and reinsurance subsidiaries and Arch Re Bermuda on a cutoff basis as of January 1, 2018 and the impact of a loss portfolio transfer in 2017. The remainder of the change was due to changes in the mix and type of business.

2017 versus 2016: The underwriting expense ratio for the reinsurance segment was 32.2% in 2017, compared to 33.6% in 2016. Due to intercompany loss portfolio transfers effective on December 31, 2017 that transferred \$1.36 billion of net retained reserves for losses and allocated loss adjustment expenses between subsidiaries, the reinsurance segment's 2017 acquisition expense ratio reflected 1.2 points of federal excise taxes in connection with such activity.

Mortgage Segment

Our mortgage operations include U.S. and international mortgage insurance and reinsurance operations as well as participation in GSE credit risk-sharing transactions. Our mortgage group includes direct mortgage insurance in the U.S. primarily through Arch Mortgage Insurance Company and United Guaranty Residential Insurance Company (together, "Arch MI U.S."); mortgage reinsurance through Arch Re Bermuda to mortgage insurers on both a proportional and non-

Net Premiums Earned.

The following table sets forth our mortgage segment's net premiums earned by client location and underwriting location (*i.e.*, where the business is underwritten):

	Year Ended December 31,		
	2018	2017	2016
Net premiums earned by client location			
United States	\$ 1,116,007	\$ 1,014,439	\$ 265,527
Other	70,229	42,727	21,189
Total	<u>\$ 1,186,236</u>	<u>\$ 1,057,166</u>	<u>\$ 286,716</u>
Net premiums earned by underwriting location			
United States	\$ 1,009,765	\$ 901,858	\$ 155,929
Other	176,471	155,308	130,787
Total	<u>\$ 1,186,236</u>	<u>\$ 1,057,166</u>	<u>\$ 286,716</u>

Net premiums earned for 2018 were 12.2% higher than in 2017, primarily due to growth in insurance in force for Arch MI U.S. Growth from 2016 to 2017 primarily reflected the impact of the acquisition of UGC, which occurred as of December 31, 2016.

Other Underwriting Income.

Other underwriting income, which is primarily related to GSE risk-sharing transactions receiving derivative accounting treatment, was \$13.0 million for 2018, compared to \$15.7 million for 2017 and \$17.0 million for 2016.

Losses and Loss Adjustment Expenses.

The table below shows the components of the mortgage segment's loss ratio:

	Year Ended December 31,		
	2018	2017	2016
Current year	16.0 %	21.7 %	17.5 %
Prior period reserve development	(9.1)%	(9.0)%	(7.4)%
Loss ratio	<u>6.9 %</u>	<u>12.7 %</u>	<u>10.1 %</u>

Unlike property and casualty business for which we estimate ultimate losses on premiums earned, losses on mortgage insurance business are only recorded at the time a borrower is delinquent on their mortgage, in accordance with primary mortgage insurance industry practice. Because our primary mortgage insurance reserving process does not take into account the impact of future losses from loans that are not delinquent, mortgage insurance loss reserves are not an estimate of ultimate losses. In addition to establishing loss reserves for delinquent loans, under GAAP, we are required to establish a premium deficiency reserve for our mortgage insurance products if the amount of expected future losses and maintenance costs exceeds expected future premiums, existing

reserves and the anticipated investment income for such product. We assess the need for a premium deficiency reserve on a quarterly basis and perform a full analysis annually. No such reserve was established during 2018, 2017 or 2016.

Current Year Loss Ratio.

2018 versus 2017: The mortgage segment's current year loss ratio was 5.7 points lower in 2018 compared to 2017. The current year loss ratio for 2018 reflects the current favorable macroeconomic environment as the percentage of loans in default on first lien business decreased from 2.23% at December 31, 2017 to 1.60% at December 31, 2018. In addition, the loss ratio for 2017 was slightly impacted by delinquencies emanating from new notices from areas impacted by the 2017 third quarter hurricanes that subsequently cured during 2018.

2017 versus 2016: The mortgage segment's current year loss ratio was 4.2 points higher in 2017 compared to 2016. The current year loss ratio for 2017 reflects changes in the mix of business due to the UGC acquisition when compared to 2016, and the minor impact of delinquencies emanating from new notices from areas impacted by the 2017 third quarter hurricanes.

We insure mortgages for homes in areas that have been impacted by catastrophic events, including 2018 events such as Hurricanes Florence and Michael and the California wildfires, and 2017 events such as Hurricanes Harvey and Irma. Generally, mortgage insurance losses occur only when a credit event occurs and, following a physical damage event, when the home is restored to pre-storm condition. Our ultimate claims exposure will depend on the number of delinquency notices received and the ultimate claim rate related to such notices. In the event of natural disasters, cure rates are influenced by the adequacy of homeowners and flood insurance carried on a related property, and a borrower's access to aid from government entities and private organizations, in addition to other factors which generally impact cure rates in unaffected areas.

Prior Period Reserve Development.

The mortgage segment's net favorable development was \$107.6 million, or 9.1 points, for 2018, compared to \$95.0 million, or 9.0 points, for 2017, and \$21.2 million, or 7.4 points, for 2016. The 2017 increase in net favorable development was primarily on the acquired UGC reserves. See note 5, "Reserve for Losses and Loss Adjustment Expenses," to our consolidated financial statements in Item 8 for information about the mortgage segment's prior year reserve development.

Underwriting Expenses.

2018 versus 2017: The underwriting expense ratio for the mortgage segment was 22.0% for 2018, compared to 23.3% for 2017, reflecting the increase in net premiums earned combined

with a \$3.9 million decrease in other operating expenses due to expense savings from integration efforts. This decrease was partially offset by a higher level of acquisition expenses, due to higher NIW.

2017 versus 2016: The underwriting expense ratio for the mortgage segment was 23.3% for 2017, compared to 41.3% for 2016. The decrease in the underwriting expense ratio primarily reflects the higher level of net premiums earned from the impact of the UGC acquisition.

Corporate (Non-Underwriting) Segment

The corporate (non-underwriting) segment results include net investment income, other income (loss), corporate expenses, transaction costs and other, amortization of intangible assets, interest expense, items related to our non-cumulative preferred shares, net realized gains or losses, net impairment losses included in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses and income taxes. Such amounts exclude the results of the ‘other’ segment.

Net Investment Income.

The components of net investment income were derived from the following sources:

	Year Ended December 31,		
	2018	2017	2016
Fixed maturities	\$ 403,449	\$ 336,894	\$ 242,310
Equity securities	12,650	12,703	13,823
Short-term investments	17,802	9,343	3,619
Other (1)	70,946	79,789	66,300
Gross investment income	504,847	438,729	326,052
Investment expenses (2)	(66,889)	(56,657)	(48,859)
Net investment income	<u>\$ 437,958</u>	<u>\$ 382,072</u>	<u>\$ 277,193</u>

- (1) Amounts include dividends and other distributions on investment funds, term loan investments, funds held balances, cash balances and other.
- (2) Investment expenses were approximately 0.36% of average invested assets for 2018, compared to 0.30% for 2017 and 0.34% for 2016.

The pre-tax investment income yield was 2.36% for 2018, compared to 2.06% for 2017 and 1.92% for 2016. The higher level of net investment income for 2018 compared to 2017 and 2016 reflected an increase in the embedded book yield on fixed income securities, partially offset by a higher level of expenses. The pre-tax investment income yields were calculated based on amortized cost. Yields on future investment income may vary based on financial market conditions, investment allocation decisions and other factors.

Corporate Expenses.

Corporate expenses were \$58.6 million for 2018, compared to \$61.6 million for 2017 and \$49.4 million for 2016. Such amounts primarily represent certain holding company costs

necessary to support our worldwide insurance and reinsurance operations and costs associated with operating as a publicly traded company. The lower level of corporate expenses in 2018 compared to 2017 and 2016 was primarily due to lower incentive compensation costs.

Transaction Costs and Other.

Transaction costs and other were \$11.4 million for 2018, compared to \$22.2 million for 2017 and \$41.7 million for 2016. Amounts for 2018 were primarily attributable to the write off of intangible assets related to insurance licenses for a subsidiary of UGC which was merged with another subsidiary. For 2017, transaction costs and other primarily related to severance and severance related costs related to the UGC acquisition. For 2016, transaction costs and other included \$32.3 million of non-recurring costs such as advisory, financing and legal related to the UGC acquisition.

Amortization of Intangible Assets.

Amortization of intangible assets for 2018 was \$105.7 million, compared to \$125.8 million for 2017 and \$19.3 million for 2016. Amounts in 2018 and 2017 primarily related to amortization of finite-lived intangible assets related to the UGC acquisition.

Interest Expense.

Interest expense was \$101.0 million for 2018, compared to \$103.6 million for 2017 and \$53.5 million for 2016. Interest expense reflects amounts related to our outstanding senior notes, revolving credit agreement borrowings and other. We issued \$950.0 million of senior notes in December 2016 in connection with the UGC acquisition and borrowed \$400.0 million on our revolving credit agreement, resulting in higher borrowing costs in 2017 when compared to 2016. We repaid \$375 million and \$125 million of our revolving credit agreement borrowings during 2018 and 2017, respectively, resulting in lower borrowing costs for 2018 than in 2017.

Loss on Redemption of Preferred Shares.

In September 2017, we redeemed \$230 million of 6.75% Series C preferred shares and, in accordance with GAAP, recorded a loss of \$6.7 million to remove original issuance costs related to the redeemed shares from additional paid-in capital. In January 2018, we redeemed the remaining \$92.3 million of 6.75% Series C preferred shares outstanding and recorded a loss of \$2.7 million. Such adjustments had no impact on total shareholders’ equity or cash flows.

Net Realized Gains (Losses).

We recorded net realized loss of \$284.4 million for 2018, compared to net realized gains of \$148.8 million for 2017 and net realized gains of \$69.6 million for 2016. Currently, our

portfolio is actively managed to maximize total return within certain guidelines. The effect of financial market movements on the investment portfolio will directly impact net realized gains and losses as the portfolio is adjusted and rebalanced. Net realized gains or losses from the sale of fixed maturities primarily results from our decisions to reduce credit exposure, to change duration targets, to rebalance our portfolios or due to relative value determinations. Net realized gains or losses also includes realized and unrealized contract gains and losses on our derivative instruments, changes in the fair value of assets and liabilities accounted for using the fair value option along with re-measurement of contingent consideration liability amounts.

Net Impairment Losses Recognized in Earnings.

For 2018, we recorded \$2.8 million of credit related impairments in earnings, compared to \$7.1 million in 2017 and \$30.4 million in 2016. The impairment losses recorded in 2018 were primarily related to foreign currency. The impairment losses recorded in 2017 were primarily related to foreign currency and the liquidation of one portfolio, while the 2016 period included reductions on two asset backed securities based on information received from external investment managers and a review of cash flow projections in order to determine expected recovery values. See note 8, “Investment Information—Other-Than-Temporary Impairments,” to our consolidated financial statements in Item 8 for additional information.

Equity in Net Income (Loss) of Investments Accounted for Using the Equity Method.

We recorded \$45.6 million of equity in net income related to investments accounted for using the equity method for 2018, compared to \$142.3 million for 2017 and \$48.5 million for 2016. The 2017 results reflected strong returns on funds invested in global equities and other strategies. Investments accounted for using the equity method totaled \$1.49 billion at December 31, 2018, compared to \$1.04 billion at December 31, 2017. See note 8, “Investments—Equity in Net Income (Loss) of Investments Accounted For Using the Equity Method,” to our consolidated financial statements in Item 8 for additional information.

Net Foreign Exchange Gains or Losses.

Net foreign exchange gains for 2018 were \$58.7 million, compared to net foreign exchange losses for 2017 of \$113.3 million and net foreign exchange gains for 2016 of \$31.4 million. Amounts in such periods were primarily unrealized and resulted from the effects of revaluing our net insurance liabilities required to be settled in foreign currencies at each balance sheet date.

Income Tax Expense.

Our income tax provision on income before income taxes resulted in an expense of 13.1% for 2018, compared to an expense of 17.1% for 2017 and an expense of 4.3% for 2016. Our effective tax rate fluctuates from year to year consistent with the relative mix of income or loss reported by jurisdiction and the varying tax rates in each jurisdiction. Income tax expense for 2017 included a net \$8.1 million charge due to the revaluation of our net U.S. deferred tax asset resulting from the reduction in the U.S. corporate income tax rate from 35% to 21% effective January 1, 2018.

See note 14, “Income Taxes,” to our consolidated financial statements in Item 8 for a reconciliation of the difference between the provision for income taxes and the expected tax provision at the weighted average statutory tax rate for 2018, 2017 and 2016.

Other Segment

The ‘other’ segment includes the results of Watford Re. Pursuant to generally accepted accounting principles, Watford Re is considered a variable interest entity and we concluded that we are the primary beneficiary of Watford Re. As such, we consolidate the results of Watford Re in our consolidated financial statements, although we only own approximately 11% of Watford Re’s common equity. See note 11, “Variable Interest Entity and Noncontrolling Interests,” and note 4, “Segment Information,” to our consolidated financial statements in Item 8 for additional information.

CRITICAL ACCOUNTING POLICIES, ESTIMATES AND RECENT ACCOUNTING PRONOUNCEMENTS

The preparation of consolidated financial statements in accordance with GAAP requires us to make many estimates and judgments that affect the reported amounts of assets, liabilities (including reserves), revenues and expenses, and related disclosures of contingent liabilities. On an ongoing basis, we evaluate our estimates, including those related to revenue recognition, insurance and other reserves, reinsurance recoverables, allowance for doubtful accounts, investment valuations, goodwill and intangible assets, bad debts, income taxes, contingencies and litigation. We base our estimates on historical experience, where possible, and on various other assumptions that we believe to be reasonable under the circumstances, which form the basis for our judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Estimates and judgments for a relatively new insurance and reinsurance company, like our company, are even more difficult to make than those made in a mature company since relatively limited historical information has been reported to us through December 31, 2018. Actual results will differ from these estimates and such differences may be material. We believe that the following

critical accounting policies affect significant estimates used in the preparation of our consolidated financial statements.

Reserves for Losses and Loss Adjustment Expenses

We are required by applicable insurance laws and regulations and GAAP to establish reserves for losses and loss adjustment expenses, or Loss Reserves, that arise from the business we underwrite. Loss Reserves for our insurance, reinsurance and mortgage operations are balance sheet liabilities representing estimates of future amounts required to pay losses and loss adjustment expenses for insured or reinsured events which have occurred at or before the balance sheet date. Loss Reserves do not reflect contingency reserve allowances to account for future loss occurrences. Losses arising from future events will be estimated and recognized at the time the losses are incurred and could be substantial.

See note 6, “Short Duration Contracts,” to our consolidated financial statements in Item 8 for additional information on our reserving process.

At December 31, 2018 and 2017, our Loss Reserves, net of unpaid losses and loss adjustment expenses recoverable, by type and by operating segment were as follows:

	December 31,	
	2018	2017
Insurance segment:		
Case reserves	\$ 1,489,644	\$ 1,648,910
IBNR reserves	3,266,796	3,272,351
Total net reserves	4,756,440	4,921,261
Reinsurance segment:		
Case reserves	1,082,917	1,033,413
Additional case reserves	191,002	158,377
IBNR reserves	1,578,907	1,499,962
Total net reserves	2,852,826	2,691,752
Mortgage segment:		
Case reserves	355,606	443,069
IBNR reserves	122,304	104,169
Total net reserves (1)	477,910	547,238
Other segment:		
Case reserves	364,052	260,876
Additional case reserves	36,512	32,587
IBNR reserves	551,266	465,168
Total net reserves	951,830	758,631
Total:		
Case reserves	3,292,219	3,386,268
Additional case reserves	227,514	190,964
IBNR reserves	5,519,273	5,341,650
Total net reserves	\$ 9,039,006	\$ 8,918,882

(1) At December 31, 2018, total net reserves include \$375.8 million from U.S. primary mortgage insurance business, of which 72.8% represents policy years 2008 and prior and the remainder from later policy years. At December 31, 2017, total net reserves include \$477.1 million from U.S. primary mortgage insurance business, of which 79.8% represents policy years 2008 and prior and the remainder from later policy years.

At December 31, 2018 and 2017, the insurance segment’s Loss Reserves by major line of business, net of unpaid losses and loss adjustment expenses recoverable, were as follows:

	December 31,	
	2018	2017
Professional lines (1)	\$ 1,247,914	\$ 1,308,261
Construction and national accounts	1,166,143	1,094,300
Excess and surplus casualty (2)	631,370	672,903
Programs	482,045	644,340
Property, energy, marine and aviation	388,710	437,518
Travel, accident and health	83,836	86,122
Lenders products	52,007	53,912
Other (3)	704,415	623,905
Total net reserves	\$ 4,756,440	\$ 4,921,261

- (1) Includes professional liability, executive assurance and healthcare business.
- (2) Includes casualty and contract binding business.
- (3) Includes alternative markets, excess workers’ compensation and surety business.

At December 31, 2018 and 2017, the reinsurance segment’s Loss Reserves by major line of business, net of unpaid losses and loss adjustment expenses recoverable, were as follows:

	December 31,	
	2018	2017
Casualty (1)	\$ 1,551,550	\$ 1,489,933
Other specialty (2)	582,420	523,321
Property excluding property catastrophe (3)	422,612	376,020
Marine and aviation	130,683	135,484
Property catastrophe	90,635	98,622
Other (4)	74,926	68,372
Total net reserves	\$ 2,852,826	\$ 2,691,752

- (1) Includes executive assurance, professional liability, workers’ compensation, excess motor, healthcare and other.
- (2) Includes non-excess motor, surety, accident and health, workers’ compensation catastrophe, agriculture, trade credit and other.
- (3) Includes facultative business.
- (4) Includes life, casualty clash and other.

Potential Variability in Loss Reserves

The tables below summarize the effect of reasonably likely scenarios on the key actuarial assumptions used to estimate our Loss Reserves, net of unpaid losses and loss adjustment expenses recoverable, at December 31, 2018 by underwriting segment (excluding the ‘other’ segment). The scenarios shown in the tables summarize the effect of (i) changes to the expected loss ratio selections used at December 31, 2018, which represent loss ratio point increases or decreases to the expected loss ratios used, and (ii) changes to the loss development patterns used in our reserving process at December 31, 2018, which represent claims reporting that is either slower or faster than the reporting patterns used. We believe that the illustrated sensitivities are indicative of the potential variability inherent in the estimation process of those parameters. The results show

the impact of varying each key actuarial assumption using the chosen sensitivity on our IBNR reserves, on a net basis and across all accident years.

INSURANCE SEGMENT	Higher Expected Loss Ratios	Slower Loss Development Patterns
Reserving lines selected assumptions:		
Property, energy, marine and aviation	5 points	3 months
Third party occurrence business	10	6
Third party claims-made business	10	6
All other	10	6
Increase (decrease) in Loss Reserves:		
Property, energy, marine and aviation	\$ 22,535	\$ 25,570
Third party occurrence business	242,617	128,893
Third party claims-made business	116,092	124,271
All other	138,959	148,815

INSURANCE SEGMENT	Lower Expected Loss Ratios	Faster Loss Development Patterns
Reserving lines selected assumptions:		
Property, energy, marine and aviation	(5) points	(3) months
Third party occurrence business	(10)	(6)
Third party claims-made business	(10)	(6)
Multi-line and other specialty	(10)	(6)
Increase (decrease) in Loss Reserves:		
Property, energy, marine and aviation	\$ (21,926)	\$ (20,646)
Third party occurrence business	(242,224)	(115,036)
Third party claims-made business	(116,092)	(95,565)
Multi-line and other specialty	(133,762)	(103,161)

REINSURANCE SEGMENT	Higher Expected Loss Ratios	Slower Loss Development Patterns
Reserving lines selected assumptions:		
Casualty	10 points	6 months
Other specialty	5	3
Property excluding property catastrophe	5	3
Property catastrophe	5	3
Marine and aviation	5	3
Other	5	3
Increase (decrease) in Loss Reserves:		
Casualty	\$ 113,253	\$ 131,860
Other specialty	58,548	33,113
Property excluding property catastrophe	14,449	36,179
Property catastrophe	2,719	4,874
Marine and aviation	7,243	11,212
Other	4,972	3,270

REINSURANCE SEGMENT	Lower Expected Loss Ratios	Faster Loss Development Patterns
Reserving lines selected assumptions:		
Casualty	(10) points	(6) months
Other specialty	(5)	(3)
Property excluding property catastrophe	(5)	(3)
Property catastrophe	(5)	(3)
Marine and aviation	(5)	(3)
Other	(5)	(3)
Increase (decrease) in Loss Reserves:		
Casualty	\$ (113,264)	\$ (104,119)
Other specialty	(58,548)	(52,975)
Property excluding property catastrophe	(14,475)	(33,988)
Property catastrophe	(2,719)	(3,028)
Marine and aviation	(7,255)	(11,130)
Other	(4,972)	(3,067)

It is not necessarily appropriate to sum the total impact for a specific factor or the total impact for a specific business category as the business categories are not perfectly correlated. In addition, the potential variability shown in the tables above are reasonably likely scenarios of changes in our key assumptions at December 31, 2018 and are not meant to be a “best case” or “worst case” series of outcomes and, therefore, it is possible that future variations may be more or less than the amounts set forth above.

For our mortgage segment, we considered the sensitivity of loss reserve estimates at December 31, 2018 by assessing the potential changes resulting from a parallel shift in severity and default to claim rate. For example, assuming all other factors remain constant, for every one percentage point change in primary claim severity (which we estimate to be 27% of the unpaid principal balance at December 31, 2018), we estimated that our loss reserves would change by approximately \$17.0 million at December 31, 2018. For every one percentage point change in our primary net default to claim rate (which we estimate to be approximately 36% at December 31, 2018), we estimated a \$13.0 million change in our loss reserves at December 31, 2018.

Simulation Results

In order to illustrate the potential volatility in our Loss Reserves, we used a Monte Carlo simulation approach to simulate a range of results based on various probabilities. Both the probabilities and related modeling are subject to inherent uncertainties. The simulation relies on a significant number of assumptions, such as the potential for multiple entities to react similarly to external events, and includes other statistical assumptions. The simulation results shown for each segment do not add to the total simulation results, as the individual segment simulation results do not reflect the diversification effects across our segments.

At December 31, 2018, our recorded Loss Reserves by underwriting segment, net of unpaid losses and loss adjustment expenses recoverable, and the results of the simulation were as follows:

	Insurance Segment	Reinsurance Segment	Mortgage Segment	Total
Loss Reserves (1)	\$4,756,440	\$2,852,826	\$477,910	\$8,087,176
Simulation results:				
90th percentile (2)	\$5,772,504	\$3,577,073	\$571,959	\$9,483,035
10th percentile (3)	\$3,799,556	\$2,219,249	\$390,240	\$6,777,556

- (1) Net of reinsurance recoverables. Excludes amounts reflected in the 'other' segment.
- (2) Simulation results indicate that a 90% probability exists that the net reserves for losses and loss adjustment expenses will not exceed the indicated amount.
- (3) Simulation results indicate that a 10% probability exists that the net reserves for losses and loss adjustment expenses will be at or below the indicated amount.

For informational purposes, based on the total simulation results, a change in our Loss Reserves to the amount indicated at the 90th percentile would result in a decrease in income before income taxes of approximately \$1.40 billion, or \$3.38 per diluted share, while a change in our Loss Reserves to the amount indicated at the 10th percentile would result in an increase in income before income taxes of approximately \$1.31 billion, or \$3.17 per diluted share. The simulation results noted above are informational only, and no assurance can be given that our ultimate losses will not be significantly different than the simulation results shown above, and such differences could directly and significantly impact earnings favorably or unfavorably in the period they are determined. We do not have significant exposure to pre-2002 liabilities, such as asbestos-related illnesses and other long-tail liabilities. It is difficult to provide meaningful trend information for certain liability/casualty coverages for which the claim-tail may be especially long, as claims are often reported and ultimately paid or settled years, or even decades, after the related loss events occur. Any

estimates and assumptions made as part of the reserving process could prove to be inaccurate due to several factors, including the fact that relatively limited historical information has been reported to us through December 31, 2018.

Mortgage Operations Supplemental Information

The mortgage segment's insurance in force ("IIF") and risk in force ("RIF") were as follows at December 31, 2018 and 2017:

(U.S. Dollars in millions)	December 31,			
	2018		2017	
	Amount	%	Amount	%
Insurance In Force (IIF) (1):				
U.S. primary mortgage insurance	\$ 276,538	72.1	\$ 253,914	72.2
Mortgage reinsurance	25,975	6.8	28,017	8.0
Other (2)	81,147	21.2	69,905	19.9
Total	<u>\$ 383,660</u>	<u>100.0</u>	<u>\$ 351,836</u>	<u>100.0</u>
Risk In Force (RIF) (3):				
U.S. primary mortgage insurance	\$ 70,995	92.3	\$ 64,904	92.3
Mortgage reinsurance	2,217	2.9	2,473	3.5
Other (2)	3,728	4.8	2,921	4.2
Total	<u>\$ 76,940</u>	<u>100.0</u>	<u>\$ 70,298</u>	<u>100.0</u>

- (1) Represents the aggregate dollar amount of each insured mortgage loan's current principal balance.
- (2) Includes participation in GSE credit risk-sharing transactions and international insurance business.
- (3) Represents the aggregate amount of each insured mortgage loan's current principal balance multiplied by the insurance coverage percentage specified in the policy for insurance policies issued and after contract limits and/or loss ratio caps for credit risk-sharing or reinsurance transactions.

The insurance in force and risk in force for our U.S. primary mortgage insurance business by policy year were as follows at December 31, 2018:

(U.S. Dollars in millions)	IIF		RIF		Delinquency
	Amount	%	Amount	%	Rate (1)
Policy year:					
2008 and prior	\$ 20,501	7.4	\$ 4,738	6.7	9.07%
2009	709	0.3	162	0.2	3.25%
2010	646	0.2	175	0.2	2.62%
2011	2,530	0.9	701	1.0	1.57%
2012	9,650	3.5	2,664	3.8	0.78%
2013	16,823	6.1	4,676	6.6	0.89%
2014	18,274	6.6	4,947	7.0	0.97%
2015	33,781	12.2	8,849	12.5	0.69%
2016	52,324	18.9	13,407	18.9	0.77%
2017	54,287	19.6	13,793	19.4	0.55%
2018	67,013	24.2	16,883	23.8	0.15%
Total	<u>\$ 276,538</u>	<u>100.0</u>	<u>\$ 70,995</u>	<u>100.0</u>	<u>1.60%</u>

- (1) Represents the ending percentage of loans in default.

The insurance in force and risk in force for our U.S. primary mortgage insurance business by policy year were as follows at December 31, 2017:

(U.S. Dollars in millions)	IIF		RIF		Delinquency Rate (1)
	Amount	%	Amount	%	
Policy year:					
2008 and prior	\$ 26,140	10.3	\$ 6,003	9.2	10.24%
2009	1,072	0.4	253	0.4	2.94%
2010	1,089	0.4	295	0.5	2.31%
2011	3,828	1.5	1,046	1.6	1.37%
2012	13,247	5.2	3,629	5.6	0.75%
2013	21,840	8.6	5,996	9.2	0.95%
2014	22,884	9.0	6,112	9.4	1.10%
2015	41,991	16.5	10,828	16.7	0.77%
2016	62,020	24.4	15,643	24.1	0.80%
2017	59,803	23.6	15,099	23.3	0.35%
Total	\$ 253,914	100.0	\$ 64,904	100.0	2.23%

(1) Represents the ending percentage of loans in default.

The following tables provide supplemental disclosures on risk in force for our U.S. primary mortgage insurance business at December 31, 2018 and 2017:

(U.S. Dollars in millions)	December 31,			
	2018		2017	
	Amount	%	Amount	%
Credit quality (FICO):				
>=740	\$ 41,066	57.8	\$ 37,794	58.2
680-739	23,954	33.7	21,213	32.7
620-679	5,485	7.7	5,159	7.9
<620	490	0.7	738	1.1
Total	\$ 70,995	100.0	\$ 64,904	100.0
Weighted average FICO score	743		743	
Loan-to-Value (LTV):				
95.01% and above	\$ 7,918	11.2	\$ 6,337	9.8
90.01% to 95.00%	39,370	55.5	36,174	55.7
85.01% to 90.00%	20,643	29.1	19,482	30.0
85.00% and below	3,064	4.3	2,911	4.5
Total	\$ 70,995	100.0	\$ 64,904	100.0
Weighted average LTV	93.0%		92.9%	
Total RIF, net of external reinsurance	\$ 55,755		\$ 49,100	

(U.S. Dollars in millions)	December 31,			
	2018		2017	
	Amount	%	Amount	%
Total RIF by State:				
Texas	\$ 5,491	7.7	\$ 5,151	7.9
California	4,505	6.3	3,803	5.9
Florida	3,541	5.0	2,881	4.4
Virginia	2,931	4.1	2,773	4.3
Georgia	2,573	3.6	2,331	3.6
North Carolina	2,505	3.5	2,410	3.7
Illinois	2,482	3.5	2,229	3.4
Washington	2,408	3.4	2,294	3.5
Maryland	2,407	3.4	2,234	3.4
Minnesota	2,400	3.4	2,165	3.3
Others	39,752	56.0	36,633	56.4
Total	\$ 70,995	100.0	\$ 64,904	100.0

The following table provides supplemental disclosures for our U.S. primary mortgage insurance business related to insured loans and loss metrics for the years ended December 31, 2018 and 2017:

(U.S. Dollars in thousands, except loan and claim count)	Year Ended December 31,	
	2018	2017
Rollforward of insured loans in default:		
Beginning delinquent number of loans	27,068	29,691
New notices (1)	37,310	41,846
Cures	(39,896)	(38,413)
Paid claims	(3,817)	(6,056)
Ending delinquent number of loans (1)(2)	20,665	27,068
Ending number of policies in force (2)	1,289,295	1,213,382
Delinquency rate (1)(2)	1.60%	2.23%
Losses:		
Number of claims paid	3,817	6,056
Total paid claims	\$ 159,474	\$ 265,924
Average per claim	\$ 41.8	\$ 43.9
Severity (3)	102.0%	103.4%
Average reserve per default (in thousands) (1)(2)	\$ 17.4	\$ 16.5

- (1) 2018 year includes no new notices and approximately 200 ending delinquent loans at December 31, 2018 from areas impacted by the 2017 third quarter hurricanes.
- (2) Includes first lien primary and pool policies.
- (3) Represents total paid claims divided by RIF of loans for which claims were paid.

The risk-to-capital ratio, which represents total current (non-delinquent) risk in force, net of reinsurance, divided by total statutory capital, for Arch MI U.S. was approximately 13.0 to 1 at December 31, 2018, compared to 10.8 to 1 at December 31, 2017.

Ceded Reinsurance

In the normal course of business, our insurance and mortgage insurance operations cede a portion of their premium on a quota share or excess of loss basis through treaty or facultative reinsurance agreements. Our reinsurance operations also obtain

reinsurance whereby another reinsurer contractually agrees to indemnify it for all or a portion of the reinsurance risks underwritten by our reinsurance operations. Such arrangements, where one reinsurer provides reinsurance to another reinsurer, are usually referred to as “retrocessional reinsurance” arrangements. In addition, our reinsurance subsidiaries participate in “common account” retrocessional arrangements for certain pro rata treaties. Such arrangements reduce the effect of individual or aggregate losses to all companies participating on such treaties, including the reinsurers, such as our reinsurance operations, and the ceding company. Reinsurance recoverables are recorded as assets, predicated on the reinsurers’ ability to meet their obligations under the reinsurance agreements. If the reinsurers are unable to satisfy their obligations under the agreements, our insurance or reinsurance operations would be liable for such defaulted amounts.

The availability and cost of reinsurance and retrocessional protection is subject to market conditions, which are beyond our control. Although we believe that our insurance and reinsurance operations have been successful in obtaining adequate reinsurance and retrocessional protection, it is not certain that they will be able to continue to obtain adequate protection at cost effective levels. As a result of such market conditions and other factors, our insurance, reinsurance and mortgage operations may not be able to successfully mitigate risk through reinsurance and retrocessional arrangements and may lead to increased volatility in our results of operations in future periods. See “Risk Factors—Risks Relating to Our Industry—The failure of any of the loss limitation methods we employ could have a material adverse effect on our financial condition or results of operations.”

Effective July 1, 2018, our insurance operations had in effect a reinsurance program which provided coverage for certain property-catastrophe related losses equal to \$275 million in excess of a \$75 million retention per occurrence. Such amounts compare to \$200 million in excess of a \$150 million retention per occurrence prior to July 1, 2018.

For purposes of managing risk, we reinsure a portion of our exposures, paying to reinsurers a part of the premiums received on the policies we write, and we may also use retrocessional protection. On a consolidated basis, ceded premiums written represented 23.2% of gross premiums written for 2018, compared to 22.1% for 2017 and 22.5% for 2016. We monitor the financial condition of our reinsurers and attempt to place coverages only with substantial, financially sound carriers. If the financial condition of our reinsurers or retrocessionaires deteriorates, resulting in an impairment of their ability to make payments, we will provide for probable losses resulting from our inability to collect amounts due from such parties, as appropriate. We evaluate the credit worthiness of all the reinsurers to which we cede business. If our analysis indicates that there is significant uncertainty regarding our ability to

collect amounts due from reinsurers, managing general agents, brokers and other clients, we will record a provision for doubtful accounts. See “Risk Factors—Risks Relating to Our Company—We are exposed to credit risk in certain of our business operations” and “Financial Condition, Liquidity and Capital Resources—Financial Condition—Premiums Receivable and Reinsurance Recoverables” for further details.

Premium Revenues and Related Expenses

Insurance premiums written are generally recorded at the policy inception and are primarily earned on a pro rata basis over the terms of the policies for all products, usually 12 months. Premiums written include estimates in our insurance operations’ programs, specialty lines, collateral protection business and for participation in involuntary pools. Such premium estimates are derived from multiple sources which include the historical experience of the underlying business, similar business and available industry information. Unearned premium reserves represent the portion of premiums written that relates to the unexpired terms of in-force insurance policies.

Reinsurance premiums written include amounts reported by brokers and ceding companies, supplemented by our own estimates of premiums where reports have not been received. The determination of premium estimates requires a review of our experience with the ceding companies, familiarity with each market, the timing of the reported information, an analysis and understanding of the characteristics of each line of business, and management’s judgment of the impact of various factors, including premium or loss trends, on the volume of business written and ceded to us. On an ongoing basis, our underwriters review the amounts reported by these third parties for reasonableness based on their experience and knowledge of the subject class of business, taking into account our historical experience with the brokers or ceding companies. In addition, reinsurance contracts under which we assume business generally contain specific provisions which allow us to perform audits of the ceding company to ensure compliance with the terms and conditions of the contract, including accurate and timely reporting of information. Based on a review of all available information, management establishes premium estimates where reports have not been received. Premium estimates are updated when new information is received and differences between such estimates and actual amounts are recorded in the period in which estimates are changed or the actual amounts are determined. Premiums written are recorded based on the type of contracts we write. Premiums on our excess of loss and pro rata reinsurance contracts are estimated when the business is underwritten. For excess of loss contracts, premiums are recorded as written based on the terms of the contract. Estimates of premiums written under pro rata contracts are recorded in the period in which the underlying risks incept and are based on information provided by the brokers and the ceding companies. For multi-year reinsurance treaties which are payable in annual installments, generally, only the initial

annual installment is included as premiums written at policy inception due to the ability of the reinsured to commute or cancel coverage during the term of the policy. The remaining annual installments are included as premiums written at each successive anniversary date within the multi-year term.

Reinstatement premiums for our insurance and reinsurance operations are recognized at the time a loss event occurs, where coverage limits for the remaining life of the contract are reinstated under pre-defined contract terms. Reinstatement premiums, if obligatory, are fully earned when recognized. The accrual of reinstatement premiums is based on an estimate of losses and loss adjustment expenses, which reflects management's judgment, as described above in "—Reserves for Losses and Loss Adjustment Expenses."

The amount of reinsurance premium estimates included in premiums receivable and the amount of related acquisition expenses by type of business were as follows at December 31, 2018:

	December 31, 2018		
	Gross Amount	Acquisition Expenses	Net Amount
Other specialty	\$ 248,580	\$ (59,304)	\$ 189,276
Casualty	224,025	(71,613)	152,412
Property excluding property catastrophe	104,250	(32,656)	71,594
Marine and aviation	49,072	(13,084)	35,988
Property catastrophe	1,759	(103)	1,656
Other	80,295	(11,673)	68,622
Total	<u>\$ 707,981</u>	<u>\$ (188,433)</u>	<u>\$ 519,548</u>

Premium estimates are reviewed by management at least quarterly. Such review includes a comparison of actual reported premiums to expected ultimate premiums along with a review of the aging and collection of premium estimates. Based on management's review, the appropriateness of the premium estimates is evaluated, and any adjustment to these estimates is recorded in the period in which it becomes known. Adjustments to premium estimates could be material and such adjustments could directly and significantly impact earnings favorably or unfavorably in the period they are determined because the estimated premium may be fully or substantially earned.

A significant portion of amounts included as premiums receivable, which represent estimated premiums written, net of commissions, are not currently due based on the terms of the underlying contracts. Based on currently available information, management believes that the premium estimates included in premiums receivable will be collectible and, therefore, no provision for doubtful accounts has been recorded on the premium estimates at December 31, 2018.

Reinsurance premiums assumed, irrespective of the class of business, are generally earned on a pro rata basis over the terms of the underlying policies or reinsurance contracts. Contracts

and policies written on a "losses occurring" basis cover claims that may occur during the term of the contract or policy, which is typically 12 months. Accordingly, the premium is earned evenly over the term. Contracts which are written on a "risks attaching" basis cover claims which attach to the underlying insurance policies written during the terms of such contracts. Premiums earned on such contracts usually extend beyond the original term of the reinsurance contract, typically resulting in recognition of premiums earned over a 24-month period.

Certain of our reinsurance contracts include provisions that adjust premiums or acquisition expenses based upon the experience under the contracts. Premiums written and earned, as well as related acquisition expenses, are recorded based upon the projected experience under such contracts.

Retroactive reinsurance reimburses a ceding company for liabilities incurred as a result of past insurable events covered by the underlying policies reinsured. In certain instances, reinsurance contracts cover losses both on a prospective basis and on a retroactive basis and, accordingly, we bifurcate the prospective and retrospective elements of these reinsurance contracts and accounts for each element separately where practical. Underwriting income generated in connection with retroactive reinsurance contracts is deferred and amortized into income over the settlement period while losses are charged to income immediately. Subsequent changes in estimated amount or timing of cash flows under such retroactive reinsurance contracts are accounted for by adjusting the previously deferred amount to the balance that would have existed had the revised estimate been available at the inception of the reinsurance transaction, with a corresponding charge or credit to income.

Mortgage guaranty insurance policies are contracts that are generally non-cancelable by the insurer, are renewable at a fixed price, and provide for payment of premiums on a monthly, annual or single basis. Upon renewal, we are not able to re-underwrite or re-price our policies. Consistent with industry accounting practices, premiums written on a monthly basis are earned as coverage is provided. Premiums written on an annual basis are amortized on a monthly pro rata basis over the year of coverage. Primary mortgage insurance premiums written on policies covering more than one year are referred to as single premiums. A portion of the revenue from single premiums is recognized in premiums earned in the current period, and the remaining portion is deferred as unearned premiums and earned over the estimated expiration of risk of the policy. If single premium policies related to insured loans are canceled due to repayment by the borrower and the policy is a non-refundable product, the remaining unearned premium related to each canceled policy is recognized as earned premium upon notification of the cancellation.

Unearned premiums represent the portion of premiums written that is applicable to the estimated unexpired risk of insured loans. A portion of premium payments may be refundable if the

insured cancels coverage, which generally occurs when the loan is repaid, the loan amortizes to a sufficiently low amount to trigger a lender permitted or legally required cancellation, or the value of the property has increased sufficiently in accordance with the terms of the contract. Premium refunds reduce premiums earned in the consolidated statements of income. Generally, only unearned premiums are refundable.

Acquisition costs that are directly related and incremental to the successful acquisition or renewal of business are deferred and amortized based on the type of contract. For property and casualty insurance and reinsurance contracts, deferred acquisition costs are amortized over the period in which the related premiums are earned. Consistent with mortgage insurance industry accounting practice, amortization of acquisition costs related to the mortgage insurance contracts for each underwriting year's book of business is recorded in proportion to estimated gross profits. Estimated gross profits are comprised of earned premiums and losses and loss adjustment expenses. For each underwriting year, we estimate the rate of amortization to reflect actual experience and any changes to persistency or loss development.

Acquisition expenses and other expenses related to our underwriting operations that vary with, and are directly related to, the successful acquisition or renewal of business are deferred and amortized based on the type of contract. Our insurance and reinsurance operations capitalize incremental direct external costs that result from acquiring a contract but do not capitalize salaries, benefits and other internal underwriting costs. For our mortgage insurance operations, which include a substantial direct sales force, both external and certain internal direct costs are deferred and amortized. Deferred acquisition costs are carried at their estimated realizable value and take into account anticipated losses and loss adjustment expenses, based on historical and current experience, and anticipated investment income.

A premium deficiency occurs if the sum of anticipated losses and loss adjustment expenses, unamortized acquisition costs and maintenance costs and anticipated investment income exceed unearned premiums. A premium deficiency reserve ("PDR") is recorded by charging any unamortized acquisition costs to expense to the extent required in order to eliminate the deficiency. If the premium deficiency exceeds unamortized acquisition costs then a liability is accrued for the excess deficiency.

To assess the need for a PDR on our mortgage exposures, we develop loss projections based on modeled loan defaults related to our current policies in force. This projection is based on recent trends in default experience, severity and rates of defaulted loans moving to claim, as well as recent trends in the rate at which loans are prepaid, and incorporates anticipated interest income. Evaluating the expected profitability of our existing mortgage insurance business and the need for a PDR for our

mortgage business involves significant reliance upon assumptions and estimates with regard to the likelihood, magnitude and timing of potential losses and premium revenues. The models, assumptions and estimates we use to evaluate the need for a PDR may prove to be inaccurate, especially during an extended economic downturn or a period of extreme market volatility and uncertainty.

No premium deficiency charges were recorded by us during 2018, 2017 and 2016.

Fair Value Measurements

Accounting guidance regarding fair value measurements addresses how companies should measure fair value when they are required to use a fair value measure for recognition or disclosure purposes under GAAP and provides a common definition of fair value to be used throughout GAAP. It defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly fashion between market participants at the measurement date. In addition, it establishes a three-level valuation hierarchy for the disclosure of fair value measurements. The valuation hierarchy is based upon the transparency of inputs to the valuation of an asset or liability as of the measurement date. The level in the hierarchy within which a given fair value measurement falls is determined based on the lowest level input that is significant to the measurement (Level 1 being the highest priority and Level 3 being the lowest priority).

We determine the existence of an active market based on our judgment as to whether transactions for the financial instrument occur in such market with sufficient frequency and volume to provide reliable pricing information. The independent pricing sources obtain market quotations and actual transaction prices for securities that have quoted prices in active markets. We use quoted values and other data provided by nationally recognized independent pricing sources as inputs into our process for determining fair values of our fixed maturity investments. To validate the techniques or models used by pricing sources, our review process includes, but is not limited to: quantitative analysis (*e.g.*, comparing the quarterly return for each managed portfolio to their target benchmark, with significant differences identified and investigated); a review of the average number of prices obtained in the pricing process and the range of resulting fair values; initial and ongoing evaluation of methodologies used by outside parties to calculate fair value; comparing the fair value estimates to our knowledge of the current market; a comparison of the pricing services' fair values to other pricing services' fair values for the same investments; and back-testing, which includes randomly selecting purchased or sold securities and comparing the executed prices to the fair value estimates from the pricing service. Where multiple quotes or prices were obtained, a price source hierarchy was maintained in order to determine which price source would be used (*i.e.*, a price obtained from a pricing service with more seniority in the

hierarchy will be used from a less senior one in all cases). The hierarchy prioritizes pricing services based on availability and reliability and assigns the highest priority to index providers. Based on the above review, we will challenge any prices for a security or portfolio which are considered not to be representative of fair value.

The independent pricing sources obtain market quotations and actual transaction prices for securities that have quoted prices in active markets. Each source has its own proprietary method for determining the fair value of securities that are not actively traded. In general, these methods involve the use of “matrix pricing” in which the independent pricing source uses observable market inputs including, but not limited to, investment yields, credit risks and spreads, benchmarking of like securities, broker-dealer quotes, reported trades and sector groupings to determine a reasonable fair value. In addition, pricing vendors use model processes, such as an Option Adjusted Spread model, to develop prepayment and interest rate scenarios. The Option Adjusted Spread model is commonly used to estimate fair value for securities such as mortgage backed and asset backed securities. In certain circumstances, when fair values are unavailable from these independent pricing sources, quotes are obtained directly from broker-dealers who are active in the corresponding markets. Such quotes are subject to the validation procedures noted above.

We review our securities measured at fair value and discuss the proper classification of such investments with investment advisors and others. See note 9, “Fair Value,” to our consolidated financial statements in Item 8 for a summary of our financial assets and liabilities measured at fair value at December 31, 2018 by valuation hierarchy.

Other-Than-Temporary Impairments

On a quarterly basis, we perform reviews of our investments to determine whether declines in fair value below the cost basis are considered other-than-temporary in accordance with applicable accounting guidance regarding the recognition and presentation of other-than-temporary impairments (“OTTI”). The process of determining whether a security is other-than-temporarily impaired requires judgment and involves analyzing many factors. These factors include: an analysis of the liquidity, business prospects and overall financial condition of the issuer; the time period in which there was a significant decline in value; the significance of the decline; and the analysis of specific credit events.

For debt securities, we separate an OTTI into two components when there are credit related losses associated with the impaired debt security for which we assert that we do not have the intent to sell the security, and it is more likely than not that we will not be required to sell the security before recovery of its cost basis. The amount of the OTTI related to a credit loss is recognized in earnings, and the amount of the OTTI related to

other factors (*e.g.*, interest rates, market conditions, etc.) is recorded as a component of other comprehensive income or loss. The amount of the credit loss of an impaired debt security is the difference between the amortized cost and the greater of (i) the present value of expected future cash flows and (ii) the fair value of the security. In instances where no credit loss exists but it is more likely than not that we will have to sell the debt security prior to the anticipated recovery, the decline in fair value below amortized cost is recognized as an OTTI in earnings. In periods after the recognition of an OTTI on debt securities, we account for such securities as if they had been purchased on the measurement date of the OTTI at an amortized cost basis equal to the previous amortized cost basis less the OTTI recognized in earnings. For debt securities for which OTTI were recognized in earnings, the difference between the new amortized cost basis and the cash flows expected to be collected will be accreted or amortized into net investment income.

For 2018, we recorded \$2.8 million of credit related impairments in earnings, compared to \$7.1 million in 2017 and \$30.4 million in 2016. See note 8, “Investment Information—Other-Than-Temporary Impairments,” to our consolidated financial statements in Item 8 for additional information.

Reclassifications

We have reclassified the presentation of certain prior year information to conform to the current presentation. Such reclassifications had no effect on our net income, shareholders’ equity or cash flows.

Recent Accounting Pronouncements

See note 3(q), “Significant Accounting Policies—Recent Accounting Pronouncements,” to our consolidated financial statements in Item 8 for disclosures concerning recent accounting pronouncements.

FINANCIAL CONDITION

Investable Assets

At December 31, 2018, total investable assets held by Arch were \$19.57 billion, excluding the \$2.76 billion included in the ‘other’ segment (*i.e.*, attributable to Watford Re).

Investable Assets Held by Arch

The Finance, Investment and Risk Committee (“FIR”) of our board of directors establishes our investment policies and sets the parameters for creating guidelines for our investment managers. The FIR reviews the implementation of the investment strategy on a regular basis. Our current approach stresses preservation of capital, market liquidity and diversification of risk. While maintaining our emphasis on preservation of capital and liquidity, we expect our portfolio to become more diversified and, as a result, we may expand into areas which are not currently part of our investment strategy. Our Chief Investment Officer administers the investment portfolio, oversees our investment managers and formulates investment strategy in conjunction with the FIR.

The following table summarizes the fair value of investable assets held by Arch (*i.e.*, excluding the ‘other’ segment):

Investable assets (1):	Estimated Fair Value	% of Total
December 31, 2018		
Fixed maturities (2)	\$ 14,881,902	76.1
Short-term investments (2)	995,926	5.1
Cash	583,027	3.0
Equity securities (2)	368,843	1.9
Other investments (2)	1,261,525	6.4
Investments accounted for using the equity method	1,493,791	7.6
Securities transactions entered into but not settled at the balance sheet date	(18,153)	(0.1)
Total investable assets held by Arch	<u>\$ 19,566,861</u>	<u>100.0</u>
Average effective duration (in years)	3.38	
Average S&P/Moody’s credit ratings (3)	AA/Aa2	
Embedded book yield (4)	2.89%	
December 31, 2017		
Fixed maturities (2)	\$ 14,798,213	75.1
Short-term investments (2)	1,509,713	7.7
Cash	551,696	2.8
Equity securities (2)	576,040	2.9
Other investments (2)	1,476,960	7.5
Investments accounted for using the equity method	1,041,322	5.3
Securities transactions entered into but not settled at the balance sheet date	(237,523)	(1.2)
Total investable assets held by Arch	<u>\$ 19,716,421</u>	<u>100.0</u>
Average effective duration (in years)	2.83	
Average S&P/Moody’s credit ratings (3)	AA-/Aa2	
Embedded book yield (4)	2.32%	

- (1) In securities lending transactions, we receive collateral in excess of the fair value of the securities pledged. For purposes of this table, we have excluded the collateral received under securities lending, at fair value and included the securities pledged under securities lending, at fair value.
- (2) Includes investments carried as available for sale, at fair value and at fair value under the fair value option.
- (3) Average credit ratings on our investment portfolio on securities with ratings by Standard & Poor’s Rating Services (“S&P”) and Moody’s Investors Service (“Moody’s”).
- (4) Before investment expenses.

At December 31, 2018, approximately \$14.08 billion, or 72%, of total investable assets held by Arch were internally managed, compared to \$13.73 billion, or 70%, at December 31, 2017.

The following table summarizes our fixed maturities and fixed maturities pledged under securities lending agreements (“Fixed Maturities”) by type:

	Estimated Fair Value	% of Total
December 31, 2018		
Corporate bonds	\$ 5,735,526	38.5
Mortgage backed securities	535,763	3.6
Municipal bonds	1,012,308	6.8
Commercial mortgage backed securities	729,442	4.9
U.S. government and government agencies	3,601,269	24.2
Non-U.S. government securities	1,713,891	11.5
Asset backed securities	1,553,703	10.4
Total	<u>\$ 14,881,902</u>	<u>100.0</u>
December 31, 2017		
Corporate bonds	\$ 4,787,272	32.4
Mortgage backed securities	328,924	2.2
Municipal bonds	2,158,840	14.6
Commercial mortgage backed securities	545,817	3.7
U.S. government and government agencies	3,484,257	23.5
Non-U.S. government securities	1,704,337	11.5
Asset backed securities	1,788,766	12.1
Total	<u>\$ 14,798,213</u>	<u>100.0</u>

The following table provides the credit quality distribution of our Fixed Maturities. For individual fixed maturities, S&P ratings are used. In the absence of an S&P rating, ratings from Moody’s are used, followed by ratings from Fitch Ratings.

	Estimated Fair Value	% of Total
December 31, 2018		
U.S. government and gov’t agencies (1)	\$ 4,194,676	28.2
AAA	3,551,039	23.9
AA	2,129,336	14.3
A	3,069,656	20.6
BBB	1,251,205	8.4
BB	275,201	1.8
B	183,614	1.2
Lower than B	61,271	0.4
Not rated	165,904	1.1
Total	<u>\$ 14,881,902</u>	<u>100.0</u>
December 31, 2017		
U.S. government and gov’t agencies (1)	\$ 3,771,835	25.5
AAA	4,080,808	27.6
AA	2,440,864	16.5
A	2,470,936	16.7
BBB	1,157,136	7.8
BB	313,286	2.1
B	254,011	1.7
Lower than B	77,543	0.5
Not rated	231,794	1.6
Total	<u>\$ 14,798,213</u>	<u>100.0</u>

(1) Includes U.S. government-sponsored agency mortgage backed securities and agency commercial mortgage backed securities.

The following table provides information on the severity of the unrealized loss position as a percentage of amortized cost for all Fixed Maturities which were in an unrealized loss position:

Severity of gross unrealized losses:	Estimated Fair Value	Gross Unrealized Losses	% of Total Gross Unrealized Losses
December 31, 2018			
0-10%	\$ 8,722,837	\$ (190,170)	92.5
10-20%	87,188	(13,012)	6.3
20-30%	3,359	(1,058)	0.5
Greater than 30%	2,363	(1,266)	0.6
Total	<u>\$ 8,815,747</u>	<u>\$ (205,506)</u>	<u>100.0</u>
December 31, 2017			
0-10%	\$ 9,598,768	\$ (93,057)	87.6
10-20%	82,638	(11,269)	10.6
20-30%	2,108	(671)	0.6
Greater than 30%	1,881	(1,184)	1.1
Total	<u>\$ 9,685,395</u>	<u>\$ (106,181)</u>	<u>100.0</u>

The following table summarizes our top ten exposures to fixed income corporate issuers by fair value at December 31, 2018, excluding guaranteed amounts and covered bonds:

	Estimated Fair Value	Credit Rating (1)
JPMorgan Chase & Co.	\$ 203,200	A-/A1
Bank of America Corporation	190,088	A-/A3
Wells Fargo & Company	171,886	A/Aa3
Apple Inc.	164,486	AA+/Aa1
Citigroup Inc.	152,321	A/A2
Nestle S.A.	114,889	AA-/Aa2
Daimler AG	108,692	A/A2
Morgan Stanley	102,420	BBB+/A3
The Goldman Sachs Group, Inc.	94,379	BBB+/A3
Deere & Company	91,792	A/A2
Total	<u>\$ 1,394,153</u>	

(1) Average credit ratings as assigned by S&P and Moody’s, respectively.

The following table provides information on our structured securities, which include residential mortgage-backed securities (RMBS), commercial mortgage-backed securities (CMBS) and asset backed securities (“ABS”):

	Agencies	Investment Grade	Below Investment Grade	Total
Dec. 31, 2018				
RMBS	\$ 488,862	\$ 15,410	\$ 31,491	\$ 535,763
CMBS	104,547	602,865	22,030	729,442
ABS	—	1,485,150	68,553	1,553,703
Total	<u>\$ 593,409</u>	<u>\$ 2,103,425</u>	<u>\$ 122,074</u>	<u>\$ 2,818,908</u>
Dec. 31, 2017				
RMBS	\$ 284,466	\$ 14,581	\$ 29,877	\$ 328,924
CMBS	3,112	465,980	76,725	545,817
ABS	—	1,691,232	97,534	1,788,766
Total	<u>\$ 287,578</u>	<u>\$ 2,171,793</u>	<u>\$ 204,136</u>	<u>\$ 2,663,507</u>

The following table provides information on the fair value of our Eurozone investments at December 31, 2018:

Country (1)	Sovereign (2)	Corporate Bonds	Other (3)	Total
Germany	\$ 338,409	\$ 3,119	\$ 45,834	\$ 387,362
Netherlands	77,088	143,308	23,420	243,816
France	—	33,080	31,442	64,522
Luxembourg	—	10,858	12,555	23,413
Spain	—	1,324	8,144	9,468
Ireland	—	4,727	1,482	6,209
Finland	—	4,349	1,821	6,170
Italy	—	—	1,748	1,748
Austria	—	—	1,122	1,122
Portugal	—	—	897	897
Greece	74	—	496	570
Supranational (4)	—	—	—	—
Estonia	—	—	—	—
Total	<u>\$ 415,571</u>	<u>\$ 200,765</u>	<u>\$ 128,961</u>	<u>\$ 745,297</u>

- (1) The country allocations set forth in the table are based on various assumptions made by us in assessing the country in which the underlying credit risk resides, including a review of the jurisdiction of organization, business operations and other factors. Based on such analysis, we do not believe that we have any other Eurozone investments at December 31, 2018.
- (2) Includes securities issued and/or guaranteed by Eurozone governments.
- (3) Includes bank loans, equities and other.

At December 31, 2018, our investment portfolio included \$368.8 million of equity securities, compared to \$576.0 million at December 31, 2017. Our equity portfolio includes publicly traded common stocks in the natural resources, energy, consumer staples and other sectors.

The following table summarizes our other investments:

	December 31,	
	2018	2017
Available for sale securities:		
Asia and emerging markets	\$ —	\$ 135,140
Investment grade fixed income	—	53,878
Credit related funds	—	18,365
Other	—	57,606
Total available for sale (1)	<u>—</u>	<u>264,989</u>
Fair value option:		
Term loan investments (par value: \$288,841 and \$326,339)	281,635	326,085
Lending	524,112	399,099
Credit related funds	152,361	132,131
Energy	117,509	132,709
Investment grade fixed income	101,902	102,347
Infrastructure	45,371	82,291
Private equity	24,383	23,593
Real estate	14,252	13,716
Total fair value option	<u>1,261,525</u>	<u>1,211,971</u>
Total	<u>\$ 1,261,525</u>	<u>\$ 1,476,960</u>

- (1) The Company reviewed the accounting treatment for three limited partnership investments which were accounted for as available for sale at December 31, 2017 during the 2018 first quarter and determined, based on reconsideration during the period of the Company's percentage ownership, that the equity method of accounting was appropriate for such investments.

The following table summarizes our investments accounted for using the equity method:

	December 31,	
	2018	2017
Credit related funds	\$ 429,402	\$ 263,034
Equities	375,273	292,762
Real estate	232,647	176,328
Lending	125,041	66,093
Private equity	114,019	96,310
Infrastructure	113,748	99,338
Energy	103,661	47,457
Total	<u>\$ 1,493,791</u>	<u>\$ 1,041,322</u>

Our investment strategy allows for the use of derivative instruments. We utilize various derivative instruments such as futures contracts to enhance investment performance, replicate investment positions or manage market exposures and duration risk that would be allowed under our investment guidelines if implemented in other ways. See note 10, “Derivative Instruments,” to our consolidated financial statements in Item 8 for additional disclosures concerning derivatives.

Accounting guidance regarding fair value measurements addresses how companies should measure fair value when they are required to use a fair value measure for recognition or disclosure purposes under GAAP and provides a common definition of fair value to be used throughout GAAP. See note 9, “Fair Value,” to our consolidated financial statements in Item

8 for a summary of our financial assets and liabilities measured at fair value at December 31, 2018 and 2017 segregated by level in the fair value hierarchy.

Investable Assets in the ‘Other’ Segment

Investable assets in the ‘other’ segment are managed by Watford Re. The board of directors of Watford Re establishes their investment policies and guidelines. Watford Re’s investments are accounted for using the fair value option with changes in the carrying value of such investments recorded in net realized gains or losses.

The following table summarizes investable assets in the ‘other’ segment:

	December 31,	
	2018	2017
Investments accounted for using the fair value option:		
Other investments	\$ 1,050,414	\$ 924,410
Fixed maturities	922,819	1,177,033
Short-term investments	282,131	256,755
Equity securities	56,638	67,868
Total	<u>2,312,002</u>	<u>2,426,066</u>
Fixed maturities available for sale, at fair value	393,351	—
Equity securities	32,206	—
Cash	63,529	54,503
Securities sold but not yet purchased	(7,790)	(34,375)
Securities transactions entered into but not settled at the balance sheet date	(35,635)	(6,127)
Total investable assets included in ‘other’ segment	<u>\$ 2,757,663</u>	<u>\$ 2,440,067</u>

Reinsurance Recoverables

At December 31, 2018 and 2017, approximately 63.0% and 69.9% of reinsurance recoverables on paid and unpaid losses (not including ceded unearned premiums) of \$2.92 billion and \$2.54 billion, respectively, were due from carriers which had an A.M. Best rating of “A-” or better while 37.0% and 30.1%, respectively, were from companies not rated. For items not rated, over 90% of such amount was collateralized through reinsurance trusts or letters of credit at December 31, 2018 and 2017. The largest reinsurance recoverables from any one carrier was approximately 2.7% and 2.2%, respectively, of total shareholders’ equity available to Arch at December 31, 2018 and 2017.

The following table details our reinsurance recoverables at December 31, 2018:

	% of Total	A.M. Best Rating (1)
Everest Reinsurance Company	6.4	A+
Munich Reinsurance America, Inc.	5.1	A+
Hannover Rückversicherung AG	4.7	A+
Swiss Reinsurance America Corporation	4.3	A+
XL Catlin plc	4.1	A+
Partner Reinsurance Company of the U.S.	4.1	A
Transatlantic Reinsurance Company	3.4	A+
Berkley Insurance Company	3.1	A+
Lloyd’s syndicates (2)	2.9	A
Liberty Mutual Insurance Company	2.5	A
Renaissance Reinsurance	2.2	A
All other -- fully collateralized reinsurers (3)	12.9	NR
All other -- “A-” or better	20.0	
All other -- not rated (4)	24.3	
Total	<u>100.0</u>	

- (1) The financial strength ratings are as of February 4, 2019 and were assigned by A.M. Best based on its opinion of the insurer’s financial strength as of such date. An explanation of the ratings listed in the table follows: the rating of “A+” is designated “Superior”; and the “A” rating is designated “Excellent.”
- (2) The A.M. Best group rating of “A” (Excellent) has been applied to all Lloyd’s syndicates.
- (3) Such amount is fully collateralized through reinsurance trusts.
- (4) Over 90% of such amount is collateralized through reinsurance trusts or letters of credit.

Reserves for Losses and Loss Adjustment Expenses

We establish reserves for losses and LAE (Loss Reserves) which represent estimates involving actuarial and statistical projections, at a given point in time, of our expectations of the ultimate settlement and administration costs of losses incurred. Estimating Loss Reserves is inherently difficult, which is exacerbated by the fact that we have relatively limited historical experience upon which to base such estimates. We utilize actuarial models as well as available historical insurance industry loss ratio experience and loss development patterns to assist in the establishment of Loss Reserves. Actual losses and loss adjustment expenses paid will deviate, perhaps substantially, from the reserve estimates reflected in our financial statements. See “Management’s Discussion and Analysis of Financial Condition and Results of Operations—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Reserves for Losses and Loss Adjustment Expenses” and “Business—Reserves” for further details.

Shareholders' Equity and Book Value per Share

Total shareholders' equity available to Arch was \$9.44 billion at December 31, 2018, compared to \$9.20 billion at December 31, 2017. The increase in 2018 was primarily attributable to underwriting results, partially offset by share repurchases.

The following table presents the calculation of book value per share:

(U.S. dollars in thousands, except share data)	December 31,	
	2018	2017
Total shareholders' equity available to Arch	\$ 9,439,827	\$ 9,196,602
Less preferred shareholders' equity	780,000	872,555
Common shareholders' equity available to Arch	\$ 8,659,827	\$ 8,324,047
Common shares and common share equivalents outstanding, net of treasury shares (1)	402,454,834	409,956,417
Book value per share	\$ 21.52	\$ 20.30

(1) Excludes the effects of 20,076,593 and 19,770,174 stock options and 1,307,304 and 913,488 restricted stock units outstanding at December 31, 2018 and 2017, respectively.

LIQUIDITY

This section does not include information specific to Watford Re. We do not guarantee or provide credit support for Watford Re, and our financial exposure to Watford Re is limited to our investment in Watford Re's common and preferred shares and counterparty credit risk (mitigated by collateral) arising from reinsurance transactions with Watford Re.

Liquidity is a measure of our ability to access sufficient cash flows to meet the short-term and long-term cash requirements of our business operations.

Arch Capital is a holding company whose assets primarily consist of the shares in its subsidiaries. Generally, Arch Capital depends on its available cash resources, liquid investments and dividends or other distributions from its subsidiaries to make payments, including the payment of debt service obligations and operating expenses it may incur and any dividends or liquidation amounts with respect to our preferred and common shares.

In 2018, Arch Capital received dividends of \$398.7 million from Arch Re Bermuda, our Bermuda-based reinsurer and insurer. In 2018, Arch-U.S. received \$25.0 million of dividends from Arch Re U.S., our U.S. licensed reinsurer, and \$525.0 million of dividends from Arch U.S. MI Holdings. Arch U.S. MI Holdings received aggregate dividends and return of capital from subsidiaries of \$971.1 million in 2018. Arch U.S. MI

Holdings used such proceeds to pay down \$375.0 million of its revolving credit agreement borrowings and pay dividends to Arch-U.S.

Our insurance and reinsurance operations provide liquidity in that premiums are received in advance, sometimes substantially in advance, of the time losses are paid. The period of time from the occurrence of a claim through the settlement of the liability may extend many years into the future. Sources of liquidity include cash flows from operations, financing arrangements or routine sales of investments.

As part of our investment strategy, we seek to establish a level of cash and highly liquid short-term and intermediate-term securities which, combined with expected cash flow, is believed by us to be adequate to meet our foreseeable payment obligations. However, due to the nature of our operations, cash flows are affected by claim payments that may comprise large payments on a limited number of claims and which can fluctuate from year to year. We believe that our liquid investments and cash flow will provide us with sufficient liquidity in order to meet our claim payment obligations. However, the timing and amounts of actual claim payments related to recorded Loss Reserves vary based on many factors, including large individual losses, changes in the legal environment, as well as general market conditions. The ultimate amount of the claim payments could differ materially from our estimated amounts. Certain lines of business written by us, such as excess casualty, have loss experience characterized as low frequency and high severity. The foregoing may result in significant variability in loss payment patterns. The impact of this variability can be exacerbated by the fact that the timing of the receipt of reinsurance recoverables owed to us may be slower than anticipated by us. Therefore, the irregular timing of claim payments can create significant variations in cash flows from operations between periods and may require us to utilize other sources of liquidity to make these payments, which may include the sale of investments or utilization of existing or new credit facilities or capital market transactions. If the source of liquidity is the sale of investments, we may be forced to sell such investments at a loss, which may be material.

We expect that our liquidity needs, including our anticipated insurance obligations and operating and capital expenditure needs, for the next twelve months, at a minimum, will be met by funds generated from underwriting activities and investment income, as well as by our balance of cash, short-term investments, proceeds on the sale or maturity of our investments, and our credit facilities.

Dividend Restrictions

Arch Capital has no material restrictions on its ability to make distributions to shareholders, however the ability of our regulated insurance and reinsurance subsidiaries to pay dividends or make distributions or other payments to us is limited by the applicable local laws and relevant regulations of the various countries and states in which we operate. See note 23, “Statutory Information,” to our consolidated financial statements in Item 8 for additional information on dividend restrictions.

The payment of dividends from Arch Re Bermuda is, under certain circumstances, limited under Bermuda law, which requires our Bermuda operating subsidiary to maintain certain measures of solvency and liquidity.

Our U.S. insurance and reinsurance subsidiaries are subject to insurance laws and regulations in the jurisdictions in which they operate. The ability of our regulated insurance subsidiaries to pay dividends or make distributions is dependent on their ability to meet applicable regulatory standards. These regulations include restrictions that limit the amount of dividends or other distributions, such as loans or cash advances, available to shareholders without prior approval of the insurance regulatory authorities. Each state requires prior regulatory approval of any payment of extraordinary dividends.

We also have insurance subsidiaries that are the parent company for other insurance subsidiaries, which means that dividends and other distributions will be subject to multiple layers of regulations in order for our insurance subsidiaries to be able to dividend funds to Arch Capital. The inability of the subsidiaries of Arch Capital to pay dividends and other permitted distributions could have a material adverse effect on Arch Capital’s cash requirements and our ability to make principal, interest and dividend payments on the senior notes, preferred shares and common shares.

In addition to meeting applicable regulatory standards, the ability of our insurance and reinsurance subsidiaries to pay dividends is also constrained by our dependence on the financial strength ratings of our insurance and reinsurance subsidiaries from independent rating agencies. The ratings from these agencies depend to a large extent on the capitalization levels of our insurance and reinsurance subsidiaries. We believe that Arch Capital has sufficient cash resources and available dividend capacity to service its indebtedness and other current outstanding obligations.

Restricted Assets

Our insurance, reinsurance and mortgage insurance subsidiaries are required to maintain assets on deposit, which primarily consist of fixed maturities, with various regulatory authorities to support their operations. The assets on deposit are available to settle insurance and reinsurance liabilities to third

parties. Our insurance and reinsurance subsidiaries maintain assets in trust accounts as collateral for insurance and reinsurance transactions with affiliated companies and also have investments in segregated portfolios primarily to provide collateral or guarantees for letters of credit to third parties. At December 31, 2018 and 2017, such amounts approximated \$6.76 billion and \$6.01 billion, respectively, excluding amounts related to the ‘other’ segment.

Our investments in certain securities, including certain fixed income and structured securities, investments in funds accounted for using the equity method, other alternative investments and investments in ventures such as Watford Re and others may be illiquid due to contractual provisions or investment market conditions. If we require significant amounts of cash on short notice in excess of anticipated cash requirements, then we may have difficulty selling these investments in a timely manner or may be forced to sell or terminate them at unfavorable values. Our unfunded investment commitments totaled approximately \$1.77 billion at December 31, 2018 and are callable by our investment managers. The timing of the funding of investment commitments is uncertain and may require us to access cash on short notice.

Cash Flows

The following table summarizes our cash flows from operating, investing and financing activities, excluding amounts related to the ‘other’ segment:

	Year Ended December 31,		
	2018	2017	2016
Total cash provided by (used for):			
Operating activities	\$ 1,331,278	\$ 809,580	\$ 1,103,529
Investing activities	(268,734)	(884,452)	(2,597,738)
Financing activities	(987,679)	(166,829)	1,830,042
Effects of exchange rate changes on foreign currency cash	(16,383)	15,584	(14,005)
Increase (decrease) in cash	<u>\$ 58,482</u>	<u>\$ (226,117)</u>	<u>\$ 321,828</u>

- Cash provided by operating activities for 2018 was higher than in 2017, primarily reflecting an increase in premiums collected, a lower level of net losses paid and lower purchases of tax and loss bonds. The 2017 period reflected a higher level of paid losses and purchases of tax and loss bonds, while 2016 reflected lower net losses paid.
- Cash used for investing activities for 2018 was lower than in 2017, reflecting changes in cash collateral related to securities lending for both. Activity for 2016 reflected our acquisition of UGC, which closed on December 31, 2016.
- Cash used for financing activities for 2018 was higher than the cash used in 2017, reflecting share repurchases of \$282.8

million, a \$375 million repayment of borrowing on our revolving credit and changes in cash collateral related to securities lending. Activity for 2017 reflected changes in cash collateral related to securities lending and a \$125 million repayment of borrowing on our revolving credit agreement. Cash provided by financing activities for 2016 reflected various capital raising activity, such as the issuance of \$950.0 million of senior notes and \$450.0 million of preferred shares combined with \$400.0 million of borrowings under our revolving credit facility in order to fund some of the cash consideration portion of the UGC acquisition.

Investments

At December 31, 2018, our investable assets were \$19.57 billion, excluding the \$2.76 billion of investable assets related to the ‘other’ segment. The primary goals of our asset liability management process are to satisfy the insurance liabilities, manage the interest rate risk embedded in those insurance liabilities and maintain sufficient liquidity to cover fluctuations in projected liability cash flows, including debt service obligations. Generally, the expected principal and interest payments produced by our fixed income portfolio adequately fund the estimated runoff of our insurance reserves. Although this is not an exact cash flow match in each period, the substantial degree by which the fair value of the fixed income portfolio exceeds the expected present value of the net insurance liabilities, as well as the positive cash flow from newly sold policies and the large amount of high quality liquid bonds, provide assurance of our ability to fund the payment of claims and to service our outstanding debt without having to sell securities at distressed prices or access credit facilities.

Changes in general economic conditions, including new or continued sovereign debt concerns in Eurozone countries or downgrades of U.S. securities by credit rating agencies, could have a material adverse effect on financial markets and economic conditions in the U.S. and throughout the world. In turn, this could have a material adverse effect on our business, financial condition and results of operations and, in particular, this could have a material adverse effect on the value and liquidity of securities in our investment portfolio. Our investment portfolio as of December 31, 2018 included \$415.6 million of securities issued and/or guaranteed by Eurozone governments at fair value, \$3.60 billion of obligations of the U.S. government and government agencies at fair value and \$1.01 billion of municipal bonds at fair value. Please refer to Item 1A “Risk Factors” for a discussion of other risks relating to our business and investment portfolio.

CAPITAL RESOURCES

This section does not include information specific to Watford Re. We do not guarantee or provide credit support for Watford Re, and our financial exposure to Watford Re is limited to our investment in Watford Re’s common and preferred shares and counterparty credit risk (mitigated by collateral) arising from reinsurance transactions with Watford Re.

The following table provides an analysis of our capital structure:

(U.S. dollars in thousands, except share data)	December 31,	
	2018	2017
Debt:		
Senior notes, due May 2034	\$ 300,000	\$ 300,000
Arch-U.S. senior notes, due Nov 2043 (1)	500,000	500,000
Arch Finance senior notes, due Dec 2026 (1)	500,000	500,000
Arch Finance senior notes, due Dec 2046 (1)	450,000	450,000
Deferred debt issuance costs on senior notes	(16,472)	(17,116)
Revolving credit agreement borrowings due Oct 2021 (2)	—	375,000
Total	\$ 1,733,528	\$ 2,107,884
Shareholders’ equity available to Arch:		
Series C non-cumulative preferred shares (3)	—	92,555
Series E non-cumulative preferred shares	450,000	450,000
Series F non-cumulative preferred shares	330,000	330,000
Common shareholders’ equity	8,659,827	8,324,047
Total	\$ 9,439,827	\$ 9,196,602
Total capital available to Arch	\$11,173,355	\$11,304,486
Senior notes to total capital (%)	15.5	15.3
Revolving credit agreement borrowings to total capital (%)	—	3.3
Debt to total capital (%)	15.5	18.6
Preferred to total capital (%)	7.0	7.7
Debt and preferred to total capital (%)	22.5	26.4

- (1) Fully and unconditionally guaranteed by Arch Capital.
- (2) \$500 million unsecured facility for revolving loans and letters of credit.
- (3) Redeemed on January 2, 2018.

Arch Capital and Arch-U.S. are each holding companies and, accordingly, they conduct substantially all of their operations through their operating subsidiaries. Arch Capital Finance LLC (“Arch Finance”) is a wholly owned subsidiary of Arch U.S. MI Holdings Inc., a U.S. holding company. As a result, Arch Capital, Arch-U.S. and Arch Finance’s cash flows and their ability to service their debt depends upon the earnings of their operating subsidiaries and on their ability to distribute the earnings, loans or other payments from such subsidiaries to Arch Capital, Arch-U.S. and Arch Finance, respectively.

See note 17, “Debt and Financing Arrangements,” to our consolidated financial statements in Item 8 for additional disclosures concerning our senior notes and revolving credit

agreement borrowings. For additional information on our preferred shares, see note 19, "Shareholders' Equity," to our consolidated financial statements in Item 8.

During 2018, 2017 and 2016, we made interest payments of \$100.1 million, \$103.7 million and \$50.4 million, respectively, related to our senior notes and other financing arrangements.

In November 2017, Arch Capital, Arch-U.S. and Arch Finance filed a universal shelf registration statement with the SEC. This registration statement allows for the possible future offer and sale by us of various types of securities, including unsecured debt securities, preference shares, common shares, warrants, share purchase contracts and units and depositary shares. The shelf registration statement enables us to efficiently access the public debt and/or equity capital markets in order to meet our future capital needs. The shelf registration statement also allows selling shareholders to resell common shares that they own in one or more offerings from time to time. We will not receive any proceeds from any shares offered by the selling shareholders.

Capital Adequacy

We monitor our capital adequacy on a regular basis and will seek to adjust our capital base (up or down) according to the needs of our business. The future capital requirements of our business will depend on many factors, including our ability to write new business successfully and to establish premium rates and reserves at levels sufficient to cover losses. Our ability to underwrite is largely dependent upon the quality of our claims paying and financial strength ratings as evaluated by independent rating agencies. In particular, we require (1) sufficient capital to maintain our financial strength ratings, as issued by several ratings agencies, at a level considered necessary by management to enable our key operating subsidiaries to compete; (2) sufficient capital to enable our underwriting subsidiaries to meet the capital adequacy tests performed by statutory agencies in the U.S. and other key markets; and (3) our non-U.S. operating companies are required to post letters of credit and other forms of collateral that are necessary for them to operate as they are "non-admitted" under U.S. state insurance regulations.

In addition, Arch MI U.S. is required to maintain compliance with the GSEs requirements, known as the Private Mortgage Insurer Eligibility Requirements or "PMIERS." The financial requirements require an eligible mortgage insurer's available assets, which generally include only the most liquid assets of an insurer, to meet or exceed "minimum required assets" as of each quarter end. Minimum required assets are calculated from PMIERS tables with several risk dimensions (including origination year, original loan-to-value and original credit score of performing loans, and the delinquency status of non-performing loans) and are subject to a minimum amount. Arch MI U.S. satisfied the PMIERS' financial requirements as of

December 31, 2018 with a PMIERS sufficiency ratio of 141%, compared to 129% at December 31, 2017.

As part of our capital management program, we may seek to raise additional capital or may seek to return capital to our shareholders through share repurchases, cash dividends or other methods (or a combination of such methods). Any such determination will be at the discretion of our board of directors and will be dependent upon our profits, financial requirements and other factors, including legal restrictions, rating agency requirements and such other factors as our board of directors deems relevant.

To the extent that our existing capital is insufficient to fund our future operating requirements or maintain such ratings, we may need to raise additional funds through financings or limit our growth. We can provide no assurance that, if needed, we would be able to obtain additional funds through financing on satisfactory terms or at all. Any adverse developments in the financial markets, such as disruptions, uncertainty or volatility in the capital and credit markets, may result in realized and unrealized capital losses that could have a material adverse effect on our results of operations, financial position and our businesses, and may also limit our access to capital required to operate our business. In addition to common share capital, we depend on external sources of finance to support our underwriting activities, which can be in the form (or any combination) of debt securities, preference shares, common equity and bank credit facilities providing loans and/or letters of credit.

Arch Capital, through its subsidiaries, provides financial support to certain of its insurance subsidiaries and affiliates, through certain reinsurance arrangements beneficial to the ratings of such subsidiaries. Historically, our U.S.-based insurance, reinsurance and mortgage insurance subsidiaries have entered into separate reinsurance arrangements with Arch Re Bermuda covering individual lines of business. The reinsurance agreements between our U.S.-based property casualty insurance and reinsurance subsidiaries and Arch Re Bermuda were canceled on a cutoff basis as of January 1, 2018. As a result, the level of subject business ceded to Arch Re Bermuda was substantially lower in 2018 than in prior periods.

Except as described in the above paragraph, or where express reinsurance, guarantee or other financial support contractual arrangements are in place, each of Arch Capital's subsidiaries or affiliates is solely responsible for its own liabilities and commitments (and no other Arch Capital subsidiary or affiliate is so responsible). Any reinsurance arrangements, guarantees or other financial support contractual arrangements that are in place are solely for the benefit of the Arch Capital subsidiary or affiliate involved and third parties (creditors or insureds of such entity) are not express beneficiaries of such arrangements.

Share Repurchase Program

The board of directors of Arch Capital has authorized the investment in Arch Capital's common shares through a share repurchase program. Since the inception of the share repurchase program through December 31, 2018, Arch Capital has repurchased approximately 386.2 million common shares for an aggregate purchase price of \$3.97 billion. At December 31, 2018, approximately \$163.7 million of share repurchases were available under the program. Repurchases under the program may be effected from time to time in open market or privately negotiated transactions through December 31, 2019. The timing and amount of the repurchase transactions under this program will depend on a variety of factors, including market conditions and corporate and regulatory considerations. We will continue to monitor our share price and, depending upon results of operations, market conditions and the development of the economy, as well as other factors, we will consider share repurchases on an opportunistic basis.

CONTRACTUAL OBLIGATIONS AND COMMITMENTS

This section does not include information specific to Watford Re. We do not guarantee or provide credit support for Watford Re, and our financial exposure to Watford Re is limited to our investment in Watford Re's common and preferred shares and counterparty credit risk (mitigated by collateral) arising from reinsurance transactions with Watford Re.

Contractual Obligations

The following table provides an analysis of our contractual commitments at December 31, 2018:

	Payment due by period				
	Total	2019	2020 and 2021	2022 and 2023	Thereafter
Operating activities					
Estimated gross payments for losses and loss adjustment expenses (1)	\$ 10,820,538	\$ 2,782,107	\$ 3,247,828	\$ 1,719,215	\$ 3,071,388
Deposit accounting liabilities (2)	15,739	7,640	1,149	1,625	5,325
Contractholder payables (3)	2,079,111	674,417	720,908	288,657	395,129
Operating lease obligations	193,151	31,088	59,842	47,476	54,745
Purchase obligations	39,471	23,224	15,925	315	7
Contingent consideration liabilities (4)	68,215	58,000	10,215	—	—
Investing activities					
Unfunded investment commitments (5)	1,765,282	1,765,282	—	—	—
Financing activities					
Securities lending payable (6)	274,125	274,125	—	—	—
Senior notes (including interest payments)	3,525,752	90,465	180,929	180,929	3,073,429
Capital lease obligations	13,070	6,204	6,866	—	—
Total contractual obligations and commitments	<u>\$ 18,794,454</u>	<u>\$ 5,712,552</u>	<u>\$ 4,243,662</u>	<u>\$ 2,238,217</u>	<u>\$ 6,600,023</u>

- (1) The estimated expected contractual commitments related to the reserves for losses and loss adjustment expenses are presented on a gross basis (*i.e.*, not reflecting any corresponding reinsurance recoverable amounts that would be due to us). It should be noted that until a claim has been presented to us, determined to be valid, quantified and settled, there is no known obligation on an individual transaction basis, and while estimable in the aggregate, the timing and amount contain significant uncertainty.
- (2) The estimated expected contractual commitments related to deposit accounting liabilities have been estimated using projected cash flows from the underlying contracts. It should be noted that, due to the nature of such liabilities, the timing and amount contain significant uncertainty.
- (3) Certain insurance policies written by our insurance operations feature large deductibles, primarily in construction and national accounts lines. Under such contracts, we are obligated to pay the claimant for the full amount of the claim and are subsequently reimbursed by the policyholder for the deductible amount. In the event we are unable to collect from the policyholder, we would be liable for such defaulted amounts.
- (4) Pursuant to our 2014 acquisition of the CMG Entities, we are required to make remaining contingent consideration payments as re-calculated over an earn-out period. For purposes of this table, the maximum exposure has been shown using an estimated payout pattern.
- (5) Unfunded investment commitments are callable by our investment managers. We have assumed that such investments will be funded in the next year but the funding may occur over a longer period of time, due to market conditions and other factors.
- (6) As part of our securities lending program, we loan securities to third parties and receive collateral in the form of cash or securities. Such collateral is due back to the third parties at the close of the securities lending transactions, a majority of which is overnight and continuous by nature.

Letter of Credit and Revolving Credit Facilities

In the normal course of its operations, the Company enters into agreements with financial institutions to obtain secured and unsecured credit facilities.

On October 26, 2016, Arch Capital and certain of its subsidiaries entered into an \$850.0 million five-year credit facility (the "Credit Facility") with a syndication of lenders. The Credit Facility consists of a \$350.0 million secured facility for letters of credit (the "Secured Facility") and a \$500.0 million unsecured facility for revolving loans and letters of credit (the "Unsecured Facility"). Obligations of each borrower under the Secured Facility for letters of credit are secured by cash and eligible securities of such borrower held in collateral

accounts. Subject to the receipt of commitments, the Secured Facility may be increased by up to an aggregate of \$350.0 million, and the Unsecured Facility may be increased to an amount not to exceed \$750.0 million. Arch Capital has a one-time option to convert any or all outstanding revolving loans of Arch Capital and/or Arch-U.S. to term loans with the same terms as the revolving loans except that any prepayments may not be re-borrowed. Arch-U.S. guarantees the obligations of Arch Capital, and Arch Capital guarantees the obligations of Arch-U.S. Borrowings of revolving loans may be made at a variable rate based on LIBOR or an alternative base rate at the option of Arch Capital. Secured letters of credit are available for issuance on behalf of Arch Capital insurance and reinsurance subsidiaries. The Credit Facility is structured such

that each party that requests a letter of credit or borrowing does so only for itself and for only its own obligations.

The Credit Facility contains certain restrictive covenants customary for facilities of this type, including restrictions on indebtedness, consolidated tangible net worth, minimum shareholders' equity levels and minimum financial strength ratings. Arch Capital and its subsidiaries which are party to the agreement were in compliance with all covenants contained therein at December 31, 2018.

Commitments under the Credit Facility will expire on October 26, 2021, and all loans then outstanding must be repaid. Letters of credit issued under the Unsecured Facility will not have an expiration date later than October 26, 2022.

Under the \$350.0 million secured letter of credit facility, Arch Capital's subsidiaries had \$174.8 million of letters of credit outstanding and remaining capacity of \$175.2 million at December 31, 2018. In addition, certain of Arch Capital's subsidiaries had outstanding letters of credit of \$167.5 million, which were issued in the normal course of business. When issued, these letters of credit are secured by a portion of the investment portfolio. At December 31, 2018, these letters of credit were secured by investments with a fair value of \$362.0 million.

The Company's outstanding revolving credit agreement borrowings were as follows:

	Year Ended December 31,	
	2018	2017
Arch-U.S.	\$ —	\$ 375,000
Total revolving credit agreement borrowings	\$ —	\$ 375,000

RATINGS

Our ability to underwrite business is affected by the quality of our claims paying ability and financial strength ratings as evaluated by independent agencies. Such ratings from third party internationally recognized statistical rating organizations or agencies are instrumental in establishing the financial security of companies in our industry. We believe that the primary users of such ratings include commercial and investment banks, policyholders, brokers, ceding companies and investors. Insurance ratings are also used by insurance and reinsurance intermediaries as an important means of assessing the financial strength and quality of insurers and reinsurers, and are often an important factor in the decision by an insured or intermediary of whether to place business with a particular insurance or reinsurance provider. Periodically, rating agencies evaluate us to confirm that we continue to meet their criteria for the ratings assigned to us by them. S&P, Moody's, A.M. Best Company and Fitch Ratings are ratings agencies which

have assigned financial strength ratings to one or more of Arch Capital's subsidiaries.

If we are not able to obtain adequate capital, our business, results of operations and financial condition could be adversely affected, which could include, among other things, the following possible outcomes: (1) potential downgrades in the financial strength ratings assigned by ratings agencies to our operating subsidiaries, which could place those operating subsidiaries at a competitive disadvantage compared to higher-rated competitors; (2) reductions in the amount of business that our operating subsidiaries are able to write in order to meet capital adequacy-based tests enforced by statutory agencies; and (3) any resultant ratings downgrades could, among other things, affect our ability to write business and increase the cost of bank credit and letters of credit. In addition, under certain of the reinsurance agreements assumed by our reinsurance operations, upon the occurrence of a ratings downgrade or other specified triggering event with respect to our reinsurance operations, such as a reduction in surplus by specified amounts during specified periods, our ceding company clients may be provided with certain rights, including, among other things, the right to terminate the subject reinsurance agreement and/or to require that our reinsurance operations post additional collateral.

The ratings issued on our companies by these agencies are announced publicly and are available directly from the agencies. Our Internet site (www.ir.archcapgroup.com, under Credit Ratings) contains information about our ratings, but such information on our website is not incorporated by reference into this report.

CATASTROPHIC EVENTS AND SEVERE ECONOMIC EVENTS

We have large aggregate exposures to natural and man-made catastrophic events and severe economic events. Catastrophes can be caused by various events, including hurricanes, floods, windstorms, earthquakes, hailstorms, tornadoes, explosions, severe winter weather, fires, droughts and other natural disasters. Catastrophes can also cause losses in non-property business such as mortgage insurance, workers' compensation or general liability. In addition to the nature of property business, we believe that economic and geographic trends affecting insured property, including inflation, property value appreciation and geographic concentration, tend to generally increase the size of losses from catastrophic events over time.

We have substantial exposure to unexpected, large losses resulting from future man-made catastrophic events, such as acts of war, acts of terrorism and political instability. These risks are inherently unpredictable. It is difficult to predict the timing of such events with statistical certainty or estimate the amount of loss any given occurrence will generate. It is not possible to

completely eliminate our exposure to unforecasted or unpredictable events and, to the extent that losses from such risks occur, our financial condition and results of operations could be materially adversely affected. Therefore, claims for natural and man-made catastrophic events could expose us to large losses and cause substantial volatility in our results of operations, which could cause the value of our common shares to fluctuate widely. In certain instances, we specifically insure and reinsure risks resulting from terrorism. Even in cases where we attempt to exclude losses from terrorism and certain other similar risks from some coverages written by us, we may not be successful in doing so. Moreover, irrespective of the clarity and inclusiveness of policy language, there can be no assurance that a court or arbitration panel will limit enforceability of policy language or otherwise issue a ruling adverse to us.

We seek to limit our loss exposure by writing a number of our reinsurance contracts on an excess of loss basis, adhering to maximum limitations on reinsurance written in defined geographical zones, limiting program size for each client and prudent underwriting of each program written. In the case of proportional treaties, we may seek per occurrence limitations or loss ratio caps to limit the impact of losses from any one or series of events. In our insurance operations, we seek to limit our exposure through the purchase of reinsurance. We cannot be certain that any of these loss limitation methods will be effective. We also seek to limit our loss exposure by geographic diversification. Geographic zone limitations involve significant underwriting judgments, including the determination of the area of the zones and the inclusion of a particular policy within a particular zone's limits. There can be no assurance that various provisions of our policies, such as limitations or exclusions from coverage or choice of forum, will be enforceable in the manner we intend. Disputes relating to coverage and choice of legal forum may also arise. Underwriting is inherently a matter of judgment, involving important assumptions about matters that are inherently unpredictable and beyond our control, and for which historical experience and probability analysis may not provide sufficient guidance. One or more catastrophic or other events could result in claims that substantially exceed our expectations, which could have a material adverse effect on our financial condition or our results of operations, possibly to the extent of eliminating our shareholders' equity.

For our natural catastrophe exposed business, we seek to limit the amount of exposure we will assume from any one insured or reinsured and the amount of the exposure to catastrophe losses from a single event in any geographic zone. We monitor our exposure to catastrophic events, including earthquake and wind and periodically reevaluate the estimated probable maximum pre-tax loss for such exposures. Our estimated probable maximum pre-tax loss is determined through the use of modeling techniques, but such estimate does not represent our total potential loss for such exposures.

Our models employ both proprietary and vendor-based systems and include cross-line correlations for property, marine, offshore energy, aviation, workers compensation and personal accident. We seek to limit the probable maximum pre-tax loss to a specific level for severe catastrophic events. Currently, we seek to limit our 1-in-250 year return period net probable maximum loss from a severe catastrophic event in any geographic zone to approximately 25% of total shareholders' equity available to Arch. We reserve the right to change this threshold at any time.

Based on in-force exposure estimated as of January 1, 2019, our modeled peak zone catastrophe exposure is a windstorm affecting the Northeastern U.S., with a net probable maximum pre-tax loss of \$374 million, followed by windstorms affecting Florida Tri-County and the Gulf of Mexico with net probable maximum pre-tax losses of \$330 million and \$299 million, respectively. Our exposures to other perils, such as U.S. earthquake and international events, were less than the exposures arising from U.S. windstorms and hurricanes in both periods. As of January 1, 2019, our modeled peak zone earthquake exposure (San Francisco area earthquake) represented approximately 77% of our peak zone catastrophe exposure, and our modeled peak zone international exposure (Japan earthquake) was substantially less than both our peak zone windstorm and earthquake exposures.

We also have significant exposure to losses due to mortgage defaults resulting from severe economic events in the future. For our U.S. mortgage insurance business, we have developed a proprietary risk model ("Realistic Disaster Scenario" or "RDS") that simulates the maximum loss resulting from a severe economic downturn impacting the housing market. The RDS models the collective impact of adverse conditions for key economic indicators, the most significant of which is a decline in home prices. The RDS model projects paths of future home prices, unemployment rates, income levels and interest rates and assumes correlation across states and geographic regions. The resulting future performance of our in-force portfolio is then estimated under the economic stress scenario, reflecting loan and borrower information.

Currently, we seek to limit our modeled RDS loss from a severe economic event to approximately 25% of total tangible shareholders' equity available to Arch (total shareholders' equity available to Arch less goodwill and intangible assets). We reserve the right to change this threshold at any time. Based on in-force exposure estimated as of January 1, 2019, our modeled RDS loss was less than 12% of tangible shareholders' equity available to Arch.

Net probable maximum loss estimates are net of expected reinsurance recoveries, before income tax and before excess reinsurance reinstatement premiums. RDS loss estimates are net of expected reinsurance recoveries and after income tax. Catastrophe loss estimates are reflective of the zone indicated

and not the entire portfolio. Since hurricanes and windstorms can affect more than one zone and make multiple landfalls, our catastrophe loss estimates include clash estimates from other zones. Our catastrophe loss estimates and RDS loss estimates do not represent our maximum exposures and it is highly likely that our actual incurred losses would vary materially from the modeled estimates. There can be no assurances that we will not suffer pre-tax losses greater than 25% of our total shareholders' equity or tangible shareholders' equity from one or more catastrophic events or severe economic events due to several factors, including the inherent uncertainties in estimating the frequency and severity of such events and the margin of error in making such determinations resulting from potential inaccuracies and inadequacies in the data provided by clients and brokers, the modeling techniques and the application of such techniques or as a result of a decision to change the percentage of shareholders' equity exposed to a single catastrophic event or severe economic event. In addition, actual losses may increase if our reinsurers fail to meet their obligations to us or the reinsurance protections purchased by us are exhausted or are otherwise unavailable. See "Risk Factors—Risk Relating to Our Industry." Depending on business opportunities and the mix of business that may comprise our insurance, reinsurance and mortgage portfolios, we may seek to adjust our self-imposed limitations on probable maximum pre-tax loss for catastrophe exposed business and mortgage default exposed business. See "—Critical Accounting Policies, Estimates and Recent Accounting Pronouncements—Ceded Reinsurance" for a discussion of our catastrophe reinsurance programs.

OFF-BALANCE SHEET ARRANGEMENTS

We have entered into various aggregate excess of loss reinsurance agreements with various special purpose reinsurance companies domiciled in Bermuda. These are special purpose variable interest entities that are not consolidated in our financial results because we do not have the unilateral power to direct those activities that are significant to its economic performance. As of December 31, 2018, our estimated off-balance sheet maximum exposure to loss from such entities was \$11.2 million. See note 11, "Variable Interest Entity and Noncontrolling Interests," to our consolidated financial statements in Item 8 for additional information.

MARKET SENSITIVE INSTRUMENTS AND RISK MANAGEMENT

Our investment results are subject to a variety of risks, including risks related to changes in the business, financial condition or results of operations of the entities in which we invest, as well as changes in general economic conditions and overall market conditions. We are also exposed to potential loss from various

market risks, including changes in equity prices, interest rates and foreign currency exchange rates.

In accordance with the SEC's Financial Reporting Release No. 48, we performed a sensitivity analysis to determine the effects that market risk exposures could have on the future earnings, fair values or cash flows of our financial instruments as of December 31, 2018. Market risk represents the risk of changes in the fair value of a financial instrument and consists of several components, including liquidity, basis and price risks.

The sensitivity analysis performed as of December 31, 2018 presents hypothetical losses in cash flows, earnings and fair values of market sensitive instruments which were held by us on December 31, 2018 and are sensitive to changes in interest rates and equity security prices. This risk management discussion and the estimated amounts generated from the following sensitivity analysis represent forward-looking statements of market risk assuming certain adverse market conditions occur. Actual results in the future may differ materially from these projected results due to actual developments in the global financial markets. The analysis methods used by us to assess and mitigate risk should not be considered projections of future events of losses.

We have not included Watford Re in the following analyses as we do not guarantee or provide credit support for Watford Re, and our financial exposure to Watford Re is limited to its investment in Watford Re's common and preferred shares and counterparty credit risk (mitigated by collateral) arising from the reinsurance transactions.

The focus of the SEC's market risk rules is on price risk. For purposes of specific risk analysis, we employ sensitivity analysis to determine the effects that market risk exposures could have on the future earnings, fair values or cash flows of our financial instruments. The financial instruments included in the following sensitivity analysis consist of all of our investments and cash.

Investment Market Risk

Fixed Income Securities. We invest in interest rate sensitive securities, primarily debt securities. We consider the effect of interest rate movements on the market value of our fixed maturities, fixed maturities pledged under securities lending agreements, short-term investments and certain of our other investments which invest in fixed income securities and the corresponding change in unrealized appreciation. As interest rates rise, the market value of our interest rate sensitive securities falls, and the converse is also true. Based on historical observations, there is a low probability that all interest rate yield curves would shift in the same direction at the same time. Furthermore, at times interest rate movements in certain credit sectors exhibit a much lower correlation to changes in U.S. Treasury yields. Accordingly, the actual effect of interest rate

movements may differ materially from the amounts set forth in the following tables.

The following table summarizes the effect that an immediate, parallel shift in the interest rate yield curve would have had on our investment portfolio at December 31, 2018 and 2017:

(U.S. dollars in billions)	Interest Rate Shift in Basis Points				
	-100	-50	-	+50	+100
Dec. 31, 2018					
Total fair value	\$ 19.23	\$ 18.91	\$ 18.62	\$ 18.30	\$ 17.98
Change from base	3.3%	1.6%		(1.7)%	(3.4)%
Change in unrealized value	\$ 0.61	\$ 0.30		\$ (0.32)	\$ (0.63)
Dec. 31, 2017					
Total fair value	\$ 19.11	\$ 18.85	\$ 18.59	\$ 18.33	\$ 18.09
Change from base	2.8%	1.4%		(1.4)%	(2.7)%
Change in unrealized value	\$ 0.52	\$ 0.26		\$ (0.26)	\$ (0.50)

In addition, we consider the effect of credit spread movements on the market value of our fixed maturities, fixed maturities pledged under securities lending agreements, short-term investments and certain of our other investments and investments accounted for using the equity method which invest in fixed income securities and the corresponding change in unrealized appreciation. As credit spreads widen, the fair value of our fixed income securities falls, and the converse is also true.

The following table summarizes the effect that an immediate, parallel shift in credit spreads in a static interest rate environment would have had on the portfolio at December 31, 2018 and 2017:

(U.S. dollars in billions)	Credit Spread Shift in Percentage				
	-100	-50	-	+50	+100
Dec. 31, 2018					
Total fair value	\$ 19.08	\$ 18.84	\$ 18.62	\$ 18.39	\$ 18.15
Change from base	2.5%	1.2%		(1.2)%	(2.5)%
Change in unrealized value	\$ 0.47	\$ 0.22		\$ (0.22)	\$ (0.47)
Dec. 31, 2017					
Total fair value	\$ 18.96	\$ 18.77	\$ 18.59	\$ 18.40	\$ 18.22
Change from base	2.0%	1.0%		(1.0)%	(2.0)%
Change in unrealized value	\$ 0.37	\$ 0.19		\$ (0.19)	\$ (0.37)

Another method that attempts to measure portfolio risk is Value-at-Risk (“VaR”). VaR attempts to take into account a broad cross-section of risks facing a portfolio by utilizing relevant securities volatility data skewed towards the most recent months and quarters. VaR measures the amount of a portfolio at risk for outcomes 1.65 standard deviations from the mean

based on normal market conditions over a one year time horizon and is expressed as a percentage of the portfolio’s initial value. In other words, 95% of the time, should the risks taken into account in the VaR model perform per their historical tendencies, the portfolio’s loss in any one year period is expected to be less than or equal to the calculated VaR, stated as a percentage of the measured portfolio’s initial value. As of December 31, 2018, our portfolio’s VaR was estimated to be 3.02%, compared to an estimated 3.10% at December 31, 2017.

Equity Securities, Privately Held Securities and Other Investments. Our investment portfolio includes an allocation to equity securities, privately held securities and certain other investments. At December 31, 2018 and 2017, the fair value of our investments in equity securities, privately held securities and certain other investments totaled \$368.8 million and \$576.0 million, respectively. These securities are exposed to price risk, which is the potential loss arising from decreases in fair value. An immediate hypothetical 10% depreciation in the value of each position would reduce the fair value of such investments by approximately \$36.9 million and \$57.6 million at December 31, 2018 and 2017, respectively, and would have decreased book value per share by approximately \$0.09 and \$0.14, respectively.

Investment-Related Derivatives. At December 31, 2018, the notional value of all derivative instruments (excluding to-be-announced mortgage backed securities which are included in the fixed income securities analysis above and foreign currency forward contracts which are included in the foreign currency exchange risk analysis below) was \$4.95 billion, compared to \$2.44 billion at December 31, 2017. If the underlying exposure of each investment-related derivative held at December 31, 2018 depreciated by 100 basis points, it would have resulted in a reduction in net income of approximately \$49.5 million, and a decrease in book value per share of \$0.12, compared to \$24.4 million and \$0.06, respectively, on investment-related derivatives held at December 31, 2017. If the underlying exposure of each investment-related derivative held at December 31, 2018 appreciated by 100 basis points, it would have resulted in an increase in net income of approximately \$49.5 million, and an increase in book value per share of \$0.12, compared to \$24.4 million and \$0.06, respectively, on investment-related derivatives held at December 31, 2017. See note 10, “Derivative Instruments,” to our consolidated financial statements in Item 8 for additional disclosures concerning derivatives.

For further discussion on investment activity, please refer to “—Financial Condition, Liquidity and Capital Resources—Financial Condition—Investable Assets.”

Foreign Currency Exchange Risk

Foreign currency rate risk is the potential change in value, income and cash flow arising from adverse changes in foreign

currency exchange rates. Through our subsidiaries and branches located in various foreign countries, we conduct our insurance and reinsurance operations in a variety of local currencies other than the U.S. Dollar. We generally hold investments in foreign currencies which are intended to mitigate our exposure to foreign currency fluctuations in our net insurance liabilities. We may also utilize foreign currency forward contracts and currency options as part of our investment strategy. See note 10, “Derivative Instruments,” to our consolidated financial statements in Item 8 for additional information.

The following table provides a summary of our net foreign currency exchange exposures, as well as foreign currency derivatives in place to manage these exposures:

(U.S. dollars in thousands, except per share data)	December 31, 2018	December 31, 2017
Net assets (liabilities), denominated in foreign currencies, excluding shareholders' equity and derivatives	\$ (561,311)	\$ 401,966
Shareholders' equity denominated in foreign currencies (1)	478,678	345,743
Net foreign currency forward contracts outstanding (2)	241,442	(123,732)
Net exposures denominated in foreign currencies	<u>\$ 158,809</u>	<u>\$ 623,977</u>
Pre-tax impact of a hypothetical 10% appreciation of the U.S. Dollar against foreign currencies:		
Shareholders' equity	\$ (15,881)	\$ (62,398)
Book value per share	\$ (0.04)	\$ (0.15)
Pre-tax impact of a hypothetical 10% decline of the U.S. Dollar against foreign currencies:		
Shareholders' equity	\$ 15,881	\$ 62,398
Book value per share	\$ 0.04	\$ 0.15

- (1) Represents capital contributions held in the foreign currencies of our operating units.
- (2) Represents the net notional value of outstanding foreign currency forward contracts.

Although the Company generally attempts to match the currency of its projected liabilities with investments in the same currencies, from time to time the Company may elect to over or underweight one or more currencies, which could increase the Company's exposure to foreign currency fluctuations and increase the volatility of the Company's shareholders' equity. Historical observations indicate a low probability that all foreign currency exchange rates would shift against the U.S. Dollar in the same direction and at the same time and, accordingly, the actual effect of foreign currency rate movements may differ materially from the amounts set forth above. For further discussion on foreign exchange activity, please refer to “—Results of Operations.”

Effects of Inflation

We do not believe that inflation has had a material effect on our consolidated results of operations, except insofar as inflation may affect our reserves for losses and loss adjustment expenses and interest rates. The potential exists, after a catastrophe loss, for the development of inflationary pressures in a local economy. The anticipated effects of inflation on us are considered in our catastrophe loss models. The actual effects of inflation on our results cannot be accurately known until claims are ultimately settled.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Reference is made to the information appearing above under the subheading “Market Sensitive Instruments and Risk Management” under the caption “Management's Discussion and Analysis of Financial Condition and Results of Operation,” which information is hereby incorporated by reference.

ITEM 8. FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA

Index to Financial Statements	Page No.
Report of Independent Registered Public Accounting Firm	94
Consolidated Balance Sheets	
At December 31, 2018 and December 31, 2017	96
Consolidated Statements of Income	
For the years ended December 31, 2018, 2017 and 2016	97
Consolidated Statements of Comprehensive Income	
For the years ended December 31, 2018, 2017 and 2016	98
Consolidated Statements of Changes in Shareholders' Equity	
For the years ended December 31, 2018, 2017 and 2016	99
Consolidated Statements of Cash Flows	
For the years ended December 31, 2018, 2017 and 2016	100
Notes to Consolidated Financial Statements	
Note 1 - General	101
Note 2 - Businesses Acquired	101
Note 3 - Significant Accounting Policies	101
Note 4 - Segment Information	110
Note 5 - Reserve for Losses and Loss Adjustment Expenses	117
Note 6 - Short Duration Contracts	119
Note 7 - Reinsurance	131
Note 8 - Investment Information	133
Note 9 - Fair Value	139
Note 10 - Derivative Instruments	145
Note 11 - VIE and Noncontrolling Interests	146
Note 12 - Other Comprehensive Income (Loss)	149
Note 13 - Earnings Per Common Share	151
Note 14 - Income Taxes	151
Note 15 - Transactions with Related Parties	154
Note 16 - Commitments and Contingencies	154
Note 17 - Debt and Financing Arrangements	156
Note 18 - Goodwill and Intangible Assets	157
Note 19 - Shareholders' Equity	158
Note 20 - Share-Based Compensation	160
Note 21 - Retirement Plans	162
Note 22 - Legal Proceedings	162
Note 23 - Statutory Information	163
Note 24 - Unaudited Condensed Quarterly Financial Information	166
Note 25 - Guarantor Financial Information	167
Note 26 - Subsequent Event	175

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Shareholders of Arch Capital Group Ltd.

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Arch Capital Group Ltd. and its subsidiaries (the “Company”) as of December 31, 2018 and 2017, and the related consolidated statements of income, of comprehensive income, of changes in shareholders’ equity, and of cash flows for each of the three years in the period ended December 31, 2018, including the related notes and financial statement schedules listed in the index appearing under Item 15(a)(2) (collectively referred to as the “consolidated financial statements”). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2018, in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in Management's Annual Report on Internal Control Over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company’s consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

A handwritten signature in black ink that reads "PricewaterhouseCoopers LLP". The signature is written in a cursive, flowing style.

PricewaterhouseCoopers LLP

New York, New York
February 28, 2019

We have served as the Company's or its predecessor's auditor since 1995.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
CONSOLIDATED BALANCE SHEETS
(U.S. dollars in thousands, except share data)

	December 31,	
	2018	2017
Assets		
Investments:		
Fixed maturities available for sale, at fair value (amortized cost: \$14,829,902 and \$13,869,460)	\$ 14,699,010	\$ 13,876,003
Short-term investments available for sale, at fair value (amortized cost: \$956,238 and \$1,468,955)	955,880	1,469,042
Collateral received under securities lending, at fair value (amortized cost: \$274,125 and \$476,605)	274,133	476,615
Equity securities, at fair value	338,899	495,804
Other investments available for sale, at fair value (cost: \$0 and \$198,163)	—	264,989
Investments accounted for using the fair value option	3,983,571	4,216,237
Investments accounted for using the equity method	1,493,791	1,041,322
Total investments	<u>21,745,284</u>	<u>21,840,012</u>
Cash	646,556	606,199
Accrued investment income	114,641	113,133
Securities pledged under securities lending, at fair value (amortized cost: \$266,786 and \$463,181)	268,395	464,917
Premiums receivable	1,299,150	1,135,249
Reinsurance recoverable on unpaid and paid losses and loss adjustment expenses	2,919,372	2,540,143
Contractholder receivables	2,079,111	1,978,414
Ceded unearned premiums	975,469	926,611
Deferred acquisition costs	569,574	535,824
Receivable for securities sold	36,246	205,536
Goodwill and intangible assets	634,920	652,611
Other assets	929,611	1,053,009
Total assets	<u>\$ 32,218,329</u>	<u>\$ 32,051,658</u>
Liabilities		
Reserve for losses and loss adjustment expenses	\$ 11,853,297	\$ 11,383,792
Unearned premiums	3,753,636	3,622,314
Reinsurance balances payable	393,107	323,496
Contractholder payables	2,079,111	1,978,414
Collateral held for insured obligations	236,630	240,183
Senior notes	1,733,528	1,732,884
Revolving credit agreement borrowings	455,682	816,132
Securities lending payable	274,125	476,605
Payable for securities purchased	90,034	449,186
Other liabilities	911,500	782,717
Total liabilities	<u>21,780,650</u>	<u>21,805,723</u>
Commitments and Contingencies		
Redeemable noncontrolling interests	206,292	205,922
Shareholders' Equity		
Non-cumulative preferred shares	780,000	872,555
Convertible non-voting common equivalent preferred shares	—	489,627
Common shares (\$0.0011 par, shares issued: 570,737,283 and 549,872,226)	634	611
Additional paid-in capital	1,793,781	1,230,617
Retained earnings	9,426,299	8,562,889
Accumulated other comprehensive income (loss), net of deferred income tax	(178,720)	118,044
Common shares held in treasury, at cost (shares: 168,282,449 and 156,938,409)	(2,382,167)	(2,077,741)
Total shareholders' equity available to Arch	<u>9,439,827</u>	<u>9,196,602</u>
Non-redeemable noncontrolling interests	791,560	843,411
Total shareholders' equity	<u>10,231,387</u>	<u>10,040,013</u>
Total liabilities, noncontrolling interests and shareholders' equity	<u>\$ 32,218,329</u>	<u>\$ 32,051,658</u>

See Notes to Consolidated Financial Statements

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF INCOME
(U.S. dollars in thousands, except share data)

Year Ended December 31,

	2018	2017	2016
Revenues			
Net premiums written	\$ 5,346,747	\$ 4,961,373	\$ 4,031,391
Change in unearned premiums	(114,772)	(116,841)	(146,569)
Net premiums earned	5,231,975	4,844,532	3,884,822
Net investment income	563,633	470,872	366,742
Net realized gains (losses)	(405,344)	149,141	137,586
Other-than-temporary impairment losses	(2,829)	(7,138)	(30,794)
Less investment impairments recognized in other comprehensive income, before taxes	—	—	352
Net impairment losses recognized in earnings	(2,829)	(7,138)	(30,442)
Other underwriting income	15,073	30,253	57,173
Equity in net income of investments accounted for using the equity method	45,641	142,286	48,475
Other income (loss)	2,419	(2,571)	(800)
Total revenues	5,450,568	5,627,375	4,463,556
Expenses			
Losses and loss adjustment expenses	2,890,106	2,967,446	2,185,599
Acquisition expenses	805,135	775,458	667,625
Other operating expenses	677,809	684,451	624,090
Corporate expenses	78,994	83,752	81,746
Amortization of intangible assets	105,670	125,778	19,343
Interest expense	120,484	117,431	66,252
Net foreign exchange losses (gains)	(69,402)	115,782	(36,651)
Total expenses	4,608,796	4,870,098	3,608,004
Income before income taxes	841,772	757,277	855,552
Income taxes:			
Current tax (benefit) expense	85,863	(45,736)	50,745
Deferred tax expense (benefit)	28,088	173,304	(19,371)
Income tax expense	113,951	127,568	31,374
Net income	\$ 727,821	\$ 629,709	\$ 824,178
Net (income) loss attributable to noncontrolling interests	30,150	(10,431)	(131,440)
Net income available to Arch	757,971	619,278	692,738
Preferred dividends	(41,645)	(46,041)	(28,070)
Loss on redemption of preferred shares	(2,710)	(6,735)	—
Net income available to Arch common shareholders	\$ 713,616	\$ 566,502	\$ 664,668
Net income per common share and common share equivalent			
Basic	\$ 1.76	\$ 1.40	\$ 1.83
Diluted	\$ 1.73	\$ 1.36	\$ 1.78
Weighted average common shares and common share equivalents outstanding			
Basic	404,347,621	404,138,364	362,376,342
Diluted	412,906,478	417,785,025	374,152,479

See Notes to Consolidated Financial Statements

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
(U.S. dollars in thousands)

	Year Ended December 31,		
	2018	2017	2016
Comprehensive Income			
Net income	\$ 727,821	\$ 629,709	\$ 824,178
Other comprehensive income (loss), net of deferred income tax			
Unrealized appreciation (decline) in value of available-for-sale investments:			
Unrealized holding gains (losses) arising during year	(270,057)	252,904	(21,013)
Portion of other-than-temporary impairment losses recognized in other comprehensive income, net of deferred income tax	—	—	(352)
Reclassification of net realized gains, net of income taxes, included in net income	144,573	(67,863)	(56,361)
Foreign currency translation adjustments	(24,830)	47,014	(20,381)
Comprehensive income	<u>577,507</u>	<u>861,764</u>	<u>726,071</u>
Net (income) loss attributable to noncontrolling interests	30,150	(10,431)	(131,440)
Other comprehensive (income) loss attributable to noncontrolling interests	3,346	530	68
Comprehensive income available to Arch	<u>\$ 611,003</u>	<u>\$ 851,863</u>	<u>\$ 594,699</u>

See Notes to Consolidated Financial Statements

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CHANGES IN SHAREHOLDERS' EQUITY
(U.S. dollars in thousands)

	Year Ended December 31,		
	2018	2017	2016
Non-cumulative preferred shares			
Balance at beginning of year	\$ 872,555	\$ 772,555	\$ 325,000
Preferred shares issued	—	330,000	450,000
Preferred shares redeemed	(92,555)	(230,000)	(2,445)
Balance at end of year	<u>780,000</u>	<u>872,555</u>	<u>772,555</u>
Convertible non-voting common equivalent preferred shares			
Balance at beginning of year	489,627	1,101,304	—
Series D preferred shares issued	—	—	1,101,304
Preferred shares converted to common shares	(489,627)	(611,677)	—
Balance at end of year	<u>—</u>	<u>489,627</u>	<u>1,101,304</u>
Common shares			
Balance at beginning of year	611	582	577
Common shares issued, net	23	29	5
Balance at end of year	<u>634</u>	<u>611</u>	<u>582</u>
Additional paid-in capital			
Balance at beginning of year	1,230,617	531,687	467,339
Preferred shares converted to common shares	489,608	611,653	—
Other changes	73,556	87,277	64,348
Balance at end of year	<u>1,793,781</u>	<u>1,230,617</u>	<u>531,687</u>
Retained earnings			
Balance at beginning of year	8,562,889	7,996,701	7,332,032
Cumulative effect of an accounting change (see Note 3)	149,794	(314)	—
Balance at beginning of year, as adjusted	8,712,683	7,996,387	7,332,032
Net income	727,821	629,709	824,178
Net (income) loss attributable to noncontrolling interests	30,150	(10,431)	(131,439)
Preferred share dividends	(41,645)	(46,041)	(28,070)
Loss on redemption of preferred shares	(2,710)	(6,735)	—
Balance at end of year	<u>9,426,299</u>	<u>8,562,889</u>	<u>7,996,701</u>
Accumulated other comprehensive income (loss)			
Balance at beginning of year	118,044	(114,541)	(16,502)
Unrealized appreciation (decline) in value of available-for-sale investments, net of deferred income tax:			
Balance at beginning of year	157,400	(27,641)	50,085
Cumulative effect of an accounting change (see Note 3)	(149,794)	—	—
Balance at beginning of year, as adjusted	7,606	(27,641)	50,085
Unrealized holding gains (losses) during period, net of reclassification adjustment	(125,484)	185,041	(77,374)
Unrealized holding gains (losses) during period attributable to noncontrolling interests	3,700	—	—
Portion of other-than-temporary impairment losses recognized in other comprehensive income, net of deferred income tax	—	—	(352)
Balance at end of year	<u>(114,178)</u>	<u>157,400</u>	<u>(27,641)</u>
Foreign currency translation adjustments, net of deferred income tax:			
Balance at beginning of year	(39,356)	(86,900)	(66,587)
Foreign currency translation adjustments	(24,830)	47,014	(20,381)
Foreign currency translation adjustments attributable to noncontrolling interests	(356)	530	68
Balance at end of year	<u>(64,542)</u>	<u>(39,356)</u>	<u>(86,900)</u>
Balance at end of year	<u>(178,720)</u>	<u>118,044</u>	<u>(114,541)</u>
Common shares held in treasury, at cost			
Balance at beginning of year	(2,077,741)	(2,034,570)	(1,941,904)
Shares repurchased for treasury	(304,426)	(43,171)	(92,666)
Balance at end of year	<u>(2,382,167)</u>	<u>(2,077,741)</u>	<u>(2,034,570)</u>
Total shareholders' equity available to Arch	9,439,827	9,196,602	8,253,718
Non-redeemable noncontrolling interests	791,560	843,411	851,854
Total shareholders' equity	<u>\$ 10,231,387</u>	<u>\$ 10,040,013</u>	<u>\$ 9,105,572</u>

See Notes to Consolidated Financial Statements

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
CONSOLIDATED STATEMENTS OF CASH FLOWS
(U.S. dollars in thousands)

	Year Ended December 31,		
	2018	2017	2016
Operating Activities			
Net income	\$ 727,821	\$ 629,709	\$ 824,178
Adjustments to reconcile net income to net cash provided by operating activities:			
Net realized (gains) losses	387,550	(174,517)	(178,507)
Net impairment losses recognized in earnings	2,829	7,138	30,442
Equity in net income or loss of investments accounted for using the equity method and other income or loss	36,694	(79,540)	5,644
Amortization of intangible assets	105,670	125,778	19,343
Share-based compensation	55,776	67,798	56,581
Changes in:			
Reserve for losses and loss adjustment expenses, net of unpaid losses and loss adjustment expenses recoverable	243,734	614,534	372,244
Unearned premiums, net of ceded unearned premiums	114,772	116,841	146,569
Premiums receivable	(211,296)	(31,405)	(71,613)
Deferred acquisition costs	(37,847)	(78,378)	(38,597)
Reinsurance balances payable	73,438	8,529	31,542
Other items, net	60,181	(111,609)	179,603
Net cash provided by operating activities	<u>1,559,322</u>	<u>1,094,878</u>	<u>1,377,429</u>
Investing Activities			
Purchases of fixed maturity investments	(33,327,660)	(36,806,913)	(35,532,810)
Purchases of equity securities	(1,001,149)	(1,021,016)	(665,702)
Purchases of other investments	(2,014,622)	(2,020,624)	(1,389,406)
Proceeds from sales of fixed maturity investments	31,513,271	35,686,779	34,559,966
Proceeds from sales of equity securities	1,118,445	1,056,401	751,728
Proceeds from sales, redemptions and maturities of other investments	1,561,958	1,528,617	1,149,328
Proceeds from redemptions and maturities of fixed maturity investments	892,755	907,417	755,007
Net settlements of derivative instruments	44,699	(28,563)	(17,068)
Net (purchases) sales of short-term investments	485,473	(734,554)	(123,410)
Change in cash collateral related to securities lending	180,883	12,540	(155,248)
Acquisitions, net of cash	—	—	(1,992,720)
Purchases of fixed assets	(29,809)	(22,841)	(15,303)
Other	21,736	90,875	(27,795)
Net cash provided by (used for) investing activities	<u>(554,020)</u>	<u>(1,351,882)</u>	<u>(2,703,433)</u>
Financing Activities			
Proceeds from issuance of preferred shares, net	—	319,694	434,899
Redemption of preferred shares	(92,555)	(230,000)	(2,445)
Purchases of common shares under share repurchase program	(282,762)	—	(75,256)
Proceeds from common shares issued, net	(7,608)	(21,048)	(2,418)
Proceeds from borrowings	218,259	253,415	1,386,741
Repayments of borrowings	(576,401)	(197,000)	(219,171)
Change in cash collateral related to securities lending	(180,883)	(12,540)	155,248
Dividends paid to redeemable noncontrolling interests	(17,989)	(17,989)	(17,989)
Other	(7,226)	(51,896)	4,130
Preferred dividends paid	(41,645)	(46,041)	(28,070)
Net cash provided by (used for) financing activities	<u>(988,810)</u>	<u>(3,405)</u>	<u>1,635,669</u>
Effects of exchange rate changes on foreign currency cash and restricted cash	(19,133)	18,124	(21,191)
Increase (decrease) in cash and restricted cash	(2,641)	(242,285)	288,474
Cash and restricted cash, beginning of year	727,284	969,569	681,095
Cash and restricted cash, end of year	<u>\$ 724,643</u>	<u>\$ 727,284</u>	<u>\$ 969,569</u>
Income taxes paid	\$ (980)	\$ 51,781	\$ 50,621
Interest paid	\$ 119,775	\$ 117,374	\$ 63,288
Non-cash consideration paid in convertible non-voting common equivalent preferred shares	\$ —	\$ —	\$ 1,101,304

See Notes to Consolidated Financial Statements

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. General

Arch Capital Group Ltd. (“Arch Capital”) is a Bermuda public limited liability company which provides insurance, reinsurance and mortgage insurance on a worldwide basis through its wholly owned subsidiaries.

As used herein, the “Company” means Arch Capital and its subsidiaries. Similarly, “Common Shares” means the common shares of Arch Capital. The Company’s consolidated financial statements include the results of Watford Holdings Ltd., and its wholly owned subsidiaries (“Watford Re”). See note 11, “Variable Interest Entity and Noncontrolling Interests”.

The Company has reclassified the presentation of certain prior year information to conform to the current presentation. Such reclassifications had no effect on the Company’s net income, shareholders’ equity or cash flows. Tabular amounts are in U.S. Dollars in thousands, except share amounts, unless otherwise noted.

2. Business Acquired

McNeil

On December 6, 2018, the Company closed the acquisition of McNeil & Co. (“McNeil”), a nationwide leader in specialized risk management and insurance programs headquartered in Cortland, New York.

Arch MI Asia Limited

On July 1, 2017, the Company completed its previously announced acquisition of AIG United Guaranty Insurance (Asia) Limited (renamed “Arch MI Asia Limited”) following the payment of \$40.0 million to AIG. Arch MI Asia Limited compliments the Company’s existing private mortgage insurance businesses, which have operations in the United States, Europe and Australia.

3. Significant Accounting Policies

(a) Basis of Presentation

The consolidated financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America (“GAAP”) and include the accounts of Arch Capital and its subsidiaries, including Arch Reinsurance Ltd. (“Arch Re Bermuda”), Arch Reinsurance Company (“Arch Re U.S.”), Arch-U.S., Arch Insurance Company, Arch Specialty Insurance Company, Arch Excess & Surplus Insurance Company, Arch Indemnity Insurance Company, Arch Insurance Canada Ltd. (“Arch Insurance Canada”), Arch Reinsurance Europe Underwriting Designated Activity Company (“Arch Re

Europe”), Arch Mortgage Insurance Company, Arch Mortgage Guaranty Company, United Guaranty Residential Insurance Company, Arch Mortgage Insurance Designated Activity Company (“Arch MI Europe”), Arch Insurance Company (Europe) Limited (“Arch Insurance Company Europe”), Lloyd’s of London syndicate 2012 and related companies (“Arch Syndicate 2012”), Gulf Reinsurance Limited and Watford Re. All significant intercompany transactions and balances have been eliminated in consolidation.

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ materially from those estimates and assumptions. The Company’s principal estimates include:

- The reserve for losses and loss adjustment expenses;
- Reinsurance recoverable on unpaid and paid losses and loss adjustment expenses, including the provision for uncollectible amounts;
- Estimates of written and earned premiums;
- The valuation of the investment portfolio and assessment of other-than-temporary impairments (“OTTI”);
- The valuation of purchased intangible assets;
- The assessment of goodwill and intangible assets for impairment; and
- the valuation of deferred tax assets.

The Company has reclassified the presentation of certain prior year information to conform to the current presentation. Such reclassifications had no effect on the Company’s net income, shareholders’ equity or cash flows.

In 2018, the shareholders approved a three-for-one stock split of the Company’s common shares. All historical share and per share amounts reflect the effect of the stock split.

(b) Premium Revenues and Related Expenses

Insurance. Insurance premiums written are generally recorded at the policy inception and are primarily earned on a pro rata basis over the terms of the policies for all products, usually 12 months. Premiums written include estimates in the Company’s programs, specialty lines, lenders products business and for participation in involuntary pools. Such premium estimates are derived from multiple sources which include the historical experience of the underlying business, similar business and available industry information. Unearned premium reserves represent the portion of premiums written that relates to the unexpired terms of in-force insurance policies.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Reinsurance. Reinsurance premiums written include amounts reported by brokers and ceding companies, supplemented by the Company's own estimates of premiums where reports have not been received. The determination of premium estimates requires a review of the Company's experience with the ceding companies, familiarity with each market, the timing of the reported information, an analysis and understanding of the characteristics of each line of business, and management's judgment of the impact of various factors, including premium or loss trends, on the volume of business written and ceded to the Company. On an ongoing basis, the Company's underwriters review the amounts reported by these third parties for reasonableness based on their experience and knowledge of the subject class of business, taking into account the Company's historical experience with the brokers or ceding companies. In addition, reinsurance contracts under which the Company assumes business generally contain specific provisions which allow the Company to perform audits of the ceding company to ensure compliance with the terms and conditions of the contract, including accurate and timely reporting of information. Based on a review of all available information, management establishes premium estimates where reports have not been received. Premium estimates are updated when new information is received and differences between such estimates and actual amounts are recorded in the period in which estimates are changed or the actual amounts are determined.

Reinsurance premiums written are recorded based on the type of contracts the Company writes. Premiums on the Company's excess of loss and pro rata reinsurance contracts are estimated when the business is underwritten. For excess of loss contracts, premiums are recorded as written based on the terms of the contract. Estimates of premiums written under pro rata contracts are recorded in the period in which the underlying risks are expected to incept and are based on information provided by the brokers and the ceding companies. For multi-year reinsurance treaties which are payable in annual installments, generally, only the initial annual installment is included as premiums written at policy inception due to the ability of the reinsured to commute or cancel coverage during the term of the policy. The remaining annual installments are included as premiums written at each successive anniversary date within the multi-year term.

Reinstatement premiums for the Company's insurance and reinsurance operations are recognized at the time a loss event occurs, where coverage limits for the remaining life of the contract are reinstated under pre-defined contract terms. Reinstatement premiums, if obligatory, are fully earned when recognized. The accrual of reinstatement premiums is based on an estimate of losses and loss adjustment expenses, which reflects management's judgment.

Premium estimates are reviewed by management at least quarterly. Such review includes a comparison of actual reported premiums to expected ultimate premiums along with a review

of the aging and collection of premium estimates. Based on management's review, the appropriateness of the premium estimates is evaluated, and any adjustment to these estimates is recorded in the period in which it becomes known. Adjustments to premium estimates could be material and such adjustments could directly and significantly impact earnings favorably or unfavorably in the period they are determined because the estimated premium may be fully or substantially earned. A significant portion of amounts included as premiums receivable, which represent estimated premiums written, net of commissions, are not currently due based on the terms of the underlying contracts.

Reinsurance premiums written, irrespective of the class of business, are generally earned on a pro rata basis over the terms of the underlying policies or reinsurance contracts. Contracts and policies written on a "losses occurring" basis cover claims that may occur during the term of the contract or policy, which is typically 12 months. Accordingly, the premium is earned evenly over the term. Contracts which are written on a "risks attaching" basis cover claims which attach to the underlying insurance policies written during the terms of such contracts. Premiums earned on such contracts usually extend beyond the original term of the reinsurance contract, typically resulting in recognition of premiums earned over a 24-month period. Certain of the Company's reinsurance contracts include provisions that adjust premiums or acquisition expenses based upon the experience under the contracts. Premiums written and earned, as well as related acquisition expenses, are recorded based upon the projected experience under such contracts.

The Company also writes certain reinsurance business that is intended to provide insurers with risk management solutions that complement traditional reinsurance. Under these contracts, the Company assumes a measured amount of insurance risk in exchange for an anticipated margin, which is typically lower than on traditional reinsurance contracts. The terms and conditions of these contracts may include additional or return premiums based on loss experience, loss corridors, sublimits and caps. Examples of such business include aggregate stop-loss coverages, financial quota share coverages and multi-year retrospectively rated excess of loss coverages. If these contracts are deemed to transfer risk, they are accounted for as reinsurance. Otherwise, such contracts are accounted for under the deposit method.

Mortgage. Mortgage guaranty insurance policies are contracts that are generally non-cancelable by the insurer, are renewable at a fixed price, and provide for payment of premiums on a monthly, annual or single basis. Upon renewal, the Company is not able to re-underwrite or re-price its policies. Consistent with industry accounting practices, premiums written on a monthly basis are earned as coverage is provided. Premiums written on an annual basis are amortized on a monthly pro rata basis over the year of coverage. Primary mortgage insurance premiums written on policies covering more than one year are

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

referred to as single premiums. A portion of the revenue from single premiums is recognized in premiums earned in the current period, and the remaining portion is deferred as unearned premiums and earned over the estimated expiration of risk of the policy. If single premium policies related to insured loans are canceled due to repayment by the borrower and the policy is a non-refundable product, the remaining unearned premium related to each canceled policy is recognized as earned premium upon notification of the cancellation.

Unearned premiums represent the portion of premiums written that is applicable to the estimated unexpired risk of insured loans. A portion of premium payments may be refundable if the insured cancels coverage, which generally occurs when the loan is repaid, the loan amortizes to a sufficiently low amount to trigger a lender permitted or legally required cancellation, or the value of the property has increased sufficiently in accordance with the terms of the contract. Premium refunds reduce premiums earned in the consolidated statements of income. Generally, only unearned premiums are refundable.

Acquisition Costs. Acquisition costs that are directly related and incremental to the successful acquisition or renewal of business are deferred and amortized based on the type of contract. The Company's insurance and reinsurance operations capitalize incremental direct external costs that result from acquiring a contract but do not capitalize salaries, benefits and other internal underwriting costs. For the Company's mortgage insurance operations, which include a substantial direct sales force, both external and certain internal direct costs are deferred and amortized. For property and casualty insurance and reinsurance contracts, deferred acquisition costs are amortized over the period in which the related premiums are earned. Consistent with mortgage insurance industry accounting practice, amortization of acquisition costs related to the mortgage insurance contracts for each underwriting year's book of business is recorded in proportion to estimated gross profits. Estimated gross profits are comprised of earned premiums and losses and loss adjustment expenses. For each underwriting year, the Company estimates the rate of amortization to reflect actual experience and any changes to persistency or loss development.

Deferred acquisition costs are carried at their estimated realizable value and take into account anticipated losses and loss adjustment expenses, based on historical and current experience, and anticipated investment income.

A premium deficiency occurs if the sum of anticipated losses and loss adjustment expenses, unamortized acquisition costs and maintenance costs exceed unearned premiums (including expected future premiums) and anticipated investment income. A premium deficiency reserve ("PDR") is recorded by charging any unamortized acquisition costs to expense to the extent required in order to eliminate the deficiency. If the premium

deficiency exceeds unamortized acquisition costs then a liability is accrued for the excess deficiency.

To assess the need for a PDR on mortgage exposures, the Company develops loss projections based on modeled loan defaults related to its current policies in force. This projection is based on recent trends in default experience, severity and rates of defaulted loans moving to claim, as well as recent trends in the rate at which loans are prepaid, and incorporates anticipated interest income. Evaluating the expected profitability of the Company's existing mortgage insurance business and the need for a PDR for its mortgage business involves significant reliance upon assumptions and estimates with regard to the likelihood, magnitude and timing of potential losses and premium revenues.

No premium deficiency charges were recorded by the Company during 2018, 2017 or 2016.

(c) Deposit Accounting

Certain assumed reinsurance contracts that are deemed not to transfer insurance risk, are accounted for using the deposit method of accounting. However, it is possible that the Company could incur financial losses on such contracts. Management exercises significant judgment in the assumptions used in determining whether assumed contracts should be accounted for as reinsurance contracts or deposit contracts. For those contracts that contain only significant underwriting risk, the estimated profit margin is deferred and amortized over the contract period and such amount is included in the Company's underwriting results. When the estimated profit margin is explicit, the margin is reflected as other underwriting income and any adverse financial results on such contracts are reflected as incurred losses. When the estimated profit margin is implicit, the margin is reflected as an offset to paid losses and any adverse financial results on such contracts are reflected as incurred losses. Additional judgments are required when applying the accounting guidance with respect to the revenue recognition criteria for contracts deemed to transfer only significant underwriting risk. For those contracts that contain only significant timing risk, an accretion rate is established at inception of the contract based on actuarial estimates whereby the deposit accounting liability is increased to the estimated amount payable over the contract term. The accretion on the deposit is based on the expected rate of return required to fund the expected future payment obligations. Periodically the Company reassesses the estimated ultimate liability and the related expected rate of return. The accretion of the deposit accounting liability as well as changes to the estimated ultimate liability and the accretion rate would be reflected as part of interest expense in the Company's results of operations. Any negative accretion in a deposit accounting liability is shown in other underwriting income in the Company's results of operations.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Under some of these contracts, the ceding company retains the related assets on a funds-held basis. Such amounts are included in “Other assets” on the Company’s balance sheet. Interest income produced by those assets are recorded as part of net investment income in the Company’s results of operations.

(d) Retroactive Accounting

Retroactive reinsurance reimburses a ceding company for liabilities incurred as a result of past insurable events covered by the underlying policies reinsured. In certain instances, reinsurance contracts cover losses both on a prospective basis and on a retroactive basis and, accordingly, the Company bifurcates the prospective and retrospective elements of these reinsurance contracts and accounts for each element separately where practical. Underwriting income generated in connection with retroactive reinsurance contracts is deferred and amortized into income over the settlement period while losses are charged to income immediately. Subsequent changes in estimated amount or timing of cash flows under such retroactive reinsurance contracts are accounted for by adjusting the previously deferred amount to the balance that would have existed had the revised estimate been available at the inception of the reinsurance transaction, with a corresponding charge or credit to income.

(e) Reinsurance Ceded

In the normal course of business, the Company purchases reinsurance to increase capacity and to limit the impact of individual losses and events on its underwriting results by reinsuring certain levels of risk with other insurance enterprises or reinsurers. The Company uses pro rata, excess of loss and facultative reinsurance contracts. Reinsurance ceding commissions that represent a recovery of acquisition costs are recognized as a reduction to acquisition costs while the remaining portion is deferred. The accompanying consolidated statement of income reflects premiums and losses and loss adjustment expenses and acquisition costs, net of reinsurance ceded. See note 7, “Reinsurance” for information on the Company’s reinsurance usage. Reinsurance premiums ceded and unpaid losses and loss adjustment expenses recoverable are estimated in a manner consistent with that of the original policies issued and the terms of the reinsurance contracts. If the reinsurers are unable to satisfy their obligations under the agreements, the Company’s insurance or reinsurance subsidiaries would be liable for such defaulted amounts.

(f) Cash

Cash includes cash equivalents, which are investments with original maturities of three months or less that are not managed by external or internal investment advisors.

(g) Investments

The Company currently classifies substantially all of its fixed maturity investments and short-term investments as “available for sale” and, accordingly, they are carried at estimated fair value (also known as fair value) with the changes in fair value recorded as an unrealized gain or loss component of accumulated other comprehensive income in shareholders’ equity. The fair value of fixed maturity securities and equities securities is generally determined from quotations received from nationally recognized pricing services, or when such prices are not available, by reference to broker or underwriter bid indications. Short-term investments comprise securities due to mature within one year of the date of issue. Short-term investments include certain cash equivalents which are part of investment portfolios under the management of external and internal investment managers.

The Company enters into securities lending agreements with financial institutions to enhance investment income whereby it loans certain of its securities to third parties, primarily major brokerage firms, for short periods of time through a lending agent. Such securities have been reclassified as “Securities pledged under securities lending, at fair value.” The Company maintains legal control over the securities it lends, retains the earnings and cash flows associated with the loaned securities and receives a fee from the borrower for the temporary use of the securities. Collateral received is required at a rate of 102% or greater of the fair value of the loaned securities including accrued investment income and is monitored and maintained by the lending agent. Such collateral is reflected as “Collateral received under securities lending, at fair value.”

The Company’s investment portfolio includes certain funds that, due to their ownership structure, are accounted for by the Company using the equity method. In applying the equity method, these investments are initially recorded at cost and are subsequently adjusted based on the Company’s proportionate share of the net income or loss of the funds (which include changes in the fair value of the underlying securities in the funds). Such investments are generally recorded on a one to three month lag based on the availability of reports from the investment funds. Changes in the carrying value of such investments are recorded in net income as “Equity in net income (loss) of investments accounted for using the equity method.” As such, fluctuations in the carrying value of the investments accounted for using the equity method may increase the volatility of the Company’s reported results of operations.

The Company’s investment portfolio includes equity securities that are accounted for at fair value. Such holdings primarily include publicly traded common stocks. Dividend income on equities is reflected in net investment income. Changes in fair value on equity securities are included in “Net realized gains (losses)” in the consolidated statement of income.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The Company elected to carry certain fixed maturity securities, equity securities and other investments at fair value under the fair value option afforded by accounting guidance regarding the fair value option for financial assets and liabilities. The fair value for certain of the Company's other investments are determined using net asset values ("NAVs") as advised by external fund managers. The NAV is based on the fund manager's valuation of the underlying holdings in accordance with the fund's governing documents.

Changes in fair value of investments accounted for using the fair value option are included in "Net realized gains (losses)." The primary reasons for electing the fair value option were to address simplification and cost-benefit considerations.

The Company invests in limited partner interests and shares of limited liability companies. Such amounts are included in investments accounted for using the equity method, other investments available for sale and investments accounted for using the fair value option. These investments can often have characteristics of a variable interest entity ("VIE"). A VIE refers to entities that have characteristics such as (i) insufficient equity at risk to allow the entity to finance its activities without additional financial support or (ii) instances where the equity investors, as a group, do not have the characteristic of a controlling financial interest. If the Company is determined to be the primary beneficiary, it is required to consolidate the VIE. The primary beneficiary is defined as the variable interest holder that is determined to have the controlling financial interest as a result of having both (i) the power to direct the activities of a VIE that most significantly impact the economic performance of the VIE and (ii) the obligation to absorb losses or right to receive benefits from the VIE that could potentially be significant to the VIE. At inception of the VIE as well as on an ongoing basis, the Company determines whether it is the primary beneficiary based on an analysis of the Company's level of involvement in the VIE, the contractual terms, and the overall structure of the VIE. The Company's maximum exposure to loss with respect to these investments is limited to the investment carrying amounts reported in the Company's consolidated balance sheet and any unfunded commitment.

The Company performs quarterly reviews of its investments to determine whether declines in fair value below the cost basis are considered other-than-temporary in accordance with applicable accounting guidance regarding the recognition and presentation of OTTI. The process of determining whether a security is other-than-temporarily impaired requires judgment and involves analyzing many factors. These factors include (i) an analysis of the liquidity, business prospects and overall financial condition of the issuer, (ii) the time period in which there was a significant decline in value, (iii) the significance of the decline and (iv) the analysis of specific credit events.

When there are credit-related losses associated with debt securities for which the Company does not have an intent to

sell and it is more likely than not that it will not be required to sell the security before recovery of its cost basis, the amount of the OTTI related to a credit loss is recognized in earnings and the amount of the OTTI related to other factors (e.g., interest rates, market conditions, etc.) is recorded as a component of other comprehensive income (loss). The amount of the credit loss of an impaired debt security is the difference between the amortized cost and the greater of (i) the present value of expected future cash flows and (ii) the fair value of the security. In instances where no credit loss exists but it is more likely than not that the Company will have to sell the debt security prior to the anticipated recovery, the decline in fair value below amortized cost is recognized as an OTTI in earnings. In periods after the recognition of an OTTI on debt securities, the Company accounts for such securities as if they had been purchased on the measurement date of the OTTI at an amortized cost basis equal to the previous amortized cost basis less the OTTI recognized in earnings. For debt securities for which OTTI were recognized in earnings, the difference between the new amortized cost basis and the cash flows expected to be collected will be accreted or amortized into net investment income. See note 8, "Investment Information" for additional information.

Net investment income includes interest and dividend income together with amortization of market premiums and discounts and is net of investment management and custody fees. Anticipated prepayments and expected maturities are used in applying the interest method for certain investments such as mortgage and other asset-backed securities. When actual prepayments differ significantly from anticipated prepayments, the effective yield is recalculated to reflect actual payments to date and anticipated future payments. The net investment in such securities is adjusted to the amount that would have existed had the new effective yield been applied since the acquisition of the security. Such adjustments, if any, are included in net investment income when determined.

Investment gains or losses realized on the sale of investments, except for certain fund investments, are determined on a first-in, first-out basis and are reflected in net income. Investment gains or losses realized on the sale of certain fund investments are determined on an average cost basis. Unrealized appreciation or decline in the value of available for sale securities, which are carried at fair value, is excluded from net income and recorded as a separate component of accumulated other comprehensive income, net of applicable deferred income tax.

(h) Derivative Instruments

The Company recognizes all derivative instruments, including embedded derivative instruments, at fair value in its consolidated balance sheets. The Company employs the use of derivative instruments within its operations to mitigate risks arising from assets and liabilities held in foreign currencies as

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

well as part of its overall investment strategy. For such instruments, changes in assets and liabilities measured at fair value are recorded as “Net realized gains” in the consolidated statements of income. In addition, the Company’s derivative instruments include amounts related to underwriting activities where an insurance or reinsurance contract meets the accounting definition of a derivative instrument. For such contracts, changes in fair value are reflected in “Other underwriting income” in the consolidated statements of income as the underlying contract originates from the Company’s underwriting operations. For the periods ended 2018, 2017, and 2016, the Company did not designate any derivative instruments as hedges under the relevant accounting guidance. See note 10, “Derivative Instruments” for additional information.

(i) Reserves for Losses and Loss Adjustment Expenses

Insurance and Reinsurance. The reserve for losses and loss adjustment expenses consists of estimates of unpaid reported losses and loss adjustment expenses and estimates for losses incurred but not reported. The reserve for unpaid reported losses and loss adjustment expenses, established by management based on reports from ceding companies and claims from insureds, excludes estimates of amounts related to losses under high deductible policies, and represents the estimated ultimate cost of events or conditions that have been reported to or specifically identified by the Company. Such reserves are supplemented by management’s estimates of reserves for losses incurred for which reports or claims have not been received. The Company’s reserves are based on a combination of reserving methods, incorporating both Company and industry loss development patterns. The Company selects the initial expected loss and loss adjustment expense ratios based on information derived by its underwriters and actuaries during the initial pricing of the business, supplemented by industry data where appropriate. Such ratios consider, among other things, rate changes and changes in terms and conditions that have been observed in the market. These estimates are reviewed regularly and, as experience develops and new information becomes known, the reserves are adjusted as necessary. Such adjustments, if any, are reflected in income in the period in which they are determined. As actual loss information has been reported, the Company has developed its own loss experience and its reserving methods include other actuarial techniques. Over time, such techniques have been given further weight in its reserving process based on the continuing maturation of the Company’s reserves. Inherent in the estimates of ultimate losses and loss adjustment expenses are expected trends in claims severity and frequency and other factors which may vary significantly as claims are settled. Accordingly, ultimate losses and loss adjustment expenses may differ materially from the amounts recorded in the accompanying consolidated financial statements. Losses and loss adjustment expenses are recorded on an undiscounted basis, except for excess workers’

compensation and employers’ liability business written by the Company’s insurance operations.

Mortgage. The reserves for mortgage guaranty insurance losses and loss adjustment expenses are the estimated claim settlement costs on notices of delinquency that have been received by the Company, as well as loan delinquencies that have been incurred but have not been reported by the lenders. Consistent with primary mortgage insurance industry accounting practice, the Company does not establish loss reserves for future claims on insured loans that are not currently delinquent (defined as two consecutive missed payments). The Company establishes loss reserves on a case-by-case basis when insured loans are reported delinquent using estimated claim rates and average claim sizes for each cohort, net of any salvage recoverable. The Company also reserves for delinquencies that have occurred but have not yet been reported to the Company prior to the close of an accounting period. To determine this reserve, the Company estimates the number of delinquencies not yet reported using historical information regarding late reported delinquencies and applies estimated claim rates and claim sizes for the estimated delinquencies not yet reported.

The establishment of reserves across the Company’s segments is an inherently uncertain process, are necessarily based on estimates, and the ultimate net cost may vary from such estimates. The methods for making such estimates and for establishing the resulting liability are reviewed and updated using the most current information available. Any resulting adjustments, which may be material, are reflected in current operations.

(j) Contractholder Receivables and Payables and Collateral Held for Insured Obligations

Certain insurance policies written by the Company’s insurance operations feature large deductibles, primarily in its construction and national accounts lines of business. Under such contracts, the Company is obligated to pay the claimant for the full amount of the claim. The Company is subsequently reimbursed by the policyholder for the deductible amount. These amounts are included on a gross basis in the consolidated balance sheet in contractholder payables and contractholder receivables, respectively. In the event that the Company is unable to collect from the policyholder, the Company would be liable for such defaulted amounts. Collateral, primarily in the form of letters of credit, cash and trusts, is obtained from the policyholder to mitigate the Company’s credit risk. In the instances where the Company receives collateral in the form of cash, the Company reflects it in “Collateral held for insured obligations.”

(k) Foreign Exchange

Assets and liabilities of foreign operations whose functional currency is not the U.S. Dollar are translated at the prevailing

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

exchange rates at each balance sheet date. Revenues and expenses of such foreign operations are translated at average exchange rates during the year. The net effect of the translation adjustments for foreign operations is included in accumulated other comprehensive income, net of applicable deferred income tax. Monetary assets and liabilities, such as premiums receivable and the reserve for losses and loss adjustment expenses, denominated in foreign currencies are revalued at the exchange rate in effect at the balance sheet date with the resulting foreign exchange gains and losses included in net income. Accounts that are classified as non-monetary, such as deferred acquisition costs and the unearned premium reserves, are not revalued. In the case of foreign currency denominated fixed maturity securities which are classified as “available for sale,” the change in exchange rates between the local currency in which the investments are denominated and the Company’s functional currency at each balance sheet date is included in unrealized appreciation or decline in value of securities, a component of accumulated other comprehensive income, net of applicable deferred income tax.

(l) Income Taxes

Deferred income taxes reflect the expected future tax consequences of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and amounts used for income tax purposes. A valuation allowance is recorded if it is more likely than not that some or all of a deferred tax asset may not be realized. The Company considers future taxable income and feasible tax planning strategies in assessing the need for a valuation allowance. In the event the Company determines that it will not be able to realize all or part of its deferred income tax assets in the future, an adjustment to the deferred income tax assets would be charged to income in the period in which such determination is made. In addition, if the Company subsequently assesses that the valuation allowance is no longer needed, a benefit would be recorded to income in the period in which such determination is made. See note 14, “Income Taxes” for additional information.

The Company recognizes a tax benefit where it concludes that it is more likely than not that the tax benefit will be sustained on audit by the taxing authority based solely on the technical merits of the associated tax position. If the recognition threshold is met, the Company recognizes a tax benefit measured at the largest amount of the tax benefit that, in the Company’s judgment, is greater than 50% likely to be realized. The Company records interest and penalties related to unrecognized tax benefits in the provision for income taxes.

(m) Share-Based Payment Arrangements

The Company applies a fair value based measurement method in accounting for its share-based payment arrangements with eligible employees and directors. Compensation expense is

estimated based on the fair value of the award at the grant date and is recognized in net income over the requisite service period with a corresponding increase in shareholders’ equity. No value is attributed to awards that employees forfeit because they fail to satisfy vesting conditions. The Company’s (i) time-based awards generally vest over a three year period with one-third vesting on the first, second and third anniversaries of the grant date and (ii) performance-based awards cliff vest after each three-year performance period based on achievement of the specified performance criteria. The share-based compensation expense associated with awards that have graded vesting features and vest based on service conditions only is calculated on a straight-line basis over the requisite service period for the entire award. Compensation expense recognized in connection with performance awards is based on the achievement of the specified performance and service conditions. The final measure of compensation expense recognized over the requisite service period reflects the final performance outcome. During the recognition period compensation expense is accrued based on the performance condition that is probable of achievement. For awards granted to retirement-eligible employees where no service is required for the employee to retain the award, the grant date fair value is immediately recognized as compensation expense at the grant date because the employee is able to retain the award without continuing to provide service. For employees near retirement eligibility, attribution of compensation cost is over the period from the grant date to the retirement eligibility date. These charges had no impact on the Company’s cash flows or total shareholders’ equity. See note 20, “Share-Based Compensation” for information relating to the Company’s share-based payment awards.

(n) Guaranty Fund and Other Related Assessments

Liabilities for guaranty fund and other related assessments in the Company’s insurance and reinsurance operations are accrued when the Company receives notice that an amount is payable, or earlier if a reasonable estimate of the assessment can be made.

(o) Treasury Shares

Treasury shares are common shares purchased by the Company and not subsequently canceled. These shares are recorded at cost and result in a reduction of the Company’s shareholders’ equity in its Consolidated Balance Sheets.

(p) Goodwill and Intangible Assets

Goodwill represents the excess of the purchase price of an acquisition over the fair value of the net assets acquired and is assigned to the applicable reporting unit at acquisition. Goodwill is evaluated for impairment on an annual basis. Impairment tests may be performed more frequently if the facts and circumstances indicate a possible impairment. In performing impairment tests, the Company may first assess

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

qualitative factors to determine whether it is more likely than not (that is, more than a 50% probability) that the fair value of a reporting unit exceeds its carrying amount as a basis for determining whether it is necessary to perform the two-step goodwill impairment test described in the accounting guidance.

Indefinite-lived intangible assets, such as insurance licenses are evaluated for impairment similar to goodwill. Finite-lived intangible assets and liabilities include the value of acquired insurance and reinsurance contracts, which are estimated based on the present value of future expected cash flows and amortized in proportion to the estimated profits expected to be realized. Other finite-lived intangible assets or liabilities, including favorable or unfavorable contracts, are amortized over their useful lives. Finite-lived intangible assets and liabilities are periodically reviewed for indicators of impairment. An impairment is recognized when the carrying amount is not recoverable from its undiscounted cash flows and is measured as the difference between the carrying amount and fair value.

If goodwill or intangible assets are impaired, such assets are written down to their fair values with the related expense recorded in the Company's results of operations.

(q) Recent Accounting Pronouncements

Recently Issued Accounting Standards Adopted

The Company adopted Financial Accounting Standards Board ("FASB") Accounting Standard Update ("ASU") 2016-01, "Financial Instruments - Overall (Subtopic 825-10) - Recognition and Measurement of Financial Assets and Financial Liabilities," which enhances the reporting model for financial instruments and provides improved financial information to readers of the financial statements. Among other provisions focused on improving the recognition and measurement of financial instruments, the ASU significantly changes the income statement impact of equity instruments and the recognition of changes in fair value of financial liabilities attributable to an entity's own credit risk when the fair value option is elected. The ASU requires equity instruments that do not result in consolidation and are not accounted for under the equity method to be measured at fair value with any changes in fair value recognized in net income rather than other comprehensive income. Upon adoption of this ASU, the Company recorded a cumulative effect adjustment of \$149.8 million in retained earnings and an offsetting decrease in accumulated other comprehensive income. The adoption of this ASU did not have a material impact on the Company's financial position, cash flows, or total comprehensive income, but may increase volatility in the Company's results of operations in future periods.

The Company adopted ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," which creates a new comprehensive revenue recognition standard that serves as a

single source of revenue guidance for all companies in all industries. The guidance applies to all companies that either enter into contracts with customers to transfer goods or services or enter into contracts for the transfer of non-financial assets, unless those contracts are within the scope of other standards, such as insurance contracts or financial instruments. The ASU also requires enhanced disclosures about revenue. The Company adopted the ASU using the modified retrospective method, whereby the cumulative effect of adoption was recognized as an adjustment to retained earnings at the date of initial application. The impact of the adoption of this ASU was not material, mostly because the accounting for insurance contracts is outside of the scope of ASU 2014-09.

The Company adopted ASU 2016-18, "Statement of Cash Flows (Topic 230) - Restricted Cash," which requires that restricted cash and restricted cash equivalents be included with cash and cash equivalents in the reconciliation of beginning and ending cash on the statements of cash flows. As a result, transfers between cash and cash equivalents and restricted cash and restricted cash equivalents will no longer be presented on the statement of cash flows. The revised presentation required in this ASU is reflected in the Company's consolidated statements of cash flows for both periods presented. The adoption of this ASU did not have any effect on the Company's results of operations, financial position or comprehensive income.

The Company adopted ASU 2016-15, "Statement of Cash Flows (Topic 230) - *Classification of Certain Cash Receipts and Cash Payments*," which addresses several clarifications on the presentation and classification of certain cash receipts and cash payments in the statement of cash flows. Among several other cash flow issues, the ASU specifically addresses the classification of debt prepayment or debt issuance costs, contingent consideration payments made after a business combination and distributions received from equity method investees. The ASU also provides a broader principle on identifying the type of activity of the cash flow item by focusing on the cash flow item's nature and the predominant source or use of that item. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

The Company adopted ASU 2016-16, "Income Taxes (Topic 740) - *Intra-Entity Transfers of Assets Other than Inventory*," which requires entities to recognize current and deferred income tax resulting from an intra-entity asset transfer when the transfer occurs. Previously, recognition of income tax consequences under GAAP was not allowed until the asset had been sold to a third party. The adoption of this ASU did not have a material impact on the Company's consolidated financial statements.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Recently Issued Accounting Standards Not Yet Adopted

ASU 2016-13, “Financial Instruments - Credit Losses (Topic 326),” was issued in June, 2016. The ASU changes how entities will measure credit losses for most financial assets and certain other instruments that aren’t measured at fair value through net income. The ASU requires an entity to estimate its lifetime “expected credit loss” and record an allowance that, when deducted from the amortized cost basis of the financial asset, presents the net amount expected to be collected on the financial asset. The ASU is effective for the 2020 first quarter, though early application is permitted in the 2019 first quarter, and should be applied on a modified retrospective basis for the majority of the provisions with a cumulative-effect adjustment to retained earnings at the beginning of the year of adoption. Upon adoption, the Company expects the new standard to have an impact on certain type of investment securities, reinsurance recoverables and contractholder receivables. The Company is currently assessing the impact the implementation of this ASU will have on its consolidated financial statements.

ASU 2017-08 “Receivables - Nonrefundable Fees and Other Costs (Subtopic 310-20), *Premium Amortization on Purchased Callable Debt Securities*,” was issued in March, 2017. This ASU shortens the amortization period for certain callable debt securities held at a premium and requires the premium to be amortized to the earliest call date. However, the new guidance does not require an accounting change for securities held at a discount whose discount continues to be amortized to maturity. The standard is effective for financial statements issued for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2018, with early adoption permitted. The adoption of the guidance requires a modified retrospective approach with a cumulative-effect adjustment to retained earnings. The adoption of this ASU is not expected to have a material effect on the Company’s consolidated financial statements.

ASU 2018-02 “Income Statement-Reporting Comprehensive Income (Topic 220) - *Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income*,” was issued in February 2018 to allow the reclassification of the stranded tax effects in accumulated other comprehensive income (“AOCI”) resulting from the Tax Cuts and Jobs Act of 2017 (“Tax Cuts Act”). Current guidance requires the effect of a change in tax laws or rates on deferred tax balances to be reported in income from continuing operations in the accounting period that includes the period of enactment, even if the related income tax effects were originally charged or credited directly to AOCI. The amount of the reclassification would include the effect of the change in the U.S. federal corporate income tax rate on the gross deferred tax amounts and related valuation allowances, if any, at the date of the enactment of the Tax Cuts Act related to items in AOCI. The updated guidance is effective for reporting periods beginning after December 15, 2018 and is to be applied retrospectively to

each period in which the effect of the Tax Cuts Act related to items remaining in AOCI are recognized or at the beginning of the period of adoption. Early adoption is permitted. The adoption of this ASU is not expected to have a material effect on the Company’s results of operations, financial position or liquidity.

ASU 2018-07 “Improvements to Nonemployee Share-Based Payment Accounting” was issued in June, 2018 to simplify the accounting for share-based payments granted to nonemployees for goods and services. Under this ASU, most of the guidance on such payments to nonemployees would be aligned with the requirements for share-based payments granted to employees. The ASU is effective for reporting periods beginning after December 15, 2018. The Company has granted share-based payment awards only to employees as defined by accounting guidance and does not expect this guidance to have a material impact on its consolidated financial statements.

ASU 2018-11, “Leases: Targeted Improvements (Topic 842),” was issued in July, 2018. This ASU will ease implementation of the lease standard (ASU 2016-02). The guidance provides an alternative transition method by which leases are recognized at the date of adoption. Entities that elect this transition option will still be required to adopt the new leases standard using the modified retrospective transition method required by the standard, but they will recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption rather than in the earliest period presented. The Company will adopt this alternative transition method as of January 1, 2019 for leases existing at the date of adoption. The Company will also elect certain practical expedients that allow the Company not to reassess existing leases under the new guidance. Based on the Company’s analysis, the primary impact of adoption will be the recognition of a right of use asset and a lease liability for operating leases pertaining to the Company’s real estate portfolio that are expected to represent less than one percent of the Company’s Total Assets and Total Liabilities, respectively.

ASU 2018-13, “Fair Value Measurement (Topic 820): Disclosure Framework - Changes to the Disclosure Requirements for Fair Value Measurement,” was issued in August, 2018. The ASU modifies the disclosure requirements on fair value measurement as part of the disclosure framework project with the objective to improve the effectiveness of disclosures in the notes to the financial statements. The amendments in this update allow for removal of (1) the amount and reasons for transfer between Level 1 and Level 2 of the fair value hierarchy; (2) the policy for transfers between levels; and (3) the valuation processes for Level 3 fair value measurements. The ASU is effective for fiscal years beginning after December 15, 2019 and interim periods within those fiscal years. The Company is currently evaluating the impact of the new guidance on its consolidated financial statements.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

ASU 2018-15, “Intangibles - Goodwill and Other - *Internal-Use Software (Subtopic 350-40)*,” was issued in the 2018 third quarter. This ASU aligns the requirements for capitalizing certain implementation costs incurred in a cloud computing arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. The standard is effective for financial statements issued for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019, with early adoption permitted. The guidance provides flexibility in adoption, allowing for either retrospective adjustment or prospective adjustment for all implementation costs incurred after the date of adoption. The Company is currently evaluating the impact of the new guidance on the consolidated financial statements.

4. Segment Information

The Company classifies its businesses into three underwriting segments — insurance, reinsurance and mortgage — and two other operating segments — ‘other’ and corporate (non-underwriting). The Company determined its reportable segments using the management approach described in accounting guidance regarding disclosures about segments of an enterprise and related information. The accounting policies of the segments are the same as those used for the preparation of the Company’s consolidated financial statements. Intersegment business is allocated to the segment accountable for the underwriting results.

The Company’s insurance, reinsurance and mortgage segments each have managers who are responsible for the overall profitability of their respective segments and who are directly accountable to the Company’s chief operating decision makers, the President and Chief Executive Officer of Arch Capital and the Chief Financial Officer of Arch Capital. The chief operating decision makers do not assess performance, measure return on equity or make resource allocation decisions on a line of business basis. Management measures segment performance for its three underwriting segments based on underwriting income or loss. The Company does not manage its assets by underwriting segment, with the exception of goodwill and intangible assets, and, accordingly, investment income is not allocated to each underwriting segment.

The insurance segment consists of the Company’s insurance underwriting units which offer specialty product lines on a worldwide basis. Product lines include:

- *Construction and national accounts*: primary and excess casualty coverages to middle and large accounts in the construction industry and a wide range of products for middle and large national accounts, specializing in loss sensitive primary casualty insurance programs (including

large deductible, self-insured retention and retrospectively rated programs).

- *Excess and surplus casualty*: primary and excess casualty insurance coverages, including middle market energy business, and contract binding, which primarily provides casualty coverage through a network of appointed agents to small and medium risks.
- *Lenders products*: collateral protection, debt cancellation and service contract reimbursement products to banks, credit unions, automotive dealerships and original equipment manufacturers and other specialty programs that pertain to automotive lending and leasing.
- *Professional lines*: directors’ and officers’ liability, errors and omissions liability, employment practices liability, fiduciary liability, crime, professional indemnity and other financial related coverages for corporate, private equity, venture capital, real estate investment trust, limited partnership, financial institution and not-for-profit clients of all sizes and medical professional and general liability insurance coverages for the healthcare industry. The business is predominately written on a claims-made basis.
- *Programs*: primarily package policies, underwriting workers’ compensation and umbrella liability business in support of desirable package programs, targeting program managers with unique expertise and niche products offering general liability, commercial automobile, inland marine and property business with minimal catastrophe exposure.
- *Property, energy, marine and aviation*: primary and excess general property insurance coverages, including catastrophe-exposed property coverage, for commercial clients. Coverages for marine include hull, war, specie and liability. Aviation and stand-alone terrorism are also offered.
- *Travel, accident and health*: specialty travel and accident and related insurance products for individual, group travelers, travel agents and suppliers, as well as accident and health, which provides accident, disability and medical plan insurance coverages for employer groups, medical plan members, students and other participant groups.
- *Other*: includes alternative market risks (including captive insurance programs), excess workers’ compensation and employer’s liability insurance coverages for qualified self-insured groups, associations and trusts, and contract and commercial surety coverages, including contract bonds (payment and performance bonds) primarily for medium and large contractors and commercial surety bonds for Fortune 1000 companies and smaller transaction business programs.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The reinsurance segment consists of the Company's reinsurance underwriting units which offer specialty product lines on a worldwide basis. Product lines include:

- *Casualty*: provides coverage to ceding company clients on third party liability and workers' compensation exposures from ceding company clients, primarily on a treaty basis. Exposures include, among others, executive assurance, professional liability, workers' compensation, excess and umbrella liability, excess motor and healthcare business.
- *Marine and aviation*: provides coverage for energy, hull, cargo, specie, liability and transit, and aviation business, including airline and general aviation risks. Business written may also include space business, which includes coverages for satellite assembly, launch and operation for commercial space programs.
- *Other specialty*: provides coverage to ceding company clients for proportional motor and other lines including surety, accident and health, workers' compensation catastrophe, agriculture, trade credit and political risk.
- *Property catastrophe*: provides protection for most catastrophic losses that are covered in the underlying policies written by reinsureds, including hurricane, earthquake, flood, tornado, hail and fire, and coverage for other perils on a case-by-case basis. Property catastrophe reinsurance provides coverage on an excess of loss basis when aggregate losses and loss adjustment expense from a single occurrence of a covered peril exceed the retention specified in the contract.
- *Property excluding property catastrophe*: provides coverage for both personal lines and commercial property exposures and principally covers buildings, structures, equipment and contents. The primary perils in this business include fire, explosion, collapse, riot, vandalism, wind, tornado, flood and earthquake. Business is assumed

on both a proportional and excess of loss basis. In addition, facultative business is written which focuses on commercial property risks on an excess of loss basis.

- *Other*: includes life reinsurance business on both a proportional and non-proportional basis, casualty clash business and, in limited instances, non-traditional business which is intended to provide insurers with risk management solutions that complement traditional reinsurance.

The mortgage segment includes the Company's U.S. and international mortgage insurance and reinsurance operations as well as government sponsored enterprise ("GSE") credit-risk sharing transactions. AMIC and UGRIC (combined "Arch MI U.S.") are approved as eligible mortgage insurers by Federal National Mortgage Association ("Fannie Mae") and Federal Home Loan Mortgage Corporation ("Freddie Mac"), each a government sponsored enterprise, or "GSE."

The corporate (non-underwriting) segment results include net investment income, other income (loss), other expenses incurred by the Company, interest expense, net realized gains or losses, net impairment losses included in earnings, equity in net income or loss of investments accounted for using the equity method, net foreign exchange gains or losses, transaction costs and other, income taxes and items related to the Company's non-cumulative preferred shares. Such amounts exclude the results of the 'other' segment.

The 'other' segment includes the results of Watford Re (see note 11, "Variable Interest Entity and Noncontrolling Interests"). Watford Re has its own management and board of directors that is responsible for the overall profitability of the 'other' segment. For the 'other' segment, performance is measured based on net income or loss.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following tables summarize the Company's underwriting income or loss by segment, together with a reconciliation of underwriting income or loss to net income available to Arch common shareholders, summary information regarding net premiums written and earned by major line of business and net premiums written by location:

	Year Ended December 31, 2018					
	Insurance	Reinsurance	Mortgage	Sub-Total	Other	Total
Gross premiums written (1)	\$ 3,262,332	\$ 1,912,522	\$ 1,360,708	\$ 6,534,423	\$ 735,015	\$ 6,961,004
Premiums ceded	(1,050,207)	(539,950)	(202,833)	(1,791,851)	(130,840)	(1,614,257)
Net premiums written	2,212,125	1,372,572	1,157,875	4,742,572	604,175	5,346,747
Change in unearned premiums	(6,464)	(111,356)	28,361	(89,459)	(25,313)	(114,772)
Net premiums earned	2,205,661	1,261,216	1,186,236	4,653,113	578,862	5,231,975
Other underwriting income (loss)	—	(682)	13,033	12,351	2,722	15,073
Losses and loss adjustment expenses	(1,520,680)	(846,882)	(81,289)	(2,448,851)	(441,255)	(2,890,106)
Acquisition expenses	(349,702)	(211,280)	(118,595)	(679,577)	(125,558)	(805,135)
Other operating expenses	(364,138)	(133,350)	(142,432)	(639,920)	(37,889)	(677,809)
Underwriting income (loss)	\$ (28,859)	\$ 69,022	\$ 856,953	897,116	(23,118)	873,998
Net investment income				437,958	125,675	563,633
Net realized gains (losses)				(284,429)	(120,915)	(405,344)
Net impairment losses recognized in earnings				(2,829)	—	(2,829)
Equity in net income (loss) of investments accounted for using the equity method				45,641	—	45,641
Other income (loss)				2,419	—	2,419
Corporate expenses				(58,608)	—	(58,608)
Transaction costs and other				(11,386)	(9,000)	(20,386)
Amortization of intangible assets				(105,670)	—	(105,670)
Interest expense				(101,019)	(19,465)	(120,484)
Net foreign exchange gains (losses)				58,711	10,691	69,402
Income (loss) before income taxes				877,904	(36,132)	841,772
Income tax expense				(113,924)	(27)	(113,951)
Net income (loss)				763,980	(36,159)	727,821
Dividends attributable to redeemable noncontrolling interests				—	(18,357)	(18,357)
Amounts attributable to nonredeemable noncontrolling interests				—	48,507	48,507
Net income (loss) available to Arch				763,980	(6,009)	757,971
Preferred dividends				(41,645)	—	(41,645)
Loss on redemption of preferred shares				(2,710)	—	(2,710)
Net income (loss) available to Arch common shareholders				\$ 719,625	\$ (6,009)	\$ 713,616
Underwriting Ratios						
Loss ratio	68.9%	67.1%	6.9%	52.6%	76.2%	55.2%
Acquisition expense ratio	15.9%	16.8%	10.0%	14.6%	21.7%	15.4%
Other operating expense ratio	16.5%	10.6%	12.0%	13.8%	6.5%	13.0%
Combined ratio	101.3%	94.5%	28.9%	81.0%	104.4%	83.6%
Goodwill and intangible assets	\$ 114,012	\$ —	\$ 513,258	\$ 627,270	\$ 7,650	\$ 634,920
Total investable assets				\$ 19,566,861	\$ 2,757,663	\$ 22,324,524
Total assets				28,845,473	3,372,856	32,218,329
Total liabilities				19,518,395	2,262,255	21,780,650

- (1) Certain amounts included in the gross premiums written of each segment are related to intersegment transactions. Accordingly, the sum of gross premiums written for each segment does not agree to the total gross premiums written as shown in the table above due to the elimination of intersegment transactions in the total.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

	Year Ended December 31, 2017					
	Insurance	Reinsurance	Mortgage	Sub-Total	Other	Total
Gross premiums written (1)	\$ 3,081,086	\$ 1,640,399	\$ 1,368,138	\$ 6,088,254	\$ 600,304	\$ 6,368,425
Premiums ceded	(958,646)	(465,925)	(256,796)	(1,679,998)	(47,187)	(1,407,052)
Net premiums written	2,122,440	1,174,474	1,111,342	4,408,256	553,117	4,961,373
Change in unearned premiums	(9,422)	(31,853)	(54,176)	(95,451)	(21,390)	(116,841)
Net premiums earned	2,113,018	1,142,621	1,057,166	4,312,805	531,727	4,844,532
Other underwriting income	—	11,336	15,737	27,073	3,180	30,253
Losses and loss adjustment expenses	(1,622,444)	(773,923)	(134,677)	(2,531,044)	(436,402)	(2,967,446)
Acquisition expenses, net	(323,639)	(221,250)	(100,598)	(645,487)	(129,971)	(775,458)
Other operating expenses	(359,524)	(146,663)	(146,336)	(652,523)	(31,928)	(684,451)
Underwriting income (loss)	\$ (192,589)	\$ 12,121	\$ 691,292	510,824	(63,394)	447,430
Net investment income				382,072	88,800	470,872
Net realized gains (losses)				148,798	343	149,141
Net impairment losses recognized in earnings				(7,138)	—	(7,138)
Equity in net income (loss) of investments accounted for using the equity method				142,286	—	142,286
Other income (loss)				(2,571)	—	(2,571)
Corporate expenses				(61,602)	—	(61,602)
Transaction costs and other				(22,150)	—	(22,150)
Amortization of intangible assets				(125,778)	—	(125,778)
Interest expense				(103,592)	(13,839)	(117,431)
Net foreign exchange gains (losses)				(113,345)	(2,437)	(115,782)
Income before income taxes				747,804	9,473	757,277
Income tax (expense) benefit				(127,547)	(21)	(127,568)
Net income				620,257	9,452	629,709
Dividends attributable to redeemable noncontrolling interests				—	(18,344)	(18,344)
Amounts attributable to nonredeemable noncontrolling interests				—	7,913	7,913
Net income (loss) available to Arch				620,257	(979)	619,278
Preferred dividends				(46,041)	—	(46,041)
Loss on redemption of preferred shares				(6,735)	—	(6,735)
Net income (loss) available to Arch common shareholders				\$ 567,481	\$ (979)	\$ 566,502
Underwriting Ratios						
Loss ratio	76.8%	67.7%	12.7%	58.7%	82.1%	61.3%
Acquisition expense ratio	15.3%	19.4%	9.5%	15.0%	24.4%	16.0%
Other operating expense ratio	17.0%	12.8%	13.8%	15.1%	6.0%	14.1%
Combined ratio	109.1%	99.9%	36.0%	88.8%	112.5%	91.4%
Goodwill and intangible assets	\$ 22,310	\$ 211	\$ 622,440	\$ 644,961	\$ 7,650	\$ 652,611
Total investable assets				\$ 19,716,421	\$ 2,440,067	\$ 22,156,488
Total assets				29,037,004	3,014,654	32,051,658
Total liabilities				19,959,574	1,846,149	21,805,723

- (1) Certain amounts included in the gross premiums written of each segment are related to intersegment transactions. Accordingly, the sum of gross premiums written for each segment does not agree to the total gross premiums written as shown in the table above due to the elimination of intersegment transactions in the total.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2016

	Insurance	Reinsurance	Mortgage	Sub-Total	Other	Total
Gross premiums written (1)	\$ 3,027,049	\$ 1,494,397	\$ 499,725	\$ 5,019,363	\$ 535,094	\$ 5,202,134
Premiums ceded	(954,768)	(440,541)	(108,259)	(1,501,760)	(21,306)	(1,170,743)
Net premiums written	2,072,281	1,053,856	391,466	3,517,603	513,788	4,031,391
Change in unearned premiums	1,623	2,376	(104,750)	(100,751)	(45,818)	(146,569)
Net premiums earned	2,073,904	1,056,232	286,716	3,416,852	467,970	3,884,822
Other underwriting income	—	36,403	17,024	53,427	3,746	57,173
Losses and loss adjustment expenses	(1,359,313)	(475,762)	(28,943)	(1,864,018)	(321,581)	(2,185,599)
Acquisition expenses, net	(304,050)	(212,258)	(21,790)	(538,098)	(129,527)	(667,625)
Other operating expenses	(350,260)	(142,616)	(96,672)	(589,548)	(25,163)	(614,711)
Underwriting income (loss)	\$ 60,281	\$ 261,999	\$ 156,335	478,615	(4,555)	474,060
Net investment income				277,193	89,549	366,742
Net realized gains (losses)				69,586	68,000	137,586
Net impairment losses recognized in earnings				(30,442)	—	(30,442)
Equity in net income (loss) of investments accounted for using the equity method				48,475	—	48,475
Other income (loss)				(800)	—	(800)
Corporate expenses				(49,396)	—	(49,396)
Transaction costs and other				(41,729)	—	(41,729)
Amortization of intangible assets				(19,343)	—	(19,343)
Interest expense				(53,464)	(12,788)	(66,252)
Net foreign exchange gains (losses)				31,409	5,242	36,651
Income before income taxes				710,104	145,448	855,552
Income tax benefit				(31,375)	1	(31,374)
Net income				678,729	145,449	824,178
Dividends attributable to redeemable noncontrolling interests				—	(18,349)	(18,349)
Amounts attributable to nonredeemable noncontrolling interests				—	(113,091)	(113,091)
Net income available to Arch				678,729	14,009	692,738
Preferred dividends				(28,070)	—	(28,070)
Net income available to Arch common shareholders				\$ 650,659	\$ 14,009	\$ 664,668
Underwriting Ratios						
Loss ratio	65.5%	45.0%	10.1%	54.6%	68.7%	56.3%
Acquisition expense ratio	14.7%	20.1%	7.6%	15.7%	27.7%	17.2%
Other operating expense ratio	16.9%	13.5%	33.7%	17.3%	5.4%	15.8%
Combined ratio	97.1%	78.6%	51.4%	87.6%	101.8%	89.3%
Goodwill and intangible assets	\$ 25,206	\$ 956	\$ 747,741	\$ 773,903	\$ 7,650	\$ 781,553
Total investable assets				\$ 18,636,189	\$ 1,857,763	\$ 20,493,952
Total assets				26,989,359	2,382,750	29,372,109
Total liabilities				18,855,858	1,205,126	20,060,984

- (1) Certain amounts included in the gross premiums written of each segment are related to intersegment transactions. Accordingly, the sum of gross premiums written for each segment does not agree to the total gross premiums written as shown in the table above due to the elimination of intersegment transactions in the total.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following tables provide summary information regarding net premiums written and earned by major line of business and net premiums written by location:

INSURANCE SEGMENT	Year Ended December 31,		
	2018	2017	2016
Net premiums earned (1)			
Professional lines (2)	\$ 458,425	\$ 444,137	\$ 431,391
Programs	389,186	364,639	357,715
Construction and national accounts	322,440	324,517	322,072
Travel, accident and health	297,147	257,358	219,169
Property, energy, marine and aviation	205,069	173,779	188,938
Excess and surplus casualty (3)	172,424	195,154	219,046
Lenders products	94,248	97,043	98,517
Other (4)	266,722	256,391	237,056
Total	\$ 2,205,661	\$ 2,113,018	\$ 2,073,904
Net premiums written by underwriting location (1)			
United States	\$ 1,736,651	\$ 1,715,467	\$ 1,690,208
Europe	401,974	344,836	327,034
Other	73,500	62,137	55,039
Total	\$ 2,212,125	\$ 2,122,440	\$ 2,072,281

(1) Insurance segment results include premiums assumed through intersegment transactions and exclude premiums ceded through intersegment transactions.

(2) Includes professional liability, executive assurance and healthcare business.

(3) Includes casualty and contract binding business.

(4) Includes alternative markets, excess workers' compensation and surety business.

REINSURANCE SEGMENT	Year Ended December 31,		
	2018	2017	2016
Net premiums earned (1)			
Other specialty (2)	\$ 474,568	\$ 408,566	\$ 329,994
Casualty (3)	347,034	341,122	300,160
Property excluding property catastrophe	287,788	255,453	282,018
Property catastrophe	75,249	73,300	73,803
Marine and aviation	39,238	36,214	52,579
Other (4)	37,339	27,966	17,678
Total	\$ 1,261,216	\$ 1,142,621	\$ 1,056,232
Net premiums written by underwriting location (1)			
United States	\$ 413,550	\$ 399,379	\$ 432,683
Bermuda	487,523	350,681	277,625
Europe and other	471,499	424,414	343,548
Total	\$ 1,372,572	\$ 1,174,474	\$ 1,053,856

(1) Reinsurance segment results include premiums assumed through intersegment transactions and exclude premiums ceded through intersegment transactions.

(2) Includes proportional motor, surety, accident and health, workers' compensation catastrophe, agriculture, trade credit and other.

(3) Includes executive assurance, professional liability, workers' compensation, excess motor, healthcare and other.

(4) Includes life, casualty clash and other.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

MORTGAGE SEGMENT	Year Ended December 31,		
	2018	2017	2016
Net premiums earned by underwriting location			
United States	\$ 1,009,765	\$ 901,858	\$ 155,929
Other	176,471	155,308	130,787
Total	\$ 1,186,236	\$ 1,057,166	\$ 286,716
Net premiums written by underwriting location			
United States	\$ 948,323	\$ 903,329	\$ 186,826
Other	209,552	208,013	204,640
Total	\$ 1,157,875	\$ 1,111,342	\$ 391,466

OTHER SEGMENT	Year Ended December 31,		
	2018	2017	2016
Net premiums earned (1)			
Casualty (2)	\$ 277,589	\$ 333,275	\$ 320,767
Other specialty (3)	204,485	135,855	101,768
Property catastrophe	10,998	12,690	11,421
Property excluding property catastrophe	2,802	1,392	1,436
Marine and aviation	420	1,024	1,811
Other (4)	82,568	47,491	30,767
Total	\$ 578,862	\$ 531,727	\$ 467,970
Net premiums written by underwriting location (1)			
United States	\$ 49,800	\$ 11,750	\$ 5,714
Europe	91,635	91,463	50,195
Bermuda	462,740	449,904	457,879
Total	\$ 604,175	\$ 553,117	\$ 513,788

- (1) Other segment results include premiums assumed through intersegment transactions and exclude premiums ceded through intersegment transactions.
(2) Includes professional liability, excess motor, programs and other.
(3) Includes proportional motor and other.
(4) Includes mortgage and other.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

5. Reserve for Losses and Loss Adjustment Expenses

The following table represents an analysis of losses and loss adjustment expenses and a reconciliation of the beginning and ending reserve for losses and loss adjustment expenses:

	Year Ended December 31,		
	2018	2017	2016
Reserve for losses and loss adjustment expenses at beginning of year	\$ 11,383,792	\$ 10,200,960	\$ 9,125,250
Unpaid losses and loss adjustment expenses recoverable	2,464,910	2,083,575	1,828,837
Net reserve for losses and loss adjustment expenses at beginning of year	8,918,882	8,117,385	7,296,413
Net incurred losses and loss adjustment expenses relating to losses occurring in:			
Current year	3,162,818	3,205,428	2,455,563
Prior years	(272,712)	(237,982)	(269,964)
Total net incurred losses and loss adjustment expenses	2,890,106	2,967,446	2,185,599
Net losses and loss adjustment expense reserves of acquired business (1)	—	—	551,096
Retroactive reinsurance transaction (2)	(420,404)	—	—
Foreign exchange (gains) losses	(143,414)	186,963	(102,367)
Net paid losses and loss adjustment expenses relating to losses occurring in:			
Current year	(524,048)	(505,424)	(445,700)
Prior years	(1,682,116)	(1,847,488)	(1,367,656)
Total net paid losses and loss adjustment expenses	(2,206,164)	(2,352,912)	(1,813,356)
Net reserve for losses and loss adjustment expenses at end of year	9,039,006	8,918,882	8,117,385
Unpaid losses and loss adjustment expenses recoverable	2,814,291	2,464,910	2,083,575
Reserve for losses and loss adjustment expenses at end of year	<u>\$ 11,853,297</u>	<u>\$ 11,383,792</u>	<u>\$ 10,200,960</u>

- (1) The 2016 amount related to the acquisition of UGC.
- (2) During the 2018 second quarter, a subsidiary of the Company entered into a retroactive reinsurance transaction with a third party reinsurer to reinsure runoff liabilities associated with certain discontinued U.S. specialty casualty and program exposures.

2018 Prior Year Reserve Development

During 2018, the Company recorded estimated net favorable development on prior year loss reserves of \$272.7 million, which consisted of \$138.5 million from the reinsurance segment, \$24.4 million from the insurance segment, \$107.6 million from the mortgage segment and \$2.2 million from the 'other' segment.

The reinsurance segment's net favorable development of \$138.5 million, or 11.0 points of net earned premium, consisted of \$110.4 million from short-tailed lines and \$28.1 million of net favorable development from medium-tailed and long-tailed lines. Favorable development in short-tailed lines included \$80.8 million from property catastrophe and property other than property catastrophe reserves, primarily from the 2008 to 2017 underwriting years (i.e., losses attributable to contracts having an inception or renewal date within the given twelve-month period). The net reduction of loss estimates for the reinsurance segment's short-tailed lines primarily resulted from varying levels of reported and paid claims activity than previously

anticipated which led to decreases in certain loss ratio selections during 2018. Net favorable development of \$28.1 million in medium-tailed and long-tailed lines included reductions in casualty reserves of \$12.5 million, primarily from the 2002 to 2010 underwriting years, and in marine and aviation reserves of \$15.6 million, spread across most underwriting years.

The insurance segment's net favorable development of \$24.4 million, or 1.1 points of net earned premium, consisted of \$48.4 million of net favorable development from short-tailed lines and \$26.3 million of net favorable development from long-tailed lines, partially offset by \$50.3 million of net adverse development from medium-tailed lines. Favorable development in short-tailed lines predominantly consisted of \$50.1 million of net favorable development in property lines, primarily from the 2010 to 2017 accident years (i.e., the year in which a loss occurred), partially offset by \$5.0 million of adverse development on travel, accident and health business from the 2013 to 2017 accident years. Net favorable development in long-tailed lines of \$26.3 million included \$19.7 million of net favorable development on executive

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

assurance business, primarily from the 2015 accident year, and \$1.4 million of net favorable development in casualty business, primarily from the 2009 to 2015 accident years. Net adverse development in medium tailed lines of \$50.3 million was primarily due to net adverse development in contract binding business for accident years 2013 to 2017.

The mortgage segment's net favorable development of \$107.6 million, or 9.1 points of net earned premium, included \$103.4 million of favorable development on U.S. primary mortgage business. Such development was primarily driven by lower than expected claim emergence across most origination years and also reflected \$26.3 million related to second lien and other portfolios, primarily due to subrogation recoveries.

2017 Prior Year Reserve Development

During 2017, the Company recorded estimated net favorable development on prior year loss reserves of \$238.0 million, which consisted of \$165.4 million from the reinsurance segment, \$8.6 million from the insurance segment and \$95.0 million from the mortgage segment, less adverse development of \$31.0 million from the 'other' segment.

The reinsurance segment's net favorable development of \$165.4 million, or 14.5 points of net earned premium, consisted of \$101.0 million from short-tailed lines and \$64.4 million of net favorable development from medium-tailed and long-tailed lines. Favorable development in short-tailed lines included \$82.6 million from property catastrophe and property other than property catastrophe reserves, primarily from the 2009 to 2016 underwriting years. The net reduction of loss estimates for the reinsurance segment's short-tailed lines primarily resulted from varying levels of reported and paid claims activity than previously anticipated which led to decreases in certain loss ratio selections during 2017. Net favorable development of \$64.4 million in medium-tailed and long-tailed lines included reductions in casualty reserves of \$43.7 million, primarily from the 2002 to 2013 underwriting years, and in marine and aviation reserves of \$19.6 million, spread across most underwriting years.

The insurance segment's net favorable development of \$8.6 million, or 4.0 points of net earned premium, consisted of \$14.9 million of net favorable development from short-tailed lines and \$11.8 million of net favorable development from long-tailed lines, partially offset by \$18.1 million of net adverse development from medium-tailed lines. Favorable development in short-tailed lines predominantly consisted of \$22.8 million of net favorable development in property lines, primarily from the 2011 to 2016 accident years, partially offset by \$11.8 million of adverse development on travel, accident and health business from the 2014 to 2016 accident years. Net favorable development in long-tailed lines of \$11.8 million included \$10.0 million of net favorable development on executive assurance business, primarily from the 2013 accident

year, and \$8.3 million of net favorable development in casualty business, primarily from the 2007 to 2013 accident years. Net adverse development in medium-tailed lines of \$18.1 million included \$56.3 million of net adverse development in program business, primarily from the 2013 to 2015 accident years and primarily driven by a few inactive programs that were non-renewed in 2015 and early in 2016, partially offset by \$36.2 million of net favorable development in professional liability business, primarily from the 2010 to 2016 accident years.

The mortgage segment's net favorable development of \$95.0 million, or 9.0 points of net earned premium, for 2017, included \$89.3 million of favorable development on U.S. primary mortgage business. Such development was primarily driven by lower than expected claim emergence across most origination years and also reflected \$33.8 million related to second lien and other portfolios, primarily due to subrogation recoveries.

2016 Prior Year Reserve Development

During 2016, the Company recorded estimated net favorable development on prior year loss reserves of \$270 million, which consisted of \$218.8 million from the reinsurance segment, \$33.1 million from the insurance segment, \$21.2 million from the mortgage segment less adverse development of \$3.1 million from the 'other' segment.

The reinsurance segment's net favorable development of \$218.8 million, or 20.7 points of net earned premium, consisted of \$133.8 million from short-tailed lines and \$85.0 million of net favorable development from medium-tailed and long-tailed lines. Favorable development in short-tailed lines included \$113.6 million from property catastrophe and property other than property catastrophe reserves, primarily from the 2009 to 2015 underwriting years. The net reduction of loss estimates for the reinsurance segment's short-tailed lines primarily resulted from varying levels of reported and paid claims activity than previously anticipated which led to decreases in certain loss ratio selections during 2016. Net favorable development of \$85.0 million in medium-tailed and long-tailed lines included reductions in casualty reserves of \$86.1 million, primarily from the 2002 to 2013 underwriting years.

The insurance segment's net favorable development of \$33.1 million, or 1.6 points of net earned premium, consisted of \$8.7 million of net favorable development from short-tailed lines and \$24.4 million of net favorable development from medium-tailed and long-tailed lines. Favorable development in short-tailed lines predominantly consisted of \$17.2 million of net favorable development in property lines, primarily from the 2008 to 2014 accident years, partially offset by \$11.1 million of adverse development on travel, accident and health business from the 2012 to 2015 accident years. Net favorable development in medium-tailed and long-tailed lines of \$24.4 million included \$53.8 million of net favorable development on professional lines, primarily from the 2008 to 2012 accident

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

years, partially offset by \$33.1 million of net adverse development in program business, primarily from the 2013 to 2015 accident years. The adverse development in program business was primarily driven by a few inactive programs that were non-renewed in 2015 and early in 2016.

The mortgage segment’s net favorable development of \$21.2 million, or 7.4 points of net earned premium, for 2016, included \$18.5 million of favorable development on U.S. primary mortgage business, reflecting a decrease in the number of delinquent loans and a lower claim rate on such loans. Such development was primarily from the 2004 to 2008 and 2014 origination years. The mortgage segment also experienced net favorable development of \$2.7 million on U.S. mortgage reinsurance business.

6. Short Duration Contracts

The Company’s reserves for losses and loss adjustment expenses primarily relate to short-duration contracts with various characteristics (e.g., type of coverage, geography, claims duration). The Company considered such information in determining the level of disaggregation for disclosures related to its short-duration contracts, as detailed in the table below:

Reportable segment	Level of disaggregation	Included lines of business
Insurance	Property energy, marine and aviation	Property energy, marine and aviation
	Third party occurrence business	Excess and surplus casualty (excluding contract binding); construction and national accounts; and other (including alternative market risks, excess workers’ compensation and employer’s liability insurance coverages)
	Third party claims-made business	Professional lines
	Multi-line and other specialty	Programs; contract binding (part of excess and surplus casualty); travel, accident and health; lenders products; and other (contract and commercial surety coverages)
Reinsurance	Casualty	Casualty
	Property catastrophe	Property catastrophe
	Property excluding property catastrophe	Property excluding property catastrophe
	Marine and aviation	Marine and aviation
	Other specialty	Other specialty
Mortgage	Direct mortgage insurance in the U.S.	Mortgage insurance on U.S. primary exposures

The Company determined the following to be insignificant for disclosure purposes: (i) amounts included in the ‘other’ segment (i.e., Watford Re) as described in note 11, “Variable Interest

Entity and Noncontrolling Interests”; (ii) certain mortgage business, including non-U.S. primary business, second lien and student loan exposures, global mortgage reinsurance and participation in various GSE credit risk-sharing products; and (iii) certain reinsurance business, including casualty clash and non-traditional lines. Such amounts are included as reconciling items.

The Company is required to establish reserves for losses and loss adjustment expenses (“Loss Reserves”) that arise from the business the Company underwrites. Loss Reserves for the insurance, reinsurance and mortgage segments represent estimates of future amounts required to pay losses and loss adjustment expenses for insured or reinsured events which have occurred at or before the balance sheet date. Loss Reserves do not reflect contingency reserve allowances to account for future loss occurrences. Losses arising from future events will be estimated and recognized at the time the losses are incurred and could be substantial.

Insurance Segment

Loss Reserves for the insurance segment are comprised of (1) estimated amounts for (1) reported losses (“case reserves”) and (2) incurred but not reported losses (“IBNR reserves”). Generally, claims personnel determine whether to establish a case reserve for the estimated amount of the ultimate settlement of individual claims. The estimate reflects the judgment of claims personnel based on general corporate reserving practices, the experience and knowledge of such personnel regarding the nature and value of the specific type of claim and, where appropriate, advice of counsel. The Company also contracts with a number of outside third party administrators in the claims process who, in certain cases, have limited authority to establish case reserves. The work of such administrators is reviewed and monitored by our claims personnel. Loss Reserves are also established to provide for loss adjustment expenses and represent the estimated expense of settling claims, including legal and other fees and the general expenses of administering the claims adjustment process. Periodically, adjustments to the case reserves may be made as additional information is reported or payments are made. IBNR reserves are established to provide for incurred claims which have not yet been reported at the balance sheet date as well as to adjust for any projected variance in case reserving. Actuaries estimate ultimate losses and loss adjustment expenses using various generally accepted actuarial methods applied to known losses and other relevant information. Like case reserves, IBNR reserves are adjusted as additional information becomes known or payments are made. The process of estimating reserves involves a considerable degree of judgment by management and, as of any given date, is inherently uncertain.

Ultimate losses and loss adjustment expenses are generally determined by extrapolation of claim emergence and settlement patterns observed in the past that can reasonably be expected

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

to persist into the future. In forecasting ultimate losses and loss adjustment expenses with respect to any line of business, past experience with respect to that line of business is the primary resource, developed through both industry and company experience, but cannot be relied upon in isolation. Uncertainties in estimating ultimate losses and loss adjustment expenses are magnified by the length of the time lag between when a claim actually occurs and when it is reported and settled. This time lag is sometimes referred to as the “claim-tail.” During this period additional facts regarding coverages written in prior accident years, as well as about actual claims and trends, may become known and, as a result, may lead to adjustments of the related Loss Reserves. If the Company determines that an adjustment is appropriate, the adjustment is recorded in the accounting period in which such determination is made. Accordingly, should Loss Reserves need to be increased or decreased in the future from amounts currently established, future results of operations would be negatively or positively impacted respectively. The Company authorizes managing general agents, general agents and other producers to write program business on the Company’s behalf within prescribed underwriting authorities. This delegated authority process introduces additional complexity to the actuarial determination of unpaid future losses and loss adjustment expenses. In order to monitor adherence to the underwriting guidelines given to such parties, the Company periodically performs underwriting and claims due diligence reviews.

In determining ultimate losses and loss adjustment expenses, the cost to indemnify claimants, provide needed legal defense and other services for insureds and administer the investigation and adjustment of claims are considered. These claim costs are influenced by many factors that change over time, such as expanded coverage definitions as a result of new court decisions, inflation in costs to repair or replace damaged property, inflation in the cost of medical services and legislated changes in statutory benefits, as well as by the particular, unique facts that pertain to each claim. As a result, the rate at which claims arose in the past and the costs to settle them may not always be representative of what will occur in the future. The factors influencing changes in claim costs are often difficult to isolate or quantify and developments in paid and incurred losses from historical trends are frequently subject to multiple and conflicting interpretations. Changes in coverage terms or claims handling practices may also cause future experience and/or development patterns to vary from the past. A key objective of actuaries in developing estimates of ultimate losses and loss adjustment expenses, and resulting IBNR reserves, is to identify aberrations and systemic changes occurring within historical experience and adjust for them so that the future can be projected more reliably. Because of the factors previously discussed, this process requires the substantial use of informed judgment and is inherently uncertain.

Although Loss Reserves are initially determined based on underwriting and pricing analyses, the Company’s insurance

segment applies several generally accepted actuarial methods, as discussed below, on a quarterly basis to evaluate the Loss Reserves, in addition to the expected loss method, in particular for Loss Reserves from more mature accident years (the year in which a loss occurred). Each quarter, as part of the reserving process, the segments’ actuaries reaffirm that the assumptions used in the reserving process continue to form a sound basis for the projection of liabilities. If actual loss activity differs substantially from expectations based on historical information, an adjustment to Loss Reserves may be supported. The Company places more or less reliance on a particular actuarial method based on the facts and circumstances at the time the estimates of Loss Reserves are made.

These methods generally fall into one of the following categories or are hybrids of one or more of the following categories:

- *Expected loss methods* - these methods are based on the assumption that ultimate losses vary proportionately with premiums. Expected loss and loss adjustment expense ratios are typically developed based upon the information derived by underwriters and actuaries during the initial pricing of the business, supplemented by industry data available from organizations, such as statistical bureaus and consulting firms, where appropriate. These ratios consider, among other things, rate increases and changes in terms and conditions that have been observed in the market. Expected loss methods are useful for estimating ultimate losses and loss adjustment expenses in the early years of long-tailed lines of business, when little or no paid or incurred loss information is available, and is commonly applied when limited loss experience exists for a company.
- *Historical incurred loss development methods* - these methods assume that the ratio of losses in one period to losses in an earlier period will remain constant in the future. These methods use incurred losses (*i.e.*, the sum of cumulative historical loss payments plus outstanding case reserves) over discrete periods of time to estimate future losses. Historical incurred loss development methods may be preferable to historical paid loss development methods because they explicitly take into account open cases and the claims adjusters’ evaluations of the cost to settle all known claims. However, historical incurred loss development methods necessarily assume that case reserving practices are consistently applied over time. Therefore, when there have been significant changes in how case reserves are established, using incurred loss data to project ultimate losses may be less reliable than other methods.
- *Historical paid loss development methods* - these methods, like historical incurred loss development methods, assume that the ratio of losses in one period to losses in an earlier period will remain constant. These methods use historical

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

loss payments over discrete periods of time to estimate future losses and necessarily assume that factors that have affected paid losses in the past, such as inflation or the effects of litigation, will remain constant in the future. Because historical paid loss development methods do not use incurred losses to estimate ultimate losses, they may be more reliable than the other methods that use incurred losses in situations where there are significant changes in how incurred losses are established by a company's claims adjusters. However, historical paid loss development methods are more leveraged (meaning that small changes in payments have a larger impact on estimates of ultimate losses) than actuarial methods that use incurred losses because cumulative loss payments take much longer to equal the expected ultimate losses than cumulative incurred amounts. In addition, and for similar reasons, historical paid loss development methods are often slow to react to situations when new or different factors arise than those that have affected paid losses in the past.

- *Adjusted historical paid and incurred loss development methods* - these methods take traditional historical paid and incurred loss development methods and adjust them for the estimated impact of changes from the past in factors such as inflation, the speed of claim payments or the adequacy of case reserves. Adjusted historical paid and incurred loss development methods are often more reliable methods of predicting ultimate losses in periods of significant change, provided the actuaries can develop methods to reasonably quantify the impact of changes. As such, these methods utilize more judgment than historical paid and incurred loss development methods.
- *Bornhuetter-Ferguson ("B-F") paid and incurred loss methods* - these methods utilize actual paid and incurred losses and expected patterns of paid and incurred losses, taking the initial expected ultimate losses into account to determine an estimate of expected ultimate losses. The B-F paid and incurred loss methods are useful when there are few reported claims and a relatively less stable pattern of reported losses.
- *Frequency-Severity methods* - These methods utilize actual paid and incurred claim experience, but break the data down into its component pieces: claim counts, often expressed as a ratio to exposure or premium (frequency), and average claim size (severity). The component pieces are projected to an ultimate level and multiplied together to result in an estimate of ultimate loss. These methods are especially useful when the severity of claims can be confined to a relatively stable range of estimated ultimate average claim value.
- *Additional analyses* - other methodologies are often used in the reserving process for specific types of claims or events, such as catastrophic or other specific major events.

These include vendor catastrophe models, which are typically used in the estimation of Loss Reserves at the early stage of known catastrophic events before information has been reported to an insurer or reinsurer.

In the initial reserving process for short-tail insurance lines (consisting of property, energy, marine and aviation and other exposures including travel, accident and health and lenders products), the Company relies on a combination of the reserving methods discussed above. For catastrophe-exposed business, the reserving process also includes the usage of catastrophe models for known events and a heavy reliance on analysis of individual catastrophic events and management judgment. The development of losses on short-tail business can be unstable, especially for policies characterized by high severity, low frequency losses. As time passes, for a given accident year, additional weight is given to the paid and incurred B-F loss development methods and historical paid and incurred loss development methods in the reserving process. The Company makes a number of key assumptions in their reserving process, including that historical paid and reported development patterns are stable, catastrophe models provide useful information about our exposure to catastrophic events that have occurred and underwriters' judgment as to potential loss exposures can be relied on. The expected loss ratios used in the initial reserving process for short-tail business have varied over time due to changes in pricing, reinsurance structure, estimates of catastrophe losses, policy changes (such as attachment points, class and limits) and geographical distribution. As losses in short-tail lines are reported relatively quickly, expected loss ratios are selected for the current accident year based upon actual attritional loss ratios for earlier accident years, adjusted for rate changes, inflation, changes in reinsurance programs and expected attritional losses based on modeling. Furthermore, ultimate losses for short-tail business are known in a reasonably short period of time.

In the initial reserving process for medium-tail and long-tail insurance lines (consisting of third party occurrence business, third party claims made business, and other exposures including surety, programs and contract binding exposures), the Company primarily relies on the expected loss method. The development of the Company's medium-tail and long-tail business may be unstable, especially if there are high severity major events, as a portion of the Company's casualty business is in high excess layers. As time passes, for a given accident year, additional weight is given to the paid and incurred B-F loss development methods and historical paid and incurred loss development methods in the reserving process. The Company makes a number of key assumptions in reserving for medium-tail and long-tail lines, including that the pricing loss ratio is the best estimate of the ultimate loss ratio at the time the policy is entered into, that the loss development patterns, which are based on a combination of company and industry loss development patterns and adjusted to reflect differences in the insurance segment's mix of business, are reasonable and that claims

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

personnel and underwriters analyses of our exposure to major events are assumed to be the best estimate of exposure to the known claims on those events. The expected loss ratios used in the initial reserving process for medium-tail and long-tail business for recent accident years have varied over time, in some cases significantly, from earlier accident years. As the credibility of historical experience for earlier accident years increases, the experience from these accident years will be given a greater weighting in the actuarial analysis to determine future accident year expected loss ratios, adjusted for changes in pricing, loss trends, terms and conditions and reinsurance structure.

In 2018, the Company entered into a loss portfolio transfer and adverse development cover reinsurance agreement accounted

for as retroactive reinsurance. The agreement transfers Loss Reserves and future favorable or adverse development on certain runoff programs, within multi-line and other specialty business, and certain third party occurrence business (the "Covered Lines"). As incurred losses and allocated loss adjustment expenses for the Covered Lines are ceded to the reinsurer, the Company is not exposed to changes in the amount, timing and uncertainty of cash flows arising from the Covered Lines. To avoid distortion, the incurred losses and allocated loss adjustment expenses and cumulative paid losses and loss adjustment expenses for the Covered Lines are excluded entirely from the tables below. Reinsurance recoverables at December 31, 2018 included \$245.8 million related to this reinsurance agreement.

The following tables present information on the insurance segment's short-duration insurance contracts:

Property, energy, marine and aviation (\$000's except claim count)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018	
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2009	\$ 256,308	\$ 259,695	\$ 231,277	\$ 220,007	\$ 205,570	\$ 199,259	\$ 197,398	\$ 191,934	\$ 190,815	\$ 191,430	\$ 1,896	3,617
2010		199,725	188,449	152,342	139,993	128,691	129,073	127,613	125,994	121,159	1,187	3,658
2011			267,016	268,029	227,170	215,580	206,981	205,514	200,923	199,600	1,064	4,197
2012				233,398	232,368	204,923	198,444	196,362	192,392	189,123	3,038	4,232
2013					158,214	155,401	147,450	141,199	134,675	132,242	2,101	4,231
2014						146,228	142,896	146,643	136,286	130,725	12,868	3,861
2015							111,020	109,172	104,024	101,404	11,507	4,493
2016								103,983	100,986	104,430	3,143	6,048
2017									281,004	244,784	43,281	6,048
2018										179,457	63,437	2,453
										Total	\$1,594,354	

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance												
2009	\$ 38,430	\$ 116,140	\$ 143,156	\$ 159,430	\$ 168,721	\$ 173,141	\$ 177,202	\$ 177,557	\$ 178,153	\$ 178,816		
2010		28,470	65,689	87,437	105,803	110,903	117,956	120,030	119,447	119,647		
2011			34,222	98,480	139,979	165,281	195,151	200,052	197,717	197,059		
2012				21,235	92,911	137,629	160,380	166,953	179,355	179,677		
2013					31,859	83,773	109,358	117,958	121,936	123,975		
2014						25,624	52,438	77,201	84,124	86,911		
2015							23,243	64,417	76,325	85,370		
2016								24,645	83,326	97,569		
2017									30,227	138,955		
2018										29,765		
										Total	1,237,744	
										All outstanding liabilities before 2009, net of reinsurance	25,620	
										Liabilities for losses and loss adjustment expenses, net of reinsurance	\$ 382,230	

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Third party occurrence business (\$000's except claim count)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018	
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2009	\$ 236,168	\$ 230,643	\$ 231,947	\$ 230,981	\$ 233,823	\$ 234,449	\$ 226,929	\$ 220,739	\$ 221,298	\$ 214,940	\$ 35,059	50,361
2010		217,459	235,309	230,792	230,981	233,286	229,618	223,647	215,530	218,487	37,599	62,652
2011			233,987	240,485	253,710	258,474	252,332	253,648	246,976	239,499	49,925	71,018
2012				240,924	262,370	267,990	270,539	257,111	252,732	242,775	70,595	65,720
2013					282,525	296,459	306,378	301,807	281,768	274,189	90,607	66,918
2014						329,379	335,231	338,647	342,858	339,216	127,656	75,322
2015							358,461	391,762	398,676	391,552	184,313	77,072
2016								389,672	394,281	405,637	237,966	76,270
2017									417,190	417,495	306,585	80,606
2018										429,713	377,969	57,688
										Total	\$3,173,503	

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance												
2009	\$ 5,618	\$ 20,162	\$ 43,727	\$ 71,986	\$ 103,601	\$ 126,824	\$ 142,359	\$ 149,370	\$ 156,787	\$ 159,642		
2010		6,755	25,517	45,594	72,740	102,440	117,316	132,833	142,570	148,251		
2011			7,009	25,165	43,303	73,280	113,302	134,321	152,699	160,451		
2012				6,964	30,805	58,402	83,133	107,982	129,519	143,045		
2013					6,837	29,207	71,321	101,170	122,103	149,012		
2014						9,206	40,206	71,497	112,578	161,863		
2015							11,110	44,532	88,436	139,332		
2016								11,686	41,934	87,479		
2017									13,395	52,299		
2018										16,998		
										Total	1,218,372	
											All outstanding liabilities before 2009, net of reinsurance	134,229
											Liabilities for losses and loss adjustment expenses, net of reinsurance	\$2,089,360

Third party claims-made business (\$000's except claim count)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018	
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2009	\$ 284,308	\$ 318,554	\$ 308,848	\$ 307,365	\$ 304,122	\$ 304,228	\$ 307,528	\$ 303,793	\$ 301,909	\$ 288,185	\$ 8,073	10,907
2010		285,454	311,585	333,227	338,993	331,922	315,420	298,917	287,825	285,174	11,252	12,335
2011			282,888	325,151	316,424	311,114	316,658	296,106	288,319	285,912	24,770	11,759
2012				310,964	313,827	312,282	307,500	283,928	275,654	273,280	27,916	14,752
2013					295,986	313,670	317,289	314,551	294,754	287,299	58,923	14,529
2014						260,667	276,056	295,274	278,840	278,644	50,437	13,925
2015							255,994	274,602	276,446	256,863	94,539	13,480
2016								272,732	291,430	305,253	111,019	15,212
2017									270,555	283,410	161,218	15,820
2018										270,203	213,449	10,653
										Total	\$2,814,223	

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance												
2009	\$ 11,398	\$ 55,601	\$ 108,303	\$ 149,913	\$ 187,293	\$ 202,236	\$ 236,185	\$ 245,717	\$ 250,438	\$ 246,953		
2010		13,989	71,011	128,259	163,239	198,511	214,886	229,400	238,885	244,411		
2011			13,596	71,342	128,471	171,963	205,140	224,456	240,552	250,972		
2012				17,429	67,651	118,536	161,244	184,604	209,376	223,843		
2013					18,613	85,408	134,802	174,900	198,156	214,411		
2014						13,609	62,576	127,969	172,963	205,739		
2015							8,879	51,389	100,147	125,258		
2016								10,470	68,218	126,371		
2017									9,294	67,003		
2018										12,180		
										Total	1,717,141	
											All outstanding liabilities before 2009, net of reinsurance	105,520
											Liabilities for losses and loss adjustment expenses, net of reinsurance	\$1,202,602

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Multi-line and other specialty (\$000's except claim count)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018	
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2009	\$ 207,671	\$ 216,268	\$ 212,738	\$ 206,057	\$ 196,062	\$ 195,157	\$ 191,653	\$ 189,457	\$ 185,080	\$ 183,117	\$ 2,292	33,724
2010		172,583	175,942	168,860	166,643	158,000	154,763	153,686	154,092	152,170	3,136	37,930
2011			182,683	188,262	182,385	176,000	172,276	171,842	168,913	169,996	4,482	44,942
2012				252,627	263,530	257,574	255,343	254,051	247,042	246,754	8,102	55,738
2013					274,555	282,436	273,565	280,049	271,695	274,710	12,404	72,296
2014						348,683	372,406	368,613	387,171	397,410	25,654	111,115
2015							397,204	417,353	420,775	442,386	43,362	132,517
2016								480,501	504,857	513,112	76,648	175,923
2017									551,920	577,626	142,735	213,874
2018										568,410	278,704	157,528
										Total	\$3,525,691	

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance												
2009	\$ 62,166	\$ 114,262	\$ 143,199	\$ 154,804	\$ 160,203	\$ 177,192	\$ 178,028	\$ 179,659	\$ 179,796	\$ 177,413		
2010		49,804	91,013	110,927	125,726	135,835	140,359	143,614	146,846	146,709		
2011			51,179	102,988	117,513	136,253	147,769	151,235	157,224	159,196		
2012				78,217	165,429	189,464	208,620	221,842	231,778	232,503		
2013					86,560	152,201	184,835	220,543	237,916	251,061		
2014						108,939	204,999	253,533	306,518	340,771		
2015							141,335	249,330	304,338	349,949		
2016								180,017	323,950	381,291		
2017									187,760	361,761		
2018										213,723		
										Total	2,614,377	
										All outstanding liabilities before 2009, net of reinsurance	21,825	
										Liabilities for losses and loss adjustment expenses, net of reinsurance	\$ 933,139	

The following table presents the average annual percentage payout of incurred losses and allocated loss adjustment expenses by age, net of reinsurance, as of December 31, 2018:

	Average annual percentage payout of incurred losses and allocated loss adjustment expenses by age, net of reinsurance										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Property, energy, marine and aviation	19.1%	38.0%	17.5%	9.9%	5.4%	3.7%	0.7%	(0.2)%	0.2%	0.3 %	
Third party occurrence business	3.0%	8.4%	10.8%	12.0%	12.9%	9.0%	6.9%	3.7 %	3.0%	1.3 %	
Third party claims-made business	4.6%	19.0%	19.5%	13.9%	10.9%	6.5%	6.9%	3.4 %	1.8%	(1.2)%	
Multi-line and other specialty	32.5%	28.0%	11.9%	10.2%	6.1%	4.6%	1.6%	1.4 %	—	(1.3)%	

Reinsurance Segment

Loss Reserves for the Company's reinsurance segment are comprised of (1) case reserves, (2) additional case reserves ("ACRs") and (3) IBNR reserves. The Company receives reports of claims notices from ceding companies and records case reserves based upon the amount of reserves recommended by the ceding company. Case reserves may be supplemented by ACRs, which may be estimated by the Company's claims personnel ahead of official notification from the ceding company, or when judgment regarding the size or severity of the known event differs from the ceding company. In certain instances, the Company establishes ACRs even when the ceding company does not report any liability on a known event. In addition, specific claim information reported by ceding companies or obtained through claim audits can alert the Company to emerging trends such as changing legal interpretations of coverage and liability, claims from unexpected sources or classes of business, and significant changes in the frequency or severity of individual claims. Such information is often used in the process of estimating IBNR

reserves. IBNR reserves are established to provide for incurred claims which have not yet been reported at the balance sheet date as well as to adjust for any projected variance in case reserving. Actuaries estimate ultimate losses and loss adjustment expenses using various generally accepted actuarial methods applied to known losses and other relevant information. Like case reserves, IBNR reserves are adjusted as additional information becomes known or payments are made. The process of estimating Loss Reserves involves a considerable degree of judgment by management and, as of any given date, is inherently uncertain.

The estimation of Loss Reserves for the reinsurance segment is subject to the same risk factors as the estimation of Loss Reserves for the insurance segment. In addition, the inherent uncertainties of estimating such reserves are even greater for reinsurers, due primarily to the following factors: (1) the claim-tail for reinsurers is generally longer because claims are first reported to the ceding company and then to the reinsurer through one or more intermediaries, (2) the reliance on premium estimates, where reports have not been received from the ceding

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

company, in the reserving process, (3) the potential for writing a number of reinsurance contracts with different ceding companies with the same exposure to a single loss event, (4) the diversity of loss development patterns among different types of reinsurance contracts, (5) the necessary reliance on the ceding companies for information regarding reported claims and (6) the differing reserving practices among ceding companies.

As with the insurance segment, the process of estimating Loss Reserves for the reinsurance segment involves a considerable degree of judgment by management and, as of any given date, is inherently uncertain. As discussed above, such uncertainty is greater for reinsurers compared to insurers. As a result, our reinsurance operations obtain information from numerous sources to assist in the process. Pricing actuaries from the reinsurance segment devote considerable effort to understanding and analyzing a ceding company's operations and loss history during the underwriting of the business, using a combination of ceding company and industry statistics. Such statistics normally include historical premium and loss data by class of business, individual claim information for larger claims, distributions of insurance limits provided, loss reporting and payment patterns, and rate change history. This analysis is used to project expected loss ratios for each treaty during the upcoming contract period.

As mentioned above, there can be a considerable time lag from the time a claim is reported to a ceding company to the time it is reported to the reinsurer. The lag can be several years in some cases and may be attributed to a number of reasons, including the time it takes to investigate a claim, delays associated with the litigation process, the deterioration in a claimant's physical condition many years after an accident occurs, the case reserving approach of the ceding company, etc. In the reserving process, the Company assumes that such lags are predictable, on average, over time and therefore the lags are contemplated in the loss reporting patterns used in their actuarial methods. This means that the reinsurance segment must rely on estimates for a longer period of time than does an insurance company. Backlogs in the recording of assumed reinsurance can also complicate the accuracy of loss reserve estimation. As of December 31, 2018 there were no significant backlogs related to the processing of assumed reinsurance information at our reinsurance operations.

The reinsurance segment relies heavily on information reported by ceding companies, as discussed above. In order to determine the accuracy and completeness of such information, underwriters, actuaries, and claims personnel often perform audits of ceding companies and regularly review information received from ceding companies for unusual or unexpected results. Material findings are usually discussed with the ceding companies. The Company sometimes encounters situations where they determine that a claim presentation from a ceding company is not in accordance with contract terms. In these

situations, the Company attempts to resolve the dispute with the ceding company. Most situations are resolved amicably and without the need for litigation or arbitration. However, in the infrequent situations where a resolution is not possible, the Company will vigorously defend its position in such disputes.

Although Loss Reserves are initially determined based on underwriting and pricing analysis, the Company applies several generally accepted actuarial methods, as discussed above, on a quarterly basis to evaluate its Loss Reserves in addition to the expected loss method, in particular for reserves from more mature underwriting years (the year in which business is underwritten). Each quarter, as part of the reserving process, the Company's actuaries reaffirm that the assumptions used in the reserving process continue to form a sound basis for projection of liabilities. If actual loss activity differs substantially from expectations based on historical information, an adjustment to Loss Reserves may be supported. Estimated Loss Reserves for more mature underwriting years are now based more on actual loss activity and historical patterns than on the initial assumptions based on pricing indications. More recent underwriting years rely more heavily on internal pricing assumptions. The Company places more or less reliance on a particular actuarial method based on the facts and circumstances at the time the estimates of Loss Reserves are made.

In the initial reserving process for short-tail reinsurance lines (consisting of property excluding property catastrophe and property catastrophe exposures), the Company relies on a combination of the reserving methods discussed above. For known catastrophic events, the reserving process also includes the usage of catastrophe models and a heavy reliance on analysis which includes ceding company inquiries and management judgment. The development of property losses may be unstable, especially where there is high catastrophic exposure, may be characterized by high severity, low frequency losses for excess and catastrophe-exposed business and may be highly correlated across contracts. As time passes, for a given underwriting year, additional weight is given to the paid and incurred B-F loss development methods and historical paid and incurred loss development methods in the reserving process. The Company makes a number of key assumptions in reserving for short-tail lines, including that historical paid and reported development patterns are stable, catastrophe models provide useful information about our exposure to catastrophic events that have occurred and our underwriters' judgment and guidance received from ceding companies as to potential loss exposures may be relied on. The expected loss ratios used in the initial reserving process for property exposures have varied over time due to changes in pricing, reinsurance structure, estimates of catastrophe losses, terms and conditions and geographical distribution. As losses in property lines are reported relatively quickly, expected loss ratios are selected for the current underwriting year incorporating the experience for earlier underwriting years, adjusted for rate changes, inflation, changes

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

in reinsurance programs, expectations about present and future market conditions and expected attritional losses based on modeling. Due to the short-tail nature of property business, reported loss experience emerges quickly and ultimate losses are known in a reasonably short period of time.

In the initial reserving process for medium-tail and long-tail reinsurance lines (consisting of casualty, other specialty, marine and aviation and other exposures), the Company primarily relies on the expected loss method. The development of medium-tail and long-tail business may be unstable, especially if there are high severity major events, with business written on an excess of loss basis typically having a longer tail than business written on a pro rata basis. As time passes, for a given underwriting year, additional weight is given to the paid and incurred B-F loss development methods and historical paid and incurred loss development methods in the reserving process. Our reinsurance operations make a number of key assumptions in reserving for

medium-tail and long-tail lines, including that the pricing loss ratio is the best estimate of the ultimate loss ratio at the time the contract is entered into, historical paid and reported development patterns are stable and claims personnel and underwriters analyses of our exposure to major events are assumed to be our best estimate of our exposure to the known claims on those events. The expected loss ratios used in our reinsurance operations' initial reserving process for medium-tail and long-tail contracts have varied over time due to changes in pricing, terms and conditions and reinsurance structure. As the credibility of historical experience for earlier underwriting years increases, the experience from these underwriting years will be used in the actuarial analysis to determine future underwriting year expected loss ratios, adjusted for changes in pricing, loss trends, terms and conditions and reinsurance structure.

The following tables present information on the reinsurance segment's short-duration insurance contracts:

Casualty (\$000's)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018		
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims	
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018			
2009	\$ 264,480		\$ 302,754	\$ 282,973	\$ 278,150	\$ 267,531	\$ 251,072	\$ 236,678	\$ 233,385	\$ 229,352	\$	23,066	N/A
2010		\$ 284,826	\$ 196,680	\$ 199,759	\$ 191,255	\$ 180,620	\$ 169,558	\$ 163,692	\$ 159,617	\$ 153,833		28,667	N/A
2011			\$ 152,868	\$ 156,477	\$ 150,389	\$ 145,464	\$ 141,168	\$ 138,025	\$ 131,996	\$ 129,198		27,389	N/A
2012				\$ 146,883	\$ 144,812	\$ 140,684	\$ 128,804	\$ 118,515	\$ 112,924	\$ 121,523		35,014	N/A
2013					\$ 168,454	\$ 161,653	\$ 157,664	\$ 151,365	\$ 139,105	\$ 137,497		46,862	N/A
2014						\$ 217,119	\$ 222,346	\$ 219,445	\$ 232,855	\$ 229,403		59,924	N/A
2015							\$ 221,440	\$ 220,485	\$ 228,753	\$ 235,910		74,096	N/A
2016								\$ 212,415	\$ 225,043	\$ 247,457		90,163	N/A
2017									\$ 262,678	\$ 249,862		100,635	N/A
2018										\$ 275,614		232,788	N/A
										Total	\$2,009,649		

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance													
2009	\$ 3,239	\$ 19,340	\$ 46,999	\$ 73,749	\$ 105,497	\$ 134,997	\$ 149,179	\$ 159,636	\$ 169,140	\$ 176,526			
2010		2,180	21,441	39,111	54,296	72,570	83,198	94,225	102,156	110,752			
2011			2,313	11,945	22,654	39,982	56,246	65,948	73,075	78,356			
2012				1,329	8,827	15,600	27,018	38,493	50,045	61,845			
2013					2,525	10,146	23,712	44,315	56,084	64,778			
2014						3,963	16,171	41,141	64,055	91,670			
2015							4,467	20,285	47,155	70,895			
2016								5,705	25,677	51,653			
2017									6,428	29,376			
2018										7,582			
										Total	743,433		
											All outstanding liabilities before 2009, net of reinsurance	271,596	
											Liabilities for losses and loss adjustment expenses, net of reinsurance	<u>\$1,537,812</u>	

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Property catastrophe (\$000's)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018		
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims	
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018			
2009	\$ 74,406	\$ 32,329	\$ 19,638	\$ 18,130	\$ 16,999	\$ 16,750	\$ 15,814	\$ 15,480	\$ 13,538	\$ 13,690	\$	1	N/A
2010		92,783	47,040	38,740	38,643	42,154	42,552	42,349	42,553	42,367			N/A
2011			203,928	183,818	165,421	152,746	148,913	148,187	145,987	141,909			N/A
2012				150,095	123,138	108,615	102,141	99,915	99,101	97,066		165	N/A
2013					66,815	47,542	36,216	31,735	29,191	28,479		(122)	N/A
2014						44,905	30,625	25,154	22,327	20,586		91	N/A
2015							32,210	16,882	10,603	4,664		465	N/A
2016								22,814	16,233	12,617		1,287	N/A
2017									78,404	45,517		(1,334)	N/A
2018										72,695		8,864	N/A
										Total	\$ 479,590		

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance										
2009	\$ 9,913	\$ 13,192	\$ 14,755	\$ 15,006	\$ 15,034	\$ 15,051	\$ 13,448	\$ 13,445		
2010		8,445	23,340	31,273	37,207	38,388	39,963	41,204	41,258	41,436
2011			59,506	82,096	113,268	127,940	133,416	135,903	137,945	138,333
2012				25,850	70,840	83,852	90,757	92,916	94,045	94,655
2013					12,081	19,070	23,904	25,768	27,542	27,784
2014						13,668	19,851	18,330	19,159	18,751
2015							(3,689)	(3,224)	884	1,148
2016								(7,528)	1,038	1,305
2017									28,736	27,476
2018										25,463
									Total	389,796
									All outstanding liabilities before 2009, net of reinsurance	795
									Liabilities for losses and loss adjustment expenses, net of reinsurance	\$ 90,589

Property excluding property catastrophe (\$000's)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018		
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims	
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018			
2009	\$ 215,898	\$ 193,095	\$ 170,632	\$ 163,862	\$ 163,105	\$ 161,027	\$ 158,150	\$ 148,637	\$ 147,851	\$ 147,699	\$	677	N/A
2010		142,370	128,120	117,896	112,218	110,263	108,137	104,365	101,187	100,407		1,463	N/A
2011			206,299	179,130	166,638	162,988	158,847	157,551	155,295	154,280		3,749	N/A
2012				155,798	121,450	123,595	119,032	114,621	112,406	110,941		3,301	N/A
2013					115,395	76,864	70,525	66,159	64,437	63,660		2,850	N/A
2014						143,078	117,057	98,948	90,699	88,429		5,785	N/A
2015							213,438	188,073	183,747	187,936		14,017	N/A
2016								175,193	144,617	136,710		21,416	N/A
2017									255,485	237,905		27,440	N/A
2018										221,278		80,569	N/A
										Total	\$1,449,245		

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance										
2009	\$ 66,121	\$ 116,563	\$ 133,842	\$ 138,188	\$ 140,019	\$ 142,531	\$ 143,640	\$ 144,448	\$ 145,558	\$ 146,035
2010		37,778	76,414	88,181	93,343	95,533	96,681	97,326	97,756	97,697
2011			47,484	121,037	140,893	145,387	147,439	148,540	148,788	149,060
2012				26,072	77,939	93,151	101,820	102,796	103,432	102,610
2013					25,973	42,704	49,790	52,968	53,767	55,648
2014						23,509	62,797	71,677	76,619	78,260
2015							75,296	118,438	148,889	159,754
2016								33,191	94,313	98,126
2017									25,135	115,914
2018										29,358
									Total	1,032,462
									All outstanding liabilities before 2009, net of reinsurance	4,589
									Liabilities for losses and loss adjustment expenses, net of reinsurance	\$ 421,372

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Marine and aviation (\$000's)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018	
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2009	\$ 49,837	\$ 41,300	\$ 35,522	\$ 33,814	\$ 30,963	\$ 29,720	\$ 28,292	\$ 28,044	\$ 27,092	\$ 26,476	\$ 1,597	N/A
2010		40,974	42,297	38,519	35,425	33,522	31,907	31,157	30,325	28,515	130	N/A
2011			39,322	32,910	35,845	32,402	28,780	27,183	27,244	24,854	2,046	N/A
2012				59,021	58,869	55,030	52,260	51,052	49,693	46,011	5,070	N/A
2013					39,029	37,854	36,807	35,372	35,271	34,526	8,757	N/A
2014						30,982	29,193	27,389	25,687	23,684	7,340	N/A
2015							33,782	37,570	31,780	31,707	6,587	N/A
2016								27,353	22,727	23,545	12,237	N/A
2017									28,738	26,291	13,156	N/A
2018										28,124	20,582	N/A
										Total	\$ 293,733	

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance												
2009	\$ 6,858	\$ 16,189	\$ 19,311	\$ 22,416	\$ 22,491	\$ 22,834	\$ 23,424	\$ 23,911	\$ 24,011	\$ 24,254		
2010		8,523	13,402	16,751	18,478	20,218	26,529	27,176	27,538	27,113		
2011			4,420	12,121	16,528	19,227	15,944	16,617	21,971	21,894		
2012				2,658	11,438	27,527	33,295	35,031	36,227	37,711		
2013					4,940	13,842	18,519	21,505	22,508	23,776		
2014						4,190	8,001	11,592	12,463	14,637		
2015							2	13,420	19,021	20,846		
2016								(7,321)	(1,686)	504		
2017									1,651	6,472		
2018										1,996		
										Total	179,203	
											All outstanding liabilities before 2009, net of reinsurance	16,118
											Liabilities for losses and loss adjustment expenses, net of reinsurance	\$ 130,648

Other specialty (\$000's)

Incurred losses and allocated loss adjustment expenses, net of reinsurance											December 31, 2018	
Accident year	Year ended December 31,										Total of IBNR liabilities plus expected development on reported claims	Cumulative number of reported claims
	2009 unaudited	2010 unaudited	2011 unaudited	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2009	\$ 60,519	\$ 49,729	\$ 44,643	\$ 38,585	\$ 36,475	\$ 34,481	\$ 35,639	\$ 36,080	\$ 37,019	\$ 35,495	\$ 1,301	N/A
2010		43,327	33,029	26,188	23,943	22,945	22,593	22,356	22,117	21,503	1,218	N/A
2011			111,939	96,897	92,835	91,215	89,395	88,033	87,430	85,533	1,622	N/A
2012				220,373	209,461	199,250	193,549	191,472	194,484	192,687	17,581	N/A
2013					250,247	224,173	214,239	210,697	211,767	209,288	22,085	N/A
2014						275,308	256,735	258,643	251,837	246,727	25,557	N/A
2015							210,349	201,875	200,065	197,231	31,932	N/A
2016								222,374	219,923	214,107	37,828	N/A
2017									274,622	264,006	67,191	N/A
2018										331,820	152,632	N/A
										Total	\$1,798,397	

Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance												
2009	\$ 9,243	\$ 27,483	\$ 30,345	\$ 30,215	\$ 30,192	\$ 30,075	\$ 30,557	\$ 31,318	\$ 31,436	\$ 31,429		
2010		4,071	13,501	16,659	17,687	18,472	19,058	19,282	19,900	19,920		
2011			28,762	57,599	69,698	74,285	77,714	79,464	81,681	82,786		
2012				44,904	119,940	142,174	152,998	160,628	164,730	169,057		
2013					56,274	117,679	143,336	159,422	168,992	174,030		
2014						68,953	146,920	182,603	195,817	202,233		
2015							54,806	114,909	138,982	145,929		
2016								64,680	137,654	161,559		
2017									74,500	165,926		
2018										74,300		
										Total	1,227,169	
											All outstanding liabilities before 2009, net of reinsurance	9,100
											Liabilities for losses and loss adjustment expenses, net of reinsurance	\$ 580,328

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table presents the average annual percentage payout of incurred losses and allocated loss adjustment expenses by age, net of reinsurance, as of December 31, 2018:

Average annual percentage payout of incurred losses and allocated loss adjustment expenses by age, net of reinsurance

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Casualty	1.9%	7.6%	10.0%	11.3%	11.4%	8.6%	7.1%	4.6%	4.9 %	3.2%
Property catastrophe	22.9%	28.0%	19.1%	8.4%	2.5%	1.5%	1.3%	0.2%	(5.6)%	—%
Property excluding property catastrophe	29.2%	38.2%	11.3%	5.0%	1.5%	1.4%	0.2%	0.4%	0.3 %	0.3%
Marine and aviation	9.4%	25.4%	16.5%	8.5%	1.5%	6.5%	7.3%	0.9%	(0.6)%	0.9%
Other specialty	26.5%	36.4%	12.3%	4.6%	3.1%	1.8%	1.8%	2.1%	0.2 %	—%

Mortgage Segment

The Company’s mortgage segment includes (1) direct mortgage insurance in the U.S., (2) direct mortgage insurance in Europe, (3) global mortgage reinsurance and (4) participation in various GSE credit risk-sharing products, with the latter three categories along with second lien and student loan exposures excluded on the basis of insignificance for the purposes of presenting disclosures related to short duration contracts.

For direct mortgage insurance business, the Company establishes case reserves for loans that have been reported as delinquent by loan servicers as well as those that are delinquent but not reported (IBNR reserves). The Company’s U.S. mortgage insurance operations also reserve for the expenses of adjusting claims related to these delinquencies. The trigger that creates a case reserve estimate is that an insured loan is reported to us as being two payments in arrears. The actuarial reviews and documentation created in the reserving process are completed in accordance with generally accepted actuarial standards. The selected assumptions reflect the actuary’s judgment based on historical data and experience combined with information concerning current underwriting, economic, judicial, regulatory and other influences on ultimate claim settlements.

Because the reserving process requires the Company to forecast future conditions, it is inherently uncertain and requires significant judgment and estimation. The use of different estimates would result in the establishment of different reserve levels. Additionally, changes in accounting estimates are likely to occur from period to period as economic conditions change and the ultimate liability may vary significantly from the estimates used. Major risk factors include (but are not limited to) changes in home prices and borrower equity, which can limit the borrower’s ability to sell the property and satisfy the outstanding loan balance, and changes in unemployment, which can affect the borrower’s income and ability to make mortgage payments.

The lead methodology used by the Company is a frequency-severity method based on the inventory of pending delinquencies. Each month the loan servicers report the delinquency status of each insured loan. Using the frequency-severity method allows the Company to take advantage of its knowledge of the number of delinquent loans and the coverage

provided (“risk size”) on those loans by directly relating the reserves to these amounts. The delinquencies are grouped into homogeneous cohorts for analysis, reflecting product type and age of delinquency. A claim rate is then developed for each cohort which represents the frequency with which the delinquencies become claims. The claim rates are based on an analysis of the patterns of emerging cure counts and claim counts, the foreclosure status of the pending delinquencies, the product and geographical mix of the delinquencies and our view of future economic and claim conditions, which include trends in home prices and unemployment. Claim rates can vary materially by age of delinquency, depending on the mix of delinquencies and economic conditions.

Claim size estimates are determined by examining the risk sizes on the delinquent loans and estimating the portion of risk that will be paid, as well as any expenses. This is done based on a review of historical development patterns, an assessment of economic conditions and the level of equity the borrowers may have in their homes, as well as considering economic conditions and loss mitigation opportunities. Mortgage insurance is generally not subject to large claim sizes, as with some other lines of insurance. A claim size over \$250,000 is rare, and this helps reduce the volatility of claim size estimates. The claim rate and claim size assumptions generate case reserves for the population of reported delinquencies. The reserve for unreported delinquencies (included in IBNR reserves) is estimated by looking at historical patterns of reporting. Claim rates and claim sizes can then be assigned to estimated unreported delinquencies using assumptions made in the establishment of case reserves.

Mortgage insurance Loss Reserves are short-tail, in the sense that the vast majority of delinquencies are resolved within two years of being reported. While reserves are initially analyzed by reserve cohort, as described above, they are also rolled up by underwriting year to ensure that reserve assumptions are consistent with the performance of the underwriting year. The accuracy of prior reserve assumptions is also checked in hindsight to determine if adjustments to the assumptions are needed.

Loss Reserves for the Company’s mortgage reinsurance business and GSE credit-risk sharing transactions are comprised of case reserves and IBNR reserves. The Company’s mortgage reinsurance operations receive reports of delinquent

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

loans and claims notices from ceding companies and record case reserves based upon the amount of reserves recommended by the ceding company. In addition, specific claim and

delinquency information reported by ceding companies is used in the process of estimating IBNR reserves.

The tables below include the acquired business of UGC across all periods presented. Due to the length of time for which claims incurred typically remain outstanding prior to payment and the Company's formation of the mortgage segment in 2014, the Company determined that seven accident years was sufficient for its current disclosures. The following table presents information on the mortgage segment's short-duration insurance contracts:

Direct mortgage insurance business in the U.S. (\$000's except claim count)								December 31, 2018	
Incurred losses and allocated loss adjustment expenses, net of reinsurance								Total of IBNR liabilities plus expected development on reported claims	Cumulative number of paid claims
Year ended December 31,									
Accident year	2012 unaudited	2013 unaudited	2014 unaudited	2015 unaudited	2016 unaudited	2017 unaudited	2018		
2012	520,835	480,592	475,317	469,238	467,296	459,467	458,065	223	15,036
2013		469,311	419,668	411,793	405,809	395,693	393,149	237	9,386
2014			316,095	297,151	279,434	266,027	265,992	393	6,170
2015				222,790	197,238	198,001	194,677	490	4,330
2016					183,556	170,532	148,715	876	3,040
2017						179,376	132,220	2,765	1,413
2018							132,318	13,590	132
							Total	\$ 1,725,136	
Cumulative paid losses and allocated loss adjustment expenses, net of reinsurance									
2012	(106,065)	186,605	327,605	395,695	426,024	441,577	448,151		
2013		41,447	203,957	308,956	353,189	373,909	382,200		
2014			20,099	129,159	201,925	233,879	247,038		
2015				16,159	92,431	151,222	171,337		
2016					11,462	72,201	113,357		
2017						8,622	48,112		
2018							3,966		
							1,414,161		
							All outstanding liabilities before 2012, net of reinsurance	36,051	
							Total	\$ 347,026	

The following table presents the average annual percentage payout of incurred losses and allocated loss adjustment expenses by age, net of reinsurance, as of December 31, 2018:

Average annual percentage payout of incurred losses and allocated loss adjustment expenses by age, net of reinsurance							
U.S. Primary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
	2.9%	42.7%	28.5%	12.1%	5.6%	2.8%	1.4%

Other Segment

Loss Reserves for the 'other' segment (*i.e.*, Watford Re) are comprised of case reserves, ACRs and IBNR reserves. For all business assumed by Watford Re, the Company acts as reinsurance underwriting manager, provides actuarial and risk management services and recommends a level of Loss Reserves to Watford Re. The Company does not guarantee or provide credit support for Watford Re, and the Company's financial exposure to Watford Re is limited to its investment in Watford Re's common and preferred shares and counterparty credit risk (mitigated by collateral) arising from the reinsurance transactions. The estimation of Loss Reserves for Watford Re is subject to the same risk factors as the estimation of Loss Reserves for the Company's insurance, reinsurance and mortgage segments as described earlier. Watford Re performs its own reserve reviews and sets its reserves independently. As noted previously, the Company determined that amounts in the

'other' segment are insignificant for the purposes of these footnote disclosures.

For the year ended December 31, 2018, the Company did not make any significant changes in its methodologies or assumptions as described above (a) to determine the presented amounts of IBNR reserves, (b) for expected development on case reserves.

The Company measures claim frequency information on an individual claim count basis. Claim counts are provided for the insurance and mortgage segments, where reliable information is available. For insurance business, any claim which is reported to the Company is included in the count, even if it is subsequently settled without liability to the Company. The Company does not include claim count information for losses from U.S. insurance pool business where individual loss information is unavailable and impracticable to obtain. For mortgage business, only delinquencies which subsequently

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

become claims are included in the claim count. For reinsurance business, claim counts are not provided. A significant amount of the Company's reinsurance business is written on a proportional basis, for which individual loss information is typically unavailable and impracticable to obtain.

For the year ended December 31, 2018, the Company did not make any significant changes in its methodologies or assumptions as described above to calculate the cumulative claim frequency.

The following table represents a reconciliation of the disclosures of net incurred and paid loss development tables to the reserve for losses and loss adjustment expenses at December 31, 2018:

	December 31, 2018
Net outstanding liabilities	
Insurance	
Property, energy, marine and aviation	\$ 382,230
Third party occurrence business	2,089,360
Third party claims-made business	1,202,602
Multi-line and other specialty	933,139
Reinsurance	
Casualty	1,537,812
Property catastrophe	90,589
Property excluding property catastrophe	421,372
Marine and aviation	130,648
Other specialty	580,328
Mortgage	
U.S. primary	347,026
Other short duration lines not included in disclosures (1)	1,106,103
Total for short duration lines	8,821,209
Unpaid losses and loss adjustment expenses recoverable	
Insurance	
Property, energy, marine and aviation	313,715
Third party occurrence business	996,451
Third party claims-made business	684,063
Multi-line and other specialty	156,964
Reinsurance	
Casualty	524,304
Property catastrophe	266,710
Property excluding property catastrophe	44,180
Marine and aviation	26,956
Other specialty	117,408
Mortgage	
U.S. primary	25,579
Other short duration lines not included in disclosures (2) (3)	326,423
Intercompany eliminations	(643,532)
Total for short duration lines	2,839,221
Lines other than short duration	35,320
Discounting	(21,145)
Unallocated claims adjustment expenses	178,692
	192,867
Total gross reserves for losses and loss adjustment expenses	\$ 11,853,297

- (1) Includes net outstanding liabilities of \$952 million for the 'other' segment.
(2) Includes unpaid loss and loss adjustment expenses recoverable of \$40.5 million for the 'other' segment.
(3) Includes unpaid loss and loss adjustment expenses recoverable of \$245.8 million related to the loss portfolio transfer reinsurance agreement.

7. Reinsurance

In the normal course of business, the Company's insurance subsidiaries cede a portion of their premium through pro rata and excess of loss reinsurance agreements on a treaty or facultative basis. The Company's reinsurance subsidiaries participate in "common account" retrocessional arrangements for certain pro rata treaties. Such arrangements reduce the effect of individual or aggregate losses to all companies participating on such treaties, including the reinsurers, such as the Company's reinsurance subsidiaries, and the ceding company. In addition, the Company's reinsurance subsidiaries may purchase retrocessional coverage as part of their risk management program. Reinsurance recoverables are recorded as assets, predicated on the reinsurers' ability to meet their obligations under the reinsurance agreements. If the reinsurers are unable to satisfy their obligations under the agreements, the Company's insurance or reinsurance subsidiaries would be liable for such defaulted amounts.

The effects of reinsurance on the Company's written and earned premiums and losses and loss adjustment expenses with unaffiliated reinsurers were as follows:

	Year Ended December 31,		
	2018	2017	2016
Premiums Written			
Direct	\$ 4,838,902	\$ 4,447,457	\$ 3,337,690
Assumed	2,122,102	1,920,968	1,864,444
Ceded	(1,614,257)	(1,407,052)	(1,170,743)
Net	<u>\$ 5,346,747</u>	<u>\$ 4,961,373</u>	<u>\$ 4,031,391</u>
Premiums Earned			
Direct	\$ 4,799,842	\$ 4,379,131	\$ 3,192,653
Assumed	1,988,038	1,856,573	1,730,884
Ceded	(1,555,905)	(1,391,172)	(1,038,715)
Net	<u>\$ 5,231,975</u>	<u>\$ 4,844,532</u>	<u>\$ 3,884,822</u>
Losses and Loss Adjustment Expenses			
Direct	\$ 2,472,133	\$ 2,568,327	\$ 1,976,853
Assumed	1,307,317	1,442,077	847,038
Ceded	(889,344)	(1,042,958)	(638,292)
Net	<u>\$ 2,890,106</u>	<u>\$ 2,967,446</u>	<u>\$ 2,185,599</u>

Reinsurance Recoverables

The Company monitors the financial condition of its reinsurers and attempts to place coverages only with substantial, financially sound carriers. Although the Company has not experienced any material credit losses to date, an inability of its reinsurers or retrocessionaires to meet their obligations to it over the relevant exposure periods for any reason could have a material adverse effect on its financial condition and results of operations. The following table summarizes the Company's reinsurance recoverables on paid and unpaid losses (not

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

including ceded unearned premiums) at December 31, 2018 and 2017:

	December 31,	
	2018	2017
Reinsurance recoverable on unpaid and paid losses and loss adjustment expenses	\$ 2,919,372	\$ 2,540,143
% due from carriers with A.M. Best rating of "A-" or better	63.0%	69.9%
% due from unrated fully collateralized reinsurers (1)	12.9%	4.2%
% due from all other carriers with no A.M. Best rating (2)	24.1%	25.9%
Largest balance due from any one carrier as % of total shareholders' equity	2.7%	2.2%

- (1) Such amount is fully collateralized through reinsurance trusts.
(2) Over 90% of such amount is collateralized through reinsurance trusts or letters of credit.

Bellemeade Re

The Company has entered into various aggregate excess of loss mortgage reinsurance agreements with various special purpose reinsurance companies domiciled in Bermuda (the "Bellemeade Agreements"). For the respective coverage periods, the Company will retain the first layer of the respective aggregate losses and the special purpose reinsurance companies will provide second layer coverage up to the outstanding coverage amount. The Company will then retain losses in excess

of the outstanding coverage limit. The aggregate excess of loss reinsurance coverage decreases over a ten-year period as the underlying covered mortgages amortize.

The following table summarizes the respective coverages and retentions at December 31, 2018:

	Initial Coverage at Issuance	Coverage at Dec. 31, 2018	First Layer Retention
Bellemeade 2015-1 Ltd. (1)	\$ 300,000	\$ 43,246	\$ 129,900
Bellemeade 2017-1 Ltd. (2)	368,100	304,373	165,700
Bellemeade 2018-1 Ltd. (3)	374,460	374,460	168,510
Bellemeade 2018-2 Ltd. (4)	653,278	653,278	352,258
Bellemeade 2018-3 Ltd. (5)	506,110	506,110	179,331

- (1) Issued in July 2015, covering in-force policies issued between January 1, 2009 and March 31, 2013.
(2) Issued in October 2017, covering in-force policies issued between January 1, 2017 and June 30, 2017.
(3) Issued in April 2018, covering in-force policies issued between July 1, 2017 and December 31, 2017.
(4) Issued in August 2018, covering in-force policies issued between April 1, 2013 and December 31, 2015.
(5) Issued in October 2018, covering in-force policies issued between January 1, 2018 and June 30, 2018.

See Note 11, "Variable Interest Entity and Noncontrolling Interests."

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

8. Investment Information

At December 31, 2018, total investable assets of \$22.32 billion included \$19.57 billion held by the Company and \$2.76 billion attributable to Watford Re.

Available For Sale Investments

The following table summarizes the fair value and cost or amortized cost of the Company's securities classified as available for sale:

	Estimated Fair Value	Gross Unrealized Gains	Gross Unrealized Losses	Cost or Amortized Cost	OTTI Unrealized Losses (2)
December 31, 2018					
Fixed maturities (1):					
Corporate bonds	\$ 5,537,548	\$ 14,476	\$ (105,428)	\$ 5,628,500	\$ (69)
Mortgage backed securities	541,193	3,991	(3,216)	540,418	(6)
Municipal bonds	1,013,395	5,380	(11,891)	1,019,906	—
Commercial mortgage backed securities	729,442	2,650	(10,751)	737,543	—
U.S. government and government agencies	3,758,698	27,189	(8,474)	3,739,983	—
Non-U.S. government securities	1,771,338	14,477	(50,948)	1,807,809	—
Asset backed securities	1,600,896	8,060	(14,798)	1,607,634	—
Total	<u>14,952,510</u>	<u>76,223</u>	<u>(205,506)</u>	<u>15,081,793</u>	<u>(75)</u>
Equity securities (3)					
Short-term investments	955,880	36	(394)	956,238	—
Total	<u>\$ 15,908,390</u>	<u>\$ 76,259</u>	<u>\$ (205,900)</u>	<u>\$ 16,038,031</u>	<u>\$ (75)</u>
December 31, 2017					
Fixed maturities (1):					
Corporate bonds	\$ 4,434,439	\$ 30,943	\$ (32,340)	\$ 4,435,836	\$ (73)
Mortgage backed securities	316,141	1,640	(2,561)	317,062	(15)
Municipal bonds	2,158,840	20,285	(12,308)	2,150,863	—
Commercial mortgage backed securities	545,817	2,131	(4,268)	547,954	—
U.S. government and government agencies	3,484,257	2,188	(28,769)	3,510,838	—
Non-U.S. government securities	1,612,754	48,764	(17,321)	1,581,311	—
Asset backed securities	1,780,143	5,147	(8,614)	1,783,610	—
Total	<u>14,332,391</u>	<u>111,098</u>	<u>(106,181)</u>	<u>14,327,474</u>	<u>(88)</u>
Equity securities	504,333	88,739	(5,583)	421,177	—
Other investments	264,989	66,946	(120)	198,163	—
Short-term investments	1,469,042	650	(563)	1,468,955	—
Total	<u>\$ 16,570,755</u>	<u>\$ 267,433</u>	<u>\$ (112,447)</u>	<u>\$ 16,415,769</u>	<u>\$ (88)</u>

- (1) In securities lending transactions, the Company receives collateral in excess of the fair value of the fixed maturities pledged. For purposes of this table, the Company has excluded the collateral received under securities lending, at fair value and included the securities pledged under securities lending, at fair value. See "—Securities Lending Agreements."
- (2) Represents the total OTTI recognized in accumulated other comprehensive income ("AOCI"). It does not include the change in fair value subsequent to the impairment measurement date. At December 31, 2018, the net unrealized gain related to securities for which a non-credit OTTI was recognized in AOCI was nil, compared to a net unrealized loss of \$0.3 million at December 31, 2017.
- (3) Effective January 1, 2018, the Company adopted new accounting guidance for financial instruments (see Note 3). As a result, equity securities are no longer accounted for as available for sale and are excluded from this table.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table summarizes, for all available for sale securities in an unrealized loss position, the fair value and gross unrealized loss by length of time the security has been in a continual unrealized loss position:

	Less than 12 Months		12 Months or More		Total	
	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses	Estimated Fair Value	Gross Unrealized Losses
December 31, 2018						
Fixed maturities (1):						
Corporate bonds	\$ 2,983,195	\$ (68,910)	\$ 1,234,865	\$ (36,518)	\$ 4,218,060	\$ (105,428)
Mortgage backed securities	84,296	(695)	109,009	(2,521)	193,305	(3,216)
Municipal bonds	233,081	(2,074)	408,155	(9,817)	641,236	(11,891)
Commercial mortgage backed securities	223,341	(2,831)	193,956	(7,920)	417,297	(10,751)
U.S. government and government agencies	635,049	(1,354)	391,102	(7,120)	1,026,151	(8,474)
Non-U.S. government securities	1,028,340	(35,524)	389,671	(15,424)	1,418,011	(50,948)
Asset backed securities	533,592	(8,832)	368,095	(5,966)	901,687	(14,798)
Total	5,720,894	(120,220)	3,094,853	(85,286)	8,815,747	(205,506)
Equity securities (2)						
Short-term investments	122,878	(394)	—	—	122,878	(394)
Total	\$ 5,843,772	\$ (120,614)	\$ 3,094,853	\$ (85,286)	\$ 8,938,625	\$ (205,900)
December 31, 2017						
Fixed maturities (1):						
Corporate bonds	\$ 2,320,716	\$ (25,411)	\$ 279,082	\$ (6,929)	\$ 2,599,798	\$ (32,340)
Mortgage backed securities	221,113	(1,715)	28,380	(846)	249,493	(2,561)
Municipal bonds	1,030,389	(8,438)	132,469	(3,870)	1,162,858	(12,308)
Commercial mortgage backed securities	225,164	(1,899)	57,291	(2,369)	282,455	(4,268)
U.S. government and government agencies	2,646,415	(26,501)	111,879	(2,268)	2,758,294	(28,769)
Non-U.S. government securities	1,218,514	(15,546)	93,530	(1,775)	1,312,044	(17,321)
Asset backed securities	1,111,246	(5,915)	209,207	(2,699)	1,320,453	(8,614)
Total	8,773,557	(85,425)	911,838	(20,756)	9,685,395	(106,181)
Equity securities	166,562	(5,583)	—	—	166,562	(5,583)
Other investments	15,025	(120)	—	—	15,025	(120)
Short-term investments	109,528	(563)	—	—	109,528	(563)
Total	\$ 9,064,672	\$ (91,691)	\$ 911,838	\$ (20,756)	\$ 9,976,510	\$ (112,447)

- (1) In securities lending transactions, the Company receives collateral in excess of the fair value of the fixed maturities pledged. For purposes of this table, the Company has excluded the collateral received and reinvested and included the fixed maturities pledged. See “—Securities Lending Agreements.”
- (2) Effective January 1, 2018, the Company adopted new accounting guidance for financial instruments (see Note 3). As a result, equity securities are no longer accounted for as available for sale and are excluded from this table.

At December 31, 2018, on a lot level basis, approximately 5,870 security lots out of a total of approximately 8,450 security lots were in an unrealized loss position and the largest single unrealized loss from a single lot in the Company’s fixed maturity portfolio was \$2.6 million. The Company believes that such securities were temporarily impaired at December 31, 2018. At December 31, 2017, on a lot level basis, approximately 3,830 security lots out of a total of approximately 7,450 security lots were in an unrealized loss position and the largest single unrealized loss from a single lot in the Company’s fixed maturity portfolio was \$1.3 million.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The contractual maturities of the Company's fixed maturities and fixed maturities pledged under securities lending agreements are shown in the following table. Expected maturities, which are management's best estimates, will differ from contractual maturities because borrowers may have the right to call or prepay obligations with or without call or prepayment penalties.

Maturity	December 31, 2018		December 31, 2017	
	Estimated Fair Value	Amortized Cost	Estimated Fair Value	Amortized Cost
Due in one year or less	\$ 276,682	\$ 279,135	\$ 550,711	\$ 548,771
Due after one year through five years	8,666,297	8,738,944	7,436,153	7,434,801
Due after five years through 10 years	2,919,232	2,951,582	3,369,635	3,369,750
Due after 10 years	218,768	226,537	333,791	325,526
	12,080,979	12,196,198	11,690,290	11,678,848
Mortgage backed securities	541,193	540,418	316,141	317,062
Commercial mortgage backed securities	729,442	737,543	545,817	547,954
Asset backed securities	1,600,896	1,607,634	1,780,143	1,783,610
Total (1)	<u>\$ 14,952,510</u>	<u>\$ 15,081,793</u>	<u>\$ 14,332,391</u>	<u>\$ 14,327,474</u>

(1) In securities lending transactions, the Company receives collateral in excess of the fair value of the fixed maturities pledged. For purposes of this table, the Company has excluded the collateral received and reinvested and included the fixed maturities pledged. See "—Securities Lending Agreements."

Securities Lending Agreements

The Company enters into securities lending agreements with financial institutions to enhance investment income whereby it loans certain of its securities to third parties, primarily major brokerage firms, for short periods of time through a lending agent. The Company maintains legal control over the securities it lends, retains the earnings and cash flows associated with the loaned securities and receives a fee from the borrower for the temporary use of the securities. An indemnification agreement with the lending agent protects the Company in the event a borrower becomes insolvent or fails to return any of the securities on loan to the Company.

The Company receives collateral in the form of cash or securities. Cash collateral primarily consists of short-term investments. At December 31, 2018, the fair value of the cash collateral received on securities lending was \$19.0 million and the fair value of security collateral received was \$255.1 million. At December 31, 2017, the fair value of the cash collateral received on securities lending was \$199.9 million and the fair value of security collateral received was \$276.7 million.

The Company's securities lending transactions were accounted for as secured borrowings with significant investment categories as follows:

	Remaining Contractual Maturity of the Agreements				Total
	Overnight and Continuous	Less than 30 Days	30-90 Days	90 Days or More	
December 31, 2018					
U.S. government and government agencies	\$ 219,276	\$ —	\$ 32,583	\$ —	\$ 251,859
Corporate bonds	7,129	—	—	—	7,129
Equity securities	15,137	—	—	—	15,137
Total	<u>\$ 241,542</u>	<u>\$ —</u>	<u>\$ 32,583</u>	<u>\$ —</u>	<u>\$ 274,125</u>
Gross amount of recognized liabilities for securities lending in offsetting disclosure in Note 10					\$ —
Amounts related to securities lending not included in offsetting disclosure in Note 10					<u>\$ 274,125</u>
December 31, 2017					
U.S. government and government agencies	\$ 343,425	\$ 20,309	\$ 76,086	\$ —	\$ 439,820
Corporate bonds	28,003	—	—	—	28,003
Equity securities	8,782	—	—	—	8,782
Total	<u>\$ 380,210</u>	<u>\$ 20,309</u>	<u>\$ 76,086</u>	<u>\$ —</u>	<u>\$ 476,605</u>
Gross amount of recognized liabilities for securities lending in offsetting disclosure in Note 10					\$ —
Amounts related to securities lending not included in offsetting disclosure in Note 10					<u>\$ 476,605</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Equity Securities, at Fair Value

At December 31, 2018, the Company held \$338.9 million of equity securities, at fair value, compared to \$495.8 million at December 31, 2017. Pursuant to new accounting guidance (see note 3, “Significant Accounting Policies - Recent Accounting Pronouncements”), changes in fair value on equity securities are recorded through net income effective January 1, 2018.

Other Investments

The following table summarizes the Company’s other investments, including available for sale and fair value option components:

	December 31,	
	2018	2017
Available for sale securities:		
Asia and emerging markets	\$ —	\$ 135,140
Investment grade fixed income	—	53,878
Credit related funds	—	18,365
Other	—	57,606
Total available for sale (1)	—	264,989
Fair value option:		
Term loan investments (par value: \$1,369,216 and \$1,223,453)	1,282,287	1,200,882
Lending	524,112	399,099
Credit related funds	202,123	181,744
Energy	117,509	132,709
Investment grade fixed income	101,902	102,347
Infrastructure	45,371	82,291
Private equity	24,383	23,593
Real estate	14,252	13,716
Total fair value option	2,311,939	2,136,381
Total	<u>\$ 2,311,939</u>	<u>\$ 2,401,370</u>

- (1) The Company reviewed the accounting treatment for three limited partnership investments which were accounted for as available for sale at December 31, 2017 during the 2018 first quarter and determined, based on reconsideration during the period of the Company’s percentage ownership, that the equity method of accounting was appropriate for such investments.

Investments Accounted For Using the Equity Method

The following table summarizes the Company’s investments accounted for using the equity method:

	December 31,	
	2018	2017
Credit related funds	\$ 429,402	\$ 263,034
Equities	375,273	292,762
Real estate	232,647	176,328
Lending	125,041	66,093
Private equity	114,019	96,310
Infrastructure	113,748	99,338
Energy	103,661	47,457
Total	<u>\$ 1,493,791</u>	<u>\$ 1,041,322</u>

In applying the equity method, investments are initially recorded at cost and are subsequently adjusted based on the Company’s proportionate share of the net income or loss of the funds (which include changes in the fair value of the underlying securities in the funds). Such investments are generally recorded on a one to three month lag based on the availability of reports from the investment funds.

A summary of financial information for the Company’s investments accounted for using the equity method is as follows:

	December 31,	
	2018	2017
Invested assets	\$ 28,299,386	\$ 22,351,894
Total assets	29,833,681	23,932,507
Total liabilities	3,406,612	2,734,662
Net assets	<u>\$ 26,427,069</u>	<u>\$ 21,197,845</u>

	Year Ended December 31,		
	2018	2017	2016
Total revenues	\$ 4,565,354	\$ 3,867,874	\$ 2,279,737
Total expenses	1,135,602	782,773	656,940
Net income (loss)	<u>\$ 3,429,752</u>	<u>\$ 3,085,101</u>	<u>\$ 1,622,797</u>

Certain of the Company’s other investments and investments accounted for using the equity method are in investment funds for which the Company has the option to redeem at agreed upon values as described in each investment fund’s subscription agreement. Depending on the terms of the various subscription agreements, investments in investment funds may be redeemed daily, monthly, quarterly or on other terms. Two common redemption restrictions which may impact the Company’s ability to redeem these investment funds are gates and lockups. A gate is a suspension of redemptions which may be implemented by the general partner or investment manager of the fund in order to defer, in whole or in part, the redemption request in the event the aggregate amount of redemption requests exceeds a predetermined percentage of the investment fund’s net assets which may otherwise hinder the general partner or investment manager’s ability to liquidate holdings in an orderly fashion in order to generate the cash necessary to fund extraordinarily large redemption payouts. A lockup period is the initial amount of time an investor is contractually required to hold the security before having the ability to redeem. If the investment funds are eligible to be redeemed, the time to redeem such fund can take weeks or months following the notification.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Fair Value Option

The following table summarizes the Company's assets and liabilities which are accounted for using the fair value option:

	<u>December 31,</u>	
	<u>2018</u>	<u>2017</u>
Fixed maturities	\$ 1,245,562	\$ 1,642,855
Other investments	2,311,939	2,136,381
Short-term investments	322,177	297,426
Equity securities	103,893	139,575
Investments accounted for using the fair value option	<u>\$ 3,983,571</u>	<u>\$ 4,216,237</u>

Limited Partnership Interests

In the normal course of its activities, the Company invests in limited partnerships as part of its overall investment strategy. Such amounts are included in 'investments accounted for using the equity method' and 'investments accounted for using the fair value option.' Based on the new accounting guidance for consolidation, the Company determined that these limited partnership interests represented variable interests in the funds because the general partner did not have a significant interest in the funds. The Company's maximum exposure to loss with respect to these investments is limited to the investment carrying amounts reported in the Company's consolidated balance sheet and any unfunded commitment.

The following table summarizes investments in limited partnership interests where the Company has a variable interest by balance sheet item:

	<u>December 31,</u>	
	<u>2018</u>	<u>2017</u>
Investments accounted for using the equity method (1)	\$ 1,493,791	\$ 1,041,322
Investments accounted for using the fair value option (2)	162,398	130,470
Total	<u>\$ 1,656,189</u>	<u>\$ 1,171,792</u>

- (1) Aggregate unfunded commitments were \$1.22 billion at December 31, 2018, compared to \$1.02 billion at December 31, 2017.
(2) Aggregate unfunded commitments were \$117.5 million at December 31, 2018, compared to \$100.4 million at December 31, 2017.

Net Investment Income

The components of net investment income were derived from the following sources:

	<u>Year Ended December 31,</u>		
	<u>2018</u>	<u>2017</u>	<u>2016</u>
Fixed maturities	\$ 470,912	\$ 385,919	\$ 295,502
Equity securities	13,154	11,752	12,536
Short-term investments	18,793	10,964	6,071
Other (1)	152,868	154,266	132,815
Gross investment income	655,727	562,901	446,924
Investment expenses	(92,094)	(92,029)	(80,182)
Net investment income	<u>\$ 563,633</u>	<u>\$ 470,872</u>	<u>\$ 366,742</u>

- (1) Includes income distributions from investment funds, term loan investments and other items.

Net Realized Gains (Losses)

Net realized gains (losses) were as follows, excluding the other-than-temporary impairment provisions:

	<u>Year Ended December 31,</u>		
	<u>2018</u>	<u>2017</u>	<u>2016</u>
Available for sale securities:			
Gross gains on investment sales	\$ 69,299	\$ 286,415	\$ 309,896
Gross losses on investment sales	(223,123)	(203,873)	(214,447)
Change in fair value of assets and liabilities accounted for using the fair value option:			
Fixed maturities	(90,898)	29,451	47,890
Other investments	(90,778)	51,124	58,687
Equity securities	(5,984)	18,707	366
Short-term investments	(461)	272	93
Equity securities, at fair value (1):			
Net realized gains (losses) on sales during the period	(40,117)	—	—
Net unrealized gains (losses) on equity securities still held at reporting date	(22,828)	—	—
Derivative instruments (2)	15,636	(7,356)	(22,612)
Other (3)	(16,090)	(25,599)	(42,287)
Net realized gains (losses)	<u>\$ (405,344)</u>	<u>\$ 149,141</u>	<u>\$ 137,586</u>

- (1) Pursuant to new accounting guidance (see Note 3), changes in fair value on equity securities are recorded through net income effective January 1, 2018.
(2) See Note 10 for information on the Company's derivative instruments.
(3) Includes the re-measurement of contingent consideration liability amounts.

Equity in Net Income (Loss) of Investments Accounted For Using the Equity Method

The Company recorded equity in net income related to investments accounted for using the equity method of \$45.6

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

million for 2018, compared to \$142.3 million for 2017 and \$48.5 million for 2016.

Other-Than-Temporary Impairments

The Company performs quarterly reviews of its available for sale investments in order to determine whether declines in fair value below the amortized cost basis were considered other-than-temporary in accordance with applicable guidance.

The following table details the net impairment losses recognized in earnings by asset class:

	Year Ended December 31,		
	2018	2017	2016
Fixed maturities:			
Mortgage backed securities	\$ (437)	\$ (1,488)	\$ (964)
Corporate bonds	(1,232)	(2,884)	(5,674)
Non-U.S. government securities	(290)	(376)	(823)
Asset backed securities	(811)	—	(14,736)
U.S. government and government agencies	—	(426)	—
Municipal bonds	—	(375)	(726)
Total	(2,770)	(5,549)	(22,923)
Short-term investments	(59)	—	—
Equity securities	—	(1,422)	(3,990)
Other investments	—	(167)	(3,529)
Net impairment losses recognized in earnings	\$ (2,829)	\$ (7,138)	\$ (30,442)

A description of the methodology and significant inputs used to measure the amount of net impairment losses recognized in earnings in 2018 is as follows:

- Corporate bonds – the Company reviewed the business prospects, credit ratings, estimated loss given default factors, foreign currency impacts and information received from asset managers and rating agencies for certain corporate bonds. Impairment losses were primarily from foreign currency impacts;
- Mortgage backed securities – the Company utilized underlying data provided by asset managers, cash flow projections and additional information from credit agencies in order to determine an expected recovery value for each security;
- Equity securities – the Company utilized information received from asset managers on common stocks, including the business prospects, recent events, industry and market data and other factors. Impairment losses were primarily on equities which were in an unrealized loss position for a significant length of time.

The Company believes that the OTTI included in accumulated other comprehensive income at December 31, 2018 on the securities which were considered by the Company to be

impaired was due to market and sector-related factors (*i.e.*, not credit losses). At December 31, 2018, the Company did not intend to sell these securities, or any other securities which were in an unrealized loss position, and determined that it is more likely than not that the Company will not be required to sell such securities before recovery of their cost basis.

The following table provides a roll forward of the amount related to credit losses recognized in earnings for which a portion of an OTTI was recognized in accumulated other comprehensive income:

	Year Ended December 31,		
	2018	2017	2016
Balance at start of year	\$ 767	\$ 13,138	\$ 26,875
Credit loss impairments recognized on securities not previously impaired	—	31	2,186
Credit loss impairments recognized on securities previously impaired	—	210	582
Reductions for increases in cash flows expected to be collected that are recognized over the remaining life of the security	—	—	—
Reductions for securities sold during the period	(130)	(12,612)	(16,505)
Balance at end of year	\$ 637	\$ 767	\$ 13,138

Restricted Assets

The Company is required to maintain assets on deposit, which primarily consist of fixed maturities, with various regulatory authorities to support its insurance and reinsurance operations. The Company's insurance and reinsurance subsidiaries maintain assets in trust accounts as collateral for insurance and reinsurance transactions with affiliated companies and also have investments in segregated portfolios primarily to provide collateral or guarantees for letters of credit to third parties.

The following table details the value of the Company's restricted assets:

	December 31,	
	2018	2017
Assets used for collateral or guarantees:		
Affiliated transactions	\$ 4,623,483	\$ 4,323,726
Third party agreements	2,181,682	1,674,304
Deposits with U.S. regulatory authorities	689,114	616,987
Deposits with non-U.S. regulatory authorities	59,624	55,895
Total restricted assets	\$ 7,553,903	\$ 6,670,912

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Reconciliation of Cash and Restricted Cash

The following table details reconciliation of cash and restricted cash within the Consolidated Balance Sheets:

	December 31,		
	2018	2017	2016
Cash	\$ 646,556	\$ 606,199	\$ 842,942
Restricted cash (included in 'other assets')	78,087	121,085	126,627
Cash and restricted cash	<u>\$ 724,643</u>	<u>\$ 727,284</u>	<u>\$ 969,569</u>

9. Fair Value

Accounting guidance regarding fair value measurements addresses how companies should measure fair value when they are required to use a fair value measure for recognition or disclosure purposes under GAAP and provides a common definition of fair value to be used throughout GAAP. It defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly fashion between market participants at the measurement date. In addition, it establishes a three-level valuation hierarchy for the disclosure of fair value measurements. The valuation hierarchy is based upon the transparency of inputs to the valuation of an asset or liability as of the measurement date. The level in the hierarchy within which a given fair value measurement falls is determined based on the lowest level input that is significant to the measurement (Level 1 being the highest priority and Level 3 being the lowest priority).

The levels in the hierarchy are defined as follows:

- Level 1: Inputs to the valuation methodology are observable inputs that reflect quoted prices (unadjusted) for *identical* assets or liabilities in *active markets*
- Level 2: Inputs to the valuation methodology include quoted prices for similar assets and liabilities in active markets, and inputs that are observable for the asset or liability, either directly or indirectly, for substantially the full term of the financial instrument
- Level 3: Inputs to the valuation methodology are unobservable and significant to the fair value measurement

Following is a description of the valuation methodologies used for securities measured at fair value, as well as the general classification of such securities pursuant to the valuation hierarchy. The Company reviews its securities measured at fair value and discusses the proper classification of such investments with investment advisers and others.

The Company determines the existence of an active market based on its judgment as to whether transactions for the financial

instrument occur in such market with sufficient frequency and volume to provide reliable pricing information. The independent pricing sources obtain market quotations and actual transaction prices for securities that have quoted prices in active markets. The Company uses quoted values and other data provided by nationally recognized independent pricing sources as inputs into its process for determining fair values of its fixed maturity investments. To validate the techniques or models used by pricing sources, the Company's review process includes, but is not limited to: (i) quantitative analysis (e.g., comparing the quarterly return for each managed portfolio to its target benchmark, with significant differences identified and investigated); (ii) a review of the prices obtained in the pricing process and the range of resulting fair values; (iii) initial and ongoing evaluation of methodologies used by outside parties to calculate fair value; (iv) a comparison of the fair value estimates to the Company's knowledge of the current market; (v) a comparison of the pricing services' fair values to other pricing services' fair values for the same investments; and (vi) periodic back-testing, which includes randomly selecting purchased or sold securities and comparing the executed prices to the fair value estimates from the pricing service. A price source hierarchy was maintained in order to determine which price source would be used (*i.e.*, a price obtained from a pricing service with more seniority in the hierarchy will be used over a less senior one in all cases). The hierarchy prioritizes pricing services based on availability and reliability and assigns the highest priority to index providers. Based on the above review, the Company will challenge any prices for a security or portfolio which are considered not to be representative of fair value.

In certain circumstances, when fair values are unavailable from these independent pricing sources, quotes are obtained directly from broker-dealers who are active in the corresponding markets. Such quotes are subject to the validation procedures noted above. Of the \$20.4 billion of financial assets and liabilities measured at fair value at December 31, 2018, approximately \$217.9 million, or 1.1%, were priced using non-binding broker-dealer quotes. Of the \$20.9 billion of financial assets and liabilities measured at fair value at December 31, 2017, approximately \$181.5 million, or 0.9%, were priced using non-binding broker-dealer quotes.

Fixed maturities

The Company uses the market approach valuation technique to estimate the fair value of its fixed maturity securities, when possible. The market approach includes obtaining prices from independent pricing services, such as index providers and pricing vendors, as well as to a lesser extent quotes from broker-dealers. The independent pricing sources obtain market quotations and actual transaction prices for securities that have quoted prices in active markets. Each source has its own proprietary method for determining the fair value of securities that are not actively traded. In general, these methods involve the use of "matrix pricing" in which the independent pricing

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

source uses observable market inputs including, but not limited to, investment yields, credit risks and spreads, benchmarking of like securities, broker-dealer quotes, reported trades and sector groupings to determine a reasonable fair value. The following describes the significant inputs generally used to determine the fair value of the Company's fixed maturity securities by asset class:

- U.S. government and government agencies — valuations provided by independent pricing services, with all prices provided through index providers and pricing vendors. The Company determined that all U.S. Treasuries would be classified as Level 1 securities due to observed levels of trading activity, the high number of strongly correlated pricing quotes received on U.S. Treasuries and other factors. The fair values of U.S. government agency securities are generally determined using the spread above the risk-free yield curve. As the yields for the risk-free yield curve and the spreads for these securities are observable market inputs, the fair values of U.S. government agency securities are classified within Level 2.
- Corporate bonds — valuations provided by independent pricing services, substantially all through index providers and pricing vendors with a small amount through broker-dealers. The fair values of these securities are generally determined using the spread above the risk-free yield curve. These spreads are generally obtained from the new issue market, secondary trading and from broker-dealers who trade in the relevant security market. As the significant inputs used in the pricing process for corporate bonds are observable market inputs, the fair value of these securities are classified within Level 2.
- Mortgage-backed securities — valuations provided by independent pricing services, substantially all through pricing vendors and index providers with a small amount through broker-dealers. The fair values of these securities are generally determined through the use of pricing models (including Option Adjusted Spread) which use spreads to determine the expected average life of the securities. These spreads are generally obtained from the new issue market, secondary trading and from broker-dealers who trade in the relevant security market. The pricing services also review prepayment speeds and other indicators, when applicable. As the significant inputs used in the pricing process for mortgage-backed securities are observable market inputs, the fair value of these securities are classified within Level 2.
- Municipal bonds — valuations provided by independent pricing services, with all prices provided through index providers and pricing vendors. The fair values of these securities are generally determined using spreads obtained from broker-dealers who trade in the relevant security market, trade prices and the new issue market. As the significant inputs used in the pricing process for municipal bonds are observable market inputs, the fair value of these securities are classified within Level 2.
- Commercial mortgage-backed securities — valuations provided by independent pricing services, substantially all through index providers and pricing vendors with a small amount through broker-dealers. The fair values of these securities are generally determined through the use of pricing models which use spreads to determine the appropriate average life of the securities. These spreads are generally obtained from the new issue market, secondary trading and from broker-dealers who trade in the relevant security market. As the significant inputs used in the pricing process for commercial mortgage-backed securities are observable market inputs, the fair value of these securities are classified within Level 2.
- Non-U.S. government securities — valuations provided by independent pricing services, with all prices provided through index providers and pricing vendors. The fair values of these securities are generally based on international indices or valuation models which include daily observed yield curves, cross-currency basis index spreads and country credit spreads. As the significant inputs used in the pricing process for non-U.S. government securities are observable market inputs, the fair value of these securities are classified within Level 2.
- Asset-backed securities — valuations provided by independent pricing services, substantially all through index providers and pricing vendors with a small amount through broker-dealers. The fair values of these securities are generally determined through the use of pricing models (including Option Adjusted Spread) which use spreads to determine the appropriate average life of the securities. These spreads are generally obtained from the new issue market, secondary trading and from broker-dealers who trade in the relevant security market. As the significant inputs used in the pricing process for asset-backed securities are observable market inputs, the fair value of these securities are classified within Level 2. A small number of securities are included in Level 3 due to a low level of transparency on the inputs used in the pricing process.

Equity securities

The Company determined that exchange-traded equity securities would be included in Level 1 as their fair values are based on quoted market prices in active markets. Other equity securities are included in Level 2 of the valuation hierarchy.

Other investments

The Company determined that exchange-traded investments would be included in Level 1 as their fair values are based on quoted market prices in active markets. Other investments also include term loan investments for which fair values are estimated by using quoted prices of term loan investments with similar characteristics, pricing models or matrix pricing. Such investments are generally classified within Level 2. A small number of securities are included in Level 3 due to a low level of transparency on the inputs used in the pricing process. The fair values for certain of the Company's other investments are

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

determined using net asset values as advised by external fund managers, based on the fund manager's valuation of the underlying holdings in accordance with the fund's governing documents. Certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy.

Derivative instruments

The Company's futures contracts, foreign currency forward contracts, interest rate swaps and other derivatives trade in the over-the-counter derivative market. The Company uses the market approach valuation technique to estimate the fair value for these derivatives based on significant observable market inputs from third party pricing vendors, non-binding broker-dealer quotes and/or recent trading activity. As the significant inputs used in the pricing process for these derivative instruments are observable market inputs, the fair value of these securities are classified within Level 2.

Short-term investments

The Company determined that certain of its short-term investments held in highly liquid money market-type funds, Treasury bills and commercial paper would be included in Level 1 as their fair values are based on quoted market prices in active markets. The fair values of other short-term investments are generally determined using the spread above the risk-free yield curve and are classified within Level 2.

Contingent consideration liabilities

Contingent consideration liabilities (included in 'other liabilities' in the consolidated balance sheets) include amounts related to the Company's 2014 acquisition of CMG Mortgage Insurance Company and its affiliated mortgage insurance companies (the "CMG Entities") and other acquisitions. Such amounts are remeasured at fair value at each balance sheet date with changes in fair value recognized in 'net realized gains (losses).' To determine the fair value of contingent consideration liabilities, the Company estimates future payments using an income approach based on modeled inputs which include a weighted average cost of capital. The Company determined that contingent consideration liabilities would be included within Level 3.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table presents the Company's financial assets and liabilities measured at fair value by level at December 31, 2018:

	Fair Value Measurement Using:			
	Estimated Fair Value	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
<u>Assets measured at fair value (1):</u>				
Available for sale securities:				
Fixed maturities:				
Corporate bonds	\$ 5,537,548	\$ —	\$ 5,529,407	\$ 8,141
Mortgage backed securities	541,193	—	540,884	309
Municipal bonds	1,013,395	—	1,013,395	—
Commercial mortgage backed securities	729,442	—	729,438	4
U.S. government and government agencies	3,758,698	3,657,181	101,517	—
Non-U.S. government securities	1,771,338	—	1,771,338	—
Asset backed securities	1,600,896	—	1,600,896	—
Total	14,952,510	3,657,181	11,286,875	8,454
Short-term investments	955,880	875,881	79,999	—
Equity securities, at fair value	353,794	321,927	31,867	—
Derivative instruments (4)	73,893	—	73,893	—
Fair value option:				
Corporate bonds	852,585	—	846,827	5,758
Non-U.S. government bonds	79,066	—	79,066	—
Mortgage backed securities	16,731	—	16,731	—
Municipal bonds	7,144	—	7,144	—
Commercial mortgage backed securities	—	—	—	—
Asset backed securities	178,790	—	178,790	—
U.S. government and government agencies	111,246	111,138	108	—
Short-term investments	322,177	278,579	43,598	—
Equity securities	103,893	48,827	55,066	—
Other investments	1,254,220	39,107	1,152,408	62,705
Other investments measured at net asset value (2)	1,057,719	—	—	—
Total	3,983,571	477,651	2,379,738	68,463
Total assets measured at fair value	\$ 20,319,648	\$ 5,332,640	\$ 13,852,372	\$ 76,917
<u>Liabilities measured at fair value:</u>				
Contingent consideration liabilities	\$ (66,665)	\$ —	\$ —	\$ (66,665)
Securities sold but not yet purchased (3)	(7,790)	—	(7,790)	—
Derivative instruments (4)	(20,664)	—	(20,664)	—
Total liabilities measured at fair value	\$ (95,119)	\$ —	\$ (28,454)	\$ (66,665)

- (1) In securities lending transactions, the Company receives collateral in excess of the fair value of the securities pledged. For purposes of this table, the Company has excluded the collateral received under securities lending, at fair value and included the securities pledged under securities lending, at fair value. See Note 8.
- (2) In accordance with applicable accounting guidance, certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the amounts presented in the consolidated balance sheets.
- (3) Represents the Company's obligations to deliver securities that it did not own at the time of sale. Such amounts are included in "other liabilities" on the Company's consolidated balance sheets.
- (4) See Note 10.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table presents the Company's financial assets and liabilities measured at fair value by level at December 31, 2017:

	Fair Value Measurement Using:			
	Estimated Fair Value	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
<u>Assets measured at fair value (1):</u>				
Available for sale securities:				
Fixed maturities:				
Corporate bonds	\$ 4,434,439	\$ —	\$ 4,424,979	\$ 9,460
Mortgage backed securities	316,141	—	315,754	387
Municipal bonds	2,158,840	—	2,158,840	—
Commercial mortgage backed securities	545,817	—	545,277	540
U.S. government and government agencies	3,484,257	3,408,902	75,355	—
Non-U.S. government securities	1,612,754	—	1,612,754	—
Asset backed securities	1,780,143	—	1,775,143	5,000
Total	14,332,391	3,408,902	10,908,102	15,387
Equity securities	504,333	498,182	6,151	—
Short-term investments	1,469,042	1,420,732	48,310	—
Other investments	76,427	74,611	1,816	—
Other investments measured at net asset value (2)	188,562	—	—	—
Total other investments	264,989	74,611	1,816	—
Derivative instruments (4)	15,747	—	15,747	—
Fair value option:				
Corporate bonds	1,068,725	—	1,056,508	12,217
Non-U.S. government bonds	195,788	—	195,788	—
Mortgage backed securities	20,491	—	20,491	—
Municipal bonds	15,210	—	15,210	—
Commercial mortgage backed securities	11,997	—	11,997	—
Asset backed securities	99,354	—	99,354	—
U.S. government and government agencies	231,290	231,019	271	—
Short-term investments	297,426	40,166	257,260	—
Equity securities	139,575	67,440	72,135	—
Other investments	1,128,094	82,291	986,636	59,167
Other investments measured at net asset value (2)	1,008,287	—	—	—
Total	4,216,237	420,916	2,715,650	71,384
Total assets measured at fair value	\$ 20,802,739	\$ 5,823,343	\$ 13,695,776	\$ 86,771
<u>Liabilities measured at fair value:</u>				
Contingent consideration liabilities	\$ (60,996)	\$ —	\$ —	\$ (60,996)
Securities sold but not yet purchased (3)	(34,375)	—	(34,375)	—
Derivative instruments (4)	(20,464)	—	(20,464)	—
Total liabilities measured at fair value	\$ (115,835)	\$ —	\$ (54,839)	\$ (60,996)

- (1) In securities lending transactions, the Company receives collateral in excess of the fair value of the securities pledged. For purposes of this table, the Company has excluded the collateral received under securities lending, at fair value and included the securities pledged under securities lending, at fair value. See Note 8.
- (2) In accordance with applicable accounting guidance, certain investments that are measured at fair value using the net asset value per share (or its equivalent) practical expedient have not been classified in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the amounts presented in the consolidated balance sheets.
- (3) Represents the Company's obligations to deliver securities that it did not own at the time of sale. Such amounts are included in "other liabilities" on the Company's consolidated balance sheets.
- (4) See Note 10.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table presents a reconciliation of the beginning and ending balances for all financial assets and liabilities measured at fair value on a recurring basis using Level 3 inputs for 2018 and 2017:

	Assets					Liabilities
	Available For Sale		Fair Value Option			Contingent Consideration Liabilities
	Structured Securities (1)	Corporate Bonds	Corporate Bonds	Other Investments	Total	
Year Ended December 31, 2018						
Balance at beginning of year	\$ 5,927	\$ 9,460	\$ 12,217	\$ 59,167	\$ 86,771	\$ (60,996)
Total gains or (losses) (realized/unrealized)						
Included in earnings (2)	4	(1)	(334)	(1,416)	(1,747)	(5,669)
Included in other comprehensive income	(11)	(296)	—	—	(307)	—
Purchases, issuances, sales and settlements						
Purchases	—	802	—	6,250	7,052	—
Issuances	—	—	—	—	—	—
Sales	(5,003)	—	—	(296)	(5,299)	—
Settlements	(604)	(1,824)	(6,125)	(1,000)	(9,553)	—
Transfers in and/or out of Level 3	—	—	—	—	—	—
Balance at end of year	<u>\$ 313</u>	<u>\$ 8,141</u>	<u>\$ 5,758</u>	<u>\$ 62,705</u>	<u>\$ 76,917</u>	<u>\$ (66,665)</u>
Year Ended December 31, 2017						
Balance at beginning of year	\$ 11,289	\$ 18,344	\$ —	\$ 25,000	\$ 54,633	\$ (122,350)
Total gains or (losses) (realized/unrealized)						
Included in earnings (2)	3,779	688	1,021	4	5,492	(10,837)
Included in other comprehensive income	7	713	—	—	720	—
Purchases, issuances, sales and settlements						
Purchases	—	4,935	—	1,348	6,283	—
Issuances	—	—	—	—	—	—
Sales	(13,640)	(14,897)	—	—	(28,537)	—
Settlements	(1,457)	(455)	(275)	(901)	(3,088)	72,191
Transfers in and/or out of Level 3	5,949	132	11,471	33,716	51,268	—
Balance at end of year	<u>\$ 5,927</u>	<u>\$ 9,460</u>	<u>\$ 12,217</u>	<u>\$ 59,167</u>	<u>\$ 86,771</u>	<u>\$ (60,996)</u>

- (1) Includes asset backed securities, mortgage backed securities and commercial mortgage backed securities.
(2) Gains or losses were included in net realized gains (losses).

Financial Instruments Disclosed, But Not Carried, At Fair Value

The Company uses various financial instruments in the normal course of its business. The carrying values of cash, accrued investment income, receivable for securities sold, certain other assets, payable for securities purchased and certain other liabilities approximated their fair values at December 31, 2018, due to their respective short maturities. As these financial instruments are not actively traded, their respective fair values are classified within Level 2.

At December 31, 2018, the Company's senior notes were carried at their cost, net of debt issuance costs, of \$1.73 billion and had a fair value of \$1.88 billion. At December 31, 2017, the Company's senior notes were carried at their cost, net of debt issuance costs, of \$1.73 billion and had a fair value of \$2.04 billion. The fair values of the senior notes were obtained from a third party pricing service and are based on observable market inputs. As such, the fair value of the senior notes is classified within Level 2.

Fair Value Measurements on a Non-Recurring Basis

The Company measures the fair value of certain assets on a non-recurring basis, generally quarterly, annually, or when events or changes in circumstances indicate that the carrying amount of the assets may not be recoverable. These assets include investments accounted for using the equity method, certain other investments, goodwill and intangible assets, and long-lived assets. The Company uses a variety of techniques to measure the fair value of these assets when appropriate, as described below:

Investments accounted for using the equity method. When the Company determines that the carrying value of these assets may not be recoverable, the Company records the assets at fair value with the loss recognized in income. In such cases, the Company measures the fair value of these assets using the techniques discussed above in "—Fair Value Measurements on a Recurring Basis."

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Goodwill and Intangible Assets. The Company tests goodwill and intangible assets for impairment whenever events or changes in circumstances indicate the carrying amount may not be recoverable. When the Company determines goodwill and intangible assets may be impaired, the Company uses techniques including discounted expected future cash flows, to measure fair value.

Long-Lived Assets. The Company tests its long-lived assets for impairment whenever events or changes in circumstances indicate the carrying amount of a long-lived asset may not be recoverable.

10. Derivative Instruments

The Company's investment strategy allows for the use of derivative instruments. The Company's derivative instruments are recorded on its consolidated balance sheets at fair value. The Company utilizes exchange traded U.S. Treasury note, Eurodollar and other futures contracts and commodity futures to manage portfolio duration or replicate investment positions in its portfolios and the Company routinely utilizes foreign currency forward contracts, currency options, index futures contracts and other derivatives as part of its total return objective. In addition, certain of the Company's investments are managed in portfolios which incorporate the use of foreign currency forward contracts which are intended to provide an economic hedge against foreign currency movements.

In addition, the Company purchases to-be-announced mortgage backed securities ("TBAs") as part of its investment strategy. TBAs represent commitments to purchase a future issuance of agency mortgage backed securities. For the period between purchase of a TBA and issuance of the underlying security, the Company's position is accounted for as a derivative. The Company purchases TBAs in both long and short positions to enhance investment performance and as part of its overall investment strategy.

The following table summarizes information on the fair values and notional values of the Company's derivative instruments:

	Estimated Fair Value		Notional Value (1)
	Asset Derivatives	Liability Derivatives	
December 31, 2018			
Futures contracts (2)	\$ 51,800	\$ (2,115)	\$ 3,153,518
Foreign currency forward contracts (2)	8,147	(7,796)	1,008,907
TBAs (3)	8,292	—	8,132
Other (2)	13,946	(10,753)	2,213,981
Total	<u>\$ 82,185</u>	<u>\$ (20,664)</u>	
December 31, 2017			
Futures contracts (2)	\$ 3,371	\$ (1,542)	\$ 1,452,497
Foreign currency forward contracts (2)	4,478	(4,381)	686,941
TBAs (3)	27,184	—	27,066
Other (2)	7,898	(14,541)	1,457,345
Total	<u>\$ 42,931</u>	<u>\$ (20,464)</u>	

- (1) Represents the absolute notional value of all outstanding contracts, consisting of long and short positions.
- (2) The fair value of asset derivatives are included in 'other assets' and the fair value of liability derivatives are included in 'other liabilities.' Such amounts include risk in force on GSE credit-risk sharing transactions that are accounted for as derivatives.
- (3) The fair value of TBAs are included in 'fixed maturities available for sale, at fair value.'

The Company did not hold any derivatives which were designated as hedging instruments at December 31, 2018 or 2017.

The Company's derivative instruments can be traded under master netting agreements, which establish terms that apply to all derivative transactions with a counterparty. In the event of a bankruptcy or other stipulated event of default, such agreements provide that the non-defaulting party may elect to terminate all outstanding derivative transactions, in which case all individual derivative positions (loss or gain) with a counterparty are closed out and netted and replaced with a single amount, usually referred to as the termination amount, which is expressed in a single currency. The resulting single net amount, where positive, is payable to the party "in-the-money" regardless of whether or not it is the defaulting party, unless the parties have agreed that only the non-defaulting party is entitled to receive a termination payment where the net amount is positive and is in its favor. Effectively, contractual close-out netting reduces the derivatives credit exposure from a gross to a net exposure. At December 31, 2018, \$80.4 million and \$18.9 million, respectively, of asset derivatives and liability derivatives were subject to a master netting agreement compared to \$40.6 million and \$19.6 million, respectively, at December 31, 2017. The remaining derivatives

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

included in the table above were not subject to a master netting agreement.

All realized and unrealized contract gains and losses on the Company's derivative instruments are reflected in net realized gains (losses) in the consolidated statements of income, as summarized in the following table:

Derivatives not designated as hedging instruments	Year Ended December 31,		
	2018	2017	2016
Net realized gains (losses):			
Futures contracts	\$ 48,443	\$ 9,318	\$ (5,474)
Foreign currency forward contracts	(21,770)	(14,495)	(9,588)
TBAAs	(133)	9	577
Other	(10,904)	(2,188)	(8,127)
Total	<u>\$ 15,636</u>	<u>\$ (7,356)</u>	<u>\$ (22,612)</u>

11. Variable Interest Entity and Noncontrolling Interests

Watford Holdings Ltd.

In March 2014, Watford Re raised approximately \$1.1 billion of capital consisting of \$907.3 million in common equity (\$895.6 million net of issuance costs) and \$226.6 million in preference equity (\$219.2 million net of issuance costs and discount). The Company invested \$100.0 million and acquired 2,500,000 common shares, approximately 11% of Watford Holdings Ltd.'s common equity, and a warrant to purchase up to 975,503 additional common shares. The warrants expire on March 31, 2020, and are exercisable at any time following the listing of the common shares on a U.S. national securities exchange. The exercise price of the warrants is determined on the date of exercise based on certain targeted returns for existing common shareholders. As of December 31, 2018, the exercise price was \$77.94 per share.

Subsidiaries of the Company act as Watford Re's reinsurance and insurance underwriting managers.

HPS Investment Partners, LLC ("HPS") manages Watford Re's non-investment grade credit portfolios, and the Company manages Watford Re's investment grade portfolios, each under separate long term services agreements. John Rathgeber, previously Vice Chairman of Arch Worldwide Reinsurance Group, is CEO of Watford Re. In addition, Maamoun Rajeh and Nicolas Papadopoulo, both officers of the Company, serve on the board of directors of Watford Re.

The Company concluded that Watford Re is a VIE and that the Company is the primary beneficiary. The Company includes the results of Watford Re in its consolidated financial

statements. The Company concluded that Watford Re should be reflected in a separate operating segment ('other') and provides the income statement and total investable assets, total assets and total liabilities of Watford Re within Note 4.

Because Watford Re is an independent company, the assets of Watford Re can be used only to settle obligations of Watford Re and Watford Re is solely responsible for its own liabilities and commitments. The Company's financial exposure to Watford Re is limited to its investment in Watford Re's common shares and counterparty credit risk (mitigated by collateral) arising from the reinsurance transactions.

The following table provides the carrying amount and balance sheet caption in which the assets and liabilities of Watford Re are reported:

	December 31,	
	2018	2017
Assets		
Investments accounted for using the fair value option	\$ 2,312,003	\$ 2,426,066
Fixed maturities available for sale, at fair value	393,351	—
Equity securities, at fair value	32,206	—
Cash	63,529	54,503
Accrued investment income	19,461	18,261
Premiums receivable	227,301	177,492
Reinsurance recoverable on unpaid and paid losses and LAE	86,445	42,777
Ceded unearned premiums	61,587	24,762
Deferred acquisition costs, net	80,858	85,961
Receivable for securities sold	24,507	36,374
Goodwill and intangible assets	7,650	7,650
Other assets	63,959	140,808
Total assets of consolidated VIE	<u>\$ 3,372,857</u>	<u>\$ 3,014,654</u>
Liabilities		
Reserves for losses and loss adjustment expenses	\$ 1,032,760	\$ 798,262
Unearned premiums	390,114	330,644
Reinsurance balances payable	21,034	18,424
Revolving credit agreement borrowings	455,682	441,132
Payable for securities purchased	60,142	42,501
Other liabilities	302,524	215,186
Total liabilities of consolidated VIE	<u>\$ 2,262,256</u>	<u>\$ 1,846,149</u>
Redeemable noncontrolling interests	\$ 220,992	\$ 220,622

The following table summarizes Watford Re's cash flow from operating, investing and financing activities.

	Year Ended December 31,		
	2018	2017	2016
Total cash provided by (used for):			
Operating activities	229,315	286,558	275,175
Investing activities	(285,281)	(467,418)	(105,695)
Financing activities	(2,406)	162,152	(195,647)

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Non-redeemable noncontrolling interests

The Company accounts for the portion of Watford Re's common equity attributable to third party investors in the shareholders' equity section of its consolidated balance sheets. The noncontrolling ownership in Watford Re's common shares was approximately 89% at December 31, 2018. The portion of Watford Re's income or loss attributable to third party investors is recorded in the consolidated statements of income in 'net (income) loss attributable to noncontrolling interests.'

The following table sets forth activity in the non-redeemable noncontrolling interests:

	December 31,	
	2018	2017
Balance, beginning of year	\$ 843,411	\$ 851,854
Amounts attributable to noncontrolling interests	(48,507)	(7,913)
Other comprehensive (income) loss attributable to noncontrolling interests	(3,344)	(530)
Balance, end of year	<u>\$ 791,560</u>	<u>\$ 843,411</u>

Redeemable noncontrolling interests

The Company accounts for redeemable noncontrolling interests in the mezzanine section of its consolidated balance sheet. Such redeemable noncontrolling interests relate to the 9,065,200 cumulative redeemable preference shares ("Watford Preference Shares") issued in late March 2014 with a par value of \$0.01 per share and a liquidation preference of \$25.00 per share. The Watford Preference Shares were issued at a discounted amount of \$24.50 per share. Holders of the Watford Preference Shares will be entitled to receive, if declared by Watford Re's board, quarterly cash dividends on the last day of March, June, September, and December. Dividends will accrue from the closing date to June 30, 2019 at a fixed rate of 8.5% per annum. From June 30, 2019 and subsequent, dividends will accrue based on a floating rate equal to the 3 month U.S. dollar LIBOR (with a 1% floor) plus a margin based on the difference between the fixed rate and the 5 year mid swap rate to the floating rate as set out on the Bloomberg Screen IRSB 18. The Watford Preference Shares may be redeemed by Watford Re on or after June 30, 2019 or at the option of the preferred shareholders at any time on or after June 30, 2034. Because the redemption features are not solely within the control of Watford Re, the Company accounts for the redeemable noncontrolling interests in the Watford Preference Shares in the mezzanine section of its consolidated balance sheets. Preferred dividends on the Watford Preference Shares, including the accretion of the discount and issuance costs, was \$19.6 million for 2018, 2017 and 2016. Preferred dividends, including the accretion of the discount and issuance costs, are included in 'amounts attributable to noncontrolling interests' in the Company's consolidated statements of income.

The following table sets forth activity in the redeemable noncontrolling interests:

	December 31,		
	2018	2017	2016
Balance, beginning of year	\$ 205,922	\$ 205,553	\$ 205,182
Accretion of preference share issuance costs	370	369	371
Balance, end of year	<u>\$ 206,292</u>	<u>\$ 205,922</u>	<u>\$ 205,553</u>

The portion of Watford Re's income or loss attributable to third party investors is recorded in the consolidated statements of income in 'net (income) loss attributable to noncontrolling interests' as summarized in the table below:

	December 31,		
	2018	2017	2016
Amounts attributable to non-redeemable noncontrolling interests	\$ 48,507	\$ 7,913	\$(113,091)
Dividends attributable to redeemable noncontrolling interests	(18,357)	(18,344)	(18,349)
Net (income) loss attributable to noncontrolling interests	<u>\$ 30,150</u>	<u>\$ (10,431)</u>	<u>\$(131,440)</u>

Bellemeade Re

The Company has entered into various aggregate excess of loss mortgage reinsurance agreements with various special purpose reinsurance companies domiciled in Bermuda (the Bellemeade Agreements). At the time the Bellemeade Agreements were entered into, the applicability of the accounting guidance that addresses VIEs was evaluated. As a result of the evaluation of the Bellemeade Agreements, the Company concluded that these entities are VIEs. However, given that the ceding insurers do not have the unilateral power to direct those activities that are significant to their economic performance, the Company does not consolidate such entities in its consolidated financial statements.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table presents total assets of the Bellemeade entities, as well as the Company's maximum exposure to loss associated with these VIEs, calculated as the spread between contractual payments and the value of the underlying notional amount of VIE assets or liabilities.

	Total VIE Assets	Maximum Exposure to Loss		
		On- Balance Sheet	Off- Balance Sheet	Total
December 31, 2018				
Bellemeade 2015-1 Ltd. (Jul-15)	\$ 43,246	\$ 112	\$ 498	\$ 610
Bellemeade 2017-1 Ltd. (Oct-17)	304,373	165	1,312	1,477
Bellemeade 2018-1 Ltd. (Apr-18)	374,460	132	3,539	3,671
Bellemeade 2018-2 Ltd. (Aug-18)	653,278	874	4,005	4,879
Bellemeade 2018-3 Ltd. (Oct-18)	506,110	469	1,836	2,305
Total	\$1,881,467	\$ 1,752	\$ 11,190	\$ 12,942
December 31, 2017				
Bellemeade 2015-1 Ltd. (Jul-15)	92,390	471	832	1,303
Bellemeade 2016-1 Ltd. (May-16)	135,201	20	527	547
Bellemeade 2017-1 Ltd. (Oct-17)	347,139	391	1,867	2,258
Total	\$ 574,730	\$ 882	\$ 3,226	\$ 4,108

See Note 7, "Reinsurance."

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

12. Other Comprehensive Income (Loss)

The following table presents the changes in each component of AOCI, net of noncontrolling interests:

	Unrealized Appreciation on Available-For-Sale Investments	Foreign Currency Translation Adjustments	Total
Year Ended December 31, 2018			
Beginning balance	\$ 157,400	\$ (39,356)	\$ 118,044
Cumulative effect of an accounting change	(149,794)	—	(149,794)
Other comprehensive income (loss) before reclassifications	(266,357)	(25,186)	(291,543)
Amounts reclassified from accumulated other comprehensive income	144,573	—	144,573
Net current period other comprehensive income (loss)	(121,784)	(25,186)	(146,970)
Ending balance	<u>\$ (114,178)</u>	<u>\$ (64,542)</u>	<u>\$ (178,720)</u>
Year Ended December 31, 2017			
Beginning balance	\$ (27,641)	\$ (86,900)	\$ (114,541)
Other comprehensive income (loss) before reclassifications	252,904	47,544	300,448
Amounts reclassified from accumulated other comprehensive income	(67,863)	—	(67,863)
Net current period other comprehensive income (loss)	185,041	47,544	232,585
Ending balance	<u>\$ 157,400</u>	<u>\$ (39,356)</u>	<u>\$ 118,044</u>
Year Ended December 31, 2016			
Beginning balance	\$ 50,085	\$ (66,587)	\$ (16,502)
Other comprehensive income (loss) before reclassifications	(21,365)	(20,313)	(41,678)
Amounts reclassified from accumulated other comprehensive income	(56,361)	—	(56,361)
Net current period other comprehensive income (loss)	(77,726)	(20,313)	(98,039)
Ending balance	<u>\$ (27,641)</u>	<u>\$ (86,900)</u>	<u>\$ (114,541)</u>

The following tables present details about amounts reclassified from accumulated other comprehensive income and the tax effects allocated to each component of other comprehensive income (loss):

Details About AOCI Components	Consolidated Statement of Income Line Item That Includes Reclassification	Amounts Reclassified from AOCI		
		Year Ended December 31,		
		2018	2017	2016
Unrealized appreciation on available-for-sale investments				
	Net realized gains	\$ (153,822)	\$ 82,542	\$ 95,448
	Other-than-temporary impairment losses	(2,829)	(7,138)	(30,794)
	Total before tax	(156,651)	75,404	64,654
	Income tax (expense) benefit	12,078	(7,541)	(8,293)
	Net of tax	<u>\$ (144,573)</u>	<u>\$ 67,863</u>	<u>\$ 56,361</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Following are the related tax effects allocated to each component of other comprehensive income (loss):

	<u>Before Tax Amount</u>	<u>Tax Expense (Benefit)</u>	<u>Net of Tax Amount</u>
Year Ended December 31, 2018			
Unrealized appreciation (decline) in value of investments:			
Unrealized holding gains (losses) arising during period	\$ (294,267)	\$ (24,210)	\$ (270,057)
Portion of other-than-temporary impairment losses recognized in other comprehensive income (loss)	—	—	—
Less reclassification of net realized gains (losses) included in net income	(156,651)	(12,078)	(144,573)
Foreign currency translation adjustments	(25,006)	(176)	(24,830)
Other comprehensive income (loss)	<u>\$ (162,622)</u>	<u>\$ (12,308)</u>	<u>\$ (150,314)</u>
Year Ended December 31, 2017			
Unrealized appreciation (decline) in value of investments:			
Unrealized holding gains (losses) arising during period	\$ 266,559	\$ 13,655	\$ 252,904
Portion of other-than-temporary impairment losses recognized in other comprehensive income (loss)	—	—	—
Less reclassification of net realized gains (losses) included in net income	75,404	7,541	67,863
Foreign currency translation adjustments	47,549	535	47,014
Other comprehensive income (loss)	<u>\$ 238,704</u>	<u>\$ 6,649</u>	<u>\$ 232,055</u>
Year Ended December 31, 2016			
Unrealized appreciation (decline) in value of investments:			
Unrealized holding gains (losses) arising during period	\$ (26,159)	\$ (5,146)	\$ (21,013)
Portion of other-than-temporary impairment losses recognized in other comprehensive income (loss)	(352)	—	(352)
Less reclassification of net realized gains (losses) included in net income	64,654	8,293	56,361
Foreign currency translation adjustments	(20,120)	261	(20,381)
Other comprehensive income (loss)	<u>\$ (111,285)</u>	<u>\$ (13,178)</u>	<u>\$ (98,107)</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

13. Earnings Per Common Share

The calculation of basic earnings per common share is computed by dividing income available to Arch common shareholders by the weighted average number of Common Shares and common share equivalents outstanding. The following table sets forth the computation of basic and diluted earnings per common share:

	Year Ended December 31,		
	2018	2017	2016
Numerator:			
Net income	\$ 727,821	\$ 629,709	\$ 824,178
Amounts attributable to noncontrolling interests	30,150	(10,431)	(131,440)
Net income available to Arch	757,971	619,278	692,738
Preferred dividends	(41,645)	(46,041)	(28,070)
Loss on redemption of preferred shares	(2,710)	(6,735)	—
Net income available to Arch common shareholders	<u>\$ 713,616</u>	<u>\$ 566,502</u>	<u>\$ 664,668</u>
Denominator:			
Weighted average common shares outstanding	401,036,376	377,531,628	362,271,729
Series D preferred securities (1)	3,311,245	26,606,736	104,613
Weighted average common shares outstanding – basic	404,347,621	404,138,364	362,376,342
Effect of dilutive common share equivalents:			
Nonvested restricted shares	1,474,207	3,936,594	3,877,077
Stock options (2)	7,084,650	9,710,067	7,899,060
Weighted average common shares and common share equivalents outstanding – diluted	<u>412,906,478</u>	<u>417,785,025</u>	<u>374,152,479</u>
Earnings per common share:			
Basic	<u>\$ 1.76</u>	<u>\$ 1.40</u>	<u>\$ 1.83</u>
Diluted	<u>\$ 1.73</u>	<u>\$ 1.36</u>	<u>\$ 1.78</u>

- (1) The company has determined that, based on a review of the terms, features and rights of the Company's non-voting common equivalent preferred shares compared to the rights of the Company's common shareholders, the underlying common shares that the convertible securities convert to were common share equivalents at the time of their issuance.
- (2) Certain stock options were not included in the computation of diluted earnings per share where the exercise price of the stock options exceeded the average market price and would have been anti-dilutive or where, when applying the treasury stock method to in-the-money options, the sum of the proceeds, including unrecognized compensation, exceeded the average market price and would have been anti-dilutive. For 2018, 2017 and 2016, the number of stock options excluded were 5,673,821, 2,603,451 and 2,168,187, respectively.

14. Income Taxes

Arch Capital is incorporated under the laws of Bermuda and, under current Bermuda law, is not obligated to pay any taxes in Bermuda based upon income or capital gains. The Company has received a written undertaking from the Minister of Finance in Bermuda under the Exempted Undertakings Tax Protection Act 1966 that, in the event that any legislation is enacted in Bermuda imposing any tax computed on profits, income, gain or appreciation on any capital asset, or any tax in the nature of estate duty or inheritance tax, such tax will not be applicable to Arch Capital or any of its operations until March 31, 2035. This undertaking does not, however, prevent the imposition of taxes on any person ordinarily resident in Bermuda or any company in respect of its ownership of real property or leasehold interests in Bermuda.

Arch Capital and its non-U.S. subsidiaries will be subject to U.S. federal income tax only to the extent that they derive U.S.

source income that is subject to U.S. withholding tax or income that is effectively connected with the conduct of a trade or business within the U.S. and is not exempt from U.S. tax under an applicable income tax treaty with the U.S. Arch Capital and its non-U.S. subsidiaries will be subject to a withholding tax on dividends from U.S. investments and interest from certain U.S. payors (subject to reduction by any applicable income tax treaty). Arch Capital and its non-U.S. subsidiaries intend to conduct their operations in a manner that will not cause them to be treated as engaged in a trade or business in the United States and, therefore, will not be required to pay U.S. federal income taxes (other than U.S. excise taxes on insurance and reinsurance premium and withholding taxes on dividends and certain other U.S. source investment income). However, because there is uncertainty as to the activities which constitute being engaged in a trade or business within the United States, there can be no assurances that the U.S. Internal Revenue Service will not contend successfully that Arch Capital or its non-U.S. subsidiaries are engaged in a trade or business in the United States. If Arch Capital or any of its non-U.S. subsidiaries

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

were subject to U.S. income tax, Arch Capital's shareholders' equity and earnings could be materially adversely affected. Arch Capital has subsidiaries and branches that operate in various jurisdictions around the world that are subject to tax in the jurisdictions in which they operate. The significant jurisdictions in which Arch Capital's subsidiaries and branches are subject to tax are the United States, United Kingdom, Ireland, Canada, Switzerland, Australia and Denmark.

The components of income taxes attributable to operations were as follows:

	Year Ended December 31,		
	2018	2017	2016
Current expense (benefit):			
United States	\$ 73,078	\$ (51,705)	\$ 40,300
Non-U.S.	12,785	5,969	10,445
	<u>85,863</u>	<u>(45,736)</u>	<u>50,745</u>
Deferred expense (benefit):			
United States	19,544	169,093	(14,641)
Non-U.S.	8,544	4,211	(4,730)
	<u>28,088</u>	<u>173,304</u>	<u>(19,371)</u>
Income tax expense	<u>\$ 113,951</u>	<u>\$ 127,568</u>	<u>\$ 31,374</u>

The Company's income or loss before income taxes was earned in the following jurisdictions:

	Year Ended December 31,		
	2018	2017	2016
Income (loss) Before Income Taxes:			
Bermuda	\$ 388,492	\$ 406,054	\$ 801,155
United States	440,823	381,157	51,577
Other	12,457	(29,934)	2,820
Total	<u>\$ 841,772</u>	<u>\$ 757,277</u>	<u>\$ 855,552</u>

The expected tax provision computed on pre-tax income or loss at the weighted average tax rate has been calculated as the sum of the pre-tax income in each jurisdiction multiplied by that jurisdiction's applicable statutory tax rate. The 2018 applicable statutory tax rates by jurisdiction were as follows: Bermuda (0.0%), United States (21.0%), United Kingdom (19.0%), Ireland (12.5%), Denmark (22.0%), Canada (26.5%), Gibraltar (10.0%), Australia (30.0%), Hong Kong (16.5%) and the Netherlands (20.0%). The United States rate was 35% in 2017 and 2016.

A reconciliation of the difference between the provision for income taxes and the expected tax provision at the weighted average tax rate follows:

	Year Ended December 31,		
	2018	2017	2016
Expected income tax expense (benefit) computed on pre-tax income at weighted average income tax rate	\$ 91,529	\$ 126,262	\$ 17,365
Addition (reduction) in income tax expense (benefit) resulting from:			
Tax-exempt investment income	(4,790)	(13,330)	(8,830)
Meals and entertainment	1,060	1,063	954
State taxes, net of U.S. federal tax benefit	2,086	732	1,073
Foreign branch taxes	5,428	5,752	5,496
Prior year adjustment	(2,522)	(559)	(4,756)
Foreign exchange gains & losses	1,293	(572)	223
Changes in applicable tax rate	(128)	7,745	1,209
Dividend withholding taxes	6,594	232	3,319
Change in valuation allowance	18,396	14,798	4,730
Contingent consideration	740	3,785	9,353
Share based compensation	(5,356)	(18,733)	—
Other	(379)	393	1,238
Income tax expense (benefit)	<u>\$ 113,951</u>	<u>\$ 127,568</u>	<u>\$ 31,374</u>

The effect of a change in tax laws or rates on deferred taxes assets and liabilities is recognized in income in the period in which such change is enacted.

On December 22, 2017, the Tax Cuts Act was signed into law by the President of the United States which significantly changes the U.S. tax law in many ways including a reduction of the U.S. federal income tax rate from 35% to 21% effective January 1, 2018. Also on December 22, 2017, the Securities and Exchange Commission issued, Staff Accounting Bulletin No. 118 ("SAB 118") which provides guidance on accounting for tax effects of the Tax Cuts Act. SAB 118 provided a measurement period of up to one year from the enactment date to complete the accounting. During 2018, the Company finalized its accounting for the income tax impact of the Tax Cuts Act resulting in a tax expense of \$1.2 million primarily attributable to the write down of temporary differences identified following the filing of the Company's 2017 corporate tax return offset by AMT credits that are currently recoverable.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Deferred income tax assets and liabilities reflect temporary differences based on enacted tax rates between the carrying amounts of assets and liabilities for financial reporting and income tax purposes. Significant components of the Company's deferred income tax assets and liabilities were as follows:

	December 31,	
	2018	2017
Deferred income tax assets:		
Net operating loss	\$ 24,089	\$ 33,723
Uncrystallized losses	7,960	9,132
AMT credit carryforward	2,652	12,327
Discounting of net loss reserves	43,130	33,659
Deferred ceding commission	—	6,934
Net unearned premium reserve	68,305	47,682
Compensation liabilities	20,492	20,234
Foreign tax credit carryforward	9,116	6,610
Interest expense	1,387	3,815
Goodwill and intangible assets	17,127	3,688
Bad debt reserves	5,626	5,073
Net unrealized foreign exchange gains	949	464
Net unrealized decline of investments	13,453	1,602
Other, net	3,418	1,628
Deferred tax assets before valuation allowance	217,704	186,571
Valuation allowance	(44,659)	(30,591)
Deferred tax assets net of valuation allowance	173,045	155,980
Deferred income tax liabilities:		
Depreciation and amortization	(2,559)	(2,333)
Deposit accounting liability	(2,292)	(2,392)
Contingency reserve	(112,852)	(110,632)
Deferred policy acquisition costs	(32,105)	—
Other, net	(735)	(1,061)
Total deferred tax liabilities	(150,543)	(116,418)
Net deferred income tax assets	\$ 22,502	\$ 39,562

The Company provides a valuation allowance to reduce certain deferred tax assets to an amount which management expects to more likely than not be realized. As of December 31, 2018, the Company's valuation allowance was \$44.7 million, compared to \$30.6 million at December 31, 2017. The valuation allowance in both periods was primarily attributable to valuation allowance on the Company's U.K. Canadian and Australian operations and certain other deferred tax assets relating to loss carryforwards that have a limited use.

At December 31, 2018, the Company's net operating loss carryforwards and tax credits were as follows:

	Year Ended December 31,	
	2018	Expiration
Operating Loss Carryforwards		
United Kingdom	\$ 59,500	No expiration
Ireland	14,000	No expiration
Australia	16,000	No expiration
Hong Kong	12,800	No expiration
United States (1) (2)	24,400	2029 - 2038
Tax Credits		
U.K. foreign tax credits	9,116	No expiration
U.S. refundable AMT credits	2,652	No expiration

(1) Includes \$4.6 million net operating loss carryforwards from Watford Re.

(2) On January 30, 2014, the Company's U.S. mortgage operations underwent an ownership change for U.S. federal income tax purposes as a result of the Company's acquisition of the CMG Entities. As a result of this ownership change, a limitation has been imposed upon the utilization of approximately \$9.6 million of the Company's existing U.S. net operating loss carryforwards. Utilization is limited to approximately \$0.6 million per year in accordance with Section 382 of the Internal Revenue Code of 1986 as amended ("the Code").

The Company's U.S. mortgage operations are eligible for a tax deduction, subject to certain limitations, under Section 832(e) of the Code for amounts required by state law or regulation to be set aside in statutory contingency reserves. The deduction is allowed only to the extent that the Company purchases non-interest bearing U.S. Mortgage Guaranty Tax and Loss Bonds ("T&L Bonds") issued by the U.S. Treasury Department in an amount equal to the tax benefit derived from deducting any portion of the statutory contingency reserves. T&L Bonds are reflected in 'other assets' on the Company's balance sheet and totaled approximately \$182.7 million at December 31, 2018, compared to \$177.2 million at December 31, 2017.

Deferred income tax liabilities have not been accrued with respect to the undistributed earnings of the Company's U.S., U.K. and Ireland subsidiaries as it is the Company's intention that all such earnings will be indefinitely reinvested. If the earnings were to be distributed, as dividends or otherwise, such amounts may be subject to withholding tax in the jurisdiction of the paying entity. The Company no longer intends to indefinitely reinvest earnings from the Company's Canada subsidiary, however, no income or withholding taxes have been accrued as the Canada subsidiary does not have positive cumulative earnings and profits and therefore a distribution from this particular subsidiary would not be subject to income taxes or withholding taxes. Potential tax implications of repatriation from the Company's unremitted earnings that are indefinitely reinvested are driven by facts at the time of distribution. Therefore it is not practicable to estimate the income tax liabilities that might be incurred if such earnings were remitted. Distributions from the U.K. or Ireland would not be subject to withholding tax and no deferred income tax liability would need to be accrued.

The Company recognizes interest and penalties relating to unrecognized tax benefits in the provision for income taxes. As

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

of December 31, 2018, the Company's total unrecognized tax benefits, including interest and penalties, were \$2.0 million. If recognized, the full amount of the unrecognized tax benefit would generally decrease the current year annual effective tax rate. A reconciliation of the beginning and ending amount of unrecognized tax benefits is as follows:

	December 31,	
	2018	2017
Balance at beginning of year	\$ 2,008	\$ 2,008
Additions based on tax positions related to the current year	—	—
Additions for tax positions of prior years	—	—
Reductions for tax positions of prior years	—	—
Settlements	—	—
Balance at end of year	<u>\$ 2,008</u>	<u>\$ 2,008</u>

The Company or its subsidiaries or branches files income tax returns in the U.S. federal jurisdiction and various state, local and foreign jurisdictions. The following table details open tax years that are potentially subject to examination by local tax authorities, in the following major jurisdictions:

Jurisdiction	Tax Years
United States	2015-2018
United Kingdom	2017-2018
Ireland	2014-2018
Canada	2014-2018
Switzerland	2017-2018
Denmark	2015-2018

As of December 31, 2018, the Company's current income tax recoverable (included in "Other assets") was \$21.2 million.

15. Transactions with Related Parties

Kewsong Lee, a director of Arch Capital until November 2, 2017, resigned from Arch Capital's Board of Directors because of the expansion of his duties at The Carlyle Group ("Carlyle") following his promotion to co-CEO effective January 1, 2018. As part of its investment philosophy, the Company invests a portion of its investment portfolio in alternative investment funds. As of December 31, 2017, the total value of the Company's investments in funds or other investments managed by Carlyle was approximately \$293.0 million, and the Company had aggregate unfunded commitments to funds managed by Carlyle of \$468.8 million. The Company may make additional commitments to funds managed by Carlyle from time to time. During 2017 and 2016, the Company made aggregate capital contributions to funds managed by Carlyle of \$131.8 million and \$62.1 million, respectively. During 2017 and 2016, the Company received aggregate cash distributions from funds managed by Carlyle of \$55.6 million and \$21.5 million, respectively.

Certain directors and executive officers of the Company own common and preference shares of Watford Re. See note 11, "Variable Interest Entity and Noncontrolling Interests," for information about Watford Re.

16. Commitments and Contingencies

Concentrations of Credit Risk

The creditworthiness of a counterparty is evaluated by the Company, taking into account credit ratings assigned by independent agencies. The credit approval process involves an assessment of factors, including, among others, the counterparty, country and industry credit exposure limits. Collateral may be required, at the discretion of the Company, on certain transactions based on the creditworthiness of the counterparty.

The areas where significant concentrations of credit risk may exist include unpaid losses and loss adjustment expenses recoverable, contractholder receivables, ceded unearned premiums, paid losses and loss adjustment expenses recoverable net of reinsurance balances payable, investments and cash and cash equivalent balances. A credit exposure exists with respect to reinsurance recoverables as they may become uncollectible. The Company manages its credit risk in its reinsurance relationships by transacting with reinsurers that it considers financially sound and, if necessary, the Company may hold collateral in the form of funds, trust accounts and/or irrevocable letters of credit. This collateral can be drawn on for amounts that remain unpaid beyond specified time periods on an individual reinsurer basis. In addition, certain insurance policies written by the Company's insurance operations feature

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

large deductibles, primarily in its construction and national accounts lines of business. Under such contracts, the Company is obligated to pay the claimant for the full amount of the claim. The Company is subsequently reimbursed by the policyholder for the deductible amount. These amounts are included on a gross basis in the consolidated balance sheet in contractholder payables and contractholder receivables, respectively. In the event that the Company is unable to collect from the policyholder, the Company would be liable for such defaulted amounts. Collateral, primarily in the form of letters of credit, cash and trusts, is obtained from the policyholder to mitigate the Company's credit risk. In the instances where the company receives collateral in the form of cash, the Company records a related liability in "Collateral held for insured obligations."

In addition, the Company underwrites a significant amount of its business through brokers and a credit risk exists should any of these brokers be unable to fulfill their contractual obligations with respect to the payments of insurance and reinsurance balances owed to the Company. The following table summarizes the percentage of the Company's gross premiums written generated from or placed by the largest brokers:

Broker	Year Ended December 31,		
	2018	2017	2016
Aon Corporation and its subsidiaries	11.4%	11.3%	14.4%
Marsh & McLennan Companies and its subsidiaries	9.3%	10.7%	13.5%

No other broker and no one insured or reinsured accounted for more than 10% of gross premiums written for 2018, 2017 and 2016.

The Company's available for sale investment portfolio is managed in accordance with guidelines that have been tailored to meet specific investment strategies, including standards of diversification, which limit the allowable holdings of any single issue. There were no investments in any entity in excess of 10% of the Company's shareholders' equity at December 31, 2018 other than investments issued or guaranteed by the United States government or its agencies.

Investment Commitments

The Company's investment commitments, which are primarily related to agreements entered into by the Company to invest in funds and separately managed accounts when called upon, were approximately \$1.77 billion and \$1.70 billion at December 31, 2018 and 2017, respectively.

Contingent Consideration Liability

Pursuant to the Company's 2014 acquisition of the CMG Entities, the Company made a contingent consideration payment of \$71.7 million in April 2017. The maximum

remaining amount of contingent consideration payments is \$68.2 million over the remaining earn-out period. To the extent that the adjusted book value of the CMG Entities drops below the cumulative amount paid by the Company, no additional payments would be due.

Leases and Purchase Obligations

At December 31, 2018, the future minimum rental commitments, exclusive of escalation clauses and maintenance costs and net of rental income, for all of the Company's operating leases are as follows:

2019	\$ 31,088
2020	30,491
2021	29,351
2022	26,068
2023	21,408
2024 and thereafter	54,745
Total	<u>\$ 193,151</u>

All of these leases are for the rental of office space, with expiration terms that range from 2019 to 2030. Rental expense, net of income from subleases, was approximately \$27.6 million, \$31.1 million and \$24.2 million for 2018, 2017 and 2016, respectively.

At December 31, 2018, the Company has entered into capital lease agreements. The future lease payments for the Company's capital leases are expected to be \$6.2 million, \$4.8 million and \$2.1 million for 2019, 2020 and 2021, respectively.

The Company has also entered into certain agreements which commit the Company to purchase goods or services, primarily related to software and computerized systems. Such purchase obligations were approximately \$39.5 million and \$29.7 million at December 31, 2018 and 2017, respectively.

Employment and Other Arrangements

At December 31, 2018, the Company has entered into employment agreements with certain of its executive officers. Such employment arrangements provide for compensation in the form of base salary, annual bonus, share-based awards, participation in the Company's employee benefit programs and the reimbursements of expenses.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

17. Debt and Financing Arrangements

The Company's senior notes payable at December 31, 2018 and 2017 were as follows:

	Interest (Fixed)	Principal Amount	Carrying Amount at December 31,	
			2018	2017
2034 notes (1)	7.350%	300,000	297,150	297,053
2043 notes (2)	5.144%	500,000	494,723	494,621
2026 notes (3)	4.011%	500,000	496,417	496,043
2046 notes (4)	5.031%	450,000	445,238	445,167
		<u>\$ 1,750,000</u>	<u>\$ 1,733,528</u>	<u>\$ 1,732,884</u>

(1) Senior notes of Arch Capital issued on May 4, 2004 and due May 1, 2034 ("2034 notes").

(2) Senior notes of Arch-U.S., a wholly-owned subsidiary of Arch Capital, issued on December 13, 2013 and due November 1, 2043 ("2043 notes"), fully and unconditionally guaranteed by Arch Capital.

(3) Senior notes of Arch Capital Finance LLC ("Arch Finance"), a wholly-owned finance subsidiary of Arch Capital, issued on December 8, 2016 and due December 15, 2026 ("2026 notes"), fully and unconditionally guaranteed by Arch Capital.

(4) Senior notes of Arch Finance issued on December 8, 2016 and due December 15, 2046 ("2046 notes"), fully and unconditionally guaranteed by Arch Capital.

The 2034 notes are Arch Capital's senior unsecured obligations and rank equally with all of its existing and future senior unsecured indebtedness. Interest payments on the 2034 notes are due on May 1st and November 1st of each year. Arch Capital may redeem the 2034 notes at any time and from time to time, in whole or in part, at a "make-whole" redemption price.

The 2043 notes are unsecured and unsubordinated obligations of Arch-U.S. and Arch Capital, respectively, and rank equally and ratably with the other unsecured and unsubordinated indebtedness of Arch-U.S. and Arch Capital, respectively. Interest payments on the 2043 notes are due on May 1st and November 1st of each year. Arch-U.S. may redeem the 2043 notes at any time and from time to time, in whole or in part, at a "make-whole" redemption price.

The 2026 notes are unsecured and unsubordinated obligations of Arch Finance and Arch Capital, respectively, and rank equally and ratably with the other unsecured and unsubordinated indebtedness of Arch Finance and Arch Capital, respectively. Interest payments on the 2026 notes are due on June 15th and December 15th of each year. Arch Finance may redeem the 2026 notes at any time and from time to time, in whole or in part, at a "make-whole" redemption price.

The 2046 notes are unsecured and unsubordinated obligations of Arch Finance and Arch Capital, respectively, and rank equally and ratably with the other unsecured and unsubordinated indebtedness of Arch Finance and Arch Capital, respectively. Interest payments on the 2046 notes are due on June 15th and December 15th of each year. Arch Finance may

redeem the 2046 notes at any time and from time to time, in whole or in part, at a "make-whole" redemption price.

Letter of Credit and Revolving Credit Facilities

In the normal course of its operations, the Company enters into agreements with financial institutions to obtain secured and unsecured credit facilities.

On October 26, 2016, Arch Capital and certain of its subsidiaries entered into an \$850.0 million five-year credit facility (the "Credit Facility") with a syndication of lenders. The Credit Facility consists of a \$350.0 million secured facility for letters of credit (the "Secured Facility") and a \$500.0 million unsecured facility for revolving loans and letters of credit (the "Unsecured Facility"). Obligations of each borrower under the Secured Facility for letters of credit are secured by cash and eligible securities of such borrower held in collateral accounts. Subject to the receipt of commitments, the Secured Facility may be increased by up to an aggregate of \$350.0 million, and the Unsecured Facility may be increased to an amount not to exceed \$750.0 million. Arch Capital has a one-time option to convert any or all outstanding revolving loans of Arch Capital and/or Arch-U.S. to term loans with the same terms as the revolving loans except that any prepayments may not be re-borrowed. Arch-U.S. guarantees the obligations of Arch Capital, and Arch Capital guarantees the obligations of Arch-U.S. Borrowings of revolving loans may be made at a variable rate based on LIBOR or an alternative base rate at the option of Arch Capital. Secured letters of credit are available for issuance on behalf of Arch Capital insurance and reinsurance subsidiaries. The Credit Facility is structured such that each party that requests a letter of credit or borrowing does so only for itself and for only its own obligations.

The Credit Facility contains certain restrictive covenants customary for facilities of this type, including restrictions on indebtedness, consolidated tangible net worth, minimum shareholders' equity levels and minimum financial strength ratings. Arch Capital and its subsidiaries which are party to the agreement were in compliance with all covenants contained therein at December 31, 2018.

Commitments under the Credit Facility will expire on October 26, 2021, and all loans then outstanding must be repaid. Letters of credit issued under the Unsecured Facility will not have an expiration date later than October 26, 2022.

Under the \$350.0 million secured letter of credit facility, Arch Capital's subsidiaries had \$174.8 million of letters of credit outstanding and remaining capacity of \$175.2 million at December 31, 2018. In addition, certain of Arch Capital's subsidiaries had outstanding letters of credit of \$167.5 million, which were issued in the normal course of business. When issued, these letters of credit are secured by a portion of the investment portfolio. At December 31, 2018, these letters of

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

credit were secured by investments with a fair value of \$362.0 million.

Watford Re has access to a \$100 million letter of credit facility expiring on May 16, 2019 and an \$800 million secured credit facility expiring on November 30, 2021, that provides for borrowings and the issuance of letters of credit not to exceed \$400 million. Borrowings of revolving loans may be made by Watford Re at a variable rate based on LIBOR or an alternative base rate at the option of Watford Re. At December 31, 2018, Watford Re had \$68.9 million in outstanding letters of credit under the two facilities and \$455.7 million of borrowings outstanding under the secured credit facility, backed by Watford Re's investment portfolio. Watford Re was in compliance with all covenants contained in both of its credit facilities at December 31, 2018. The Company does not guarantee or provide credit support for Watford Re, and the Company's financial exposure to Watford Re is limited to its investment in Watford Re's common and preferred shares and counterparty credit risk (mitigated by collateral) arising from the reinsurance transactions.

The Company's outstanding revolving credit agreement borrowings were as follows:

	Year Ended December 31,	
	2018	2017
Arch-U.S.	\$ —	\$ 375,000
Watford Re	455,682	441,132
Total revolving credit agreement borrowings	<u>\$ 455,682</u>	<u>\$ 816,132</u>

18. Goodwill and Intangible Assets

The following table shows an analysis of goodwill and intangible assets:

	Goodwill	Intangible assets (indefinite life)	Intangible assets (finite life)	Total
Net balance at Dec. 31, 2016	\$ 204,022	\$ 68,174	\$ 509,357	\$ 781,553
Acquisitions	806	—	2,300	3,106
Amortization	—	—	(125,778)	(125,778)
Foreign currency movements and other adjustments	(6,592)	—	322	(6,270)
Net balance at Dec. 31, 2017	198,236	68,174	386,201	652,611
Acquisitions	51,476	—	43,000	94,476
Amortization	—	—	(105,670)	(105,670)
Impairment (1)	—	(6,300)	—	(6,300)
Foreign currency movements and other adjustments	(92)	—	(105)	(197)
Net balance at Dec. 31, 2018	<u>\$ 249,620</u>	<u>\$ 61,874</u>	<u>\$ 323,426</u>	<u>\$ 634,920</u>
Gross balance at Dec. 31, 2018	\$ 256,668	\$ 61,874	\$ 662,101	\$ 980,643
Accumulated amortization	—	—	(337,190)	(337,190)
Foreign currency movements and other adjustments	(7,048)	—	(1,485)	(8,533)
Net balance at Dec. 31, 2018	<u>\$ 249,620</u>	<u>\$ 61,874</u>	<u>\$ 323,426</u>	<u>\$ 634,920</u>

(1) The impairment to the indefinite-lived intangible assets during the year ended December 31, 2018 of \$6.3 million related to insurance licenses from the acquisition of UGC that were forfeited as a result of the merger of two subsidiaries. The impairment was recorded in "corporate expenses" in the consolidated statement of income.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

The following table presents the components of goodwill and intangible assets:

	Gross Balance	Accumulated Amortization	Foreign Currency Translation Adjustment and Other	Net Balance
Dec. 31, 2018				
Acquired insurance contracts	\$ 435,067	\$ (271,981)	\$ (150)	\$ 162,936
Operating platform	47,400	(35,402)	—	11,998
Distribution relationships	186,611	(36,718)	(1,335)	148,558
Goodwill	256,668	—	(7,048)	249,620
Insurance licenses	61,874	—	—	61,874
Unfavorable service contract	(9,533)	7,949	—	(1,584)
Other	2,556	(1,038)	—	1,518
Total	\$ 980,643	\$ (337,190)	\$ (8,533)	\$ 634,920
Dec. 31, 2017				
Acquired insurance contracts	\$ 435,067	\$ (182,947)	\$ (150)	\$ 251,970
Operating platform	44,900	(26,422)	—	18,478
Distribution relationships	147,611	(28,321)	(1,230)	118,060
Goodwill	205,192	—	(6,956)	198,236
Insurance licenses	68,174	—	—	68,174
Unfavorable service contract	(9,533)	6,997	—	(2,536)
Other	1,056	(827)	—	229
Total	\$ 892,467	\$ (231,520)	\$ (8,336)	\$ 652,611

The estimated remaining amortization expense for the Company's intangible assets with finite lives is as follows:

2019	\$ 77,529
2020	49,689
2021	33,043
2022	27,149
2023	24,908
2024 and thereafter	111,108
Total	\$ 323,426

The estimated remaining useful lives of these assets range from one to eighteen years at December 31, 2018.

Other than the impairment described above, the Company's annual impairment reviews for goodwill and intangible assets did not result in the recognition of impairment losses for 2018, 2017 and 2016.

19. Shareholders' Equity

Authorized and Issued

The authorized share capital of Arch Capital consists of 1.8 billion Common Shares, par value of \$0.0011 per share, and 50 million Preferred Shares, par value of \$0.01 per share.

Common Shares

The following table presents a roll-forward of changes in Arch Capital's issued and outstanding Common Shares:

	Year Ended December 31,		
	2018	2017	2016
Common Shares:			
Shares issued and outstanding, beginning of year	549,872,226	523,932,303	519,323,547
Shares issued (1)	2,757,506	3,388,344	3,447,336
Conversion of Series D preferred shares (2)	17,022,600	21,265,860	—
Restricted shares issued, net of cancellations	1,084,951	1,285,719	1,161,420
Shares issued and outstanding, end of year	570,737,283	549,872,226	523,932,303
Common shares in treasury, end of year	(168,282,449)	(156,938,409)	(155,569,752)
Shares issued and outstanding, end of year	<u>402,454,834</u>	<u>392,933,817</u>	<u>368,362,551</u>

- (1) Includes shares issued from the exercise of stock options and stock appreciation rights, and shares issued from the employee share purchase plan.
- (2) Such shares represent common shares that were issued upon conversion of the non-voting common equivalent preference shares issued in connection with the AIG acquisition.

Three-For-One Common Share Split

In May 2018, shareholders approved a proposal to amend the memorandum of association by sub-dividing the authorized common shares of Arch Capital to effect a three-for-one split of Arch Capital's common shares. The share split changed the Company's authorized common shares to 1.8 billion common shares (600 million previously), with a par value of \$.0011 per share (\$.0033 previously). Information pertaining to the composition of the Company's shareholders' equity accounts, shares and earnings per share has been retroactively restated in the accompanying financial statements and notes to the consolidated financial statements to reflect the share split.

Share Repurchase Program

The board of directors of Arch Capital has authorized the investment in Arch Capital's common shares through a share repurchase program. At December 31, 2018, approximately \$163.7 million of share repurchases were available under the program. Repurchases under the program may be effected from

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

time to time in open market or privately negotiated transactions through December 31, 2019. The timing and amount of the repurchase transactions under this program will depend on a variety of factors, including market conditions and corporate and regulatory considerations.

Repurchases of Arch Capital’s common shares in connection with the share repurchase plan and other share-based transactions were held in the treasury under the cost method, and the cost of the common shares acquired is included in ‘Common shares held in treasury, at cost.’ At December 31, 2018, Arch Capital held 168.3 million shares for an aggregate cost of \$2.38 billion in treasury, at cost.

The Company’s repurchases under the share repurchase program were as follows:

	Year Ended December 31,		
	2018	2017	2016
Aggregate cost of shares repurchased	\$ 282,762	\$ —	\$ 75,256
Shares repurchased	10,559,850	—	3,420,411
Average price per share repurchased	\$ 26.78	\$ —	\$ 22.00

Since the inception of the share repurchase program through December 31, 2018, Arch Capital has repurchased approximately 386.2 million common shares for an aggregate purchase price of \$3.97 billion.

Convertible Non-Voting Common Equivalent Preferred Shares

On December 31, 2016, the Company completed the acquisition of all of the outstanding shares of capital stock of UGC. Based upon a formula set forth in the Stock Purchase Agreement, AIG received 1,276,282 of Arch Capital’s Series D convertible non-voting common equivalent preferred shares (“Series D Preferred Shares”). Each Series D Preferred Share converts to 10 shares of Arch Capital fully paid non-assessable common stock.

The Company determined, based on a review of the terms features and rights of the series D preferred shares compared to the rights of the Company’s common shareholders, the underlying 38,288,460 common shares (split adjusted) that the convertible securities convert to were common share equivalents at the time of their issuance.

In June 2017, Arch Capital completed an underwritten public secondary offering of 21,265,860 common shares (split adjusted) by AIG following transfer of 708,862 Series D Preferred Shares. In March 2018, Arch Capital completed an underwritten public secondary offering of 17,022,600 common shares (split adjusted) by AIG following transfer of 567,420 Series D Preferred Shares. Proceeds from the sale of common shares pursuant to the public offering were received by AIG.

At December 31, 2018, no Series D Preferred Shares were outstanding.

Series F Preferred Shares

In August 2017 and November 2017, Arch Capital completed combined \$330 million of underwritten public offerings (\$230 million in August 2017 and \$100 million in November 2017) of 13.2 million depositary shares (the “Series F Depositary Shares”), each of which represents a 1/1,000th interest in a share of its 5.45% Non-Cumulative Preferred Shares, Series F, have a \$0.01 par value and \$25,000 liquidation preference per share (equivalent to \$25 liquidation preference per Series F Depositary Share) (the “Series F Preferred Shares”). Each Series F Depositary Share, evidenced by a depositary receipt, entitles the holder, through the depositary, to a proportional fractional interest in all rights and preferences of the Series F Preferred Shares represented thereby (including any dividend, liquidation, redemption and voting rights).

Holders of Series F Preferred Shares will be entitled to receive dividend payments only when, as and if declared by our board of directors or a duly authorized committee of the board. Any such dividends will be payable from, and including, the date of original issue on a noncumulative basis, quarterly in arrears on the last day of March, June, September and December of each year, at an annual rate of 5.45%. Dividends on the Series F Preferred Shares are not cumulative. The Company will be restricted from paying dividends on or repurchasing its common shares unless certain dividend payments are made on the Series F Preferred Shares.

Except in specified circumstances relating to certain tax or corporate events, the Series F Preferred Shares are not redeemable prior to August 17, 2022 (the fifth anniversary of the issue date). On and after that date, the Series F Preferred Shares will be redeemable at the Company’s option, in whole or in part, at a redemption price of \$25,000 per share of the Series F Preferred Shares (equivalent to \$25 per depositary share), plus any declared and unpaid dividends, without accumulation of any undeclared dividends to, but excluding, the redemption date. The Series F Depositary Shares will be redeemed if and to the extent the related Series F Preferred Shares are redeemed by the Company. Neither the Series F Depositary Shares nor the Series F Preferred Shares have a stated maturity, nor will they be subject to any sinking fund or mandatory redemption. The Series F Preferred Shares are not convertible into any other securities. The Series F Preferred Shares will not have voting rights, except under limited circumstances. The net proceeds from the Series F Preferred Share offerings were used to redeem the Company’s outstanding 6.75% Series C Non-Cumulative Preferred Shares.

Series E Preferred Shares

On September 29, 2016, Arch Capital completed a \$450 million underwritten public offering of 18.0 million depositary shares

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

(the “Series E Depositary Shares”), each of which represents a 1/1,000th interest in a share of its 5.25% Non-Cumulative Preferred Shares, Series E, have a \$0.01 par value and \$25,000 liquidation preference per share (equivalent to \$25 liquidation preference per Series E Depositary Share) (the “Series E Preferred Shares”). Each Series E Depositary Share, evidenced by a depositary receipt, entitles the holder, through the depositary, to a proportional fractional interest in all rights and preferences of the Series E Preferred Shares represented thereby (including any dividend, liquidation, redemption and voting rights).

Holders of Series E Preferred Shares will be entitled to receive dividend payments only when, as and if declared by our board of directors or a duly authorized committee of the board. Any such dividends will be payable from, and including, the date of original issue on a non-cumulative basis, quarterly in arrears on the last day of March, June, September and December of each year, at an annual rate of 5.25%. Dividends on the Series E Preferred Shares are not cumulative. The Company will be restricted from paying dividends on or repurchasing its common shares unless certain dividend payments are made on the Series E preferred shares.

Except in specified circumstances relating to certain tax or corporate events, the Series E Preferred Shares are not redeemable prior to September 29, 2021 (the fifth anniversary of the issue date). On and after that date, the Series E Preferred Shares will be redeemable at the Company’s option, in whole or in part, at a redemption price of \$25,000 per share of the Series E Preferred Shares (equivalent to \$25 per Series E Depositary Share), plus any declared and unpaid dividends, without accumulation of any undeclared dividends to, but excluding, the redemption date. The Series E Depositary Shares will be redeemed if and to the extent the related Series E Preferred Shares are redeemed by the Company. Neither the Series E Depositary Shares nor the Series E Preferred Shares have a stated maturity, nor will they be subject to any sinking fund or mandatory redemption. The Series E Preferred Shares are not convertible into any other securities. The Series E Preferred Shares will not have voting rights, except under limited circumstances.

Series C Preferred Shares

On January 2, 2018, Arch Capital redeemed all outstanding 6.75% Series C non-cumulative preferred shares. The preferred shares were redeemed at a redemption price equal to \$25 per share, plus all declared and unpaid dividends to (but excluding) the redemption date. In accordance with GAAP, following the redemption, original issuance costs related to such shares have been removed from additional paid-in capital and recorded as a “loss on redemption of preferred shares.” Such adjustment had no impact on total shareholders’ equity or cash flows.

20. Share-Based Compensation

Long Term Incentive and Share Award Plans

The Company utilizes share-based compensation plans for officers, other employees and directors of Arch Capital and its subsidiaries to provide competitive compensation opportunities, to encourage long-term service, to recognize individual contributions and reward achievement of performance goals and to promote the creation of long-term value for shareholders by aligning the interests of such persons with those of shareholders.

The 2018 Long-Term Incentive and Share Award Plan (the “2018 Plan”) became effective as of May 9, 2018 following approval by shareholders of the Company. The 2018 Plan provides for the issuance of restricted stock units, performance units, restricted shares, performance shares, stock options and stock appreciation rights and other equity-based awards to our employees and directors. The 2018 Plan authorizes the issuance of 34,500,000 common shares and will terminate as to future awards on February 28, 2028. At December 31, 2018, 32,890,632 shares are available for future issuance.

The 2015 Long Term Incentive and Share Award Plan (the (“2015 Plan”) authorizes the issuance of 12,900,000 common shares and became effective as of May 7, 2015 following approval by shareholders of the Company. The 2015 Plan provides for the issuance of share-based awards to our employees and directors and will terminate as to future awards on February 26, 2025. At December 31, 2018, 251,820 shares are available for future issuance.

The 2012 Long Term Incentive and Share Award Plan (the “2012 Plan”) became effective as of May 9, 2012 following approval by shareholders of the Company. The 2012 Plan authorizes the issuance of 22,301,772 common shares and will terminate as to future awards on February 28, 2022. At December 31, 2018, 389,406 shares are available for grant under the 2012 Plan.

Upon shareholder approval on May 6, 2016, the Amended and Restated Arch Capital Group Ltd. 2007 Employee Share Purchase Plan (the “ESPP”) became effective and a total of 4,689,777 common shares were reserved for issuance. The purpose of the ESPP is to give employees of Arch Capital and its subsidiaries an opportunity to purchase common shares through payroll deductions, thereby encouraging employees to share in the economic growth and success of Arch Capital and its subsidiaries. The ESPP is designed to qualify as an “employee share purchase plan” under Section 423 of the Code. At December 31, 2018, approximately 3,281,686 shares remain available for issuance.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Stock Options and Stock Appreciation Rights

The Company generally issues stock options and SARs to eligible employees, with exercise prices equal to the fair market values of the Company's Common Shares on the grant dates. Such grants generally vest over a three year period with one-third vesting on the first, second and third anniversaries of the grant date.

The grant date fair value is determined using the Black-Scholes option valuation model. The expected life assumption was based on an expected term analysis, which incorporated the Company's historical exercise experience. Expected volatility is based on the Company's daily historical trading data of its common shares. The table below summarizes the assumptions used.

	Year Ended December 31,		
	2018	2017	2016
Dividend yield	—%	—%	—%
Expected volatility	21.3%	21.3%	21.7%
Risk free interest rate	2.8%	2.0%	1.4%
Expected option life	6.0 years	6.0 years	6.0 years

A summary of stock option and SAR activity under the Company's Long Term Incentive and Share Award Plans during 2018 is presented below:

	Year Ended December 31, 2018			
	Number of Options / SARs	Weighted Average Exercise Price	Weighted Average Contractual Term	Aggregate Intrinsic Value
Outstanding, beginning of year	19,770,174	\$ 17.22		
Granted	3,158,715	\$ 27.22		
Exercised	(2,649,229)	\$ 11.99		
Forfeited or expired	(203,067)	\$ 28.68		
Outstanding, end of year	20,076,593	\$ 19.37	5.44	\$ 161,666
Exercisable, end of year	16,162,208	\$ 17.29	4.59	\$ 160,363

The aggregate intrinsic value of stock options and SARs exercised represents the difference between the exercise price of the stock options and SARs and the closing market price of the Company's common shares on the exercise dates. During 2018, the Company received proceeds of \$6.6 million from the exercise of stock options and recognized a tax benefit of \$4.9 million from the exercise of stock options and SARs.

	Year Ended December 31,		
	2018	2017	2016
Weighted average grant date fair value	\$ 7.50	\$ 8.15	\$ 5.71
Aggregate intrinsic value of Options/SARs exercised	\$ 43,468	\$ 64,173	\$ 59,617

Restricted Common Shares and Restricted Units

The Company also issues restricted share and unit awards to eligible employees and directors, for which the fair value is equal to the fair market values of the Company's Common Shares on the grant dates. Restricted share and unit awards generally vest over a three year period with one-third vesting on the first, second and third anniversaries of the grant date.

A summary of restricted share and restricted unit activity under the Company's Long Term Incentive and Share Award Plans for 2018 is presented below:

	Restricted Common Shares	Restricted Unit Awards
Unvested Shares:		
Unvested balance, beginning of year	2,517,009	456,477
Granted	484,940	1,078,347
Vested	(1,269,057)	(223,929)
Forfeited	(113,607)	(56,337)
Unvested balance, end of year	1,619,285	1,254,558

Weighted Average Grant Date Fair Value:		
Unvested balance, beginning of year	\$ 27.76	\$ 28.94
Granted	\$ 26.76	\$ 26.90
Vested	\$ 25.89	\$ 27.04
Forfeited	\$ 28.56	\$ 27.78
Unvested balance, end of year	\$ 28.88	\$ 27.58

The following table presents the weighted average grant date fair value of restricted shares and restricted unit awards granted and the aggregate fair value of restricted shares and unit awards vesting in each year.

	Year Ended December 31,		
	2018	2017	2016
Restricted shares and restricted unit awards granted	1,563,287	1,747,176	1,442,940
Weighted average grant date fair value	\$ 26.86	\$ 32.02	\$ 23.91
Aggregate fair value of vested restricted shares and units awards	\$ 39,898	\$ 133,848	\$ 45,206

The aggregate intrinsic value of restricted units outstanding at December 31, 2018 was \$34.6 million, and the aggregate intrinsic value of restricted units vested and deferred was \$1.1 million.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Performance Awards

The Company also issues performance share and unit awards (“performance awards”) to eligible employees, which are earned based on the achievement of pre-established threshold, target and maximum goals over three-year performance periods. Final payouts depend on the level of achievement along with each employees continued service through the vest date. The grant date fair value of the performance awards is measured using a Monte Carlo simulation model, which incorporated the assumptions summarized in the table below. Expected volatility is based on the Company’s daily historical trading data of its common shares. The cumulative compensation expense recognized and unrecognized as of any reporting period date represents the adjusted estimate of performance shares and units that will ultimately be awarded, valued at their original grant date fair values.

	Year Ended December 31,		
	2018	2017	2016
Expected volatility	16.2%	—%	—%
Risk free interest rate	2.6%	—%	—%

	Performance Shares	Performance Units
	Unvested Shares:	
Unvested balance, beginning of year	—	—
Granted	730,520	12,993
Vested	—	—
Forfeited	(15,192)	0
Unvested balance, end of year	715,328	12,993

Weighted Average Grant Date Fair Value:

Unvested balance, beginning of year	\$ —	\$ —
Granted	\$ 24.77	\$ 24.71
Vested	\$ —	\$ —
Forfeited	\$ 24.65	\$ 0.00
Unvested balance, end of year	\$ 24.77	\$ 24.71

The following table presents the weighted average grant date fair values of performance awards granted.

	Year Ended December 31,		
	2018	2017	2016
Performance awards	743,513	—	—
Weighted average grant date fair value	\$ 24.77	\$ —	\$ —

The issuance of share-based awards and amortization thereon has no effect on the Company’s consolidated shareholders’ equity.

Share-Based Compensation Expense

The following tables present pre-tax and after-tax share-based compensation expense recognized as well as the unrecognized compensation cost associated with unvested awards and the weighted average period over which it is expected to be recognized.

	Year Ended December 31,		
	2018	2017	2016
Pre-Tax			
Stock options and SARs	\$ 16,272	\$ 18,536	\$ 14,095
Restricted share and unit awards	34,025	46,884	40,398
Performance awards	4,414	—	—
ESPP	1,224	2,443	2,089
Total	\$ 55,935	\$ 67,863	\$ 56,582

After-Tax			
Stock options and SARs	\$ 14,894	\$ 16,219	\$ 11,885
Restricted share and unit awards	29,044	37,708	31,660
Performance awards	4,127	—	—
ESPP	1,114	2,171	1,861
Total	\$ 49,179	\$ 56,098	\$ 45,406

	December 31, 2018		
	Stock Options and SARs	Restricted Common Shares and Units	Performance Common Shares and Units
Unrecognized compensation cost related to unvested awards	\$ 16,478	\$ 42,979	\$ 4,768
Weighted average recognition period (years)	1.57	1.44	1.43

21. Retirement Plans

For purposes of providing employees with retirement benefits, the Company maintains defined contribution retirement plans. Contributions are based on the participants’ eligible compensation. For 2018, 2017 and 2016, the Company expensed \$40.8 million, \$40.7 million and \$30.6 million, respectively, related to these retirement plans.

22. Legal Proceedings

The Company, in common with the insurance industry in general, is subject to litigation and arbitration in the normal course of its business. As of December 31, 2018, the Company was not a party to any litigation or arbitration which is expected by management to have a material adverse effect on the Company’s results of operations and financial condition and liquidity.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

23. Statutory Information

The Company's insurance and reinsurance subsidiaries are subject to insurance and/or reinsurance laws and regulations in the jurisdictions in which they operate. These regulations include certain restrictions on the amount of dividends or other distributions available to shareholders without prior approval of the insurance regulatory authorities.

The actual and required statutory capital and surplus for the Company's principal operating subsidiaries at December 31, 2018 and 2017:

	December 31,	
	2018	2017
Actual capital and surplus (1):		
Bermuda	\$ 11,605,652	\$ 9,841,225
Ireland	653,055	543,929
United States	4,195,477	4,850,148
United Kingdom	386,892	320,857
Canada	59,096	63,390
Required capital and surplus:		
Bermuda	\$ 4,718,345	\$ 3,761,939
Ireland	429,117	383,966
United States	1,783,268	1,816,919
United Kingdom	271,864	270,242
Canada	33,189	35,846

(1) Such amounts include ownership interests in affiliated insurance and reinsurance subsidiaries.

There were no state-prescribed or permitted regulatory accounting practices for any of the Company's insurance or reinsurance entities that resulted in reported statutory surplus that differed from that which would have been reported under the prescribed practices of the respective regulatory authorities, including the National Association of Insurance Commissioners. The differences between statutory financial statements and statements prepared in accordance with GAAP vary by jurisdiction, however, with the primary differences being that statutory financial statements may not reflect deferred acquisition costs, certain net deferred tax assets, goodwill and intangible assets, unrealized appreciation or depreciation on debt securities and certain unauthorized reinsurance recoverables and include contingency reserves.

The statutory net income (loss) for the Company's principal operating subsidiaries for 2018, 2017 and 2016 was as follows:

	Year Ended December 31,		
	2018	2017	2016
Statutory net income (loss):			
Bermuda	\$ 919,554	\$ 881,665	\$ 886,492
Ireland	29,223	(14,438)	26,935
United States	292,831	500,412	67,826
United Kingdom	(18,467)	(33,257)	(7,512)
Canada	2,525	158	621

Bermuda

The Company has two Bermuda based subsidiaries: Arch Re Bermuda, a Class 4 insurer and long-term insurer, and Watford Re, a Class 4 insurer. Under the Bermuda Insurance Act 1978 (the "Insurance Act"), these subsidiaries are required to maintain minimum statutory capital and surplus equal to the greater of a minimum solvency margin and the enhanced capital requirement as determined by the Bermuda Monetary Authority ("BMA"). The enhanced capital requirement is calculated based on the Bermuda Solvency Capital Requirement model, a risk-based model that takes into account the risk characteristics of different aspects of the company's business. At December 31, 2018 and 2017, all such requirements were met.

The ability of these subsidiaries to pay dividends is limited under Bermuda law and regulations. Under the Insurance Act, Arch Re Bermuda is restricted with respect to the payment of dividends. Arch Re Bermuda is prohibited from declaring or paying in any financial year dividends of more than 25% of its total statutory capital and surplus (as shown on its previous financial year's statutory balance sheet) unless it files, at least seven days before payment of such dividends, with the Bermuda Monetary Authority an affidavit stating that it will continue to meet the required margins following the declaration of those dividends. Accordingly, Arch Re Bermuda can pay approximately \$2.62 billion to Arch Capital during 2019 without providing an affidavit to the BMA.

Ireland

The Company has two Irish subsidiaries: Arch Re Europe, an authorized life and non-life reinsurer, and Arch MI Europe, an authorized non-life insurer. Irish authorized reinsurers and insurers, such as Arch Re Europe and Arch MI Europe, are also subject to the general body of Irish laws and regulations including the provisions of the Companies Act 2014. Arch Re Europe and Arch MI Europe are subject to the supervision of the Central Bank of Ireland ("CBOI") and must comply with Irish insurance acts and regulations as well as with directions and guidance issued by the CBOI. These subsidiaries are

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

required to maintain a minimum level of capital. At December 31, 2018 and 2017, these requirements were met.

The amount of dividends these subsidiaries are permitted to declare is limited to accumulated, realized profits, so far as not previously utilized by distribution or capitalization, less its accumulated, realized losses, so far as not previously written off in a reduction or reorganization of capital duly made. The solvency and capital requirements must still be met following any distribution. Dividends or distributions, if any, made by Arch Re Europe would result in an increase in available capital at Arch Re Bermuda.

United States

The Company's U.S. insurance and reinsurance subsidiaries are subject to insurance laws and regulations in the jurisdictions in which they operate. The ability of the Company's regulated insurance subsidiaries to pay dividends or make distributions is dependent on their ability to meet applicable regulatory standards. These regulations include restrictions that limit the amount of dividends or other distributions, such as loans or cash advances, available to shareholders without prior approval of the insurance regulatory authorities.

Dividends or distributions, if any, made by Arch Re U.S. would result in an increase in available capital at Arch-U.S., the Company's U.S. holding company. Arch Re U.S. can declare a maximum of approximately \$123.2 million of dividends during 2019 subject to the approval of the Commissioner of the Delaware Department of Insurance.

Arch Mortgage Insurance Company and United Guaranty Residential Insurance Company have each been approved as an eligible mortgage insurer by Fannie Mae and Freddie Mac, subject to maintaining certain ongoing requirements ("eligible mortgage insurers"). In April 2015, the GSEs published comprehensive, revised requirements, known as the Private Mortgage Insurer Eligibility Requirements or "PMIERS." As clarified and revised by the Guidance Letters issued by the GSEs in December 2016 and March 2017, the PMIERS apply to the Company's eligible mortgage insurers, but do not apply to Arch Mortgage Guaranty Company, which is not GSE-approved.

The amount of assets required to satisfy the revised financial requirements of the PMIERS at any point in time will be affected by many factors, including macro-economic conditions, the size and composition of our eligible mortgage insurers' mortgage insurance portfolio at the point in time, and the amount of risk ceded to reinsurers that may be deducted in our calculation of "minimum required assets."

The Company's U.S. mortgage insurance subsidiaries are subject to detailed regulation by their domiciliary and primary regulators, the Wisconsin Office of the Commissioner of Insurance ("Wisconsin OCI") for Arch Mortgage Insurance

Company and Arch Mortgage Guaranty Company, the North Carolina Department of Insurance ("NC DOI") for United Guaranty Residential Insurance Company, and by state insurance departments in each state in which they are licensed. As mandated by state insurance laws, mortgage insurers are generally mono-line companies restricted to writing a single type of insurance business, such as mortgage insurance business. Each company is subject to either Wisconsin or North Carolina statutory requirements as to payment of dividends. Generally, both Wisconsin and North Carolina law precludes any dividend before giving at least 30 days' notice to the Wisconsin OCI or NC DOI, as applicable, and prohibits paying any dividend unless it is fair and reasonable to do so. In addition, the state regulators and the GSEs limit or restrict our eligible mortgage insurers' ability to pay stockholder dividends or otherwise return capital to shareholders. Under respective states law, our U.S. mortgage subsidiaries can declare a maximum of approximately \$324.4 million of dividends during 2019. In certain instances, approval by the GSEs would be required for dividends or other forms of return of capital to shareholders due to the requirements under PMIERS, including the minimum required assets imposed on our eligible mortgage insurers by the GSEs. Such dividend would result in an increase in available capital at Arch U.S. MI Holdings Inc., a subsidiary of Arch-U.S.

Mortgage insurance companies licensed in Wisconsin or North Carolina are required to establish contingency loss reserves for purposes of statutory accounting in an amount equal to at least 50% of net earned premiums. These amounts generally cannot be withdrawn for a period of 10 years and are separate liabilities for statutory accounting purposes, which affects the ability to pay dividends. However, with prior regulatory approval, a mortgage insurance company may make early withdrawals from the contingency reserve when incurred losses exceed 35% of net premiums earned in a calendar year.

Under Wisconsin and North Carolina law, as well as that of 14 other states, a mortgage insurer must maintain a minimum amount of statutory capital relative to its risk in force in order for the mortgage insurer to continue to write new business. While formulations of minimum capital vary in certain jurisdictions, the most common measure applied allows for a maximum risk-to-capital ratio of 25 to 1. Wisconsin and North Carolina both require a mortgage insurer to maintain a "minimum policyholder position" calculated in accordance with their respective regulations. Policyholders' position consists primarily of statutory policyholders' surplus plus the statutory contingency reserve, less ceded reinsurance. While the statutory contingency reserve is reported as a liability on the statutory balance sheet, for risk-to-capital ratio calculations, it is included as capital for purposes of statutory capital.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

United Kingdom

The Prudential Regulation Authority (“PRA”) and the Financial Conduct Authority (“FCA”) regulate insurance and reinsurance companies and the FCA regulates firms carrying on insurance mediation activities operating in the U.K., both under the Financial Services and Markets Act 2000. The Company’s European insurance operations are conducted on two platforms: Arch Insurance Company Europe and Arch Syndicate 2012. Arch Syndicate 2012 has one member, Arch Syndicate Investments Ltd. (“ASIL”) and is managed by Arch Underwriting at Lloyd’s Ltd (“AUAL”). All U.K. companies are also subject to a range of statutory provisions, including the laws and regulations of the Companies Acts 2006 (as amended) (the “U.K. Companies Acts”).

Arch Insurance Company Europe and AUAL (on behalf of itself, Arch Syndicate 2012 and ASIL) must maintain a margin of solvency at all times under the Solvency II Directive from the European Insurance and Occupational Pensions Authority. The regulations stipulate that insurers are required to maintain the minimum capital requirement and solvency capital requirement at all times. The capital requirements are calculated by reference to standard formulae defined in Solvency II. At December 31, 2018 and 2017, our subsidiaries were in compliance with these requirements.

As a corporate member of Lloyd’s, ASIL is subject to the oversight of the Council of Lloyd’s. The capital required to support a Syndicate’s underwriting capacity, or funds at Lloyd’s, is assessed annually and is determined by Lloyd’s in accordance with the capital adequacy rules established by the PRA. The Company has provided capital to support the underwriting of Arch Syndicate 2012 in the form of pledged assets provided by Arch Re Bermuda. The amount which the Company provides as funds at Lloyd’s is not available for distribution to the Company for the payment of dividends. Lloyd’s is supervised by the PRA and required to implement certain rules prescribed by the PRA under the Lloyd’s Act of 1982 regarding the operation of the Lloyd’s market. With respect to managing agents and corporate members, Lloyd’s prescribes certain minimum standards relating to management and control, solvency and other requirements and monitors managing agents’ compliance with such standards.

Under U.K. law, all U.K. companies are restricted from declaring a dividend to their shareholders unless they have “profits available for distribution.” The calculation as to whether a company has sufficient profits is based on its accumulated realized profits minus its accumulated realized losses. U.K. insurance regulatory laws do not prohibit the payment of dividends, but the PRA or FCA, as applicable, requires that insurance companies and insurance intermediaries maintain certain solvency margins and may restrict the payment of a dividend by Arch Insurance Company Europe, AUAL and ASIL.

Canada

Arch Insurance Canada and the Canadian branch of Arch Re U.S. (“Arch Re Canada”) are subject to federal, as well as provincial and territorial, regulation in Canada. The Office of the Superintendent of Financial Institutions (“OSFI”) is the federal regulatory body that, under the Insurance Companies Act (Canada), regulates federal Canadian and non-Canadian insurance companies operating in Canada. Arch Insurance Canada and Arch Re Canada are subject to regulation in the provinces and territories in which they underwrite insurance/reinsurance, and the primary goal of insurance/reinsurance regulation at the provincial and territorial levels is to govern the market conduct of insurance/reinsurance companies. Arch Insurance Canada is licensed to carry on insurance business by OSFI and in each province and territory. Arch Re Canada is licensed to carry-on reinsurance business by OSFI and in the provinces of Ontario and Quebec.

Under the Insurance Companies Act (Canada), Arch Insurance Canada is required to maintain an adequate amount of capital in Canada, calculated in accordance with a test promulgated by OSFI called the Minimum Capital Test (“MCT”), and Arch Re Canada is required to maintain an adequate margin of assets over liabilities in Canada, calculated in accordance with a test promulgated by OSFI called the Branch Adequacy of Assets Test. Dividends or distributions, if any, made by Arch Insurance Canada would result in an increase in available capital at Arch Insurance Company (see “—United States” section).

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

24. Unaudited Condensed Quarterly Financial Information

The following table summarizes the 2018 and 2017 unaudited condensed quarterly financial information:

	Fourth Quarter	Third Quarter	Second Quarter	First Quarter
Year Ended December 31, 2018				
Net premiums written	\$ 1,301,754	\$ 1,333,553	\$ 1,298,896	\$ 1,412,544
Net premiums earned	1,369,435	1,290,878	1,336,763	1,234,899
Net investment income	157,217	144,024	135,668	126,724
Net realized gains (losses)	(166,030)	(51,705)	(76,611)	(110,998)
Net impairment losses recognized in earnings	(1,705)	(492)	(470)	(162)
Underwriting income (loss)	166,955	234,581	235,465	236,997
Net income (loss) attributable to Arch	136,494	227,408	243,646	150,423
Preferred dividends	(10,403)	(10,402)	(10,403)	(10,437)
Net income (loss) available to Arch common shareholders	126,091	217,006	233,243	137,276
Net income (loss) per common share -- basic	\$ 0.31	\$ 0.54	\$ 0.58	\$ 0.34
Net income (loss) per common share -- diluted	\$ 0.31	\$ 0.53	\$ 0.56	\$ 0.33
Year Ended December 31, 2017				
Net premiums written	\$ 1,111,015	\$ 1,325,403	\$ 1,248,695	\$ 1,276,260
Net premiums earned	1,224,755	1,261,886	1,240,874	1,117,017
Net investment income	125,415	116,459	111,124	117,874
Net realized gains (losses)	26,978	66,275	21,735	34,153
Net impairment losses recognized in earnings	(1,723)	(1,878)	(1,730)	(1,807)
Underwriting income (loss)	182,111	(142,172)	195,419	212,072
Net income (loss) attributable to Arch	214,640	(33,656)	185,167	253,127
Preferred dividends	(11,105)	(12,369)	(11,349)	(11,218)
Net income (loss) available to Arch common shareholders	203,535	(52,760)	173,818	241,909
Net income (loss) per common share -- basic	\$ 0.50	\$ (0.13)	\$ 0.43	\$ 0.60
Net income (loss) per common share -- diluted	\$ 0.49	\$ (0.13)	\$ 0.42	\$ 0.58

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

25. Guarantor Financial Information

The following tables present condensed consolidating balance sheets at December 31, 2018 and 2017 and condensed consolidating statements of income, comprehensive income and cash flows for 2018, 2017 and 2016 for Arch Capital, Arch-U.S., a 100% owned subsidiary of Arch Capital, and Arch Capital's other subsidiaries.

Condensed Consolidating Balance Sheet	December 31, 2018				
	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Assets					
Total investments	\$ 104	\$ 452,674	\$ 21,307,206	\$ (14,700)	\$ 21,745,284
Cash	6,125	5,940	634,491	—	646,556
Investments in subsidiaries	9,735,256	3,999,243	—	(13,734,499)	—
Due from subsidiaries and affiliates	9	2	1,802,686	(1,802,697)	—
Premiums receivable	—	—	1,834,389	(535,239)	1,299,150
Reinsurance recoverable on unpaid and paid losses and loss adjustment expenses	—	—	8,618,660	(5,699,288)	2,919,372
Contractholder receivables	—	—	2,079,111	—	2,079,111
Ceded unearned premiums	—	—	1,730,262	(754,793)	975,469
Deferred acquisition costs	—	—	618,535	(48,961)	569,574
Goodwill and intangible assets	—	—	634,920	—	634,920
Other assets	12,588	80,949	1,466,438	(211,082)	1,348,893
Total assets	<u>\$ 9,754,082</u>	<u>\$ 4,538,808</u>	<u>\$ 40,726,698</u>	<u>\$ (22,801,259)</u>	<u>\$ 32,218,329</u>
Liabilities					
Reserve for losses and loss adjustment expenses	\$ —	\$ —	\$ 17,345,142	\$ (5,491,845)	\$ 11,853,297
Unearned premiums	—	—	4,508,429	(754,793)	3,753,636
Reinsurance balances payable	—	—	928,346	(535,239)	393,107
Contractholder payables	—	—	2,079,111	—	2,079,111
Collateral held for insured obligations	—	—	236,630	—	236,630
Senior notes	297,150	494,723	941,655	—	1,733,528
Revolving credit agreement borrowings	—	—	455,682	—	455,682
Due to subsidiaries and affiliates	—	536,805	1,265,892	(1,802,697)	—
Other liabilities	17,105	26,270	1,699,768	(467,484)	1,275,659
Total liabilities	<u>314,255</u>	<u>1,057,798</u>	<u>29,460,655</u>	<u>(9,052,058)</u>	<u>21,780,650</u>
Redeemable noncontrolling interests	<u>—</u>	<u>—</u>	<u>220,992</u>	<u>(14,700)</u>	<u>206,292</u>
Shareholders' Equity					
Total shareholders' equity available to Arch	9,439,827	3,481,010	10,253,491	(13,734,501)	9,439,827
Non-redeemable noncontrolling interests	—	—	791,560	—	791,560
Total shareholders' equity	<u>9,439,827</u>	<u>3,481,010</u>	<u>11,045,051</u>	<u>(13,734,501)</u>	<u>10,231,387</u>
Total liabilities, noncontrolling interests and shareholders' equity	<u>\$ 9,754,082</u>	<u>\$ 4,538,808</u>	<u>\$ 40,726,698</u>	<u>\$ (22,801,259)</u>	<u>\$ 32,218,329</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

December 31, 2017

Condensed Consolidating Balance Sheet	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Assets					
Total investments	\$ 96,540	\$ 46,281	\$ 21,711,891	\$ (14,700)	\$ 21,840,012
Cash	9,997	30,380	565,822	—	606,199
Investments in subsidiaries	9,396,621	4,097,765	—	(13,494,386)	—
Due from subsidiaries and affiliates	394	—	1,828,864	(1,829,258)	—
Premiums receivable	—	—	2,967,701	(1,832,452)	1,135,249
Reinsurance recoverable on unpaid and paid losses and loss adjustment expenses	—	—	8,442,192	(5,902,049)	2,540,143
Contractholder receivables	—	—	1,978,414	—	1,978,414
Ceded unearned premiums	—	—	2,165,789	(1,239,178)	926,611
Deferred acquisition costs	—	—	693,053	(157,229)	535,824
Goodwill and intangible assets	—	—	652,611	—	652,611
Other assets	13,176	49,585	1,860,505	(86,671)	1,836,595
Total assets	\$ 9,516,728	\$ 4,224,011	\$ 42,866,842	\$ (24,555,923)	\$ 32,051,658
Liabilities					
Reserve for losses and loss adjustment expenses	\$ —	\$ —	\$ 17,236,401	\$ (5,852,609)	\$ 11,383,792
Unearned premiums	—	—	4,861,491	(1,239,177)	3,622,314
Reinsurance balances payable	—	—	2,155,947	(1,832,451)	323,496
Contractholder payables	—	—	1,978,414	—	1,978,414
Collateral held for insured obligations	—	—	240,183	—	240,183
Deposit accounting liabilities	—	—	—	—	—
Senior notes	297,053	494,621	941,210	—	1,732,884
Revolving credit agreement borrowings	—	—	816,132	—	816,132
Due to subsidiaries and affiliates	235	536,919	1,292,104	(1,829,258)	—
Other liabilities	22,838	29,317	1,949,696	(293,343)	1,708,508
Total liabilities	320,126	1,060,857	31,471,578	(11,046,838)	21,805,723
Redeemable noncontrolling interests	—	—	220,622	(14,700)	205,922
Shareholders' Equity					
Total shareholders' equity available to Arch	9,196,602	3,163,154	10,331,231	(13,494,385)	9,196,602
Non-redeemable noncontrolling interests	—	—	843,411	—	843,411
Total shareholders' equity	9,196,602	3,163,154	11,174,642	(13,494,385)	10,040,013
Total liabilities, noncontrolling interests and shareholders' equity	\$ 9,516,728	\$ 4,224,011	\$ 42,866,842	\$ (24,555,923)	\$ 32,051,658

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2018

Condensed Consolidating Statement of Income and Comprehensive Income	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Revenues					
Net premiums earned	\$ —	\$ —	\$ 5,231,975	\$ —	\$ 5,231,975
Net investment income	49	3,902	649,394	(89,712)	563,633
Net realized gains (losses)	29	(2,676)	(410,014)	7,317	(405,344)
Net impairment losses recognized in earnings	—	—	(2,829)	—	(2,829)
Other underwriting income	—	—	15,073	—	15,073
Equity in net income (loss) of investments accounted for using the equity method	—	—	45,641	—	45,641
Other income (loss)	1,918	—	501	—	2,419
Total revenues	<u>1,996</u>	<u>1,226</u>	<u>5,529,741</u>	<u>(82,395)</u>	<u>5,450,568</u>
Expenses					
Losses and loss adjustment expenses	—	—	2,890,106	—	2,890,106
Acquisition expenses	—	—	805,135	—	805,135
Other operating expenses	—	—	677,809	—	677,809
Corporate expenses	64,279	2,422	12,293	—	78,994
Amortization of intangible assets	—	—	105,670	—	105,670
Interest expense	22,147	48,103	138,672	(88,438)	120,484
Net foreign exchange (gains) losses	30	—	(59,607)	(9,825)	(69,402)
Total expenses	<u>86,456</u>	<u>50,525</u>	<u>4,570,078</u>	<u>(98,263)</u>	<u>4,608,796</u>
Income (loss) before income taxes	(84,460)	(49,299)	959,663	15,868	841,772
Income tax (expense) benefit	—	13,314	(127,265)	—	(113,951)
Income (loss) before equity in net income of subsidiaries	(84,460)	(35,985)	832,398	15,868	727,821
Equity in net income of subsidiaries	842,431	388,260	—	(1,230,691)	—
Net income	757,971	352,275	832,398	(1,214,823)	727,821
Net (income) loss attributable to noncontrolling interests	—	—	28,875	1,275	30,150
Net income available to Arch	757,971	352,275	861,273	(1,213,548)	757,971
Preferred dividends	(41,645)	—	—	—	(41,645)
Loss on redemption of preferred shares	(2,710)	—	—	—	(2,710)
Net income available to Arch common shareholders	<u>\$ 713,616</u>	<u>\$ 352,275</u>	<u>\$ 861,273</u>	<u>\$ (1,213,548)</u>	<u>\$ 713,616</u>
Comprehensive income (loss) available to Arch	<u>\$ 611,003</u>	<u>\$ 292,973</u>	<u>\$ 730,828</u>	<u>\$ (1,023,801)</u>	<u>\$ 611,003</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2017

Condensed Consolidating Statement of Income and Comprehensive Income	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Revenues					
Net premiums earned	\$ —	\$ —	\$ 4,844,532	\$ —	\$ 4,844,532
Net investment income	243	1,420	559,963	(90,754)	470,872
Net realized gains (losses)	—	—	149,141	—	149,141
Net impairment losses recognized in earnings	—	—	(7,138)	—	(7,138)
Other underwriting income	—	—	30,253	—	30,253
Equity in net income (loss) of investments accounted for using the equity method	—	—	142,286	—	142,286
Other income (loss)	(482)	—	(2,089)	—	(2,571)
Total revenues	<u>(239)</u>	<u>1,420</u>	<u>5,716,948</u>	<u>(90,754)</u>	<u>5,627,375</u>
Expenses					
Losses and loss adjustment expenses	—	—	2,967,446	—	2,967,446
Acquisition expenses	—	—	775,458	—	775,458
Other operating expenses	—	—	684,451	—	684,451
Corporate expenses	67,450	4,152	12,150	—	83,752
Amortization of intangible assets	—	—	125,778	—	125,778
Interest expense	23,560	47,993	135,342	(89,464)	117,431
Net foreign exchange (gains) losses	2	—	68,900	46,880	115,782
Total expenses	<u>91,012</u>	<u>52,145</u>	<u>4,769,525</u>	<u>(42,584)</u>	<u>4,870,098</u>
Income (loss) before income taxes	(91,251)	(50,725)	947,423	(48,170)	757,277
Income tax (expense) benefit	—	10,333	(137,901)	—	(127,568)
Income (loss) before equity in net income of subsidiaries	(91,251)	(40,392)	809,522	(48,170)	629,709
Equity in net income of subsidiaries	710,529	303,991	—	(1,014,520)	—
Net income	619,278	263,599	809,522	(1,062,690)	629,709
Net (income) loss attributable to noncontrolling interests	—	—	(11,721)	1,290	(10,431)
Net income available to Arch	619,278	263,599	797,801	(1,061,400)	619,278
Preferred dividends	(46,041)	—	—	—	(46,041)
Loss on repurchase of preferred shares	(6,735)	—	—	—	(6,735)
Net income available to Arch common shareholders	<u>\$ 566,502</u>	<u>\$ 263,599</u>	<u>\$ 797,801</u>	<u>\$ (1,061,400)</u>	<u>\$ 566,502</u>
Comprehensive income (loss) available to Arch	<u>\$ 851,863</u>	<u>\$ 288,752</u>	<u>\$ 983,475</u>	<u>\$ (1,272,227)</u>	<u>\$ 851,863</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2016

Condensed Consolidating Statement of Income and Comprehensive Income	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Revenues					
Net premiums earned	\$ —	\$ —	\$ 3,884,822	\$ —	\$ 3,884,822
Net investment income	694	3,162	393,114	(30,228)	366,742
Net realized gains (losses)	12	5	137,569	—	137,586
Net impairment losses recognized in earnings	—	—	(30,442)	—	(30,442)
Other underwriting income	—	—	73,671	(16,498)	57,173
Equity in net income (loss) of investments accounted for using the equity method	—	—	48,475	—	48,475
Other income (loss)	180	—	(980)	—	(800)
Total revenues	<u>886</u>	<u>3,167</u>	<u>4,506,229</u>	<u>(46,726)</u>	<u>4,463,556</u>
Expenses					
Losses and loss adjustment expenses	—	—	2,185,599	—	2,185,599
Acquisition expenses	—	—	667,625	—	667,625
Other operating expenses	—	—	624,090	—	624,090
Corporate expenses	49,540	1,940	30,266	—	81,746
Amortization of intangible assets	—	—	19,343	—	19,343
Interest expense	23,769	27,165	60,757	(45,439)	66,252
Net foreign exchange (gains) losses	—	—	(17,217)	(19,434)	(36,651)
Total expenses	<u>73,309</u>	<u>29,105</u>	<u>3,570,463</u>	<u>(64,873)</u>	<u>3,608,004</u>
Income (loss) before income taxes	(72,423)	(25,938)	935,766	18,147	855,552
Income tax (expense) benefit	—	8,676	(40,050)	—	(31,374)
Income (loss) before equity in net income of subsidiaries	(72,423)	(17,262)	895,716	18,147	824,178
Equity in net income of subsidiaries	765,161	54,497	—	(819,658)	—
Net income	692,738	37,235	895,716	(801,511)	824,178
Net (income) loss attributable to noncontrolling interests	—	—	(132,727)	1,287	(131,440)
Net income available to Arch	692,738	37,235	762,989	(800,224)	692,738
Preferred dividends	(28,070)	—	—	—	(28,070)
Net income available to Arch common shareholders	<u>\$ 664,668</u>	<u>\$ 37,235</u>	<u>\$ 762,989</u>	<u>\$ (800,224)</u>	<u>\$ 664,668</u>
Comprehensive income (loss) available to Arch	<u>\$ 594,699</u>	<u>\$ 13,444</u>	<u>\$ 684,447</u>	<u>\$ (697,891)</u>	<u>\$ 594,699</u>

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2018

Condensed Consolidating Statement of Cash Flows	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Operating Activities					
Net Cash Provided By (Used For) Operating Activities	\$ 324,319	\$ 481,751	\$ 1,703,181	\$ (949,929)	\$ 1,559,322
Investing Activities					
Purchases of fixed maturity investments	—	(906,482)	(33,662,541)	1,241,363	(33,327,660)
Purchases of equity securities	—	(44,830)	(956,319)	—	(1,001,149)
Purchases of other investments	—	—	(2,014,622)	—	(2,014,622)
Proceeds from the sales of fixed maturity investments	—	535,947	32,218,687	(1,241,363)	31,513,271
Proceeds from the sales of equity securities	—	—	1,118,445	—	1,118,445
Proceeds from the sales, redemptions and maturities of other investments	—	—	1,561,958	—	1,561,958
Proceeds from redemptions and maturities of fixed maturity investments	—	—	892,755	—	892,755
Net settlements of derivative instruments	—	—	44,699	—	44,699
Net (purchases) sales of short-term investments	96,476	7,674	381,323	—	485,473
Change in cash collateral related to securities lending	—	—	180,883	—	180,883
Contributions to subsidiaries	—	(98,500)	98,500	—	—
Purchases of fixed assets	(110)	—	(29,699)	—	(29,809)
Other	(4)	—	21,740	—	21,736
Net Cash Provided By (Used For) Investing Activities	96,362	(506,191)	(144,191)	—	(554,020)
Financing Activities					
Redemption of preferred shares	(92,555)	—	—	—	(92,555)
Purchases of common shares under share repurchase program	(282,762)	—	—	—	(282,762)
Proceeds from common shares issued, net	(7,608)	—	—	—	(7,608)
Proceeds from intercompany borrowings	—	—	—	—	—
Proceeds from borrowings	—	—	218,259	—	218,259
Repayments of intercompany loans	—	—	—	—	—
Repayments of borrowings	—	—	(576,401)	—	(576,401)
Change in cash collateral related to securities lending	—	—	(180,883)	—	(180,883)
Dividends paid to redeemable noncontrolling interests	—	—	(19,264)	1,275	(17,989)
Dividends paid to parent (1)	—	—	(948,654)	948,654	—
Other	—	—	(7,226)	—	(7,226)
Preferred dividends paid	(41,645)	—	—	—	(41,645)
Net Cash Provided By (Used For) Financing Activities	(424,570)	—	(1,514,169)	949,929	(988,810)
Effects of exchange rate changes on foreign currency cash and restricted cash	—	—	(19,133)	—	(19,133)
Increase (decrease) in cash and restricted cash	(3,889)	(24,440)	25,688	—	(2,641)
Cash and restricted cash, beginning of year	10,048	30,380	686,856	—	727,284
Cash and restricted cash, end of period	\$ 6,159	\$ 5,940	\$ 712,544	\$ —	\$ 724,643

(1) Included in net cash provided by (used for) operating activities in the Arch Capital (Parent Guarantor) and/or Arch-U.S. (Subsidiary Issuer) columns.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2017

Condensed Consolidating Statement of Cash Flows	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Operating Activities					
Net Cash Provided By (Used For) Operating Activities	\$ 159,130	\$ (10,289)	\$ 1,649,751	\$ (703,714)	\$ 1,094,878
Investing Activities					
Purchases of fixed maturity investments	—	—	(36,806,913)	—	(36,806,913)
Purchases of equity securities	—	—	(1,021,016)	—	(1,021,016)
Purchases of other investments	—	—	(2,020,624)	—	(2,020,624)
Proceeds from the sales of fixed maturity investments	—	—	35,686,779	—	35,686,779
Proceeds from the sales of equity securities	—	—	1,056,401	—	1,056,401
Proceeds from the sales, redemptions and maturities of other investments	—	—	1,528,617	—	1,528,617
Proceeds from redemptions and maturities of fixed maturity investments	—	—	907,417	—	907,417
Net settlements of derivative instruments	—	—	(28,563)	—	(28,563)
Net (purchases) sales of short-term investments	(93,864)	(4,586)	(636,104)	—	(734,554)
Change in cash collateral related to securities lending	—	—	12,540	—	12,540
Contributions to subsidiaries	20,457	(73,700)	(423,998)	477,241	—
Issuance of intercompany loans	—	—	(47,000)	47,000	—
Repayment of intercompany loans	—	47,000	80,840	(127,840)	—
Acquisitions, net of cash	—	—	—	—	—
Purchases of fixed assets	(18)	—	(22,823)	—	(22,841)
Other	—	—	111,516	(20,641)	90,875
Net Cash Provided By (Used For) Investing Activities	(73,425)	(31,286)	(1,622,931)	375,760	(1,351,882)
Financing Activities					
Proceeds from issuance of preferred shares, net	319,694	—	—	—	319,694
Redemption of preferred shares	(230,000)	—	—	—	(230,000)
Proceeds from common shares issued, net	(21,048)	—	477,244	(477,244)	(21,048)
Proceeds from intercompany borrowings	—	—	47,000	(47,000)	—
Proceeds from borrowings	—	—	253,415	—	253,415
Repayments of intercompany borrowings	—	—	(127,840)	127,840	—
Repayments of borrowings	(100,000)	—	(97,000)	—	(197,000)
Change in cash collateral related to securities lending	—	—	(12,540)	—	(12,540)
Dividends paid to redeemable noncontrolling interests	—	—	(19,264)	1,275	(17,989)
Dividends paid to parent (1)	—	—	(702,442)	702,442	—
Other	—	—	(72,537)	20,641	(51,896)
Preferred dividends paid	(46,041)	—	—	—	(46,041)
Net Cash Provided By (Used For) Financing Activities	(77,395)	—	(253,964)	327,954	(3,405)
Effects of exchange rate changes on foreign currency cash and restricted cash	—	—	18,124	—	18,124
Increase (decrease) in cash and restricted cash	8,310	(41,575)	(209,020)	—	(242,285)
Cash and restricted cash, beginning of year	1,738	71,955	895,876	—	969,569
Cash and restricted cash, end of period	\$ 10,048	\$ 30,380	\$ 686,856	\$ —	\$ 727,284

(1) Included in net cash provided by (used for) operating activities in the Arch Capital (Parent Guarantor) and/or Arch-U.S. (Subsidiary Issuer) columns.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Year Ended December 31, 2016

Condensed Consolidating Statement of Cash Flows	Arch Capital (Parent Guarantor)	Arch-U.S. (Subsidiary Issuer)	Other Arch Capital Subsidiaries	Consolidating Adjustments and Eliminations	Arch Capital Consolidated
Operating Activities					
Net Cash Provided By (Used For) Operating Activities	\$ 148,209	\$ 6,395	\$ 1,445,953	\$ (223,128)	\$ 1,377,429
Investing Activities					
Purchases of fixed maturity investments	—	—	(35,532,810)	—	(35,532,810)
Purchases of equity securities	—	—	(665,702)	—	(665,702)
Purchases of other investments	—	—	(1,389,406)	—	(1,389,406)
Proceeds from the sales of fixed maturity investments	—	—	34,559,966	—	34,559,966
Proceeds from the sales of equity securities	—	—	751,728	—	751,728
Proceeds from the sales, redemptions and maturities of other investments	—	—	1,149,328	—	1,149,328
Proceeds from redemptions and maturities of fixed maturity investments	—	41,500	713,507	—	755,007
Net settlements of derivative instruments	—	—	(17,068)	—	(17,068)
Net (purchases) sales of short-term investments	(2,075)	(40,963)	(80,372)	—	(123,410)
Change in cash collateral related to securities lending	—	—	(155,248)	—	(155,248)
Contributions to subsidiaries	(479,912)	(887,650)	(546,269)	1,913,831	—
Issuance of intercompany loans	—	—	(1,460,000)	1,460,000	—
Acquisitions, net of cash	—	—	(1,992,720)	—	(1,992,720)
Purchases of fixed assets	(8)	—	(15,295)	—	(15,303)
Other	2,000	—	(29,795)	—	(27,795)
Net Cash Provided By (Used For) Investing Activities	(479,995)	(887,113)	(4,710,156)	3,373,831	(2,703,433)
Financing Activities					
Proceeds from issuance of Series C preferred shares issued, net	434,899	—	—	—	434,899
Redemption of preferred shares	(2,445)	—	—	—	(2,445)
Purchases of common shares under share repurchase program	(75,256)	—	—	—	(75,256)
Proceeds from common shares issued, net	(2,418)	435,450	1,478,381	(1,913,831)	(2,418)
Proceeds from intercompany borrowings	—	500,000	960,000	(1,460,000)	—
Proceeds from borrowings	—	—	1,386,741	—	1,386,741
Repayments of borrowings	—	—	(219,171)	—	(219,171)
Change in cash collateral relating to securities lending	—	—	155,248	—	155,248
Dividends paid to redeemable noncontrolling	—	—	(19,264)	1,275	(17,989)
Dividends paid to parent (1)	—	—	(221,853)	221,853	—
Other	(48)	200	3,978	—	4,130
Preferred dividends paid	(28,070)	—	—	—	(28,070)
Net Cash Provided By (Used For) Financing Activities	326,662	935,650	3,524,060	(3,150,703)	1,635,669
Effects of exchange rate changes on foreign currency cash and restricted cash	—	—	(21,191)	—	(21,191)
Increase (decrease) in cash and restricted cash	(5,124)	54,932	238,666	—	288,474
Cash and restricted cash, beginning of year	6,862	17,023	657,210	—	681,095
Cash and restricted cash, end of period	\$ 1,738	\$ 71,955	\$ 895,876	\$ —	\$ 969,569

(1) Included in net cash provided by (used for) operating activities in the Arch Capital (Parent Guarantor) and/or Arch-U.S. (Subsidiary Issuer) columns.

26. Subsequent Event

Business Acquired

On November 1, 2018, the Company announced that its U.K. insurance operations entered into a renewal rights transaction with The Ardonagh Group of a U.K. commercial lines book of business, consisting of commercial property, casualty, motor, professional liability, personal accident and travel business. The transaction closed on January 1, 2019.

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE

None.

ITEM 9A. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

In connection with the filing of this Form 10-K, our management, including the Chief Executive Officer and Chief Financial Officer, conducted an evaluation, as of December 31, 2018, for the purposes set forth in the applicable rules under the Securities and Exchange Act of 1934, as amended (the “Exchange Act”). Based on that evaluation, the Chief Executive Officer and Chief Financial Officer concluded that the disclosure controls and procedures are effective.

We continue to enhance our operating procedures and internal controls (including information technology initiatives and controls over financial reporting) to effectively support our business and our regulatory and reporting requirements. Our management does not expect that our disclosure controls or our internal controls will prevent all errors and all fraud. A control system, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Further, the design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. As a result of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within the company have been detected. These inherent limitations include the realities that judgments in decision making can be faulty, and that breakdowns can occur because of simple error or mistake. Additionally, controls can be circumvented by the individual acts of some persons or by collusion of two or more people.

The design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with the policies or procedures may deteriorate. As a result of the inherent limitations in a cost-effective control system, misstatement due to error or fraud may occur and not be detected. Accordingly, our disclosure controls and procedures are designed to provide reasonable, not absolute, assurance that the disclosure controls and procedures are met.

Management’s Annual Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act. Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2018. In making this assessment, management used the criteria set forth by the Committee of Sponsoring Organizations (COSO) of the Treadway Commission in *Internal Control-Integrated Framework (2013)*.

Based on our assessment, management determined that, as of December 31, 2018, our internal control over financial reporting was effective. The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report included in Item 8.

Changes in Internal Control Over Financial Reporting

There have been no changes in internal control over financial reporting that occurred in connection with our evaluation required pursuant to Rules 13a-15 and 15d-15 under the Exchange Act during the fiscal quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

Disclosure of Certain Activities Under Section 13(r) of the Securities Exchange Act of 1934

Section 13(r) of the Securities Exchange Act of 1934, as amended, requires an issuer to disclose in its annual or quarterly reports whether it or an affiliate knowingly engaged in certain activities described in that section, including certain activities related to Iran during the period covered by the report.

On January 16, 2016, the Office of Foreign Assets Control of the U.S. Department of the Treasury (“OFAC”) adopted General License H which authorized non-U.S. entities that are owned or controlled by a U.S. person to engage in certain activities with Iran so long as they complied with certain specific requirements set forth therein.

As and when allowed by the applicable law and regulations, certain of our non-U.S. subsidiaries provide global marine and energy policies and global marine reinsurance which may have some exposure to Iran. The global marine policies and reinsurance provide coverage for vessels navigating into and out of ports worldwide. In light of European Union and U.S. modifications to Iran sanctions in 2016, including the issuance of General License H, and consistent with General License H, we have been notified that certain of our policyholders shipped cargo to and from Iran, and that such cargo may include transporting crude oil from Iran to another country. Since these policies insure multiple voyages and fleets containing multiple ships, we are unable to attribute gross revenues or net profits from these policies to activities involving Iran. On May 8, 2018,

the President announced that the U.S. would withdraw from the Joint Comprehensive Plan of Action and begin reinstating Iranian sanctions. Since May 8, 2018, our non-U.S. subsidiaries operating under General License H have not entered into any new transactions that had previously been permitted under General License H. On June 27, 2018, OFAC revoked General License H and added regulations which authorized all transactions and activities ordinarily incident and necessary to the winding down of activities previously approved under General License H through November 4, 2018. Our non-U.S. subsidiaries operating under General License H completed their wind down activities by November 4, 2018, in accordance with all applicable laws and regulations.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information required by this item is incorporated by reference from the information to be included in our definitive proxy statement (“Proxy Statement”) for our annual meeting of shareholders to be held in 2018, which we intend to file with the SEC pursuant to Regulation 14A before May 1, 2019. Copies of our code of ethics applicable to our chief executive officer, chief financial officer and principal accounting officer or controller are available free of charge to investors upon written request addressed to the attention of Arch Capital’s corporate secretary, Waterloo House, 100 Pitts Bay Road, Pembroke HM 08, Bermuda. In addition, our code of ethics and certain other basic corporate documents, including the charters of our audit committee, compensation committee and nominating committee are posted on our website. If any substantive amendments are made to the code of ethics or if

there is a grant of a waiver, including any implicit waiver, we will disclose the nature of such amendment or waiver on our website or in a report on Form 8-K, to the extent required by applicable law or the rules and regulations of any exchange applicable to us. Our website address is intended to be an inactive, textual reference only and none of the material on our website is incorporated by reference into this report.

ITEM 11. EXECUTIVE COMPENSATION

The information required by this item is incorporated by reference from the information to be included in the Proxy Statement which we intend to file pursuant to Regulation 14A

with the SEC before May 1, 2019, which Proxy Statement is incorporated by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

Other than the information set forth below, the information required by this item is incorporated by reference from the information to be included in the Proxy Statement which we intend to file pursuant to Regulation 14A with the SEC before May 1, 2019, which Proxy Statement is incorporated by reference.

The following information is as of December 31, 2018:

	<u>Column A</u>	<u>Column B</u>	<u>Column C</u>
<u>Plan Category</u>	<u>Number of Securities to be Issued Upon Exercise of Outstanding Stock Options(1), Warrants and Rights</u>	<u>Weighted-Average Exercise Price of Outstanding Stock Options(1), Warrants and Rights (\$)</u>	<u>Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column A)</u>
Equity compensation plans approved by security holders	21,383,897	\$ 19.37	37,136,857
Equity compensation plans not approved by security holders	—	—	—
Total	21,383,897	\$ 19.37	37,136,857 (2)

- (1) Includes all vested and unvested stock options outstanding of 20,076,593 and restricted stock and performance units outstanding of 1,307,304. The weighted average exercise price does not take into account restricted stock units. In addition, the weighted average remaining contractual life of the Company's outstanding exercisable stock options and SARs at December 31, 2018 was 5.4 years.
- (2) Includes 3,281,686 common shares remaining available for future issuance under our Employee Share Purchase Plan and 33,855,171 common shares remaining available for future issuance under our equity compensation plans. Shares available for future issuance under our equity compensation plans may be issued in the form of stock options, SARs, restricted shares, restricted share units payable in common shares or cash, share awards in lieu of cash awards, dividend equivalents, performance shares and performance units and other share-based awards. In addition, 9,784,515 common shares, or 28.9% of the 33,855,171 common shares remaining available for future issuance may be issued in connection with full value awards (i.e., awards other than stock options or SARs).

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE

The information required by this item is incorporated by reference from the information to be included in the Proxy Statement which we intend to file pursuant to Regulation 14A

with the SEC before May 1, 2019, which Proxy Statement is incorporated by reference.

ITEM 14. PRINCIPAL ACCOUNTANT FEES AND SERVICES

The information required by this item is incorporated by reference from the information to be included in our Proxy Statement which we intend to file pursuant to Regulation 14A

with the SEC before May 1, 2019, which Proxy Statement is incorporated by reference.

PART IV

ITEM 15. EXHIBITS AND FINANCIAL STATEMENT SCHEDULES

(a) Financial Statements, Financial Statement Schedules and Exhibits.**1. Financial Statements**

Included in Part II – see Item 8 of this report.

2. Financial Statement Schedules

	<u>Page No.</u>
III. Supplementary Insurance Information	
For the years ended December 31, 2018, 2017 and 2016	186
IV. Reinsurance	
For the years ended December 31, 2018, 2017 and 2016	187
VI. Supplementary Information for Property and Casualty Insurance Underwriters	
For the years ended December 31, 2018, 2017 and 2016	188

Schedules other than those listed above are omitted for the reason that they are not applicable or the information is provided in Item 8 of this report.

3. Exhibits

Exhibit Number	Exhibit Description	Incorporated by Reference			Filed Herewith
		Form	Original Number	Date Filed	
3.1	Memorandum of Association of ACGL	S-4	3.1	September 8, 2000	
3.2	Bye-Laws of ACGL	10-Q	3	August 5, 2016	
3.3	ACGL Certificate of Deposit of Memorandum of Increase of Share Capital	10-K	3.3	February 28, 2011	
4.1.1	Certificate of Designations of Series E Non-Cumulative Preferred Shares	8-K	4.1	September 29, 2016	
4.1.2	Certificate of Designations of Series F Non-Cumulative Preferred Shares	8-K	4.1	August 17, 2017	
4.2.1	Specimen Common Share Certificate	10-K405	4.1	April 2, 2001	
4.2.2	Specimen Series E Non-Cumulative Preferred Share Certificate	8-K	4.2	September 29, 2016	
4.2.3	Specimen Series F Non-Cumulative Preferred Share Certificate	8-K	4.2	August 17, 2017	
4.3.1	Indenture, dated as of May 4, 2004, between ACGL, as issuer, and JPMorgan Chase Bank, N.A. (formerly JPMorgan Chase Bank) (“JPMCB”), as trustee	8-K	99.2	May 7, 2004	
4.3.2	First Supplemental Indenture, dated as of May 4, 2004, between ACGL, as issuer, and JPMCB, as trustee	8-K	99.3	May 7, 2004	
4.3.3	Indenture, dated as of December 13, 2013, among Arch Capital Group (U.S.) Inc. (“Arch U.S.”), as issuer, ACGL, as guarantor, and The Bank of New York Mellon (“BNYM”), as trustee	8-K	4.1	December 13, 2013	
4.3.4	First Supplemental Indenture, dated as of December 13, 2013, among Arch U.S., as issuer, ACGL, as guarantor, and BNYM, as trustee	8-K	4.2	December 13, 2013	
4.3.5	Second Supplemental Indenture, dated as of May 10, 2018, among Arch Capital Finance LLC, as issuer, ACGL, as guarantor, and BNYM, as trustee	8-K	4.1	May 15, 2018	
4.4.1	Deposit Agreement, dated September 29, 2016, between ACGL, as issuer, and American Stock Transfer & Trust Company, LLC (“AST”), as depository, registrar and transfer agent and as dividend disbursing agent and redemption agent, and the holders from time to time of the depository receipts	8-K	4.3	September 29, 2016	
4.4.2	Deposit Agreement, dated August 17, 2017, between ACGL, as issuer, and AST, as depository, registrar and transfer agent and as dividend disbursing agent and redemption agent, and the holders from time to time of the depository receipts	8-K	4.3	August 17, 2017	
4.5.1	Form of Depositary Receipt, dated September 29, 2016	8-K	4.4	September 29, 2016	
4.5.2	Form of Depositary Receipt, dated August 17, 2017	8-K	4.4	August 17, 2017	
4.6.1	Indenture, dated as of December 8, 2016, among Arch Capital Finance LLC, as issuer, ACGL, as guarantor, and BNYM, as trustee	8-K	4.1	December 9, 2016	
4.6.2	First Supplemental Indenture, dated as of December 8, 2016, among Arch Capital Finance LLC, as issuer, ACGL, as guarantor, and BNYM, as trustee	8-K	4.2	December 9, 2016	
10.1.1	ACGL 2002 Long Term Incentive and Share Award Plan (“2002 Plan”)†	10-Q	10.1	August 14, 2002	
10.1.2	First Amendment to the 2002 Plan†	10-Q	10.4	November 12, 2003	
10.1.3	Second Amendment to the 2002 Plan†	10-K	10.6	March 2, 2009	
10.2.1	Third Amended and Restated ACGL Incentive Compensation Plan†	10-Q	10.7	August 5, 2016	
10.2.2	First Amendment to Third Amended and Restated ACGL Incentive Compensation Plan†	10-Q	10.1	May 5, 2017	
10.3.1	ACGL 2007 Long Term Incentive and Share Award Plan†	DEF 14A		April 3, 2007	
10.3.2	ACGL 2012 Long Term Incentive and Share Award Plan†	DEF 14A		March 27, 2012	
10.3.3	ACGL 2015 Long Term Incentive and Share Award Plan†	DEF 14A		March 26, 2015	
10.3.4	ACGL 2018 Long Term Incentive and Share Award Plan†	DEF 14A		March 28, 2018	
10.3.5	ACGL Amended and Restated 2007 Employee Share Purchase Plan†	DEF 14A		March 23, 2016	
10.4.1	Restricted Share Unit Agreement, dated as of February 20, 2003, between ACGL and Constantine Iordanou (“February RSU Agreement”)†	10-K	10.7.15	March 10, 2004	
10.4.2	First Amendment to February RSU Agreement dated as of December 9, 2008 grant†	10-K	10.10.9	March 2, 2009	
10.4.3	Second Amendment to February RSU Agreement dated as of July 9, 2009 grant†	10-Q	10.1	November 9, 2009	
10.4.4	Form of Restricted Share Agreement, dated as of May 13, 2015, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Nicolas Papadopoulos, Maamoun Rajeh, Andrew Rippert and Louis T. Petrillo†	10-Q	10.2	August 7, 2015	
10.4.5	Form of Restricted Share Agreement, dated as of May 13, 2016, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Nicolas Papadopoulos, Maamoun Rajeh, Andrew Rippert and Louis T. Petrillo†	10-Q	10.2	August 5, 2016	
10.4.6	Form of Restricted Share Agreement, dated as of May 4, 2017, between ACGL and each of the Non-Employee Directors of ACGL†	10-Q	10.3	August 4, 2017	

10.4.7	Form of Restricted Share Agreement, dated as of May 8, 2017, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Nicolas Papadopoulo, Maamoun Rajeh, Andrew Rippert and Louis T. Petrillo†	10-Q	10.4	August 4, 2017
10.4.8	Form of Restricted Share Agreement, dated as of September 19, 2017, between ACGL and each of Nicolas Papadopoulo and Maamoun Rajeh†	10-K	10.4.13	February 28, 2018
10.4.9	Form of Restricted Share Agreement for Named Executive Officers and certain Executive Officers of ACGL and subsidiaries†	10-Q	10.3	August 8, 2018
10.4.10	Form of Restricted Share Agreement between ACGL and each of the Non-Employee Directors of ACGL†	10-Q	10.6	August 8, 2018
10.4.11	Restricted Share Agreement, dated as of May 9, 2018, between ACGL and Constantine Iordanou†	10-Q	10.7	August 8, 2018
10.5	Form of Performance Restricted Share Agreement for Named Executive Officers and certain Executive Officers of ACGL and subsidiaries†	10-Q	10.5	August 8, 2018
10.6.1	Form of Non-Qualified Stock Option Agreement, dated as of May 13, 2015, between ACGL and each of Constantine Iordanou, Marc Grandisson and W. Preston Hutchings†	10-Q	10.3	August 7, 2015
10.6.2	Non-Qualified Stock Option Agreement, dated as of February 26, 2016, between ACGL and Constantine Iordanou†	10-Q	10.6	August 5, 2016
10.6.3	Form of Non-Qualified Stock Option Agreement, dated as of May 13, 2016, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Nicolas Papadopoulo, Maamoun Rajeh, Andrew Rippert and Louis T. Petrillo†	10-Q	10.3	August 5, 2016
10.6.4	Non-Qualified Stock Option Agreement, dated as of February 24, 2017, between ACGL and Constantine Iordanou†	10-Q	10.22	November 3, 2017
10.6.5	Form of Non-Qualified Stock Option Agreement, dated as of May 8, 2017, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Nicolas Papadopoulo, Maamoun Rajeh, Andrew Rippert and Louis T. Petrillo†	10-Q	10.5	August 4, 2017
10.6.6	Non-Qualified Stock Option Agreement, dated as of September 19, 2017, between ACGL and Maamoun Rajeh†	10-K	10.5.6	February 28, 2018
10.6.7	Non-Qualified Stock Option Agreement, dated as of September 19, 2017, between ACGL and Nicolas Papadopoulo†	10-K	10.5.7	February 28, 2018
10.6.8	Form of Non-Qualified Stock Option Agreement for Named Executive Officers and certain Executive Officers of ACGL and subsidiaries†	10-Q	10.4	August 8, 2018
10.6.9	Non-Qualified Stock Option Agreement, dated as of May 9, 2018, between ACGL and Constantine Iordanou†	10-Q	10.8	August 8, 2018
10.6.10	Non-Qualified Stock Option Agreement, dated as of March 1, 2018, between ACGL and Constantine Iordanou†	10-Q	10.4	May 9, 2018
10.6.11	Non-Qualified Stock Option Agreement, dated as of April 9, 2018, between ACGL and Marc Grandisson†	10-Q	10.5	May 9, 2018
10.7.1	Form of Share Appreciation Right Agreement, dated as of May 9, 2008, between ACGL and each of Constantine Iordanou, John D. Vollaro, Marc Grandisson, W. Preston Hutchings and Louis T. Petrillo†	10-Q	10.1	November 10, 2008
10.7.2	Form of Share Appreciation Right Agreement, dated as of May 6, 2009, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings and John D. Vollaro†	10-K	10.12.4	February 26, 2010
10.7.3	Share Appreciation Right Agreement, dated as of February 25, 2010, between ACGL and Constantine Iordanou†	10-Q	10.4	November 9, 2012
10.7.4	Form of Share Appreciation Right Agreement, dated as of May 5, 2010, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings and Louis T. Petrillo†	10-Q	10.4	November 8, 2010
10.7.5	Share Appreciation Right Agreement, dated as of May 6, 2011, between ACGL and Marc Grandisson†	10-Q	10.7	November 8, 2011
10.7.6	Share Appreciation Right Agreement, dated as of May 6, 2011, between ACGL and W. Preston Hutchings†	10-Q	10.9	November 8, 2011
10.7.7	Share Appreciation Right Agreement, dated as of May 6, 2011, between ACGL and Constantine Iordanou†	10-Q	10.10	November 8, 2011
10.7.8	Share Appreciation Right Agreement, dated as of May 6, 2011, between ACGL and Louis T. Petrillo†	10-Q	10.12	November 8, 2011
10.7.9	Share Appreciation Right Agreement, dated as of May 6, 2011, between ACGL and Maamoun Rajeh†	10-Q	10.1	November 3, 2017
10.7.10	Share Appreciation Right Agreement dated as of February 29, 2012, between ACGL and Constantine Iordanou†	10-Q	10.5	November 9, 2012
10.7.11	Share Appreciation Right Agreement, dated as of May 9, 2012, between ACGL and Andrew Rippert†	10-Q	10.3	November 3, 2017
10.7.12	Share Appreciation Right Agreement, dated as of May 9, 2012 between ACGL and Maamoun Rajeh†	10-Q	10.2	November 3, 2017

10.7.13	Form of Share Appreciation Right Agreement, dated as of May 9, 2012, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings and Louis T. Petrillo†	10-Q	10.3	November 9, 2012	
10.7.14	Share Appreciation Right Agreement, dated as of July 1, 2012 between ACGL and Maamoun Rajeh†	10-Q	10.4	November 3, 2017	
10.7.15	Share Appreciation Right Agreement, dated as of November 12, 2012, between Arch Capital Group Ltd. and Andrew Rippert†	10-Q	10.9	November 3, 2017	
10.7.16	Form of Share Appreciation Right Agreement, dated as of November 12, 2012, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Maamoun Rajeh and Louis T. Petrillo†	10-Q	10.3	August 9, 2013	
10.7.17	Share Appreciation Right Agreement, dated as of May 9, 2013, between Arch Capital Group Ltd. and Andrew Rippert†	10-Q	10.11	November 3, 2017	
10.7.18	Form of Share Appreciation Right Agreement, dated as of May 9, 2013, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Maamoun Rajeh and Louis T. Petrillo†	10-Q	10.2	November 8, 2013	
10.7.19	Share Appreciation Right Agreement, dated as of February 4, 2014, between Arch Capital Group Ltd. and Andrew Rippert†	10-Q	10.12	November 3, 2017	
10.7.20	Share Appreciation Right Agreement, dated as of February 28, 2014, between ACGL and Constantine Iordanou†	10-Q	10.6	August 8, 2014	
10.7.21	Share Appreciation Right Agreement, dated as of May 13, 2014, between ACGL and Andrew Rippert†	10-Q	10.14	November 3, 2017	
10.7.22	Form of Share Appreciation Right Agreement, dated as of May 13, 2014, between ACGL and each of Constantine Iordanou, Marc Grandisson, W. Preston Hutchings, Maamoun Rajeh and Louis T. Petrillo†	10-Q	10.3	August 8, 2014	
10.7.23	Share Appreciation Right Agreement, dated as of July 1, 2014, between ACGL and Maamoun Rajeh†	10-Q	10.15	November 3, 2017	
10.7.24	Share Appreciation Right Agreement, dated as of November 6, 2014, between ACGL and Marc Grandisson†	10-Q	10.2	May 8, 2015	
10.7.25	Share Appreciation Right Agreement, dated as of February 27, 2015, between ACGL and Constantine Iordanou†	10-Q	10.5	August 5, 2016	
10.8.1	Employment Agreement, dated as of October 27, 2008, between ACGL and John D. Vollaro†	8-K	10.1	October 28, 2008	
10.8.2	Amendment to Employment Agreement, dated February 27, 2015, between ACGL and John D. Vollaro†	10-Q	10.1	May 8, 2015	
10.8.3	Second Amendment to Employment Agreement, dated as of January 1, 2018, between ACGL and John D. Vollaro†	10-Q	10.1	May 9, 2018	
10.9	Employment Agreement, dated as of February 1, 2018, between ACGL and W. Preston Hutchings†	10-Q	10.2	August 8, 2018	
10.10	Service Agreement, dated September 21, 2017 between ACGL and Constantine Iordanou	8-K	10.1	September 22, 2017	
10.11	Employment Agreement, dated as of September 19, 2017 between ACGL and Maamoun Rajeh†	10-Q	10.26	November 3, 2017	
10.12	Employment Agreement, dated as of September 19, 2017 between ACGL and Nicholas Papadopoulos†	10-Q	10.27	November 3, 2017	
10.13	Employment Agreement, dated as of October 30, 2017, between ACGL and Andrew Rippert†	10-Q	10.28	November 3, 2017	
10.14	Employment Agreement, dated as of May 25, 2018, between ACGL and François Morin†	8-K/A	10.1	July 26, 2018	
10.15	Employment Agreement, dated as of April 9, 2018, between ACGL and Marc Grandisson†	8-K/A	10.1	April 11, 2018	
10.16	Employment Agreement, dated as of November 13, 2018, between Arch Capital Services Inc. and Louis Petrillo (filed herewith)†				X
10.17	Arch U.S. Executive Supplemental Non-Qualified Savings and Retirement Plan†	10-K	10.24	March 2, 2009	
10.18.1	Stock Purchase Agreement, dated as of August 15, 2016, between ACGL and American International Group, Inc. (“AIG”)	8-K	2.1	August 16, 2016	
10.18.2	First Amendment to Stock Purchase Agreement between ACGL and AIG	10-Q	10.1	August 4, 2017	
10.18.3	Second Amendment to Stock Purchase Agreement between ACGL and AIG	10-Q	10.2	August 4, 2017	
10.19	Second Amended and Restated Credit Agreement, dated as of October 26, 2016, by and among ACGL, certain of its subsidiaries as subsidiary borrowers, Bank of America, N.A., as Administrative Agent, Fronting Bank and L/C Administrator, and the lenders party thereto	8-K	10.1	October 26, 2016	
21	Subsidiaries of Registrant (filed herewith)				X
23	Consent of PricewaterhouseCoopers LLP (filed herewith)				X
24	Power of Attorney (filed herewith)				X
31.1	Certification of Chief Executive Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (filed herewith)				X

31.2	Certification of Chief Financial Officer pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 (filed herewith)	X
32.1	Certification of Chief Executive Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (filed herewith)	X
32.2	Certification of Chief Financial Officer pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 (filed herewith)	X
101	The following financial information from ACGL's Annual Report on Form 10-K for the year ended December 31, 2018 formatted in XBRL: (i) Consolidated Balance Sheets at December 31, 2018 and 2017; (ii) Consolidated Statements of Income for the years ended December 31, 2018, 2017 and 2016; (iii) Consolidated Statements of Comprehensive Income for the years ended December 31, 2018, 2017 and 2016; (iv) Consolidated Statements of Changes in Shareholders' Equity for the years ended December 31, 2018, 2017 and 2016; (v) Consolidated Statements of Cash Flows for the years ended December 31, 2018, 2017 and 2016; and (vi) Notes to Consolidated Financial Statements	X

† Management contract or compensatory plan or arrangement.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

ARCH CAPITAL GROUP LTD.
(Registrant)

By: /s/ Marc Grandisson

Name: Marc Grandisson

Title: President and Chief Executive Officer (Principal Executive Officer)

February 28, 2019

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

<u>Name</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Marc Grandisson</u> Marc Grandisson	President and Chief Executive Officer (Principal Executive Officer)	February 28, 2019
<u>/s/ François Morin</u> François Morin	Executive Vice President and Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	February 28, 2019
<u>*</u> Constantine Iordanou	Chairman of the Board	February 28, 2019
<u>*</u> John L. Bunce, Jr.	Director	February 28, 2019
<u>*</u> Eric W. Doppstadt	Director	February 28, 2019
<u>*</u> Laurie S. Goodman	Director	February 28, 2019

<u>Name</u>	<u>Title</u>	<u>Date</u>
* _____ Louis J. Paglia	Director	February 28, 2019
* _____ John M. Pasquesi	Director	February 28, 2019
* _____ Brian S. Posner	Director	February 28, 2019
* _____ Eugene S. Sunshine	Director	February 28, 2019
* _____ John D. Vollaro	Director	February 28, 2019

* By François Morin, as attorney-in-fact and agent, pursuant to a power of attorney, a copy of which has been filed with the Securities and Exchange Commission as Exhibit 24 to this report.

/s/ François Morin

Name: François Morin
Attorney-in-Fact

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
SUPPLEMENTARY INSURANCE INFORMATION
(U.S. dollars in thousands)

	Deferred Acquisition Costs	Reserves for Losses and Loss Adjustment Expenses	Unearned Premiums	Net Premiums Earned	Net Investment Income (1)	Net Losses and Loss Adjustment Expenses Incurred	Amortization of Deferred Acquisition Costs	Other Operating Expenses (2)	Net Premiums Written
December 31, 2018									
Insurance	\$152,360	\$7,093,018	\$1,549,183	\$2,205,661	NM	\$1,520,680	\$349,702	\$364,138	\$2,212,125
Reinsurance	166,276	3,215,909	710,774	1,261,216	NM	846,882	211,280	133,350	1,372,572
Mortgage	170,080	511,610	1,103,565	1,186,236	NM	81,289	118,595	142,432	1,157,875
Other	80,858	1,032,760	390,114	578,862	NM	441,255	125,558	37,889	604,175
Total	\$569,574	\$11,853,297	\$3,753,636	\$5,231,975	NM	\$2,890,106	\$805,135	\$677,809	\$5,346,747
December 31, 2017									
Insurance	\$159,224	\$6,952,676	\$1,451,390	\$2,113,018	NM	\$1,622,444	\$323,639	\$359,524	\$2,122,440
Reinsurance	150,582	3,053,694	633,810	1,142,621	NM	773,923	221,250	146,663	1,174,474
Mortgage	140,057	579,160	1,206,470	1,057,166	NM	134,677	100,598	146,336	1,111,342
Other	85,961	798,262	330,644	531,727	NM	436,402	129,971	31,928	553,117
Total	\$535,824	\$11,383,792	\$3,622,314	\$4,844,532	NM	\$2,967,446	\$775,458	\$684,451	\$4,961,373
December 31, 2016									
Insurance	\$152,983	\$6,502,745	\$1,403,822	\$2,073,904	NM	\$1,622,444	\$323,639	\$359,524	\$2,122,440
Reinsurance	121,806	2,506,239	532,759	1,056,232	NM	773,923	221,250	146,663	1,174,474
Mortgage	86,392	681,167	1,176,809	286,716	NM	134,677	100,598	146,336	1,111,342
Other	86,379	510,809	293,480	467,970	NM	436,402	129,971	31,928	553,117
Total	\$447,560	\$10,200,960	\$3,406,870	\$3,884,822	NM	\$2,967,446	\$775,458	\$684,451	\$4,961,373

- (1) The Company does not manage its assets by segment and, accordingly, net investment income is not allocated to each underwriting segment. See note 4, "Segment Information," to our consolidated financial statements in Item 8 for information related to the 'other' segment.
- (2) Certain other operating expenses relate to the Company's corporate segment (non-underwriting). Such amounts are not reflected in the table above. Note 4, "Segment Information," to our consolidated financial statements in Item 8 for information related to the corporate segment.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
REINSURANCE
(U.S. dollars in thousands)

	<u>Gross Amount</u>	<u>Ceded to Other Companies (1)</u>	<u>Assumed From Other Companies (1)</u>	<u>Net Amount</u>	<u>Percentage of Amount Assumed to Net</u>
Year Ended December 31, 2018					
Premiums Written:					
Insurance	\$ 3,232,234	\$ (1,050,207)	\$ 30,098	\$ 2,212,125	1.4%
Reinsurance	213,809	(539,950)	1,698,713	1,372,572	123.8%
Mortgage	1,139,099	(202,833)	221,609	1,157,875	19.1%
Other	253,760	(130,840)	481,255	604,175	79.7%
Total	<u>\$ 4,838,902</u>	<u>\$ (1,614,257)</u>	<u>\$ 2,122,102</u>	<u>\$ 5,346,747</u>	<u>39.7%</u>
Year Ended December 31, 2017					
Premiums Written:					
Insurance	\$ 3,050,876	\$ (958,646)	\$ 30,210	\$ 2,122,440	1.4%
Reinsurance	152,404	(465,925)	1,487,995	1,174,474	126.7%
Mortgage	1,110,319	(256,796)	257,819	1,111,342	23.2%
Other	133,858	(47,187)	466,446	553,117	84.3%
Total	<u>\$ 4,447,457</u>	<u>\$ (1,407,052)</u>	<u>\$ 1,920,968</u>	<u>\$ 4,961,373</u>	<u>38.7%</u>
Year Ended December 31, 2016					
Premiums Written:					
Insurance	\$ 2,999,106	\$ (954,768)	\$ 27,943	\$ 2,072,281	1.3%
Reinsurance	62,427	(440,541)	1,431,970	1,053,856	135.9%
Mortgage	209,351	(108,259)	290,374	391,466	74.2%
Other	66,806	(21,306)	468,288	513,788	91.1%
Total	<u>\$ 3,337,690</u>	<u>\$ (1,170,743)</u>	<u>\$ 1,864,444</u>	<u>\$ 4,031,391</u>	<u>46.2%</u>

- (1) Certain amounts included in the gross premiums written of each segment are related to intersegment transactions and are included in the gross premiums written of each segment. Accordingly, the sum of gross premiums written for each segment does not agree to the total gross premiums written as shown in the table above due to the elimination of intersegment transactions in the total.

ARCH CAPITAL GROUP LTD. AND SUBSIDIARIES
SUPPLEMENTARY INFORMATION FOR PROPERTY AND CASUALTY INSURANCE UNDERWRITERS
(U.S. dollars in thousands)

Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H		Column I	Column J	Column K
Affiliation with Registrant	Deferred Acquisition Costs	Reserves for Losses and Loss Adjustment Expenses	Discount, if any, deducted in Column C	Unearned Premiums	Net Premiums Earned	Net Investment Income	Net Losses and Loss Adjustment Expenses Incurred Related to		Amortization of Deferred Acquisition Costs	Net Paid Losses and Loss Adjustment Expenses	Net Premiums Written
							(a) Current Year	(b) Prior Years			
Consolidated Subsidiaries											
2018	\$ 569,574	\$ 11,853,297	\$ 21,145	\$ 3,753,636	\$ 5,231,975	\$ 563,633	\$ 3,162,818	\$ (272,712)	\$ 805,135	\$ 2,206,164	\$ 5,346,747
2017	535,824	11,383,792	20,016	3,622,314	4,844,532	470,872	3,205,428	(237,982)	775,458	2,352,912	4,961,373
2016	447,560	10,200,960	18,246	3,406,870	3,884,822	366,742	2,455,563	(269,964)	667,625	1,813,356	4,031,391

ITEM 16. FORM 10-K SUMMARY

Not applicable.

ARCH CAPITAL GROUP LTD.

CORPORATE INFORMATION

Directors

Constantine Iordanou^{3,4}
Chairman

John L. Bunce, Jr.^{2,3,4,5}
*Managing Director of Greyhawk Capital Management, LLC
and Senior Advisor to Hellman & Friedman LLC*

Eric W. Doppstadt^{4,5}
*Vice President and Chief Investment Officer of the
Ford Foundation*

Laurie S. Goodman^{1,6}
*Vice President at the Urban Institute and
Founder and Co-Director of its Housing Finance Policy Center*

Yiorgos Lillikas^{1,6}
*President of the Parliamentarian Committee for International
and European Affairs of the Republic of Cyprus,
Former Minister of Foreign Affairs of the Republic of
Cyprus (E.U.) and Former Minister of Commerce, Industry
and Tourism of the Republic of Cyprus*

Louis J. Paglia^{1,2,5,6}
*Founder of Oakstone Capital LLC and Former Executive
Vice President of UIL Holdings Corporation*

John M. Pasquesi^{2,3,4,5,6}
*Lead Director
Vice Chairman
Managing Member of Otter Capital LLC*

Brian S. Posner^{1,4,6}
President of Point Rider Group LLC

Eugene S. Sunshine^{1,2,5}
*Former Senior Vice President for Business and Finance
at Northwestern University*

John D. Vollaro^{4,6}
*Senior Advisor
Former Executive Vice President, Chief Financial Officer
and Treasurer*

Officers

Dennis R. Brand
Chairman, Worldwide Services

David E. Gansberg
Chief Executive Officer of Global Mortgage Group

Marc Grandisson³
*President and Chief Executive Officer
Director*

W. Preston Hutchings
*Senior Vice President and Chief Investment Officer, and
President of Arch Investment Management Ltd.*

François Morin
*Executive Vice President, Chief Financial Officer
and Treasurer*

Nicolas Papadopoulos
*Chairman and Chief Executive Officer of Arch Worldwide
Insurance Group and Chief Underwriting Officer for Property
and Casualty Operations*

Louis T. Petrillo
*General Counsel
President of Arch Capital Services Inc.*

Maamoun Rajeh
*Chairman and Chief Executive Officer of Arch Worldwide
Reinsurance Group*

Andrew T. Rippert
Chief Innovation and Strategic Investment Officer

Carl D. Sullo
*Chief Human Resources Officer
Real Estate and Administrative Services*

- 1 Audit Committee
- 2 Compensation Committee
- 3 Executive Committee
- 4 Finance, Investment and Risk Committee
- 5 Nominating and Governance Committee
- 6 Underwriting Oversight Committee

SHAREHOLDER INFORMATION

Corporate Address

Waterloo House, Ground Floor
100 Pitts Bay Road
Pembroke HM 08
Bermuda
(441) 278-9250
(441) 278-9255 facsimile

Market Information

The common shares of Arch Capital Group Ltd. are listed on the NASDAQ Global Select Market under the symbol ACGL.

Transfer Agent

American Stock Transfer & Trust Company, LLC
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Shareholder Inquiries

François Morin
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and Treasurer*
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