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Analysis and Valuation of Insurance Companies

Industry Study Number Two

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ANALYSIS AND VALUATION OF INSURANCE COMPANIES

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Overview

During 2008 and 2009, the insurance industry experienced unprecedented volatility. The large swings in insurers' market valuations, and the significant role that financial reporting played in the uncertainty surrounding insurance companies during that period, highlight the importance of understanding insurers' financial information and its implications for the risk and value of insurance companies. To facilitate an informed use of insurers' financial reports, this manuscript reviews the accounting practices of insurance companies, discusses the financial analysis and valuation of insurers, summarizes relevant insights from academic research, and provides related empirical evidence.

The paper contains three sections. The first section describes the insurance business, including activities and organization of insurance companies, products and services, distribution channels, competition, regulation, taxation, and risks and risk management. The second section discusses how insurance activities are reflected in financial reports. Specifically, for each key line item from insurers' financial statements, the study provides evidence on the economic significance of the item, reviews the related US accounting principles, discusses earnings quality issues, describes analyses and red flags that inform on the item's quality, reviews selected research findings, and describes the primary differences between International Financial Reporting Standards (IFRS) and US GAAP.

Building on the discussion and analyses in the previous two sections, the third section addresses the valuation of insurance companies. The section starts by discussing the primary drivers of insurers' intrinsic value, including profitability, growth prospects and cost of equity capital, as well as accounting quality indicators that inform on the reliability of the measured drivers. It then describes relative and fundamental valuation models that translate those fundamentals into value estimates. Finally, in the context of fundamental valuation models, the study presents a template for forecasting the key financial statement line items of insurance companies.

This document is rather long and its efficient use, therefore, requires an understanding of the structure and content of the different sections. The first two sections of the document are mostly descriptive, while the final section is primarily prescriptive. All three sections discuss academic papers, often with significant details. To increase the usefulness of the literature review, the papers are discussed in separate categories by main focus. However, many of the studies provide evidence relevant to multiple categories. The subsections containing detailed discussions of academic research usually follow a summary of the main findings and can generally be skipped without loss of continuity.

1. Business

This section describes the business of insurance. It is divided into seven subsections: the primary activities and organization of insurance companies (subsection 1.1), the products and services offered by insurance companies (1.2), distribution channels (1.3), competition (1.4), regulation (1.5), taxation (1.6), and risks and risk management (1.7).

1.1 Activities and Organization

Insurance provides economic protection from identified risks occurring or discovered within a specified period. Insurance is a unique product in that the ultimate cost is often unknown until long after the coverage period, while the revenue—premium payments by policyholders—are received before or during the coverage period.

Insurance contracts are classified as either property and casualty (**PC**) or life and health (**LH**) policies:

PC insurance – contracts providing protection against (a) damage to or loss of property caused by various perils, such as fire, damage or theft, (b) legal liability resulting from injuries to other persons or damage to their property, (c) losses resulting from various sources of business interruption, or (d) losses due to accident or illness.

LH insurance – contracts that pay off in lump sums or annuities upon the insured's death, disability, or retirement.

Some insurance policies, primarily health-related policies, have both PC and LH characteristics and can therefore be classified as either PC or LH.

Most insurance companies specialize in either PC or LH insurance, but some have significant operations in both segments. In addition, while many insurers underwrite reinsurance policies (insurance sold to insurers), some focus on reinsurance as their core activity. Insurers increasingly offer products and services that involve little or no insurance protection, such as investment products and fee-based services. The industry also includes companies that provide insurance brokerage services (sourcing of insurance contracts on behalf of customers). Reflecting this variation in activities, the Global Industry Classification (GIC) system classifies insurance companies as follows:

Life and Health Insurers (40301020) – Companies providing primarily life, disability, indemnity or supplemental health insurance. This category excludes managed health care companies, which are included in the Health Care sector. Examples include MetLife Inc. (MET), Prudential Financial (PRU), AFLAC Inc. (AFL), Lincoln National Corp. (LNC), Unum Group (UNM), and Torchmark Corp. (TMK).

Property and Casualty Insurers (40301040) – Companies providing primarily property and casualty insurance. Examples include Berkshire Hathaway Inc. (BRK-A&B), Allstate Corp. (ALL), The Travelers Companies Inc. (TRV), Ace Limited (ACE), The Chubb Corporation (CB), Progressive Corp. (PGR), and CNA Financial Corp. (CNA).

Multi-line Insurers (40301030) – Companies with diversified interests in life, health, property and casualty insurance. Examples include American International Group Inc. (AIG), Hartford Financial Services Group Inc. (HIG), and Assurant Inc. (AIZ).

Reinsurers (40301050) – Companies providing primarily reinsurance. Examples include Reinsurance Group of America Inc. (RGA), Everest Re Group Ltd. (RE), PartnerRe Ltd. (PRE), Arch Capital Group Ltd. (ACGL), Transatlantic Holdings Inc. (TRH), and ReinsuranceRe Holdings Ltd. (RNR).

Insurance Brokers (40301010) – Companies providing insurance and reinsurance brokerage services. Examples include AON Corporation (AON), Marsh & Mclennan (MMC), Willis (WSH), Arthur J Gallagher & Co. (AJG), and Brown & Brown Inc. (BRO).

The primary purpose of the insurance business is the spreading of risks. Because the risks associated with different policies are not perfectly correlated, the total risk of a portfolio of policies is smaller than the sum of the policies' risks. Thus, insurance functions as a mechanism to diversify PC and LH risks, similar to the role of mutual funds in diversifying investment risks. In fact, because insurers accumulate substantial funds in conducting their business, they also diversify investment risks for their stakeholders by investing in diversified portfolios.

The activities of insurance companies include underwriting insurance policies (including determining the acceptability of risks, the coverage terms, and the premium), billing and collecting premiums, and investigating and settling claims made under policies. Other activities include investing the accumulated funds and managing the portfolio. Investing activities are particularly important for LH insurers; for many LH insurers, the spread between the return on investments and the interest cost of insurance liabilities is the primary source of income.[1] Investment income is also significant for PC insurers. PC insurers accumulate substantial funds due to the time gap between the receipt of premiums and payment of claims, and they invest and manage these funds to generate investment income. This income contributes to earnings and so affects the pricing of insurance policies.

The time gap between the receipt of premiums and payment of claims, which creates the so-called **float**, consists of four components. The first is the time interval between the receipt of premium and the occurrence of insured events. In most cases this component is relatively small, because the duration of PC policies is usually short, six-months to a year. This component of the float is reflected in the financial statements in the balance of the unearned premium liability. The other three components, which vary in importance across PC lines, relate to the gap between the occurrence of insured events and the subsequent payments. Some insured losses are discovered many years after the event (e.g., exposure to asbestos), and in many cases the claim settlement process extends over several years (e.g., medical malpractice litigation). Also, in some cases insurance payments are made over extended periods of time (e.g., workers' compensation). These three components of the float are reflected in the financial statements in the balance of the reserve for losses and loss adjustment expenses, which insurers are required to accrue when insured events occur. Accordingly, the analysis of the float often focuses on unearned premium (first source of float) and, primarily, the loss reserve (other three sources of float).

PC contracts involve greater uncertainty than LH contracts because both the frequency and magnitude of PC claims are more volatile than LH claims. PC losses are highly sensitive to catastrophic events such as hurricanes, earthquakes and terrorism acts, events which typically

[1] As discussed in Section 2, the primary liabilities of LH insurers are the liability for future policyholder benefits and policyholder account balances. Interest cost is accrued on both liabilities, although for future policyholder benefits it is included in the benefits expense.

have limited effect on LH claims. In addition, the required payment for PC insurance claims depends on the insured's loss (subject to limits), while for LH insurance it is often the face value of the policy.

Because PC reserves involve greater uncertainty than LH liabilities, PC insurers hold larger equity cushions and generally invest in less risky assets compared to LH insurers. They also reinsure significant portions of their exposure, issue insurance-linked securities, and arrange contingent capital facilities. In addition, because the timing of PC claim payments is less predictable and generally nearer than that of LH benefit payments, PC insurers invest in more liquid and shorter maturity (and therefore less interest rate sensitive) assets, particularly securities. In contrast, LH insurers often invest significant amounts in long term mortgages and risky securities.

Some insurers obtain thrift or banking charters and use the charters to cross-sell related products to insurance clients. LH insurers often use thrift or banking charters to provide trust services which complement life insurance and retirement and estate planning activities. For example, life insurance policies can be used to fund trusts, retirement funds may be direct deposited into checking accounts, and certificates of deposit may be incorporated into asset diversification plans for retirement or estate planning purposes. PC insurers use thrift or banking charters for retail activities such as home mortgages and auto loans, which complement the auto and homeowner lines of insurance offered.

Insurance companies are also classified based on their form of ownership, where the primary forms are stock and mutual companies. Mutual insurers, which are owned by their participating policyholders, can issue debentures and similar financial instruments but not common stock. Stock companies are owned by stockholders and can issue debentures, common stock and a wide variety of related financial instruments. Most insurers are stock companies. Examples of mutual insurers include NY Life, Massachusetts Mutual Life, and State Farm (PC). A relatively new, hybrid form of ownership involves a mutual company converting into a mutual holding company with a subsidiary stock company that can issue stock to the public. This form of ownership is allowed in only some states and is uncommon. Two examples are Liberty Mutual Holding Company (PC) and Pacific Mutual Holding Company (LH).

Academic Research on Activities and Organization

Numerous studies investigate various aspects of insurers' operating, investing, and financing activities. Another prolific area of research explores differences across organizational structures, primarily stock versus mutual companies. Studies have also looked at issues relevant to the insurance industry overall, including the value of and demand for insurance, the problems of adverse selection and moral hazard in insurance, and the underwriting cycle (PC insurance). I discuss these studies in separate categories by main focus. However, many of the studies provide evidence relevant to multiple categories.

Efficiency and Profitability

This area of research concerns the success of insurance companies in conducting their operating activities, primarily in terms of efficiency and profitability. Studies examining efficiency consider several dimensions, including cost efficiency, technical efficiency, allocative efficiency, and revenue efficiency. **Cost efficiency** measures the insurer's success in minimizing costs by

comparing the costs that would be incurred by a fully efficient firm to the costs actually incurred by the firm. Cost efficiency can be decomposed into technical efficiency and allocative efficiency. **Technical efficiency** measures the firm's success in using its inputs to produce outputs.[2] **Allocative efficiency** measures the firm's success in choosing the cost minimizing combination of inputs conditional on output quantities and input prices. To be fully cost efficient, a firm must operate with full technical and allocative efficiency. **Revenue efficiency** measures the firm's success in maximizing revenues by comparing the firm's actual revenues to the revenues of a fully efficient firm with the same quantity of inputs. Primary factors that affect revenue efficiency include product-line diversification and geographic diversification.

Summary of Studies

Cummins and Xie (2008a) examine efficiency, productivity and scale economies in the US PC insurance industry over the period 1993-2006. They find that the majority of firms below median size in the industry are operating with increasing returns to scale, and the majority of firms above median size are operating with decreasing returns to scale. However, a significant number of firms in each size decile have achieved constant returns to scale. Over the sample period, the industry experienced significant gains in total factor productivity, and there is an upward trend in scale and allocative efficiency. However, cost efficiency and revenue efficiency did not improve significantly over the sample period. Regression analysis shows that efficiency and productivity gains have been distributed unevenly across the industry. More diversified firms, stock insurers, and insurance groups were more likely to achieve efficiency and productivity gains than less diversified firms, mutuals, and unaffiliated single insurers. Higher technology expenditures increase the probability of achieving optimal scale for direct writing insurers but not for independent agency firms.

Cummins, Weiss, Xie and Zi (2010) investigate economies of scope in the US insurance industry over the period 1993–2006. They test the **conglomeration hypothesis**, which holds that firms can optimize by diversifying across businesses, versus the **strategic focus hypothesis**, which holds that firms optimize by focusing on core businesses. Scope economies can originate from cost complementarities (including the sharing of inputs such as customer lists and managerial expertise), earnings diversification (which permits the firm to operate with higher leverage ratios), and revenue complementarities ("one-stop shopping" opportunities for consumers that reduce search costs). On the other hand, operating a conglomerate may increase management and coordination costs, exacerbate principal-agent conflicts, and create cross-subsidization among subsidiaries due to inefficient internal capital markets. The authors test for scope economies by estimating cost, revenue, and profit efficiency using data envelopment analysis (DEA), which measures efficiency by comparing each firm in an industry to a "best practice" efficient frontier formed by the most efficient firms in the industry. LH outputs are measured using real invested assets, the real value of incurred benefits, and additions to reserves for individual life, individual annuities, group life, group annuities, and accident-health insurance. PC outputs include real invested assets and the present values of real losses incurred for short and long-tail personal and commercial lines. The same inputs are used for each category of insurers – administrative labor, agent labor, materials and business services, and financial equity capital, all measured in real dollars using the Consumer Price Index. The authors regress efficiency scores on control variables and an indicator for strategic focus. They find that PC insurers realize cost scope economies, but these are more than offset by revenue scope diseconomies. LH insurers realize both cost and revenue scope diseconomies. Hence, they conclude that strategic focus is superior to conglomeration in the insurance industry.

Elango, Ma, and Pope (2008) investigate the relationship between product diversification and firm performance in the US PC insurance industry using data for 1994-2002. The extent of product diversification shares a complex and nonlinear relationship with firm performance. The findings suggest that performance

[2] Technical efficiency is related to, but not identical to, to X-efficiency. **X-efficiency** is the effectiveness with which a given set of inputs are used to produce outputs. A company is considered X-efficient if it produces the maximum output it can given the resources it employs.

benefits associated with product diversification are contingent upon an insurer's degree of geographic diversification.

Gardner and Grace (1993) estimate hybrid translog cost functions for 561 life insurers using data for the period 1985-1990. The resulting residuals are used to determine the relative efficiency of insurers in the sample and are tested to see if they are related to so-called X-efficiencies because of internal and external monitoring, or to other factors related to rent-seeking. Results show a large degree of persistent inefficiency seems to exist among sample firms, the inefficiencies relate to some internal or external monitoring, and rent-seeking may be occurring.

Liebenberg and Sommer (2008) develop and test a model that explains insurers' performance as a function of line-of-business diversification and other variables using a sample of property-liability insurers over the period 1995-2004. The results indicate that undiversified insurers consistently outperform diversified insurers. In terms of accounting performance, the diversification penalty is at least 1 percent of return on assets or 2 percent of return on equity. Using a market-based performance measure (Tobin's Q) the authors find that the market applies a significant discount to diversified insurers. The existence of a diversification penalty (and diversification discount) provides strong support for the strategic focus hypothesis. The authors also find that insurance groups underperform unaffiliated insurers and that stock insurers outperform mutuals.

Ma and Elango (2008) investigate the relationship between property-liability insurers' international operations and their risk-adjusted returns using cross-section and time-series data for the years 1992 through 2000. The findings indicate that the relationship between international operations and performance is contingent upon the degree of product diversification. Insurance companies with focused operations in terms of product lines achieve higher risk-adjusted performance as they increase their exposures to international markets. However, insurers who are highly diversified across product lines face declining returns with greater exposure to international markets.

Eling and Luhnen (2010) conduct an efficiency comparison of 6,462 insurers from 36 countries. They find a steady technical and cost efficiency growth in international insurance markets from 2002 to 2006, with large differences across countries. Denmark and Japan have the highest average efficiency, whereas the Philippines is the least efficient. Regarding organizational form, the results are not consistent with the expense preference hypothesis, which claims that mutuals should be less efficient than stocks due to higher agency costs. Only minor variations are found when comparing different frontier efficiency methodologies (data envelopment analysis, stochastic frontier analysis).

Using a sample US property-liability insurance companies that had an IPO during the period 1994 to 2005 and a benchmark sample of private insurers, **Xie (2010)** finds that the likelihood of an IPO significantly increases with size and premium growth. IPO firms experience no post-issue underperformance in efficiency, operating profitability, or stock returns; they register improvement in allocative and cost efficiency; and they reduce financial leverage and reinsurance usage. Moreover, IPO firms are active in follow-on SEO issues and acquisition activities. The findings are mostly consistent with the theory that firms go public for easier access to capital and to ease capital constraints.

New business for PC insurers generates high loss ratios that gradually decline as a book of business goes through successive renewal cycles. Although the experience on new business is initially unprofitable, the renewal book of business eventually becomes profitable over time. Within this context, insurers need to manage their exposure growth in order to maximize long run profitability. **D'Arcy and Gorvett (2004)** use a Dynamic Financial Analysis (DFA) model, which utilizes Monte Carlo simulation, to determine optimal growth rates of a PC insurer.

Economies of Scale

Operating efficiency—the focus of the previous section—is affected by the scale of operations. Thus, studies examining efficiency often provide evidence on the relationship between performance and size. This topic also has important implications for mergers and acquisitions,

another area of research that has received significant attention. I discuss M&A studied in a separate section below; here I focus on studies that specifically address economies of scale.

Summary of Studies

Cummins and Weiss (1993) investigate the efficiency of PC insurers by estimating stochastic cost frontiers for three size-stratified samples of property-liability insurers over the period 1980–1988. A translog cost function and input share equations are estimated using maximum likelihood techniques. The results show that large insurers operate in a narrow range around an average efficiency level of about 90 percent relative to their cost frontier. Efficiency levels for medium and small insurers are about 80 and 88 percent in relation to their respective frontiers. Wider variations in efficiency are present for these two groups in comparison with large insurers. Large insurers slightly over-produce loss settlement services, while small and medium-size insurers under-produce this output. The small and intermediate size groups are characterized by economies of scale, suggesting the potential for cost reductions from consolidations in the industry.

Toivanen (1997) studies economies of scale and scope in Finnish non-life insurance. The production process is separated into cost and portfolio management functions. Firms expand their branch network to either gain market power or informational advantages. There are diseconomies of scale at firm level and economies of scale at branch level, and economies of scope in production. Large firms in the non-life insurance industry pay a substantial premium to gain market power via branch networks. The retained premiums-curve of portfolio management is U-shaped and a positive function of the number of branches.

Investments

Although investment income constitutes a large share of insurers' income (see the statistics in Section 2.1), relatively few studies investigate the investing activities of insurance companies. This is likely due to the fact that insurers' investment activities are not particularly different from those of other financial institutions. I review here research that explores investment policies specifically relevant for insurers. Studies that examine accounting issues related to insurers' investments are discussed in Section 2.6.

Summary of Studies

Heyman and Rowland (2006) point out that investment officers of publicly held PC companies wrestle with the question of how best to contribute to shareholder value. One approach is to manage the investments independent of the insurance operations, as if they were a closed-end investment company that happens to be funded by insurance underwriting. Another approach is to invest funds primarily to defease the firm's liabilities and thus support the insurance operations of a company whose principal value derives from its insurance activities. The authors emphasize the second approach. They argue that the investment policy of most insurance companies should have two primary objectives: (1) immunizing insurance reserves with a fixed-income portfolio and (2) earning "abnormal returns" on surplus in "a responsible and disciplined" way. The latter goal means adhering to an asset allocation approach that takes account of the risk-reward tradeoffs presented by a broad variety of investment types as well as the accounting treatment of investment income. The authors further argue that net investment income ("NII") is the best benchmark of performance and that active management and portfolio approaches that aim to produce a growing, but relatively stable NII would maximize market value.

Pottier (2007) examine the determinants of private debt holdings in the life insurance industry. The results suggest that larger insurers, insurers with higher financial quality, mutual insurers, publicly traded insurers, insurers facing stringent regulation, and insurers with greater cash holdings are more prevalent lenders in the private debt market.

Liebenberg, Carson, and Hoyt (2009) examine life insurance policy loan demand in terms of four hypotheses that have been put forth in the literature. In contrast to previous studies that examined aggregate data, the authors use detailed data from the Survey of Consumer Finances that allow an alternative and in some cases more direct examination of policy loan demand based on individual household circumstances. Unlike prior studies, the authors find a significantly positive relation between loan demand and recent household expense or income shocks. By observing actual life insurance holdings and policy loan data for families, the authors provide evidence in support of the policy loan emergency fund hypothesis. The findings are particularly relevant for insurers since the results provide evidence of an increase in policy loan disintermediation following expense and/or income shocks at the household level, conditions that are particularly prevalent during recessionary times due to unemployment or reduced work hours. Such a finding is fundamental for insurers as they account for the effects of economic conditions in their estimates of policy loan demand. The results also suggest that credit scores may be useful predictors of loan demand, and thus insurers may be able to improve their estimates of future policy loan demand by using credit scores or other credit information.

Chen, Yao, and Yu (2007) find that active equity mutual funds managed by insurance companies underperform peer funds by over 1% per year. The lower returns of insurance funds are not due to less risky investments; instead insurance funds have lower risk-adjusted returns, and their fund flows are less sensitive to performance when they perform poorly. Across insurance funds, those with heavy advertising, directly established by insurers, using parent firms' brandnames, or whose managers simultaneously manage substantial non-mutual-fund assets, are more likely to underperform. The authors conclude that insurers' efforts to cross-sell mutual funds aggravate agency problems that erode fund performance.

Governance and Compensation

While the use of governance and compensation characteristics as control variables is quite common in studies analyzing insurance companies, a few papers specifically investigate issues related to governance structures and compensation schemes in the insurance industry.

Summary of Studies

Ke, Petroni, and Safieddine (1999) investigate the relation between CEO compensation and accounting performance measures as a function of ownership structure. Publicly-held property-liability insurers are used to consider the relation for firms with diffusely-held ownership; privately-held property-liability insurers are used to consider the relation for firms with closely-held ownership. The authors find a significant positive association between return on assets and the level of compensation for publicly-held insurers but, consistent with optimal contracting theory, no such relationship for privately-held insurers is found. Their results suggest that within closely-held firms, CEO compensation is less based on objective measures like accounting information and more on subjective measures.

Mayers and Smith (1992) compare compensation levels of executives of mutual and stock life insurance companies. They find that (1) the compensation of mutual executives is lower than that of stock executives, (2) the compensation of mutual-subsidiary executives is lower than that of stock-subsidiary executives, and (3) the compensation of mutual executives is less responsive to firm performance than that of stock executives. This evidence is consistent with the existence of differences in corporate investment opportunity sets and resulting differences in required managerial discretion between mutual and stock life insurance companies.

Extant research on non-financial service firms indicates that board size is a key determinant of firm performance. PC insurers, however, face a different set of agency costs and a more intense regulatory environment than most non-financial firms. Both of these factors were reinforced by the implementation of the Financial Services Modernization Act in 2000. **Pacini, Hillison, and Marlett (2008)** document a significant inverse relation between publicly traded PC insurer performance and board size in the post-Financial Services Modernization Act period. Publicly traded PC insurer performance, measured by market-to-book ratio, return

on revenues, and the operating ratio, was enhanced for firms with smaller board sizes in 2000 and 2001. The authors find that publicly traded PC insurers on average increased board size in 2000 and 2001. In a post-Financial Services Modernization Act environment, board size appears to be related to publicly traded PC insurer performance, but more research is necessary to develop a complete understanding of its role in P&L insurer corporate governance.

Monitoring by outside board members and incentive compensation provisions in executive pay packages are alternative mechanisms for controlling incentive problems between owners and managers. The control hypothesis suggests that if incentive conflicts vary materially, those firms with more outside directors also should implement a higher degree of pay-for-performance sensitivity. **Mayers and Smith (2010)** provide evidence consistent with this control hypothesis. They document a relation between board structure and the extent to which executive compensation is tied to performance in mutuals: compensation changes are significantly more sensitive to changes in return on assets when the fraction of outsiders on the board is high.

Ke (2001) investigates how taxes affect managerial compensation for a sample of privately held insurers whose managers own a large percentage of the firm's stock during 1989-1996. Shareholder/managers receive two types of income from the firm they own: compensation income as employees, and investment income as shareholders. Although compensation income is taxable to employees and deductible by employers, investment income is subject to double taxation. Thus, the mix of the two is an important tax-planning decision for management-owned insurers. The author finds that as individual tax rates increased relative to corporate tax rates from 1989-1992 to 1993-1996, shareholder/managers paid themselves less tax-deductible compensation relative to a control sample of non-management-owned insurers (i.e., privately held insurers with no managerial ownership).

Mergers and Acquisitions

Merger and acquisition activity in the insurance industry has been very significant for many years. According to the Insurance Information Institute,[3] the number of merger and acquisition transactions in the US insurance industry during the years 1999 to 2008 has ranged between 255 and 522 annually, with average total annual transactions value of about $40 billion. Similar to other industries, the motivations for M&A transactions in the insurance industry are to increase geographical reach and product range in order to benefit from scale and scope economies, and to obtain financial synergies including benefits due to diversification, size, debt capacity and tax effects. Given the proliferation of M&A activity in the insurance industry, it is not surprising that a large number of studies have examined these activities, including the following.

Summary of Studies

Akhigbe and Madura (2001) investigate how the market revalues the acquirer, target, and rival insurance companies in response to merger announcements. They find that the target, acquirer and rival insurance companies experience favorable valuation effects at merger announcements. These findings support the signaling hypothesis (i.e., that rivals are also potentially undervalued and may be acquired). The intra-industry effects of insurance company mergers are more pronounced for insurance companies that have a similar size and are located in the same region as the target insurance company.

The reasons for mergers and acquisitions in the insurance industry are usually not disclosed by regulators, investors, or managers. **BarNiv and Hathorn (1997)** explicate that accounting and financial information can explain merger or insolvency decisions in the industry. The study emphasizes that a timely merger can serve as a viable alternative to insolvency. A logit analysis of solvent and insolvent insurers is performed to generate the probability of insolvency for each merged insurer. Timely mergers serve as an

[3] Insurance Information Institute, *The Insurance Fact Book 2010*.

alternative to insolvency for 20% to 46% of the merged insurers, which is higher than that found in other industries. Attributes are identified that distinguish merged distressed insurers from insolvent insurers. It is concluded that investors in firms that acquire distressed insurers earn significant negative returns and earn significantly lower returns than investors in firms that sell distressed insurers.

Berger, Cummins, Weiss, and Zi (2000) provide evidence on the validity of the *conglomeration hypothesis* versus the *strategic focus hypothesis* for financial institutions using data on US insurance companies. They distinguish between the hypotheses using measures of the relative efficiency of joint versus specialized production, which take both costs and revenues into account. The results suggest that the conglomeration hypothesis dominates for some types of financial service providers and the strategic focus hypothesis dominates for other types. This may explain the empirical puzzle of why joint producers and specialists both appear to be competitively viable in the long run.

Boubakri, Dionne, and Triki (2008) examine the long run performance of M&A transactions in the property-liability insurance industry. Specifically, they investigate whether such transactions create value for the bidders' shareholders, and assess how corporate governance mechanisms, internal and external, affect such performance. The results show that M&A create value in the long run as buy and hold abnormal returns are positive and significant after 3 years. While tender offers appear to be more profitable than mergers, the evidence does not support the conjecture that domestic transactions create more value than cross-border transactions. Furthermore, positive returns are significantly higher for frequent acquirers and in countries where investor protection is weaker. Internal corporate governance mechanisms, such as board independence, and CEO share ownership, are also significant determinants of the long run positive performance of bidders.

Chamberlain and Tennyson (1998) investigate the prevalence of financial synergies as a motive for merger and acquisition activity in the property-liability insurance industry. Two hypotheses are developed and tested based upon theories of information asymmetries and firm financing decisions (Myers and Majluf 1984): (1) that financial synergies are a primary motive for insurance mergers in general and (2) that mergers motivated by financial synergies will be more prevalent in periods following negative industry capital shocks. The hypothesis that financial synergies are a motive for mergers following negative industry capital shocks receives strong support.

Cummins, Tennyson, and Weiss (1999) examine the relationship between mergers and acquisitions, efficiency, and scale economies in the US life insurance industry. The authors estimate cost and revenue efficiency over the period 1988-1995 using data envelopment analysis (DEA). The Malmquist methodology is used to measure changes in efficiency over time. The authors find that acquired firms achieve greater efficiency gains than firms that have not been involved in mergers or acquisitions. Firms operating with non-decreasing returns to scale (NDRS) and financially vulnerable firms are more likely to be acquisition targets. Overall, mergers and acquisitions in the life insurance industry have had a beneficial effect on efficiency.

Deregulation of the European financial services market during the 1990s led to an unprecedented wave of mergers and acquisitions (M&As) in the insurance industry. From 1990-2002 there were 2,595 M&As involving European insurers of which 1,669 resulted in a change in control. **Cummins and Weiss (2004)** investigate whether M&As in the European insurance market create value for shareholders by studying the stock price impact of M&A transactions on target and acquiring firms. The analysis shows that European M&As created small negative cumulative average abnormal returns CAARs) for acquirers (generally less than 1%) and substantial positive CAARs for targets (in the range of 12% to 15%). Cross-border transactions were value-neutral for acquirers, whereas within-border transactions led to significant value loss (approximately 2%) for acquirers. For targets, both cross-border and within-border transactions led to substantial value-creation.

Cummins and Xie (2008b) analyze the productivity and efficiency effects of mergers and acquisitions (M&As) in the US property-liability insurance industry during the period 1994–2003 using data envelopment analysis (DEA) and Malmquist productivity indices. The authors seek to determine whether M&As are value-enhancing, value-neutral, or value-reducing. The analysis examines efficiency and productivity change for acquirers, acquisition targets, and non-M&A firms. They also examine the firm characteristics associated with becoming an acquirer or target through probit analysis. The results provide

evidence that M&As in property-liability insurance were value-enhancing. Acquiring firms achieved more revenue efficiency gains than non-acquiring firms, and target firms experienced greater cost and allocative efficiency growth than non-targets. Factors other than efficiency enhancement are important factors in property-liability insurer M&As. Financially vulnerable insurers are significantly more likely to become acquisition targets, consistent with corporate control theory. M&As are also motivated to achieve diversification. However, there is no evidence that scale economies played an important role in the insurance M&A wave.

Cummins and Xie (2008c) examine the relationship between firm efficiency and stock market reaction to acquisitions and divestitures in the US property-liability insurance industry during the period 1997-2003. The authors use data envelopment analysis (DEA) to estimate firm cost and revenue efficiency. Abnormal returns are measured using the standard market model event study methodology. The authors then conduct multiple regression analysis with cumulative abnormal returns as dependent variables and efficiency and control variables as regressors. The results show that efficient acquirers and targets have higher cumulative abnormal returns but inefficient divesting firms have higher cumulative abnormal returns. The findings are consistent with insurance acquisitions and divestitures being driven primarily by value-maximizing motivations and also show that frontier efficiency provides relevant information for value-maximizing managers.

Elango (2006) examines the shareholder wealth effects of 52 international acquisitions in 24 countries undertaken by US firms in the insurance industry during the years 1997-2003. Firms undertaking overseas acquisitions face statistically insignificant negative market returns. The market returns faced by firms during such acquisitions tend to vary by the degree of wealth of the host country, amount of bilateral trade between host and home country, extent of potential liabilities of foreignness (LOF) faced by the firm, and economies of scope. Insurers are likely to face relatively higher positive returns while seeking entry into countries with large size markets and which have extensive trade relationships with the US insurers, but are likely to face negative returns when entering markets that have potential pitfalls of LOF. The market does see higher risk in acquisitions made in countries characterized by greater differences in culture, environment, legal systems, and geographic distance. Additionally, there is limited evidence indicating that firms gaining scope economies might be able to reduce the negative impact of LOP.

Fields, Fraser, and Kolari (2007) examine the viability of bank/insurer combinations for US and non-US mergers between 1997 and 2002. They find positive gains and no significant risk shifts for shareholders of bidding firms, and that higher CEO stock ownership results in less positive gains for shareholders.

Floreani and Rigamonti (2001) examine the stock market valuation of mergers in the insurance industry between 1996 and 2000 in Europe and in the US. They form a sample of 56 deals in which the acquiring company is listed. Insurance companies' mergers enhance value for bidder shareholders. Over the event window (-20,+2), the average abnormal returns for acquiring firms is 3.65%. The abnormal returns increase with the relative size of deal value. Mergers occurring between insurance companies located in the same European country are not valued positively by the market, while cross-border deals appear to increase shareholder's wealth. The analysis of a sub-sample of listed bidders and targets reveals that the combined insurance companies experience a 5.27% gain over the (-20,+2) event window and, consistent with previous findings, target shareholders substantially increase their wealth.

Focarelli and Pozzolo (2008) investigate what factors might help explain the internationalization strategy of banks and insurance companies, by comparing the determinants of cross-border M&As in the two sectors in a unified framework. The empirical analysis shows that between 1990 and 2003 the internationalization of banks and insurance companies followed similar patterns. Distance and economic and cultural integration are important determinants for both the banks' and the insurance companies' expansion abroad. Comparative advantage also has a prominent role, the more so for banks. The evidence is less supportive of the view that cross-border M&As are more frequent between similar countries, as predicted by the new trade theory. Finally, and most interestingly, the authors find indirect evidence consistent with the hypothesis that implicit barriers to foreign entry are more important in explaining the behavior of banks than that of insurance companies.

Organizational Form

A significant number of studies examine differences between stock and mutual companies, primarily as they relate to efficiency of operations and risk-taking. Also, several studies investigate the initial and subsequent pricing and performance of demutualization IPOs.

Summary of Studies

Cummins, Weiss, and Zi (1999) estimate the relative efficiency of stock and mutual PC insurers using nonparametric frontier efficiency methods. Cross-frontier analysis measures the relative efficiency of each organizational form by computing the efficiency of each stock (mutual) firm relative to a reference set consisting of all mutual (stock) firms. The authors test agency-theoretic hypotheses about organizational form, including the managerial discretion and expense preference hypotheses. The results indicate that stocks and mutuals are operating on separate production and cost frontiers and thus represent distinct technologies. Consistent with the managerial discretion hypothesis, the stock technology dominates the mutual technology for producing stock outputs and the mutual technology dominates the stock technology for producing mutual outputs. However, consistent with the expense preference hypothesis, the stock cost frontier dominates the mutual cost frontier. These results are inconsistent with an earlier study by Cummins and Zi (1998), which finds that stock and mutual insurers are equally efficient after controlling for firm size.

Cummins, Rubio-Misas, and Zi (2004) provide new information on the effects of organizational structure on efficiency by analyzing Spanish stock and mutual insurers over the period 1989–1997. The authors test the efficient structure hypothesis, which predicts that the market will sort organizational forms into market segments where they have comparative advantages, and the expense preference hypothesis, which predicts that mutuals will be less efficient than stocks. Technical, cost, and revenue frontiers are estimated using data envelopment analysis. The results indicate that stocks and mutuals are operating on separate production, cost, and revenue frontiers and thus represent distinct technologies. In cost and revenue efficiency, stocks of all sizes dominate mutuals in the production of stock output vectors, and smaller mutuals dominate stocks in the production of mutual output vectors. Larger mutuals are neither dominated by nor dominant over stocks in the cost and revenue comparisons. Thus, large mutuals appear to be vulnerable to competition from stock insurers in Spain. Overall, the results are consistent with the efficient structure hypothesis but are generally not consistent with the expense preference hypothesis.

Fukuyama (1997) investigates productive efficiency and productivity changes of Japanese life insurance companies by focusing primarily on the ownership structures (mutual and stock) and economic conditions (expansion and recession). This research indicates that mutual and stock companies possess identical technologies despite differences in incentives of managers and in legal form, but productive efficiency and productivity performances differ from time to time across the two ownership types under different economic conditions.

Jeng, Lai, and McNamara (2007) examine the efficiency changes of US life insurers before and after demutualization in the 1980s and 1990s. The authors use two frontier approaches –the value-added approach and the financial intermediary approach—to measure the efficiency changes. The results using the value-added approach indicate that demutualized life insurers improve their efficiency before demutualization. On the other hand, the evidence using the financial intermediary approach shows the efficiency of the demutualized life insurers relative to mutual control insurers deteriorates before demutualization and improves after conversion. The difference in the results between the two approaches is due to the fact that the financial intermediary approach considers financial conditions. The results of both approaches suggest that there is no efficiency improvement after demutualization relative to stock control insurers. There is, however, efficiency improvement relative to mutual control insurers when the financial intermediary approach is used.

Mayers and Smith (1986) test the implications of different theories of the efficiency of mutual insurance companies by examining the changes in stock prices, premium income, and management turnover that accompany mutualization -- the switch from a common-stock to a mutual-ownership structure. The sample used in the analysis includes 30 firms that went through the mutualization process over the period 1879-1968.

The results indicate that: 1. growth in premium income from policyholders remains constant, 2. policy lapse rates do not increase, 3. stockholders receive a premium for their stock, 4. management turnover declines, and 5. there is no significant change in product mix. Therefore, no group of claimholders systematically loses in the sample of firms that chose to mutualize. A subdivision of the sample by concentration of ownership prior to mutualization reinforces these findings. It is concluded that, for this sample of firms, mutualization is, on average, efficiency-enhancing.

The size distribution of mutual property-liability insurers has a larger proportion of relatively small companies than the size distribution of stock property-liability insurers. Small mutuals are unlikely to offer risk-sharing advantages over conventional insurance, so these firms must offer their members other advantages. **Ligon and Thistle (2005)** develop a theoretical model showing that these mutuals may offer advantages over conventional insurance in addressing problems of adverse selection. When adverse selection exists, conventional insurers may coexist with small mutuals. Small mutuals may be strictly preferred by low-risk individuals. The size of the mutuals is limited by asymmetric information problems.

Using life insurer data for 1993-1999, **Baranoff and Sager (2003)** find that stock companies have larger financial leverage and more risky assets than mutual companies. These differences in risk-taking are a (if not *the*) major reason for the higher ROE of stock companies compared to mutuals.

In mutuals, ownership rights are not transferable, which restricts the effectiveness of control mechanisms like external takeovers and increase the importance of monitoring by outside directors. Accordingly, **Mayers, Shivdasani, and Smith (1997)** find that (1) mutuals employ more outside directors than stocks; (2) firms that switch between stock and mutual charters make corresponding changes in board composition; (3) mutuals' bylaws more frequently stipulate participation by outside directors; and (4) mutuals with more outside directors make lower expenditures on salaries, wages, and rent.

Lai, McNamara, and Yu (2008) examine the wealth effect of demutualization initial public offerings (IPOs) by investigating underpricing and post-conversion long-run stock performance. The results suggest that there is more "money left on the table" for demutualized insurers than for non-demutualized insurers. The authors show that higher underpricing for demutualized firms can be explained by greater market demand, market sentiment, and the size of the offering. Further, contrary to previous research reporting an average underperformance of industrial IPOs, the authors show that demutualization IPOs outperform non-IPO firms with comparable size and book-to-market ratios and non-demurualized insurers. The authors present evidence that the outperformance in stock returns is mainly attributable to improvement in post-demutualization operating performance and demand at the time of the IPOs. The combined results of underpricing and long-term performance suggest that the wealth of policyholders who choose stock rather than cash or policy credits is hot harmed by demutualization. Stockholders who purchase demutualized company shares either during or after the IPO earn superior returns. These findings are consistent with the efficiency improvement hypothesis.

Viswanathan (2006) examines the pricing of initial public offerings (IPOs) that follow insurance company demutualizations. The study finds that on average demutualization insurer IPOs post significantly higher first-day returns than nondemutualization insurer IPOs. These gains would accrue to the initial investors and to those policyholders who receive compensation in the form of shares in the newly created stock insurer. Attractive returns are sustained for both groups of insurers during the first few years after IPO.

Value of and Demand for Insurance

Most products and services provide or are expected to provide ex-post benefits. Insurance, in contrast, provides ex-post benefits only if low probability events occur. Therefore, the value of insurance to customers may not be as clear as the value of other products or services. Accordingly, studies have investigated the value of and demand for insurance.

Summary of Studies

Ligon and Cather (1997) argue that insurance reduces uncertainty regarding future wealth and so allows insureds to make better decisions regarding consumption and investment. This informational value of insurance does not require consumer risk aversion. Lines of insurance with longer resolution periods should impact relatively more decisions and have higher informational value. Empirical tests using data from the property-liability insurance market suggest that the willingness to pay per dollar of coverage (as measured by relative market demand across lines of insurance) is greater for lines of insurance with longer resolution periods consistent with a positive informational value of insurance.

Li, Moshirian, Nguyen, and Wee (2007) examine the determinants of life insurance consumption in OECD countries. Consistent with previous results, the study finds a significant positive income elasticity of life insurance demand. Demand also increases with the number of dependents and level of education, and decreases with life expectancy and social security expenditure. The country's level of financial development and its insurance market's degree of competition appear to stimulate life insurance sales, whereas high inflation and real interest rates tend to decrease consumption. Overall, life insurance demand is better explained when the product market and socioeconomic factors are jointly considered.

Li, Moshirian, and Sim (2003) study the determinants of intra-industry trade (IIT) in insurance services. The article analyzes and measures the magnitude of IIT in insurance services for the US. The empirical results of the determinants of IIT indicate that foreign direct investment in insurance services (FDI) is a significant contributor to the volume of trade in insurance services. These empirical findings confirm the new theoretical trade models that, unlike the traditional trade theory that considered trade and foreign direct investment in insurance services as substitutes, trade and FDI complement each other and hence multinational insurance companies are contributing to an increase in the volume of trade in insurance services. Furthermore, this study shows that trade intensity between the US and its trading partners leads to product differentiation in insurance services and hence an increase in consumer welfare.

Cummins and Danzon (1997) develop a model of price determination in insurance markets. Insurance is provided by firms that are subject to default risk. Demand for insurance is inversely related to insurer default risk and is imperfectly price elastic because of information asymmetries and private information in insurance markets. The model predicts that the price of insurance, measured by the ratio of premiums to discounted losses, is inversely related to insurer default risk and that insurers have optimal capital structures. Price may increase or decrease following a loss shock that depletes the insurer's capital, depending on factors such as the effect of the shock on the price elasticity of demand. Empirical tests using firm-level data support the hypothesis that the price of insurance is inversely related to insurer default risk and provide evidence that prices declined in response to the loss shocks of the mid-1980s.

Prior research suggests that the occurrence of a catastrophe may lead to increases in risk perception, risk mitigation, and insurance purchasing behavior. Given the extensive damage that often is inflicted by natural disasters, such a phenomenon is intuitive for property risks. Similarly, **Fier and Carson (2009)** posit that the occurrence of catastrophes also may be associated with an increased demand for coverage against mortality risk. Based on US state-level data for the period 1994 through 2004, the authors provide evidence of a significant relationship between catastrophes and life insurance demand, both for states directly affected by the event and for neighboring states.

Using the Survey of Consumer Finances, **Grace and Lin (2007)** examine the life cycle demand for different types of life insurance. Specifically, the authors test whether consumers' aversion to income volatility resulting from the death of a household's wage-earner affects their purchase of life insurance. They develop a financial vulnerability index to control for the risk to the household, and examine the life cycle demand for several categories of life insurance. In contrast to previous research, the authors find that there is a relationship between financial vulnerability and the amount of term life or total life insurance purchased. In addition, they find that (1) older consumers use less life insurance to protect a certain level of financial vulnerability than younger consumers, (2) life insurance demand is jointly determined as part of a household's portfolio, and (3) households take into account the value of family members' non-monetary contribution in their insurance purchase.

Adverse Selection and Moral Hazard

Adverse selection in insurance is the tendency of individuals and companies with higher than average potential for claims to seek to obtain insurance coverage to a greater degree than low risk individuals or companies. For example, people with severe health problems have strong incentives to buy health insurance, and companies employing workers in dangerous occupations may be particularly inclined to buy workers' compensation coverage. To combat adverse selection, insurers engage in selective underwriting and adjust premiums for risk factors (e.g., setting high life insurance premiums for smokers). **Moral hazard** in insurance relates to the tendency of insureds to engage in more risky activities than they would if they had no insurance. It also refers to the possibility that insureds may deliberately cause an insured event or pretend that such an event occurred to obtain insurance payments. Moral hazard concerns are mitigated through selective underwriting (e.g., moral individuals, thriving business, occupied properties), insurance deductibles, policy exclusions, contingent pricing, and other methods. I next review several studies dealing with adverse selection and moral hazard in insurance.

Summary of Studies

Cummins and Tennyson (1996) provide new evidence on moral hazard in insurance markets by analyzing the frequency of automobile bodily injury liability (BIL) claims. The authors conduct cross-sectional regressions of statewide BIL claims frequency rates on variables representing state economic, demographic, and legal characteristics that affect the marginal costs and benefits of filing claims. As an indicator of moral hazard, the authors use survey data on consumer attitudes toward various types of dishonest behavior relating to insurance claims. The results provide strong support for the hypothesis that attitudes toward dishonest behavior are related to BIL claims frequency, and thus provide evidence of significant moral hazard in automobile insurance markets.

D'Arcy and Doherty (1990) discuss the persistence of adverse selection in the automobile insurance market. The first set of models identified were the single-period competitive models that induce policyholders to sort into risk classes by selecting from a menu of contracts. In these models, each of the contracts in the menu available to policyholders is defined both with respect to the amount of coverage and the price per unit of coverage. The basic mechanism of these models is simple. The policyholder is asked his risk class and is then offered a multiperiod binding insurance contract that is priced initially according to his response. However, the pricing of successive renewals of the contract is based on the accumulated loss experience up to the date of that renewal. In contrast with the price-quantity contracts, which are rarely observed, experience related contracts are quite common in insurance markets. Automobile insurance, group life and group health insurance typically are experience related. Self-selection can be induced in which good risks select an experience-rated, multiperiod contract that is binding only on the insurer. Bad risks select single-period contracts that are not experience rated.

Kessler (2008) discusses the market for long-term care insurance. There are three major risks for insurers that provide long-term care insurance: risk of escalating costs, risk of adverse selection and risk of moral hazard. Despite these risks, the long-term care insurance is a potentially expanding market for insurance companies able to innovate and design products tailored to this very specific demand.

Saito (2006) examines whether adverse selection or moral hazard could be induced by rate regulation, which prohibits insurance companies from considering some attributes of drivers in setting premiums. Using an individual data set from a heavily regulated automobile insurance market, the authors find no evidence of adverse selection or moral hazard: risk and coverage are not statistically dependent. This finding supports the view that the adverse selection phenomenon exists only to a very limited extent in this market.

Underwriting Cycle

The **underwriting cycle** is the tendency of PC insurance premiums, profits, and availability of coverage to rise and fall with some regularity over time. A cycle begins when insurers tighten their underwriting standards and sharply raise premiums after a period of severe underwriting losses or other negative shocks to capital (e.g., investment losses). Stricter standards and higher premium rates lead to an increase in profits and accumulation of capital. The increase in underwriting capacity increases competition, which in turn drives premium rates down and relaxes underwriting standards, thereby causing underwriting losses and setting the stage for the cycle to begin again. The underwriting cycle has been the focus of many academic papers. Some recent ones are described next.

Summary of Studies

According to conventional theory, insurance premiums should be informationally efficient predictors of the present value of policy claims and expenses. **Bourgeon, Picard, and Pouyet (2008)** develop an alternative theory of insurance market dynamics based on two assumptions. First, insured risks are dependent. Under this assumption, insurers' net worth determines the market capacity since it is necessary to back the contractual promises to pay claims. Second, in raising net worth, external equity is more costly than internal equity. The theory explains the variation in premiums and insurance contracts over the "insurance cycle" and is supported by tests on postwar data.

Negative shocks to industry capital and significant capital adjustment costs have been offered as an explanation of periodic "crises" in the property-liability insurance market. According to these capacity constraint models, in which post-shock production must meet a solvency constraint, increases in price can cause some or perhaps all of the cost of a negative shock to capital to be shifted to policyholders. **Cagle and Harrington (1995)** develop a model of insurance supply with capacity constraints and endogenous insolvency risk that incorporates limited liability and potential loss of insurer intangible capital. If industry demand is inelastic with respect to price and capital, the model predicts that price will increase following a negative shock to capital, but by less than the amount needed to fully offset the shock. Equity value and the expected recovery by policyholders for post-shock production are predicted to decline. Elastic demand mitigates shock-induced price increases.

Chung and Weiss (2004) investigate the determinants of reinsurance prices in an attempt to shed light on the role of reinsurance in observed underwriting cycles in the primary market. Nonproportional reinsurance is highlighted, since it is designed to cover the tail of the loss distribution and is therefore considered to be relatively riskier than proportional reinsurance. The results support both the capacity constraint hypothesis and the risky debt hypothesis. Under the capacity constraint hypothesis, insurance prices are bid-up when capital is scarce and fall when capital is plentiful. Equilibrium price also might be affected if policyholders and/or (re)insurers change their loss expectations after events such as catastrophes (probability updating), leading to increased prices. Thus, the price increases follow the loss shocks because of constriction in supply *and* increased demand. The risky debt hypothesis predicts that policyholders are willing to pay higher premiums for greater financial quality; loss shocks that deplete the capital (surplus) of the firm are hypothesized to affect prices by driving insurers away from their optimal capital structures.

Insurance profits exhibit cyclical behavior that has been attributed to capital market constraints. **Doherty and Garven (1995)** show that changes in interest rates simultaneously affect the insurer's capital structure and the equilibrium underwriting profit. Depending upon asset and liability maturity structure, capital market access, and reinsurance availability, insurers will be differently affected by changing interest rates. The average market response to changing interest rates roughly tracks market clearing prices. These "cyclical" effects are enhanced for firms with mismatched assets and liabilities and more costly access to new capital and reinsurance. This evidence supports the capacity constraint hypothesis.

Insurance markets sometimes exhibit "crises" in which prices rise dramatically and coverage is unavailable or is rationed at the new prices. A recent explanation for such crises is the "capacity constraint" model. Crises usually follow sudden and large depletions in insurers' equity or surplus. The capacity constraint model argues that frictional costs in replacing surplus, and limited liability, give rise to a kinked insurance supply function and that crises arise from discontinuous short term adjustments around the kink. While this model explains much about liability insurance crises, it still leaves unexplained their most prominent feature; that insurance is rationed or unavailable. **Doherty and Posey (1997)** look to equity shocks and capital market frictions to explain crises and combine this with a model of optimal risk sharing contracts under the information conditions characteristic of this market. The authors use implicit long term contracts with truth telling constraints to address information asymmetries and this allows us to model crises that exhibit rationing. The model is tested in the market most dramatically affected by such crises in the 1980's, the general liability insurance market.

Gron (1994) provides empirical support for the primary predictions of capacity constraint theories of property-casualty insurance cycles. The primary implications concern industry capacity and the difference between the price of insurance and noncapital costs, referred to here as the price-payment margin (PPM). Capacity constraint theories predict that low capacity will lead to higher PPMs and that capacity growth will follow PPM increases as insurers rebuild capacity. Price-payment margin and capacity series are constructed using industry time series for 1949-90. The estimation finds that PPM growth varies inversely with capacity at the beginning of the period and also inversely with changes in capacity. In addition, declines in capacity are associated with PPM growth next period, while increases in capacity generally have no significant effect on next period's PPM growth. Furthermore, current capacity growth is positively correlated with last period's PPM growth.

Heterogeneous information or weak incentives for solvency could have caused some general liability insurers to charge low ex ante prices during the early 1980s and mid-to-late 1990s, putting downward pressure on other firms' prices and plausibly aggravating subsequent periods of rapid premium growth. **Harrington, Danzon, and Epstein (2008)** analyze whether the 1994–1999 "soft" market in medical malpractice insurance led some firms to underprice, grow rapidly, and subsequently experience upward revisions in loss forecasts ("loss development"), which could have aggravated subsequent market "crises". Consistent with the underpricing hypothesis, the results indicate a positive relation between loss development and premium growth among growing firms. Underpricing was likely more prevalent among non-specialist malpractice insurers.

Lamm-Tennant and Weiss (1997) investigate the causes of insurance underwriting cycles. A generalized least squares analysis of changes in premium levels is used to test the rational expectations/institutional intervention hypothesis across countries as well as within each country. The authors also examine the relation between cycle length and the market/institutional features of each country. Finally, a logistic model is used to predict the presence of a cycle based on the market/institutional features. The results suggest that the rational expectations/institutional intervention hypothesis explains many aspects of the underwriting cycle, including cycle length.

Leng (2006a) examines whether the properties of the combined-ratio series, an indicator of underwriting profitability in property-liability insurance, have changed over time. Using the autocorrelation function (ACF) and partial autocorrelation function (PACF), the authors check whether combined ratios are stationary. Underwriting profit has worsened in recent years, and combined ratios are non-stationary. This characteristic of combined ratios needs further analysis for its impact on underwriting cycles. Traditional concepts of underwriting cycles, such as predictable cycle lengths and trends, may have changed. The possibility of a non-stationary combined-ratio series is recognized, and the possible existence of non-stationarity and breaks in combined ratios is introduced.

Leng (2006b) examines the existence of underwriting cycles for the property-liability insurance industry as a whole, and by line of business, by testing whether the combined ratio is stationary and stable. The augmented Dickey-Fuller (ADF) test is employed for unit roots, while dummy variable methods, the Chow test, and switching regression are used for stability. Underwriting profits of most lines of business and all lines combined are not stationary and have structural changes. For the whole property-liability industry, a structural change occurred in 1981. Before the change, underwriting cycles existed since combined ratios followed an

AR(2) process. After the change, combined ratios are non-stationary. Without clear underwriting cycles, there is more difficulty for the insurance industry in pricing and reserving, for regulators in monitoring the financial strength of insurers, and for customers in terms of the affordability and availability of insurance. The paper recognizes the non-stationarity of combined-ratio series, years of structural changes in the insurance industry and specific lines of business, and the possibility that underwriting profit is co-integrated with investment income.

Leng and Meier (2006) discuss the findings of a study of multinational underwriting cycles in property-liability insurance in Switzerland, Germany, the United States and Japan. A description of the study design and methodology is given. The study provides a hypothesis that the factors affecting underwriting cycles are mainly country-specific rather than global/international.

Meier (2006) examines the existence of underwriting cycles in property-liability insurance for Switzerland, the USA, Japan, and West Germany over a period of 40 years (1957-1997). Cycles are found for the USA, West Germany and Switzerland, whereas most specifications for Japan have not revealed cycles. For West Germany, much longer cycles than in earlier studies are found. In general, the cycles get longer for the longer period, 1957-1997. The author concludes that the hypothesis of cycles of six years in length no longer holds globally.

Meier and Outreville (2006) discuss the findings of the existence of an underwriting cycle in property-liability insurance for France, Germany and Switzerland and for the European reinsurance industry. The study also reveals that the reinsurance price index has a strong influence on the primary market loss ratios of the three countries.

1.2 Products and Services

This section describes the primary products and services offered by insurers: first PC products, then LH products, and finally other, non-insurance services.

Property and Casualty Products

PC insurers offer insurance products in many different lines; the primary ones are:

Automobile – coverage for personal injury (Personal Injury Protection or PIP, un/under-insured motorist bodily injury), automobile damage sustained by the insured (collision, comprehensive, un/under-insured motorist property damage), and liability to third parties for losses caused by the insured (bodily injury liability, property damage liability).

Homeowners insurance – covers the house and other structures on the property, as well as personal possessions inside the house, against a wide variety of perils including windstorms, fire and theft. Homeowners insurance also covers additional living expenses (the cost of living elsewhere while the house is being restored after a disaster) and accidental injuries caused to third parties and/or their property. Coverage for flood and earthquake damage is excluded.

Workers' compensation – coverage for benefit payments to employees for work-related injuries, deaths and diseases, regardless of fault.

Commercial multiple peril – package coverage including most property and liability coverage except workers' compensation, automobile insurance, and surety bonds.

Professional liability – covers physicians, surgeons, dentists, hospitals, engineers, architects, accountants, attorneys, directors, and other professionals from liability arising from error or misconduct in providing or failing to provide professional service.

Fire and allied lines – coverage for fire, windstorm, hail, and water damage (but not floods).

Inland marine – coverage for property that may be transported from one place to another, as well as bridges, tunnels and other instrumentalities of transportation.

Ocean marine – coverage for ships, cargos, and freight.

Accident and health – covers loss by sickness or accidental bodily injury, including disability income insurance and accidental death and dismemberment insurance.

Fidelity insurance – protects employers for loss due to embezzlement or misappropriation of funds by an employee.

Surety insurance – a three-party agreement in which the insurer agrees to pay a second party or make complete an obligation in response to the default, acts, or omissions of an insured.

Of the above lines, private passenger auto insurance is by far the most significant one. According to the Insurance Information Institute,[4] $159 billion out of $440 billion of net PC premiums written in 2008 were for private passenger auto insurance. The second biggest category is homeowner multiple peril, with net premiums written of $57 billion. Other significant lines include "other liability" (coverages protecting against legal liability resulting from negligence, carelessness, or failure to act; $39 billion), workers' compensation ($37

[4] Insurance Information Institute, *The Insurance Fact Book 2010*.

billion), commercial multiple peril ($30 billion), commercial auto ($24 billion), fire ($10 billion), and medical malpractice ($10 billion). There are also many relatively small lines, which are primarily commercial. Overall, the totals of commercial and personal lines are similar ($225 billion versus $215 billion, respectively, in 2008).

Life and Health Products

Traditional life policies provide primarily death benefits, although many contracts have significant saving elements or contain living benefit clauses. The products offered by life insurers also include life-contingent annuities as well as pure investment contracts. Health insurance contracts provide reimbursements for medical expenses or income in the case of disability. According to the Insurance Information Institute,[5] direct premium written in the LH insurance sub-industry were approximately $684 billion in 2008. About 51% were paid for annuities (32% ordinary individual, 19% group), 25% for life (20% ordinary, 5% group), and 24% for accident and health (13% group, 11% other). Approximately 60% of the individual annuities' premiums paid in 2008 were for variable products.

Life Insurance Policies

There are many variants of life insurance contracts. Some contracts—including term and whole life—are used exclusively or primarily to provide protection against premature death. Others—such as endowment and universal life—combine protection against premature death with a type of savings vehicle.

Term insurance – provides protection for a fixed term (e.g., 1, 5, or 15 years). If death occurs during the policy's term, a fixed amount is paid to the beneficiary. There are no other benefits or cash value build-up. **Guaranteed renewable term insurance** can be renewed without proof of insurability (but often at much higher rates), while under other types of term insurance the insured must once again undergo an underwriting process (e.g., a medical examination).

Whole life – provides for the payment of the face value of the policy upon death of the insured, regardless of when it may occur. Premium payments are typically level during the insured's life. Because life risk increases with age, whole life contracts involve overpayment of premiums in the early years and underpayment in the latter years, and so accumulate cash value that may be borrowed against.

Endowment insurance – the face value of the policy is paid to the insured or beneficiaries either at the end of the contract period or upon the insured's death.

Universal life – a flexible premium policy that combines insurance protection with a type of savings vehicle (cash value account), which typically earns a money market rate of interest. Death benefits can be changed during the life of the policy within limits, generally subject to a medical examination. The cash value account is reduced periodically by mortality and administrative charges, and the policy lapses if the account balance is not sufficient to cover the charges.

[5] Insurance Information Institute, *The Insurance Fact Book 2010*.

Variable life – contracts that allow the insured to invest the premiums in one or more underlying portfolios offering different levels of risk and growth potentials, which are usually held in separate accounts. Unlike whole life, the cash value of the policy is not guaranteed, and poor investment performance can lead to a reduced cash value, a lower death benefit, and possible lapse of the policy without value. Some life contracts combine fixed and variable features.

Variable universal life – a universal life policy that allows for flexibility in investing the premiums (see variable life).

Life-Contingent Annuities and Investment Products

Annuities are either life-contingent or pure investment contracts. Annuities can also be classified as either fixed versus variable, immediate versus deferred, or qualified versus non-qualified. Annuity contracts also differ in the guarantees that they offer. In addition to annuities, insurers sell investment contracts which take on various forms. The following is a short description of the primary forms and classifications of annuities and investment contracts.

Life-contingent annuity – a contract that pays a periodic benefit over the remaining life of a person (the **annuitant**) or the lives of two or more persons (**joint and Survivor life**). Live-contingent annuities are essentially the reverse of life insurance. These contracts expose the insurer to longevity risk, which can be used to offset the mortality risk exposure of life insurance.

Investment contract – a contract that does not subject the insurer to a significant insurance risk of contractholder mortality or morbidity. Annuities with specified periods of payment (**period certain annuities**) are an example of investment contracts sold by insurers. Guaranteed Investment Contracts (**GICs**), which are similar to banks' certificates of deposits, are another example.

Fixed annuity – an annuity whose premiums paid earn a pre-determined rate of return (during the accumulation phase) and which pays predetermined income amounts (during the dis-accumulation phase).

Variable annuity – an annuity whose value or income payments vary according to the performance of investment funds that are selected by the contract owner from a list offered by the insurer (typically separate accounts). Some annuity contracts combine fixed and variable features.

Deferred annuity – annuity during the accumulation stage or when payments are not scheduled to start in the near term.

Immediate annuity – an annuity designed to begin making payments right away or within a short time after purchase.

Qualified annuity – an annuity used in connection with employer-sponsored plans such as 401(k) plans, defined benefit plans, or section 403(b) plans. These annuities are referred to as "qualified" because contributions are generally deductible to the employer and taxed to the employees only when received (at retirement).

Non-qualified annuity – an annuity that is not part of a qualified retirement plan, and which is therefore purchased with after-tax dollars (see definition of a qualified annuity).

Accident and Health

Accident and health insurance contracts are generally classified as either medical indemnity contracts or disability income contracts.

Medical indemnity contracts – provide benefits for medical expenses.

Disability income contracts – provide periodic benefit payments for a fixed period or for life in the event the insured is unable to work due to disability resulting from illness or injury.

Other Services

Insurance companies also provide services which do not involve significant elements of insurance or investment risks. For example, LH insurers often generate fees from services such as group plan administrative, investment advisory, and back office services. In addition, life insurance entities commonly offer products through noninsurance subsidiaries, such as finance companies, broker-dealer operations, mutual funds, unit trusts, joint ventures, mortgage banks, and real estate trusts.

Academic Research on Specific Business Lines

While most insurance studies explore issues that vary in importance across business lines, some studies focus on particular lines (e.g., auto insurance, medical malpractice), products (e.g., variable annuities), or features (e.g., annuity guarantees). I review a few examples below. Studies that address issues relevant for multiple lines are discussed in other sections of this manuscript.

Summary of Studies

Milevsky and Posner (2001) use risk-neutral option pricing theory to value the guaranteed minimum death benefit (GMDB) in variable annuities (VAs) and some mutual funds. A variety of death benefits, such as return-of-premium, rising floors, and "ratches," are analyzed. Specifically, the authors compute the fair insurance risk fee, charged to assets, that funds the embedded option. The authors' main conclusion is that a simple return-of-premium death benefit is worth between one and ten basis points, depending on gender, purchase age, and asset volatility. In contrast, the median Mortality and Expense risk charge for return-of-premium variable annuities is 115 basis points. Presumably, the remaining markup can be attributed to profits, model imperfections, or, more cynically, to an implicit payment for the tax-deferral privilege.

As of 2005, US individuals had an estimated $7.4 trillion invested in IRAs and employer-sponsored retirement accounts. Many retirees will thus face the difficult problem of turning a pool of assets into a stream of retirement income. Purchasing an immediate annuity is a common recommendation for retirees trying to maximize retirement spending. The vast majority of retirees, however, are unwilling to annuitize all their assets. **Scott (2008)** demonstrates that a "longevity annuity," which is distinct from an immediate annuity in that payouts begin late in retirement, is optimal for retirees unwilling to fully annuitize. For a typical retiree, allocating 10-15 percent of wealth to a longevity annuity creates spending benefits comparable to an allocation to an immediate annuity of 60 percent or more.

Variable annuity contracts frequently have many options and option-like features embedded in the contracts. Some are obvious, such as guaranteed minimum death benefits (GMDBs), while others are less obviously option-like. **Ulm (2006)** considers the effect of the option to transfer funds between fixed and variable accounts. If a GMDB rider is considered in isolation, it is sometimes in the policyholder's interest to transfer to the fixed fund if the fixed fund earns less than the variable fund in a risk-neutral world. On the other hand, the option to transfer will not be used if the entire annuity and rider are considered together.

Viscusi and Born (2005) use the complete property-casualty insurance files of the NAIC from 1984 to 1991 to assess the effect of medical malpractice reforms pertaining to damages levels and the degree to which these damages are insurable. Limits on noneconomic damages were most influential in affecting insurance market outcomes. Several punitive damages variables specifically affected the medical malpractice insurance market, including limits on punitive damage levels, prohibitions of the insurability of punitive damages, and prohibition of punitive damages awards. Estimates for insurance losses, premiums, and loss ratios indicate effects of reform in the expected directions, where the greatest constraining effects were for losses. The quantile regression analysis of losses indicates that punitive damages reforms and limits were most consequential for firms at the high end of the loss spectrum. Tort reforms also enhanced insurer profitability during this time period.

1.3 Distribution Channels

Two distinct classes of insurance distribution systems are used in the US: direct writing and agency (independent) writing. Direct writing arrangements include companies that sell through employees (direct marketers), companies that use exclusive or captive agents (i.e., agents constrained to represent the products of only one insurer), and companies that sell through the internet, telephone or mail. Under direct writing arrangements, the insurer owns the customer list and thus benefit from any residual profits that arise from the insurance transaction. In contrast, under independent agency, the agent or broker may represent the competing products of several insurers and generally has ownership rights to the customer list. Agency ownership of the list means that the insurer cannot replace the agent or contact clients directly without the agent's permission. Moreover, the agent has the unrestricted legal right to move the business to another insurer.

From the insurer's perspective, independent agency writing is generally more costly than direct writing (e.g., Barrese and Nelson 1992). On the other hand, independent agency writing requires smaller upfront investments and involves lower fixed costs compared to direct writing. It therefore provides two benefits: (1) ability to grow when the resources required for direct writing are unavailable, and (2) low operating leverage and hence low profit sensitivity to fluctuations in volume.

The distinctions between direct and agency writers, and between agents and brokers, are often blurred. Since the 1990s, many insurers have been using multiple distribution channels to reach potential customers. Similarly, while in theory agents (whether captive or independent) represent the insurance company and brokers represent the customers, in practice brokers often have significant ties to the insurance companies with which they place the business.

According to the Insurance Information Institute,[6] agency writing dominates direct writing in life lines. In 2008, agency writing accounted for 92% of the life market share (56% independent, 36% affiliated), direct writing accounted for 3%, and sales by banks, financial advisors, professional groups and other non-traditional channels accounted for the remaining 5% (primarily variable annuities). While agency writing has accounted for more than 90% of life lines throughout the last decade, the share of independent agency writing has steadily increased throughout that period. In 1999, independent and affiliated agents had similar market shares.

In contrast, in PC lines, independent agents steadily lost market share from the early 1980s through the early 2000s, but have gained in recent years. The PC market shares of direct and independent writing are currently about 50% each, compared to about 60% independent and 40% direct in the 80s. Within PC lines, direct writing dominates in personal lines with about 70% market share, but agency writing has a similar lead in commercial lines.

The loss of independent agency PC market share was most notably in personal lines; independent agency share of commercial lines has remained relatively stable. The increase in direct writers' share in personal lines has been attributed to investments in advertising, technology, standardization and mechanization, which significantly reduced the cost of insurance production (Regan, 1997). These investments, however, are not as cost-effective in complex commercial lines, because of the increasing number of variables that must be accounted for.

[6] Insurance Information Institute, *The Insurance Fact Book 2010*.

Additional explanations for the relative strength of independent agencies in commercial lines relate to the benefits of having an intermediary in the transaction. Businesses and other policyholders with high search costs due to product complexity are willing to pay an independent agent to search for an appropriate insurer from among those the agent represents (Posey and Yavas 1995). Moreover, due to its ownership of the customer list, the agent is likely to invest in performing risk assessment, which is particularly important for complex contracts (Regan 1997). Independent agency is also valuable when intervention in disputes between insurers and policyholders is potentially beneficial, because the independent agent can credibly threaten to move the business to other insurers if the dispute is not resolved favorably. This benefit of intermediation is likely to be particularly high in non-standardized business lines (e.g., Cummins and Weiss 1992).

Academic Research on Distribution Channels

This section elaborates on the papers mentioned above and reviews additional ones.

Summary of Studies

Property-liability insurance is distributed through a direct-writer system, where agents represent one insurer, and an independent-agency system, where agents represent several insurers. Independent-agency insurers have higher costs than direct writers. The market-imperfections hypothesis attributes the coexistence of the two types of insurers to impediments to competition, while the product-quality hypothesis holds that independent-agency insurers provide higher-quality services. **Berger, Cummins, and Weiss (1997)** measure cost efficiency and profit efficiency for property-liability insurers and find strong support for the product-quality hypothesis, implying that independent-agency insurers produce higher-quality outputs and are compensated by higher revenues.

Cummins and Doherty (2006) analyze the economic functions of independent insurance intermediaries (brokers and independent agents), focusing on the commercial property-casualty insurance market. Insurance intermediaries are essentially market makers who match the insurance needs of policyholders with insurers who have the capability of meeting those needs. Intermediary compensation comprises premium-based commissions, expressed as a percentage of the premium paid, and contingent commissions based on the profitability, persistency, and/or volume of the business placed with the insurer. The authors find that premium-based and contingent commissions are passed on to policyholders in the premium. However, contingent commissions can enhance competitive bidding by aligning the insurer's and the intermediary's interests. This alignment of interests gives insurers more confidence in the selection of risks and thus helps to break the "winner's curse" and encourages insurers to bid more aggressively. Independent intermediaries also help markets operate more efficiently by reducing the information asymmetries between insurers and buyers that can cause adverse selection.

Gron (1998) provides an empirical investigation of a multiple principal-multiple agent relationship under changing industry conditions. Using 34 years of biannual data, the study investigates the relationship between property-casualty insurers and agents representing multiple insurers. Several facts emerge. Average commission rates and the number of insurers represented are lower when insurers have higher profitability. Agency income is not systematically related to insurer profitability. Competition from alternative distribution systems and technological innovation has reduced commission rates. Larger agencies have lower average commission rates.

Barrese and Nelson (1992) find that that exclusive agency firms have lower expenses than independent agency firms, and that direct mail merchandisers have lower expenses than either type of agency firm.

Using private passenger automobile insurance complaint data, **Barrese, Doerpinghaus, and Nelson (1995)** find that the independent agency system provides superior service for private passenger automobile insurance and that the service differential decreases with insurer size. This evidence supports the argument made by defenders of the independent agency system that higher expense ratios and persistency of the system are at least partially attributable to better customer services. This result is important because private passenger automobile insurance data is a line that does not require much individual underwriting or claims handling expertise. That is, independent agents provide better service even in a line that requires little specialized service. Nevertheless, the continuing loss of private passenger automobile insurance market share suggests that the service differential provided by independent agency insurers is not sufficiently valued by policyholders to offset the cost of the service package.

Regan (1997) examines the choice of insurance distribution system from a transaction cost analysis perspective. Under independent agency, the agent's ownership of the customer list gives the agent incentives to perform risk assessment and other activities that would be more costly under a more vertically-integrated system. Independent agency offers advantages to insurers when products are complex, underlying uncertainty is high, and the benefits from investments in advertising, information technology and similar items are relatively small (so the agent does not free-ride these investments). Exclusive dealing insurers are able to invest in relationship-specific assets that lower production costs and give them an advantage in relatively standardized lines and markets. The empirical results confirm the importance of transaction cost variables in the distribution system choice and are robust across different specifications of the regression model.

Regan (1999) examines whether independent agency insurers are more expensive to operate than direct writers in personal auto insurance, workers compensation, or general liability. The results demonstrate that independent agency insurers do not have higher expense ratios than direct writers in personal auto insurance, workers compensation, or general liability.

Veneziaa, Galaia and Shapira (1999) provide a separating equilibrium explanation for the existence of the independent insurance agent system despite the potentially higher costs of this system compared to those of the exclusive agents system (or direct underwriting). A model is developed assuming asymmetric information between insurers and insureds; the former do not know the riskiness of the latter. The authors also assume that the claims service provided by the independent agent system to its clients is superior to that offered by direct underwriting system, that is, insureds using the independent agent system are more likely to receive reimbursement of their claims. Competition compels the insurers to provide within their own system the best contract to the insured. It is shown that in equilibrium the safer insureds choose direct underwriting, whereas the riskier ones choose independent agents. The predictions of the model agree with previous research demonstrating that the independent agent system is costlier than direct underwriting. The present model suggests that this does not result from inefficiency but rather from self-selection. The empirical implication of this analysis is that, ceteris paribus, the incidence of claims made by clients of the independent agents system is higher than that of clients of direct underwriting. Implications for the coexistence of different distribution systems due to unbundling of services in other industries such as brokerage houses and the health care industry are discussed.

Studies have also examined the relationship between distribution channels and firm characteristics. For example, using life insurer data for 1993-1999, **Baranoff and Sager (2003)** find that brokerage distribution is associated with lower financial leverage and asset risk taking.

1.4 Competition

Insurance markets are highly competitive both as to price and service. In the PC sub-industry, a large number of insurers sell relatively homogenous products. There are modest barriers to entry, minimal economies of scale, and low levels of market concentration (e.g., Cummins and Weiss 1991). Generally, no single company or group of companies dominates the market, and concentration metrics such as the Herfindahl Index are relatively low. For example, according to the Insurance Services Office (ISO), the Herfindahl Index for PC insurers was 357 in 2008, significantly smaller than the 1,000 cut-off below which an industry is considered unconcentrated by the US Department of Justice.

Competition in the LH sub-industry is also intense although, compared to PC insurance, LH products are generally less homogenous and there are fewer LH insurance companies. Unlike PC insurers, which compete primarily within the industry, LH insurers also compete with banks and other financial institutions. This is especially true for variable annuities, investment products, and asset management.

As discussed in Section 1.5 below, the insurance industry is regulated at the state level, and there is significant variation in regulation across states. In general, competition is less intense and concentration levels are higher in stringently regulated markets. The common explanation for this correlation is that regulation causes some insurers to withdraw from markets with stringent regulation. However, research suggests that the negative relationship between competition and regulation is due in part to reverse causation, that is, state legislators enact stringent regulation in response to reduced competition.

Insurers compete for business on the basis of price, financial strength, availability of coverage desired by customers (servicing specific customer groups or needs, or offering a degree of customization that is of value to the insured), and quality of service, including the quality of the claim adjustment service.

Academic Research on Competition

As discussed in Section 1.1, competition among insurers is one of the primary causes of underwriting cycles in PC insurance and is itself affected by factors that drive the cycle, such as the availability of capital and investment returns. Thus, the discussion of underwriting cycles in Section 1.1 covers several papers that provide evidence regarding competition among insurers, the drivers of competition, and its effects. In addition, Section 1.5 below reviews papers that focus on regulation and its various effects, including the impact on competition. Other studies that examine issues related to competition among insurers are reviewed in this section.

Summary of Studies

The exemption of the insurance industry from federal antitrust law has generated some controversy, particularly in light of periodic price and availability crises in certain line of insurance. Antitrust restrictions in the United States are generally based on the assumption that high levels of concentration in an industry will make it more likely that firms will collude to raise prices and restrict supply, resulting in higher prices for consumers. **Bajtelsmit and Bouzouita (1998)** examine the relationship between profitability and market structure in automobile insurance. They find a significant positive impact of concentration on profitability for combined liability and physical damage lines in private passenger automobile insurance for the period 1984 through 1992. Differences in rate regulation across states are not found to impact profitability.

Chidambaran, Pugel, and Saunders (1997) present an empirical analysis of the economic performance of the US property-liability insurance industry, using estimations across 18 lines of insurance for the years 1984 through 1993. They adopt an industrial organization approach, focusing on the economic loss ratio as a measure of pricing performance. The concentration ratio for the line and the share of direct writers in the line are both found to be significant determinants of performance. The results are consistent with shortcomings in competition in some insurance lines.

Gron (1995) examines rate regulation and the market share of insurers using exclusive agents, known as direct writers. Direct writers have lower market share in rate regulation states; however, the effect is observed in both the regulated automobile lines and the less regulated homeowners' insurance. This suggests that statute implementation and not the statue itself affects insurers' market shares. Including measures of the political influence of insurers using nonexclusive agents and that of their agents on regulators in estimation removes the association between regulation and direct writers' market share. Combined with the different parties' support for regulation, the results indicate that nonexclusive agents used political influence to slow direct writers' growth.

Harrington and Danzon (1994) analyze alleged underpricing of general liability insurance prior to the mid-1980s liability insurance crisis. The theoretical analysis considers whether moral hazard and/or heterogeneous information for forecasting claim costs can cause some firms to price too low and depress other firms' prices. Cross-sectional analysis of insurer loss forecast revisions (which should be greater for firms with low prices caused by moral hazard or heterogeneous information) and premium growth provides evidence consistent with low pricing due to moral hazard but not heterogeneous information. The evidence also implies that shifts in the loss distribution produced large industry-wide forecast errors.

Neale and Peterson (2005) examine the effects of Gramm-Leach-Bliley Act on the insurance industry. The authors document an increase in shareholder wealth and a decrease in risk across the insurance industry following events associated with the Act. They also find that property-casualty insurers are the primary beneficiaries from the act. Despite concerns about consolidation in the financial services industry as a result of the Act, there is no change in concentration in the insurance industry.

Choi and Weiss (2005) examine the relationships among market structure and performance in property-liability insurers over the period 1992-1998. They find that cost-efficient firms charge lower prices than competitors, enabling them to capture larger market shares and economic rents, leading to increased concentration. On the other hand, prices and profits are found to be higher for revenue-efficient firms. Revenue X-efficiency is derived from activities such as cross-selling and may rely heavily on the use of detailed information from customer databases to identify potential customers.

1.5 Regulation

Insurance in the US is regulated at the state level. The states have enacted extensive regulatory laws with the primary objective of protecting policyholders. This section starts with a short review of Statutory Accounting Principles (SAP)—the accounting procedures used by insurers in preparing regulatory reports—and then discusses solvency and rate regulation. The final subsection reviews relevant academic research and discusses additional aspects of regulation such as guaranty funds and restrictions on exit.

Statutory Accounting Principles

Insurance companies file an annual statement, prepared on the basis of Statutory Accounting Principles (SAP), with each state in which they are licensed as well as with the National Association of Insurance Commissioners (NAIC). The annual statements filed with the regulatory authorities are used to monitor the financial condition of insurance companies in the periods between examinations by state or zone auditors (insurance companies are usually examined once every three to five years).

The NAIC codified SAP in the *Accounting Practices and Procedures Manual*. The insurance laws and regulations of the states require insurance companies domiciled in the states to comply with the guidance provided in that manual except as prescribed or permitted by state law. SAP generally reflects a liquidating rather than going concern basis of accounting. For example, SAP requires that deferred policy acquisition costs be expensed immediately instead of matched against the premiums as they are earned and recognized in income. Accordingly, performance measures calculated using SAP numbers typically appear less favorable than those prepared using GAAP numbers. The primary differences between SAP and GAAP are described below. Section 2 provides a detailed discussion of GAAP.

Non-Admitted Assets

Some GAAP assets are excluded from the SAP balance sheet, with a corresponding decrease in equity (termed "policyholder surplus" under SAP). Non-admitted assets include: office furniture, equipment other than Electronic Data Processing (EDP), fixtures, leasehold improvements, vehicles, prepaid expenses, premium balances that are 90 days or more past due, and advances to agents. Some assets are partially non-admitted, that is, they are subject to a cap. Examples include EDP equipment and software, and deferred tax assets. The rationale for the exclusion of non-admitted assets is that they generally cannot be used to pay claims.

Policy Acquisition Costs

Under SAP policy acquisition costs are expensed immediately, while under GAAP they are deferred and amortized over the period in which the related premiums are earned.

Reserves

PC reserves are generally calculated similarly for SAP and GAAP, but LH reserves are calculated differently. SAP generally uses statutory tables or formulas to determine LH reserves, while GAAP measures LH liabilities based on discretionary estimates.

Investments

As described in Section 2 below, insurers' investments are primarily in debt securities. Under SAP, debt securities are reported at amortized cost or at the lower of amortized cost and fair value, depending on their designation by the NAIC. For some debt securities that are reported at amortized cost, LH insurers maintain a corresponding formula-driven asset valuation reserve. Under GAAP, investments in debt securities are reported at amortized cost if management has the intent and ability to hold them to maturity, and at fair value otherwise; no valuation allowance is maintained for securities.

Additional SAP-GAAP differences related to investments include the following. Under SAP, investments in preferred stocks are reported at either book value, fair value, or lower of book or fair value, depending on their quality (as designated by the NAIC), while under GAAP they are generally reported at fair value. In addition, the trading classification, which requires income statement recognition of holding gains and losses, does not exist under SAP. Finally, consolidation is not applied under SAP. Instead, investments in subsidiary, controlled or affiliated entities are reported using either a market valuation approach or the equity method.

Under both systems, investments in the common stocks of unaffiliated companies are generally reported at fair value, and marketable securities are written down for other-than-temporary impairment.

Reinsurance

Under SAP, ceded reinsurance assets and liabilities are generally netted against the corresponding liabilities and assets, respectively, while under GAAP they are reported gross.

Postretirement Benefits

Under SAP, liabilities are generally recognized only with respect to vested benefits.

Leases

The capital lease method is not used under SAP.

Solvency Regulation

Regulators use three primary systems to monitor insurers' solvency: The Insurance Regulatory Information System (IRIS), Financial Analysis and Solvency Tracking (FAST), and Risk-based Capital (RBC).

Insurance Regulatory Information System

The Insurance Regulatory Information System (IRIS) has been used since 1972 to help insurance regulators evaluate the financial condition of insurance companies. IRIS ratios provide a comprehensive method for screening and analyzing the financial position of insurance companies. State insurance commissions use IRIS ratios as an initial screening system to identify firms for further regulatory scrutiny. A "usual range" is developed for each ratio, which encompasses results expected for the majority of companies during a normal year. Because

economic conditions are not static, the expected range of each ratio is reviewed annually and revised when deemed necessary. Insurers with four or more ratios outside the usual range are given priority for further investigation.

The IRIS system is only a preliminary screen for targeting troubled firms, and regulators exercise judgment concerning the appropriate response to IRIS failure. Research suggests that this system often fails to predict insurers' failure. For example, Bratton (1994) reports that even one year prior to insolvency almost half of the failing companies in his sample had three or fewer violations and would not have attracted regulatory attention. One potential explanation for the relatively weak performance of the IRIS system is that it is based on well-known ratios, constructed from reported results. This creates incentives for firms to manage their reported results to pass the screen. As discussed in section 2.2 below, PC insurers often "manage" loss reserves to reduce the reported number of IRIS ratio violations. Although IRIS ratios are continued to be used for solvency screening, their effect has been diluted since the adoption of the Financial Analysis and Solvency Tracking (FAST) system and the Risk-Based Cased (RBC) formulas in the early 1990s.

Financial Analysis and Solvency Tracking System

Similar to the IRIS system, FAST is a regulatory solvency screening systems designed to screen and prioritize insurance companies for more in-depth financial analysis. The practical objective is to identify insurers that are in or headed toward financial trouble to facilitate timely regulatory intervention to prevent insolvency or reduce the costs of insolvencies that do occur. The FAST system uses two types of analysis to examine an insurer's financial statement information: ratio analysis of the insurer's most recent financial statements, and analysis of the five-year history of specific aspects of the insurer's financial statements. The FAST system focuses on large, nationally prominent insurers, while smaller insurers are still primarily evaluated using IRIS ratios.

Risk-Based Capital

Risk-based capital (RBC) is a measure adopted by the NAIC and enacted by states for determining the minimum statutory capital and surplus requirements of insurers. Risk-based capital formulas are used by state regulatory authorities to identify insurance companies that may be undercapitalized and that merit further regulatory attention. The ratio of a company's actual policyholder surplus to its minimum capital requirement determines whether any state regulatory action is required. Insurers having total adjusted capital less than that required by the RBC calculation are subject to varying degrees of regulatory action depending on the level of capital inadequacy.

The RBC formulas, which are adjusted periodically by the NAIC, prescribe a series of risk measurements to determine a minimum capital amount for an insurance company, based on the profile of the individual company and its line of business. The RBC formula for life companies establishes capital requirements related to assets, asset/liability mismatch, underwriting risk, credit risk, interest rate risk, and some aspects of business risk. The RBC formula for property and casualty companies includes asset risk, underwriting and reserving risk, credit risk, and some aspects of business risk. The RBC computation also applies a simplistic covariance calculation to multiple risk areas.

There are five outcomes to the RBC calculation which are determined by comparing the insurer's capital to its Risk-Based Capital. This ratio is calculated and reported annually. Depending upon the level of the RBC ratio, the following remedial actions are available: (1) RBC ratio of 200% or more: "no action," but a trend test may be required.[7] (2) RBC ratio of 150 to 200%: the insurer must prepare a report to the regulator outlining a comprehensive financial plan that identifies the conditions that contributed to the company's financial condition, and contain proposals to correct the financial problems. (3) RBC ratio of 100 to 150%: the insurer is also required to file an action plan, and the state insurance commissioner is required to perform any examinations or analyses to the insurer's business and operations that he or she deems necessary. The state insurance commissioner also issues appropriate corrective orders to address the company's financial problems. (4) RBC ratio of 70 to 100%: the regulator is authorized to take control of the insurer. (5) RBC ratio of less than 70% requires the regulator to take steps to place the insurer under control.

Rate Regulation

The McCarran-Ferguson Act of 1945 grants states the authority to regulate insurance rates. In all states, regulators have oversight of insurance rates, but the regulatory requirements applying to premium rates vary from state to state. In general, premium regulation provides that rates cannot be excessive, inadequate or unfairly discriminatory, and it restricts insurers' ability to change rates, particularly with respect to personal lines products such as automobile and homeowners insurance. In addition, certain states limit the use of catastrophe models or credit scoring, apply premium rate freezes, or restrict insurers' ability to cancel or not renew certain policies.

The primary input used by insurers in developing rates, and by regulators in evaluating those rates, is the loss reserve estimate. Rates that appear either too high or too low in relation to the level of reserves are likely to attract unwanted regulatory scrutiny. Thus, the rate-making process and the loss-reserving process are interrelated. As discussed in Section 2.2 below, insurers exercise discretion in measuring loss reserves and in determining rates to maximize expected profits.

Academic Research on Regulation

Regulation affects most if not all aspects of insurers' activities. Accordingly, much of the academic research on insurance concerns regulation or involves regulatory effects. Here I review studies that focus on regulation. I classify regulatory-related studies as dealing with either solvency regulation, rate regulation, restrictions on exit ("exit regulation"), guaranty funds, regulation efficiency, or deregulation.

[7] LH insurers whose RBC ratio is between 200% and 250% are subject to a trend test. The trend test calculates the greater of the decrease in the margin between the current year and prior year and the average of the past three years. The assumption is that the decrease could occur again in the coming year. Any company with a negative trend below a certain level is treated as if its RBC ratio was between 150% and 200%. Similarly PC insurers with RBC ratio between 200 and 300% and a combined ratio greater than 120% are treated as if its RBC ratio was between 150% and 200%.

Solvency Regulation

Summary of Studies

Baranoff and Sager (2002) explore the relation between capital and risk in the life insurance industry in the period after the adoption of life risk-based capital (RBC) regulation. The authors estimate a model which expresses the interrelations among capital and two measures of risk: product risk and asset risk. The asset-risk measure reflects credit or solvency risk as in RBC. Product risk assessment for life insurance products is rationalized by transaction-cost economics – contractual uncertainty. A significant finding is that for life insurers the relation between capital and asset risk is positive. This agrees with prior studies for the property/casualty insurance industry and some banking studies. But the relation between capital and product risk is negative. This is consistent with the hypothesized impact of guarantee funds in other studies. The contrast between the positive relation of capital to asset risk and the negative relation of capital to product risk underscores the importance of distinguishing these two components of risk.

Two competing approaches to setting risk-based capital (RBC) parameters are the traditional probability of ruin approach and the more recent expected policyholder deficit (EPD) ratio approach. The probability of ruin approach develops capital standards based on a fixed maximum probability of insolvency regardless of cost. The EPD ratio approach allows tradeoffs between the risk of insolvency and the average cost of insolvency so as to force the product of these two numbers, the EPD, to some fixed value. **Barth (2000)** develops risk-based capital parameters for private passenger auto liability reserve risk using both methods. The author shows that capital standards developed using the EPD approach increase the risk of insolvency for larger insurers that pose the greatest potential indirect costs to the insurance market through market disruptions in the wake of a major insolvency. These findings have important public policy implications because the EPD approach currently forms the basis for both the Standard & Poor's capital adequacy model and the A.M. Best Company's Best's Capital Adequacy Ratio (BCAR), and it is also used by the American Academy of Actuaries' Risk-Based Capital Task Force as a basis for recommendations to the National Association of Insurance Commissioners (NAIC) on parameters in the regulatory RBC model.

Cummins, Grace, and Phillips (1999) analyze the accuracy of the principal models used by US insurance regulators to predict insolvencies in the property-liability insurance industry and compare these models with a relatively new solvency testing approach – cash flow simulation. Specifically, the authors compare the risk-based capital (RBC) system introduced by the NAIC in 1994, the Financial Analysis and Surveillance Tracking (FAST) audit ratio system used by the NAIC, and a cash flow simulation model developed by the authors. Both the RBC and FAST systems are static, ratio-based approaches to solvency testing, whereas the cash flow simulation model implements dynamic financial analysis. Logistic regression analysis is used to test the models for a large sample of solvent and insolvent property-liability insurers, using data from the years 1990 through 1992 to predict insolvencies over three-year prediction horizons. The authors find that the FAST system dominates RBC as a static method for predicting insurer insolvencies. Further, the authors find the cash flow simulation variables add significant explanatory power to the regressions and lead to more accurate solvency prediction than the ratio-based models taken alone.

Cummins, Harrington, and Klein (1995) analyze the accuracy of the risk-based capital formula for property-liability insurers that was adopted in 1993 by the NAIC. A logit analysis is conducted on a large sample of solvent and insolvent insurers spanning the period 1989–1993. Predictive accuracy is very low when the ratio of NAIC risk-based capital to actual capital is the sole indendent variable in the logit analysis, but accuracy improves significantly when the components of the formula and variables for firm size and organizational form are used as regressors. Improvements in the formula are needed to facilitate prompt corrective action and reduce insolvency costs.

For a fixed probability of wrongly classifying a strong insurer as being weak (Type I error), **Grace, Harrington, and Klein (1998)** examine the classification power (the probability of correctly identifying a weak insurer as being weak) for two potential solvency detection methods. The first is to classify insurers using ratios based on risk-based capital (RBC) standards and the second is to use the Financial Analysis Tracking System (FAST) solvency screening mechanism created by the National Association of Insurance

Commissioners (NAIC). The authors test the hypothesis that the RBC system has at least as much power for identifying financially weak insurers as the FAST scoring system does. The empirical results are largely inconsistent with this hypothesis: RBC ratios are less powerful than FAST scores in identifying financially weak property-liability insurers during the sample periods. However, the authors also find that RBC ratios and FAST scores are jointly more powerful in identifying weak insurers than FAST scores alone, which suggests that RBC ratios may convey new information about insolvency risk despite their relatively low power on a univariate basis.

Hooker, Bulmer, Cooper, Green, and Hinton (1997) look at the problems of assessing, for solvency purposes, the capital requirements of a non-life insurer in the context of the United Kingdom. It considers how these capital requirements might vary according to the different risks to which an insurer is subject and how this Risk Based Capital (RBC) might be measured in practice, using as a case study the RBC formula recently introduced in the United States of America. The paper also discusses the application of RBC concepts to the problem of internal capital allocation, to assist in measuring an insurer's rate of return to shareholders by business unit, as well as the more obvious regulatory application. The advantages and disadvantages of a formula-based approach to capital requirements for solvency purposes are discussed in comparison with possible alternative approaches to insurance supervision.

Lamm-Tennant, Starks, and Stokes (1996) propose a process for identifying potentially insolvent insurers on a cost-effective basis. A loss cost function is developed such that the effectiveness of monitoring is maximized relative to a cost constraint. The loss cost function is supported by a model that provides a rank ordering of financial institutions according to their probability of insolvency. When tested against a full sample of property-liability insurance companies, the procedure provides information critical to maximizing the effectiveness of regulatory resources available for solvency surveillance and performs well as a predictor of insolvency. Likewise, the rank ordering of insurers overcomes an estimation problem critical to establishing risk-adjusted guaranty assessments.

Supervisors of The Australian Prudential Regulation Authority (APRA) use expert judgment to rate the risk of failure of general insurers (GIs). Using statistical data, **Sharpe and Stadnik (2008)** model the determinants of GI ratings and solvency cover and find: (1) sufficient predictive power in statistical data to identify GIs for earlier review and assist in quality assurance of APRA's ratings and (2) that profitability, solvency cover, investment, and underwriting risk play different roles in rating foreign branch and Australian-incorporated GIs. The authors conclude that supervisors generally correctly incorporate the effects of risk indicators on GI risk into their ratings.

The National Association of Insurance Commissioners' (NAIC) two primary early warning systems, the Insurance Regulatory Information System (IRIS) and the Financial Analysis and Solvency Tracking System (FAST), both include premium growth ratios as early warning signals of financial impairment. The NAICs risk-based capital formula includes two specific capital charges for excessive growth, one of which is applied to premiums to measure near-term risk, and the other is applied to reserves to address long-term effects. Given the use of premium growth as a risk measure in regulatory and private risk assessment models, the impact of growth on underwriting profitability is an important question. **Barth and Eckles (2009)** find a negative relationship between premium growth and changes in loss ratios, suggesting that premium growth alone does not necessarily result in higher underwriting risk. Further, there is a positive relationship between claim count growth and changes in loss ratios, suggesting that claim count growth may be a preferred measure of underwriting risk.

Harrington (2009) considers the role of American International Group (AIG) and the insurance sector in the 2007-2009 financial crisis and the implications for insurance regulation. The AIG crisis and general financial crisis were precipitated by the bursting of the housing price bubble and attendant increases in actual and expected mortgage default rates. The predominant problem was the attendant decline in values of loans and mortgage-related securities. The AIG crisis was heavily influenced by the CDS written by AIG financial products, not by insurance products written by regulated insurance subsidiaries. AIG also ran into major problems with its life insurance subsidiaries' securities lending program. The holding company was highly levered, and its overall investment portfolio was significantly exposed to reductions in the value of mortgage-related securities. The author argues ineffective banking regulation played a more significant role than

insurance regulation in the financial crisis and AIG intervention. He further contends that systemic risk is relatively low in insurance markets compared with banking, especially for property-casualty insurance, in part because insurers hold greater amounts of capital in relation to their liabilities, reducing their vulnerability to shocks.

Cummins and Phillips (2009) provide an empirical analysis of insolvency experience, capitalization, and causes of insolvencies in the US insurance industry, and compare the US risk-based capital (RBC) system with the EU's Solvency II system and the Swiss Solvency Test (SST). Solvency experience in the US life and property/casualty insurance industries has generally been favorable. The insolvency rates, numbers of insolvencies, and costs in terms of guaranty funds assessments have been quite low, particularly during the most recent decade. Thus, the insurance industry generally appears to be prudently managed, and insurance regulation appears to be effective. Nevertheless, there are areas where regulation could be improved. The comparative analysis of RBC, Solvency II, and the SST shows that the US system is out-of-date. Solvency II and the SST are principles-based systems that utilize market values to measure solvency, whereas RBC is a rules-based system that utilizes statutory accounting values. The US system is static and ratio-based, whereas the European systems are dynamic and model-based. RBC is "one size fits all," contrary to Solvency II and the SST, which can be geared to individual insurer characteristics. The US system ignores risks such as operational risk and catastrophe risk, and overlooks qualitative criteria such as risk management systems and corporate governance. The authors provide suggestion for improving the US system to address these limitations.

Rate Regulation

Summary of Studies

Most studies on rate regulation of insurance have suggested that it results in lower prices than competition, although there is disagreement about the magnitude of the regulatory price effect. **Cummins, Phillips, and Tennyson (2001)** investigate the effects of political influence on the price of automobile insurance to consumers. It examines whether the average price per dollar of insurance benefits received (the unit price of insurance) is affected by political influence activities of consumer and industry interest groups in states that regulate insurance prices. The tests are obtained by statistical analysis of the unit price of insurance on variables designed to capture the effects of political influence, using data from all 50 US states over the time period 1980-1996. The results support the hypothesis that political influence plays a role in determining prices in regulated states.

The antitrust exemptions provided by the McCarran-Ferguson Act are often identified as the cause of a variety of problems that have plagued the PC insurance industry in the last decade. In particular, proponents of repeal of the Act suggest that it has facilitated anticompetitive behavior by insurers, which in turn contributed to the liability and auto insurance crises of the 1980s. **Joskow and McLaughlin (1991)** examine industry structure, behavior, and performance and assess possible market imperfections that may justify price regulation and special antitrust treatment. They find that the major barrier to effective competition is state rate regulation rather than anticompetitive behavior. Specifically, the causes of the liability and auto insurance crises are explained by changes in market conditions and regulatory constraints rather than anticompetitive behavior. While there is no need for the broad antitrust exemptions contained in the Act, there is a danger that repeal will lead to more inefficient price regulation unless reform of the Act includes restrictions on state rate regulation. The authors propose reform legislation that both narrows the industry's antitrust exemption and promotes competition.

Weiss and Choi (2008) investigate the impact of regulation on state automobile insurance markets. They find that (1) insurers in competitive and non-stringently regulated states may benefit from market power by charging higher unit prices; however, (2) insurers in these states are on average more cost efficient, and cost X-efficient insurers charge lower prices and earn smaller profits. The empirical results also suggest that insurers in some rate regulated states are less revenue and cost-scale efficient than in competitive states.

Exit Regulation

Summary of Studies

Kwon, Kim, and Lee (2005) examine theoretical and practical aspects of exit regulation in insurance as well as internal and external factors that firms may use to select a market exit strategy. Comparing regulatory stringency and permitted forms of market exit in selected countries in Asia, Europe, and North America, the authors find several commonalities. Regulators tend to accentuate their responsibility for protecting policyholders' interests, be deeply involved in most exit processes, and prefer other forms of exit (e.g., buy-out of liabilities or a complete acquisition of business by another firm) than immediate dissolution of insurers. However, not all governments examined are ready to effectively deal with matters related to insurers' exits from the market. Some governments need better structured regulation and transparency in market exit regulation.

Guaranty Funds

Insurance guaranty funds have been adopted in all states to compensate policyholders for losses resulting from insurance company insolvencies. However, the lines covered by each state, the maximum amount per claim, and the structure of guarantee fund, vary from state to state.

Summary of Studies

Guaranty fund assessments are usually a flat percentage of premiums. **Cummins (1988)** argues that this structure can induce insurers to adopt high-risk strategies, a problem that can be avoided through the use of risk-based premiums. The study develops risk-based premium formulas for three cases: a) an ongoing insurer with stochastic assets and liabilities, b) an ongoing insurer also subject to jumps in liabilities (catastrophes), and c) a policy cohort, where claims eventually run off to zero. Premium estimates are provided and compared with actual guaranty fund assessment rates.

Lee, Mayers, and Smith (1997) examine changes in property-liability insurers' risk-taking around enactments of state guaranty fund laws which occurred over the period 1969-1981. Evidence suggests that the risk of insurers' asset portfolios increases following enactments. But this increase in risk is significant only for stock insurers. Evidence of increased risk-taking following guaranty-fund adoptions suggests that the way these funds are organized creates counterproductive investment incentives, especially for stock companies.

Lee and Smith (1999) find that the enactment of property–casualty insurance guaranty fund statutes in the US was associated with a decrease in insurers' reserves for Homeowners and Commercial Multi-Peril insurance. Loss ratios among states enacting guaranty fund statutes declined relative to other states. Tests on loss accruals confirm that the effect was due to decrease in reserves. Other tests that distinguish between guaranty fund statutes offer no evidence that guaranty funds encouraged sound insurers to monitor competitors and assist regulators in identifying weak insurers. Instead, the data are consistent with an explanation where insurance regulators identify and discourage risk-increasing activity.

Duan and Yu (2005) develop a multiperiod model to measure the costs posed to the guaranty fund in a setting that incorporates risk-based capital regulations, interest rate risk and the possibility of catastrophic losses. The guaranty contract is modeled as a put option on the asset of the insurance company with a stochastic strike price and an uncertain maturity. The impacts of the key factors of this model are examined numerically and shown to make material differences in the costs to the guaranty fund.

Regulation Efficiency

Summary of Studies

Grace and Phillips (2007) investigate the incentives states have to provide insurance regulatory services in an efficient manner. Regulation of the insurance industry in the United States is unique, as it is conducted primarily at the state level whereas the majority of insurance sales are interstate. Consistent with predictions from the federalism literature, the authors find evidence of trans-state externalities, as states with small domestic insurance markets are less efficient producers of insurance regulation and appear to allow states that choose to expend the greatest resources to regulate for them. In addition, states with more profitable domestic insurers are shown to export greater levels of regulation, suggesting extraterritorial regulation may erect modest barriers to entry. The authors find evidence of increasing economies of scale in the production of insurance regulation after controlling for these regulatory externalities.

Grace and Phillips (2008) test whether the past or future labor market choices of insurance commissioners provide incentives for regulators in states with price regulation to either favor or oppose the industry by allowing prices that differ significantly from what would otherwise be the competitive market outcome. Using biographical data on insurance regulators, economic and state specific market structure and regulatory variables, and state premium and loss data on the personal automobile insurance market, the authors find no evidence consumers in prior approval states paid significantly different "unit prices" for insurance than consumers in states that allow competitive market forces to determine equilibrium prices during the time period 1985–2002. The authors do, however, find evidence regulators who obtained the position of insurance commissioner by popular election and those who seek higher elective office following their tenure as insurance commissioner allow higher overall "unit prices" relative to competitive market states. The "unit price" of insurance in regulated states is not statistically different from the competitive market outcome for regulators that make lateral moves back into state government and it is mildly higher for regulators who enter the insurance industry following their tenure. Finally, the authors find some evidence regulators who describe themselves as consumer advocates are successful reducing the price of insurance in favor of consumers in regulated markets. Overall the results are consistent with the existence of asymmetric information in the regulatory process that agents use to enhance their career aspirations.

Deregulation

Summary of Studies

The Citicorp-Travelers Group merger increased the prospects for new legislation to remove the barriers between banking and insurance, resulting in a positive wealth effect for institutions most likely to gain from deregulation. **Carow (2001)** examines abnormal returns surrounding the merger and find that life insurance companies and large banks (excluding Citicorp and Travelers Group) have significant stock price increases, while the returns of small banks, health insurers, and property/casualty insurers are insignificantly different from 0. This evidence suggests that investors expect large banks and insurance companies to receive significant benefits from congressional legislation which removes barriers to selling of insurance products by banks (bancassurance).

Cummins and Rubio-Misas (2006) examine the effects of deregulation and consolidation in financial services markets by analyzing the Spanish insurance industry. The sample period 1989-98 spans the introduction of the European Union's (EU) third Generation Insurance Directives, which deregulated the EU insurance market. Deregulation has led to dramatic changes in the Spanish insurance market: the number of firms declined by 35%, average firm size increased by 275%, and unit prices declined significantly in both life and non-life insurance. The analysis covers the causes and effects of consolidation using modern frontier efficiency analysis to estimate cost, technical, and allocative efficiency, as well as using Malmquist analysis to measure total factor productivity (TFP) change. The results show that many small, inefficient, and financially underperforming firms were eliminated from the market due to insolvency or liquidation. As a result, the

market experienced significant growth in TFP over the sample period. Consolidation not only reduced the number of firms operating with increasing returns to scale but also increased the number operating with decreasing returns to scale. Hence, many large firms should focus on improving efficiency by adopting best practices rather than on further growth.

1.6 Taxation

Insurers pay federal income taxes and state premium taxes. Some states also levy income taxes. I discuss federal and state taxation in turn.

Federal Taxation

Insurers' taxable income is measured using SAP, but with several adjustments applied. The primary adjustments are described below.

Municipal Bond Interest Income

Municipal bond interest income is partially exempt from federal taxable income. Unlike other investors for which this income is fully exempt, the proration provision of the 1986 Tax Reform Act adds 15% of tax-exempt income to the regular taxable income of insurance companies. This implies that the effective tax rate on tax exempt income is 15% × 35% = 5.25%, where 35% is the top federal tax rate on corporate income. As discussed next, proration also apply to the dividend received deduction.

Dividend Received Deduction

Companies deduct from their taxable income a portion or all of the dividends received from domestic corporations. Specifically, for 80% to 100% owned domestic subsidiaries, dividends are eligible for 100% deduction; for 20% to 80% (exclusive) owned domestic corporations, dividends are eligible for 80% deduction; and for less than 20% owned domestic corporations, dividends are eligible for 70% deduction. However, for insurers receiving dividends from less than 80% owned domestic corporations, the proration provision of the tax code adds 15% of the dividend received deduction back to taxable income. Thus, for example, the effective tax rate on dividends from unaffiliated entities is 30% × 35% = 10.50% for non-insurers and (30% × 35%) + (15% × 70% × 35%) = 14.175% for insurers.

Discounting of Loss Reserve

Prior to the Tax Reform Act of 1986 (TRA86), PC insurers' deductions for losses and loss expenses were based on the undiscounted sum of expected payments for claim losses, similar to SAP and GAAP. Since 1987, under the provisions of TRA86, the basis for computing the loss deduction is the discounted loss reserve. That is, each year the deduction for losses and loss expenses is either (a) the total of paid losses and the change in the discounted reserves, or, equivalently, (b) the statutory losses and loss expenses minus the change in the **reserve discount**, where the reserve discount is the contra-liability account that reduces the undiscounted reserve to its discounted value. Thus, the tax deduction for losses and loss expenses measures current losses at present value (instead of undiscounted amounts) but also includes an interest cost charge on the beginning-of-period liability (the increase in the discounted reserve or the reduction in the reserve discount due to the passage of time). Whether the net effect of these two adjustments is to increase or reduce the deduction relative to the SAP expense in a given period depends on several factors, the primary one being the growth rate in the insurance book during the period.

Life Insurance Reserves

The amount deductible is generally equal to the greater of the net surrender value or the reserve computed under IRC prescribed standards on a policy-by-policy basis. The deduction is subject to a ceiling: the tax basis reserve for life insurance benefits may not exceed the statutory reserve amounts.

Revenue Offset

To offset the SAP immediate deduction of acquisition costs, PC insurers include 20% of the change in the unearned premium reserve in taxable income. The underlying assumption is that acquisition costs are approximately 20% of premium, so adding 20% of the change in the unearned revenue reserve undoes the conservative treatment of acquisition costs under SAP. LH insurers are required to capitalize and amortize their policy acquisition expenses, but the measurement and amortization of DAC for tax purposes involve specified formulas. DAC is determined by applying a statutory percentage (capitalization rate) to the premium derived from specified insurance contracts. The capitalization rates are 1.75% for annuity contracts, 2.05% for group life insurance contracts and 7.7% for all other specified insurance contracts. Generally, a 10-year amortization is provided for DAC.

Alternative Minimum Tax

The alternative minimum tax (AMT) operates in effect as a parallel tax system, with its own definition of taxable income, exemptions, and tax rates. Taxpayers compute tax owed under the "regular" and AMT systems and are liable for whichever is higher. The AMT system has a broader definition of taxable income and lower tax rates than the regular system. In particular, 75% of income that escapes regular income taxation is included in the AMT income due to the Adjusted Current Earnings (ACE) adjustment. The most common exclusion from taxable income that is included in the ACE adjustment is tax-exempt interest. Insurers, being the primary clientele for municipal bonds, often have substantial tax exempt interest and accordingly pay significant amounts of AMT. These payments are sometimes reversed in subsequent periods due to AMT tax credits (minimum tax credit). The regular income tax liability is reduced (adjusted) by the previous year's minimum tax credit. If the AMT exceeds the adjusted regular income tax, the excess is added to the current tax liability and becomes the new minimum tax credit.

State Taxation

All states tax premiums, but the tax rates vary from state to state. In addition to taxing premiums, some states levy income taxes, primarily on domestic insurers (i.e., insurance entities that are domiciled in the state). However, those states typically avoid double taxation by either (a) allowing the insurer to elect to be taxed on either premiums or net income, (b) allowing a credit on one of the tax returns for taxes paid on the other, or (c) exempting domestic insurers from the premium tax. State taxes are very significant. For example, Petroni and Shackelford (1995) report that in 1990 the industry paid more to the states ($7 billion) than to the US Federal government ($5.7 billion).

Academic Research on Taxation

Research on the taxation of insurance companies addresses issues related to federal and state taxes. For example, studies have examined the impact of federal taxes on reinsurance and investment strategies, the implications of differences in the taxation of stock and mutual companies, and the effects of state taxes on insurance volume, prices, organizational structure (subsidiary versus license), and premium allocation.

Federal Taxes

Summary of Studies

There are two main tax-related arguments regarding the use of reinsurance – the income volatility reduction and the income level enhancement arguments. The income volatility reduction argument contends that firms facing convex tax schedules have incentives to hedge in order to reduce the volatility of their annual taxable income and thereby lower expected tax liabilities (Smith and Stulz 1985). The income level enhancement argument (Adiel 1996) holds that reinsurance increases current taxable income due to the receipt of reinsurance commissions. Consequently, insurance firms with high marginal tax rates should use less reinsurance than those with low marginal tax rates if tax matters. **Adams, Hardwick, and Zou (2008)** test the two tax-related arguments using 1992–2001 data for a sample of United Kingdom (UK) life insurance firms, and find that UK life insurers with low before-planning marginal tax rates tend to use more reinsurance; in contrast, tax convexity is found to have no significant impact on the purchase of reinsurance and so the volatility-reduction argument is not supported.

The Tax Reform Act (TRA) of 1986 reduced the incentives for institutional investors to participate in the tax exempt bond market. **Cummins and Grace (1994)** develop a model of profit maximization incorporating the TRA provisions applicable to PC insurers. The theory predicts that PC insurers will use underwriting losses to shelter taxable investment income and invest the balance of their portfolios in tax favored securities. The empirical evidence reveals that insurers continued to invest in tax exempts following the TRA, suggesting that implicit tax rates are low enough to attract insurers into the long-term tax exempt market. However, insurers reduced the proportions of income derived from tax exempt interest and dividends following the TRA.

Ke, Outslay, and Petroni (1998) investigate the influence of home country tax systems on foreign-owned property-liability insurance company investment strategies in the United States. Specifically, the authors compare the investment strategies of foreign insurers subject to territorial and world-wide tax regimes. They predict that US subsidiaries and branches of foreign insurers domiciled in territorial tax countries (exempt insurers) will hold more US tax-exempt bonds than their counterparts subject to a world-wide tax regime. They also predict that US subsidiaries of foreign-owned insurers domiciled in world-wide tax countries will hold more US tax-exempt bonds than branches of such companies. Consistent with their prediction, the authors find that world-wide branches invest a significantly smaller proportion of their assets in US tax-exempt bonds than do exempt insurers (both branches and subsidiaries) and US-owned insurers. However, they find no statistically significant difference in the investment practices of world-wide subsidiaries and exempt and US-owned insurers. These two results indicate that tax deferral may be the equivalent of tax exemption for investments in US tax-exempt bonds.

Collins, Geisler, and Shackelford (1997) estimate the effects of taxes, regulation, earnings, and organizational form on life insurers' investment portfolio realizations (dispositions of bonds, stocks, mortgages and real estate), focusing on variation in marginal tax rates due to IRC Section 809. This provision is designed to correct a perceived inequity in the tax treatment of mutual and stock life insurers. Stock's dividend distributions are a return on capital to shareholders and thus are not deductible. However, mutual's dividend distributions represent both a return on capital and a refund of premiums to policyholders and are deductible in full. To correct this perceived inequity, Section 809 assumes mutuals and stocks earn the same economic rate

of return on equity and attributes any difference in their reported returns (computed with full deduction of policyholder dividends) to the mutuals' deductible profit distributions. Thus, mutuals are required to increase taxable income each year by an amount equal to their equity times the difference in the stock and mutual segments' returns on equity (called the 'differential earnings rate' or DER). As a result, mutual life insurers face company-specific marginal tax rates on investment portfolio gains and losses. In addition, mutual and stock life insurers may differ in their proclivities to manage regulatory capital through investment portfolio realizations. Insurers' primary sources of capital are operating earnings (including portfolio realizations), security issuances, and parent capital infusions. With the absence of shareholders, the organizational structure of mutual companies does not permit equity issuances and parent infusions as capital sources. Thus, mutuals likely are more reliant than stocks on discretionary earnings as a source of regulatory capital. The authors examine the 48 largest US-domiciled life insurance company groups (24 stock groups and 24 mutual groups) from 1985 to 1993, and find that neither stock nor mutual capital gain realizations are affected by the statutory marginal tax rate variation. However, mutuals' capital gains are affected by their company-specific equity tax rate variation. Capital regulation and earnings considerations affect both stock and mutual life insurers' investment portfolio realizations. No differences are detected between mutual and stock insurers in their propensity to use capital gain realizations to manage regulatory constraints, but mutuals have a greater proclivity to use capital gains to manage earnings than stocks.

State Taxes

Summary of Studies

Ke, Petroni, and Shackelford (2000) assess whether insurers' state taxes reduce purchases of PC coverage. Tests are conducted using state aggregates of insurer-level data from publicly available, annual accounting reports for 1993–1995. A positive relation between self-insurance and state taxes is detected, consistent with consumers opting to self-insure rather than bear the incidence of higher insurer taxes. As expected, tax effects vary with the elasticity of demand. When demand is largely inelastic, e.g., automobile liability coverage, taxes do not affect self-insurance.

Petroni and Shackelford (1995) investigate the effects of state taxes and regulation on an organizational structure decision for expanding PC insurers (subsidiary versus license). Tests are conducted of the relation between the organizational structure of 2,335 PC insurers and state tax and regulatory conditions in 1991. Evidence is provided that PC insurers structure their cross-state expansion to mitigate both state tax and regulatory costs.

Petroni and Shackelford (1999) hypothesize that, in annual accounting reports, PC insurers allocate premiums from multistate policies to reduce total state taxes. To test this prediction, they examine firm-level data, collected from the publicly available, statutory reports filed with each state government. Reported premiums at the insurer-state level, scaled by incurred losses, are regressed on state tax measures. Consistent with tax-motivated income shifting, they find the premium-loss ratio is decreasing in state tax rates. The negative relation is greatest for insurers specializing in multistate lines of business.

1.7 Risks and Risk Management

This section consists of five parts. The first three discuss the primary risks faced by insurance companies—underwriting, market and regulatory risks—while the fourth part reviews risk management tools, and the fifth summarizes relevant findings from academic research.

Underwriting Risks

Underwriting risk is the risk that the premiums collected will not be sufficient to cover the cost of coverage. Insurance prices are established based on estimates of expected claim costs and the costs to issue and administer the policy. The estimates and assumptions used to develop policy pricing may prove to ultimately be inaccurate. This may be due to poor assumptions, changing legal environments, increased longevity, higher than expected weather catastrophes, or research breakthroughs as to the causes of diseases (e.g., asbestos, lead paint). For long-tail PC lines, the total cost of the policy may not be known until many years after the coverage has been provided. Factors that were unknown at the time the policy was issued may result in increased claims and claims costs. Underwriting risk is especially high during periods of "soft" markets, when competition among insurers and excess reserves lead to aggressive pricing of policies. For PC insurers, a significant portion of the variation in profitability is due to catastrophe losses, while for LH insurers underwriting risk is driven mostly by longevity risk. I next discuss these two components of underwriting risk.

Catastrophe Risk

The Insurance Services Office (ISO) defines a catastrophe as an event that causes $25 million or more in insured property losses and affects a significant number of PC policyholders and insurers. According to the Insurance Information Institute, the number of catastrophes fluctuated between 20 and 37 per year over the period 1999 through 2008.[8] The variation in incurred losses was far greater, however, with losses ranging between $5.8 billion and $68.7 billion annually (in 2008 dollars). Approximately half of these losses were due to hurricanes and tropical storms, a quarter due to tornadoes, 8% to winter storms, 7% to terrorism, and the rest to other causes. On average, catastrophe losses constituted about 10% of total PC incurred losses during the last decade. However, the importance of these losses is much greater than implied by their average share. In particular, the dollar variability of catastrophe losses was of the same magnitude as the variability in total incurred losses, which implies that much of the economic capital held by PC insurers supports unexpected catastrophe losses.

Longevity and Mortality Risks

Longevity risk is the risk that the mortality projections used by actuaries to price and reserve life contingent annuities and other life products turn out to be erroneous. The term "longevity risk" is used in the context of annuities, because the expected cost to the insurer increases with the annuitant's life expectancy. The term "mortality risk" is used in the context of life insurance, because the expected cost to the insurer increases with the insured's risk of mortality. Yet the two terms relate to the same source of risk – uncertainty regarding insureds' life span.

[8] Insurance Information Institute, *The Insurance Fact Book 2010*.

During the 20th century, human mortality declined significantly and at a rate that was often underestimated. Predicting future mortality improvements has remained difficult, especially at most advanced ages. Given that life products often run for several decades, even small deviations from expected longevity may have relatively large effects. Moreover, the impact of longevity on annuities is non-linear, so the value of an annuity portfolio is affected not just by the average longevity but also by the dispersion of mortality around the average longevity. The excessive risk borne by insurers offering annuities explains the high premiums charged for this product as well as the crucial role of risk management of longevity in annuity providers' operations. The importance of longevity risk is likely to increase in the future due to increased interest in individual annuity products, driven by (1) the baby-boom cohort nearing retirement, (2) possible reforms of public pension regimes, and (3) the shift from defined benefit to defined contribution private pension plans.

Market Risks

Market risks represent potential economic losses arising from adverse changes in the fair value of financial instruments and other economic assets and liabilities due to changes in financial variables such as interest rates and stock prices. PC insurers' exposures to market risks relate primarily to the investment portfolio, which is exposed to interest rate risk, prepayment risk, credit risk, liquidity risk, and equity price risk. LH insurers have significant exposures to market risks due to their reserve liabilities and asset management income in addition to exposures in the investment portfolio. Accordingly, as discussed in the "Risk Management" subsection below, when evaluating market risks LH insurers focus on asset-liability management and also consider potential effects on fee income. I next discuss the primary sources of market risk.

Interest Rate Risk

The fair value of fixed rate investments fluctuates in response to changes in market interest rates. Increases or decreases in prevailing interest rates generally translate into decreases or increases, respectively, in the fair value of these instruments. For floating or variable interest rate instruments, the value effect of fluctuations in interest rates is generally limited because the discounted cash flows move in the same direction as the change in the discount rate. However, the cash flows of many variable and even floating rate instruments adjust only partially (e.g., due to caps or floors) or with substantial delays to changes in market rates, leaving significant fair value sensitivity to interest rates. In addition, changes in interest rates often affect or are correlated with changes in other determinants of fair value, including the creditworthiness of issuers, credit spreads and, primarily, the value of prepayment options.

Prepayment and Extension Risks

Prepayment risk is the risk that borrowers may repay loans or other borrowed funds earlier than expected to take advantage of a decline in interest rates. This represents a significant risk to the investor because fixed income instruments increase in value when interest rates decline. Extension risk is the risk that borrowers will repay at a slower pace than expected when interest rates increase and the value of the investments declines. Prepayment and extension risks are significant especially for instruments that can be prepaid at low or no penalty, such as callable bonds and many residential mortgages, MBS, and CMOs.

Credit Risk

Credit risk relates to fluctuations in the value of investments due to issuer or borrower default, or to changes in the perceived likelihood of default or recovery rates. Changes in credit spreads due to changes in market sentiment toward risk are generally considered part of interest rate risk.

Liquidity Risk

Liquidity risk affects insurers in several ways. At the company level, liquidity risk refers to the possibility of having insufficient liquid resources to meet obligations as they come due. This risk is particularly relevant for PC insurers because both the frequency and magnitude of PC claims are more volatile compared to LH claims. At the instrument level, liquidity risk relates to the ability (or lack thereof) to sell an instrument at market price in a timely fashion.

Equity Price Risk

Equity price risk is the potential economic loss from adverse changes in stock prices. Most insurers hold relatively small amounts of equity securities and so are not particularly sensitive to equity price risk. However, many LH insurers face significant equity price risk due to various guarantees that they provide on variable life insurance, annuities and other products. Also, the fee income that LH insurers generate for managing separate account assets and assets under management (AUM) depends on the size of these portfolios and therefore on the performance of equity markets.

Downgrade Risk

Rating agencies, including Moody's, S&P, Fitch and A.M. Best, play a particularly important role for insurers. Unlike non-financial companies for which ratings are important primarily for transactions in capital markets, insurers' ratings directly affect their operations. A key determinant of the quality of insurance policies is the financial stability of the insurer, especially for long-duration or long-tail policies. Thus, a rating downgrade may have severe consequences for insurers.

To determine an insurer's rating, rating agencies perform a comprehensive analysis. For example, on their web page A.M. Best state

> "Our rating process involves a comprehensive quantitative and qualitative analysis of a company's balance sheet strength, operating performance and business profile. This includes comparisons to peers and industry standards as well as assessments of operating plans, philosophy and management. Where the rating is assigned to a debt security, it also includes a review of the specific nature and details of the security."[9]

The primary determinant of the rating is capital adequacy. Rating agencies evaluate this aspect by assessing the NAIC risk-based capital ratios, calculating proprietary risk-based capital ratios based on their own risk factors, reviewing other financial ratios, and conducting proprietary stress tests. For example, A.M. Best calculates a capital adequacy ratio based on factors for investment risk, credit risk and underwriting risk, and Moody's uses a risk-adjusted capital

[9] http://www.ambest.com/ratings/methodology.asp.

model that employs Monte Carlo simulations to assess investment, reinsurance, reserve, and underwriting risks.

Regulatory Risks

Insurers face several sources of risk related to regulation, including rate intervention, participation in involuntary markets, assessment risk, limits on underwriting, reinsurance requirements, and restriction on dividends.

Rate Regulation

State regulators may not approve insurance rates or they may require adjustments to existing rates, which could lead to a reduction in the profitability of underwriting operations.

Participation in Involuntary Markets

Insurance regulation in certain states requires insurers to participate in programs that provide applicants with basic insurance coverages when they are not available in voluntary markets. These mechanisms are most prevalent for automobile and workers' compensation insurance. A majority of states also mandate that insurers participate in Fair Plans or Windstorm Plans, which offer basic property coverages to insureds where not otherwise available. Some states also require insurers to participate in facilities that provide homeowners, crime and other classes of insurance where periodic market constrictions may occur. Participation is based upon the amount of a company's voluntary premiums written in a particular state for the classes of insurance involved. Involuntary market plans generally are underpriced and produce unprofitable underwriting results. Therefore, an increase in required participation in involuntary markets or a worsening underwriting profitability in these markets may expose insurers to significant risk.

Assessment Risk

Insurance guaranty funds have been adopted in all states to compensate policyholders for losses resulting from insurance company insolvencies. In the event of the insolvency of a licensed insurer writing a class of insurance covered by the fund in the state, fund members are assessed in order to provide the funds necessary to pay certain claims against the insolvent insurer. Fund assessments are generally proportional to the members' premiums written for the classes of insurance written by the insolvent insurer. In certain states, a portion of the assessments can be recovered through premium tax offsets and policyholder surcharges.

Reinsurance

A few states require insurers to purchase reinsurance from a mandatory reinsurance fund. Changes in the cost of reinsurance under the program or in the required coverage may lead to a reduction in underwriting profitability.

Limits on Underwriting

Insurers are allowed to write premiums up to a certain multiple of statutory capital plus surplus. Therefore, reductions in capital—due, for example, to investment losses—may result in restrictions on the ability to generate business.

Holding Company Dividends

State insurance regulation includes restrictions on dividends from the underwriting company to the parent holding company. Dividends that do not require prior insurance department approval are limited to the current year earnings and ten percent of surplus as of the beginning of the year. Dividends in excess of that must receive prior insurance department approval. These restrictions may limit the holding company's ability to obtain funds from its subsidiaries, especially when underwriting profitability varies significantly over time and across insurance subsidiaries.

Risk Management

Managing risk is important for all companies. The primary benefits of successful risk management relate to the costs of financial distress and income taxes. For insurers, successful risk management also reduces the likelihood and extent of costly regulatory interventions and dividend restrictions (see previous section).

Financial distress costs include not just the direct cost of bankruptcy but more importantly the impact of actual and potential financial distress on the value of operations. The financial viability of a company affects the likelihood and terms of transactions with customers and suppliers. This is especially true for insurers, whose perceived financial stability affects their ability to sell insurance and the implicit discount rate that policyholders apply to the promised contractual or contingent cash flows. The likelihood of financial distress also impacts the value of intangibles, including franchise value, which have low or no value in bankruptcy.

Successful risk management may reduce the present value of income taxes by reducing the volatility of taxable income. The present value of income taxes increases with the volatility of taxable income due to the following features of the tax code: (1) progressive tax schedules, (2) provisions of the alternative minimum tax, and (3) the asymmetry in the tax treatment of income and losses (delays in obtaining the tax benefits associated with losses and the expiration of unexploited tax losses). Therefore, risk management activities that smooth taxable income over time may reduce the present value of income taxes.

To be managed successfully, risk has to be properly measured. I next discuss the primary methods used for measuring risk and then turn to a discussion of risk mitigation activities, including internal mechanisms, reinsurance, financial market solutions, letters of credit, and capital solutions.

Risk Measurement

This section focuses on insurers' own evaluation of the risks that they face. However, similar methods are used by regulators, rating agencies, and other outsiders to evaluate insurers' solvency and riskiness. I focus here on overall risk evaluation. Other parts of this study,

particularly Section 3.5, discuss the evaluation of specific risk dimensions (e.g., credit risk, investment risk) as well as investors' perception of equity risk.

The most popular metrics used in measuring and managing financial risk are Value at Risk (**VaR**) and Expected Shortfall (**ES**). VaR is the loss during an N day period that at a confidence level of X% will not be exceeded. ES (also called tail conditional VaR or tail loss) is the expected loss conditional on incurring a loss greater than VaR. VaR and ES measures are employed not just in measuring investment risks but also in the determination of economic capital (and thus capital reserves), the setting of insurance deductibles, the setting of reinsurance cedance levels, and the estimation of expected claims and expected losses. As discussed in Section 2.2, under the IASB July 2010 Exposure Draft, VaR and ES are two of the three alternative approaches to be used in measuring the risk adjustment in accounting for insurance contracts.

The use of VaR measures has increased significantly over the past decade due to the adoption of economic capital models by insurers. These models are used to supplement the factor-based approach to capital adequacy (such as the RBC model discussed in Section 1.5) and to aid in the allocation of capital to specific products. **Economic capital** is the amount of capital required to absorb potential losses which may occur at a given confidence interval and time horizon. This threshold is measured using VaR or other stochastic models. Unlike traditional ratio models, the economic capital approach is flexible enough to allow correlations between risks to be incorporated into the model. An important milestone for economic capital has been the European Union's adoption of Solvency II, which will encourage insurers to use internal models to determine their solvency capital. As discussed above, S&P and Moody's have also broadened their review of companies to supplement static risk-based capital ratios with economic capital models.

Earlier VaR measures were based on the assumption that returns of financial assets follow a multivariate normal distribution. Under this assumption the VaR for a portfolio of financial assets can easily be computed from a simple quadratic formula based on the variances and covariances of the individual asset returns. However, this approach typically understates risk due to the skewness (asymmetry) and excess kurtosis (fat-tails) of asset returns. Alternative VaR calculations overcome this shortcoming by either using skewed fat-tailed distributions, or by calculating VaR using empirical distributions or the distribution of extreme returns (the tail portions of the empirical distribution).

Another complication that arises when using VaR is the non-stability of the distributions of returns. This limitation is typically addressed by using conditional distributions which allow for changes in relevant parameters (e.g., GARCH models) or by applying larger weights to recent observations when estimating the parameters or when using empirical distributions.

VaR is used primarily to measure the net fair value exposure from all risk sources. Although VaR is sometimes utilized to evaluate specific risks such as credit or interest rate exposures, firms typically use more traditional tools for such analyses. For example, credit risk is evaluated by examining distributions of credit ratings and credit concentrations (e.g., by issuer/borrower, industry, location, etc.). Interest rate risk is evaluated using duration, convexity, and other attributes of financial instruments, and the extent to which asset and liability exposures offset each other (i.e., asset-liability management). A less sophisticated tool for measuring

interest rate risk is to evaluate maturity or repricing gaps across assets and liabilities (smaller gaps imply lower risk).

Internal Risk Mitigation

Insurers can reduce risk by adjusting their activities. Examples include:

- Designing policies that limit exposure
- Diversifying insurance exposure across geographic zones, industries, policy type, credit exposure, and other bases
- Generating a balanced portfolio of term insurance and annuity business to naturally hedge longevity/mortality risk (LH insurers)
- Using policy dividends as a mechanism for risk sharing
- Participating in underwriting pools or syndicates to limit and better diversify exposures
- Mitigating credit risk by diversifying the investment portfolio to avoid concentrations in any single issuer, industry group, or geographic location, and by limiting investments in securities with low credit ratings.
- Engaging in asset-liability management to mitigate inflation and interest rate risks
- Allocating capital across lines of business and adjusting the book of business to maintain a relatively high ratio of exiting capital to economic capital

Reinsurance

An alternative to internal risk mitigation is the transfer of risk. This has been done traditionally using reinsurance. Reinsurance is the transfer, with indemnification, of all or part of the underwriting risk from one insurer to another for a portion of the premium or other consideration. Reinsurance contacts are either proportional (e.g., quota-share contracts), where the primary underwriter and the reinsurer proportionately share all insured losses from the first dollar, or non-proportional (e.g., excess-of-loss contracts).

The primary purpose of reinsurance is risk management. For example, excess-of-loss agreements enable the primary insurer to retain losses which are relatively predictable, while sharing large and infrequent losses with the reinsurer. Other objectives of reinsurance include: to reduce the strain on the insurer's capital, to be able to provide coverage for large exposures, and to obtain informal consulting services from reinsurers in areas of underwriting, marketing, and pricing. Reinsurance reduces the strain on regulatory capital both by reducing exposure and increasing surplus. Reinsurance with admitted reinsurers reduces regulatory capital requirements and, under SAP, the commission received from the reinsurer is recognized in the period in which it is paid, thus increasing statutory income and capital.

While reinsurance is used extensively in PC insurance, it is less common in LH insurance. Reinsurance has significant limitations as a risk transfer mechanism, primarily with respect to longevity risk. Due to the systematic nature of longevity risk, reinsurance treaties covering this risk are usually expensive. In addition, many life insurance companies are reluctant to buy long-term reinsurance coverage because of substantial credit risk. In any case, the large

size of the global longevity risk exposure means that the insurance industry is limited in its ability to absorb this risk. These limitations have led to recent developments in capital market solutions for hedging longevity risk, which are discussed next.

Financial Markets Solutions

Alternative financial markets vehicles for transferring risk have been used by PC insurers for quite a while, including catastrophe bonds (CAT-bonds), catastrophe futures, weather derivatives, credit derivatives, and other derivatives. For example, catastrophe bond issues have fluctuated between one and two billion USD annually during the years 1999 through 2005, and were about $4.5, $7.5, and $2.5 billion in the years 2006, 2007, and 2008, respectively.[10] In contrast, financial market products for transferring longevity/mortality risk—the primary source of LH insurance risk—have been developed only recently, and their use is still rather limited. Longevity-linked products have been created by both the insurance industry and the capital markets. They include mortality catastrophe bonds (e.g., Swiss Re issue of short-term mortality catastrophe bond in December 2003); long-term longevity bonds (e.g., EIB/BNP/PartnerRe issue of long-term longevity bond in November 2004); survivor bonds; reverse mortgages; longevity-linked swaps and forward contracts that swap fixed for floating mortality-linked cash flows (e.g., longevity swap between Swiss Re and the UK life office Friends' Provident in April 2007, a q-forward contract[11] between JPMorgan and the UK pension fund buyout insurance company Lucida in February 2008); life-settlement securitization; and annuity futures where the underlying is the market annuity rates. The key players in the Life Market are hedgers (pension plans and annuity providers), intermediaries (investment banks and broker-dealers) and end investors (ILS funds, hedge funds, endowments, etc.).

The potential for greater underwriting capacity and lower costs make financial market vehicles a potential substitute for reinsurance of longevity risk. However, there are important impediments to the successful adoption of this alternative. Unlike reinsurance treaties, mortality contracts sold in financial markets depend on the general development of mortality and are not tailored to the insurer's portfolio. Relatedly, the development of liquidity in this market depends on the acceptance of longevity indices, such as the LifeMetrics index or the Credit Suisse Longevity Index, and the development of standardized instruments to transfer this risk.

Mortality-based financial instruments may not be zero-beta assets due to the link between stock prices and demographic changes. According to the life-cycle theory, workers save for retirement during their employment years (accumulation phase) and spend the accumulated savings during the retirement years (disaccumulation phase). The equilibrium asset prices in the economy are thus influenced by the demographically-driven supply and demand. For example, researchers have suggested that the dramatic rise in US stock prices during the 1990s is partly due to the growing demand for financial assets triggered by baby-boomers' saving for retirement. As baby boomers retire and sell assets to fund their consumption, asset prices may be negatively affected, especially if longevity increases unexpectedly (see, e.g., Ang and Maddaloni 2005).

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[10] Insurance Information Institute, *The Insurance Fact Book 2010*.

[11] **q-forwards** are derivatives involving the exchange of the realized mortality rate of a population at some future date in return for a fixed mortality rate agreed at inception.

In addition to their use in managing underwriting risks, derivatives are often employed by insurers to hedge investment risks, especially interest rate-related but also credit exposures and other market risks. Credit derivatives—primarily credit default swaps—may also be used to hedge the risk of reinsurers' insolvency. LH insurers use derivatives to hedge exposures due to various annuity and life guarantees, which are usually related to the stock market performance. Equity derivatives may also be used to manage exposure to fluctuations in fee income derived from managing separate accounts and AUM.

Letters of Credit

Many PC insurance companies negotiate terms for substantial letters of credit. These agreements are in place, available to activate in the event of a catastrophe. Letters of credit are typically not drawn on for operating funds or to finance growth, rather only for those infrequent, major events that require large amounts of immediate cash. The existence of these pre-negotiated agreements provides the company the ability to obtain cash quickly without liquidating portions of the investment portfolio. The agreements help to minimize the impact that the sale of investments in a poor investment market would have on a company's operating results.

Capital, Capital Structure and Contingent Capital

Insurers' insolvency risk is determined not only by the risks that they face and the actions that they take to mitigate those risks, but also by the capital cushion available to absorb potential losses. Thus, insurers may reduce solvency risk by increasing capital or reducing the assets base or operations supported by existing capital. For example, when faced with a negative capital shock, insurers may sell off non-core businesses, blocks of business, or specific assets in order to pay down debt. Insurers may also securitize recognized receivables or unrecognized future premium receivables to enhance capital ratios. Capital may be increased by issuing shares or subordinated debt, or by cutting dividends. A relatively new form of capital that insurers may employ to reduce solvency risk is contingent capital, which is discussed next.

Contingent capital contracts are options or hybrid securities which permit the buyer to access risk capital on prearranged terms if a covered event—generally a financial loss—occurs. Capital is obtained through the issuance of preferred shares of stock or some form of subordinated debt in exchange for cash or conversion of a previously issued debt instrument. The inherent value of contingent capital products is that, like insurance, risk capital become available immediately at the time of loss, which is when it is most needed and often most expensive. Contingent capital arrangements provide the buyers with the ability to absorb losses—for example, from catastrophe events—at a cost substantially lower than reinsurance because, unlike reinsurance, the insurer retains the risk and only locks in access to capital to continue to operate. Insurers and reinsurers participate in contingent capital transactions both as writers and buyers. Currently, the primary writer of contingent capital products is Swiss Re.

Research on Risk and Risk Management

Not surprisingly, the volume of research on risk and risk management in the insurance industry is enormous. I provide here a short survey in an order consistent with the discussion above. As in the previous sections, this survey focuses on recent work and is not comprehensive.

Catastrophe Risk

Studies have examined issues related to both natural and man-made catastrophes. Recent studies include the following.

Summary of Studies

Achleitner, Biebel, and Wichels (2002) argue that the attack on the World Trade Center revealed a significant correlation between the asset and liability sides of insurers' balance sheets. Insurance companies that previously considered themselves well capitalized, suddenly felt vulnerable to simultaneous shocks to their risk-absorbing capital. The unprecedented simultaneous shock challenges the previous investment assumption of P/C insurers that there is no major relation between underwriting and investment risks. The stronger correlation between underwriting and investment risks implies a lower overall investment risk absorption capacity. It further suggests that investment policies should be augmented by a more elaborated ALM-based risk controlling.

Chen, Doerpinghaus, Lin, and Yu (2008) examine the effects of 9/11 on the insurance industry, hypothesizing a short-run claim effect, resulting from insufficient premium ex ante for catastrophic losses, and a long-run growth effect, resulting from ex post insurance supply reductions and risk updating. They find that firm type, loss estimates, reinsurance use, and tax position are important determinants of the short-run position, and firm type, loss estimates, financial strength, underwriting risk, and reinsurance are key determinants of the firm's long-run position.

Cummins and Lewis (2003) examine the reaction of the stock prices of US property-casualty insurers to the World Trade Center (WTC) terrorist attack of September 11, 2001. Theories of insurance market equilibrium and theories of long-term contracting predict that large loss events which deplete capital and increase parameter uncertainty will affect weakly capitalized insurers more significantly than stronger firms. The empirical results are consistent with this prediction. Insurers' stock prices generally declined following the WTC attack. However, the stock prices of insurers with strong financial ratings rebounded after the first post-event week, while those of weaker insurers did not, consistent with the flight-to-quality hypothesis.

Focusing on the United States, the United Kingdom, and Germany, **Michel-Kerjan and Pedell (2006)** analyze the role that insurance can play in providing commercial enterprises with financial protection against the economic consequences of major terrorist attacks. The article begins by explaining the design and key features of terrorism insurance programs operating today in each of the three countries (TRIA in the US, Pool Re in the U.K., and Extremus in Germany). The authors then provide a detailed comparative analysis of the evolution of prices and take-up rates, with particular attention to financial institutions. For those who think the US is the most likely target for mega-terrorism, the findings are somewhat puzzling. On average, for example, companies in the US do not pay even half as much for comparable coverage under TRIA as companies pay in Germany under Extremus, which raises the questions: Is terrorism coverage under the US insurance program now drastically underpriced? If so, what would be the likely consequences of another large-scale attack in the US? On the demand side, the authors observe a dramatic increase in take-up rates in the US since 2003, revealing increased corporate concern. By contrast, the market penetration in Germany remains remarkably low. A better understanding of these programs and of the recent evolution of terrorism insurance markets in the US and Europe should help corporate and government decision makers develop more effective protection against the economic consequences of mega-terrorism.

Blau, Van Ness, and Wade (2008) examine short-selling activity around Hurricanes Katrina and Rita. They find that abnormal short selling does not increase until 2 trading days after the landfall of Katrina and that short-selling activity is much more significant around Rita. There was a substantial increase in short-selling activity in the trading days prior to the landfall of Rita and relatively less short-selling activity in the trading days after landfall. There is little evidence that suggests that traders short insurance stocks with more potential exposure in the Gulf region than other insurance stocks in the days before landfall.

Sheremet and Lucas (2008) study the possibility for international diversification of catastrophe risk by the insurance sector. Adopting the argument that large insurance losses may be a 'globalizing factor' for the

industry, they study the dependence of geographically distant insurance markets via equity returns. In particular, the authors employ conditional copula theory to model the bivariate dependence of the insurance industry. They disentangle the causes of dependence stemming from the asset side from those from the liability side by conditioning on general market conditions, and find that for both Europe–America and Europe–Asia the dependence is significant. Moreover, there are asymmetric effects: the international dependence is particularly high for losses, even after conditioning for the asset side dependence. Finally, the authors investigate the time variation in copula parameters and find evidence that dependence in the insurance sector has increased over time, thus reducing the scope for international diversification of large losses in this sector.

Longevity Risk

As discussed above, longevity/mortality risk is the primary risk faced by LH insurers. Accordingly, many academic studies have examined various aspects of this risk, particularly its systematic nature.

Summary of Studies

Ang and Maddaloni (2005) examine the link between equity risk premiums and demographic changes using a sample covering the whole twentieth century for the US, Japan, UK, Germany and France, and a shorter sample covering the last third of the twentieth century for fifteen countries. The authors find that demographic variables significantly predict excess returns internationally. However, the demographic predictability found in the US by past studies for the average age of the population does not extend to other countries. Pooling international data, the authors find that, on average, faster growth in the fraction of retired persons significantly decreases risk premiums. This demographic predictability of risk premiums is stronger for countries with well-developed social security systems and lesser-developed financial markets.

Demographic risk, i.e., the risk that life tables change in a nondeterministic way, is a serious threat to the financial stability of an insurance company having underwritten life insurance and annuity business. The inverse influence of changes in mortality laws on the market value of life insurance and annuity liabilities creates natural hedging opportunities. Within a realistically calibrated shareholder value (SHV) maximization framework, **Gründl, Post, and Schulze (2006)** analyze the implications of demographic risk on the optimal risk management mix (equity capital, asset allocation, and product policy) for a limited liability insurance company operating in a market with insolvency-averse insurance buyers. The results show that the utilization of natural hedging is optimal only if equity is scarce. Otherwise, hedging can even destroy SHV. A sensitivity analysis shows that a misspecification of demographic risk has severe consequences for both the insurer and the insured. This result highlights the importance of further research in the field of demographic risk.

Mortality rates depend on socio-economic and behavioral risk factors, and actuarial calculations for life insurance policies usually reflect this. It is typically assumed, however, that these risk factors are observed only at policy issue, and the impact of changes that occur later is not considered. **Kwon and Jones (2008)** present a discrete-time, multi-state model for risk factor changes and mortality, which facilitates a more accurate description of mortality dynamics and quantification of variability in mortality. This model is extended to reflect health status and then used to analyze the impact of selective lapsation of life insurance policies and to predict mortality under reentry term insurance.

The law of large numbers breaks down when pricing life-contingent claims under stochastic as opposed to deterministic mortality rates. In contrast to the classical situation when the underlying mortality decrements are known with certainty, the limiting per-policy risk goes to a non-zero constant. **Milevsky, Promislow, and Young (2006)** decompose the standard deviation per policy into systematic and non-systematic components, akin to the analysis of individual stock (equity) risk in a Markowitz portfolio framework. Drawing upon the financial analogy of the Sharpe Ratio, they develop a premium pricing methodology under aggregate mortality risk.

Fundamental to the modeling of longevity risk is the specification of the assumptions used in demographic forecasting models that are designed to project past experience into future years, with or without modifications based on expert opinion about influential factors not represented in the historical data. Stochastic forecasts are required to explicitly quantify the uncertainty of forecasted cohort survival functions, including uncertainty due to process variance, parameter errors, and model misspecification errors. Current applications typically ignore the latter two sources although the potential impact of model misspecification errors is substantial. Such errors arise from a lack of understanding of the nature and causes of historical changes in longevity and the implications of these factors for the future. **Stallard (2006)** reviews the literature on the nature and causes of historical changes in longevity and recent efforts at deterministic and stochastic forecasting based on these data. The review reveals that plausible alternative sets of forecasting assumptions have been derived from the same sets of historical data, implying that further methodological development will be needed to integrate the various assumptions into a single coherent forecasting model. Illustrative calculations based on existing forecasts indicate that the ranges of uncertainty for older cohorts' survival functions will be at a manageable level. Uncertainty ranges for younger cohorts will be larger and the need for greater precision will likely motivate further model development.

Interest Rate Risk

Interest rate risk is a major concern for essentially all insurers. Insurers hold large investments in fixed income instruments, whose value vary inversely with changes in interest rates. This effect is particularly strong for LH insurers, because they invest primarily in long-term fixed income instruments and operate with high financial leverage.[12] In addition, the value of reserve liabilities is inversely related to interest rates, especially for LH insurers and for PC insurers that specialize in long tail lines. Interest rates also affect net investment income and therefore the pricing of insurance products. In addition to these relatively straightforward effects, changes in interest rates impact the value of various embedded options such as mortgage prepayments, policy surrenders and debt calls, as well as the demand for insurance products. Again, these effects are particularly strong for LH insurers. I next review several studies that investigate interest rate related issues.

Summary of Studies

Brewer, Carson, Elyasiani, Mansur, and Scott (2007) investigate the interest rate sensitivity of monthly stock returns of life insurers. Results based on data for the period 1975 through 2000 indicate that life insurer equity values are sensitive to long-term interest rates and that interest sensitivity varies across subperiods and across risk-based and size-based portfolios. The results complement insolvency research that links insurer financial performance to changes in interest rates.

Carson, Elyasiani, and Mansur (2008) show why insurers manage both capital structure (leverage) and interest rate risk (surplus duration) as part of their effort to maximize value. Leverage provides tax benefits but increases the probability of financial distress. Exposure to interest rate risk expropriates value but puts the franchise value at risk. As a result of these trade-offs, the stock return behavior of insurers demonstrates that they are exposed to time-varying market and interest rate risks. The interest rate sensitivity is negative and highly significant for large Life and P&C insurers but insignificant for the smaller firms, whereas market and interest rate risks for diversified firms are smaller than those for non-diversified firms for both geographic and product diversification.

[12] As shown in Section 2, PC insurers invest in equity securities in addition to fixed income instruments. In addition, compared to LH insurers, PC insurers hold shorter-term fixed income instruments and maintain lower leverage ratios.

The historical perception by life insurance companies has been that spreads obtained in the senior secured floating-rate bank loan market have tended to be insufficient on a credit spread basis to justify the investment. **Gold, Leat, and Perrin (1997)** argue that an analysis based solely on credit spreads is insufficient. The return impact on a portfolio with respect to the inclusion of senior secured loans must include an analysis of credit risk in the context of change in interest rates, which may more than offset yield shortfall. Using an asset/liability efficient frontier technique that examines the return and risk characteristics of investment strategies with a blend of senior secured bank loans and fixed income investments, the authors show that using senior secured loans in an investment portfolio tends to reduce financial risk for life insurance companies.

Lee and Stock (2000) explore how embedded options in assets and liabilities of financial institutions impact interest rate risk, which is measured by equity value change with interest rate movements. The authors find that both asset and liability durations decline when embedded options are present where liability duration declines more substantially. This leads to a duration-mismatch and a negative change in equity value when interest rates rise, but a positive change for interest rate declines. In a more sophisticated model, an option adjusted duration-matching strategy eliminates interest rate risk caused by duration-mismatch, but the convexity-mismatch remains large due to large *negative* convexity of callable assets and large *positive* convexity of putable liabilities. The interest rate risk introduced by convexity mismatch is quite large in comparison to that of duration mismatch. The pattern of this impact is complex and strongest for roughly intermediate maturities. The authors propose and show that a simple convexity hedging strategy with putable assets and callable liabilities (or caps and floors combined with floating rate assets and liabilities) reduces the interest rate risk substantially.

Dickinson (2000) argues that falling interest rates affect non-life insurers. In competitive markets insurance prices tend to rise to compensate for the reduction in investment income. In a regime of low interest rates, insurance companies suffer financial loss.

Credit Risk

Summary of Studies

Baranoff and Sager (2009) explore US life insurers' exposure to mortgage backed securities (MBS) and its potential impact on capital should the credit ratings of these bonds be lowered. They analyze 2 years: 2003 (well before the realization of problems with these instruments) and 2006 (immediately prior). They create five potential scenarios of different severity for re-categorizing MBS credit ratings and compute the theoretical impact on measured insurer asset risk, via a proxy for the C-1 component of life insurers' risk-based capital. Under all scenarios, they find large increases in assessed asset risk. The authors then model insurer capital structure as a function of asset risk and other factors to assess whether insurers had prepared their capital structures for the possibility of problems with these instruments. The findings indicate not only that insurers were unprepared for MBS downgrades, but also that they reduced capital as they accumulated MBS, as though acquiring MBS should raise the overall quality of the investment portfolio. Finally, the authors analyze possible adjustments to capital to accommodate the now recognized increased risks of MBS. Their models suggest, for example, that an insurer with median residential MBS exposure might be expected to increase its capital by 10 percent or more to maintain a historical relationship between capital and risk factors, in the event of a moderate re-categorization of MBS risk. Even larger adjustments are indicated should the crisis spread to commercial MBS as well.

Downgrade Risk

Summary of Studies

Epermanis and Harrington (2006) conduct an analysis of abnormal premium growth surrounding changes in financial strength ratings for a large panel of property/casualty insurers. The findings generally indicate

significant premium declines in the year of and the year following rating downgrades. Consistent with greater risk sensitivity of demand, premium declines were concentrated among commercial insurance, which has narrower guaranty fund protection than personal insurance. Premium declines were greater for firms with low pre-downgrade ratings, and especially pronounced for firms falling below an A- rating. There is no evidence of moral hazard in the form of rapid commercial or personal lines premium growth following downgrades of A- or low-rated insurers.

Operational Risk

A relatively new area of research in risk management concerns operational risk, that is, "the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events" (The Basel Committee on Banking Supervision). The following are several examples of studies in this area.

Summary of Studies

The more established methods for quantifying operational risk are linear models such as time series models, econometric models, empirical actuarial models, and extreme value theory. Due to data limitations and complex interaction between operational risk variables, various nonlinear methods have been proposed, one of which is Bayesian networks. Using an idealized example of a fictitious on line business, **Cowell, Verrall, and Yoon (2007)** construct a Bayesian network that models various risk factors and their combination into an overall loss distribution. Using this model, the authors show how established Bayesian network methodology can be applied to: (1) form posterior marginal distributions of variables based on evidence, (2) simulate scenarios, (3) update the parameters of the model using data, and (4) quantify in real-time how well the model predictions compare to actual data. A specific example of Bayesian networks application to operational risk in an insurance setting is then suggested.

Cummins, Lewis, and Wei (2006) use the OpVar database to conducts an event study analysis of the impact of operational loss events on the market values of banks and insurance companies, industries which experienced an increased market and regulatory scrutiny of operational losses. The analysis covers all publicly reported banking and insurance operational risk events affecting publicly traded US institutions from 1978 to 2003 that caused operational losses of at least $10 million – a total of 403 bank events and 89 insurance company events. The results reveal a strong, statistically significant negative stock price reaction to announcements of operational loss events. On average, the market value response is larger for insurers than for banks. Moreover, the market value loss significantly exceeds the amount of the operational loss reported, implying that such losses convey adverse implications about future cash flows. Losses are proportionately larger for institutions with higher Tobin's *Q* ratios, implying that operational loss events are more costly in market value terms for firms with strong growth prospects.

Cummins, Wei, and Xie (2008) present an event study analysis of the market value impact of operational risk events on non-announcing firms in the US banking and insurance industries. The authors seek evidence of positive or negative intra or inter-sector spillover effects on stock prices in the commercial banking, investment banking, and insurance industries. The rationale for anticipating inter-sector spillovers is the integration of the previously fragmented markets for financial services that has occurred over the past twenty-five years. The authors find that operational risk events cause significant negative intra and inter-sector spillover effects. Regression analysis reveals that the spillovers are information-based rather than purely contagious.

Foreign Exchange Risk

Summary of Studies

Li, Moshirian, Wee, and Wu (2009) study the foreign exchange exposure of US insurers. The evidence shows that no systematic difference exists in the currency risk profiles of life and non-life segments within the insurance industry. This suggests that life and non-life insurers have similar risk exposure management strategies arising from similar risk pooling and financial intermediary functions. The empirical results reveal that a sizable proportion of US insurers are exposed to foreign exchange movements against the seven largest US trade partners in insurance services (U.K., Japan, Switzerland, Netherlands, France, Germany and Canada). Significant operational and size effects are also documented as well as positive correlation between the frequency of foreign exchange exposure and time horizon.

Risk Measurement and Prediction of Financial Distress

Risk measurement is a crucial element of risk management programs, and is therefore an important activity for insurance companies. In addition, outsiders—including regulators, rating agencies, investors, policyholders and other parties—have strong interest in monitoring the risk profile of insurers and their solvency. Research on risk measurement has focused on outsiders' evaluation of solvency risk and the prediction of financial distress.

Summary of Studies

Baranoff, Papadopoulos, and Sager (2007) explore the role of risk in the capital structure decision of life insurers during the period 1994 through 2000. It identifies two groups of insurer risk factors that arise from the major activities of life insurers: investing (asset risk) and underwriting (product risk). They authors compare two candidate measures for the role of proxy for asset-related risks. One measure, called regulatory asset risk (RAR), derives from the regulatory tradition of concern with solvency and is related to the C-1 component of risk-based capital. The other measure, called opportunity asset risk (OAR), is motivated by traditional finance concerns with market risk and reflects volatility of returns. Product-related risks are proxied by underwriting exposures in different product lines. The authors find that RAR and OAR are not equivalent proxies for asset risks. Although overlapping to some extent, each illuminates different aspects of the asset risk-capital interrelationship. In particular, RAR does not seem to affect the capital structure decision of small firms, although OAR does. This contrasts with large insurers, for whom both RAR and OAR have significant effects on capital that comport with the finite risk hypothesis. More detailed analysis suggests that the lack of effect of RAR for small insurers may result from RAR's proxying some factors that induce finite risk for part of the small insurer sample, and other factors that favor the excessive risk hypothesis.

Brockett, Golden, Jang, and Yang (2006) examine the effect of the statistical / mathematical model selected and the variable set considered on the ability to identify financially troubled life insurers. Models considered are two artificial neural network methods (back-propagation and learning vector quantization (LVQ)) and two more standard statistical methods (Multiple discriminant analysis and logistic regression analysis). The variable sets considered are the insurance regulatory information system (IRIS) variables, the financial analysis solvency tracking (FAST) variables, and Texas early warning information system (EWIS) variables, and a data set consisting of twenty-two variables selected by the authors in conjunction with the research staff at TDI and a review of the insolvency prediction literature. The results show that the back-propagation (BP) and LVQ outperform the traditional statistical approaches for all four variable sets with a consistent superiority across the two different evaluation criteria (total misclassification cost and resubstitution risk criteria), and that the twenty-two variables and the Texas EWIS variable sets are more efficient than the IRIS and the FAST variable sets for identification of financially troubled life insurers in most comparisons.

Browne and Hoyt (1995) identify a set of factors exogenous to individual property/liability insurers that are statistically related to the overall rate of insurer insolvencies. Using quarterly data for the period 1970

through 1990, the authors find that economic and insurance market variables are important predictors of property/liability insurer failure rates. The sensitivity of the insurer insolvency rate to two of the insurance market factors is particularly striking: A 10% reduction in the number of property/liability insurers results in an 82% reduction in the insolvency rate, all else being equal. A reduction of five points in the combined ratio results in an 18% reduction in the insolvency rate.

Carson and Hoyt (1995) analyze 1986 through 1990 data for a sample of life insurers that did or did not become financially impaired during 1989 through 1991. Empirical evidence suggests that surplus measures and leverage measures are strong indicators of insurer financial strength; however, no evidence is found for a strong relationship between state minimum capital requirements and insolvency.

Dowd and Blake (2006) discuss a number of quantile-based risk measures (QBRMs) that have recently been developed in the financial risk and actuarial/insurance literatures. The measures considered include the Value-at-Risk (VaR), coherent risk measures, spectral risk measures, and distortion risk measures. The authors discuss and compare the properties of these different measures, and point out that the VaR is seriously flawed. They then discuss how QBRMs can be estimated, and discuss some of the many ways they might be applied to insurance risk problems. These applications are typically very complex, and this complexity means that the most appropriate estimation method will often be some form of stochastic simulation.

Gatzert and Schmeiser (2008) aim to identify fair equity-premium combinations for non-life insurers that satisfy solvency capital requirements imposed by regulatory authorities. In particular, the authors compare target capital derived using the value at risk concept as planned for Solvency II in the European Union with the tail value at risk concept as required by the Swiss Solvency Test. The model framework uses Merton's jump-diffusion process for the market value of liabilities and a geometric Brownian motion for the asset process; fair valuation is conducted using option pricing theory. The authors show that even if regulatory requirements are satisfied under different risk measures and parameterizations, the associated costs of insolvency – measured with the insurer's default put option value – can differ substantially.

Leadbetter and Dibra (2008) analyze the involuntary exit of 35 property and casualty insurance companies from the Canadian insurance market during 1960-2005 and find evidence that inadequate pricing and deficient loss reserves are the leading cause of insurer insolvency. Overall, the operating environment generally provides the catalyst for insolvency, either through turbulent financial markets or reduced profitability in the industry, but most causes of involuntary exit can be linked back to three sources within an institution: the quality and experience of governance/management, internal operational processes, and risk appetite. Further, other than inadequate pricing, the results, when compared with the few studies in various jurisdictions, indicate there are few universal causes of involuntary exit across jurisdictions, and hence supervisory approaches to insurer insolvency should be flexible and adaptable to the environment.

Pottier and Sommer (2006) investigate whether certain insurers are inherently more difficult to evaluate than others. They identify certain insurer characteristics that are associated with greater difficulty in financial strength evaluation, as proxied for by the level of rating disagreement by Moody's and Standard and Poor's. Specifically, the empirical results indicate that insurers that exhibit the following characteristics are more difficult to assess in terms of financial strength: smaller insurers, stock insurers, insurers with a history of reserving errors, insurers that use less reinsurance, insurers with greater levels of investment in stocks and low-grade bonds, and insurers that are more geographically diversified.

Sharpe and Stadnik (2007) develop and test a statistical model to identify Australian general insurers experiencing financial distress over the 1999-2001 period. Using a logit model and two measures of financial distress they are able to predict, with reasonable confidence, the insurers more likely to be distressed. These insurers are generally small and have low return on assets and cession ratios. Relative to holdings of liquid assets they have high levels of property and reinsurance assets, and low levels of equity holdings. They also write more overseas business, and less motor insurance and long-tailed insurance lines, relative to fire and household insurance.

Internal Risk Mitigation

This section reviews studies that address risk mitigation techniques that involve limited or no interactions with outsiders. While insurers may use different internal risk mitigation tools (see discussion above), research has focused on asset-liability management and economic capital allocations.

Summary of Studies

Asset/Liability Management (A/L M) is viewed as a key component of the broader field of enterprise risk management (ERM). A/L M takes a narrower view of risks than ERM, focusing primarily on interest rate risks as they impact both sides of the balance sheet, but also credit risk, liquidity risk, and the volatility of profit margins. ERM "is the strategy that aligns the firm's business with the risk factors of its environment in the pursuit of strategic objectives. It consists of the conceptual framework, organizational approaches, and tools that integrate market, credit, liquidity, operational, and business risks in achieving the organization's objectives." **Babbel (2001)** traces the development of A/L M from its early beginnings up to the present time, and describes how it is likely to evolve in the future.

Myers and Read (2001) show how option pricing methods can be used to allocate required capital (surplus) across lines of insurance. The capital allocations depend on the uncertainty about each line's losses and also on correlations with other lines' losses and with asset returns. The allocations depend on the marginal contribution of each line to default value, that is, to the present value of the insurance company's option to default. The authors show that marginal default values add up to the total default value for the company, so that the capital allocations are unique and not arbitrary. They therefore disagree with prior literature arguing that capital should not be allocated to lines of business or should be allocated uniformly. The study presents several examples based on standard option pricing methods. However, the "adding up" result justifying unique capital allocations holds for any joint probability distribution of losses and asset returns. The study concludes with implications for insurance pricing and regulation.

Gründl and Schmeiser (2007) show that in their framework no capital allocation to lines of business is needed for pricing insurance contracts. They further argue that in the case of having to cover frictional costs, Myers and Read's (2001) suggested capital allocation method may lead to inappropriate insurance prices. Beside the purpose of pricing insurance contracts, capital allocation methods proposed in the literature and used in insurance practice are typically intended to help derive capital budgeting decisions in insurance companies, such as expanding or contracting lines of business. The authors argue that net present value analyses provide better capital budgeting decisions than capital allocation in general.

Sherris (2006) considers the links between solvency, capital allocation, and fair rate of return in insurance. A method to allocate capital in insurance to lines of business is developed based on an economic definition of solvency and the market value of the insurer balance sheet. Solvency, and its financial impact, is determined by the value of the insolvency exchange option. The allocation of capital is determined using a complete markets' arbitrage-free model and, as a result, has desirable properties, such as the allocated capital "adds up" and is consistent with the economic value of the balance sheet assets and liabilities. A single-period discrete-state model example is used to illustrate the results. The impact of adding lines of business is briefly considered.

Zanjani (2002) studies multi-line pricing and capital allocation by insurance companies when solvency matters to consumers, capital is costly to hold, and the average loss is uncertain. In this environment, product quality concerns lead firms to diversify across markets and charge high prices for risk that threatens company solvency, even if the risk is unrelated to other asset risk. Price differences across markets are traced to differences in capital required at the margin to maintain solvency. Finally, the paper shows that capital costs have significant effects on catastrophe insurance markets because of high marginal capital requirements.

Reinsurance

Studies have examined the risk mitigation, tax, and regulatory effects of reinsurance, often distinguishing between traditional and financial (finite) reinsurance. Research has also examined implications of the availability and pricing of reinsurance, globalization effects, and the distinction between reinsurers and insurers.

Summary of Studies

Reinsurance transactions generally increase both regulatory capital and taxable income. These effects suggest that, all else equal, reinsurance should increase with regulatory costs and decline with the marginal tax rate. **Adiel (1996)** finds that insurers enter into financial (finite) reinsurance transactions to reduce regulatory costs, but his results do not support the hypothesis that insurers adjust their reinsurance level as a function of their marginal tax rates.

Insurance industry accounts of the liability insurance crisis of the mid-1980s often cite disruption of supply in reinsurance markets as an important contributing factor. **Berger, Cummins, and Tennyson (1992)** investigate the extent to which events in reinsurance markets affected liability insurance market outcomes. They document significant shocks to reinsurance supply in the early 1980s and find evidence of subsequent disruptions to the price and availability of reinsurance. Regression analysis of liability insurance profitability over the time period supports the hypothesis that problems in reinsurance markets played an important role in the crisis.

Cummins and Weiss (2000) analyze the effects of consolidation on the capacity and efficiency of the global reinsurance market. The demand for global reinsurance is in part due to covariability of risk in local markets that can be reduced by diversifying internationally and in part due to the failure of the law of large numbers for risks that are very large and infrequent. Some risks of this type—globally insurable risks—can be diversified in the reinsurance market, but others—globally diversifiable risks—cannot be diversified effectively in insurance and reinsurance markets but can be securitized. Consolidation in the reinsurance industry has been driven by an increase in the frequency and severity of insured losses due to natural disasters as well as by an increase in the demand for reinsurance for non-catastrophic losses. The authors demonstrate the benefits of consolidation analytically and empirically: improved industry capacity to respond to adverse loss shocks, increased industry efficiency due to larger average firm size (and thus enhanced diversification) and high relative efficiency of acquiring firms (which can improve the performance of relatively inefficient acquisition targets), and the often low capitalization of acquisition targets (whose removal from the market has the potential to stabilize the market and enhance its ability to sustain unexpectedly large losses). Finally, consolidation in the reinsurance industry is expected to increase relative market capacity by concentrating reinsurer resources in a smaller number of firms and thus increases the covariability of losses within the industry, bringing the industry closer to operating as a single firm. According to **Borch's theorem**, Pareto optimality in the market for reinsurance requires that all reinsurers hold a proportionate share of the "market portfolio" of insurance risk.

Cole, Lee, and McCullough (2007) examine reinsurers' decision to internationalize and find support for traditional factors impacting globalization such as host market size, loss experience, and competitiveness as well as reinsurer's ability to expand based on available capacity. With the continued interdependence of the world reinsurance marketplace, as well as the recent expansion of the European Union, internationalization issues are of critical importance not only to US insurers, reinsurers, and regulators, but also to their global counterparts.

Cole and McCullough (2006) examine the effect of the state of the international reinsurance market on the demand for reinsurance by US insurers. Both the overall demand for reinsurance and the utilization of foreign reinsurance by US insurers are explored. The study finds that in addition to the traditional motives for the corporate demand for insurance, the state of the US reinsurance industry impacts the amount of reinsurance demanded by US insurers. The study also finds that the decision to utilize some percentage of foreign reinsurance is driven primarily by the financial and operational characteristics of the ceding company such as

firm size, group affiliation, and organizational form, but differences between the foreign and US reinsurance markets do not seem to impact the decision to utilize foreign reinsurance.

Empirical studies use alternative definitions of reinsurers. **Cole and McCullough (2008)** document variation in the characteristics of the firms being categorized as insurers and reinsurers under different definitions. They further show that there are significant differences in the results of multivariate analyses exploring common research questions when using alternative definitions of reinsurers utilized in prior research and when professional reinsurers and incidental reinsurers are grouped together.

Culp and Heaton (2005) discuss the uses and implications of finite reinsurance. They note that finite risk reinsurance has become the subject of investigations, litigation, and possibly new regulation. Finite risk solutions mainly help industrial companies manage timing, funding, and insurance risks. They generally take the form of structured insurance products designed to help companies manage risks often regarded as exotic or "tail" risks, such as environmental or asbestos liability. Although such products are underwritten by insurance or reinsurance companies, they typically involve limited risk transfer (hence the name "finite risk") while providing the insured companies with a means of pre-funding their expected losses, or what is often called "pre-loss financing." Finite risk provides a more credible and transparent alternative to self-insurance—one that reassures investors both by capping the liability and eliminating the possibility for manipulation of reserves. Abuses of finite risk products usually concern the degree to which transactions are accounted for, disclosed, and represented to investors as achieving "significant risk transfer" when there is little or no such transfer.

Purchasing reinsurance reduces insurers' insolvency risk by stabilizing loss experience, increasing capacity, limiting liability on specific risks, and/or protecting against catastrophes. Consequently, reinsurance purchase should reduce capital costs. However, transferring risk to reinsurers is expensive. The cost of reinsurance for an insurer can be much larger than the actuarial price of the risk transferred. **Cummins, Dionne, Gagne, and Nouira (2008)** analyze empirically the costs and the benefits of reinsurance for a sample of US property-liability insurers. The results show that reinsurance purchase increases significantly the insurer's costs but reduces significantly the volatility of the loss ratio. With purchasing reinsurance, insurers accept to pay higher costs of insurance production to reduce their underwriting risk.

Fields, Klein, and Myskowski (1998) examine the intra-industry effect of Lloyd's financial distress on publicly traded US insurance companies. Given Lloyd's prominence in the international insurance industry, large losses raised questions about the industry's capacity for certain types of risks and the financial solvency of other insurers. The market value of US property-liability insurers fell significantly at the announcement. This decline is related to the firm's revenues from insurance and reinsurance exposure. Results support contagion between Lloyd's distress and the US insurance industry. The study raises concerns about the potential for a systematic disruption of the supply of reinsurance in the international marketplace.

Froot and O'Connell (2008) model the equilibrium price and quantity of risk transfer between firms and financial intermediaries. Value-maximizing firms have downward sloping demands to cede risk, while intermediaries, who assume risk, provide less-than-fully-elastic supply. The authors show that equilibrium required returns will be "high" in the presence of financing imperfections that make intermediary capital costly. Moreover, financing imperfections can give rise to intermediary market power, so that small changes in financial imperfections can give rise to large changes in price. The authors develop tests of this alternative against the null that the supply of intermediary capital is perfectly elastic. The authors take the US catastrophe reinsurance market as an example, using detailed data from Guy Carpenter & Co., covering a large fraction of the catastrophe risks exchanged during 1970–94. The results suggest that the price of reinsurance generally exceeds "fair" values, particularly in the aftermath of large events, that market power of reinsurers is not a complete explanation for such pricing, and that reinsurers' high costs of capital appear to play an important role.

Gründl and Schmeiser (2002) discuss various approaches to pricing double-trigger reinsurance contracts – a new type of contract that has emerged in the area of "alternative risk transfer," with reinsurance recoverables contingent on the performance of a capital market index. The potential coverage from this type of contract depends on both underwriting and financial risk. The authors determine the reinsurer's reservation

price that enables to retain the same level of safety after signing the contract by issuing additional equity capital. They also contrast the financial insurance pricing models with an actuarial pricing model that has as its objective no lessening of the reinsurance company's expected profits and no worsening of its safety level. The authors show that actuarial pricing can cause the reinsurer to reject positive NPV reinsurance contracts. Finally, the authors discuss conditions leading to a market for double-trigger reinsurance contracts.

The reinsurance market is the secondary market for insurance risks. It has a very specific organization. Direct insurers rarely trade risks with each other. Rather, they cede part of their primary risks to specialized professional reinsurers who have no primary business. **Plantin (2006)** offers a model of equilibrium in reinsurance and capital markets in which professional reinsurers arise endogenously. Their role is to monitor primary insurers credibly, so that insurers can raise capital more easily. In equilibrium, the financial structure of primary insurers consists of a mix of reinsurance and outside capital. The comparative statics yield empirical predictions which are broadly in line with a number of stylized facts from the reinsurance market.

Venezian, Viswanathan, and Jucá (2005) test the accuracy of the rule that, for large numbers of primary insurers, the optimal number of reinsurers in a market is given asymptotically by the square root of the total number of primary insurers (Powers and Shubik 2005). The numbers of primary insurers and reinsurers existing in a range of 18-20 different national insurance markets over a period of 11 years are used. The empirical results are consistent with the square-root rule. In addition, the authors find that the number of reinsurers may also be associated with the market's willingness to pay for risk. When the market's perception of risk is high, there is a greater supply of reinsurance to provide capacity to primary insurers. An empirical model is presented that deals explicitly with the number of insurers and reinsurers in a market.

Financial Market Solutions

Although insurance-related capital market products are a relatively recent development, research in this area is already quite extensive, consistent with the potential importance of these alternative risk transfer mechanisms.

Summary of Studies

Biffis and Blake (2009) note that in the last few years, the risk of mortality improvements has become increasingly capital intensive for pension funds and annuity providers to manage. The reason is that longevity risk has been systematically underestimated, making balance sheets vulnerable to unexpected increases in liabilities. The traditional way of transferring longevity risk is through insurance and reinsurance markets. However, these lack the capacity and liquidity to support the huge global exposure to longevity risk. Capital markets, on the other hand, offer additional capacity and liquidity. Mortality-linked securities can be used to transfer longevity risk to the capital markets and lead to more transparent and competitive pricing of longevity risk. Nevertheless, despite growing enthusiasm, longevity risk transfers have been materializing only slowly. One reason is the imbalance in scale between existing exposures and willing hedge suppliers. Another reason is that a traded mortality-linked security has to meet the different needs of hedgers (concerned with hedge effectiveness) and investors (concerned with liquidity and the risk/return trade-off), which are difficult to reconcile given the long-term nature and other characteristics of longevity risk. A third reason is the absence of an established market price for longevity risk. The authors provide an overview of the recent developments in capital markets aimed at overcoming such difficulties and at creating a liquid market in mortality-linked securities and derivatives.

Blake, Cairns, Dowd, and MacMinn (2006) examine the main characteristics of longevity bonds (LBs) and show that they can take a large variety of forms which can vary enormously in their sensitivities to longevity shocks. The authors examine different ways of financially engineering LBs and consider problems arising from the dearth of ultra-long government bonds and the choice of the reference population index. The article also looks at valuation issues in an incomplete markets context and finishes with an examination of how LBs can be used as a risk management tool for hedging longevity risks.

Chen and Cummins (2010) analyze the securitization of longevity risk with an emphasis on longevity risk modeling and longevity bond premium pricing. They utilize a random walk model with drift to fit small variations of mortality improvements and employ extreme value theory to model rare longevity events. The method has the advantage of both capturing mortality improvements within sample and extrapolating rare, out-of-sample longevity events. The authors demonstrate that the risk cubic model developed for pricing catastrophe bonds can be applied to mortality and longevity bond pricing and use the model to calculate risk premiums for longevity bonds.

Canter, Cole, and Sandor (1997) discuss how insurance derivatives, particularly the Chicago Board of Trade's catastrophe options contracts, can be used to increase capacity in the property catastrophe insurance industry in the US These new financial instruments enable the capital markets to provide the insurance industry with the reinsurance capacity it needs. The capital markets are willing to perform this role because of the characteristics of securitized insurance risk: positive excess returns and diversification benefits. The article also demonstrates how insurance companies can use insurance derivatives such as catastrophe options and catastrophe-linked bonds as effective, low-cost risk management tools.

Cowley and Cummins (2005) analyze securitization in the insurance industry with an emphasis on lessons from prior securitizations and techniques that can be employed to mitigate the remaining impediments to the more widespread securitization of insurance risk. The article focuses on life insurance and annuity securitizations. It begins with an overview and analysis of asset-backed securities, followed by a discussion of securitization as a potential source of value creation in the insurance industry. The principal life insurance and annuity securitizations that have been conducted in recent years are then analyzed, followed by a discussion of possible approaches to overcoming impediments to securitization.

One of the most significant economic developments of the past decade has been the convergence of the financial services industry, particularly the capital markets and (re)insurance sectors. This convergence has been driven by the increase in the frequency and severity of catastrophic risk, market inefficiencies created by (re)insurance underwriting cycles, advances in computing and communications technologies, the emergence of enterprise risk management, and other factors. These trends have led to the development of hybrid insurance/financial instruments that blend elements of financial contracts with traditional reinsurance, as well as new financial instruments patterned on asset-backed securities, futures, and options that provide direct access to capital markets. **Cummins and Weiss** (2009) provide a survey and overview of the hybrid and pure financial markets instruments and provide new information on the pricing and returns on contracts such as industry loss warranties and Cat bonds.

Longevity risk is a major issue for insurers and pension funds, especially due to annuity products. Thus, securitization of longevity risk could offer great opportunities for hedging. **Denuit, Devolder, and Goderniaux (2007)** propose to design survivor bonds which could be issued directly by insurers. To guaranty some transparency in the product, the survivor bond is based on a public mortality index. The authors show how the classical Lee-Carter model for mortality forecasting can be used to price such a risky coupon survivor bond.

Doherty (1997) argues that the high costs of reinsurance present the opportunity for hedging instruments to be offered to primary insurers that are both competitive with current reinsurance and that offer investors high rates of return. But the combination of high reinsurance premiums and the vast capacity of the capital market for diversification is not sufficient to ensure the success of these new instruments. If new instruments such as catastrophe options and catastrophe-linked bonds are to compete successfully with reinsurance, they must provide a cost-effective means of resolving incentive conflicts between the primary insurer and the ultimate risk bearer that are known as "moral hazard." Without an effective solution of this moral hazard problem, the use of past insurance loss data to estimate the potential returns for purchasers of catastrophe bonds and other such instruments will be misleading and unreliable. The paper demonstrates that both traditional reinsurance and each of the new catastrophe hedging instruments presents insurance companies and other hedgers with the challenge of managing a different combination of moral hazard, credit risk, and basis risk. For example, traditional catastrophe reinsurance is subject to significant credit risk and moral hazard, but little if any basis risk. By contrast, both catastrophe options and bonds can be designed in ways that reduce moral hazard and credit risk, but at the cost of taking on some basis risk. The risk manager's task in

such circumstances is to design an instrument that embodies the optimal, or cost-minimizing, trade-off among these three sources of risk.

High correlations between risks can increase insurers' required capital and/or reduce the availability of insurance. For such insurance lines, securitization is rapidly emerging as an alternative form of risk transfer. The ultimate success of securitization in replacing or complementing traditional insurance and reinsurance products depends on the ability of securitization to facilitate and/or be facilitated by insurance contracts. **Doherty and Schlesinger (2002)** consider how insured losses might be decomposed into separate components, one of which is a type of "systemic risk" that is highly correlated among insureds. Such a correlated component might conceivably be hedged directly by individuals but is more likely to be hedged by insurers. The authors examine how insurance contracts may be designed to allow the insured a mechanism to retain all or part of the systemic component. Examples are provided that illustrate this methodology in several types of insurance markets subject to systemic risk.

The profits of many businesses are strongly affected by weather related events, and insurance against weather related risks (acts of God) has been a traditional domain for transfer of (certain) of these risks. Recent innovations in the capital market have now provided financial instruments to transfer and hedge some of these risks. Unlike insurance solutions, however, using these financial derivative instruments creates a situation in which the return to the purchaser of the instrument is no longer perfectly correlated with the loss experienced. Such a mismatch creates new risks which must be examined and evaluated as part of ascertaining cost effective risk management plans. **Golden, Wang, and Yang (2007)** analyze the two engendered risks – basis risk (the risk created by the fact that the return from the financial derivative is a function of weather at a pre-specified geographical location which may not be identical to the location of the firm) and credit risk (the risk that the counterparty to the derivative contract may not perform). Using custom tailored derivatives from the over the counter market can decrease basis risk but increases credit risk. Using standardized exchange traded derivatives decreases credit risk but increases basis risk. The effectiveness of using hedging methods involving forwards and futures having linear payoffs (linear hedging) and methods using derivatives having nonlinear payoffs such as those involving options (nonlinear hedging) for the purpose of hedging basis risk are examined jointly with credit risk.

Using data collected from the annual statements of 571 life insurers, **Colquitt and Hoyt (1997)** estimate separate models for the probability and degree of use of futures and options by life insurers for the purpose of hedging economic risks. As hypothesized, hedging increases in proxies for the costs of financial distress and asymmetric information, and decreases with proxies for the costs of hedging. The results also suggest that an insurer's matching of asset and liability durations (on-balance-sheet hedging) serves as a substitute for hedging with futures and options (off-balance-sheet hedging) and that the use of reinsurance serves as a signal for those firms that are predisposed to hedging firm risk.

Cummins, Phillips, and Smith (2001) analyze the derivatives holdings of US insurers to empirically investigate the general hypotheses developed in the financial literature to explain why widely held, value-maximizing firms engage in risk management. The authors also develop a new hypothesis suggesting that although measures of risk and illiquidity will be positively associated with an insurer's decision to engage in risk management, these same measures of risk will be negatively related to the volume of hedging for the set of firms who choose to hedge using derivatives. The authors' analysis provides considerable support for general hypotheses about hedging by value-maximizing firms. The authors also find support for the hypothesis that, conditional on having risk exposures large enough to warrant participation, firms with a larger appetite for risk will engage in less hedging than firms with lower risk tolerance.

Cummins and Song (2008) study the usage of two common hedging tools, reinsurance and derivatives, by property and casualty insurance companies. In a simple mean-variance efficient optimization model, the two hedging tools display substitutive effect when asset and liability do not display strong natural hedging. The authors verify this relationship using a six-year insurance company firm-level data on reinsurance usage and off-balance sheet derivative trading recorded between 2000 and 2005. Controlling for firm specific variables, such as size, return and credit rating, such substitution effect indeed exists in the insurance companies' hedging decisions under a two-stage simultaneous equation framework.

Derivatives are important risk management tools widely used by financial institutions, including insurers. Insurers rely on derivatives for managing actuarial, market, credit and liquidity risks. **Raturi (2005)** analyzes data from statutory insurance company filings with state regulators in the US and finds that derivatives are used primarily by large life insurance companies. This could be explained by the significant economies of scale that are possible when using derivatives. Smaller firms do not have the resources to invest in the latest risk management technologies, and management may be uncomfortable using such new tools. Surveys and anecdotal evidence also suggest that, for insurance companies, the lack of familiarity with the regulatory and accounting treatment of derivatives is another reason for their cautious derivative usage.

Cummins and Trainar (2009) argue that when the magnitude of potential losses and the correlation of risks are high, the cost of capital required to maintain acceptable solvency levels may be uneconomical. In such cases, securitization has a role to play by passing the risks along to broader capital markets through bonds and options rather than through the traditional mechanism of (re)insurer equity capital being held by diversified investors. Securitization also serves as a substitute or supplement for reinsurance in other ways such as mitigating inequities in claims settlements in the event of reinsurer defaults, collateralizing the low-frequency risks that are likely to be hardest hit when the assets of a defaulted reinsurer are distributed, and facilitating regulatory arbitrage. Because of the advantages of reinsurance in handling relatively small, independent risks and mitigating informational asymmetries, it is not expected that securitization will replace reinsurance. However, securitization is likely to play an important role in permitting insurers and reinsurers to achieve optimal combinations of risk diversification and risk shifting to the capital markets, especially for catastrophic risks. Thus, while insurance securitization may have complicated the landscape of insurance and reinsurance, it brings ample opportunities for the insurance and reinsurance industries to create more efficient markets for financing risks.

Capital and Capital Structure

Capital and capital structure have various effects on insurers. Studies have generally focused on the impact on solvency risk, potential growth, and pricing. Other important implications concern capital utilization, tax effects, and interest rate sensitivity. Some of these effects are discussed in other sections of this document. In particular, research on the impact of capital on growth and pricing has been reviewed in the discussion of underwriting cycles in Section 1.1. Additional studies include the following.

Summary of Studies

Cummins and Sommer (1996) investigate the capital and portfolio risk decisions of PC insurance firms. They find a positive relationship between insurer capital and risk, which suggests that firms balance these two factors to achieve their desired overall insolvency risk. They also provide evidence that managerial incentives play a role in determining capital and risk in insurance markets. Similarly, **Baranoff and Sager (2003)** document a positive relationship between capital ratios and asset risk using life insurer data for 1993-1999.

Capitalization levels in the property-liability insurance industry as measured using the capital-to-assets ratio rose from 25% in 1989 to 35% by 1999. **Cummins and Nini (2002)** investigate whether this capital increase represents a legitimate response to changing market conditions or a true inefficiency that leads to performance penalties for insurers. The author finds that most insurers were significantly over-capitalized during this period.

Powell, Sommer, and Eckles (2008) investigate two issues related to internal capital markets (ICMs) in insurance groups. The first and most fundamental question is simply whether or not ICMs are active within insurance groups. The second is whether or not ICMs are efficient. They find evidence that ICMs play a significant role in the investment behavior of affiliated insurers, and that capital is allocated to subsidiaries with the best expected performance.

For insurers, the choice of financial structure is a complex, multidimensional decision. It involves trading-off (1) tax benefits and increasing probability of incurring the cost of financial distress associated with leverage, and (2) protecting franchise or charter value and expropriating value through increasing exposure to interest rate risk. Within this framework, **Staking and Babbel (1995)** investigate the relation between leverage, interest rate sensitivity and firm value in the PC insurance industry. Equity value, as gauged by Tobin's q, is determined to be related to an insurer's choice of financial structure. It is shown that the market value of equity at first grows but later declines as leverage increases. Interest rate risk has the opposite effect. Equity value first declines with interest rate risk, but then rises at high levels of interest rate risk. These results are consistent with the prediction that financial institutions will expend scarce resources to control risk in order to protect franchise value and may indeed be signaling the existence of these valuable intangibles via these actions.

Systemic Risk

Summary of Studies

A significant contributing factor to the Financial Crisis of 2007-2009 was the apparent interconnectedness among hedge funds, banks, brokers, and insurance companies, which amplified shocks into systemic events. **Billio, Getmansky, Lo, and Pelizzon (2010)** propose five measures of systemic risk based on statistical relations among the market returns of these four types of financial institutions. Using correlations, cross-autocorrelations, principal components analysis, regime-switching models, and Granger causality tests, the authors find that all four sectors have become highly interrelated and less liquid over the past decade, increasing the level of systemic risk in the finance and insurance industries. These measures can also identify and quantify financial crisis periods. The results suggest that while hedge funds can provide early indications of market dislocation, their contributions to systemic risk may not be as significant as those of banks, insurance companies, and brokers who take on risks more appropriate for hedge funds.

2. Financial Reporting and Line-Item Analysis

This section discusses primary line items from insurers' financial statements. For each key item, I evaluate its economic significance, review the related US accounting principles, discuss implications for earnings quality, evaluate the susceptibility of the item to error and manipulation, describe analyses which inform on the item's quality, review selected research findings, and describe the primary differences between International Financial Reporting Standards (IFRS) and US GAAP.

Accounting quality is affected by many factors. Three primary ones are the **complexity** of the underlying transactions and related accounting treatment, the **uncertainty** associated with the transactions and reported amounts, and the extent of managerial **discretion** involved in measuring and reporting transactions. Complexity and uncertainty could cause mistakes in financial reporting and, similar to managerial discretion, could provide managers with opportunities to manage earnings. From a user's perspective, these factors reduce the understandability and reliability of financial information. Complexity is a particular concern for LH insurers, while uncertainty hinders the usefulness of financial reporting by PC insurers, primarily those with significant exposure to catastrophe losses. Managerial discretion is a relevant concern for essentially all insurance companies. The line item discussion below considers these and other factors when evaluating the quality of each reported item.

The IASB is currently developing a comprehensive standard on accounting for insurance contracts, which will address recognition, measurement, presentation, and disclosure requirements. In the meantime, insurance accounting under IFRS is prescribed by IFRS 4, which was issued in 2004 as an interim standard pending completion of the comprehensive project. IFRS 4 addresses recognition and measurement of rights and obligations under insurance contracts in only a limited way, and it permits a wide variety of accounting practices for insurance contracts. In contrast, US GAAP includes several comprehensive pronouncements (SFAS 60, 97, 113, 120, and 163) and other comprehensive industry accounting guides, and allows for significantly less discretion. However, in 2008 the FASB has decided to join in the IASB's insurance contracts project, and most likely the two Boards will issue similar standards in the not-too-far future. Section 2.2 discusses the current stage of the IASB and FASB deliberations.

To evaluate the economic significance of the financial statement line items, I report summary statistics for a sample of US insurance companies. The sample includes insurer-year observations (industry GIC 403010) during the period 1999-2009 with data available in the COMPUSTAT North America Fundamental Annual dataset using the Financial Services (FS) format. To mitigate backfill and other biases, I start the sample period in 1999 and remove insurer-year observations with unavailable market value. FS format data are available in COMPUSTAT starting 1982, but coverage increased significantly in 1999. The market value restriction mitigates biases due to backfill adjustments for IPOs. I also exclude the AIG observations because they had an undue effect on the statistics, primarily in the later years. The relatively long sample period smoothes out the effects of economic shocks and business cycles, but may also conceal important trends. Therefore, to evaluate the representativeness of the results for more recent periods, I repeated all analyses using data for 2009 only as well as for the last three and five years. These results are not tabulated, but I discuss differences when they are significant.

Before discussing the statistics, one caveat is in order. The statistics relate to accounting data reported by public insurers satisfying the above sample selection criteria. The results may not generalize to private insurance companies or other public insurers that are excluded from the sample due to data unavailability.

Table 2.0.1 presents the average values over the eleven years (1999-2009) of the number of insurers, and the aggregate and average values of revenue, net income, total assets, book value and market capitalization. Statistics are presented for all insurers (All) as well as for the following five sub-industries: Life and Health (LH), Property and Casualty (PC), Multiline (ML), Reinsurers (Re), and Insurance Brokers (IB).

Table 2.0.1: Sample Statistics

	All	LH	PC	ML	Re	IB
# of insurers	99	23	56	10	10	1
Total revenue (Billions of USD)	432	131	212	60	21	8
Total net income (Billions of USD)	30	8	16	4	2	1
Total assets (Billions of USD)	2,690	1,325	790	469	81	24
Total equity (Billions of USD)	355	91	193	45	21	5
Total market value (Billions of USD)	484	126	273	51	24	10
Average revenue (Millions of USD)	4,575	6,298	4,181	6,397	2,084	8,407
Average net income (Millions of USD)	313	380	312	358	187	654
Average assets (Millions of USD)	28,539	65,324	15,564	49,817	7,744	24,495
Average equity (Millions of USD)	3,824	4,423	3,926	4,833	1,914	4,653
Average market value (Millions of USD)	5,038	5,902	5,298	5,342	2,307	9,898

The table presents time series averages (1999-2009) of the cross sectional values of the variables.

As shown in Table 2.0.1, the number of insurers and their average size vary significantly across the five sub-industries. Some of this variation is due to omitted observations. In particular, COMPUSTAT provides data using the Financial Services (FS) format for only one insurance broker: AON Corporation. For other insurance brokers, COMPUSTAT provides data using the industrial format only.

The aggregate statistics in Table 2.0.1 indicate that LH and PC are the primary sub-industries, and the discussion will accordingly focus on these sub-industries. The PC sub-industry dominates in terms of the number of firms, revenue share and equity share, but it accounts for a relatively small percentage of total assets. LH insurers hold about half of the industry's assets, but their revenues and equity account for only a quarter of the respective industry totals. These statistics reflect the substantial operating differences between PC and LH insurers. In fact, the operations and financial profile of LH insurers are more similar to banks than to PC insurers. In particular, LH insurers have substantially higher leverage ratios and lower turnover ratios. These differences in the drivers of shareholders' profitability essentially offset each other—the two sub-industries had comparable average ROE of about 8-9% during the sample period (the third driver of shareholder profitability—net income margin—was also comparable for the two industries). These statistics imply that when comparing insurers that operate in different sub-industries (e.g., PC versus LH), one may examine ROE and net margin, but making inferences based on differences in leverage or turnover would be problematic. To

gain additional insights regarding the financial profiles of insurers, I next turn to a common-size analysis.

2.1 Common-Size Financial Statements

This section evaluates the economic significance of insurers' financial statement line items using annual common-size analyses. The analyses are conducted with aggregate data (for all insurers) as well as sub-industry data, for each of the years 1999 through 2009. The tables reported below provide the time-series averages of the corresponding annual common-size analyses. Common-size statistics are calculated using the aggregate values of the numerator and denominator for the relevant group.

Table 2.1.1 provides a common-size presentation of the primary asset groups. The largest asset class is investments. This is true for each of the sub-industries, except insurance brokers. Separate account assets constitute the second largest asset category. These assets are reported primarily by LH and ML insurers. As discussed in more detail below, separate account assets are very similar to assets under management (AUM)—insurers generally do not bear the risk or receive the return of these investments; instead, they earn administrative and management fees. Still, unlike AUM, separate account assets are reported on the balance sheet. Excluding these assets and related liabilities from the balance sheet yields a more informative representation.

Table 2.1.1: Primary Asset Categories

	All	LH	PC	ML	Re	IB
Cash	2%	2%	3%	1%	4%	2%
Investment Assets (including ST)	56%	57%	62%	44%	70%	26%
Accounts Receivable (including premium)	3%	1%	6%	2%	5%	37%
Reinsurance Assets	5%	2%	9%	7%	11%	0%
Intangible Assets (other than DAC)	2%	1%	4%	1%	0%	20%
Deferred Policy Acquisition Costs	4%	4%	2%	4%	4%	3%
Separate Account Assets	20%	28%	2%	35%	0%	0%
Other Assets	7%	5%	12%	5%	5%	12%
Total Assets	100%	100%	100%	100%	100%	100%

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

Table 2.1.2 presents the asset side of the adjusted common size balance sheet, which excludes separate accounts. This format reveals interesting asset composition differences across the sub-industries. In particular, for LH insurers, investment assets constitute almost 80% of adjusted assets, and deferred policy acquisition costs (DAC) constitute 6%. In contrast, for PC insurers, investments account for only 63% of adjusted assets, and DAC constitute a mere 2%. Instead, PC insurers have substantial reinsurance assets, receivables, and other assets.

Table 2.1.2: Primary Asset Categories Excluding Separate Accounts

	All	LH	PC	ML	Re	IB
Cash	3%	3%	3%	1%	4%	2%
Investment Assets (including ST)	71%	79%	63%	69%	70%	26%
Accounts Receivable (including premium)	4%	2%	6%	4%	5%	37%
Reinsurance Assets	7%	3%	10%	11%	11%	0%
Intangible Assets (other than DAC)	3%	2%	4%	1%	0%	20%
Deferred Policy Acquisition Costs	4%	6%	2%	6%	4%	3%
Other Assets	9%	7%	12%	8%	5%	12%
Assets excluding separate account assets	100%	100%	100%	100%	100%	100%

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

Turning to the liabilities and equity side of the balance sheet, the statistics in Table 2.1.3 reveal significant differences in leverage and liability composition. In particular, the equity ratios of PC and Re insurers are about three times those of LH and ML insurers. These differences in leverage are partially due to differences in separate accounts which, as discussed above, effectively inflate the balance sheet. I therefore recalculate the common size statistics excluding separate account liabilities.

Table 2.1.3: Primary Liabilities and Equity Categories

	All	LH	PC	ML	Re	IB
Insurance reserves	48%	53%	45%	41%	56%	11%
Unearned premiums	4%	0%	9%	4%	7%	9%
Reinsurance liabilities	1%	0%	1%	0%	2%	0%
Debt	6%	5%	9%	4%	6%	8%
Separate account liabilities	20%	28%	2%	35%	0%	0%
Other liabilities	8%	7%	10%	5%	4%	56%
Non-controlling interest and preferred stock	1%	0%	1%	1%	1%	1%
Common equity	13%	7%	24%	9%	24%	19%
Total liabilities and equity	100%	100%	100%	100%	100%	100%

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

Table 2.1.4 presents the liability and equity statistics obtained after excluding separate account liabilities. As expected, the exclusion of separate accounts significantly increases the equity ratios of LH and ML insurers, but the differences relative to PC and Re insurers remain large. In addition to higher equity ratios, PC insurers report significant amounts of unearned premiums while, as discussed in Section 2.2 below, LH insurers generally recognize premium revenue when payments are received and so have little or no unearned revenue. The differences in equity and unearned premiums are offset by insurance reserves. For LH insurers, insurance reserves constitute 73% of total adjusted liabilities and equity, which is about 60% larger than the corresponding ratio for PC insurers.

Table 2.1.4: Primary Liabilities and Equity Categories Excluding Separate Accounts

	All	LH	PC	ML	Re	IB
Insurance reserves	60%	73%	46%	63%	56%	11%
Unearned premiums	5%	0%	9%	6%	7%	9%
Reinsurance liabilities	1%	0%	1%	1%	2%	0%
Debt	7%	7%	9%	6%	6%	8%
Other liabilities	10%	9%	10%	8%	4%	56%
Non-controlling interest and preferred stock	1%	0%	1%	1%	1%	1%
Common equity	17%	10%	25%	15%	24%	19%
Total	100%	100%	100%	100%	100%	100%

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

Table 2.1.5 presents common size income statements. Insurance premiums constitute the majority of reported revenue, primarily for Re and PC insurers. On average, insurance premiums account for 64% of revenue, while investment income constitutes 19%. The profitability picture is quite different, however. Insurance expenses constitute a high percentage of premium revenues, while investment expenses are very small. For the sample used in this study, insurance-related expenses are on average higher than insurance premiums (54% benefits and claims, 8% amortization of DAC, and most of the 26% "other operating expenses"). In contrast, investment expenses are only 1% of revenue. Still, these statistics do not necessarily imply that insurance activities are unprofitable. The "claims" part of "benefits and claims," which measures expected future payments for insured events that have already occurred, is generally reported undiscounted. Thus, the reported expense overstates the economic expense. This distortion is quite significant, particularly for long-tail PC lines. In addition, "benefits and claims" include the increase in the present value of the liability for future policy benefits due to the passage of time. This expense component, which is very similar to the interest cost component of defined benefit postretirement plans, is effectively a financing expense, not an insurance cost. Finally, "benefits and claims" includes interest credited to universal life and other deposit-like accounts. This expense is clearly a financing cost, yet companies often aggregate it together with "policy benefits." COMPUSTAT includes this expense in "benefits and claims" even when it is reported separately.

Table 2.1.5: Common-size Income Statements

	All	LH	PC	ML	Re	IB
Insurance premium	64%	54%	71%	65%	86%	26%
Investment income	19%	35%	11%	18%	14%	5%
Fee income	8%	12%	5%	8%	0%	72%
Realized investments gains (losses), net	0%	-2%	1%	-2%	0%	0%
Other revenue	9%	2%	12%	11%	0%	0%
Total revenue	100%	100%	100%	100%	100%	100%
Benefits and claims	54%	59%	51%	55%	64%	14%
Amortization of deferred acquisition costs	8%	4%	10%	12%	11%	0%
Other operating expenses	26%	24%	26%	23%	13%	76%
Investment expense	1%	2%	0%	1%	1%	0%
Interest expense	2%	2%	2%	2%	1%	2%
Total pretax expenses	90%	91%	89%	92%	90%	89%
Special pretax items	0%	0%	0%	-1%	0%	-1%
Pretax income	9%	9%	10%	7%	10%	10%
Income taxes	2%	2%	3%	2%	2%	3%
Special after-tax items	0%	0%	0%	1%	0%	1%
Minority interest and preferred dividend	1%	1%	0%	1%	0%	0%
Net income available to common	6%	5%	7%	5%	8%	8%

The table presents time series averages (1999-2009) of aggregate common-size income statement data.

The statistics related to three of the line items in the above common size income statements understate their economic significance. These are special pretax items, special after-tax items and, primarily, net realized investments gains (losses). The average values of these items are close to zero, but this is due to offsetting positive and negative amounts. For many insurer-year observations, the magnitude of these items is quite significant.

Unlike the balance sheet, which explicitly reports reinsurance assets and liabilities, premium revenues are reported net of ceded premiums, and benefits and claims are reported net of expected recoveries from reinsurers. Information regarding the gross amounts is provided in the notes.

While the net income margin is comparable across the five sub-industries, the revenue and expense compositions are quite different. For LH insurers, investment income constitutes a substantially higher percentage of total revenue than for other insurers. This difference reflects the banking-like feature of LH insurance. LH insurers generate much of their income from a spread business: they obtain funds from policy and contract holders on which they pay relatively low interest rates and invest those funds in higher yield instruments. This spread, even when relatively small, is a primary source of LH insurers' earnings due to their high leverage ratios.

LH insurers also generate significantly more fee income than PC insurers. This is due to in part to fees on insurance policies, but also to income from non-insurance activities such as managing AUM. For insurance brokers, fees are the primary source of revenue.

The differences in expense composition across the sub-industries are smaller than the revenue differences but are still significant. Compared to PC insurers, LH insurers have significantly higher "benefits and claims" expense ratios, but this is offset by smaller DAC amortization and "other operating expenses." Reinsurers have the highest "benefits and claims" ratio but the lowest "other operating expenses" ratio. This is consistent with the wholesale nature of reinsurance, which is substantially less expensive to underwrite than retail operations.

I next provide an in-depth analysis of the financial statement line-items. I discuss the following accounts in separate subsections: insurance reserves (2.2), premium revenue (2.3), policy acquisition costs (2.4), reinsurance (2.5), investment assets (2.6), separate accounts (2.7), debt (2.8), and derivatives (2.9). Each of these subsections also discusses related accounts.

2.2 Insurance Reserves and Related Expenses

The most significant liabilities for most insurers are insurance reserves. Table 2.2.1 reports the composition of these liabilities. Insurance reserves include the liability for future policy benefits (LH insurance) and claim reserves (PC and LH). These reserves relate to both direct insurance and assumed reinsurance. COMPUSTAT reports reserves attributed to a separate reinsurance division as "reinsurance reserves," without providing the breakdown between policy benefits and claim reserves. In addition, COMPUSTAT reports policyholders' account balances together with other "sundry" insurance reserves (e.g., participation funds, reserves attributed to a separate international division).

Table 2.2.1: Insurance Reserves

	All	LH	PC	ML	Re	IB
Reserves for benefits	46%	61%	21%	54%	0%	46%
Reserves for claims	35%	15%	71%	41%	5%	40%
Reinsurance reserves	3%	1%	1%	0%	93%	0%
Policyholders' accounts and sundry reserves	16%	24%	8%	5%	1%	14%
Total	100%	100%	100%	100%	100%	100%

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

As expected, LH reserves consist primarily of future policy benefits, while PC reserves consist primarily of claim reserves. Still, LH insurers report significant claim reserves, and PC insurers report substantial benefit reserves. The reserves for benefits reported by PC insurers are due to LH operations, as some PC insurers provide LH coverage (mostly health-related) in addition to PC insurance. The claim reserves reported by LH insurers are partially due to claims stemming from LH operations as well as to PC operations. LH claim reserves are accounted for similar to PC claim reserves. However, reserves for policy benefits are measured very differently. The next three subsections discuss the claim reserve, the reserve for future policy benefits, and the liability for policyholders' accounts. The final two subsections discuss IFRS for reserve liabilities, and the proposed IASB and FASB changes to insurance accounting.

Claim Reserves and Related Expenses

Claim reserves represent estimated future payments to settle claims related to insured events that have occurred by the balance sheet date. PC insurers typically refer to this liability as the loss reserve, while LH insurers refer to it as the liability for policy and contract claims. In both cases, the liability includes estimates of claim expenses (e.g., adjustment and litigation costs) in addition to expected claim payments.

The **loss reserve** represents the estimated liability for PC claims that have been reported to the insurer but not yet settled and claims incurred but not reported. It is generally estimated based upon the insurer's historical experience and actuarial assumptions that consider the effects of current developments, anticipated trends, and risk management programs (some common methods are described below). The reserve is reported net of anticipated salvage and subrogation. Adjustments to the loss reserve are included in income in the period in which the estimates change.

Similarly, the **liability for policy and contract claims** measures the estimated ultimate cost of settling claims related to incurred but not reported death, disability and long-term care as well as claims which have been reported but not yet settled. Estimates for the development of incurred but not reported claims are derived from actuarial analyses of historical patterns of claims and claim development for each line of business. Adjustments to these estimates and differences between estimates and payments for claims are recognized in policyholder benefits and claims expense in the period in which the estimates are changed or payments are made.

While claim reserves are reported by both PC and LH insurers, their economic significance and the subjectivity involved in their measurement is substantially higher for PC insurers. Accordingly, the remainder of this section focuses on loss reserves.

Estimating the loss reserve involves significant discretion, which some insurers exploit to "manage" income and capital (e.g., Petroni 1992, Beaver and McNichols 1998, Beaver et al. 2003). The loss reserve is relatively easy to manipulate due to the considerable uncertainty and subjectivity inherent in its estimation (e.g., Petroni and Beasley 1996). Insurers' incentives to manipulate the reserve are related to its effects on income taxes, financial reporting and, primarily, regulatory metrics that are used to monitor insurers' solvency (surplus, risk based capital, IRIS ratios) and evaluate the reasonableness of premium rates. Insurance companies are typically inclined to understate the reserve. Under-reserving boosts reported policyholder surplus, which affects underwriting capacity (e.g., Petroni 1992, Penalva 1998, Nelson 2000). Understating the loss reserve also improves many of the IRIS ratios and enables insurers to justify competitive premium rates (Penalva 1998, Nelson 2000).

The following is an example of an alleged understatement of the loss reserve. Bancinsurance Corporation, an Ohio insurance company, participated in a bail and immigration bond program as a reinsurer during the period 2001 through 2004. In Accounting and Auditing Enforcement Release (AAER) No. 3069, the SEC alleges that shortly before Bancinsurance filed its Form 10-K for fiscal year 2003 it was notified that there were more than $1 million in reinsurance claims under the Program. These claims represented 2003 losses and were therefore required to be reflected in Bancinsurance's fiscal 2003 financial statements. However, Bancinsurance did not report these claims in the 2003 10-K.

While insurers are usually motivated to understate the loss reserve, in some cases they may be inclined to overstate it, either to reduce the present value of income tax payments (Gaver and Paterson 1999), to smooth reported income in highly profitable years (Petroni et al. 2000), to justify high premium rates (Penalva 1998, Nelson 2000), or to signal high accounting quality. In most cases, however, incentives to understate the reserve are likely to be stronger than any motivation to overstate it.

In addition to the "earnings management" biases discussed above, reported loss reserves are affected by two offsetting accounting distortions: an anti-conservative provision of FASB Interpretation No. 14 that requires that the ***minimum*** value of equally-likely outcomes of a probable loss contingency be accrued as a liability, and the practice of reporting most loss reserves undiscounted.[13] Of these two distortions, the lack of discounting typically dominates.

[13] Historically, arguments for recognizing undiscounted loss reserves included conservatism, materiality, and uncertainty regarding the timing of payments. These arguments are less convincing nowadays, with conservatism currently receiving less emphasis by accounting standard setters, the increasing length of settlement periods ("tails")

Only few loss reserves are reported discounted, the primary ones being settled workers' compensation claims and loss reserve for financial guarantee insurance.[14] The loss reserve is reported undiscounted also under SAP, but for tax purposes the reserve and related expense are discounted (see Section 1.6).

The overstatement of loss reserves due to the lack of discounting should increase with the time span between the incidence of a loss and the settlement of the claim (settlement period or "tail"). However, this may not always be the case. Nelson (2000) finds that the understatement of loss reserves relative to the subsequent payments increases with the length of the settlement period. That is, it appears that some insurers are effectively discounting the reserve for the time value of money by understating the undiscounted losses. In addition, because the uncertainty regarding ultimate losses increases with the settlement period (see below), the understatement of loss reserves due to minimum value measurement of equally-likely outcomes (FASB Interpretation No. 14) increases with the tail.

Numerous factors contribute to the inherent uncertainty in estimating loss reserves, and most of them are correlated with the tail. These include changes in the inflation rate for goods and services related to covered damages such as medical care and home repair costs; changes in the judicial interpretation of policy provisions relating to the determination of coverage; changes in the general attitude of juries in the determination of liability and damages; legislative actions; changes in the medical condition of claimants; changes in the estimates of the number and/or severity of claims that have been incurred but not reported as of the date of the financial statements; and changes in the claim handling procedures.

The "losses and loss expenses" reported in the income statement are equal to the periodic change in the loss reserve, plus payments during the year for claims and claim settlement expenses, minus the corresponding reinsurance recoveries (see Section 2.5). Equivalently, losses and loss expenses are equal to estimated costs to settle claims related to insurance coverage during the year, plus the change in the estimated cost to settle claims relating to insurance coverage in prior years, minus the corresponding reinsurance recoveries.

Loss Reserve Development Disclosure

Due to the large magnitude of the loss reserve, its discretionary nature and inherent uncertainty, and the incentives that managers have to manipulate it, PC insurers are required to provide detailed disclosures regarding loss reserving, including information on paid losses and adjustments made to previous reserve estimates for each of the previous nine years. This information can be used to evaluate the reliability of loss reserve estimates as well as to evaluate the length of the tail. For example, insurers that report reserve deficiency year after year are more likely to understate losses related to current coverage. Exhibit 2.2.1 presents an example of

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for some PC lines, and advances in modelling which facilitate better estimation of the amount and magnitude of future claim payments.

[14] Settled workers' companion claims are reported discounted because the amount and timing of the cash flows are known or estimable with reasonable precision. Effective January 1, 2009, insurers that provide financial guarantee coverage adopted SFAS 163 which requires the recognition of a loss reserve for the excess of the present value of expected net cash outflows to be paid under the insurance contract over the unearned premium revenue for that contract.

disclosures regarding loss reserve development. Ryan (2007) provides a detailed discussion of loss reserve analysis.

Exhibit 2.2.1: CNA Financial Corporation – 2008 Annual Report
Schedule of Loss Reserve Development

Calendar Year Ended (In millions)	1998	1999 (a)	2000	2001 (b)	2002 (c)	2003	2004	2005	2006	2007	2008
Originally reported gross reserves for unpaid claim and claim adjustment expenses	$ 28,506	$ 26,850	$ 26,510	$ 29,649	$ 25,719	$ 31,284	$ 31,204	$ 30,694	$ 29,459	$ 28,415	$ 27,475
Originally reported ceded recoverable	5,182	6,091	7,333	11,703	10,490	13,847	13,682	10,438	8,078	6,945	6,213
Originally reported net reserves for unpaid claim and claim adjustment expenses	$ 23,324	$ 20,759	$ 19,177	$ 17,946	$ 15,229	$ 17,437	$ 17,522	$ 20,256	$ 21,381	$ 21,470	$ 21,262
Cumulative net paid as of:											
One year later	$ 7,321	$ 6,547	$ 7,686	$ 5,981	$ 5,373	$ 4,382	$ 2,651	$ 3,442	$ 4,436	$ 4,308	$ -
Two years later	12,241	11,937	11,992	10,355	8,768	6,104	4,963	7,022	7,676	-	-
Three years later	16,020	15,256	15,291	12,954	9,747	7,780	7,825	9,620	-	-	-
Four years later	18,271	18,151	17,333	13,244	10,870	10,085	9,914	-	-	-	-
Five years later	20,779	19,686	17,775	13,922	12,814	11,834	-	-	-	-	-
Six years later	21,970	20,206	18,970	15,493	14,320	-	-	-	-	-	-
Seven years later	22,564	21,231	20,297	16,769	-	-	-	-	-	-	-
Eight years later	23,453	22,373	21,382	-	-	-	-	-	-	-	-
Nine years later	24,426	23,276	-	-	-	-	-	-	-	-	-
Ten years later	25,178	-	-	-	-	-	-	-	-	-	-
Net reserves re-estimated as of:											
End of initial year	$ 23,324	$ 20,759	$ 19,177	$ 17,946	$ 15,229	$ 17,437	$ 17,522	$ 20,256	$ 21,381	$ 21,470	$ 21,262
One year later	24,306	21,163	21,502	17,980	17,650	17,671	18,513	20,588	21,601	21,463	-
Two years later	24,134	23,217	21,555	20,533	18,248	19,120	19,044	20,975	21,706	-	-
Three years later	26,038	23,081	24,058	21,109	19,814	19,760	19,631	21,408	-	-	-
Four years later	25,711	25,590	24,587	22,547	20,384	20,425	20,212	-	-	-	-
Five years later	27,754	26,000	25,594	22,983	21,076	21,060	-	-	-	-	-
Six years later	28,078	26,625	26,023	23,603	21,769	-	-	-	-	-	-
Seven years later	28,437	27,009	26,585	24,267	-	-	-	-	-	-	-
Eight years later	28,705	27,541	27,207	-	-	-	-	-	-	-	-
Nine years later	29,211	28,035	-	-	-	-	-	-	-	-	-
Ten years later	29,674	-	-	-	-	-	-	-	-	-	-
Total net (deficiency) redundancy	$ (6,350)	$ (7,276)	$ (8,030)	$ (6,321)	$ (6,540)	$ (3,623)	$ (2,690)	$ (1,152)	$ (325)	$ 7	$ -
Reconciliation to gross re-estimated reserves:											
Net reserves re-estimated	$ 29,674	$ 28,035	$ 27,207	$ 24,267	$ 21,769	$ 21,060	$ 20,212	$ 21,408	$ 21,706	$ 21,463	$ -
Re-estimated ceded recoverable	8,178	10,673	11,458	16,965	16,313	14,709	13,576	10,935	8,622	7,277	-
Total gross re-estimated reserves	$ 37,852	$ 38,708	$ 38,665	$ 41,232	$ 38,082	$ 35,769	$ 33,788	$ 32,343	$ 30,328	$ 28,740	$ -
Net (deficiency) redundancy related to:											
Asbestos claims	$ (2,152)	$ (1,576)	$ (1,511)	$ (739)	$ (748)	$ (98)	$ (43)	$ (34)	$ (32)	$ (27)	$ -
Environmental claims	(616)	(616)	(559)	(212)	(207)	(134)	(134)	(83)	(84)	(83)	-
Total asbestos and environmental	(2,768)	(2,192)	(2,070)	(951)	(955)	(232)	(177)	(117)	(116)	(110)	-
Other claims	(3,582)	(5,084)	(5,960)	(5,370)	(5,585)	(3,391)	(2,513)	(1,035)	(209)	117	-
Total net (deficiency) redundancy	$ (6,350)	$ (7,276)	$ (8,030)	$ (6,321)	$ (6,540)	$ (3,623)	$ (2,690)	$ (1,152)	$ (325)	$ 7	$ -

In addition to the detailed loss reserve development schedule, insurers are required to provide in the notes to the financial statements a reconciliation of the total reserve for claim and claim adjustment expenses (i.e., the total of the PC loss reserve and any LH claim reserve). This disclosure summarizes information from the loss reserve development schedule and adds information about LH claim reserve development and the impact of any discounting. Exhibit 2.2.2 provides an example of such disclosures.

Exhibit 2.2.2: CNA Financial Corporation – 2008 Annual Report
Reconciliation of Claim and Claim Adjustment Expense Reserves

As of and for the years ended December 31 (In millions)	2008	2007	2006
Reserves, beginning of year:			
Gross	$ 28,588	$ 29,636	$ 30,938
Ceded	7,056	8,191	10,605
Net reserves, beginning of year	21,532	21,445	20,333
Net incurred claim and claim adjustment expenses:			
Provision for insured events of current year	5,193	4,939	4,840
(Decrease) increase in provision for insured events of prior years	(5)	231	361
Amortization of discount	123	120	121
Total net incurred (a)	5,311	5,290	5,322
Net payments attributable to:			
Current year events	1,034	867	835
Prior year events	4,328	4,447	3,439
Reinsurance recoverable against net reserve transferred under retroactive reinsurance agreements	(10)	(17)	(13)
Total net payments (b)	5,352	5,297	4,261
Foreign currency translation adjustment	(186)	94	51
Net reserves, end of year	21,305	21,532	21,445
Ceded reserves, end of year	6,288	7,056	8,191
Gross reserves, end of year	$ 27,593	$ 28,588	$ 29,636

Note that the reported reserves and related amounts in the claim reserve schedule (Exhibit 2.2.2) are different from the corresponding amounts in the loss reserve development schedule (Exhibit 2.2.1). For example, the "(decrease) increase in provision for insured events of prior years" in 2008 is ($5) million while the amount implied by the loss reserve development schedule is ($7). The following schedule, which is presented in the same footnote, explains that this difference is due to the inclusion of LH reserves.

Exhibit 2.2.3: CNA Financial Corporation – 2008 Annual Report
Reserve Development

Years ended December 31 (In millions)	2008	2007	2006
Asbestos and environmental pollution	$ 110	$ 7	$ -
Other	(117)	213	332
Property and casualty reserve development	(7)	220	332
Life reserve development in life company	2	11	29
Total	$ (5)	$ 231	$ 361

Loss Reserve Estimation Methods

PC insurers use various approaches to estimate the loss reserve. These methods rely on the premise that past experience, adjusted for the effects of current developments and likely trends, is an appropriate basis for predicting future outcomes. Most actuarial methods estimate ultimate losses for each cohort of claims such as an accident year/line component, and the cohort's loss reserve is calculated by subtracting the paid-to-date losses from the estimated ultimate losses. The overall loss reserve is calculated by summing the cohorts' loss reserves. The following is a description of the most common approaches for estimating ultimate losses for each cohort of claims.

Paid Loss Development Factor Method. This method is also called the **chain ladder method**. It assumes that the losses yet to emerge for an accident year are proportional to the cumulative losses paid so far. The basic premise is that cumulative paid losses for a given cohort of claims (e.g., accident year / product line) will grow in a stable, predictable pattern from year-to-year, based on the age of the cohort. Age-to-age growth factors, called "link ratios," are calculated based on the development of cumulative paid losses in prior years.

For example, if cumulative paid losses for a product line ABC for accident year 2007 were $1,200 as of December 31, 2007 (12 months after the start of that accident year) and then grew to $1,440 as of December 31, 2008 (24 months after the start), the link ratio for that accident year from 12 to 24 months would be 1.20. This link ratio may be used to project loss development for the current accident year. For example, if cumulative paid losses for accident year 2008 (the current year) were $1,500 as of December 31, 2008, we can project that overall losses will be $1,800 (1,500×1.2) and so estimate the loss reserve at $300. This calculation assumes that no further losses will be paid after 2009, and it uses one historical development (from year 2007 to 2008) to project future developments. A more accurate calculation can be obtained by also considering prior years. For example, if cumulative paid losses for accident year 2006 were $1,000 as of December 31, 2006, then grew to $1,300 as of December 31, 2007, and finally grew to $1,430 as of December 31, 2008, the 12-to-24 month link ratio may be projected to be 1.25 (average of 1.2 and 1.3) and the 24-to-36 month ratio may be projected to be 1.1. Accordingly, overall losses for accident year 2008 will be projected to be $2,062.5 (1,500×1.25×1.1).

Continuing with the above example, if additional losses are expected to be paid after 2010 (i.e., more than two years after the 2008 accident year), additional link ratios using prior year data would have to be calculated and applied. For example, if growth is expected to end at 60 months, then the ultimate indication for an accident year with cumulative losses at 12 months equals those losses times a 12-to-24 month link ratio, times a 24-to-36 month link ratio, times a 36-to-48 month link ratio, times a 48-to-60 month link ratio. The accuracy of the link ratios may be improved by (1) considering additional prior years, (2) assigning greater weights in measuring the link ratios to accident years with high claim frequency, (3) adjusting the link ratios for past and expected changes in loss experience, and (4) fitting a smooth pattern.[15]

[15] The time series of the link ratios is sometimes adjusted to fit a smooth pattern, typically an S-curve (called the S-curve method), which depicts an initial slow change followed by a rapid change and then ending in a slow change again (i.e., an "S" shaped line). The actuarial application of these curves fit the reported data to-date for a particular cohort of claims to an S-curve to project future activity for that cohort.

Case Incurred Loss Development Factor Method. This variant of the loss development factor method is based on the growth in cumulative case incurred losses (i.e., the sum of accident-year paid losses plus accident-year case reserves) rather than accident-year paid losses. The basic premise of the method is that cumulative case incurred losses for a given cohort of claims will grow in a stable, predictable pattern from year-to-year, based on the age of the cohort. For lines of business such as medical malpractice, in which it will likely be several years between the time a claim is incurred and when it is paid, there will be no paid losses in the earlier development periods of an accident year on which to base age-to-age factors. Therefore, for such lines of business it is more appropriate to use case-incurred losses when calculating age-to-age factors.

Reported Claim Development Method. This method is used to estimate ultimate claim counts for a given cohort of claims such as an accident year/product line component. If the reported-to-date counts are then subtracted from the estimated ultimate counts, the result is an indication of the "Incurred But Not Reported" (IBNR) counts. The approach is the same as the "loss development method," but based on the growth in cumulative claim counts rather than losses. The basic premise of the method is that cumulative claim counts for a given cohort of claims will grow in a stable, predictable pattern from year-to-year, based on the age of the cohort.

Frequency / Severity Value Method. This method is also called the **average value method** or **average cost per claim method**. Under this method, the loss reserve is calculated as the product of known or estimated ultimate claim counts and an estimate of the average cost per claim. Estimated ultimate claim counts are frequently based on a claim count development method (see above). Average claim costs are often estimated by fitting historical severity data to an observed trend. Generally, this method works best for high frequency, low severity classes of business, where ultimate claim counts are known or reliably estimable and average values are expected to be fairly predictable from one year to the next.

Expected Loss Ratio Method. This method uses loss ratios for prior accident years, adjusted to reflect recent loss trends, the current risk environment, changes in the book of business and changes in the pricing and underwriting, to determine the appropriate expected loss ratio for a given accident year. The expected loss ratio for each accident year is multiplied by the earned premiums for that year to calculate estimated ultimate losses.

Bornheutter-Ferguson Method. This method is a combination of an expected loss ratio method and the loss development factor method. It requires an estimate of the expected loss ratio for each accident year, the total premium for each accident year, and the expected loss development factors. Under this method, the loss reserve (A) is estimated by multiplying expected total losses under the expected loss ratio method (B) by the proportion of losses that has not been paid yet as estimated using the loss development method (C). Specifically, B = expected loss ratio × earned premium, C = 1 – 1 / the product of the remaining link ratios, and A = B × C. Ultimate losses are estimated as the total of losses incurred to date and the estimated reserve. The technique is most useful when actual reported losses for an accident year are a poor indicator of future incurred but not reported (IBNR) losses for the same accident year, as is often the case when there is a low frequency of loss but a very high potential severity.

Ground-up Analysis. Under this method, ultimate claim costs for a given cohort of claims such as an accident year / product line component are calculated by analyzing the exposure at an individual insured level and estimating the ultimate losses for those insureds using deterministic or stochastic scenarios and/or simulations. The total losses for the cohort are the sum of the

losses for each individual insured. In practice, the method is sometimes simplified by performing the individual insured analysis only for the larger insureds, with the costs for the smaller insureds estimated via sampling approaches (extrapolated to the rest of the smaller insured population) or aggregate approaches (using assumptions consistent with the ground-up larger insured analysis).

Academic Research on the Loss Reserve

Accounting issues related to PC insurers' loss reserves have been the focus of many studies. Academics and practitioners are interested in the reporting of loss reserves for various reasons, including the economic significance of the reserves, the substantial discretion involved in their measurement, the controversy regarding the accounting treatment (e.g., lack of discounting, reporting the minimum of equally-likely amounts), and, importantly, the disclosures of subsequent adjustments to loss reserve estimates which provide a unique opportunity for testing accounting errors and manipulations. This section reviews recent accounting studies that focus on the loss reserve or losses and loss expenses.

Summary of Studies

Accounting earnings are subject to estimation error. Under GAAP, corrections to estimates are included in current and future earnings, but characteristics of previous errors are not disclosed. An exception exists for PC insurers. SEC-mandated disclosures reveal errors in previous claim expense estimates as well as the correction for those errors in current earnings. An important issue is whether these detailed disclosures are value-relevant. **Anthony and Petroni (1997)** examine the information content of the disclosures by testing whether estimation errors in previous earnings influence the reflection of current earnings in price. Results suggest that investors use these disclosures in valuation decisions. Insurers with more variable estimation errors have smaller earnings response coefficients.

Beaver and McNichols (1998) examine characteristics and valuation of loss reserves of PC insurers. Using SEC disclosures of revisions (development) in loss reserve estimates, the authors document substantial serial correlation in loss reserve development, indicating that reported loss reserves do not fully reflect available information, consistent with management exercising discretion over reported loss reserves. They further find that loss reserve development reported one year after the balance sheet date has significant explanatory power for firm value incremental to book value of equity and earnings, suggesting investors at least partially identify management's influence on reported loss reserves, and adjust firm values accordingly.

Beaver and McNichols (2001) examine whether the stock prices of PC insurers fully reflect information contained in earnings, cash flows and accruals, focusing on one particular accrual – development of loss reserves. The loss reserve is a major accrual for PC insurers, requires substantial judgment, and is the subject of unique disclosures that reveal the ex post error in management estimates. The paper finds that investors underestimate the persistence of cash flows and overestimate the persistence of accruals for PC insurers, but the evidence suggests the market does not underestimate the persistence of the development accrual.

Beaver, McNichols, and Nelson (2000) examine whether PC insurance companies manage the loss reserve to influence investor expectations at the time of equity issuances. They estimate firms' discretionary behavior for several years prior to initial public offerings using reserve revisions (development). Based on a sample of 80 initial public offerings and 116 seasoned equity offerings between 1985 and 1997, the authors do not find evidence to support the hypothesis that managers opportunistically manage the loss reserve prior to equity offerings, although they do find evidence of loss reserve management, particularly by financially weak firms.

Beaver, McNichols, and Nelson (2003) document that PC insurers with small positive earnings understate loss reserves relative to insurers with small negative earnings. Furthermore, loss reserves are

managed across the entire distribution of earnings, with the most income-increasing reserve accruals reported by small profit firms, and the most income-decreasing reserve accruals reported by firms with the highest earnings. The authors analyze this pattern separately for public, private, and mutual companies, and find that public companies and mutuals manage loss reserves to avoid losses, but that private companies do not.

Black, Hyman, Silver, and Sage (2008) study defense costs for commercially insured personal injury tort claims in Texas over 1988-2004, and insurer reserves for those costs. Controlling for payouts, real defense costs in medical malpractice ("med mal") cases rise by 4.6 percent per year. The rate of increase is similar for legal fees and for other expenses. Real hourly rates for personal injury defense counsel are flat. Defense costs in med mal cases correlate strongly with payouts, with the stage at which a case is resolved, and with case duration. Mean duration declined over time. Med mal insurers predominantly use outside counsel. Case-level variation in initial expense reserves predicts a small fraction of actual defense costs. In other areas of tort litigation (auto, general commercial, multi-peril, and other professional liability), defense costs rose by 2.2 percent per year. Defense costs in these cases are predicted by the same factors as in med mal cases, plus the presence of multiple defendants. Insurer reserving practices raise some puzzles. Med mal insurers did not react to the sustained rise in defense costs by adjusting their expense reserves, either in real dollars or relative to reserves for payouts. Thus, expense reserves declined substantially relative to defense costs. In other litigation areas, expense reserves rose along with defense costs.

Gaver and Paterson (1999) investigate the extent to which property-casualty insurers select levels of loss reserves, net capital gains and net stock transactions to meet solvency and tax reporting goals, where insurer solvency is measured using Insurance Regulatory Information Systems (IRIS) ratios. They find that financially healthy insurers tend to overstate reserves in an attempt to reduce their tax liability.

State oversight of the insurance industry became the subject of intense congressional criticism as insurance firm failures escalated in the late 1980s. In particular, claims of possible manipulation of loss reserves were alleged. In response to these criticisms, the NAIC instituted a program for accrediting states that met certain standards aimed at improving the quality of the financial statement information reported by insurers domiciled within their borders. **Gaver and Paterson (2000)** investigate the association between the timing of state accreditation and the loss reserving practices of financially struggling insurers in the property-casualty industry. The results suggest that under-reserving by financially weak insurers declined in the post-accreditation period. This relation is apparent even after controlling for other influences on the reserve choice, such as tax goals and exogenous time-dependent effects. An interpretation is that improvements in insurer solvency monitoring related to accreditation are associated with a decrease in insurers' proclivities to use accounting discretion to circumvent regulatory oversight.

Gaver and Paterson (2001) examine the association between external monitoring and earnings management by PC insurers. Specifically, they investigate whether certain auditor-actuary pairs are associated with less understatement of the loss reserve account by financially struggling insurers. The data consist of loss adjustments reported by 465 PC insurers for reserves established in 1993. The results indicate that under-reserving by weak insurers is essentially eliminated when the firm uses auditors and actuaries that are both from Big Six accounting firms. In contrast, non-Big Six actuaries have less impact on underreserving by weak insurers. The quality usually associated with Big Six auditors falls when the audit firm relies on third party actuaries to evaluate the loss reserve estimates of struggling insurance clients. It appears that Big Six actuaries insist on more conservative loss reserve levels because, compared to actuarial consulting firms, they are more attuned to the liability exposure of the auditor.

Gaver and Paterson (2004) find that insurers manage loss reserves to avoid violating IRIS ratio bounds, which are used by regulators for solvency assessment. In their sample, almost two-thirds of the firms that would violate four or more IRIS ratios successfully adjust reserves to reduce the reported number of violations to less than four. This finding is significant because four violations usually trigger regulatory intervention. These results indicate that non-earnings goals are an important influence on discretionary accounting choice, and that reserve manipulation can postpone needed regulatory intervention, sometimes for an extended period.

Gaver and Paterson (2007) analyze the loss-reserving practices of 562 insurance companies in 1993 to assess the relation between client influence and auditor oversight. The authors find that financially struggling insurers tend to under-reserve, but this behavior is attenuated when the weak insurer is important to the local practice office of the auditor. This result holds across various measures of client influence and supports the contention of Reynolds and Francis (2001) that auditors allow less accounting discretion to their larger clients.

Gaver, Paterson, and Pacini (2008) examine the relation between the auditor liability standard in an insurance company's state of domicile and that insurer's loss reserve error. They hypothesize that when auditors face greater legal liability they will have less tolerance for loss reserve understatements by their insurance clients. To test this hypothesis, the authors analyze a sample of 3,279 loss reserve observations from 1993 through 1997. Consistent with Petroni (1992), the authors find that financially struggling insurers tend to under-reserve. This behavior is attenuated when the insurer is domiciled in a state which uses either the Restatement of Torts or the reasonable foreseeability standard to determine the auditor's liability to third parties. Compared to the case where the auditor's liability is defined by the legal concept of privity, these standards impose greater legal costs on auditors for ordinary negligence. The results suggest that auditors demand more conservative reporting when they face higher legal costs. They are inconsistent with the view that reputation concerns alone discipline auditors to apply uniformly stringent oversight to their insurance clients.

Grace and Leverty (2009) examine the effect of rate regulation on the management of the property-liability insurer loss reserve. The political cost hypothesis predicts that managers make accounting choices to reduce wealth transfers resulting from the regulatory process. Managers may understate reserves to justify lower rates to regulators. Alternatively, managers may have an incentive to report loss inflating discretionary reserves to reduce the cost of regulatory rate suppression. The authors find that insurers overstate reserves in the presence of stringent rate regulation. Investigating the impact along the conditional reserve error distribution, they discover that a majority of the response occurs from underreserving firms underreserving less because of stringent rate regulation.

Nelson (2000) examines whether the reported loss reserves of PC insurers contain an implicit discount for the time value of money. Reporting the present value of loss reserves enables insurers to justify competitive levels of insurance premiums to regulators. The evidence indicates that there is a positive and significant discount rate implicit in the relation between reported loss reserves and future claim payments. Moreover, insurers subject to relatively stringent rate regulation discount to a greater extent than do other insurers. The results also suggest that implicit discounting is distinct from solvency and tax motives to exercise discretion over the loss reserve.

Penalva (1998) investigates whether PC insurance companies exercise accounting discretion when reporting the claim loss reserve, in response to regulatory, tax, signaling, and financial reporting incentives. The loss reserve that would have been reported in the absence of managerial discretion is first modeled by using a latent variable technique, the Kalman filter. The results show that the proposed model achieves an 80% success rate in detecting reserve manipulation and its direction, and that it also has good predictive properties. In a second stage, the estimated discretionary component of the loss reserve is regressed on exogenous variables that proxy for the various incentives to exercise accounting discretion. The results of these tests indicate that financially weak insurers understate the loss reserve in order to avoid regulatory scrutiny. The incentive to appear solvent is quite strong and overpowers all the other incentives when firms are financially weak. Second, financially strong insurers overstate the loss reserve in order to pay lower taxes. Third, unlike financially weak insurers, strong insurers use the loss reserve to signal future profitability. Fourth, insurers understate the loss reserve, or overstate it less, in order to obtain more competitive rates from regulators and attract more business.

Petroni (1992) examines the response of managers of PC insurers to the differential costs and benefits of understating the liability for outstanding claim losses. The primary hypothesis is that the incentive to underestimate the liability is a decreasing function of the insurer's actual financial position. Empirical tests suggest that managers of financially weak insurers bias downward their estimates of claim loss reserves

relative to other insurers after controlling for exogenous economic factors. Evidence also reveals that managers of insurers 'close' to receiving regulatory attention understate reserve estimates to an even larger degree.

Petroni and Beasley (1996) examine the accuracy and bias in the accounting estimate of claim loss reserves of 197 PC insurers (985 insurer-years) during 1979-83. The authors also test for differences in accuracy and bias as a function of the size of the insurer's auditing firm. The accuracy of a reported reserve is defined as the absolute magnitude of the difference between the reported reserve and its ex-post realized value, while bias is defined as the signed difference between the reported reserve and its ex post realized value. Both accuracy and bias are evaluated relative to total assets and net premiums. The authors demonstrate that claim loss reserve estimation errors in audited accounting information exceed materiality thresholds in over 90% of the sample. For errors that exceed materiality the average absolute error is over 8% of assets. The magnitude of the error reflects both audit judgment and the high level of uncertainty inherent in the estimate.

Petroni, Ryan, and Wahlen (2000) develop and estimate a PC-industry specific model in which proxies for both discretion and non-discretion are used to partition loss reserve revisions into discretionary and non-discretionary components. They find that discretionary revisions are negatively associated with future profitability, positively associated with firm risk, and negatively associated with market-to-book ratios, and that non-discretionary revisions are positively associated with future profitability and risk but are not associated with market-to-book ratios.

Liability for Future Policy Benefits

A liability for future policy benefits is recognized with respect to LH coverage. It represents the present value of future benefits to be paid to or on behalf of policyholders, including related expenses, less the present value of expected future net premiums. **Net premiums** are calculated by subtracting from each gross premium payment an estimate of the embedded underwriting profit, that is, net premiums are equal to the portion of gross premiums required to provide for all benefits and expenses. Future benefit and expense payments are estimated based on assumptions regarding expected mortality, morbidity, terminations and expenses, applicable at the time the insurance contracts are made. The **discount rate** is the net investment yield that the insurer expects to earn on the premiums at the inception of the contract; it is estimated considering actual yields, trends in yields, portfolio mix and maturities, and investment expenses.

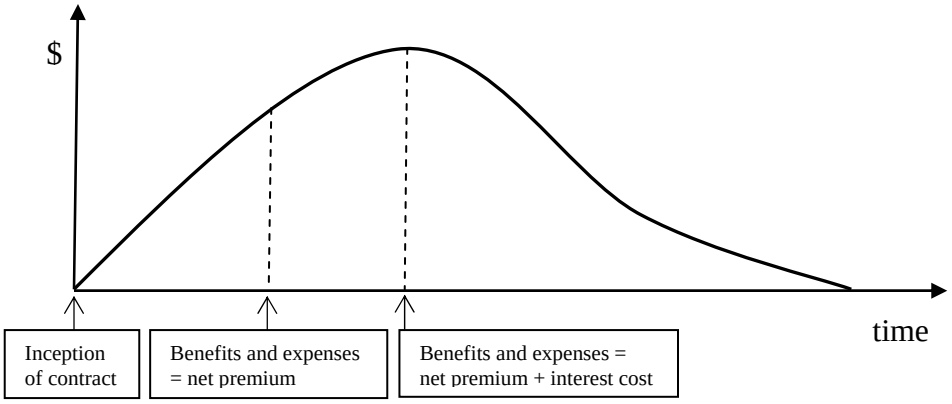
The liability for future policy benefits also includes a **provision for the risk of adverse deviation**. The risk of adverse deviation allows for possible unfavorable deviations from assumptions regarding investment yields, mortality, morbidity, terminations, expenses, and other assumptions used in calculating the liability. This concept is referred to as **risk load** when used by PC insurers.

At the inception of the contract—before any premium is received—the present value of the net premiums is equal to the present value of the benefits and expenses, where the "best-estimate assumptions" are changed to incorporate the risk of adverse deviation. For example, expected gross premiums are reduced for the risk of unexpected terminations or mortality, expected benefits and expenses are increased or shifted closer for the risk of unexpected or early payments, and the discount rate is reduced to allow for unexpectedly low investment returns. The net premiums are then calculated by reducing the gross premiums to the amounts that result in the present value equality.

Original assumptions are used in subsequent accounting periods to measure the liability for future policy benefits (referred to as the "**lock-in concept**"), unless a premium deficiency exists. Each period, expected net premiums, benefits and expenses for the period are dropped

from the present value calculation, and the present value is recalculated with all remaining cash flows becoming one period closer. Because expected net premiums are larger than expected benefits and expenses in the early years of most life insurance policies, the liability (which is initially zero) increases over time. The liability continues to increase even when payments for benefits and expenses exceed the net premiums as long as that excess is smaller than the interest cost component (the increase in the present value of expected net payments due to the passage of time). However, from some point on, the excess of the benefits and expenses over the net premiums becomes larger than the interest cost and the liability starts to decline. Exhibit 2.2.4 demonstrates this pattern.

Exhibit 2.2.4: Liability for Future Policy Benefits over Time



A **premium deficiency** is recognized if there is a probable loss on a block of insurance contracts, grouped consistent with how policies are marketed, serviced, and measured. A loss may result from unfavorable actual experience with respect to investment yields, mortality, morbidity, terminations or expenses, or from changes in expectations regarding future levels of these factors. A premium deficiency is calculated as the excess of the revised estimate of the liability over the difference between the recognized liability and deferred policy acquisition costs, where the revised liability is derived using assumptions that reflect current estimates of investment yields, mortality, morbidity, terminations and expenses. Unlike the original liability, the revised liability does not include a provision for the risk of adverse deviation, and it is calculated by discounting gross, not net, premiums.

The rationale of the premium deficiency calculation is that the revised liability represents the net ***economic*** cost associated with the block of insurance contracts, while the difference between the recognized liability and deferred policy acquisition costs represents the net ***recognized*** cost (DAC represent costs incurred in acquiring the policies that have not yet been recognized). A probable loss exists if the expected economic cost is greater than the net recognized cost. Such losses should be uncommon due to two provisions in the premium deficiency calculation, which reduce the revised liability compared to the recognized one: the revised liability does not include a provision for the risk of adverse deviation, and the discounted future benefits are reduced by the gross, not net, premiums. Thus, premium deficiencies are recognized only for blocks that suffer a substantial decline in profitability.

A premium deficiency is charged to income, with a corresponding reduction in DAC or an increase in the liability for future policy benefits. If a premium deficiency does occur, subsequent measurements of the liability are based on the revised assumptions. Insurers are required to periodically evaluate whether there is a premium deficiency.

Insurers have substantial discretion in recognizing premium deficiency. The criteria regarding when and how deficiency should be tested and measured leave much space for interpretation, which some insurers may exploit to manipulate income. For example, due to offsetting within blocks, grouping many policies in conducting deficiency evaluation reduces the likelihood and expected amount of deficiency compared to using small blocks. Moreover, to measure the deficiency, the insurer has to re-estimate all the inputs to the reserve calculation discussed above (except the provision for adverse risk deviation), which are highly discretionary. Again, some insurers might exploit this flexibility to manipulate income.

The **policyholders' benefits expense** is calculated as the total of benefit payments during the period and the change in the liability for future policy benefits. Unlike PC reserves, which generally measure undiscounted amounts, the liability for future policy benefits reports the present value of future payments, which implies that changes in the liability are also due to interest cost. That is, the policyholders' benefits expense includes an interest charge on the beginning-of-year liability in addition to the cost of insurance coverage for the year.

The above discussion describes the basic accounting treatment for the liability for future policy benefits and the related expense. In practice, there are some implementation and reporting differences across products and companies. For example, for traditional participating life insurance products, insurers calculate the liability for future policy benefits using the mortality and interest rate assumptions applied in calculating the policies' guaranteed cash surrender values. In addition, the reported liability for future policy benefits often includes liabilities for guaranteed benefits related to nontraditional life and annuity contracts (discussed below) and certain unearned revenues. Some LH insurers include in the liability for future policy benefits the liability for unpaid claims and claim adjustment expenses.

As discussed in Section 2.7 below, variable annuity contracts for which investment income and investment gains and losses accrue directly to, and investment risk is borne by, the contractholder, are reported as a separate account liability. However, insurers often provide various guarantees to variable annuity contractholders, and obligations under these guarantees are generally included in the liability for future policy benefits. For example, an insurer may guarantee a value of no less than total deposits made to the contract less any partial withdrawals, or total deposits less any partial withdrawals plus a minimum return, or the highest contract value on specified dates minus any withdrawals. These guarantees may relate to benefits that are payable in the event of death (**guaranteed minimum death benefits** or "GMDB"), annuitization (**guaranteed minimum income benefits** or "GMIB"), at specified dates during the accumulation period (**guaranteed minimum accumulation benefits** or "GMAB"), or at withdrawal (**guaranteed minimum withdrawal benefits** or "GMWB"). In addition, some variable life, variable universal life and universal life contracts guarantee to the contractholder a death benefit even when there is insufficient value to cover monthly mortality and expense charges, whereas otherwise the contract would typically lapse ("**no lapse guarantee**").

Liabilities for the above guarantees, which are generally included in the liability for future policy benefits, are measured and accounted for as follows. GMDB and GMIB liabilities

are measured by accruing expected payments under these guarantees, with the related changes in the liabilities included in policyholders' benefits expense. In contrast, GMAB, GMWB and similar guarantees are considered embedded derivatives that require bifurcation under SFAS No. 133 and are recorded at fair value. Changes in the fair value of these derivatives, along with any related fees, are recorded in realized investment gains (losses).

Policyholder Account Balances

Policyholder account balances represent an accumulation of account deposits plus credited interest less withdrawals, expenses and mortality charges (when applicable). This liability account also includes amounts that have been assessed to compensate the insurer for services to be performed over future periods, and any amounts previously assessed against policyholders that are refundable on termination of the contract. Policyholder accounts are primarily associated with universal life policies and general account investment products. Also included in this liability are policyholder dividends due and unpaid on participating policies and policyholder dividends left on deposit. Policyholder account balances exclude annuities with life contingencies (included in the liability for future policy benefits) and separate accounts variable life and annuities (reported as separate account liabilities).

IFRS for Insurance Reserves

Accounting for insurance contracts under the international standard is prescribed by IFRS 4, which is an interim standard pending completion of the insurance project currently undertaken by the IASB and FASB. IFRS 4 permits a wide variety of accounting practices for insurance contracts. In effect, it allows companies to continue to use the previous (country-specific) accounting principles, subject to some adjustments. The primary provisions of IFRS 4 are discussed next.

IFRS 4 applies to virtually all insurance and reinsurance contracts, whether written by a registered insurer or not. This is in contrast to US GAAP which generally applies to insurers only. IFRS 4 defines an insurance contract as "a contract under which one party (the insurer) accepts significant insurance risk from another party (the policyholder) by agreeing to compensate the policyholder if a specified uncertain event (the insured event) adversely affects the policyholder." This definition focuses on the substance of the economic transaction rather than its legal form. Similar to US GAAP, this definition means that certain financial reinsurance contracts and policies with a low degree of risk transfer (e.g. certain finite risk contracts) do not meet the definition of insurance contracts and should therefore be accounted for as deposits.

IFRS 4 requires some contracts that have investment and insurance features to be unbundled and accounted for separately, with the investment component accounted for as a deposit. These include certain multi-year reinsurance contracts linked to an experience account and other, primarily financial reinsurance contracts.[16] Similarly, IFRS 4 requires that some embedded derivatives, including life products offering a guarantee of minimum equity returns on surrender or maturity, be reported at fair value with value changes recorded in the income statement. However, embedded derivatives that are themselves insurance contracts, including

[16] Financial reinsurance is the combination of financing and reinsuring insured losses. Financial reinsurance contracts limit reinsurance coverage and are accordingly often referred to as finite-risk reinsurance.

guaranteed annuity options (GAOs) and guaranteed minimum death benefits (GMDBs), are excluded from this requirement.

Additional recognition requirements of IFRS 4 include: (1) prohibition on recognizing provisions for possible claims under contracts that are not in existence at the reporting date (such as catastrophe and equalization provisions); (2) test for the adequacy of recognized insurance liabilities and for impairment of reinsurance assets; (3) prohibition on derecognition of insurance liabilities before they are discharged, cancelled, or expired; (4) disallowing the offsetting of insurance liabilities against related reinsurance assets, and the offsetting of expense or income from reinsurance contracts against the income or expense, respectively, from the related insurance contract.

With respect to the initial adoption of IFRS, except the above requirements, IFRS 4 permits insurers to change their accounting policies for insurance contracts only if the changes are expected to improve the usefulness of financial information. In addition, the standard specifies some practices—such as reporting insurance liabilities undiscounted—that are allowed if they were used prior to the adoption of IFRS 4, but cannot be adopted subsequently.

IFRS 4 requires detailed quantitative and qualitative information to help users understand the amounts in the insurer's financial statements and the risks that arise from insurance contracts, including disclosures regarding accounting policies, the most significant assumptions, risk management objectives and policies, and terms and conditions of insurance contracts that have a material effect on the amount, timing, and uncertainty of the insurer's future cash flows.

Proposed IASB and FASB Standards

As discussed above, the IASB and FASB are currently developing new standards for insurance contracts. The FASB joined the IASB project, but the two Boards are expected to issue separate standards, which are not likely to be identical. On September 17, 2010, the FASB issued a Discussion Paper, *Preliminary Views on Insurance Contracts.* The Discussion Paper (DP) includes a comparison of the IASB's Exposure Draft, *Insurance Contracts* (issued July 30, 2010), the FASB's preliminary views, and current US GAAP. Exhibit 2.2.5 presents a summary of the primary differences between the two proposals and current US GAAP. This summary follows a similar format to that of the comparison provided in the appendix of the DP, but it is more concise and includes some interpretation. Subsequent sections of this monograph—particularly 2.3 and 2.4—elaborate on current US GAAP.

Exhibit 2.2.5: Comparison of Alternative Accounting Methods for Insurance Liabilities

Item	Current US GAAP	IASB's Exposure Draft	FASB's Preliminary Views
Scope	• Insurance contracts written by insurance entities	• Insurance contracts written by all companies • Investment contracts containing a discretionary participation feature	• Insurance contracts written by all companies
Scope exceptions	• None stated explicitly	• Some items that may meet the definition of insurance contracts such as product warranties and pension plans	• Similar to IASB, but not identical exclusions

Item	Current US GAAP	IASB's Exposure Draft	FASB's Preliminary Views
Insurance contract benefit	• Indemnification	• Compensation (broader notion than indemnification)	• Same as IASB
Contract boundary	• The period over which the contract is expected to remain in force	• Through the point at which the insurer is no longer required to provide coverage or has the right or practical ability to reassess the risk of the particular policyholder and can set a price that fully reflects that risk	• Same as IASB
Unbundling	• Some embedded derivatives	• Any component that is not closely related to the insurance coverage specified in a contract (broader notion)	• Same as IASB
Valuation approach	• Entity-specific inputs	• Primarily entity-specific inputs, but market inputs should be used for market-related variables such as expected inflation (this is different from the 2007 discussion paper which emphasized fair value)	• Similar but not identical to IASB
Expected cash flows	• Single "best estimate"	• Probability-weighted, based on scenario analysis	• Same as IASB
Revisions to expected cash flows	• Only when there is premium deficiency	• Updated each period, with the impact of the change on the present value of the cash flows recognized in income	• Same as IASB
Discounting	• Short-duration: generally undiscounted • Long-duration: discounted	• Discounted	• Same as IASB
Discount rate	• Based on the estimated investment yields (net of related investment expenses) expected at the contract issue • Because investment yields are higher for risky investments, this approach indirectly incorporates an important determinant of own risk in the discounting of liabilities	• Based on the yield curve for risk free investments, with an adjustment for illiquidity (e.g., Treasury bonds can be sold at will but most insurance policies are illiquid) • May be adjusted to reflect the expected return on the assets backing the liabilities only if the amount owed depends on that return • Adjusted each period to reflect current rates, with the impact of the change on the present value of the cash flows recognized in income • There is no consideration of own risk in the measurement of insurance liabilities	• Same as IASB

Item	Current US GAAP	IASB's Exposure Draft	FASB's Preliminary Views
Composite margin	• Concept does not exist	• Concept does not exist • IASB's risk adjustment and residual margin building blocks, whose total at inception is equal to the FASB's composite margin, are accounted for differently (see discussion below)	• Measured as the difference between the present value of cash inflows and outflows • Included in the insurance contract liability • Recognized in income over time in proportion to the ratio of incurred versus total (premiums + claims + benefits)
Risk adjustment	• Concept does not exist • The provision for adverse risk deviation allows for possible unfavorable deviations from assumptions, not for the pricing of uncertainty • The provision for adverse risk deviation is locked in at inception	• Measures the increase in insurance liabilities to reflect the pricing (from the insurer's perspective) of uncertainty regarding the amount and timing of future cash flows • Three methods are allowed for measuring the risk adjustment: VaR, expected shortfall, and cost of capital (see discussion in Section 1.7) • The risk adjustment is estimated at the portfolio level, so diversification should reduce it • The risk adjustment is updated each period with changes recognized in income • The risk adjustment should generally decline over time as cash flows are collected and paid, the duration of remaining cash flows decline, and relevant information accumulates	• Part of the composite margin
Residual margin	• Concept does not exist	• The excess of the difference between the present value of cash inflows and outflows over the risk adjustment • The residual margin is recognized in income in proportion to the coverage provided, using either straight line or based on the timing of expected claims • Unlike the other three "building blocks," this component is not remeasured each period to reflect current estimates • The residual margin is accreted interest each period using the initial discount rate	• Part of the composite margin

Item	Current US GAAP	IASB's Exposure Draft	FASB's Preliminary Views
Day one gain	• Deferred • For short duration contracts, the day one gain is generally included in the "unearned premiums" liability • For long duration contracts, the gain is deferred by reducing the premiums used in measuring the liability for future policy benefits (the liability for future policy benefits is reduced by the present value of expected "net premiums," where the difference between gross and net premiums reflects the day one gain) • The gain is generally recognized in income over time in proportion to premium revenue	• Reflected in the initial balance of the residual margin • Deferred, and recognized over the coverage period (see "residual margin" above)	• Included in the composite margin • Deferred, and recognized over time as the composite margin is recognized in income
Day one loss	• Theoretically, a premium deficiency can be recognized at inception	• Recognized immediately	• Recognized immediately, but not likely to occur because there is no separate recognition of risk adjustment
Deferred Acquisition Costs (DAC)	• Acquisition costs are the costs incurred that vary with and are primarily related to the acquisition of new and renewal insurance contracts. • New standard will reduce the amount deferred (see Section 2.4 below)	• Narrower definition • Only those costs that are incremental – that is, would not have been incurred if the insurer had not issued the contract • Costs are identified at the level of an individual insurance contract rather than at the level of a portfolio of insurance contracts	• Same as IASB
DAC reporting	• Amortizable asset	• Included in the cash outflows used to measure the insurance contract	• Same as IASB
Income statement presentation	• Net premiums earned, benefit and claim expenses, and DAC amortization	• Margin presentation: a. Change in the risk adjustment margin b. Recognition of residual margin c. Experience adjustment (the difference between the actual cash flows for the current period and previous estimates) d. Changes in estimates of future cash flows e. Accretion of interest on insurance liabilities	• Similar to IASB, but alternative methods are still under consideration

Item	Current US GAAP	IASB's Exposure Draft	FASB's Preliminary Views
Short-duration contracts - definition	• The period of short duration is not explicitly defined, but in practice it is usually one year or less	• One year or less, and no significant embedded options remaining after unbundling	• Not explicitly considered (yet)
Short-duration contracts – accounting	• Some similarities to the IASB proposal, including: - Projected cash outflows do not affect reported amounts as long as there is no premium deficiency - Unearned revenue is recognized in income in proportion to the coverage provided, typically straight line - The premium earned each period is reported as revenue - Claims and expenses and DAC amortization are reported as separate expenses	• Simplified measurement as described below • Projected cash outflows for future claims do not affect reported amounts as long as the contract is not considered onerous • The present value of the premiums is recognized as revenue in proportion to the coverage provided, using either straight line or based on the timing of expected claims • DAC is amortized using the same pattern as premium recognition • The reported preclaims liability is initially equal to premium received less DAC, and subsequently adjusted for premium collections (+), premium recognition (-), DAC amortization (+), and accreted interest (+) • Interest on the preclaims liability is accreted at the current rate • Incurred claims are measured at the present value of the fulfillment cash flows using the building block model (including the risk adjustment), as for all other insurance contracts. • An additional liability and expense are recognized if the contract is onerous, that is, if the present value of fulfillment cash flows (including the risk adjustment) exceeds the carrying amount of the preclaims obligation • The following items are reported separately in the income statement: premium revenue (determined as the gross amount of the preclaims obligation earned in the current period), claims and expenses incurred, and amortization of DAC	• NA

2.3 Revenue and Related Accruals

This section describes revenue recognition policies and revenue-related balance sheet accruals.

Revenue Recognition Policies

The accounting treatment for traditional insurance policies depends on their duration, with different revenue recognition methods used for short- and long-duration contracts. These principles are prescribed by SFAS 60. Accounting principles for nontraditional insurance policies and investment contracts are provided primarily in SFAS 97. I next describe revenue recognition practices by product line.

Property and Casualty, Nonguaranteed Short Term Life, and Health and Disability Contracts

These contracts are generally considered short-duration and are accordingly accounted for as follows. Premiums are recognized as revenue in proportion to the amount of insurance protection provided, which in most cases entails straight line recognition over the contract period. However, for some contracts the amount of protection provided varies over the contract term, or the period of risk differs from the contract period. For example, for financial guarantee contracts the amount of insurance protection often declines according to a predetermined schedule. In such cases, premiums are recognized as revenue over the period of risk in proportion to the amount of insurance protection provided.[17]

If premiums are subject to adjustment (for example, retrospectively rated insurance contracts for which the premium is determined based on claim experience), the estimated ultimate premium is recognized as revenue over the period of the contract. If the ultimate premium cannot be reasonably estimated, the cost recovery method or the deposit method may be used until the ultimate premium becomes reasonably estimable.

Traditional Life (Other than Unguaranteed Short Term), Some Annuities With life contingencies, and Title Insurance

Premiums from these contracts are generally recognized as revenue when due from policyholders. When premiums are due over a significantly shorter period than the period over which benefits are provided, a portion of the profit is deferred and recognized over subsequent periods. The amount deferred and the subsequent recognition pattern is in constant relationship to insurance in-force or, for annuities, the amount of expected future policy benefit payments.

[17] Effective 2009 (SFAS 163), the accounting treatment for financial guarantee coverage is as follows. Unearned premiums for both upfront and installment paying transactions are recognized on the balance sheet at inception. Installment unearned premiums are measured using: (1) the present value of future contractual premiums due or, (2) if the underlying insured obligation is a homogenous pool of assets which are contractually pre-payable (e.g., RMBS securities), the present value of premiums expected to be collected over the life of the transaction. Premium revenue for each reporting period is determined by multiplying the insured principal amount outstanding for that period by the ratio of (a) the total present value of the premium due or expected to be collected over the period of the contract to (b) the sum of all insured principal amounts outstanding during each reporting period over the period of the contract (either contract period or expected period). For installment paying policies, the accretion discount—that is, the difference between the undiscounted installment premiums and the present value of installment premiums—is also recognized in income each period.

Investment and Universal Life-Type Contracts

For investment contracts (including deferred annuities) and universal life-type policies, the amounts collected from policyholders are considered deposits and are not included in revenue. Instead, general account deposits are credited to policyholders' account balances, and separate account investments (most variable life and annuities) are credited to separate account liabilities. Fee income for universal life-type contracts consists of charges for policy administration, cost of insurance charges for mortality, and surrender charges assessed against policyholders' account balances. Revenues from annuities consist of surrender charges, mortality and expense risk charges, administration fees, and other fees for various benefit guarantees. These charges are recognized as revenue in the period in which services are provided. Investment management fees for AUM and separate account assets are recognized when earned.

Net Investment Income and Realized Gains and Losses

As discussed in Section 2.1, investment income is a primary source of revenue for most insurers. The recognition principles for net investment income and realized gains and losses are discussed in the investment assets section (2.6) below.

Other Revenues

Advisory fees, broker-dealer commissions and fees, and administrative service fees are recognized in the period in which services are performed.

Revenue-Related Accruals

Recognized premium revenue—referred to as "**net premiums earned**"—is equal to the difference between premiums earned, measured as discussed above, and premiums that have been ceded to reinsurers for coverage that expired during the period. Premiums earned is equal to premiums written during the period minus the change in unearned premium, where **unearned premiums** is a liability account representing premiums written that have not been earned yet. Similarly, ceded premiums that expired during the period is equal to the difference between premiums paid to reinsurance during the period and the change in prepaid reinsurance premiums, where **prepaid reinsurance premiums** is an asset account representing amounts paid to reinsurers for future coverage.

Other revenue-related accruals, which are typically small in magnitude, are premiums receivable (an asset), reinsurance payable (a liability), and unearned fee revenue (a liability). **Premiums receivable** represents amounts due from insureds. It is reported net of allowance for doubtful accounts, and is often aggregated on the balance sheet with agents' balances and other accounts receivable. **Reinsurance payable** represents amounts owed to reinsurers. **Unearned fee revenue** measures contract charges for services to be provided in future periods.

2.4 Deferred Policy Acquisition Costs and Related Expenses

Deferred policy acquisition costs (**DAC**) are incurred in connection with acquiring or renewing insurance policies. They are comprised of the costs necessary to sell and issue a policy such as broker and agent commissions, underwriters' salaries and benefits, and inspection and examination costs. Under GAAP, DAC should only include costs that vary with and are directly related to the acquisition of the policies, but in practice insurers also capitalize some fixed costs. In addition, there is significant diversity in the identification and measurement of DAC across insurers. As discussed below, in October 2010 the FASB issued a standard that addresses both issues.

DAC are paid early in the policy term while the benefits—premiums revenue—are realized over the policy term. Under the GAAP matching concept, costs are expensed in the same period in which the corresponding revenue is earned. Therefore, DAC is reported as an asset and amortized over the estimated life of the policy.[18] In contrast, costs that do not vary with and are not primarily related to the acquisition of new and renewal insurance contracts—such as those relating to investment management, general administration, and policy maintenance—are charged to expense as incurred. In addition, DAC related to internally replaced contracts is immediately written off to expense and any new deferrable expenses associated with the replacement are deferred if the contract modification substantially changes the contract. However, if the contract modification does not substantially change the contract, the existing DAC asset remains in place and any acquisition costs associated with the modification are immediately expensed.

PC companies typically issue 6 month or 12 month policies, and so their DAC represent a small portion of assets on the balance sheet (about 2% of total assets; see Table 2.1.1). In contrast, life insurance companies issue policies that are expected to remain in force for many years, and so their DAC typically represent a significant portion of reported assets (about 4% of total assets or 6% of adjusted total assets; see Tables 2.1.1 and 2.1.2 above). Still, DAC amortization as a percentage of revenue is more than twice as large for PC insurers compared to LH insurers (10% compared to 4%; see Table 2.1.5). These statistics suggest that average DAC duration is significantly longer for PC insurers. This is confirmed in Table 2.4.1 below, which reports average DAC remaining life, estimated using the ratio of DAC to DAC amortization.[19]

Table 2.4.1: DAC Remaining Life Estimates

	All	LH	PC	ML	Re	IB
Average DAC duration	2.7	10.9	0.8	2.7	1.7	NA

The table presents time series averages (1999-2009) of the aggregate ratio of DAC to DAC amortization.

LH insurers often report the DAC asset combined with an intangible asset called Value of Business Acquired (VOBA) or "present value of future profits." **VOBA** reflects the estimated

[18] As discussed in Section 1.5, a major difference between GAAP and SAP is that under SAP acquisition costs are expensed as incurred.

[19] For LH, this estimate may contain substantial error since the amortization of DAC related to most LH contracts is non-linear (see discussion below).

fair value of in-force contracts in a life insurance company acquisition, that is, the value of the right to receive future cash flows from the business in-force. VOBA is based on actuarially determined projections, by each block of business, of future policy and contract charges, premiums, mortality and morbidity, separate account performance, surrenders, operating expenses, investment returns and other factors.

Accounting for the amortization of DAC and VOBA is rather complicated. Four alternative methods are used, depending on the type of underlying policies:

- DAC for most PC policies, nonguaranteed short duration term life policies, and health and disability contracts is amortized in proportion to the premium revenue recognized, which is generally on a straight line basis over the applicable contract term or reinsurance treaty.
- DAC and VOBA related to long duration traditional life contracts (e.g., guaranteed renewable term insurance, whole life insurance) is amortized over the premium paying period in proportion to the present value of actual and expected future gross premiums. The present value of expected premiums is based upon the premium requirement of each policy and assumptions for mortality, morbidity, persistency, and investment returns at policy issuance or acquisition that include provisions for adverse deviation and are consistent with the assumptions used to calculate the liability for future policyholder benefit. These assumptions are not revised after policy issuance or acquisition unless the DAC or VOBA balance is deemed to be unrecoverable from future expected profits. Absent a premium deficiency, variability in amortization after policy issuance or acquisition is caused only by variability in premium volumes.
- DAC and VOBA related to universal life, deferred annuity contracts, and other investment-type products are amortized through earnings in proportion to the present value of estimated gross profits (**EGPs**) from projected investment, mortality and expense margins, and surrender charges over the estimated lives of the contracts. Significant assumptions in the development of EGPs include investment returns, surrender and lapse rates, rider utilization, interest spreads, and mortality margins. The present value is calculated using the interest rate that accrues to policyholder balances. The amortization is reduced by imputed interest on the DAC or VOBA balance based on rates in effect at inception or acquisition of the contracts. The EGPs are updated each period, and the cumulative DAC and VOBA amortization is re-estimated and adjusted by a cumulative charge or credit to current income.
- DAC and VOBA related to participating, dividend-paying traditional contracts are accounted for similarly to the EGF approach discussed above, except that (1) gross margins are used instead of gross profits (unlike gross profits, gross margins are net of policyholder dividends), and (2) the discount rate used is the expected investment return rather than the credited rate.

In addition to periodic amortization, DAC may be written down due to a **premium deficiency**. For short duration contracts, a premium deficiency is recognized if the expected cost of future coverage exceeds the related unearned premiums, where the cost of future coverage includes future losses, future dividends to policyholders, unamortized acquisition costs, and future maintenance costs. Premium deficiencies of short duration policies are first charged to DAC and then, if there is still a deficiency, are recognized as an additional liability. For long-duration contract, insurers have the option of accruing any premium deficiency as additional

liability instead of recognizing DAC impairment. The calculation of premium deficiency for long-duration contracts is discussed in the Section 2.3.

The guidance on deferred acquisition costs under IFRS (IFRS 4) is limited and is subject to significant judgment. IFRS neither prohibits nor requires the deferral of acquisition costs, nor does it prescribe which acquisition costs are deferrable, the period and method of their amortization, or whether an insurer should present deferred acquisition costs as an asset or as a reduction in insurance liabilities. Thus, the US accounting treatment of acquisition costs—that is, deferral as an asset and subsequent amortization—is allowed under current IFRS. This is likely to change when Phase II of the IASB insurance project is completed, as discussed in Section 2.2.

Accounting quality abuses related to DAC include the capitalization of operating expenses as DAC, insufficient amortization of DAC (for example, by overstating the persistence rate of life insurance policies), and failure to write down DAC when there is a premium deficiency. All three forms of manipulation increase equity and, for growing insurers, increase income. For example, in AAER No. 2413, the SEC alleges that three officers of New England Financial (NEF), an insurance subsidiary of MetLife, engaged in a scheme to hide certain NEF expenses in an effort to make NEF appear more efficient than it actually was. The complaint alleges that the defendants hid certain non-commission expenses by reclassifying them as commission expenses in NEF's internal books and records. This scheme resulted in the improper reclassification of over $100 million in NEF expenses as DAC, the direct result of which was the publication of materially false overstatements of MetLife and NEF net income in financial statements filed with the Commission from 2000 to 2003.

In October 2010, the FASB issued an update regarding "Accounting for Costs Associated with Acquiring or Renewing Insurance Contracts." This update addresses the diversity in practice regarding the interpretation of which costs relating to the acquisition of new or renewal insurance contracts qualify for deferral. The following acquisition costs should be capitalized if they relate directly to the successful acquisition of new or renewal insurance contracts:

- Incremental direct costs of contract acquisition, that is, costs to acquire an insurance contract that have both of the following characteristics: they result directly from and are essential to the contract transaction(s), and they would not have been incurred by the insurance entity had the contract transaction(s) not occurred.
- The portion of the employee's total compensation (excluding any compensation that is capitalized as incremental direct costs of contract acquisition) and payroll-related fringe benefits related directly to time spent performing any of the following acquisition activities for a contract that actually has been acquired: underwriting, policy issuance and processing, medical and inspection, and sales force contract selling.
- Other costs related directly to the insurer's acquisition activities in (b) that would not have been incurred by the insurance entity had the acquisition contract transaction(s) not occurred.
- Advertising costs that meet the capitalization criteria in the direct-response advertising guidance.

This standard will generally apply starting fiscal year 2012.

2.5 Reinsurance

Reinsurance contracts that indemnify the ceding enterprise against loss or liability relating to insurance risk are accounted for using reinsurance accounting. Other contracts with reinsurers are generally accounted for as deposits. Reinsurance contracts indemnify the ceding enterprise against loss or liability relating to insurance risk if there is a reasonable possibility that the reinsurer may realize significant loss from assuming insurance risk. However, if substantially all of the insurance risk relating to the reinsured portions of the underlying insurance contracts has been assumed by the reinsurer, the transaction should be accounted for using reinsurance accounting even if the reinsurer is not exposed to a reasonable possibility of significant loss.

Making the determination of whether the reinsurer is exposed to the reasonable possibility of significant loss requires an understanding of the reinsurance contract and other contracts or agreements between the ceding enterprise and the reinsurer, including an evaluation of all contractual features that (1) limit the amount of insurance risk to which the reinsurer is subject (such as experience refunds, cancellation provisions, adjustable features, or additions of profitable lines of business to the reinsurance contract) or (2) delay the timely reimbursement of claims by the reinsurer (such as through payment schedules or accumulating retentions from multiple years).

For short-term contracts, SFAS 113 provides the following guidance for the ceding enterprise's evaluation of whether it is reasonably possible for a reinsurer to realize a significant loss from the transaction. First, the evaluation should be based on the present value of all cash flows between the ceding and assuming enterprises under reasonably possible outcomes, without regard to how the individual cash flows are characterized. Second, the same interest rate should be used to compute the present value of cash flows for each reasonably possible outcome tested. Third, the significance of a loss should be evaluated by comparing the present value of all cash flows with the present value of the amounts paid or deemed to have been paid to the reinsurer.

The alternative to reinsurance accounting, which is generally used when the reinsurer is not exposed to a reasonable possibility of significant loss, is **deposit accounting**; that is, amounts paid to the reinsurer are recorded similar to bank deposits, and interest income is accrued using the effective interest rate, which is calculated using estimates of the amount and timing of future payments by the reinsurer. While deposit accounting is simple, reinsurance accounting is quite complicated. The remainder of this section discusses reinsurance accounting.

Reinsurance contracts that are legal replacements of one insurer by another (often referred to as **assumption** and **novation**) extinguish the ceding enterprise's liability to the policyholder, and therefore result in derecognition of related assets and liabilities and gain or loss recognition. However, such contracts are rare. In essentially all reinsurance transactions, the ceding enterprise is not relieved of the legal liability to its policyholder, and accordingly the related assets and liabilities remain on the ceding enterprise's balance sheet and no gain is recognized (in some cases a loss may be recognized, as discussed below). Instead, the amount paid to the reinsurer relating to the unexpired portion of reinsured contracts (**prepaid reinsurance premiums**) is reported as an asset. In addition, to the extent that the insurer is expected to indemnify the ceding enterprise for recognized liabilities (retroactive reinsurance of short duration contracts or reinsurance of existing in-force blocks of long-duration contracts), an asset representing estimated **reinsurance recoverable** is recognized.

For short duration reinsurance contracts, prepaid reinsurance premiums are amortized over the remaining contract period in proportion to the amount of insurance protection provided. If the total cost of a reinsurance contract is subject to adjustment that can be reasonably estimated, the basis for amortization is the estimated ultimate amount to be paid. For long duration contracts, prepaid reinsurance premiums are amortized over the remaining life of the underlying reinsured contracts. Receivables due from reinsurers for covered paid claims and for expected future recoveries related to recognized liabilities are accrued and measured using assumptions consistent with those used in estimating the liabilities relating to the underlying reinsured contracts. A provision for estimated uncollectible reinsurance accounts is recorded based on periodic evaluations of balances recoverable from reinsurers, the financial condition of the reinsurers, coverage disputes, and other relevant factors. The amounts of earned premiums ceded and recoveries recognized under reinsurance contracts are netted against the related income statement items (premium revenue and benefits and claims expense, respectively) and are disclosed in the footnotes to the financial statements.

While reinsurance transactions involve primarily prospective coverage, some provide for or include retroactive coverage. **Retroactive reinsurance** is reinsurance in which an assuming enterprise agrees to reimburse a ceding enterprise for liabilities incurred as a result of past insurable events covered under contracts subject to the reinsurance. Because loss reserves are reported undiscounted, amounts paid in retroactive reinsurance transactions are normally smaller than the related liabilities. In such cases, reinsurance receivables are increased to reflect the difference and the resulting gain is deferred and amortized over the estimated remaining settlement period. If the amounts and timing of the reinsurance recoveries can be reasonably estimated, the deferred gain is amortized using the effective interest rate inherent in the amount paid to the reinsurer and the estimated amounts and timing of recoveries from the reinsurer. Otherwise, the proportion of actual recoveries to total estimated recoveries determines the amount of amortization. If the amounts paid for retroactive reinsurance exceed the recorded liabilities relating to the underlying reinsured contracts, the ceding enterprise increases the related liabilities or reduces the reinsurance receivable or both at the time the reinsurance contract is entered into, and the excess is charged to earnings. Any subsequent revisions in the estimates are recognized in the period of the change by adjusting the related assets and liabilities to the amounts that would have reported had the new information been available at the inception of the reinsurance transaction.

For reinsurance of existing in-force blocks of long-duration contracts, the difference between the amounts paid and the liabilities ceded related to the underlying contracts is considered the net cost of reinsurance at the inception of the contract and is recorded as an adjustment to DAC. Thus, unlike retroactive reinsurance of short duration contracts, any loss (or gain) associated with the reinsurance of existing in-force blocks of long-duration contracts is recognized gradually through the amortization of the adjusted DAC.

Accounting for reinsurance requires extensive use of assumptions and estimates and has significant effects on the financial statements. Not surprisingly, therefore, some insurers engage in problematic accounting practices related to reinsurance. These abuses often involve circular transactions and side agreements. The following are two examples.

According to AAER No. 2909, Converium Holding AG (“Converium”), a global reinsurance company, engaged in a fraudulent scheme to improperly inflate its financial performance through the use of finite reinsurance transactions. The scheme began in 1999, when

Converium was a business unit of Zurich Financial Services ("Zurich"), operating under the name Zurich Re. Zurich, and later Converium, designed five reinsurance transactions that created the appearance of risk transfer in order to benefit from reinsurance accounting. Three of the five transactions were entered into prior to the December 2001 IPO of Converium and affected the financial statements Converium included in the IPO prospectus. In two of the three pre-IPO transactions, Zurich purchased reinsurance from Inter-Ocean, which, in turn, ceded these liabilities to a Zurich entity. Zurich's use of Inter-Ocean as an intermediary in the transaction helped obscure the transactions' circular structure and the fact that Zurich had merely moved the risk from one Zurich entity to another. For the third transaction, Zurich ceded the risk to a third-party reinsurer but simultaneously entered into an undisclosed side agreement with the reinsurer pursuant to which Zurich agreed to hold the reinsurer harmless for any losses the reinsurer realized under the reinsurance contracts. Because the ultimate risk under the reinsurance contracts remained with Zurich, these transactions should not have been accounted for as reinsurance. As a result of these transactions, Converium understated its reported loss before taxes by approximately $100 million (67%) in 2000 and by approximately $3 million (1%) in 2001. In addition, the transactions had the effect of artificially decreasing Converium's reported loss ratios for certain reporting segments in some periods. Following its IPO, Converium entered into two additional reinsurance agreements for which risk transfer was negated by undisclosed side agreements. Effectively, these side agreements protected the reinsurer against losses suffered under the reinsurance contract and placed all risk of loss on a Zurich or Converium entity.

According to AAER No. 3108, AIG and General re Corporation ("Gen Re") engaged in the following fraud. Concerns about analysts' reaction to its declining loss reserves prompted AIG to solicit Gen Re's help in structuring a transaction that would transfer $500 million of loss reserves to AIG through a reinsurance arrangement. The transaction was purportedly a retrocession contract under which Gen Re would cede to AIG all or part of a reinsurance risk it previously assumed. On the face of the contract AIG appeared to assume $100 million of risk over and above the $500 million in premiums Gen Re was obligated to pay, but this extra $100 million of risk was pure fiction added to make it appear that the contracts transferred risk to AIG. In fact, AIG assumed no risk and Gen Re incurred no premium liability. Of the $500 million in premiums set forth in the contracts, $490 million was on a "funds withheld" basis (i.e., the money was never paid to AIG but was retained by Gen Re). Gen Re was supposed to pay the remaining $10 million to AIG according to the contracts, but AIG "prefunded" the $10 million to Gen Re in what amounted to a round trip of cash in a side deal that was not reflected in the contracts. The contracts became the vehicle for improperly adding loss reserves and premium receivables to AIG's financial statements. By accounting for the contracts as if they were real reinsurance, AIG inflated its loss reserves and premiums its 2000 and 2001 balance sheet by up to $500 million.

2.6 Investment Assets

Invested assets constitute the majority of insurers' assets – about 71% of adjusted assets (see Table 2.1.2). Table 2.6.1 presents the average composition of invested assets. As shown, investments in securities constitute the majority of invested assets, especially for PC insurers. Loans are significant for LH insurers, but not for PC insurers. The differential investment compositions of PC and LH insurers reflect differences in focus—liquidity for PC insurers versus yield and asset-liability match for LH insurers. Investments in securities and loans are discussed separately below. The other categories are reviewed next.

Table 2.6.1: Investment Assets

	All	LH	PC	ML	Re	IB
Short term investments	0%	0%	0%	0%	1%	0%
Investments in securities	83%	80%	89%	85%	82%	38%
Investments in loans	9%	15%	2%	5%	3%	0%
Investments in real estate	1%	1%	0%	0%	0%	0%
Other investments	7%	4%	9%	9%	14%	62%
Total invested assets	100%	100%	100%	100%	100%	100%

The table presents aggregate common-size balance sheet data for the period 1999-2009.

Most insurers do not report a separate category of short-term investments but instead include them in "cash" or "investment in securities." Short-term investments include primarily short-term fixed income instruments such as commercial paper and T-bills. These investments are reported at either fair value or amortized historical cost which, due to the short-term nature of the instruments, approximates fair value. Interest income is calculated using the effective interest rate method, which is described below.

Real estate and related improvements held for investment are stated at cost less accumulated depreciation, possibly adjusted downward for impairment. Properties are tested for impairment whenever events or changes in circumstances indicate that the carrying amount of the asset may not be recoverable. Properties whose carrying values are greater than the corresponding undiscounted expected cash flows are written down to their fair value, with the impairment loss included in net investment gains (losses). Fair value is typically estimated using the present value of the expected cash flows, discounted at a rate commensurate with the underlying risks. Rental income is recognized on a straight-line basis over the term of the respective leases and is included in investment income. Depreciation charges on real estate held for investment are netted against investment income. Real estate held-for-sale is reported on the balance sheet at the lower of the carrying amount or fair value less expected disposition costs. For real estate acquired upon foreclosure, the initial carrying amount is the carrying value of the mortgage loan at the date of foreclosure. Real estate is not depreciated while it is classified as held-for-sale. Losses due to a decline in fair value are included in net investment gains (losses).

"Other investments" may include short term investments or investments in loans or real estate that are not material enough to be disclosed separately. For some insurers, "other investments" include investments in private equity limited partnerships or hedge funds. These investments are generally reported at fair value, but for private equity and some hedge funds fair

value estimates involve significant discretion and are often delayed. In some cases, "other investments" includes the estimated fair value of derivatives at net gain positions.

Investments in Securities

This category includes all investments in fixed income securities, passive investments in equity securities (i.e., other than control or significant influence investments), and investments in other securities. Table 2.6.2 provides the composition. As shown, investments in debt securities constitute the majority of securities holdings and, for many insurers, the majority of reported assets. Investments in equity securities are a distant second. PC insurers have significant investments in equity securities, which are generally very liquid. LH insurers invest almost exclusively in fixed income instruments.

Table 2.6.2: Investment in Securities

	All	LH	PC	ML	Re	IB
Fixed income securities	91%	97%	86%	90%	94%	86%
Equity securities	7%	2%	14%	10%	5%	14%
Other securities	1%	2%	1%	0%	0%	0%
Total investments in securities	100%	100%	100%	100%	100%	100%

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

Debt Securities

The following exhibit summarizes the accounting treatment for investments in debt securities:

Exhibit 2.6.1: Accounting for Investments in Debt Securities

	Classification	Balance Sheet	Income Statement
Cash equivalents	Liquid low risk investments with maturity of three months or less at the date of purchase	Amortized cost, which approximates fair value	Interest income
Held-to-maturity	Intent and ability to hold the securities until they mature	Amortized cost	Interest income; realized gains and losses; other-than-temporary impairments
Trading	Bought and held for the purpose of selling them in the near term in order to profit from short-term price movements	Fair value	Interest income; realized and unrealized gains and losses
Available-for-sale	All other	Fair value; unrealized gains and losses reported, net of deferred taxes, in shareholders' equity	Interest income; realized gains and losses; other-than-temporary impairments

For all four classifications, interest income is measured using the effective interest rate method. Under this method, interest income each period is equal to the product of the at-purchase yield (referred to as the "effective interest rate") and the securities' amortized cost at the beginning of the period. Amortized cost is historical cost adjusted for the cumulative amortization of any at-

purchase discount or premium, where the periodic amortization is calculated as the difference between interest income and interest receipts. Interest income is reported in the income statement as part of net investment income.

Realized gains and losses and some other-than-temporary impairments are reported in the income statement as part of net investment gains (losses). Insurers have substantial discretion in measuring other-than-temporary impairment. An investment in debt securities is assessed for other-than-temporary impairment (OTTI) if its fair value is less than the amortized cost. Since 2009, the criteria for recognizing OTTI are: (a) the insurer intents to sell the security before recovery of amortized cost, (b) there is a greater than 50% probability that the entity will be required to sell the security before recovery of amortized cost, or (c) there is a greater than 50% probability that the insurer will not recover the entire amortized cost.[20] If impairment is other-than-temporary, the impairment loss is measured as the entire difference between the amortized cost and fair value. However, if the reason for the other-than-temporary determination is (c), the non-credit related portion of the impairment is recognized in OCI instead of earnings.[21] Reversals of impairment losses are prohibited.

Equity Securities

The following exhibit summarizes the accounting treatment for passive investment in equity securities (i.e., other than control or significant influence investments).

Exhibit 2.6.2: Accounting for Passive Investments in Equity Securities

	Classification	Balance Sheet	Income Statement
Trading	Bought and held for the purpose of selling them in the near term in order to profit from short-term price movements	Fair value	Dividend income; realized and unrealized gains and losses
Available-for-sale	All other	Fair value; unrealized gains and losses reported, net of deferred taxes, in shareholders' equity	Dividend income; realized gains and losses; other-than-temporary impairments

Unlike other companies, insurers are required to report all passive investments in equity securities—including unlisted securities—at estimated fair value.

Similar to investments in debt securities, realized gains and losses and other-than-temporary impairments are reported in the income statement as part of net investment gains (losses). Unlike investments in debt securities, the following factors are considered in evaluating whether an impairment is other-than-temporary: (a) the length of the time and extent to which fair value has been less than cost, (b) the financial condition and near-term prospects of the issuer, (c) the intent and ability of the holder to retain the investment for a period of time sufficient to allow for anticipated recovery in value, (d) the cause of the price decline, and (e) other factors relevant for the determination of whether the price decline is other-than-temporary.

[20] The previous standard used less quantitative criteria, which are still used in evaluating OTTI for investments in equity securities (see below).

[21] This is a new provision. The previous standard required that the full amount be recognized in income.

IFRS

Accounting for investments in securities under IFRS is similar to US GAAP. There are some differences, however. For example, under IFRS, changes in the fair value of available-for-sale debt securities due to foreign exchange fluctuations are recognized in income, while US GAAP does not distinguish these gains and losses from other causes of changes in fair value (all changes in fair value, except OTTI, are recognized in other comprehensive income). Another difference concerns the reclassification of investments into or out of the trading category. US GAAP allow for such reclassifications when they are justified (which should be rare), but IFRS prohibits them. There are also differences related to the recognition and measurement of impairment. Under IFRS, impairment may only be triggered by evidence of credit default, while US GAAP recognizes any source of impairment as long as the fair value decline is deemed other-than-temporary.[22] Also, under IFRS impairment of held-to-maturity securities is measured relative to either fair value or the present value of expected cash flows using the historical effective interest rate. US GAAP uses fair value as the only benchmark. Finally, unlike US GAAP which prohibits reversal of recognized impairments, IFRS allows for reversal of other-than-temporary impairments if the increase in fair value can be attributed to a specific event.

Investments in real estate under IFRS may be reported at either historical cost (as in the US) or at fair value with unrealized gains and losses reported in earnings. If the fair value method is selected, *all* property classified as investment property must be accounted for using the fair value model. If the fair value reporting option is not elected, the fair values of investment properties must still be disclosed in the footnotes to the financial statements (unless not determinable). In addition, under IFRS a property interest held under an operating lease that would otherwise meet the criteria of an investment property may be classified and accounted for as investment property. This classification alternative is available on a property-by-property basis.

Accounting Quality Issues and Related Analyses

This section discusses primary accounting quality issues and analyses related to investments in securities (excluding non-passive investments is equity securities).

Timing Securities Sales or "Cherry Picking." Unrealized gains and losses on securities other than those classified as trading are excluded from reported income. Thus, insurers might manipulate reported income by selectively realizing gains or losses. For example, to increase reported income in a particular period, an insurer may sell securities with unrealized gains and refrain from selling securities with unrealized losses. A potential red flag for this form of manipulation is a large decline in net unrealized gains (losses), coupled with net realized gains (losses) which are significantly larger than the market return on similar instruments. For example, an insurer that started a given year with $200 of unrealized gains and $250 of unrealized losses, ended the year with unrealized gains of $50 and unrealized losses of $370, and reported net realized gains of $100, is likely to have selectively realized gains to increase reported income, especially if market returns on similar instruments during the year were relatively low.

[22] As discussed above, since June 2009, the non-credit portion of some OTTI is recognized in other comprehensive income.

Reclassifying Securities. Insurers might manage earnings or book value by changing the classification of securities from one category to another. For example, an insurer may reclassify securities with unrealized gains from available-for-sale to trading, thereby triggering the recognition of the unrealized gains. This form of earnings management, however, is rather limited. Most transfers are either disallowed or are permitted only under rare circumstances. In addition, reclassifications out of the held-to-maturity classification could result in the entire portfolio of held-to-maturity investments being transferred out of this category.

Managing Fair Value Estimates. Most bond trading takes place in over-the-counter markets, through a decentralized network of dealers and brokers. In addition, with the exception of US government securities, trading volume in fixed-income products is relatively low. Thus, determining the fair value of debt securities often involves significant discretion, which managers might exploit to manipulate the estimates. This is also the case for investments in equity securities of private companies. As discussed above, insurers are required to report all passive investments in equity securities at fair value, including investments in unlisted stocks.

The reliability of fair value estimates for securities can be evaluated by considering their composition (e.g., the disclosed fair value of treasuries is more reliable than that of corporate bonds), fair value level designation (e.g., level 1 fair value estimates are more reliable than level 2 or 3 estimates), and the distribution of remaining maturity (the fair value of short-term instruments is generally more reliable than the fair value of long term instruments).

Manipulating "Other-Than-Temporary" Impairments. Given the high subjectivity involved in determining whether a decline in the fair value of investment securities is temporary or permanent, firms might manipulate the recognition of impairment losses. An example of such manipulation is provided in AAER No. 2465. According to the SEC, Conseco, a financial services holding company with finance, insurance and fee-based businesses, overstated its financial results for 1999 and 2000 by hundreds of millions of dollars by avoiding write-downs of interest-only securities.

A potential indicator of failure to recognize OTTI is a large amount of unrealized losses, especially if they relate to (1) positions that have been in continuous loss for 12 months or longer, (2) credit quality as opposed to interest rate risk (for example, credit-related losses on high yield fixed-income securities are less likely to be recovered compared to interest rate related losses on investment grade fixed-income securities), or (3) level 3 or level 2 fair value estimates (these are easier to manipulate compared to level 1 estimates).

Limited Disclosures Regarding Interest Rate Risk. US GAAP require very limited disclosure regarding the interest rate risk of investments in fixed income securities. In fact, in most cases the only information provided is about maturity distribution – the amounts due in one year or less, one-to-five years, five-to ten years, and more than ten years. This information provides some indication regarding interest rate risk; for example, long maturity generally implies high duration and therefore high interest rate risk, and evenly spread cash flows imply high convexity and therefore low interest rate risk. However, interest rate risk also depends on interest rate provisions (fixed versus floating; ceiling, floors, collars, etc.) and embedded options (e.g., call or prepayment provisions). Unfortunately, no information is typically provided on these factors.

Predictable Gains. One result of using the effective interest rate method to measure interest income is that the amortized cost of investments is on average lower than their fair value. This follows because the term structure of interest rates typically has a positive slope, and so the

market yield associated with the remaining cash flows is lower than the at-purchase yield. To see this, consider the following example. Assume that the one year spot rate is 5% and the expected value of next year's spot rate is also 5%, but there is high uncertainty regarding what the spot rate will actually be. This uncertainty causes the forward rate for next year to be higher than 5%, say 10% (that is, a 5% liquidity premium). Thus, a $1,000 zero coupon note with two years to maturity would sell for $865.8 (= 1,000 / [1.05 × 1.1]). The effective yield is 7.47% (= [1,000 / 865.8]$^{0.5}$ - 1), and so interest income for the first year would be $64.68 (= 865.8 × 7.47%) and the book value at the end of the first year would be $930.48 (= 865.8 + 64.68). But, on average, the spot rate next year will be 5%, which implies a fair value for the bond of $952.38 (= 1,000 / 1.05), that is, an unrealized "gain" of $21.9 (= 952.38 - 930.48). This gain is due to the understatement of interest income in year 1. Interest income should have been $86.58 (= 865.8 × 10%) in the first year, reflecting compensation for both the time value of money and the liquidity risk, which by the end of year 1 is resolved. Instead, the effective rate method recognizes a portion of year 1's liquidity premium in year 2.

Investments in Loans and Leases

This category includes mortgage loans, policy loans, and other loans. Table 2.6.3 provides the composition of loans for insurers with positive investments in loans. As shown, mortgage loans constitute the majority of loans, but policy loans are also quite significant.

Table 2.6.3: Investments in Loans

	All	LH	PC	ML	Re	IB
Mortgage loans	61%	60%	93%	48%	33%	NA
Policy loans	25%	24%	6%	48%	67%	NA
Other loans	14%	16%	1%	5%	0%	NA
Total investments in loans	100%	100%	100%	100%	100%	NA

The table presents time series averages (1999-2009) of aggregate common-size balance sheet data.

Non-policy loans are carried at unpaid principal balance, adjusted for any yet-unamortized balance of origination fee (-), origination cost (+), acquisition premium (+) or acquisition discount (-), and net of valuation allowances. There are two types of valuation allowances: specific allowances and general allowance. Specific valuation allowances are established for impaired loans. Loans are considered to be impaired when management estimates that, based upon current information and events, it is probable that the company will be unable to collect amounts due according to the contractual terms of the loan agreement. For loans that are determined to be impaired, a valuation allowance is established for the difference between the carrying amount and either (a) the present value of the expected future cash flows discounted at the loan's original effective interest rate, (b) the loan's observable market price, or (c) the fair value of the collateral (for collateral-dependent loans). A general valuation allowance is established for estimated credit losses associated with non-impaired loans. The general allowance is typically based on the historical loss experience for the loan portfolio, adjusted for current trends. Changes in both valuation allowances are recorded in net realized gains and losses. Some investments in non-policy loans are classified as held for sale and are reported at the lower of cost or fair value, with no valuation allowance.

Policy loans are stated at the aggregate balance due, which typically approximates fair value. Policy loans typically have no defined maturity date and reduce amounts payable at death or surrender. Because policy loans are generally fully secured by the value of the policies, no valuation allowances are recognized for these loans.

Academic Research on Investments

Research has examined the quality of fair value estimates for investment securities, classification decisions, and other reporting choices related to securities gains and losses.

Summary of Studies

Petroni and Wahlen (1995) analyze the relation between fair values of equity and fixed maturity debt securities and share prices of property-liability insurers. They find that property-liability share prices can be explained by fair values of equity investments and US Treasury investments, even after controlling for historical costs. Fair value disclosures for other types of investment securities do not explain share prices beyond historical costs. The results suggest that the reliability of fair value estimates for different types of securities affects the value-relevance of related disclosures.

Norman, Petroni, and Wahlen (1998) seek to describe the substantial differences across property-liability insurers in accounting classification decisions for fixed maturity securities during 1991-1995. This period includes the years before adoption, upon initial adoption, and after adoption of FAS 115, Accounting for Certain Investments in Debt and Equity Securities. Another objective of the study is to test 2 risk-based explanations for differences in investment classification decisions under FAS 115. Under the new standard, firms are required to classify fixed maturity investment securities into trading portfolios, available-for-sale portfolios, or held-to-maturity portfolios. Findings show that managers of property-liability insurers make tradeoffs between liquidity risk and concerns about accounting volatility when making investment classification decisions under FAS 115.

Using a sample of 82 publicly traded property-liability insurers, **Lee, Petroni, and Shen (2006)** find that insurers with a tendency to manage earnings through realized securities' gains and losses (that is, cherry pickers), as well as insurers with a reputation for poor disclosure quality, are more likely to report comprehensive income in the statement of equity as opposed to the performance statement. Apparently, these insurers face the highest cost of transparency. The authors do not find a relation between the reporting decision and the volatility of comprehensive income relative to the volatility of net income.

2.7 Separate Accounts

Contract assets and liabilities that are legally insulated from the insurer's general account assets and liabilities are reported separately on the balance sheet. Separate account assets are subject to general account claims only to the extent that the value of such assets exceeds the separate account liabilities. The performance of investments in separate accounts, net of contract fees and assessments, is passed through to the contractholders. Separate accounts are used primarily for variable universal life contracts and variable deferred annuity contracts. Separate account assets are diversified funds—similar to mutual funds—which are managed by the insurance company. Contractholders select portfolios consisting of those funds, and their claims on the investments are reflected in the balance of separate account liabilities.

Separate account assets are reported on the balance sheet at fair value. Separate account liabilities are generally reported at the same amount, because the contractholders own these assets and the income (or loss) that they generate. Consistent with the fact that insurers have limited or no exposure to separate account assets and liabilities, regulatory capital calculations exclude these items and require no supporting capital for these accounts. For the same reason, in Section 2.1 I reformulated the balance sheet to exclude separate account assets and liabilities.

Unlike the balance sheet, the income statement does not report investment income, gains or losses on separate accounts. Instead, it reports the revenues earned on separate accounts, which include investment management fees, mortality and other risk charges, policy administration fees, and surrender charges. Although the investment performance of separate accounts is omitted from the income statement, it is relevant for evaluating the insurer's prospects. In particular, high investment returns increase account balances, which in turn boost fee income, decrease the value of minimum benefit guarantees, and may attract additional investments. The opposite occurs when returns are negative or lower than expected.

2.8 Debt

Debt instruments include bonds, notes, commercial paper, loans, and capital lease obligations. As reported in Table 2.1.4, debt constitutes about 7% of insurers' total equity and liabilities other than separate accounts. Debt instruments are generally reported on the balance sheet at historical cost (i.e., the amount borrowed), adjusted for the cumulative amortization of any at-issue discount or premium. Periodic amortization is measured as the difference between interest expense and interest payments, where interest expense is calculated as the product of the instruments' book value at the beginning of the period and the effective interest rate. The **effective interest rate** is the discount rate that equates the issuer's net proceeds and the present value of the coupons and principal at the issuance date. **Issuance costs** are typically reported as an amortizable asset.

Using the effective interest rate method implies that on each balance sheet date the book value of debt is equal to the present value of all remaining coupons and principal payments, discounted at the effective (historical) rate. To see why, note that from the definition of the effective interest rate it follows that

$$B_0 = C \times [1+r]^{-1} + C \times [1+r]^{-2} + \ldots + C \times [1+r]^{-n+1} + (F + C) \times [1+r]^{-n}$$

Where B_0 is the debt's book value immediately after issue, C is the coupon, r is the effective interest rate, F is the face value, and n is the number of interest periods. Under the effective interest rate method, interest expense is calculated as the product of the beginning of period book value and the effective interest rate, and the difference between interest expense and the coupon is credited or debited to debt (debt is increased if the expense is larger than the coupon and reduced if it is smaller – discount or premium amortization, respectively). Therefore,

$$\begin{aligned} B_1 &= B_0 + (B_0 \times r - C) = B_0 \times (1+r) - C = \\ &(C \times [1+r]^{-1} + C \times [1+r]^{-2} + \ldots + C \times [1+r]^{-n+1} + (F + C) \times [1+r]^{-n}) \times (1+r) - C = \\ &C + C \times [1+r]^{-1} + \ldots + C \times [1+r]^{-n} + (F + C) \times [1+r]^{-n+1} - C = \\ &C \times [1+r]^{-1} + C \times [1+r]^{-2} + \ldots + C \times [1+r]^{-n+2} + (F + C) \times [1+r]^{-n+1} \end{aligned}$$

That is, B_1 is equal to the present value of all remaining cash flows, discounted at the effective interest rate. The proof with respect to B_2 through B_n follows the same steps.

An important implication of the above result is that the relationship between the book and fair values of debt depends on the relationship between current and historical yields. For example, the large increase in credit spreads in 2008 significantly reduced the fair value of outstanding corporate debt instruments, but had limited effects on reported debt levels.

Since 1992 (SFAS 107), firms are required to disclose the estimated fair value of most financial instruments, including debt, and starting in 2009, these disclosures are made quarterly. Also, since 2008 (SFAS 159), firms may elect to report debt instruments at fair value with unrealized gains and losses included in income (the **fair value option**). Prior to 2008, firms applied fair value adjustments to debt only under strict conditions (fair value hedges under SFAS 133, some hybrid financial instruments under SFAS 155). If the fair value option is elected, issuance costs are expensed immediately.

Convertible bonds and other compound (hybrid) debt-equity instruments are generally not split into debt and equity components; instead, the full amount is reported as debt.

Consequently, in such cases debt is overstated, equity is understated, and the effective interest rate is understated. Interest expense reflects two offsetting distortions—understatement of the effective interest rate and overstatement of the amount of debt—but the first effect dominates; that is, interest expense is understated. A recent standard (FSP APB 14-1) requires bifurcation of those convertible debt Instruments that may be settled in cash upon conversion.

IFRS with respect to debt is similar to US GAAP. Debt is generally recorded at amortized cost, and interest expense and the amortization of any at-issue discount or premium are calculated using the effective interest rate method. There are some differences, however. For example, the effective interest rate is calculated using expected rather than contractual cash flows, the fair value option is restricted, and there are differences in the classification, bifurcation requirements, and measurement of some hybrid financial instruments with liability and equity components.

Accounting Quality Issues and Related Analyses

This section discusses accounting quality issues and analyses related to debt.

Gains and Losses from Early Retirement of Debt

An early retirement of debt occurs whenever a firm pays off debt instruments prior to their maturity, either by purchasing them in the open market (for traded debt), by exercising a call provision, or by other means. Such transactions normally result in reported gains or losses. The amount paid may be different from the book value either because it is affected by changes in interest rates (for example, in an open market transaction), reflects a call premium, negotiated at retirement, or for other reasons. Because early retirement of debt is largely discretionary, firms might manipulate reported income by engaging in such transactions. The discretionary and transitory nature of gains and losses from early retirement of debt implies that they should be excluded from measures of recurring income. Unfortunately, these items are often reported combined with recurring non-operating income or interest expense and are therefore difficult to discern.

Fair Value Option

For debt instruments accounted for under the fair value option, income and equity include unrealized gains and losses from fair valuing own debt. These are transitory items, which are affected primarily by unexpected changes in interest rates or the firm's credit profile. More importantly, these items are negatively correlated with economic performance. For example, if the financial condition of a firm deteriorates, the fair value of its outstanding debt would decline, resulting in an unrealized gain. If all economic assets are also marked-to-market, the losses on the assets would be larger than the gain on the debt and the firm would report a net loss (as it should). However, not all economic assets are marked-to-market on the balance sheet, and so the reported gain on debt may not be fully offset by reported losses on the assets. Therefore, the fair value option may result in overstated earnings at times of financial distress and understated earnings at times of financial recovery.

Fair-Book Difference

As demonstrated above, a difference between the fair and book values of debt implies that current interest rates are different from the effective (historical) interest rates. This could be due to changes in risk free rates, credit spreads, or the insurer's credit profile. Thus, a large difference between the fair and book values of debt implies that interest expense is likely to change significantly when the debt is recycled. Another important implication of debt fair-book differences is that economic leverage is different from book leverage. Both distortions can be mitigating by adjusting the reported book value of debt and interest expense to reflect current conditions.

Quality of Fair Value Estimates

Calculating the fair value of most debt instruments involves significant discretion. Some insurers might exploit this discretion to manipulate the disclosed (SFAS 107) or recognized (SFAS 133, 155 or 159) fair value estimates. The quality of fair value estimates for debt instruments can be evaluated by examining the reasonableness of the level of and changes in the difference between the fair and book values of reported debt in recent years, considering changes in interest rates and in the company's financial condition during those years. The evaluation should consider debt characteristics such as issuance dates, maturities, and interest rate provisions (e.g., fixed versus floating). The reliability of fair value estimates is also related to the composition of the debt instruments. For example, fair value estimates of public bonds or commercial paper are less discretionary than estimates related to private bonds or bank debt. Finally, information on the approaches used for calculating fair value and the level designation of the estimates (for instruments measured at fair value on a recurring basis) may also be useful.

Unreported Debt

Insurers might exclude from the balance sheet debt which is effectively owed by the company, primarily through the use of variable interest entities. Unfortunately, there are no simple indicators or ratios that can be used to identify unreported debt. To evaluate the potential for omitted debt obligations, one has to carefully read those sections of the MD&A and footnotes which discuss related-party transactions and variable interest entities.

Convertible debt

As discussed above, the accounting treatment of most convertible bonds and other debt instruments with equity characteristics involves significant distortions. In particular, reported debt is overstated, equity is understated, and interest expense is understated. When conducting profitability analysis, deep in-the-money convertibles should be treated as equity and income should be adjusted by "undoing" after tax interest expense of those convertibles. Other convertibles should be partially reclassified to equity and interest expense should be adjusted.

Classifying Short-Term Debt as Long-Term

Under some conditions, firms are allowed to classify short-term debt as long-term. If the firm has the intention and ability to refinance the short-term debt on a recurring basis (which is the primary requirement for such classification), this accounting treatment is inconsequential in

"normal" times. However, if the firm does not have or loses the ability to refinance the short-term debt, this accounting choice may result in misleading information.

Cash Flow Classification

Interest payments are classified as operating cash outflow while payments of principal are reported as financing cash outflow. Thus, firms might overstate cash from operations by issuing deep-discount bonds. Due to the discount amortization, net income will reflect the true cost of borrowing, but cash from operation will be overstated. This distortion, however, is not particularly important for insurers as most analysts pay little attention to the classification of reported cash flows in insurers' cash flow statements.

2.9 Derivatives

A derivative is a financial instrument that (1) has one or more underlyings and one or more notional amounts, (2) has an initial net investment smaller than would be required for other instruments with a similar response to the underlying, and (3) requires or permits net settlement or de facto net settlement. The underlying of a derivative is an asset, basket of assets, index, or another instrument, such that the value of the derivative depends on the value of that underlying. The notional amount is the quantity of the underling to which the contract applies. The following are examples of underlyings and notional amounts:

Exhibit 2.9.1: Examples of Underlyings and Notional Amounts

Derivative	Underlying	Notional
Stock option	Stock (price)	Number of shares
Currency forward	Foreign currency (exchange rate)	Amount of currency
Commodity future	Commodity (price)	Number of commodity units
Interest rate swap	Interest rate index	Dollar amount
Credit default swap	Credit instrument (credit event)	Dollar amount

De facto settlement is achieved if there is a mechanism that facilitates net settlement (e.g. exchange, assignment) or if the asset is readily convertible to cash (e.g. publicly traded securities), so that exposure at settlement is limited to the value of the derivative. For example, an option to buy 100 shares of a non-listed stock with no net settlement satisfies the first two criteria (it has an underlying—the stock—and a national amount—100 shares—and the net investment is smaller than the price of 100 shares), but it requires delivery of a non liquid underlying and is therefore not considered a derivative.

Common derivatives include:

Option – The right, not the obligation, to buy (call option) or sell (put option) an asset at a specified price during a specified period of time.

Forward contract – a contract that specifies the price and quantity of an asset to be delivered in the future.

Future contract – a standardized forward contract which is traded on an organized exchange.

Interest rate swap – an agreement under which two counterparties agree to exchange one type of interest rate cash flow for another. In a typical arrangement, one party periodically will pay a fixed amount of interest, in exchange for which that party will receive variable payments computed using a published index.

Credit default swap (CDS) - an agreement under which the protection buyer of the CDS makes a series of payments (CDS fee or spread) to the protection seller and, in exchange, receives a payoff if a credit instrument (typically a bond or loan) experiences a credit event (bankruptcy, failure to pay, or other event as specified in the agreement).

Insurers use derivatives to hedge risks, speculate, or, in some cases, generate profits from fees and spreads. Essentially all insurers face interest rate risk, and many use derivatives to mitigate this risk. Also, insurers with foreign operations are exposed to foreign exchange risk, and some use derivatives to hedge this risk. Many LH insurers are exposed to significant equity

risks due to various guarantees on variable annuities and other products as well as to the dependence of fee income on the balance of AUM and separate accounts.[23] Some LH insurers use derivatives to hedge these exposures. Finally, some insurers use credit derivatives to hedge credit exposures in their investment portfolio or reinsurance receivables.

Under US GAAP, all derivatives are recognized as either assets or liabilities on the balance sheet and are measured at fair value. The accounting treatment for derivatives gains and losses depends on whether the derivatives have been designated and qualify as part of a hedging relationship, and further, on the type of hedging relationship. A derivative that is designated and qualifies as a hedging instrument must be categorized either as a fair value hedge (a hedge of changes in the fair value of existing assets, liabilities or firm commitments[24]), a cash flow hedge (a hedge of the variability of future cash flows), or a hedge of a net investment in foreign operations. For each of the three hedge designations, gains and losses on the derivative and hedged item are reported in earnings in the same period. With no hedge designations, derivative gains and losses are immediately reported in earnings. Exhibit 2.9.2 summarizes the accounting for the four categories of derivatives.

Exhibit 2.9.2: Accounting for Derivatives

	Classification	Balance sheet	Income Statement
Fair value hedge	Hedge of changes in the fair value of existing assets, liabilities or firm commitments	Derivative at fair value; hedged item is adjusted for offsetting gain or loss	Realized and unrealized gains/losses on the derivative; offsetting gain or loss on the hedged item
Cash flow hedge	Hedge exposure to variability in the cash flows of a recognized asset or liability, or of a forecasted transaction	Derivative at fair value; unrealized gains and losses reported, net of deferred taxes, in shareholders' equity	Realized and unrealized gains/losses recognized in the same period/s as the hedged item; ineffective portion of hedge is recognized immediately
Net investment hedge	Hedge of the foreign currency exposure of a net investment in a foreign operation	Derivative at fair value; unrealized gains and losses reported, net of deferred taxes, in shareholders' equity	Realized and unrealized gains/losses recognized on disposal of investment; ineffective portion of hedge is recognized immediately
Other	All other	Derivative at fair value	Realized and unrealized gains/losses are recognized immediately

To qualify for hedge accounting, the hedge has to be "highly effective" as assessed at inception and at least every three months. **Hedge effectiveness** means that changes in the derivative's fair value or cash flow (depending on the type of hedge) should offset changes in the fair value or cash flow of the hedged item. GAAP does not specify a single method for assessing hedge effectiveness; insurers should adopt methods consistent with their risk management

[23] The balance of these accounts—and therefore fee income—is affected by stock market performance both directly (due to investments in equity securities) and indirectly (due to the effect on net flows).

[24] "Firm commitment" is a binding agreement with an unrelated party that specifies all significant terms of the transaction and includes a nontrivial disincentive for nonperformance.

strategies and prepare detailed documentation of the effectiveness test. In the US, a shortcut method that allows an entity to assume no ineffectiveness (and, hence, bypass the effectiveness test) is allowed for certain fair value or cash flow hedges of interest rate risk using interest rate swaps when certain stringent criteria are met.[25] For hedges that do not qualify for the shortcut method, if the critical terms of the hedging instrument and the entire hedged item are the same, demonstrating test effectiveness is relatively simple (the matched terms method). In other cases, hedge effectiveness is tested using methods such as the dollar offset ratio or regression analysis. The dollar offset method compares the change in the derivative's fair value or cash flow (depending on the type of hedge) to that of the hedged item, and considers the hedge effective if the ratio of the two falls within the bounds of -0.80 to -1.25. When using regression analysis to test the strength of the hedging relationship, the regression coefficient of determination (R-squared) serves as the primary measure of hedge effectiveness. A hedge is considered effective if changes in the derivative's fair value or cash flow explain a high proportion of the total variation in the fair value or cash flow of the hedged item (typically an R-squared of at least 80% is required).

Embedded derivatives are terms of a contract or instrument that behave like a derivative (for example, prepayment or call options, interest rate floors or caps). Derivatives embedded in host contracts that are not "clearly and closely related to the host contract" must be accounted for as a derivative, that is, reported at fair value with unrealized gains and losses recognized in earnings. Most embedded derivatives are considered clearly and closely related to the host contract and are therefore not bifurcated from the host document. However, some guarantees provided by LH insurers with respect to variable annuities and other investment and insurance contracts, such as guaranteed minimum withdrawal benefit and guaranteed minimum accumulation benefit are considered embedded derivative and so are measured at fair value, separately from the host product, with changes in fair value recognized in income. The fair value of these embedded derivatives is usually included in the liability for future policy benefits, and changes in the fair value are reported in net investment gains (losses).

Accounting for derivatives under IFRS is similar to US GAAP. However, there are some differences in the definition of derivatives and in hedge requirements. For example, the short-cut method for demonstrating hedge effectiveness for interest rate swaps is not permitted under IFRS, and hedge accounting for a component of risk is allowed. Most importantly for insurers, there are differences in the identification, bifurcation requirements, and measurement of embedded derivatives. Under IFRS 4, an embedded derivative in insurance contracts whose characteristics and risks are not closely related to the host contract but whose value is interdependent with the value of the insurance contract (e.g., GMWB and GMAB) need not be separated out and accounted for as a derivative. In contrast, under US GAAP, an embedded derivative whose characteristics and risks are not closely related to the host contract must be accounted for separately.

Accounting Quality Issues and Related Analyses

This section discusses primary accounting quality issues and analyses related to derivatives.

[25] These criteria include zero fair value for the swap at inception and effectively require perfect or almost perfect match of terms with the hedged instrument.

Off-Balance Sheet Risk

Similar to securities and other financial instruments, market risks associated with derivatives depend on the derivatives' notional amounts. However, unlike other financial instruments where book value is close to the notional amount (e.g., debt securities, loans), the book value of derivatives—which is equal to their fair value—is typically a fraction of the notional amount. Thus, the balance sheet fails to reflect the risk associated with derivative transactions. For example, a receive fixed/pay floating 5 year interest rate swap with a notional amount of $100 million exposes the firm to a similar interest rate risk as a five year fixed rate bond with a book value of $100 million, and yet has a zero book value at the time of inception.

Due to this failure of the balance sheet to capture the risk associated with derivative transactions, any analysis of derivative disclosures should consider the following:

- Market risks of derivatives are related to notional amounts, not book or fair values. As discussed above, the book value of derivatives is equal to their reported fair value, which grossly understates the exposure (e.g., at inception, the fair value of most derivatives is zero).
- Notional amounts of different derivatives should not be aggregated because the risks associated with a given amount of notional exposure vary significantly across derivatives. For example, the fair value volatility of a swap is significantly larger than that of a forward contract with the same notional amount, because a swap is essentially a portfolio of forward contracts on the same notional amount.
- Fair value reflects ex-post realization of risk and generally has little implications for ex-ante risk. There is one exception, however. When evaluating credit risk, the fair value of derivatives at gain positions indicates the maximum current exposure. Still, even for credit risk, potential exposure may be greater than the current exposure.
- Purchased options are paid for at the time of purchase and present no off-balance sheet risk (the risk is limited to the book value of the investment). Other derivatives typically involve no cash payment at the time of origination and present off-balance sheet risk.
- Futures and exchange-traded options have available market prices and trivial credit risk (the exchange acts as the counterparty to each contract), while OTC derivatives (swaps, forward contracts, options) usually have non-trivial credit risk and their estimated fair values involve significant discretion.[26]

[26] For some OTC derivatives, quotes are available from brokers/dealers or other market participants and can be used to estimate fair value. However, most derivatives do not have market prices or quotes, so their fair values have to be estimated. A commonly used approach for estimating derivative fair values is to calculate the present value of expected future cash flows. Another approach is to base the fair value estimate on prices of recent transactions with similarly rated counterparties or on current quotes for similar instruments. Other valuation models price derivatives relative to the underlying assets (e.g., option pricing models). These models involve potential error from two sources: (1) error due to inaccurate model assumptions (e.g., the assumption that changes in the price of the underlying asset are continuous), and (2) error in parameters (e.g., estimated volatility of the underlying).

Precision of Fair Value Estimates

Due to the unavailability of market prices for most derivatives, as well as their leverage and option characteristics, the potential for large valuation errors is higher for derivatives compared to other financial instruments. This is especially true for non-standardized derivatives.

Hedged Items Reported at Amounts other than Fair Value

When both the hedged item and the hedging derivative are marked-to-market, the balance sheet and income statement appropriately reflect net value and change in value, respectively. However, when the hedged item is reported at an amount other than fair value, book value and earnings are distorted, and the information content of the financial statements is reduced. These distortions are quite common due to the stringent requirements to qualify for hedge accounting, which often prevent firms from recognizing offsetting changes in the value of hedged items. SFAS 159 has mitigated—although not eliminated—this distortion by introducing a fair value reporting option.

Improperly Using Hedge Accounting

Under the "short cut" method, the hedge is assumed to perfectly offset fluctuations in the fair value or cash flows of the hedged instrument. In some cases, the actual offset may be imperfect, resulting in omitted gains or losses.

Unrecognized Embedded Derivatives

Standalone derivatives are always reported at fair value. In contrast, embedded derivatives typically remain off-balance sheet. Thus, the same economic exposure may be reflected differently in the financial statements, depending on whether or not derivatives are embedded in non-derivative hosts. For example, a floating rate loan and a separate purchased cap contract may create a similar exposure to a floating rate loan with an embedded cap, and yet the embedded cap will in most cases be considered "clearly and closely related" to the host loan and therefore be effectively ignored. Some insurers may take advantage of this accounting treatment to avoid fair value measurement of derivatives by deliberately embedding them in non-derivative hosts.

Classification

The same derivative position can often be classified as either a fair value or cash flow hedge. For example, a pay-fixed, receive-variable interest rate swap can be classified as either a fair value hedge of fixed rate investments or cash flow hedge of variable rate borrowing. The cash flow hedge classification results in higher book value volatility because, unlike the fair value hedge, there is no balance sheet recognition of offsetting gains or losses.

3. Valuation

Building on the discussion in the previous two sections, this section discusses the valuation of insurance companies. The first subsection (3.1) identifies the primary drivers of equity value, while the next four discuss each of these drivers: profitability in subsection 3.2, accounting quality in 3.3, growth prospects in 3.4, and risk and cost of capital in 3.5. The effects of these value drivers vary over time depending on economy- and industry-wide conditions. Subsection 3.6 identifies primary macro, industry, and line-specific factors, and discusses their impact on insurers' performance, risk and value. Finally, subsection 3.7 discusses relative and fundamental valuation models.

3.1 What Drives Value?

The value of any financial claim is the present value of expected net flows to the owners of that claim. Accordingly, the value of common equity (Equity Value or EV) is the present value of expected net flows to common equity holders (Net Equity Flow or NEF):

$$EV_0 = \frac{E[NEF_1]}{(1+r_e)^{.5}} + \frac{E[NEF_2]}{(1+r_e)^{1.5}} + ... = \sum_{t=1}^{\infty} E[NEF_t] \times (1+r_e)^{-t+.5} \quad (1)$$

where r_e is the cost of common equity capital. Equation (1) assumes that NEF is paid at the middle of each year.

Theoretically, to value existing common equity, NEF should only include flows associated with currently existing common shares. However, this approach is impractical because future dividends and share repurchases will be paid not only to existing shares but also to shares that will be issued in the future. An alternative approach is to assume that all future share issuance transactions will be at fair value; that is, the present value of the cash or other assets or services that will be received when new shares are issued is equal to the present value of the subsequent dividends and share repurchases associated with those shares.[27] Under this assumption, NEF is defined as the total of all common dividends, common share repurchases and noncash distributions, minus the fair value of assets or services to be received in exchange for issuance of common shares.

Valuation model (1) can be restated in terms of comprehensive income available to common shareholders (CI) and the book value of common equity (CE) by substituting the following relation for NEF_t:

$$NEF_t = CI_t - CE_t + CE_{t-1} \quad (2)$$

This relation postulates that changes in common equity are due to either comprehensive income available to common shareholders or to net common equity flows. Given the definitions of NEF (discussed above) and comprehensive income (net income plus other comprehensive income), equation (2) accounts for essentially all changes in common shareholders' equity.

Substitute equation (2) into (1),

[27] A similar assumption is made under the DCF model with respect to future borrowings.

$$EV_0 = \frac{E[CE_0 + CI_1 - CE_1]}{(1+r_e)^{.5}} + \frac{E[CE_1 + CI_2 - CE_2]}{(1+r_e)^{1.5}} + ...$$

For each term t, adding and subtracting $r_e \times CE_{t-1}$

$$EV_0 = \frac{E[CE_0 + CI_1 - CE_1 + r_e \times CE_0 - r_e \times CE_0]}{(1+r_e)^{.5}} + \frac{E[CE_1 + CI_2 - CE_2 + r_e \times CE_1 - r_e \times CE_1]}{(1+r_e)^{1.5}} + ...$$

Rearranging terms

$$EV_0 = \frac{E[CE_0 \times (1+r_e) + (CI_1 - r_e \times CE_0) - CE_1]}{(1+r_e)^{.5}} + \frac{E[CE_1 \times (1+r_e) + (CI_2 - r_e \times CE_1) - CE_2]}{(1+r_e)^{1.5}} + ...$$

And, finally, cancelling offsetting terms, we get

$$EV_0 = CE_0 + \sum_{t=1}^{\infty} E_0[CI_t - r_e CE_{t-1}] \times (1+r_e)^{-t+.5} \quad (3)$$

That is, equity value is equal to current book value plus the present value of expected residual income in all future years, where residual income is earnings (CI) in excess of the return required by investors given the amount (CE) and cost (r_e) of equity capital, that is, $CI_t - r_e CE_{t-1}$.[28]

I next define Return On Equity (ROE) as comprehensive income available to common shareholders divided by beginning-of-period common equity (i.e., $ROE_t = CI_t / CE_{t-1}$), and $CUM\_CE\_G_{t-1}$ as cumulative common equity growth from time zero through the beginning of future year t (i.e., $CUM\_CE\_G_{t-1} = CE_{t-1} / CE_0$). Substituting into equation (3) and algebraically manipulating the resulting equation, we get

$$EV_0 = CE_0 \times \left(1 + \sum_{t=1}^{\infty} E[(ROE_t - r_e) \times CUM\_CE\_G_{t-1}] \times (1+r_e)^{-t+.5}\right) \quad (4)$$

That is, equity value depends on the current book value (CE_0), the cost of equity capital (r_e), and expectations regarding ROE and common equity growth in all future years. Future ROE, in turn, depends on current profitability and accounting quality. ROE is quite persistent over time, implying that the current level of ROE is a reasonable starting point for predicting future ROE. In addition, in Sections 3.3, 3.4, and 3.5 below, I provide a detailed discussion of variables which inform on expected changes in ROE, with accounting quality indicators being the primary ones.

Dividing both sides of equation (4) by the book value of equity yields an equation which identifies the determinants of the value-to-book ratio: future profitability (and hence current profitability and accounting quality), growth, and the cost of equity capital.

$$\frac{EV_0}{CE_0} = 1 + \sum_{t=1}^{\infty} \frac{E[(ROE_t - r_e) \times CUM\_CE\_G_{t-1}]}{(1+r_e)^{t-.5}} \quad (5)$$

Note that equation (5) establishes a benchmark for ROE, which in turn determines the relationship between the price and book value of equity. In particular, for the price-to-book ratio to be greater than one, expected ROE must be greater than the cost of equity capital.

[28] Similar to the net equity flow model (equation (1)), which assumes that the present value of price at future date T converges to zero as T converges to infinity, to derive equation (3) one has to assume that the present value of book value at time T converges to zero as T converges to infinity. See Ohlson (1995).

Valuation equations (4) and (5) emphasize the roles of book value and shareholders' profitability (CE and ROE, respectively) in determining equity value. For reasons discussed below, these are key valuation metrics when analyzing financial service companies. Another valuation approach, which is used for essentially all companies, is to focus on earnings, earnings growth and payout. The link between these drivers and equity value can be established by expressing Net Equity Flow (NEF) as follows:

$$\mathbf{NEF_t = CI_0 \times \frac{CI_t}{CI_0} \times \frac{NEF_t}{CI_t} = CI_0 \times CUM\_EAR\_G_t \times PAYOUT_t} \quad (6)$$

That is, $CUM\_EAR\_G_t$ is defined as one plus cumulative earnings growth from year zero through future year t (i.e., $CUM\_EAR\_G_t = CI_t / CI_0$), and $PAYOUT_t$ is defined as the proportion of earnings paid out in year t (i.e., $PAYOUT_t = NEF_t / CI_t$). Substituting equation (6) into equation (1) and dividing by current comprehensive income (CI_0), we get

$$\mathbf{\frac{EV_0}{CI_0} = \sum_{t=1}^{\infty} \frac{E[CUM\_EAR\_G_t \times PAYOUT_t]}{(1+r_e)^{t-.5}}} \quad (7)$$

That is, the ratio of equity value to current comprehensive income (CI_0) depends on the cost of equity capital (r_e) and expectations regarding payout and earnings growth in all future years. Earnings growth, in turn, depends on long-term economic growth and accounting quality.

The following exhibit summarizes the determinants of the value-to-book and value-to-earnings ratios. To the extent that price reflects intrinsic value, these value drivers also affect the price-to-book and price-earnings ratios, respectively.

Exhibit 3.1.1: Determinants of Value Ratios

Value ratio	Value Drivers
Value-to-book	Profitability, accounting quality, book value growth, equity risk, long-term interest rates
Value-to-earnings	Earnings growth, accounting quality, earnings payout, equity risk, long-term interest rates

I next discuss each of the value drivers.

3.2 Profitability

Ratios used to evaluate profitability include Return On Equity (ROE), Recurring ROE, and One-Time ROE. These ratios are relevant for essentially all firms, but, for reasons discussed in Section 3.7, are particularly important when analyzing insurers and other financial service companies. In addition, ratios specifically used in analyzing insurers include the combined and operating ratios and their components (PC insurers), underwriting leverage, investment yield, and investment return. I next discuss each of these ratios as well as a measure of labor productivity—revenue per employee—which is an important driver of profitability for insurers and other companies for which skilled employees are vital. Other measures that are relevant for evaluating profitability, primarily net asset turnover, are discussed in the accounting quality subsection below.

Return on Equity (ROE)

ROE is measured as follows:

$$\textbf{ROE} = \frac{\textbf{Comprehensive Income Available to Common Shareholders}}{\textbf{Beginning of Period Common Equity}}$$

ROE measures the return per dollar of equity investment. It is a summary measure of profitability from all business activities.

As demonstrated in Section 3.1, the price-to-book ratio is greater than one if and only if expected ROE is greater than the cost of equity capital. That is, to the extent that equity measures the amount invested by shareholders and ROE measures the profitability of that investment, firms generate value if and only if ROE is greater than the cost of equity capital. Because the cost of equity capital depends on the riskiness of the investment, when analyzing profitability ROE should be interpreted in relation to equity risk.

In addition to measuring historical performance, ROE helps predict future earnings changes, especially because of its mean-reversion property. That is, high ROE is on average followed by lower ROE and therefore earnings declines, and low ROE is on average followed by higher ROE and earnings increases.

The mean reversion tendency of ROE is due to both economic forces and accounting effects. Competition among firms, entry and exit of firms, and diffusion of new ideas or practices drive abnormal levels of profitability toward the mean. Earnings reinvestment and infusion of new capital cause further convergence. When profitability is abnormal, reinvested earnings and new capital investments are likely to earn more normal levels of profitability compared to existing capital, driving future ROE (which reflects the profitability of both new and existing capital) toward the mean. The tendency of ROE to revert toward the mean is also due to transitory earnings items, such as one-time economic shocks, realized gains and losses, mark-to-market gains and losses, and leverage effects. These items, which often cause an abnormal level of ROE in a given year, generally have smaller effects on subsequent ROE due to their transitory nature.

For low ROE, mean reversion is due to **real options** and accounting distortions in addition to the above factors. Abandonment options and other real options allow firms to discontinue or restructure low profitability projects, reducing the duration of negative

profitability shocks. In contrast, firms generally do not discontinue or restructure successful projects. Accounting distortions inducing ROE reversion include the impact of conservatism and "big bath" charges. **Conservatism** is an accounting convention which requires an immediate recognition of losses (e.g., impairment charges) but delayed recognition of profits; losses are often recognized when anticipated, while profits are recognized when earned. "**Big bath**" charges are often recognized by managers in periods of particularly low performance, or following management change, to facilitate the reporting of higher earnings in future periods. These items cause mean reversion in ROE because they result in transitory declines in earnings followed by subsequent earnings increases. For example, an insurer may overstate a restructuring reserve and later release it into earnings, or it may write down DAC to lower future amortization. Moreover, the reduction in equity—the denominator used in future ROE calculations—further contributes to the subsequent increase in ROE. Consistent with these arguments, mean reversion is empirically stronger for low ROE compared to high ROE (see, e.g., Harris and Nissim 2004, Nissim 2010c).

Although ROE reverts toward the mean, the revision is protracted and incomplete, with cross-sectional differences in profitability often persisting for many years.[29] This is due to cross-sectional differences in risk (high risk implies high average profitability due to a risk/return trade-off), the impact of accounting conservatism (conservative accounting principles increase steady state ROE due to the understatement of equity), and persistent differences in economic profitability.

The pace of ROE mean-reversion varies significantly across firms and over time. Therefore, to effectively utilize the mean-reversion property of ROE in predicting earnings and estimating equity value, it is important to consider factors that affect the rate of ROE mean reversion. The tendency of ROE to revert toward the mean is particularly strong under the following circumstances:

- The gap between current and "normal" profitability is large
- The relative magnitude of transitory items is high
- The relative magnitude of reinvested earnings and new capital investments is high
- Profitability is low (as discussed above, mean reversion from below the mean is generally faster than reversion from above the mean)
- ROE is highly volatile, which implies that abnormal levels of ROE are likely due to temporary shocks

In addition, the characteristics of the company and the environment in which it operates affect the persistence of economic profitability (e.g., firm size, market share, barriers to entry, fragmented versus concentrated industry).

[29] For evidence regarding the time series behavior of ROE, see Nissim and Penman (2001), and Harris and Nissim (2004). Nissim (2010c) examines the time-series behavior of ROE in the insurance industry.

Recurring ROE

Recurring ROE is measured as follows:

$$\textbf{Recurring ROE} = \frac{\textbf{Recurring Income}}{\textbf{Beginning of Period Common Equity}}$$

Recurring ROE is a summary measure of recurring profitability from all business activities. Recurring income excludes "One Time Items," and so Recurring ROE is more persistent than ROE. Moreover, if "One-Time Items" are really transitory or at least substantially less persistent than Recurring Income, Recurring ROE may facilitate more precise predictions of future ROE than ROE itself. Accordingly, the relationship between equity value and profitability should be stronger when profitability is measured using Recurring ROE instead of ROE.

"One Time Items," which are removed from "comprehensive income available to common shareholders" in measuring recurring income, generally include "other comprehensive income," extraordinary items, income from discontinued operations, impairment charges, asset write-downs, restructuring charges, realized gains and losses, and other items which are deemed to be relatively transitory, net of related income taxes.[30] For essentially all insurers, a primary source of transitory items is realized gains and losses on investments (including OTTI). For PC insurers, a potentially large transitory item is also included in the losses and loss expenses. In addition to the current cost of coverage, losses and loss expenses include the adjustment to the previous year balance of the loss reserve ("reserve development"). This adjustment is relatively transitory because it reflects the impact of changes in estimates.[31]

The same arguments that motivate most analysts to exclude transitory items from earnings, lead some analysts to exclude Accumulated Other Comprehensive Income (AOCI) from book value when measuring ROE or the price-to-book ratio. For insurers, AOCI often cause significant volatility in ROE, similar to the effect of transitory earnings items on reported income. Still, excluding AOCI is problematic for the following reason. A primary motivation for the removal of transitory earnings from reported income is that they are discretionary, that is, management might have deliberately engaged in the transactions that generated those items (e.g., sell securities with unrealized gains to increase reported income). Thus, excluding transitory earnings items provides a measure of non-discretionary, "real" earnings. In contrast, removing AOCI actually makes the resulting book value discretionary. For example, selling a security with unrealized gains reduces AOCI and increases ex-AOCI book value, but does not change total book value.

Another, more legitimate argument for the exclusion of AOCI from book value is that excluding AOCI mitigates distortions caused by the mixed attributes model—historical cost and fair value—currently used under GAAP. Specifically, most insurers' investments are classified as available for sale and reported at fair value, with unrealized gains and losses included in AOCI. In contrast, the reserve liabilities that these investments are expected to settle are

[30] If the net investment in a discontinued component is significant, a more informative measure of Recurring Income can be constructed by adding an estimate of the normal return expected to be generated on the funds that currently fund the discontinued component. This amount should be subtracted from One Time Items.

[31] Realized gains and losses, loss reserve adjustments, and similar items are reported year after year, so referring to them as "one time" seems inappropriate. However, these items are "one time" in the sense that the *amounts* reported are highly volatile and do not recur.

generally not marked-to-market. Because the values of investments and reserve liabilities are positively correlated (both are interest rate sensitive), the inclusion of unrealized investment gains and losses in AOCI causes an artificial volatility in book value. Empirically, Nissim (2010b) finds that excluding AOCI reduces the accuracy of book value-based valuations (this paper is discussed in Section 3.7).

One-Time ROE

One Time ROE is defined as follows:

$$\textbf{One Time ROE} = \frac{\textbf{One Time Items}}{\textbf{Beginning of Period Common Equity}}$$

One Time ROE measures the impact of transitory items on shareholders' profitability. This ratio is informative about Recurring ROE for two reasons. First, it may indicate a bias in Recurring Income. For example, frequent write-downs or disposal losses suggest that the firm uses aggressive accounting policies (e.g., overcapitalization or insufficient amortization of policy acquisition costs), implying that Recurring Income is overstated. Second, negative One Time Items increase future Recurring ROE by reducing equity (the denominator of future ROE) and increasing future income. For example, a DAC write-down reduces future amortization, an OTTI of investments increases future net gains, and restructuring charges reduce future operating expenses.

The Combined Ratio and Its Components

The combined ratio and its components are defined as follows:

$$\begin{aligned}\textbf{Combined Ratio} = {} & \textbf{Loss Ratio} + \textbf{Loss Expense Ratio} \\ & + \textbf{Underwriting Expense Ratio} + \textbf{Policyholder Dividend Ratio}\end{aligned}$$

where

$$\textbf{Loss Ratio} = \frac{\textbf{Losses}}{\textbf{Net Premiums Earned}}$$

$$\textbf{Loss Expense Ratio} = \frac{\textbf{Loss expenses}}{\textbf{Net Premiums Earned}}$$

$$\textbf{Underwriting Expense Ratio} = \frac{\textbf{Underwriting expenses}}{\textbf{Net Premiums Earned}}$$

$$\textbf{Policyholder Dividend Ratio} = \frac{\textbf{Policyholder Dividends}}{\textbf{Net Premiums Earned}}$$

The combined ratio and its components measure the underwriting profitability of PC insurance companies. The policyholder dividend ratio is insignificant for the PC insurance industry overall, constituting less than one percentage point in recent years. The loss ratio is the most significant element, fluctuating between 50 and 70 percentage points in recent years. In contrast, the loss expense ratio and the underwriting expense ratio are quite stable, constituting about 12 and 26 percentage points respectively in recent years.

The loss ratio and loss expense ratio are often aggregated together and referred to as the **loss and loss expense ratio** or simply the loss ratio. Conceptually, the loss and loss expense ratio should indicate the average cost of insurance protection per each dollar of net premiums earned during the period. However, losses and loss expenses reflect not just the cost of protection provided during the year but also the adjustment to the previous year balance of the loss reserve. This adjustment is due to changes in loss estimates (the net redundancy / deficiency) and accrued interest on discounted reserves such as settled workers' compensation (see Exhibit 2.2.2 for an example of "amortization of discount"). In addition, unlike the premiums, which reflect current dollars, losses and loss expenses generally measure undiscounted future payments. This causes an overstatement of the loss and loss expense ratio, particularly for long tail liability lines. Therefore, a potentially more informative measure of current profitability can be calculated by (1) "undoing" the impact of changes in estimates and discount amortization related to prior year reserves from the losses and loss expenses, and (2) discounting losses and loss expenses related to current period coverage. This can be done using loss development disclosures (see section 2.2).

The **underwriting expense ratio** measures operational efficiency in underwriting. Specifically, this ratio represents the percentage of a company's net premiums earned that went toward underwriting expenses such as commissions to agents and brokers, state and municipal taxes, salaries, employee benefits, and other operating costs. An alternative calculation of the underwriting expense ratio is to divide the SAP measure of underwriting expenses by net premiums written. This metric compares underwriting expenses to net premiums written rather than earned because SAP treat policy acquisition costs as an expense rather than amortizable cost (see Section 1.5).

Different lines of business have intrinsically differing underwriting expense ratios. For example, boiler and machinery insurance, which requires a corps of skilled inspectors, is a high expense ratio line. In contrast, underwriting expense ratios for group health insurance are quite low. Because (1) the underwriting expense ratio is an important determinant of overall profitability, and (2) insurers attempt to set premium rates at levels adequate to generate profits, differences in the underwriting expense ratio across business lines imply opposite differences in the loss ratio. This correlation, however, is far from perfect. High underwriting expense ratio may be offset by a long tail, which allows insurers to generate significant investment income. And, of course, realized profitability is generally different from expectations.

The **combined ratio** reflects both the cost of protection and the cost of generating and maintaining the business. When the combined ratio is under 100%, underwriting results are considered profitable; when the combined ratio is over 100%, underwriting results are considered unprofitable. However, as mentioned above, the combined ratio understates true underwriting profitability by measuring losses undiscounted. Stated differently, the combined ratio does not reflect the investment profits that insurers generate on the float. The operating ratio, which is discussed next, attempts to address this deficiency.

Operating Ratio

The operating ratio is defined as follows:

$$\textbf{Operating Ratio} = \textbf{Combined Ratio} - \textbf{Net Investment Income Ratio}$$

Where

$$\textbf{Net Investment Income Ratio} = \frac{\textbf{Net Investment Income}}{\textbf{Net Premiums Earned}}$$

And,

$$\textbf{Net Investment Income} = \textbf{Investment Income - Investment Expense}$$

The **operating ratio** measures a company's overall operational profitability from underwriting and investment activities. This ratio excludes other operating income and expenses, capital gains and losses, and income taxes. An operating ratio greater than 100% suggests that the company is unable to generate profits from its underwriting and investment activities.

The **net investment income ratio** measures the income contribution of the float. Because the float results from insurance activities, this component of income should also be considered when evaluating the profitability of insurance operations. However, the net investment income ratio—and accordingly the operating ratio—often provide a poor indication of current profitability. Net investment income is earned primarily on funds obtained in prior years. Thus, for growing companies, net investment income understates the contribution of the current float, and vice versa for insurers experiencing a decline in the insurance book. Changes in the average tail of the policies or in investment opportunities add further noise.[32] Therefore, a better approach for evaluating the income contribution of the float is to estimate the extent to which the current losses and loss expenses are overstated (see discussion of the loss ratio above).

Underwriting Leverage

Underwriting leverage is measured as follows:

$$\textbf{Underwriting Leverage} = \frac{\textbf{Net Premiums Written}}{\textbf{Policyholder Surplus}}$$

Net premiums written is equal to direct insurance and reinsurance assumed during the period, less reinsurance ceded. In the context of analyzing profitability, this ratio measures the efficiency with which the insurer uses its capital resources to generate business – insurers with relatively low ratios are not fully utilizing their capital. However, a relatively low underwriting leverage ratio is not always "bad." Aggressive underwriting may lead to significant losses, especially in soft markets. Also, insurers with low leverage ratios have more room for growth, without having to dilute existing shareholders. And, importantly, the leverage ratio also measures the company's exposure to pricing errors in its current book of business. Potential losses due to underpricing of policies are related to the amount of net business written, while policyholder surplus measures the cushion available to absorb such losses.

[32] For example, a shift in focus from long-tail liability coverage to short-tail property coverage suggests that the net investment income ratio overstates the contribution of investment income associated with current underwriting. As another example, increases in interest rates to levels higher than those experienced in prior years imply that the net investment income ratio (which reflects average interest rates in prior year, when the portfolio was created) understates the contribution of investment income to the overall profitability of current underwriting.

Investment Yield

The investment yield is measured as follows:

$$\textbf{Investment Yield} = \frac{\textbf{Net Investment Income}}{\textbf{Beginning of Period Investment Assets}}$$

This ratio measures the profitability of investments and so purports to reflect investment success. However, the investment yield may not necessarily indicate investment performance for at least four reasons, which are explained next.

First, high risk investments typically have high yields, while low risk investments have low yields. For example, compared to LH insurers, PC insurers invest in shorter term, higher credit quality, and more liquid debt securities, and therefore have lower investment yields. Thus, when analyzing investment performance, the yield should be considered in relation to the riskiness of the investments.

Second, most investment assets are reported at fair value (available-for-sale securities), and so any success or failure in selecting investments is reflected in their book value, which serves as the denominator in the yield calculation. For example, if an insurer acquires securities that offer abnormal risk-adjusted yields, the fair value of those securities will subsequently increase, bringing the investment yield back to more normal levels. This effect is particularly strong for long term investments; for short- or intermediate-term investments, the denominator effect is relatively small and thus the investment yield may still reflect investment performance.

Third, any investment performance that is captured by the yield is historical, because most investments were made in prior years, and net investment income is measured using the effective (historical) interest rates. Thus, for the investment yield, the statement "past performance may not be indicative of future results," can be rephrased as "current performance may not be indicative of current results."

Fourth, in periods of substantial changes in investments, either due to growth, decline, or changes in asset mix, the measured investment yield may contain significant error. Such changes affect investment income but do not change the denominator (beginning of period investments). This error can be mitigated by adjusting the denominator for changes in invested assets during the year using quarterly financial information. Indeed, in the MD&A section, insurers report an estimate of the investment yield which is calculated using quarterly (or, in some cases, monthly, weekly, or even daily) average invested assets.

An alternative approach for measuring the investment yield is to use the amortized cost of investments instead of their book value. (For assets that are reported on the balance sheet at fair value, amortized cost is reported parenthetically or in the notes.) This calculation provides a better indication of investment performance because the denominator is based on the invested amount. Still, the calculated yield reflects past, not current investment performance.

Investment yields may also inform on accounting quality. In particular, an abnormally low investment yield may suggest that reported investments are overstated. This concern is especially relevant for investments whose estimated fair values are highly discretionary, as is often the case with illiquid, long-term, low credit quality, or option-loaded instruments. In such cases, management might overstate the reported fair value or avoid recognizing impairment (for instruments reported at amortized cost).

Investment Return

The investment return is measured as follows:

$$\textbf{Investment Return} = \frac{\textbf{Net Investment income} + \textbf{Net Gains (Losses) on Investment Assets}}{\textbf{Beginning of Period Investment Assets}}$$

where net gains (losses) is the sum of realized gains (losses) plus the change in unrealized gains (losses). Investment return has two components: investment yield and net capital gains. Unlike the investment yield which reflects risk and historical performance, the investment return measures current performance. However, this measure has it own shortcomings. Gains and losses are often due to unpredictable market fluctuations in interest rates or other macro variables, and not to superior performance. Relatedly, gains and losses are highly volatile and are typically transitory. In addition, to the extent that insurers engage in asset-liability management, gains or losses on investments are at least partially offset by unrecognized gains or losses on liabilities.

Recurring Revenue per Employee

Recurring Revenue per Employee is measured as follows:

$$\textbf{Recurring Revenue per Emploee} = \frac{\textbf{Recurring Revenue}}{\textbf{Number of Employees}}$$

For service companies, employee skills are a particularly important resource. Accordingly, the efficiency of this resource—as measured using average revenue per employee—is an important performance metric. The ratio of recurring revenue to the number of employees also informs on the value of human capital. Recurring revenue is calculated by subtracting realized gains and losses from reported revenue.

3.3 Accounting Quality

Metrics used to evaluate accounting quality include the Recurring Revenue-to-Equity Ratio, Loss Development Ratio (for PC insurers), Premium Growth, Revenue Mix Ratios, Book-Tax Difference Ratio, and the Effective Tax Rate (ETR). The first four are specific to the insurance industry, while the tax-related ratios are relevant for essentially all companies. Some of the most commonly used accounting quality ratios, such as those comparing accruals to cash flows, are less relevant for financial service companies.

Recurring Revenue-to-Equity Ratio

This ratio, which reflects net asset turnover, is measured as follows:

$$\textbf{Recurring Revenue - to - Equity Ratio} = \frac{\textbf{Recurring Revenue}}{\textbf{Equity}}$$

Financial service companies, especially insurers, need few operating assets to generate revenue, but are required to hold equity capital at levels sufficient to support their operations. Thus, unlike non-financial service firms for which turnover ratios are calculated relative to assets, insurers' turnover is more appropriately evaluated relative to equity.

Turnover ratios inform on earnings quality for several reasons. A low turnover ratio may suggest that equity is overstated either because the insurer understated its liabilities or contra-assets (e.g., loss reserve, liability for future policy benefits, tax valuation allowance), over-capitalized expenditures (e.g., including operating expenses in DAC), or understated amortization or write-downs (e.g., of DAC or investment assets). A low turnover ratio may also imply that the insurer does not use its equity efficiently.

Reserve Development Ratio

This ratio is measured as follows:

$$\textbf{Reserve Development Ratio} = \frac{\textbf{Reserve Development}}{\textbf{Beginning of Period Loss Reserve}}$$

Where reserve development is the current year adjustment to the prior year's reserve. Inferences made using this ratio are typically based on its time-series properties, such as the average value, trend, or standard deviation over recent years.

As discussed in Section 2.2, the primary expense recognized by PC insurers is "losses and loss expenses." Measuring this expense involves significant uncertainty and discretion, which often results in a large measurement error. Over time, as losses are paid and new information is obtained, insurers revise the estimate of total incurred losses, and this adjustment (called "reserve development") is included in the reported losses and loss expenses. Because the adjustment is both unrelated to current coverage and quite volatile, some analysts exclude it from the losses and loss expenses when analyzing underwriting profitability. Still, considering the time-series properties of the reserve development ratio is informative. To the extent that measurement error in loss reserving is correlated over time, past adjustments to the loss reserve inform on the precision of the reported cost of current coverage. For example, compared to other insurers, an insurer with a sequence of positive adjustments to the reserve may be more likely to understate the losses and loss expenses associated with current coverage, and an insurer with a

history of large adjustments (positive and negative) may be more likely to have large error in the reported cost of current coverage. Moreover, even if loss recognition for current coverage is adequate, to the extent that adjustments of inadequate past reserves are applied gradually (see Section 2.2), examining the time-series of the reserve development ratio may help predict future development with respect to past coverage, which will be included in the future reported losses and loss expenses.

The reserve development ratio can be calculated using either information from the Loss Reserve Development schedule or from the footnote disclosure of the Reconciliation of Claim and Claim Adjustment Expense Reserves. As discussed in Section 2.2, the latter includes information on LH claim reserve development in addition to PC loss reserve development.

Premium Growth Rate

For PC insurers, especially those writing long-tail policies, income in periods of premium growth is understated due to the overstatement of losses and loss expenses, which are measured undiscounted. If premium revenue is relatively stable over time, this bias is offset by the omission of interest expense on the loss reserve. However, when premium revenue increases (declines) over time, the omitted interest expense is smaller (larger) than the overstatement of the losses and loss expenses, and so income is understated (overstated).

Revenue Mix Ratios

The following ratios measure the distribution of recurring revenue:

$$\textbf{Net Premiums Earned Ratio} = \frac{\textbf{Net Premiums Earned}}{\textbf{Net Premiums Earned} + \textbf{Net Investment Income} + \textbf{Fee Income}}$$

$$\textbf{Net Investment Income Ratio} = \frac{\textbf{Net Investment Income}}{\textbf{Net Premiums Earned} + \textbf{Net Investment Income} + \textbf{Fee Income}}$$

and

$$\textbf{Fee Income Ratio} = \frac{\textbf{Fee Income}}{\textbf{Net Premiums Earned} + \textbf{Net Investment Income} + \textbf{Fee Income}}$$

Insurers have four primary sources of revenue: net premiums earned, net investment income, fee income (primarily LH), and realized gains and losses. These sources of revenue have different persistence and growth. Moreover, the level and persistence of the margins associated with these revenue streams are also quite different from each other. Realized gains and losses is obviously the least persistent source of income and is therefore excluded when measuring recurring revenue. Net investment income varies with interest rates and the amount of investment assets, and is generally less persistence than net premiums earned and fee income. Net premiums earned is usually the most persistent source of revenue. However, the claims expense associated with net premiums earned is quite volatile, so the persistence of underwriting income is often low, especially for PC insurers.

Book-Tax Difference Ratio

This ratio is measured as follows:

$$\textbf{Book - Tax Difference Ratio} = \frac{\textbf{After tax Income - Tax Earnings}}{\textbf{Book Value of Equity}}$$

where "tax earnings" is the tax equivalent of after-tax income. "Tax earnings" is measured by subtracting current income taxes from taxable income, which in turn is estimated by grossing up current income taxes.

A negative or low ratio suggests that reported earnings are sustainable (Lev and Nissim 2004). This follows because tax earnings are a proxy for "permanent" earnings, for at least two reasons: (1) taxable income excludes some discretionary accruals which are often used to manage earnings, and (2) many firms smooth taxable income over time, making it a proxy for future taxable income and hence future earnings. I explain these arguments in turn.

Accruals such as provisions, amortization, and impairment charges, which are often used to manage earnings, are either not tax deductible (e.g., most cases of amortization and impairment charges of intangible assets), tax deductible according to a uniform, IRS-dictated formulas (e.g., amortization and depreciation), or tax deductible only when the underlying event occurs (e.g., a debt write-off). Thus, firms' ability to use these items to manipulate taxable income is rather limited.

Firms often smooth taxable income over time because some elements of the tax code cause income taxes to increase with income volatility. These include progressive tax schedules, provisions of the alternative minimum tax, and asymmetry in the tax treatment of income and loss (delays in obtaining the tax benefits associated with losses due to carryforwards and the expiration of unexploited tax losses). Companies may smooth taxable income primarily by timing and "cheery picking" transactions. For example, to increase (reduce) taxable income, they may sell assets with unrealized gains (losses).

Effective Tax Rate (ETR)

The effective tax rate is calculated as follows:

$$\textbf{Effective Tax Rate (ETR)} = \frac{\textbf{Income Tax Expense}}{\textbf{Pretax Income}}$$

The Effective Tax Rate (ETR) is positively related to subsequent changes in net income. This follows because abnormal ETRs are often due to pretax income including non-taxable transitory items (e.g., goodwill impairment, non-deductable fines, some insurance proceeds), or the income tax expense including transitory tax adjustments (e.g., the impact of changes in tax rates, tax reserves, or valuation allowances). Thus, for example, a high ETR suggests that pretax income includes negative transitory earnings items or that the income tax expense includes positive transitory items, either way implying that net income is likely to increase.

3.4 Growth

Metrics used to evaluate growth prospects include historical growth rates in fundamentals such as earnings, revenue, dividends, equity and assets, and firm characteristics such as size and profitability. In some cases, growth rates in unrecognized or non-financial metrics are particularly relevant. For example, growth in Asset Under Management (AUM) is an important predictor of future revenues for LH insurers with significant investment advisory operations. Similarly, growth in the number of employees may serve as a proxy for growth in human capital. Insurance-specific growth metrics include premium growth and the ratio of written-to-earned premiums. Finally, many of the profitability and accounting quality indicators discussed earlier also inform on expected growth, primarily short-term growth. I next elaborate on some growth predictors.

Earnings Growth

Economic growth rates are generally auto-correlated, suggesting that historical earnings growth rates should predict future earnings growth. However, earnings growth rates are very volatile and show little persistence (e.g., Chan et al. 2003). This is due in part to cases where base earnings—from which growth is measured—are relatively small, which often result in large percentage changes. Moreover, in many cases base earnings are negative, rendering earnings growth rates meaningless. Another reason for the overall low persistence of earnings growth rates is the mean reversion tendency of earnings (see Section 3.2), which in some cases fully offsets or even reverses any earnings momentum effect.

Recurring Revenue Growth

For most firms, revenue growth rates are much more persistent than earnings growth rates. This is due to (1) fixed costs, which reduce earnings without offsetting their variability, and (2) the inclusion of transitory expense items in earnings. Therefore, revenue growth is typically a better predictor of future growth in revenue and earnings than earnings growth itself. For insurance companies, however, revenue often includes substantial realized gains and losses, which potentially reduce the persistence of revenue growth rates. Therefore, when measuring revenue growth rates, excluding realized gains and losses is likely to improve the informativeness of this metric.

Revenue growth rates are also less volatile than growth rates in assets or other balance sheet items. This follows because business combinations and other investing activities have a more gradual effect on revenue growth compared to asset growth. Investments are fully and immediately reflected on the balance sheet, while the related revenues are recognized only from the date of acquisition. Thus, shocks to revenue growth rates are more moderate and persistent than shocks to balance sheet numbers, which in turn implies that historical revenue growth rates are likely to perform better than balance sheet growth rates in predicting future growth.[33]

[33] Business combinations and other investments induce positive autocorrelation in revenue growth because the income statement for the year subsequent to the business combination reports the full year revenue of the acquired firm while the income statement in the year of the combination reports revenue only from the acquisition date.

Premium Growth Rate

Premium revenue is the primary source of revenue for most insurers, and it is generally more persistent than other revenue sources. Therefore, premium growth should help predict future revenue and earnings growth. As discussed in the previous section, premium growth also informs on earnings quality: positive growth implies potential earnings understatement due to the overstatement of recognized expenses (particularly PC insurers' undiscounted losses and loss expenses), and negative growth implies earnings overstatement. On the other hand, premium growth is often considered a risk factor, as explained next.

Premium growth is driven by exposure growth (an increase in the number of policyholders) and rate-level growth (an increase in the average price per exposure). These two sources of growth have different persistence and risk implications. Exposure growth is valuable if the products are properly priced, but in a competitive market, significant exposure growth may be an indication of underpricing. This is the primary motivation for using premium growth as a potential early warning signal of financial impairment (see Section 1.5). In contrast, premium growth attributable to rate increases may reduce risk if the same customers are paying more for the same risk exposure. However, if the rate increases alter or reflect a change in the mix of customers, the new book of business can generate unexpected losses if it is mispriced.[34]

Net Premiums Written Relative to Net Premiums Earned

Premiums written are a leading indicator of premiums earned – the primary component of most insurers' revenue. This follows because a portion of the premiums written in the current year will be earned and recognized as revenue in future years. For mature companies, previously written premiums that are earned in the current year are approximately equal to currently written premiums that will be recognized in future years. Accordingly, for mature companies the ratio of premiums written to premiums earned is approximately one. In contrast, for growing companies the ratio is greater than one, because currently written premiums that will be recognized in future years are greater than currently recognized premiums that were written in prior years. More generally, expected premium growth increases with the written-to-earned premiums ratio.

Dividend Growth

Dividend growth performs quite well in predicting earnings growth (e.g., Nissim and Ziv 2001). This follows because managers are reluctant to cut dividends, and so increase dividends only when they expect higher, sustainable earnings. However, when dividends are small relative to earnings, or when no dividends are paid, this growth predictor is less informative or unavailable, respectively.

Equity Growth

Historical growth rates in equity help predict future equity and earnings growth due to the persistence of growth rates and the correlation across financial statement items. That is, high historical equity growth implies high future equity growth and therefore high earnings growth. More importantly, historical equity growth predicts earnings growth because it implies that

[34] Barth and Eckles (2009) elaborate on these effects.

additional equity will be available to generate future earnings, that is, next year's ROE will be earned on a larger investment base. For insurers and other financial services companies, the relationship between equity growth and subsequent revenue and earnings growth is also due to regulatory capital requirements, which restrict the operations of weakly-capitalized institutions.

While current equity growth generally implies future growth, it does have some negative implications. As discussed in Section 3.3, growth in equity is often negatively related to earnings quality. In addition, earnings growth due to equity growth is costly. This follows because equity growth due to stock issuance dilute the share of existing stockholders by creating new claims on the firm's assets and cash flows, and equity growth due to earnings reinvestment implies that stockholders forgo the opportunity to use the reinvested funds (Harris and Nissim 2006).

Asset Growth

Similar to equity growth, historical asset growth helps predict future equity and earnings growth due to the persistence of growth and the correlation across financial statement items. In addition, asset growth rates are "catch all" measures of investment, which increases the capacity to generate future revenues and earnings. Asset growth is a leading indicator of revenue and earnings growth also because (1) current period revenue includes revenues generated by new assets only from the date of asset acquisition, while next period revenue will reflect a full-year activity, and (2) some investments require significant time before the assets are fully productive.

When using asset growth as a proxy for growth expectations, there are several effects that should be considered. First, asset growth is costly – it involves increased interest cost (if the asset growth is funded with new debt), equity dilution (if the growth is funded with new equity), or forgone dividends (if the growth is funded with reinvested earnings). Second, growth in assets is negatively related to earnings quality (e.g., due to overcapitalization of DAC; see Section 3.3). Third, mergers and acquisitions and lumpy capital expenditures induce high volatility in asset growth, making asset growth quite volatile over time and so poor predictor of future asset growth.

Asset Growth Due To Intangibles

Asset growth due to business combinations (acquired growth) implies a smaller effect on future earnings compared to organic growth. Acquired growth is often fully paid for, and it involves recognition of all acquired assets (e.g., VOBA, goodwill). In contrast, organic growth is more likely to represent positive NPV projects, and it involves unrecognized assets such as start up costs, investments in human capital, and other internally-developed intangibles that are expensed as incurred. The relative magnitude of acquired growth can be gauged by comparing the change in intangibles (other than DAC) to the change in total assets, because most recognized intangibles result from business combinations.

Growth in Employees

Human capital is an important economic resource for essentially all companies, but especially for service companies. Yet this resource is not directly reflected on the balance sheet or income statement. The growth rate in employees may capture growth in human capital, particularly when

the analysis also considers measures of employee productivity, such as revenue per employee (see Section 3.2).

Firm Size

Substantial research in the marketing and industrial organization (IO) literatures has documented a negative correlation between firm size and subsequent growth. Studies have attributed this correlation to diminishing returns to scale and finite demand (small firms start from a small scale of operations and so have more room for potential growth, while large firms are more likely to face limits on their growth). Size is negatively related to growth also due to life cycle effects (large firms are more likely to have products at the maturity or decline stages) and diminishing returns to learning (for large—typically old—firms there is less scope for further efficiency gains from learning). Some of these arguments may be less relevant for insurers, but the overall relationship between growth prospects and size is still likely to be negative. Section 1.1 reviews the literature on economies of scale in insurance, with implications for the relationship between growth and size.

Profitability

Profitability is positively related to subsequent investment and growth because profitable firms often have (1) better investments opportunities, (2) internal funds (which are cheaper than external funds), (3) ability to obtain operating credit, and (4) access to capital markets. For insurance companies, another factor that contributes to the positive relationship between profitability and subsequent growth is the impact of profitability on regulatory capital and perceived solvency, which in turn affects the insurer's ability to generate business (see Sections 1.5 and 1.7).

3.5 Cost of Equity Capital

An insurer's cost of equity capital is the rate of return required by its equity investors given the expected duration and risk of equity flows (dividends, share repurchases, or other distributions). It is therefore measured as the total of the risk free rate for the duration of the equity flows and a risk premium. The risk free rate is usually approximated using the ten years Treasury yield, and the risk premium is estimated using proxies for the riskiness of equity flows and the pricing of that risk.

There are at least three approaches for evaluating risk and estimating the cost of equity capital. The traditional and most common approach is to estimate the cost of equity capital based on the joint distribution of stock returns and market-wide risk factors, primarily the return on a proxy for the market portfolio and the returns on factor-mimicking portfolios. Another approach is to map fundamental risk factors (e.g., leverage, size, value ratios, industry exposures) into an estimate of the cost of equity capital. This is done using models that extract information on the pricing of those fundamentals from risk measures such as historical beta. A third approach is to reverse-engineer the cost of equity capital from market prices and earnings or cash flow forecasts. I discuss these approaches in turn.

Return-based Proxies for the Cost of Equity Capital

For many years, the most common approach for estimating the cost of equity capital has been the Capital Asset Pricing Model (**CAPM**), in spite of extensive research that demonstrates problems with this method. The fundamental premise of the CAPM is that the risk of a stock can be decomposed into two components – systematic risk, which is related to the overall market, and non-systematic (idiosyncratic) risk, which is specific to the individual stock. According to the CAPM, idiosyncratic shocks are not priced because their impact can be eliminated by holding a diversified portfolio. Systematic risk, in contrast, cannot be diversified away and therefore commands a risk premium. Under some stringent assumptions, systematic risk can be measured using the average sensitivity of the stock's return to the contemporaneous return on the market portfolio. This metric—called beta—is estimated using a time series regression of the stock's return on a proxy for the market return such as the S&P 500 (the "market model"). The risk premium is then calculated as the product of beta and an estimate of the equity risk premium.

The CAPM assumes that stock returns are normally distributed or, alternatively, that investors care only about the mean and variance of returns. However, stock return distributions are heavy-tailed, and it appears that investors care about higher moments of the return distribution in addition to the mean and variance. In particular, studies have shown that negative co-skewness—that is, a tendency to perform particularly poorly when the market overall performs poorly—and kurtosis—a measure of the heaviness of the tails of a distribution—are both priced by investors.[35] In addition, contrary to the CAPM premise, idiosyncratic volatility is correlated with expected returns, although the sign of that correlation is negative rather than positive (Ang, Hodrick, Xing, and Zhang, 2006). The first moment of the return distribution has

[35] Co-skewness measures the marginal contribution of a stock to the skewness of the market portfolio return, in the same way that the covariance (numerator of beta) represents the marginal contribution of the stock to the variance of the market portfolio return. For evidence regarding the pricing of co-skewness, see Harvey and Siddique (2000). Evidence regarding the pricing of kurtosis is provided by Dittmar (2002).

also been shown to predict stock returns. For example, Jegadeesh and Titman (1993) show that winner stocks over the past 6 months outperform losers by 1% per month during the next 6 to 12 months, and DeBondt and Thaler (1985) show that loser stocks in the past 3 to 5 years outperform winners by 25% over the next 3 years.

Over the years, as evidence contradicting the CAPM has accumulated, the market model has been extended to include additional macro factors such as unexpected inflation, unexpected changes in interest rates, and the returns on factor-mimicking portfolios. Under these models, the risk premium is calculated as the sum of the products of the stock's sensitivity to each factor and the premium associated with that factor. The primary additional factors that are currently used are the size and book-to-market factor-mimicking portfolios.[36] A less sophisticated approach—but probably one which is more commonly used by practitioners—is to adjust a market model-based estimate of the risk premium for the incremental premium associated with small or otherwise risky companies, where the incremental premium is measured based on the average historical spread relative to the market model associated with that exposure.

The above models have been implemented with respect to the cross-section of companies. While the motivations for these approaches generally apply to insurance companies as they do for other companies (e.g., investors in insurance companies care about systematic risk, and insurers' size is correlated with the risk of financial distress), insurance companies have unique characteristics which may affect their return/risk relationship. In addition, there are significant differences in exposures across insurers, especially between LH and PC insurers. For example, the distribution of PC insurance claims at the firm level can be highly skewed and heavy-tailed, implying that stock returns for PC insurers are likely to be particularly non-normal.[37] Also, some LH insurers have significant non-linear exposure to market returns due to various minimum benefit guarantees. As discussed below, Nissim (2010a) provides relevant evidence on these issues.

Fundamentals and the Cost of Equity Capital

An alternative or complementary approach for estimating the cost of equity capital is to use ratios and other fundamentals which capture various risk aspects. Fundamentals can be mapped into estimates of the cost of equity capital using quantitative or qualitative approaches. This is typically done by relating beta estimates or other risk premium proxies to financial ratios. For example, for private companies, beta is often estimated as follows: (1) historical betas are estimated for a set of firms from the same industry with sufficiently long return history; (2) each of the historical beta is "unlevered" using a formula that describes the theoretical effect of leverage on equity beta; (3) unlevered industry beta is calculated using some measure of location—usually the median—of the unlevered beta estimates; and (4) the stock's beta is estimated by levering up the industry beta using the firm's current or expected financial leverage and the theoretical beta/leverage relationship.

[36] These characteristics are correlated with the probability of financial distress, and so the returns on portfolios constructed based on these factors ("factor-mimicking portfolios") capture systematic news regarding financial distress. See Banz (1981) and Fama and French (1992, 1993, 1996).

[37] See, for example, Cummins, Dionne, McDonald, and Pritchett (1990).

A more flexible approach for incorporating fundamentals in beta estimation is to calculate "predicted betas." This is done using a procedure similar to that described above for the levering of industry beta, except that the adjustments are empirical rather than theoretical and incorporate additional fundamentals besides leverage. A simplified version of predicted beta calculations involves the following steps: (1) historical betas are estimated for a set of firms with sufficiently long return history; (2) historical beta is regressed on fundamental risk factors that are measured during the beta estimation period (e.g., industry membership, size, leverage, earnings variability); and (3) predicted beta is calculated for each firm using the coefficients from the previous step and the current or expected values of the characteristics. The same procedure can also be implemented using alternative risk measures instead of beta. For example, instead of using historical beta in step (1), one may regress estimates of the implied cost of equity capital (see next section) on the fundamental risk factors, and calculate a given company's risk premium using the regression coefficients and the values of the fundamentals for that company.

The "predicted beta" procedure described above offers several advantages. First, it allows one to obtain beta or implied cost of capital estimates for firms for which such estimates are not available (e.g., private companies or companies not followed by analysts). Second, it mitigates the effects of measurement error in the original beta or implied cost of equity capital estimates by providing for a regression residual to capture that error. Third, it informs on the sources of priced risk, as measured by the risk fundamentals. Fourth, it facilitates adjustments for future changes in the predicted risk metric due to changes in the fundamentals.

The remainder of this section discusses primary risk fundamentals. I focus here on general proxies, although I also mention several of the insurance-specific metrics discussed in previous sections (especially 1.7 and 3.2).

Financial Leverage

Financial leverage refers to the relative magnitude of debt compared to equity financing. It is a proxy for financial risk – that is, the incremental equity risk due to the use of debt in addition to equity financing. Equityholders absorb the variability of the return generated on funds obtained from creditors since creditors generally receive a constant return independent of the profitability of the investments made with those funds. Thus, financial leverage increases the variability of equity returns, which in turn implies that it increases both systematic and idiosyncratic risk as well as solvency risk.

Financial leverage has additional effects on risk. Because debt capacity is restricted, high-debt firms have limited ability to borrow additional funds when the need for such borrowing arises. In addition, high-debt firms are dependent on debt markets for continued refinancing and so are more sensitive to changes in interest rates, credit spreads, and funds availability. High financial leverage also implies that a relatively small equity cushion is available to absorb losses. Moreover, financial leverage affects business risks. When firms' fortunes deteriorate, customers and other stakeholders often require additional consideration for transacting with the firm, exacerbating the negative shock that caused the initial decline in fortune. This is especially true in the insurance industry, where financial stability is a critical element of the product provided by the insurer. Additionally, due to extensive regulation, insurers' ability to generate business may deteriorate when losses due to financial leverage mount.

Size

As discussed above, the size of a company is considered an important proxy for its risk and cost of capital. This relationship is due to several reasons. Compared to small firms, large firms are on average better diversified, more likely to use financial hedging techniques, and more profitable. They also have greater financial flexibility, lower information risk, and lower variability in profitability and growth rates. In some industries, large companies may be considered "too big to fail." Size is also strongly correlated with stock liquidity. More fundamentally, these relationships are due to many factors, including economies of scale and scope, increased bargaining power in input and output markets, mature products, access to capital markets, market attention (analysts, institutional investors), and active trading.

Insurance-Specific Risk Fundamentals

Section 1.7 discusses risk and risk management in the insurance industry, including risk measures. Additional risk metrics are described throughout this document. Instead of repeating the discussion here, I mention a few examples. Investment risks, which are significant for essentially all insurers, can be evaluated by considering portfolio mix, maturity distribution, credit rating distribution, fair value level designation (e.g., high proportion of level 3 implies high information risk), investment yields (high yields suggest high investment risk), and historical variation in investment returns, among other fundamentals. Insurance-related risks can be evaluated by examining business line and geographic compositions (e.g., exposure to high risk coverage such as some commercial liability lines or to lines and areas sensitive to catastrophe losses such as homeowner insurance in some locations), premium growth (e.g., high growth suggests potential mispricing), the combined ratio (low ratio implies that underwriting profits are available to absorb unexpected losses), the volatility of the loss ratio, the magnitude of reserve development, the length of the loss reserve's "tail" (a long tail implies high uncertainty regarding ultimate losses), the use of reinsurance (e.g., **premium leverage** – the ratio of gross premium written to net premium written, or **reserve leverage** – the ratio of gross loss reserve to net loss reserve), the quality of reinsurance (e.g., the credit quality of reinsurers), and many other factors. Overall risk assessment involves aggregating all sources of risk as well as considering the capital caution available to absorb potential losses.

Risk fundamentals can be used to evaluate equity risk and cost of capital using quantitative models (e.g., the predicted beta approach discussed above) or qualitative examinations. At a minimum, such metrics can be used as red flags. For example, Therese Vaughan, the CEO of the NAIC, noted that "excessive growth, excessive use of reinsurance (in insurance), investment strategies outside the norm, entry into new lines of business … History indicates these are potential indicators of future problems."[38]

Price-Implied Cost of Capital

When pricing equity securities, investors discount expected flows (e.g., dividends or earnings constructs) using required rates of return commensurate with the riskiness of those flows. Therefore, given price and estimates of expected flows to equity holders, one can invert an equity valuation model to obtain an estimate of the average required rate of return used by

[38] http://www.naic.org/Releases/2009_docs/090305_vaughan_presentation.pdf.

investors in valuing the stock. From the company's perspective, this estimate reflects the cost of equity capital and is accordingly referred to as the implied cost of equity capital (ICEC).[39] As a cost of capital estimate, the ICEC is useful for valuation but also in any context in which a proxy for priced risks is required. Nissim (2010a) provides a systematic analysis of the ICEC of insurance companies.

Academic Research on Insurers' Cost of Capital

Research on the cost of capital is at the core of the finance literature and also plays an important role in accounting and economics. This section concerns with studies examining the cost of capital of insurance companies. Studies discussing risk aspects of insurance operations are reviewed in Section 1.7.

Summary of Studies

Cummins and Phillips (2005) present evidence on the cost of equity capital by line of insurance for the property-liability insurance industry. The authors obtain firm beta estimates and then use the full-information industry beta (FIB) methodology to decompose the cost of capital by line. They obtain full-information beta estimates using the standard one-factor capital asset pricing model and extend the FIB methodology to incorporate the Fama-French three-factor cost of capital model. The analysis suggests the cost of capital for insurers using the Fama-French model is significantly higher than the estimates based upon the CAPM, and that there are significant differences in the cost of equity capital across lines.

Due to the highly skewed and heavy-tailed distributions associated with the insurance claims process, **Wen, Martin, Lai, and O'Brien (2008)** evaluate the Rubinstein-Leland (RL) model for its ability to improve the cost of equity estimates of insurance companies because of its distribution-free feature. The analyses show that there is as large as a 94-basis-point difference in the estimated cost of insurance equity between the RL model and the capital asset pricing model (CAPM) for the sample of property-liability insurers with more severe departures from normality. In addition, significant differences in the cost of capital estimates are found for insurers with return distributions that are asymmetrically distributed, and for small insurers. The RL model provides significant performance improvements (smaller values of excess return of the expected return of the portfolio to the model return) for a portfolio of insurers with returns that are more skewed and for a portfolio of small insurers. Finally, the analysis shows the differences in the market risk estimates are significantly influenced by firm size, degree of leverage, and degree of asymmetry.

Nissim (2010a) derives and evaluates estimates of the implied cost of equity capital of US insurance companies. During most of the period December 1981 through January 2010, the monthly median implied equity risk premium for US insurance companies ranged between 4% and 8%, with a time-series mean of 6.2%. However, during the financial crisis of 2008-2009, the implied equity premium reached unprecedented levels, exceeding 15% in November 2008. While this increase is partially due to the staleness of some analysts' earnings forecasts used in deriving the implied premium, it primarily reflects the pricing of risk during a period of extraordinary volatility. Consistent with investors demanding relatively high expected returns in periods of poor economic performance or high uncertainty, the premium was positively related to the VIX, inflation, and unemployment, and negatively related to the 10-year Treasury yield, production, consumer sentiment, and prior industry stock returns. The cross-sectional correlations between the implied equity risk premium and firm-specific risk factors were similarly consistent with expectations: the equity premium was positively related to market beta, idiosyncratic volatility, and the book-to-market ratio, and negatively related to co-skewness, size and the equity-to-assets ratio. Finally, consistent with the strong correlations between the implied equity risk premium and the macro- and firm-specific risk factors, the premium performed well in predicting stock returns in both time-series (industry) and cross-sectional (stock) tests.

[39] For a review of this literature, see Easton (2007).

3.6 Macro, Industry-Wide, and Line-Specific Drivers

Insurers' revenue and profitability are affected by many macro, industry-wide, and line-specific factors. Understanding these sensitivities is important for evaluating risk and performance, predicting future earnings, and estimating equity value. Exhibit 3.6.1 provides examples of macro, industry-wide and line-specific factors and their typical effects on insurance activities and business lines. Section 3.7, which provides a template for forecasting financial statement line items, discusses how these and other factors can be incorporated in forecasting.

Exhibit 3.6.1: Examples of Macro, Industry-Wide, and Line-Specific Factors

Activity / Line	Factor (Effect)
Premiums	Inflation (affects nominal premiums, but the effect is gradual since in-force policies are typically not adjusted for inflation)
Premiums	Overall economic activity (like most other products, the demand for insurance is affected by income)
Premiums	Catastrophes (the occurrence of a catastrophe may lead to increases in risk perception, risk mitigation, and insurance purchasing behavior)
Premiums – automobile insurance	Overall economic activity (while the demand for insurance coverage for existing cars is relatively inelastic, economic activity affects auto sales)
Premiums – automobile insurance	Interest rates (affects auto sales)
Premiums – automobile insurance	Housing prices (affects home equity loans, which are often used to finance auto purchases)
Premiums – automobile insurance	Investments in public transportation (affects auto sales)
Premiums – homeowner insurance	Housing starts
Premiums – workers' compensation	Employment (rising unemployment erodes payrolls and workers' compensation exposure base)
Premiums – commercial	Housing starts (commercial insurers with construction risk exposure)
Investment income	Interest rates (interest rate decreases lead to a reduction in interest income, especially for short-term, variable rate, and prepayment-sensitive investments; for low turnover fixed-rate portfolios, the effect is typically protracted)
Fee income	Stock market performance (affects the value of separate account assets and AUM, which in turn affects fee income)
Benefit expense	Stock market performance (poor performance increases the value of minimum benefit guarantees, which is included in the liability for future policy benefits)
Claims and claim settlement expenses	Inflation (affects nominal costs; immediate effect, due to the required adjustment to the claim and claim adjustment reserve)
Claims and claim settlement expenses – casualty, disability and LTC insurance	Trend in health cost

Activity / Line	Factor (Effect)
Claims and claim settlement expenses – automobile insurance	Gas prices (affect miles driven, which in turn impacts collision claim frequency; affects sales of light vehicles, which are associated with more severe and costly Personal Injury Protection claim costs)
Claims and claim settlement expenses – automobile insurance	Used car prices (affects fiscal damage inflation)
Claims and claim settlement expenses – homeowner insurance	Weather catastrophes
Claims and claim settlement expenses – workers' compensation	Medical cost inflation (medical costs constitute nearly 60% of claim costs, with indemnity constituting about 40%)

3.7 Valuation Models

When valuing non-financial service firms, most analysts first estimate the value of operations and then subtract the value of net debt, often estimated using its book value. The value of operations is calculated using either relative or fundamental valuation models which focus on flow measures such as free cash flow or EBITDA, with little attention paid to the book values of operating assets and liabilities. In contrast, when valuing financial service firms such as insurance companies, analysts often value the equity directly and focus on book values.

These differences in valuation approach are due to the following unique characteristics of insurers:

- Insurers, especially LH insurers, have high leverage ratios and earn a substantial portion of their profits from the spread between the return on invested assets and the cost of liabilities. Thus, a valuation approach that focuses on operating activities would omit a major part of value creation for insurers.
- The book values of major assets and liabilities of insurers are often close to fair values. Accordingly, balance sheet amounts can be used to value those assets and liabilities, or at least serve as a reasonable starting point for valuation.
- Due to regulation, insurers' ability to write premiums is directly related to their surplus, which is a regulatory proxy for equity capital. Also, insurers are required by regulators to maintain minimum equity capital at levels commensurate with the scope and riskiness of their activities. These regulatory effects make book equity a relatively useful measure of the scale of operations.

In contrast, non-financial service firms generate value primarily in operations, and the fair values of most of their assets and liabilities are substantially different from book values. In addition, while average leverage ratios are relatively small outside the financial sector, for many non-financial firms the book value of equity is small or even negative and is hardly related to market value.

This section provides a big picture discussion of the approaches used to value insurance companies. Similar to other industries, relative valuation models are the most common in practice. This approach is discussed first. Unique to life and health insurance companies, a relatively new valuation approach is to base intrinsic value estimates on disclosed embedded values. This approach, which is somewhat similar to the Net Asset Value approach used in some industries, is described in the second subsection. The final subsection discusses fundamental valuation.

Relative Valuation

Relative valuation involves estimating the value of a firm by reference to the observed prices and fundamentals of peer companies. The most common approach for implementing relative valuation is based on price multiples. A more sophisticated approach involves using conditional price multiples, which explicitly adjust observed multiples for differences in relevant value drivers.

Multiple valuation assumes that value is proportional to a particular fundamental (e.g., earnings, operating cash flow, book value of equity), and that a similar proportionality holds for

"comparable" companies, that is, firms from the same industry and/or with similar characteristics (e.g., size, leverage, expected growth). Given the choice of fundamental and a set of comparable companies, intrinsic value is estimated by simply multiplying the fundamental for the company by the corresponding multiple, which is based on the ratio of stock price to that fundamental for the group of comparable companies. The most common multiples use some form of an earnings construct, often reflecting industry-specific adjustments.

The primary disadvantage of multiple valuation is that it does not allow for simultaneous consideration of multiple fundamentals. This shortcoming is particularly relevant when valuing insurers and other financial service companies, because their book values contain significant value-relevant information incremental to earnings. One approach to allow for the concurrent consideration of both earnings and book value is to use conditional price multiples, that is, multiples that are conditioned on other fundamentals. For example, financial services companies are often valued using book multiples that are conditioned on ROE. This is achieved by regressing the price-to-book ratio on ROE and using the fitted value from the regression, evaluated at the target company's ROE, as the multiple. The fitted value, and accordingly the value estimate, depends both on earnings and book value.

Nissim (2010b) examines the accuracy of relative valuation models in the U.S. insurance industry, using price as a proxy for intrinsic value. Unlike for non-financial service companies, price-to-book multiples perform relatively well in valuing insurance companies and are not dominated by earnings-based multiples. In fact, over the last decade book value multiples have performed significantly better than earnings-based multiples. Inconsistent with the practice of many insurance analysts, excluding Accumulated Other Comprehensive Income (AOCI) from book value worsens rather than improves valuation accuracy. As expected, using income before special items improves the accuracy of earnings-based valuations, but, surprisingly, excluding realized investment gains and losses does not. Conditioning the price-to-book ratio on recurring ROE significantly improves the valuation accuracy of book value multiples. In contrast, incorporating proxies for growth, earnings quality and risk does not improve out-of-sample predictions, although these determinants of the price-to-book ratio generally have the expected effects and are significant. Limiting peers to the same sub-industry (as opposed to all insurance companies) improves valuation accuracy. Using diluted instead of outstanding shares improves earnings-based valuations but not book value-based valuations. As expected, valuations based on analysts' earnings forecasts outperform those based on reported earnings or book value. However, the gap between the valuation performance of forecasted EPS and the conditional price-to-book approach is relatively small, especially for the last decade. This later result is remarkable given that (1) analysts have access to significantly more information than earnings and book value, and (2) analysts consider price when making their forecasts. Of course, analysts also issue stock recommendations and provide other outputs which for at least some users are more important than the earnings forecasts.

Embedded Value Valuation

Life insurance companies, primarily European ones, are increasingly valued based on Embedded value (EV)—a metric voluntarily disclosed by large life insurers, which measures the

consolidated value of shareholders' interests in the covered business.[40] EV consists of the following components:

Embedded value (EV) = Adjusted Net Worth (ANW) + Value of in-force business (VIF)

Where ANW is calculated by adjusting statutory capital and surplus to include some non-admitted assets, apply mark-to-market adjustments for some assets, and subtract surplus notes and debt (non-equity surplus). VIF is the discounted value, as of the valuation date, of after-tax profits expected to be generated by the business in force until the "material" portion of in-force business has run off.

Embedded value differs from intrinsic equity value for the following reasons. First, the cash flows projections used in the VIF calculation involve significant discretion, which companies may exploit to manipulate the EV estimate. In particular, the forecasting of cash flows requires assumptions regarding margins, charges, retention rates, mortality, claim rates, expenses, tax, capital requirements, investment returns, inflation, and discount rates. Many of these assumptions are quite subjective. Second, embedded value does not include the value of future new business, that is, the discounted value of distributable earnings from new business yet to be written. Third, the disclosed embedded value is measured as of the balance sheet date, while embedded value at the time of valuation may be significantly different.

Therefore, when estimating equity value, analysts adjust the disclosed embedded value; they either multiply it by a price-multiple that is based on the price-to-embedded value ratio of comparables, or they explicitly address limitations and distortions. For example, they may attempt to "undo" potential manipulation, incorporate the impact of changes in relevant factors since the measurement date, or add an estimate of the value of future business.

Fundamental Valuation

The most common fundamental method for valuing non-financial companies involves discounting projected "free cash flows" to obtain an estimate of the value of net capital (net debt plus equity), and then subtracting an estimate of the value of net debt to obtain an estimate of equity value. Net debt is debt minus financial assets, where financial assets are financial instruments unrelated to operations. The value of debt is estimated using either its book value, disclosed fair value (under SFAS 107), or book value adjusted for the value effects of changes in interest rates or the company's credit profile since the issuance of the debt instruments. Similarly, the value of financial assets is measured using their book value, disclosed fair value (under SFAS 107 or 115) or adjusted book value.

Free cash flow forecasts are derived as the difference between forecasted operating earnings and projected changes in net operating assets (primarily working capital and fixed assets), where operating earnings exclude interest expense, interest income, dividend income, and related taxes.[41] In most cases, the starting point for deriving the earnings and net assets

[40] CFO Forum (2004). *European Embedded Value Principles and Basis for Conclusions*. Serafeim (2010) provides a detailed discussion of embedded value.

[41] An alternative definition of free cash flow is adjusted cash from operations minus capital expenditures, where cash from operations is adjusted to exclude after-tax interest expense and any after-tax return on financial assets (e.g., after-tax interest income, dividends). Under SFAS 95, *Statement of Cash Flows*, reported cash from operations includes (as a deduction) all interest and tax payments. This definition is similar, but not identical, to free cash flow

forecasts is revenue or revenue growth. It is typically assumed that asset and liability turnover ratios will not change materially, so revenue forecasts are the primary driver of assets and liabilities. To derive earnings, analysts project either profit margin or profitability (return on assets or capital), and calculate earnings as the product of sales and profit margin, or assets and return on assets. Explicit forecasts are made for a relatively small number of future years, often three to ten years. Subsequent free cash flows are estimated by assuming a constant growth rate.

In most cases, free cash flows are discounted using an estimate of the weighted average cost of capital, where the cost of debt capital is reduced to reflect the tax benefit of interest deductibility. Two alternative approaches for incorporating the value of the debt tax shield, which are much less common, are to adjust free cash flows to include the tax savings from interest deductibility (the capital cash flow approach, Ruback 2002), or to account for the value of the debt tax shield separately from the value of operations (the adjusted present value model, Myers 1974).

While free cash flow valuation is the primary fundamental valuation approach used to value non-financial companies, it is rarely used to value financial service companies. This is due to the differences between financial and non-financial companies discussed at the beginning of Section 3.7. Instead, financial service companies are typically valued by discounting expected cash flows or earnings that flow to or accrue to equity-holders. Three types of models are used: (a) discounted dividend per share, (b) discounted net equity flows, and (c) the residual income model. Although these models are analytically equivalent, in practice their implementation involves different assumptions and hence results in different value estimates. I discuss these models in turn.

The simplest and most straight-forward equity-level (as opposed to entity-level) fundamental valuation model is to calculate the value of each share by discounting expected dividends per share. However, in most cases this model either performs poorly or cannot be implemented at all. Many companies don't pay dividends and are not expected to do so in the foreseeable future. Even for companies that pay dividends, current payments may provide poor indication of long-term dividends – dividends represent value distribution, not value creation, so over a finite horizon, they are often weakly related to value.

Another approach is to first estimate the value of all outstanding shares of the company as the present value of net flows to equity holders, and then calculate the value of each share by dividing that present value by the number of outstanding shares. This approach, which is discussed in Section 3.1, is somewhat less restrictive than the discounted dividend per share model. However, it does have similar shortcomings. In particular, many companies don't pay dividends or repurchase shares, and are not expected to do so in the foreseeable future. In addition, dividends and share repurchases represent value distribution, not value creation, which implies weak relation to value.

The third approach is residual income valuation. This model, which is derived from the net equity flow model (see Section 3.1), specifies equity value as equal to current book value plus the present value of expected residual income in all future years, where residual income is earnings in excess of the return required by investors given the amount and cost of equity capital.

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calculated from earnings and changes in balance sheet accounts. The primary reason is the effect of business combinations.

The residual earnings model has several advantages compared to the dividend and net equity flow models. First, it focuses on earnings—a measure of value creation—rather than measures of value distribution. Second, current book value and residual earnings during the explicit forecast period capture a relatively large portion of equity value, which is important because assumptions regarding performance subsequent to the explicit forecast period are often quite arbitrary. Third, the residual income framework relates accounting numbers to the cost of equity capital in a way that aids in forecasting and, particularly, in modeling the terminal value. These advantages are demonstrated in Nissim (2010a), which uses the residual income model to reverse-engineer the cost of equity capital. Section 3.1 explains the link between residual income, profitability, and the cost of equity capital. Harris, Estridge and Nissim (2008) provide a more complete discussion of the residual income model and describe its implementation by Morgan Stanley.

To implement fundamental valuation, one has to forecast the discounted fundamental (dividends, net equity flow, free cash flow, residual earnings – depending on the model) for all future years. This is often achieved by projecting primary financial statement line items for a number of future years, calculating the implied discounted fundamental for those years, and projecting a constant growth rate for that fundamental in all subsequent years. The assumed long-term growth rate is usually the forecasted long-term economy-wide nominal growth rate, which implies that the explicit forecast horizon should be the period required to reach steady state. However, in many cases analysts generate explicit forecasts for a relatively small number of future years and instead allow for a period of convergence between the explicit forecast and constant growth period. For example, the convergence period may cover a period of five years during which growth rates trend linearly from their levels in the most recent explicit forecast year to the long-term (economy-wide) growth rate.

Exhibits 3.7.1 and 3.7.2 present income statement and balance sheet templates for insurers, while Exhibit 3.7.3 provides examples of the assumptions and considerations involved in projecting the different line items of these statements. The templates cover both PC and LH insurers. The focus of the forecasting assumptions and considerations is on information provided in financial reports; this should be supplemented with other information obtained by the analyst. Although the presentation in Exhibit 3.7.3 is generally consistent with the order of developing the assumptions, constructing the forecasts is an iterative process that should be repeated until all forecasts are consistent with each other.

Exhibit 3.7.1: Income Statement Template

1	**Revenues**
2	Premiums
3	Gross premiums written
4	Ceded premiums
5=3-4	Net premiums written
6	Change in unearned premiums
7	Change in prepaid premiums
8=5-6+7	Net premiums earned
9	Policy charges and fees (LH)
10	Net investment income
11	Asset management fees (some LH)
12	Other income and fees
13	Net realized gains (losses)
14=sum(8:13)	Total revenues
15	**Expenses**
16	Losses and loss expenses (PC)
17	Losses and loss expenses excl. reserve develop. and cat. losses
18	Catastrophe losses
19	Reserve development
20=17+18+19	Total losses and loss expenses
21	Policyholder benefits and claims (LH)
22	Interest credited to policyholder account balances (LH)
23	Policyholder dividends (primarily LH)
24	DAC and VOBA amortization
25	Other operating expenses
26	Interest expense on debt
27=sum(20:26)	Total expenses
28=14-27	**Pretax income**
29	Income tax expense
30	Equity method income
31=28-29+30	**Net income**
32	Net income attributable to noncontrolling interests
33	Preferred dividends
34=31-32-33	**Net income available to common shareholders**
35	**Other comprehensive income**
36=34+35	**Comprehensive income available to common shareholders**

Exhibit 3.7.2: Balance Sheet Template (Excluding Separate Accounts)

1	**Assets**
2	Invested assets
3	Prepaid reinsurance premiums
4	DAC and VOBA
5	Other assets
6=2+3+4+5	Total assets (excluding separate accounts)
7	**Liabilities**
8	Loss reserve (PC)
9	Future policyholder benefits and claims (LH)
10	Policyholder account balances (LH)
11	Unearned revenue (mostly PC)
12	Debt
13	Other liabilities
14=sum(8:13)	Total liabilities (excluding separate accounts)
15	**Equity**
16	Preferred stock
17	Common equity
18	Ex-AOCI (paid in common capital + retained earnings - treasury stock)
19	AOCI
20=18+19	Total common equity
21	Noncontrolling interests
22=16+20+21	Total equity
23=14+22	Total liabilities and equity (excluding separate accounts)

Exhibit 3.7.3: Forecasting Assumptions

Line item	Definition of Projected Driver and Forecasting Considerations
Growth rate in gross premiums written	Consider: (1) Past and current growth rates in gross premiums written; (2) Past and current inflation; (3) Past and current real growth rates in gross premiums written; (4) Expected inflation; (5) When available, a decomposition of premium growth rates into price, volume, structural changes (acquisitions and dispositions of businesses), exchange rate (fluctuations in exchange rates used to translate the financial statements of subsidiaries), and product/geographic-mix effects; this information, or portions of it, is often provided in the MD&A; (6) Decompositions of premiums by business line and geographic area; (7) Premium growth rates by business line and geographic area (for example, a projected increase in activity in high-growth markets or lines implies an increase in the overall growth rate); (8) Capital ratios (growth requires capital); (9) Stage in the underwriting cycle and forecasts for the economy, industry and business lines; Notes: (a) There is some persistence in growth rates, so future growth can be extrapolated from past trends (recognizing the significant mean reversion in growth rates, see Section 3.4); (b) Different components of revenue growth have different persistence (e.g., growth due to structural changes or exchange rate fluctuations has particularly low persistence); (c) Current inflation predicts growth in premiums written because it is measured using end-of-period prices while each period's premiums written reflect average prices during the period;
Gross premiums written	***= (1 + growth rate in gross premiums written) × prior year gross premiums written***
Ceded premium ratio	***= Premiums ceded to reinsurers / gross premiums written*** Consider: (1) Past and current ceded premium ratios; (2) Trends in the availability and cost of reinsurance; (3) Capital position (excess capital alleviates the need to reinsure); (4) Business line and geographic area mix (some lines and geographic areas—such as homeowners insurance in Florida—are prone to catastrophe losses);
Retention ratio	***= 1 - ceded premiums ratio***
Net premiums written	***= Gross premiums written × retention ratio***
Unearned premiums	***= (1 + growth rate in gross premiums written) × prior year unearned premiums***
Prepaid reinsurance premiums	***= Ceded premium ratio × unearned premiums***
Net premiums earned	***= Net premiums written - change in unearned premium + change in prepaid reinsurance premium***

Line item	Definition of Projected Driver and Forecasting Considerations
Investment yield	Consider: (1) Past and current investment yield; (2) Past and current interest rate term structures; (3) Past and current investment yield spread over benchmark rates (Treasuries, corporate bonds, municipal bonds); (4) Past, current and projected portfolio composition (fixed income versus equities, fixed versus floating interest, Treasuries/agency/corporate/MBS/municipalities, maturity, credit rating, etc.); Notes: (a) Investment yields are affected primarily by interest rates and portfolio mix, but the effects of interest rate changes are quite delayed, especially for fixed rate portfolios with low turnover; (b) When extrapolating future interest rates from term structures, one should deduct from the forward rates an estimate of the liquidity premium; (c) Insurers provide detailed information on the investment yield in the MD&A; these disclosures are finer and more precise than estimates derived using annual financial statement information; for example, insurers calculate the yield using quarterly, monthly, weekly or even daily average of invested assets to mitigate the impact of changes in the balance of investments during the year on the estimated yield (see discussion in Section 3.2); (d) The starting point for forecasting should be the current investment yield; however, this rate should be adjusted based on the above factors;
Growth rate in investment assets	Consider: (1) Past and current growth in investment assets; (2) Past, current and projected growth in net premiums written; (3) Past, current and projected investment yield (to the extent that investment income is reinvested in the portfolio);
Investment assets	***= (1 + growth rate in investment assets) × prior year investment assets***
Net investment income	***= Investment yield × prior year investment assets***
Net realized gains ratio	***= Net realized gains (losses) / prior year investment assets*** Consider: (1) Past and current net realized gains ratios; (2) Past and current ratios of net unrealized gains (losses) at the end of the year to investment assets; (3) Past, current and projected portfolio turnover; Notes: (a) Comparing (1) with the prior year value of (2) should help in predicting the rate at which unrealized gains and losses are circulated into income; (b) Forecasts of net realized gains should be based on the estimate form (a) and the current net position of unrealized gains (losses);
Net realized gains (losses)	***= Net realized gains ratio × prior year investment assets***

Line item	Definition of Projected Driver and Forecasting Considerations
Growth rate in policy charges and fees (LH)	Consider: (1) Past and current growth rates in policy charges and fees; (2) Past and current growth rates in policyholder account balances; (3) Past and current growth rates in separate accounts; (4) Past and current revenue mix ratios; (5) Past, current and projected growth rates in gross premium written; (6) Past and current stock market performance; Notes: (a) This item consists of fees for non-traditional life insurance contracts (e.g., universal life) and investment contracts (e.g., deferred annuities); it includes asset-management fees on separate accounts, cost of insurance charges, contract administration charges and surrender charges;
Policy charges and fees (LH)	***= (1 + growth rate in policy charges and fees) × prior year policy charges and fees***
Growth rate in asset management fees (some LH)	Consider: (1) Past and current growth rates in asset management fees; (2) Past and current growth rates in assets under management; (3) Past and current revenue mix ratios; (4) Past and current stock market performance; (5) Projected growth rates in gross premium written;
Asset management fees (some LH)	***= (1 + growth rate in asset management fees) × prior year asset management fees***
Growth rate in other income and fees	Consider: (1) Past and current growth rates in other income and fees; (2) Past, current and projected growth rates in gross premiums written; (3) Past and current revenue mix ratios;
Other income and fees	***= (1 + growth rate in other income and fees) × prior year other income and fees***
Revenue	***= Net premiums earned + net investment income + policy charges and fees (LH) + asset management fees (some LH) + other income and fees + net realized gains (losses)***
Loss ratio excluding reserve development and catastrophe losses (ex-dev&cat loss ratio) (PC)	***= Losses and loss expenses excluding reserve development and catastrophe losses / net premiums earned*** Consider: (1) Past and current ex-dev&cat loss ratio; (2) Past, current and projected growth in net premiums written (growth is typically associated with higher loss ratios, see Section 3.3) (2) Past, current and expected inflation (immediate effect on losses, protracted effect on premiums); (3) Past and current ratio of the loss reserve to ex-dev&cat losses and loss expenses (long-tail lines enable the insurer to generate significant net investment income, which can offset high loss ratios, see Section 3.2); (4) Stage in the underwriting cycle and forecasts for the industry and business lines; (5) Past, current and projected business line mix (loss ratios vary substantially across lines); Notes: (a) When a significant portion of the expense measures discount amortization related to prior year discounted reserves (e.g., reserves for settled workers' compensation), the discount amortization should be removed from the ratio and predicted separately;

Line item	Definition of Projected Driver and Forecasting Considerations
Losses and loss expenses excluding reserve development and catastrophe losses (PC)	**= *Loss ratio ex-dev&cat × net premiums earned***
Catastrophe loss ratio (PC)	**= *Catastrophe losses / net premiums earned*** Consider: (1) Past and current cat loss ratio (due to the high volatility of cat losses, predictions should be based on the average ratio over a reasonably long period); (2) Past, current and projected business-line mix (cat losses vary significantly across lines);
Catastrophe losses (PC)	**= *Cat loss ratio × net premiums earned***
Growth rate in loss reserve (PC)	Consider: (1) Past, current and projected growth rate in gross premiums written; (2) Past, current and projected growth in ex-dev&cat losses and loss expenses; (3) Past and current ratios of (a) ex-dev&cat losses and loss expenses to the loss reserve, and (b) gross premiums written to the loss reserve (the relative stability of these ratios over time indicates the weights on (1) and (2) in predicting the growth rate in the loss reserve);
Loss reserve (PC)	**= *(1 + growth rate in loss reserve) × prior year loss reserve***
Reserve development ratio (PC)	**= *Reserve development / prior year loss reserve*** Consider: (1) Past and current reserve development ratio; (2) Past and current ex-dev&cat loss ratio (low ratio implies high likelihood that the reserve for new coverage is understated, which would lead to reserve strengthening in the future); (3) Past and current ratio of reserves to gross premiums written (low ratio implies high likelihood that the reserve is understated, which would cause reserve strengthening in the future) Notes: (a) The reserve development generally excludes changes in the reserve due to discount amortization (see discussion of ex-dev&cat loss ratio above);
Reserve development (PC)	**= *Reserve development ratio × prior year loss reserve***
Losses and loss expenses (PC)	**= *Losses and loss expenses ex-dev&cat + Catastrophe losses + reserve development***
Policyholder benefits and claims ratio (LH)	**= *Policyholder benefits and claims / (net premiums earned + policy charges and fees)*** Consider: (1) Past and current policyholders' benefits and claims ratio; (2) Past and current interest rate term structures (high interest rates imply that the insurer is able to generate relatively high interest income and so accept relatively low underwriting margins); Notes: (a) Policyholder benefits and clams reflect the cost of insurance coverage, while revenues from providing insurance coverage are reflected both in net premiums earned (traditional insurance) and policy charges and fees (universal life and other non-traditional products);

Line item	Definition of Projected Driver and Forecasting Considerations
Policyholder benefits and claims (LH)	***= Policyholder benefits and claims ratio × (net premiums earned + policy charges and fees)***
Growth rate in the liability for future policyholder benefits and claims (LH)	Consider: (1) Past, current and projected growth rate in gross premiums written; (2) Past, current and projected growth rate in policy charges and fees (these charges and fees are partially for insurance coverage, whose cost is reflected in the liability for future policy benefits); (2) Past, current and projected growth in policyholder benefits and claims (policyholder benefits and claims include interest on the beginning-of-year liability, so the growth rate in the liability for future policyholder benefits and claims should be similar to the subsequent growth rate in policyholder benefits and claims);
Liability for future policyholder benefits and claims (LH)	***= (1 + growth rate in the liability for future policyholder benefits and claims) × prior year liability for future policyholder benefits and claims***
Effective interest rate credited to policyholder account balances (LH)	***= Interest credited to policyholder account balances / prior year policyholder account balances*** Consider: (1) Past and current effective interest rate; (2) Past and current interest rate term structures; (3) past and current credit rating (insurers with low credit rating pay high interest rates); (4) Past and current spread over benchmark rates (Treasuries, corporate bonds, municipal bonds); Notes: (a) When extrapolating future rates from term structures, one should deduct from the forward rates an estimate of the liquidity premium; (b) Changes in policyholder account balances during the year induces measurement error in the estimated rate; this error should be "undone" in the calculations or at least be considered when forecasting; (c) The starting point for forecasting should be the current rate; however, this rate should be adjusted based on the above factors;
Growth rate in policyholder account balances (LH)	Consider: (1) Past, current and projected growth rate in gross premiums written; (2) Past, current and projected growth rate in policy charges and fees (this item includes fees on policyholder accounts balances); (3) Past, current and projected effective interest rate credited to policyholder account balances (credited interest increase account balances);
Policyholder account balances (LH)	***= (1 + growth rate in policyholder account balances) × prior year policyholder account balances***
Interest credited to policyholder account balances (LH)	***= Effective interest rate credited to policyholder account balances × prior year policyholder account balances***

Line item	Definition of Projected Driver and Forecasting Considerations
Policyholder dividends ratio (primarily LH)	***= Policyholder dividends / (net premiums earned + net investment income + policy charges and fees (LH) – losses and loss expenses (PC) – policyholder benefits and claims (LH) - Interest credited to policyholder account balances (LH))*** Consider: (1) Past and current policyholder dividend ratio; (2) Past and current ratio of dividends to insurance reserves for participating policies (if this information is not available, then total insurance reserves can be used instead); Notes: (a) Policy dividends are also affected by operating expense and other income and expense items; however, the above ratio is likely to be more stable (and therefore a better predictor) than alterative calculations that include such items;[42] (b) Ideally (when information is available), the above ratio should be calculated with amounts corresponding to participating policies only;
Policyholder dividends (primarily LH)	***= Policyholder dividends ratio × (net premiums earned + net investment income + policy charges and fees (LH) – losses and loss expenses (PC) – policyholder benefits and claims (LH) - Interest credited to policyholder account balances (LH))***
DAC and VOBA amortization ratio	***= DAC and VOBA amortization / (gross premiums written + policy charges and fees (LH))*** Consider: (1) Past and current amortization ratios; (2) Past, current and projected revenue mix (amortization ratios vary across lines; see discussion in Section 2.4); (3) Past, current and projected loss ratio (there is a negative correlation between losses and acquisition costs; see discussion in Section 3.2);
DAC and VOBA amortization	***= DAC and VOBA amortization ratio × (gross premiums written + policy charges and fees (LH))***
Growth rate in DAC and VOBA	Consider: (1) Past, current and projected growth rate in the total of gross premiums written and policy charges and fees; (2) Past, current and projected growth rate in DAC and VOBA amortization (amortization of DAC and VOBA relates to the beginning-of-year balance, so the growth rate in DAC and VOBA should be similar to the subsequent growth rate in DAC and VOBA amortization); (3) Past, current and projected business-line mix (DAC vary across business lines; in particular, DAC for life contracts are significantly larger than for PC; see Section 2.4);
DAC and VOBA	***= (1 + growth rate in DAC and VOBA) × prior year balance of DAC and VOBA***

[42] For example, in its 2009 annual report, MetLife states that "policyholder dividends are approved annually by the insurance subsidiaries' boards of directors. The aggregate amount of policyholder dividends is related to actual interest, mortality, morbidity and expense experience for the year, as well as management's judgment as to the appropriate level of statutory surplus to be retained by the insurance subsidiaries."

Line item	Definition of Projected Driver and Forecasting Considerations
Other operating expense ratio	***= Other operating expenses / (net premiums earned + policy charges and fees (LH) + asset management fees (some LH) + other income and fees)*** Consider: (1) Past and current other operating expense ratios; (2) Past, current and projected values of the total of the loss ratio and the DAC and VOBA amortization ratio (there is a negative correlation between the loss and expense ratios; see discussion in Section 3.2); (3) Past, current and projected growth in gross premiums written and fee income (expense ratios are often high during periods of high growth); Notes: (a) Net investment income and net realized gains are not significant drivers of operating expenses and are therefore excluded from the ratio;
Other operating expenses	***= Other operating expense ratio × (net premiums earned + policy charges and fees (LH) + asset management fees (some LH) + other income and fees)***
Effective interest rate on debt	***= Interest expense on debt / prior year debt*** Consider: (1) Past and current effective interest rate on debt; (2) Past and current interest rate term structures; (3) Past and current credit rating; (4) Past and current spread over benchmark rates (Treasuries, corporate bonds, municipal bonds); (5) Past and current debt compositions by maturity and type (including floating versus fixed); Notes: (a) When extrapolating future rates from term structures, one should deduct from the forward rate an estimate of the liquidity premium; (b) Changes in the balance of debt during the year affect the estimated rate; this error should be "undone" in the calculations or at least considered when forecasting; (c) The starting point for forecasting should be the current effective interest rate; however, this rate should be adjusted based on the above factors;
Growth rate in debt	Consider: (1) Past, current and projected growth rate in investments (investments constitute the majority of insurers' assets, so a relatively stable debt-assets ratio implies that the two growth rates should be similar); (2) Past and current debt-asset ratios (if the current debt-asset ratio is abnormally high, future growth rates in debt are likely to be smaller than growth rates in investments);
Debt	***= (1 + growth rate in debt) × prior year debt***
Interest expense on debt	***= Effective interest rate on debt × prior year debt***
Pretax income	***= Revenue – losses and loss expenses (PC) – policyholder benefits and claims (LH) – interest credited to policyholder accounts (LH) – policyholder dividends – DAC and VOBA amortization – other operating expenses – interest expense on debt***
Effective tax rate	***= Income tax expense / pretax income*** Consider: (1) Past and current effective tax rates; (2) Past and current effective tax reconciliations (to identify persistence versus transitory items); (3) Past and current effective tax rates on U.S and foreign income; (4) Past, current and projected mix of US and foreign income; (5) Past and current deferred tax valuation allowance and unrecognized tax benefits;

Line item	Definition of Projected Driver and Forecasting Considerations
Income tax expense	***= Pretax income × effective tax rate***
Return on equity method investments	***= Equity method income / prior year equity method investments*** Consider: (1) Past and current return on equity method investments;
Growth rate in equity method investments	Consider: (1) Past and current growth in equity method investments; (2) Past, current and projected return on equity method investments (if the associated companies do not pay dividends, equity method investment should growth at least by the rate of return); (3) Past, current and projected growth rate in investments (investments constitute the majority of insurers' assets, so a relatively stable ratio of equity method investments to total assets implies that the two growth rates should be similar);
Equity method investments	***= (1 + growth rate in equity method investments) × prior year equity method investments***
Equity method income	***= Return on equity method investments × prior year equity method investments***
Net income	***= Pretax income – income taxes + equity method income***
Non-controlling share in income	***= Net income attributable to non-controlling interest / net income*** Consider: (1) Past and current non-controlling share in income; (2) Past and current ratio of non-controlling interest in equity to total equity; (3) Past and current ratio of net income attributable to non-controlling interest to prior year non-controlling interest in equity (this is, in effect, a proxy for the profitability of subsidiaries whose shares are being held by the non-controlling interest);
Net income attributable to non-controlling interest	***= Non-controlling share in income × net income***
Growth rate in preferred stock	Consider: (1) Past, current and projected growth rate in investments (investments constitute the majority of insurers' assets, so a relatively stable preferred stock-to-assets ratio implies that the two growth rates should be similar); (2) Past and current preferred stock-to-asset ratios (if the current preferred stock-to-asset ratio is abnormally high, future growth rates in preferred stock are likely to be smaller than growth rates in investments); Notes: (a) Preferred stock should be measured using the base to which the dividend rate applies; in some cases, this base is significantly larger than the par value (e.g., MetLife);
Preferred stock	***= (1 + growth rate in preferred stock) × prior year preferred stock***
Preferred dividend rate	***= Preferred dividend / prior year preferred stock*** Consider: (1) The specified preferred dividend rate; (2) Past and current preferred dividend rate; (3) Past and current term structure of interest rates; (4) Past and current credit rating;
Preferred dividends	***= Preferred dividend rate × prior year preferred stock***
Net income available to common shareholders	***= Net income – net income attributable to non-controlling interest – preferred dividends***

Line item	Definition of Projected Driver and Forecasting Considerations
Growth rate in AOCI	Consider: (1) Past and current growth rates in AOCI; (2) Past and current composition of AOCI (for example, the foreign currency translation adjustment is typically more stable than the other components); (3) Portfolio turnover (high turnover implies that unrealized gains (losses) are likely to be circulated into income in a relatively short period); Notes: (a) The forecasted growth rate should generally be negative (that is, forecasted AOCI should converge toward zero over the forecasting horizon); (b) High volatility of AOCI growth rates implies low (i.e., more negative) forecasted growth rate;
AOCI	***= (1 + growth rate in AOCI) × prior year AOCI***
Other comprehensive income ratio	***= Other comprehensive income / (revenue – net realized gains (losses))*** Consider: (1) Past and current OCI ratio; (2) Current AOCI (this will be included in future comprehensive income as it is circulated into income);
Other comprehensive income	***= Other comprehensive income ratio × (revenue – net realized gains (losses))***
Comprehensive net income available to common shareholders	***= Net income available to common shareholders + other comprehensive income***
Recurring income	***= Net income available to common shareholders – [net realized gains (losses) - reserve development – abnormal cat losses] × (1 – marginal tax rate)*** Notes: (a) Abnormal cat loss should be estimated as the difference between cat losses and the losses implied by the average cat loss ratio over several prior years;
Recurring return on common equity (Recurring ROE)	***= Recurring income / prior year common equity*** Consider: (1) Past and current Recurrent ROE; (2) Past and current interest rate term structures; (3) Past and current beta, size, leverage and the book-to-market ratio (expected ROE should be positively related to risk, see Section 3.5); (4) Management's target ROE (insurers often disclose this information); (5) Past, current and implied net asset turnover, given the common equity forecasts that result from the tentative Recurring ROE projections and the recurring income forecasts (net asset turnover is measured as the ratio of recurring revenues to prior year common equity, where recurring revenue is revenue minus net realized gains and losses); (6) The reasonableness of the implied changes in the total of paid in capital, treasury stock (-) and retained earnings (including dividend policy, share repurchases and share issuance);
Common equity	***= Next year recurring income / next year Recurring ROE***

Line item	Definition of Projected Driver and Forecasting Considerations
Noncontrolling interests ratio	***= Noncontrolling interests / common equity*** Consider: (1) Past and current noncontrolling interests ratio; (2) Past, current and implied ratio of net income attributable to noncontrolling interests to prior year noncontrolling interests (this is a proxy for the ROE of subsidiaries whose shares are being held by noncontrolling interests); Notes: (a) Past, current and projected recurring ROE cab serve as a benchmark for evaluating the reasonableness of the ratios calculated in (2);
Noncontrolling interests	***= Noncontrolling interests ratio × common equity***
Growth rate in "other assets"	Consider: (1) Past, current and projected growth rate in investments (investments constitute the majority of insurers' assets, so a relatively stable ratio of other assets to total assets implies that the two growth rates should be similar); (2) Past current and projected growth in the total of gross premiums written and policy charges and fees (some "other assets" support underwriting and other insurance operations);
Other assets	***= (1 + growth rate in other assets) × prior year other assets***
Other liabilities	***= Total assets – common equity – noncontrolling interests – preferred stock – debt – loss reserve (PC) - future policyholder benefits and claims (LH) - Policyholder account balances (LH) - Unearned revenue (mostly PC)***

Conclusion

This manuscript reviews and analyzes the activities, reporting, and valuation of insurance companies. The primary objectives are to describe the insurance business, discuss and evaluate insurers' financial information and the accounting methods used in preparing financial statements, explain how financial disclosures can be used to analyze the risk, performance, growth prospects and value of insurance companies, and describe the models used in valuing insurance companies. Another objective is to review relevant academic findings. The paper should be of interest to insurance analysts, investors, regulators, researchers, students and others interested in the insurance industry.

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