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Accounting Standards and Gains Trading

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ABSTRACT

Retained asset accounts (RAAs) allow insurers to retain life insurance proceeds and utilize the funds in their operations while compensating beneficiaries with interest payments. The funds are held in the insurers' general account and have no Federal Deposit Insurance Corporation (FDIC) protection and limited protection from the state insurance guaranty fund. Combined, this exposes the beneficiaries to the financial risk of the insurer. The use of RAAs has had its controversies, especially regarding the information provided to consumers about the use and risks associated with these accounts. Insurers continue to utilize RAAs for life insurance settlements, and beneficiaries continue to leave funds in these accounts. Therefore, to ensure continued education of the beneficiaries, an expansion of consumer disclosures is recommended.

KEYWORDS: insurance accounting; financial institutions; earnings management; interest maintenance reserves

JEL Codes: G10; G22; M41

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Executive Summary

IMPORTANCE: U.S. life insurers hold more than $5.7 trillion in assets, making the determinants of their asset allocation a matter of regulatory interest. One unique accounting rule that may affect investment strategies is the "interest maintenance reserve" (IMR), which mandates amortizing realized capital gains and losses (*RGL*) from bond sales over the asset's remaining maturity rather than recognizing gains or losses immediately. While intended to discourage "gains trading" (selling assets to manage earnings) by diluting immediate proceeds, the IMR may lead managers to engage in more extreme trading behavior. For example, managers with poor underwriting performance may realize larger capital gains to overcome the IMR's dilutive effects on net income and offset operating losses.

OBJECTIVE: This article empirically evaluates whether life insurers appear to engage in gains trading to offset operating losses, despite the inefficiencies imposed by the IMR rule. The authors utilize a quantile regression approach to examine earnings management behaviors across the entire distribution of realized capital gains, rather than focusing solely on the conditional mean estimates. To isolate the distinct influence of the IMR rule on managerial discretion, the research design compares trading in bonds, which are subject to IMR amortization, to trading in common stocks, which are not. They also evaluate trading patterns for private insurers reporting solely under statutory accounting principles (SAP) versus those voluntarily reporting under Generally Accepted Accounting Principles (GAAP).

Findings: Quantile regressions reveal significant evidence of gains trading in the upper quantiles of the realized capital gains distribution. Specifically, firms with the largest capital gains tend to have larger operating losses, a pattern consistent with selling assets to manage earnings. This behavior is driven primarily by bond sales rather than common stock sales, despite the IMR penalty involved in selling bonds. This more extreme gains trading behavior occurs among private insurers who report financial statements solely under SAP, whereas private firms that voluntarily report under GAAP (without an IMR rule) do not exhibit the same behavior.

Regulatory policy implications: The findings suggest that while the IMR rule succeeds in mitigating the immediate volatility of reported earnings, it can lead to unintended economic distortions by incentivizing "myopic behavior" among some managers. To achieve a desired earnings target under the IMR regime, managers must liquidate significantly larger volumes of assets than would otherwise be necessary. During the 2005–2017 sample period of the study, firms that exhibited gains trading behavior deferred $916 billion in bond sales proceeds to future years due to the IMR amortization rule. This study highlights the potential unintended consequences of accounting rules, which may lead to sub-optimal asset allocation, owner-manager conflicts, or undesirable outcomes for policyholders. Volatile interest rate environments may exacerbate these effects and impact the long-term financial health of insurers.

1 Introduction

Life insurers collectively represent one of the largest groups of institutional investors globally, holding more than $5.7 trillion in assets in 2024 (NAIC 2025). Regulators have strong incentives to understand the factors that motivate insurers to buy, hold, and sell investment assets. One key factor in the decision to sell an asset is how it is treated from an accounting perspective (e.g., Hanley et al. 2018; Khan et al. 2019; Hodder and Sheneman 2022). While accounting standards are intended to clearly and conservatively reflect an insurer's financial position, they also may create unintended incentives for managers, particularly with respect to investment holdings (Eling 2021). In this study, we examine patterns of "gains trading"—strategically selling assets to manage earnings—under a unique accounting rule that applies only to U.S. life insurance companies.

When a life insurance company sells its investments, the realized gains or losses (RGL) are subject to the "interest maintenance reserve" (IMR) accounting rule. This rule requires life insurers to amortize the RGL earned from the sale of a fixed-income asset over the remaining maturity of the asset.[1] Fixed-income investments are an important asset class for life insurers, as bonds comprised more than $3.6 trillion (68%) of life insurer investments in 2022 (NAIC 2023). Amortizing a bond sale means that in the year of the sale, insurers may recognize only a portion of the proceeds as income. One possible result of such a rule is that it limits the ability of managers to use realized capital gains to manage the current year's earnings—a behavior that has been well-documented in financial institutions (e.g., Beatty et al. 1995; Collins et al. 1995; Barth et al. 2017).

The IMR rule is part of statutory accounting principles (SAP), the accounting standards that apply to all regulated insurers in the U.S., regardles s of ownership structure.[2] When it was enacted, one stated goal of the IMR rule was to discourage gains trading by diluting the immediate impact of a fixed-income sale on current-year earnings (NAIC 1998). From a regulatory perspective, a rule such as the IMR may involve benefits beyond deterring gains trading. For example, the rule allows insurers to divest unprofitable investments to secure a stronger balance sheet, which aligns with regulatory objectives.[3] The trade-off is that the IMR distorts the underlying

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[1]Throughout this paper, we use both "IMR rule" and "amortization rule" to mean the part of the rule related to realizing capital gains. The specifics of the IMR rule are complex; we generalize here for introductory purposes and provide details in Section 2.

[2]Insurers file slightly different financial statements depending on the types of insurance they write. We focus on life insurers, where one of the main differences from other insurers (namely, property/casualty [P/C] or health insurers) is the existence of the IMR rule. Insurers report quarterly and annual SAP financial statements to regulators. Similar to 10-K and 10-Q SEC filings for public companies, quarterly reports provide less detail than the annual reports. We, therefore, focus on annual data in our analysis.

[3]In recessionary periods, insurers could have substantial asset holdings with unrealized losses. In the absence of the IMR rule, a firm that sells assets in this environment (e.g., for liquidity purposes) would report a substantial negative impact on reported earnings. The IMR rule alleviates such a situation, as an insurer can sell a bond and then amortize losses over the remaining life of the bond, reducing the impact of such a divestiture on earnings. Regulators limit negative IMR balances, and insurers cannot improve their capital positions by inflating negative IMR balances.

economics of asset trades with realized capital gains by artificially reducing current-year earnings from investment sales. This creates a potential disconnect between a firm's true economic results and the picture offered by its statutory accounting financial statements. Despite the IMR rule's potential to influence the real activities of managers, to the best of our knowledge, no study to date has empirically evaluated gains trading under the IMR rule.[4]

We consider a setting in which managers decide whether to realize capital gains, given the firm's observed operating income, in line with the existing literature on earnings management (e.g., Bartov 1993; Beatty and Harris 1999; Barth et al. 2017). Specifically, we focus on managers who face a year with operating losses but could offset the impact on net income by gains trading.[5] In this situation, the IMR rule creates two conflicting incentives for managers when it comes to bond sales: (i) an incentive not to gains trade because the amortization requirement under the IMR rule limits their ability to affect earnings, and (ii) an incentive to engage in extreme gains trading by realizing sufficiently large gains to overcome the limitations imposed by the IMR rule.

We begin our empirical analysis by investigating the linear relationship between *RGL* and operating losses (*NegUWInc*) through ordinary least squares (OLS) regression.[6] Our initial OLS results offer no evidence of gains trading: the relationship between *RGL* and *NegUWInc* is not significantly different from zero. Such an approach only informs on the conditional mean of *RGL*, however, and does not capture the different earnings management behaviors over the distribution of *RGL*. For example, managers with large operating losses could offset those losses by gains trading (i.e., positive *RGL*) or could take a "big bath" and divest underperforming assets (i.e., negative *RGL*). Thus, we examine gains trading over the distribution of *RGL* using quantile regression; recent studies in the literature have used this method in settings where relationships may differ over the distribution of an outcome (e.g., Grace and Leverty 2010; Armstrong et al. 2015; Li et al. 2022; Born et al. 2023).[7] In contrast to the "aggregate" view of OLS

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[4]Importantly, the IMR rule was passed around the same time as the major regulatory capital reforms in adopting the risk-based capital (RBC) standards. Because of this, any causal estimate of the effect of the IMR rule will suffer from unobserved selection of firms that respond to the regulatory capital reforms. Therefore, we analyze within-firm variation across the life insurance industry to evaluate real activities after the IMR rule was enacted.

[5]Gains trading is a general term that refers to strategically selling invested assets at a gain to achieve a financial goal (typically earnings or capital management). Our use of "gains trading" refers to a specific earnings goal: strategically selling investments at a gain in order to offset operational losses. We focus on operating losses because the IMR rule creates long-term consequences for insurers who smooth operating profits by realizing investment losses.

[6]As pointed out by Lim and Lustgarten (2002) and Elgers et al. (2003), it is important that we do not introduce bias when separating the earnings components. Our measure of operating losses represents insurance business performance. This portion of earnings is subject to limited managerial discretion in the life insurance industry. See Section 3 for more details.

[7]There are alternative ways to examine these varying earnings management strategies, such as the analyses used in Barth et al. (2017). In the Barth et al. study, firms with big bath incentives are defined as those with *any* operating loss. This is not an appropriate cutoff for the insurance industry, as it is fairly common for firms to have an operating loss in a particular year (about 25% of firm-years in our sample). Of those firms, only a small portion may be motivated to take a big bath, while others may offset losses by realizing capital gains. Our quantile regression approach allows earnings management strategies to vary over the entire distribution of *RGL*.

regression, quantile regression asks a slightly different question: Were the insurers who realized the largest gains also the insurers who experienced large operating losses?

Our quantile regression results provide evidence of gains trading in the highest quartile of the *RGL* distribution. Specifically, the relationship between *RGL* and *NegUWInc* is negative and significant above the 75th percentile of *RGL*. Firms with the largest capital gains tended to have larger operating losses. This relationship is consistent with earnings management via gains trading. We find that the relationship strengthens as we move into the highest quantiles of the *RGL* distribution; such a pattern indicates more extreme gains trading by those firms. Below the 20th percentile of *RGL*, we also observe a positive association between *RGL* and *NegUWInc*, potentially indicating "big bath" earnings management by some managers in poor operating years. Together, these findings explain why we obtain a null result in the OLS regression: the negative and positive relationships offset, generating an average near zero.[8]

Because the IMR rule applies to bond sales but not common stock sales, investigating the type of asset used for gains trading tells us whether and how managers attempt to circumvent the diluting effects of the amortization rule. Our rich set of financial statement data allows us to calculate the *RGL* for broad asset categories, including bonds (*BondRGL*) and common stocks (*CommStockRGL*). Using *BondRGL* as the dependent variable in quantile regressions, we find a pattern similar to what we observe in the upper quantiles of the total *RGL*: managers with large positive *BondRGL* tend to have larger *NegUWInc*, consistent with gains trading using bonds. These effects are economically meaningful, particularly in the tails of the distribution. In the 95th percentile of the *BondRGL* distribution, *BondRGL* increases by 10% when operating losses are one percentage point worse, on average. The relationship between operating losses and *CommStockRGL* does not exhibit a systematic pattern across the distribution of operating losses (i.e., the relationship between operating losses and *CommStockRGL* is not significantly different from zero across quantiles). We, therefore, do not find evidence that managers gains trade using stocks as a tool to circumvent the inefficiencies created by the IMR rule. Instead, we find evidence implying that managers appear to realize larger bond gains and only capture a portion of those gains as current-year net income.[9]

In addition to comparing gains trading across asset types, we also consider the role that different accounting standards play in incentivizing or discouraging gains trading. All insurers based in the U.S. are required to prepare financial statements following SAP. However, the IMR rule might not factor into managers' gains trading strategy

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[8]We control for time-invariant insurer characteristics by including insurer fixed effects in both the OLS and quantile regressions, suggesting that time-invarying insurer characteristics do not explain the differences in the results.

[9]The null result for *CommStockRGL* is somewhat counterintuitive, as gains trading in common stocks would allow managers to avoid the diluting effects of the IMR rule. However, life insurers face regulatory limits on equity investments such as common stocks, and a relatively small proportion of life insurer assets are invested in stocks (see NAIC 2017 and Table 2). In addition, common stocks are marked-to-market under GAAP and SAP. To alleviate the concern about the regulatory limits on equity holdings that can vary across states, in all of our analyses, we control for bond and stock holdings.

if they additionally report their earnings to investors following Generally Accepted Accounting Principles (GAAP). Under GAAP, realized capital gains and losses are not amortized and therefore do not dilute life insurer gains trading opportunities. While publicly traded insurers must report GAAP financials to investors and SAP financials to regulators, some privately-owned life insurers may voluntarily prepare financial statements on a GAAP basis. Most privately-owned life insurers appear to report earnings to their investors using only SAP accounting rules (see Appendix A and Section 4.3). To evaluate the prevalence of gains trading behaviors across reporting methods, we scrape private life insurer websites and differentiate SAP reporters from GAAP reporters. We document gains trading in bonds by private insurers who report only SAP financials on their website, but not by private insurers who voluntarily report GAAP financials.

The IMR rule defers income from current-year realized capital gains to future years. Exactly how much depends on the remaining maturity of each investment sold, but our data allow us to perform some back-of-the-envelope calculations on how much *RGL* is deferred to future years because of the IMR rule. We find that about sixty-eight cents out of every dollar in gains is deferred to future years. Over our sample, a total of $3.4 trillion from bond sales was deferred into the IMR account. Managers who wish to gains trade must realize larger gains than are otherwise necessary, because the IMR rule only allows them to recognize a portion of those gains in current-year income. These managers are responsible for a disproportionate amount of deferrals to the IMR; conservatively, about 7.4% of observations in our sample exhibit gains trading behavior, but their trades comprise 26.9% of deferrals to the IMR from bond sales.

We make important contributions to the literature in several areas. To begin, we contribute to the literature examining asset sales and earnings management by financial institutions. Prior studies have largely focused on banks and examine various incentives related to bank asset sales, including earnings, taxes, or regulatory capital considerations (e.g., Warfield and Linsmeier 1992; Beatty et al. 1995; Beatty and Harris 1999; Beatty et al. 2002; Barth et al. 2017). There is relatively little research on gains trading in the insurance industry, even though insurers are major institutional investors facing stringent regulation. To the best of our knowledge, Collins et al. (1997) is the only published academic study of earnings management-motivated gains trading by life insurers. They find some evidence of gains trading to smooth earnings by publicly traded life insurers (and do not study privately owned insurers), but their data predates the implementation of the IMR rule. Ellul et al. (2015) and Hanley and Nikolova (2021) find that life insurers gains trade bonds to manage regulatory capital, but do not find evidence that the relationship is motivated by earnings management incentives.[10]

[10]The primary focus of research on earnings management by insurance companies has been on the property/casualty (P/C) insurer loss reserve accrual (e.g., Petroni 1992; Beaver et al. 2003; Eckles and Halek 2010; Grace and Leverty 2010). Life insurers are not required to disclose loss reserve development with the same level of detail, making it more difficult to study the accounting implications of loss reserves. In contrast to the clear negative effects of real-activities earnings management, accruals-based earnings management can be associated with increases in firm value (Bhojraj et al. 2009) or can provide information to markets (Linck et al. 2013). However, more extreme examples of earnings management can result in value destruction if revealed to the market (e.g., Dechow et al. 1996).

We most directly extend the literature examining strategic asset sales by insurers (e.g., Gaver and Paterson 1999; Lee et al. 2006; Chiang and Niehaus 2020). We examine trading patterns under a specific accounting rule designed to influence managerial decisions. We also document different patterns across ownership structures that not only differentiate publicly traded insurers from private insurers, but also private insurers reporting GAAP financials from private insurers reporting SAP financials.

In addition, we contribute to the literature on how accounting rules factor into managerial decisions in regulated financial institutions, particularly for insurance companies. A growing literature explores how accounting standards combine with capital requirements to influence asset sale decisions (e.g., Ellul et al. 2011, 2015; Hanley and Nikolova 2021; Merrill et al. 2021; Becker et al. 2022). Our findings suggest that a unique accounting rule, the IMR, can be an important factor in the asset sale decisions for life insurers under certain conditions. We also contribute to this literature by examining the role of accounting rules on earnings management rather than capital management. Given the relationship between earnings, capital, and taxes, however, regulatory capital and tax management activities might generate some of the relationships we observe and attribute to earnings management. We address this possibility in several ways in our main analyses and robustness tests. Our findings still point to earnings management as a factor.

Our study has important implications for state insurance regulators, who are primarily tasked with monitoring insurers' financial strength. In designing statutory accounting rules, these regulators have an interest in understanding how insurers behave under current standards and evaluating whether they are acting in the interest of customers (i.e., policyholders). Asset allocation, particularly for life insurers, can lead to greater firm risk (e.g., Kim and Lin 2024; Regele and Gründl 2024). Our findings are particularly relevant given the present economic climate, in which regulators and insurers are concerned about increasing interest rates. While our sample period predates the increasing interest rate environment, our findings on managerial behavior associated with the IMR shed light on the importance of the accounting standard. (Refer to Chacosky et al. 2023; Griffin and Perez 2022; MetLife Investment Management 2023, for anecdotal discussions related to the IMR under current economic conditions.)

Our study also has implications for investors and consumers. It can be difficult for investors and consumers to detect insurers who demonstrate myopic behavior, such as selling an asset to boost short-term earnings or payout claims to policyholders. Such activities are detrimental to the long-term prospects of the firm, as selling fixed-income securities for a short-term gain involves transaction costs and trades away future cash flows. Insurers, like many financial institutions, make guarantees about their solvency far into the future (e.g., annuitants as noted in Koijen and Yogo 2022). Myopic choices by managers in such a setting can have important societal consequences.

2 Institutional background

2.1 The U.S. insurance industry

The U.S. insurance industry is regulated primarily by individual states. Insurance regulators in each state, however, are members of a nonprofit organization known as the National Association of Insurance Commissioners (NAIC), which seeks to harmonize certain aspects of insurance regulation. One primary responsibility of state insurance regulators is to monitor the financial health of insurance companies operating in their state.

To help regulators monitor insurer financial health using a consistent set of detailed financial data, the NAIC has established a set of accounting rules known as statutory accounting principles (SAP), which are designed to be conservative. Since SAP financial statements are used by regulators who are primarily interested in monitoring insurer solvency, firms are evaluated on a liquidation basis instead of as a going concern. Examples of SAP conservatism include only counting "admitted" assets (i.e., assets with sufficient liquidation value) for regulatory capital purposes or the immediate recognition of policy acquisition expenses (which amortize earned premiums over the duration of an insurance policy).

While all insurers are required to prepare SAP financial statements for reporting to state insurance regulators, some insurers also may prepare financials in accordance with GAAP. The only insurers required to do so are publicly traded firms, per U.S. Securities and Exchange Commission (SEC) regulations.[11] Privately owned insurers are not legally required to report GAAP financials to their owners, but could do so on a voluntary basis. Private companies must, therefore, weigh the benefit of less conservative reporting against the cost of preparing a new set of financial statements. In Appendix A, we tabulate the reporting methods of the 20 largest privately owned life insurers by total assets (in 2017). At least half of them report to investors using only SAP accounting rules.[12] Given the additional costs associated with preparing a second set of financial statements under different rules, it is reasonable to assume that smaller insurers are even more likely to report on a SAP-only basis. In Section 4.3, we conduct a web-scraping exercise to differentiate SAP reporters from voluntary GAAP reporters and compare their gains trading behaviors.

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[11]Beyond accounting rule differences between GAAP and SAP financial statements, there are also differences in the level of the reporting entity. SAP financial statements are prepared and submitted based on the operating company (or "affiliate") company level. Most insurers are organized as groups in order to take advantage of certain state-based regulatory or tax differences (e.g., Petroni and Shackelford 1995). Each group member must, therefore, submit their own SAP financial statement, and we use this affiliate-level data in our analysis. GAAP financial statements are typically prepared at the group (or "aggregate") company level. Aggregate companies may include non-insurance affiliates (i.e., companies that do not bear the risk of loss in insurance contracts, such as consulting businesses, claims processing services, insurance agencies, or banks). Such firms would be included in aggregate GAAP reporting but would not be required to report SAP financials to state insurance regulators.

[12]We searched for annual reports on the websites of the twenty largest (by 2017 total assets) non-public life insurance companies. Seventeen of these firms provide financial statement data on their websites. Ten of these firms report only SAP earnings, six report both SAP and GAAP earnings, and one reports only GAAP earnings. In Section 4.3, we expand this search to all privately owned life insurers (of any size) and compare SAP reporters to GAAP reporters.

2.2 Interest Maintenance Reserve

A unique feature of SAP reporting for life insurance companies is the existence of the interest maintenance reserve (IMR). The rules for the IMR are outlined by *Statement of Statutory Accounting Principles (SSAP) No. 7—Asset Valuation Reserve and Interest Maintenance Reserve*. This rule establishes the IMR as a liability account that "defers recognition of the realized capital gains and losses resulting from changes in the general level of interest rates." There is no equivalent rule for property/casualty (P/C) insurers; those firms can recognize all investment proceeds immediately and fully as income. One of the primary motivations for regulators implementing the IMR rule relates to gains trading. SSAP No. 7 specifically states that "gains trading (i.e., selectively selling securities to include realized gains in earnings) opportunities are reduced by reporting an IMR."[13] While the IMR can apply across various interest-rate-sensitive assets, it predominantly applies to capital gains and losses on bonds.[14]

There are a few exceptions in which a realized gain or loss on a bond is not amortized. These include debt securities experiencing significant changes in the NAIC's assigned credit rating (i.e., a change by two or more rating classes, out of six possible classes), debt securities deemed impaired (i.e., NAIC credit rating class of 6), and mortgage loans near default (i.e., interest is more than 90 days past due, in the process of foreclosure or conveyance, or restructured within two years). Such situations are rare, as life insurers invest the vast majority of their portfolio in conservative, high-quality bonds.[15]

The IMR rule requires proceeds to be amortized into investment income over the "expected remaining life" of the investments sold. Firms have two options for calculating the amortization upon selling an asset. First, the "seriatim method" treats the amount amortized each year as the excess of the amount of income that would have been reported in that year (if it had been held) over the amount of income that would be generated if the asset had been repurchased at its sale price. Second, the "grouped method" allows firms to group capital gains in bands of five calendar years (except for those with less than one year to maturity). While the NAIC recommends the seriatim method as the preferred approach, it recognizes that this method may

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[13]The IMR should also temper extreme reactions to interest rate changes (i.e., not changes in price related to the creditworthiness of an asset). While prior studies specifically focus on downgraded assets (e.g., Ellul et al. 2011), we are interested in fixed-income assets with price changes attributable to interest-rate changes.

[14]Specifically, the IMR rule applies to sales of bonds, preferred stock, interest rate hedges, mortgage loans, and other fixed-income investments. There are also certain liability accounts, related to reinsurance transactions, that are sensitive to interest rate changes and can, therefore, be amortized in the IMR. Our focus, however, is on the IMR as it relates to asset sale decisions, specifically bonds, as they comprise the majority of portfolio value and are relatively liquid.

[15]According to the NAIC (2015), more than 93% of insurer assets were in investment-grade bonds (classes 1 or 2 per the NAIC's assigned credit rating classes) between 2004 and 2014. While insurers often hold a small portion of their investments in lower-quality investments, and market trends may erode the quality of certain assets, capital regulation restricts the risk insurers can take; thus, nearly all of their fixed-income holdings will be subject to the IMR rule. We include year fixed effects in our regressions to account for systemic changes in the economy over time.

place an administrative burden on certain firms. Firms may use any allocation process as long as it is approved by the state insurance department.

Life insurers are required to make detailed disclosures related to their IMR. The balance of the IMR liability account appears on the balance sheet (specifically, page 3 of the annual statement "Liabilities, Surplus and Other Funds") as line 9.4, "Interest Maintenance Reserve." The reported value represents realized capital gains and losses from all previous transactions that have not yet been transferred into net income based on the amortization schedule. On the income statement (page 4 of the annual statement, "Summary of Operations"), the portion of the IMR that is amortized in the current year's net income appears as line 4, "Amortization of the Interest Maintenance Reserve." This line item includes any immediate amortization of the current year's sales, as well as continued amortizations of assets sold in previous years.

Two other pages of the annual statement provide important details for our analyses. The "Form for Calculating the Interest Maintenance Reserve" (page 28 of the annual statement) reports the full amortization schedule for all realizations subject to the IMR rule. This form first reports a reconciliation between the prior year's IMR balance and the current year's IMR balance, based on the current-year amortization as well as any new eligible capital gains and losses. The "Exhibit of Capital Gains and Losses" (page 8) reports the full amount of realized capital gains and losses transacted in the market (i.e., as if there were no IMR rule and before taxes are deducted), which is not directly part of the income statement. We use this measure to capture an economic measure of capital gains and losses rather than one artificially diluted by an accounting rule. This represents the net transactions actually conducted in the market; we use this measure in Section 5.2 to illustrate the economic effects of gains trading under the IMR rule. In Appendix B, we provide sample pages for our source data and highlight the items we use in our analysis.

3 Research design

3.1 General form

Our analyses focus on the relationship between realized capital gains and losses and operating income for firm *i* in year *t*. We estimate the equation:

$$RGL_{it} = \beta_1 PosUWInc_{it} + \beta_2 NegUWInc_{it} + \alpha \mathbf{X}_{it-1} + \zeta F_i + \psi Y_t + \varepsilon_{it}. \quad (1)$$

Our dependent variable is *RGL*. Importantly, we measure RGL after the proceeds have been amortized under the IMR rule.[16] This captures the direct net effect of

[16]Specifically, $RGL_{it} = AcctRGL_{it} + AmortRGL_{it}$. The first term ($AcctRGL_{it}$) is firm *i*'s *RGL* in year *t* as reported on the income statement, which includes only the proceeds from asset sales that are *not* subject to amortization (e.g., sales of common stock). The second term ($AmortRGL_{it}$) is the year *t* amortization for firm *i*'s investments sold in year *t* and subject to the IMR rule. It does not include transfers from the IMR due to sales made in prior years, only those sales transacted in year *t*. It is important to note that $AmortRGL_{it}$ is only a portion of the total capital gain amortizations that occur in year *t*. The IMR balance from sales in past years is known to managers and may influence the decision to sell investments in year *t*, so we include it as a control variable in our models.

year *t* asset sales on year *t* earnings. Measuring realized gains and losses in this way also provides the best comparison to established results in the literature while still incorporating the IMR rule.

Our explanatory variable of interest is operating income. For insurance companies, this is underwriting income (*UWInc*), which represents the net profit from insurance operations.[17] Similar to the approach in Barth et al. (2017), we split *UWInc* into operating gains and losses—that is, *PosUWInc* (= *UWInc* when *UWInc* > 0 and = 0 otherwise) and *NegUWInc* (= *UWInc* when *UWInc* < 0 and = 0 otherwise).

There are two reasons why we separate positive and negative operating income. First, there is evidence that financial institutions, such as banks, manage gains and losses differently (e.g., Barth et al. 2017). For insurance companies in particular, operating losses may send a more negative signal to investors and customers compared to any positive signal conveyed by operating gains (Epermanis and Harrington 2006). Second, earnings smoothing incentives and opportunities are likely different for firms with operating losses versus those with operating gains. For example, given the regulatory restrictions on insurance company investments and the overall trend in interest rates over our time period, firms with large positive earnings may have relatively few underperforming assets to divest. Firms with operating losses, on the other hand, may have more opportunities at their disposal to offset losses (i.e., assets with unrealized gains). For these reasons, we focus our discussion of results on firm years with operating losses. A negative coefficient on *NegUWInc* ($\hat{\beta}_2 < 0$) implies a pattern of gains trading to offset operating losses.[18] Another form of earnings management, taking a "big bath" and divesting underperforming assets in poor operating years, is evidenced by a positive coefficient on *NegUWInc* ($\hat{\beta}_2 > 0$). We report the coefficients on *PosUWInc* for comparison, but the gains trading incentives for these firms are less clear.

In **X**, we control for other *ex ante* factors that may affect a manager's decision to sell assets. Many of our controls are related to the insurer's investment portfolio and previous asset sales. We control for the firm's IMR balance, as managers may be less

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[17]Our measure of underwriting income is captured after any accruals-based earnings management related to underwriting accounts. We anticipate this will be minimal, as life insurer reserving involves substantially less discretion compared to P/C insurers. Prior research on earnings management in the insurance sector has focused on P/C insurers under- or over- estimating loss reserves to smooth earnings (e.g., Beaver et al. 2003; Grace and Leverty 2012) for this reason. We manually calculate underwriting income by summing premiums for life and annuity products and then subtracting benefit payments; we also include premiums and benefits of other insurance policies contingent on death probabilities (e.g., disability income and long-term care products).[17]Our measure of underwriting income is captured after any accruals-based earnings management related to underwriting accounts. We anticipate this will be minimal, as life insurer reserving involves substantially less discretion compared to P/C insurers. Prior research on earnings management in the insurance sector has focused on P/C insurers under- or over- estimating loss reserves to smooth earnings (e.g., Beaver et al. 2003; Grace and Leverty 2012) for this reason. We manually calculate underwriting income by summing premiums for life and annuity products and then subtracting benefit payments; we also include premiums and benefits of other insurance policies contingent on death probabilities (e.g., disability income and long-term care products).

[18]Note that when modeling the conditional mean of *RGL* using ordinary least squares, we can only speak to the relative magnitude of *RGL* and not the sign. As we discuss in Section 3.2, we also conduct quantile regressions, which allow us to determine whether managers are realizing capital *gains* or capital *losses*.

likely to sell investments in year *t* if there are large upcoming transfers from the IMR due to gains realized in previous years. Similar to *UWInc*, we take into account both the signs of the IMR balances and their magnitudes by separating out positive and negative IMR balances and include both *PosIMRBalance* and *NegIMRBalance* variables.[19] If a firm has large unrealized gains in its portfolio, there are more gains available to realize. We control for unrealized capital gains and losses in different asset categories (U.S. government bonds, municipal bonds, corporate bonds, and unaffiliated stocks) to take into account the differential effects of bond gains compared to stock gains, as well as different tax incentives for municipal bonds and affiliated assets.[20] We also control for the percent of the insurer's portfolio in each asset category, including cash holdings.

In addition to the investment-related factors described above, **X** includes other factors that may influence a manager's decision to gains trade. There may be tax-related incentives to realize capital gains or losses, which we proxy with a firm's cash effective tax rate (e.g., Donohoe 2015; Edwards et al. 2016).[21] Much of the existing literature documents that managers gains trade to manage regulatory capital, so we include an indicator variable for having a risk-based capital (RBC) ratio in the lowest decile each year (I(*LowRBC*)).[22] We also control for firm size with logged total assets (*LogAssets*). Because all of the continuous control variables may change based on investment transactions during year *t*, we measure them at the end of the prior year ($\mathbf{X}_{\mathbf{it-1}}$). Finally, we control for organizational form in year *t*, which can affect a life insurer's investment portfolio as well as asset sales decisions (e.g., Mayers and Smith 1994; Lee et al. 1997; Mayers et al. 1997). Specifically, we create binary variables equal to one if a firm is a member of a publicly traded insurance group, a private stock insurer, or a mutual insurer.[23] Publicly traded insurers are the omitted reference category, since they are required to report under GAAP.

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[19] We observe both positive and negative IMR balances in our sample. We note that insurers with negative IMR balances do not necessarily report better capital positions because negative IMR balances do not count as admitted assets under SAP. Additionally, we report results with a continuous measure of IMR balance in Appendix Table A.7.

[20] Preferred stocks are similar to bonds in terms of the accounting principles under SAP. Yet, we find that life insurers do not hold much of them in their portfolio. By the end of 2017, approximately 0.25% of industry assets were in preferred stocks. while 3.75% were in common stocks (NAIC 2019). We, therefore, combine unaffiliated common stock and unaffiliated preferred stock to control for the unaffiliated stock holdings.

[21] Following the literature, we calculate the cash effective tax rate as the ratio of cash taxes paid to pretax income. We gather information on cash taxes paid from insurers' "Statement of Cash Flows" pages. We proxy for pretax income by summing pretax income after dividends and taxes on net realized capital gains; both are from the "Summary of Operations" pages. Following Edwards et al. (2016), we code this as a continuous variable, bound to be between -1 and 1 (where negative values indicate a tax refund).

[22] In creating our sample (see Section 3.4), we exclude firm-years with an RBC ratio below 200%. This is a standard threshold for regulatory intervention, and asset sale decisions for these firms may be heavily influenced by regulators (NAIC 2012). Regulators also flag insurers with RBC ratios above 200% but below 300% for potential negative capital level trends. Thus, the observations designated as having a low RBC ratio are the firms closest to regulatory intervention in a given year. The mean (median) RBC ratio for these observations is 473% (420%).

[23] Since our observations are at the affiliated and unaffiliated single-firm level, none of our observations are publicly traded at the observation level. Instead, we treat all insurance entities of the parent company as being publicly traded. This includes mutual life insurer subsidiaries that belong to the publicly traded parent company (i.e., mutual holding groups). See Appendix A for details on how we construct the publicly traded insurance group variable.

To permit comparisons between firms, we scale all continuous variables by beginning-of-year total invested assets and multiply by 100.[24] Scaling in this way sometimes results in extreme values, so we winsorize continuous variables at the 1st and 99th percentiles. We also account for general market trends with year fixed effects (Y_t) and unobservable time-invariant firm characteristics with firm fixed effects (F_i). In our regressions, we estimate robust standard errors adjusted for within-firm correlations.

We conduct our initial regression analyses using ordinary least squares (OLS), which allows for comparisons to previous research. An important limitation of such an approach, however, is that it models the conditional mean of *RGL*. Earnings management is not necessarily average managerial behavior and is more likely to have occurred at the extremes of the *RGL* distribution. If the relationship between *RGL* and *NegUWInc* does not persist linearly across the distribution of *RGL*, we may not observe statistically significant estimates in an OLS setting. This motivates us to conduct a deeper analysis using quantile regression.

3.2 Quantile regression

Operating losses create two options to manage earnings using RGL. One option for managers is to offset those losses by realizing large gains (i.e., gains trading). The other option is to use it as an opportunity to divest underperforming assets, realizing large losses (i.e., take a big bath). These two behaviors exist at opposite ends of the *RGL* distribution. To properly identify gains trading behaviors, we must separate out the two options. Therefore, we conduct quantile regression analyses to test for various earnings management behaviors over the *RGL* distribution.

Quantile regressions are commonly used to overcome limitations of OLS models, especially when studying differential managerial behaviors over the distribution of an outcome. For example, Armstrong et al. (2015) and Li et al. (2022) use the method to estimate the relationship between board independence and tax avoidance in the tails of the tax avoidance distribution; Chen et al. (2019) use the method to study the relationship between stock liquidity and tax avoidance; Gleason et al. (2021) find that worker representation affects earnings management in the tails of the earnings distribution; Grace and Leverty (2010) use the method to estimate the relationship between insurance rate regulation and loss reserve errors across the distribution of loss reserve errors. Fitzenberger et al. (2001) and Fitzenberger et al. (2022) provide excellent reviews of the method.

In our panel data setting, the conditional quantile regression (CQR) models frequently adopted in the literature are not appropriate to estimate and interpret the relationship between operating losses and *RGL*. Unlike the CQR models, the

[24]Life insurers have two investment accounts, the general account and the separate account. The separate account is for assets owned and managed by policyholders of variable life/annuity products, whereas the general account is for assets owned and managed by the insurer (including assets supporting minimum guarantees of variable life/annuity products). Life insurer investments only include general account assets, and thus we scale financial variables by general account assets.

unconditional quantile regression (UQR) method introduced by Firpo et al. (2009) enables us to estimate quantile regression models without conditioning on specific covariates (i.e., a specific year or a specific firm), and the interpretation of the coefficients is similar to interpreting results produced by an OLS model. Additionally, UQR does not suffer from the incidental parameter problem that arises when applying the CQR method to panel data (Borgen 2016; Rios-Avila and Maroto 2022). These advantages have led to widespread usage of the UQR method in recent economics and business literature (e.g., Cobb and Lin 2017; Dube 2019; Damette and Kouki 2022). We, therefore, control for firm and year fixed effects in our quantile regressions with the Stata package rifhdreg (Rios-Avila 2020) to estimate the high-dimensional fixed effects UQR model in two steps. First, we estimate the partial effects of the explanatory variables (including firm and year fixed effects) on any unconditional quantile of the dependent variable to produce a vector of the Recentered Influence Functions (RIF) for each observation for the selected distributional statistics (e.g., 5th, 25th, 75th percentile) of the dependent variable (τ = 0.05, 0.25, 0.75), as proposed by Firpo et al. (2009). Next, we use the RIF as the dependent variable and fit a linear model, also including the firm and year fixed effects.

Our quantile regression model is a modified version of Equation (1):

$$Q_\tau(RGL_{it}|UWInc,X) = \beta_{1\tau}PosUWInc_{it} + \beta_{2\tau}NegUWInc_{it}$$
$$+ \alpha_\tau \mathbf{X}_{it-1} + \zeta_\tau F_i + \psi_\tau Y_t + \varepsilon_{it}, \quad (2)$$

Here, $\beta_{1\tau}$ and $\beta_{2\tau}$ are coefficient estimates for *PosUWInc* and *NegUWInc* at the τth percentile of the *RGL* distribution. Again, we center our discussion and interpretation around the coefficient on *NegUWInc*. Regression at the lowest quantiles of *RGL* examines the relationship between *NegUWInc* and larger realized capital losses; a positive $\beta_{2\tau}$ in these quantiles is evidence of big bath earnings management. The highest quantiles of *RGL* capture larger realized capital gains; a negative $\beta_{2\tau}$ in these quantiles is consistent with gains trading. A negative $\beta_{2\tau}$ in the lower quantiles or a positive$\beta_{2\tau}$ in the higher quantiles, however, is evidence of positive correlations between operating performance and asset sales (which do not have a clear earnings management interpretation). In our analyses, we denote the quantile at which *RGL* changes from negative to positive, which facilitates the interpretation of coefficient estimates.

3.3 Asset class-specific RGL

We are able to disaggregate our dependent variable *RGL* into its broad asset categories. *BondRGL* is the gross proceeds from unaffiliated bond sales that impact current-year net income (i.e., gross bond sales less the amount transferred to the IMR liability account). *CommStockRGL* is the gross proceeds from common stock sales;

there is no subtraction for transfers to the IMR account because the IMR rule applies only to fixed-income investments. We conduct quantile regressions as in Equation (2), using these asset-specific RGL measures as dependent variables. Because bonds are generally subject to amortization while stocks are not, comparing the coefficients in models using *BondRGL* and *CommStockRGL* provides more direct evidence of the role the IMR rule plays in gains trading. More generally, disentangling *RGL* by asset types sheds light on the strategy of gains trading across asset classes.

3.4 Data and sample

We use data from annual SAP financial statements filed with state insurance regulators and compiled by the NAIC. Our initial sample includes all life insurer firm-years with available financial statements from 2005 to 2017.[25] Table 1 outlines the steps of our sample selection process. First, we drop observations with missing or non-positive values of assets or premiums written. Next, we drop observations with RBC ratios less than 200%, the threshold at which state regulators must impose restrictions or take control of the firm. We then drop observations missing prior-year total assets, since we scale all continuous variables by lagged assets. To ensure the firms in our sample have at least some external investments, we drop insurers holding zero unaffiliated bonds and zero unaffiliated common stocks at the beginning of year *t*. While affiliated bonds also comply with IMR requirements, the motivation for holding or selling these assets may differ from unaffiliated bonds. Finally, we exclude observations missing any other data needed to construct the variables in our models. Our final sample consists of 5,544 firm-year observations (604 unique firms); this represents 85% of total net admitted assets for the life insurance industry.

Table 1: Data filtering steps and final sample

Data step	**Observations**	**Firms**
All filings 2005–2017	10,761	1,105
Drop if missing/negative assets or premiums	9,375	949
Drop if RBC ratio < 200% or missing	8,994	924
Drop if missing prior-year total assets	8,957	918
Drop if holding zero unaffiliated bonds and stocks	5,650	662
Final sample without missing data	**5,544**	**604**

[25]Our sample begins in 2005 to include sufficient years before the financial crisis. The sample ends before the 2017 Tax Cuts and Jobs Act (TCJA) went into effect, due to the potential distortion of the rule on earnings. We view taxes as one of many potential incentives for why insurers decide to sell an asset. In the post-TCJA period, taxes may receive less "weight" in this decision based on factors such as reducing the corporate income tax rate from 35% to 21%. Restricting our sample to the pre-TCJA period provides a cleaner empirical setting where trading incentives are relatively homogenous. Our findings related to the IMR should still be informative to regulators, as similar incentives exist post-TCJA.

We report summary statistics of our variables in Table 2. Our primary *RGL* measure is centered around zero, though there appears to be a slight negative skew. Mean *CommStockRGL* is greater than mean *BondRGL*, but this appears to be due to more positively skewed *CommStockRGL*. About 75% of firm-years in our sample have operating gains, and 25% have operating losses.[26] On average, those operating gains are about twice as large as operating losses. The vast majority of our sample reports positive beginning-of-the-year IMR balances; overall, the IMR account is a relatively small part of the balance sheet.[27] Unrealized portfolios tend to have small net gains, but similar to *RGL*, the distribution is centered around zero. On average, firms keep about half their investments in corporate bonds, 15% in municipal bonds, 11% in government bonds, and 9% in stocks. The median firm holds 3.5% of assets in cash, though some firms have large cash holdings, which skew the mean to 8%. Approximately 54% of the sample are privately owned stock companies, and 9% are organized as mutual insurers.[28] The remaining firms (37%) are part of publicly traded stock insurance groups.[29]

4 Results

4.1 Full sample

We begin by estimating Equation (1) using OLS; we report the results in column (1) of Table 3. The coefficient estimate on *NegUWInc* is not significantly different from zero, indicating that we do not find evidence that life insurance companies exhibit gains trading behaviors on average. As noted in Section 3.2, this linear estimation tells a story about conditional means, and gains trading activities may vary over the distribution of *RGL*. We examine this by conducting quantile regression analyses. In columns (2)–(6) of Table 3, we report the results over the 10th, 20th, 50th, 80th, and 90th quantiles of *RGL*, respectively.

[26]*PosUWInc* and *NegUWInc* are listed separately in Table 2 to describe data within the positive/negative income domains. Our regression analyses interact a continuous *UWInc* with a dummy for *UWInc* < 0.

[27]We tabulate additional summary statistics in Online Appendix Table A.1 and by organizational forms in Online Appendix Tables A.2 to A.4.

[28]During the 1990s and early 2000s, many life insurers demutualized and transformed into private stock insurers or restructured as mutual holding groups (Erhemjamts and Leverty 2010; Erhemjamts and Phillips 2012).

[29]Our sample excludes fraternal insurers.

Table 2: Summary statistics

		Quantile						
	Mean	SD	10th	20th	50th	80th	90th	N
RGL	−0.05	0.96	−0.83	−0.26	0.00	0.22	0.57	5,544
BondRGL	0.10	0.31	−0.08	−0.01	0.03	0.19	0.37	5,544
CommStockRGL	0.12	0.40	0.00	0.00	0.00	0.10	0.37	5,544
UWInc	10.06	21.45	−4.77	−1.08	4.67	17.23	32.62	5,544
PosUWInc	15.90	21.27	1.24	2.63	8.30	23.24	40.61	4,120
NegUWInc	−6.85	9.91	−17.54	−8.40	−3.50	−0.94	−0.36	1,424
IMRBalance	0.10	0.16	−0.01	0.00	0.05	0.17	0.27	5,544
PosIMRBalance	0.12	0.15	0.00	0.02	0.07	0.19	0.30	4,742
NegIMRBalance	−0.06	0.08	−0.17	−0.11	−0.03	−0.01	0.00	802
USGovtUnrealGL	0.33	0.87	−0.09	0.00	0.08	0.47	1.00	5,544
CorpBondUnrealGL	1.33	3.36	−1.30	−0.20	0.83	3.50	5.25	5,544
MuniBondUnrealGL	0.43	0.88	−0.15	−0.01	0.13	0.80	1.45	5,544
StockUnrealGL	0.04	0.74	−0.24	−0.03	0.00	0.11	0.45	5,544
USGovtHoldings	11.04	16.12	0.29	1.05	4.76	16.36	31.15	5,544
CorpBondHoldings	48.15	26.10	8.17	22.23	52.23	70.26	78.43	5,544
MuniBondHoldings	15.02	15.54	0.16	2.17	10.94	24.07	34.72	5,544
StockHoldings	9.34	13.79	0.32	0.95	3.98	13.76	25.10	5,544
CashHoldings	8.28	13.39	0.62	1.22	3.52	11.11	21.81	5,544
LogAssets	20.04	2.63	16.44	17.45	20.02	22.59	23.53	5,544
EffectiveTaxRate	0.17	0.40	−0.21	0.00	0.16	0.42	0.67	5,544
Inv.Income	4.85	1.80	2.51	3.64	4.98	5.93	6.46	5,544
I(LowRBC)	0.09	0.29	0.00	0.00	0.00	0.00	0.00	5,544
I(Mutual)	0.09	0.29	0.00	0.00	0.00	0.00	0.00	5,544
I(Private Stock)	0.54	0.50	0.00	0.00	1.00	1.00	1.00	5,544
I(Public Stock)	0.37	0.48	0.00	0.00	0.00	1.00	1.00	5,544

Note: All variables are lagged one year, except the *RGL* and *UWInc* variables (first six rows). Variables expressed as dollar values are scaled by lagged total invested assets and multiplied by 100. Values are, therefore, expressed as a percentage of beginning-of-year invested assets. *RGL* is realized capital gains and losses reported in the statutory income statement; *BondRGL* is realized capital gains and losses from all unaffiliated bond sales, less the amount transferred to the IMR; *CommStockRGL* is realized capital gains and losses from all unaffiliated common stock sales; *PosUWInc* is the amount of *UWInc* for observations with *UWInc* ≥ 0; *NegUWInc* is the amount of *UWInc* for observations with *UWInc* < 0; *PosIMRBalance* is the amount of amortized income from prior years' sales recognized during the reporting year (*IMRBalance*) for observations with *IMRBalance* ≥ 0; *NegIMRBalance* is the amount of *IMRBalance* for observations with *IMRBalance* < 0; *USGovtUnrealGL*, *CorpBondUnrealGL*, *MuniBondUnrealGL*, and *StockUnrealGL* are unrealized capital gains and losses from US government bonds, unaffiliated corporate bonds, municipal bonds, and unaffiliated stocks (common and preferred combined), respectively; *USGovtHoldings*, *CorpBondHoldings*, *MuniBondHoldings*, *StockHoldings* and *CashHoldings* are holdings of U.S. government bonds, unaffiliated corporate bonds, municipal bonds, unaffiliated stocks (common and preferred combined), and cash, respectively; *LogAssets* is the natural log of total invested assets; *EffectiveTaxRate* is cash taxes paid divided by pretax income; *Inv.Income* is net investment income; *I*(*LowRBC*) is an indicator equal to 1 for insurers with RBC ratios below the yearly 10th percentile value (out of all reporting firms), and 0 otherwise; *I*(*Public*) is an indicator equal to 1 for life insurers that belong to a publicly traded insurance group and 0 otherwise; *I*(*Mutual*) is an indicator equal to 1 for mutual insurers and 0 otherwise; *I*(*Private Stock*) is an indicator equal to 1 for private stock insurers and 0 otherwise.

Table 3: Linear and quantile regressions of life insurer *RGL* on underwriting income

		RGL Quantile				
	OLS (1)	0.10 (2)	0.20 (3)	0.50 (4)	0.80 (5)	0.90 (6)
PosUWInc	0.001	-0.000	-0.000	0.000	0.000	0.004
	(0.001)	(0.003)	(0.001)	(0.000)	(0.001)	(0.002)
NegUWInc	0.003	0.028***	0.012***	-0.000	-0.004*	-0.021***
	(0.004)	(0.007)	(0.003)	(0.000)	(0.002)	(0.006)
PosIMRBalance	0.276	0.679**	0.257*	0.044*	0.065	0.250
	(0.185)	(0.345)	(0.143)	(0.024)	(0.098)	(0.280)
NegIMRBalance	-0.918*	3.426***	-0.264	-0.217***	-1.389***	-4.405***
	(0.556)	(1.110)	(0.459)	(0.076)	(0.314)	(0.902)
USGovtUnrealGL	0.008	0.028	0.032	0.006	-0.012	-0.044
	(0.023)	(0.057)	(0.024)	(0.004)	(0.016)	(0.046)
CorpBondUnrealGL	0.050***	0.179***	0.069***	0.006***	0.012***	0.016
	(0.007)	(0.016)	(0.007)	(0.001)	(0.005)	(0.013)
MuniBondUnrealGL	0.023	0.075	0.067***	0.007*	0.001	0.047
	(0.020)	(0.054)	(0.022)	(0.004)	(0.015)	(0.044)
StockUnrealGL	0.128***	0.109**	0.070***	0.014***	0.081***	0.258***
	(0.027)	(0.046)	(0.019)	(0.003)	(0.013)	(0.038)
LogAssets	-0.020	-0.071	0.025	0.002	0.011	-0.071
	(0.060)	(0.109)	(0.045)	(0.007)	(0.031)	(0.088)
EffectiveTaxRate	-0.030	-0.120	0.017	-0.005	-0.029	0.015
	(0.031)	(0.082)	(0.034)	(0.006)	(0.023)	(0.067)
Inv.Income	0.005	-0.031	-0.027**	-0.007***	-0.006	0.034
	(0.015)	(0.030)	(0.012)	(0.002)	(0.009)	(0.025)
I(LowRBC)	-0.113*	-0.198	-0.089	-0.023**	0.023	-0.046
	(0.065)	(0.152)	(0.063)	(0.010)	(0.043)	(0.123)
I(Mutual)	0.164	0.177	0.113	0.023	0.031	0.594**
	(0.141)	(0.367)	(0.152)	(0.025)	(0.104)	(0.298)
I(Private Stock)	0.265***	0.599***	0.233***	0.010	0.024	0.166
	(0.092)	(0.207)	(0.086)	(0.014)	(0.059)	(0.168)
Holdings	Yes	Yes	Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.380	0.391	0.453	0.348	0.344	0.348
N	5,544	5,544	5,544	5,544	5,544	5,544

Note: The dependent variable is *RGL* for firm *i* in year *t*. Column (1) reports OLS estimates of Equation (1). Columns (2)–(6) report quantile regression estimates as described in Equation (2), with the specified quantiles reported in the header row. All control variables are lagged one year, except *I(Mutual)* and *I(Private Stock)*. We do not report coefficients on asset-class holding variables for brevity. See Online Appendix Table A.5 for full results. See Table 2 for variable definitions. Standard errors are clustered at the firm level to adjust for within-firm correlations and are reported in parentheses. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

Focusing on our explanatory variable of interest (*NegUWInc*) in the second row, two notable patterns emerge in the quantile regressions. First, the relationship between *RGL* and *NegUWInc* is positive at the 10th and 20th quantiles of *RGL* (columns (2) and (3)). This indicates that for firms with *RGL* in this region, as their operating losses get larger, their *RGL* decreases (i.e., realized losses increase); this likely stems from big bath earnings management. Second, the coefficient on *NegUWInc* is negative for the 80th and 90th quantiles of *RGL* (columns (5) and (6)), suggesting that firms at the high end of the *RGL* distribution offset their operating losses by realizing larger capital gains (i.e., gains trading). The coefficient estimate in column (6) implies that a one-standard-deviation increase in underwriting losses is associated with a 0.144 (0.021×6.849) percentage point higher *RGL* for those at the 90th percentile of *RGL*. To provide further context to interpret quantile regression results, consider the 90th percentile of *RGL* is 0.57 (percent of total assets). The coefficient estimate on *NegUWInc* for the corresponding percentile (column (6)) is -0.021, suggesting that firms with *RGL* in the top 10% of the distribution realize 0.021 percentage points more capital gains when operating losses are 1 percentage point worse. Opposite signs on the coefficients at each end of the *RGL* distribution also explain why the OLS estimates are null: averaging the positive relationship on the low end with the negative relationship on the high end results in a conditional mean near zero.

We highlight coefficient estimates on several control variables. Beginning-of-year IMR balances appear to influence the decision to sell assets. When IMR balances are negative (*NegIMRBalance*, about 15% of observations), firms tend to realize smaller (or negative) capital gains. Positive balances (*PosIMRBalance*) are only marginally associated with *RGL*. Across different models, we find that larger unrealized capital gains tend to result in larger *RGL*, which is an intuitive result. Effective tax rates are not significantly associated with *RGL*. Having a low RBC ratio (*I*(*LowRBC*)) is only marginally associated with *RGL*, though the coefficient is negative across most models. Coefficients on *I*(*Mutual*) and *I*(*PrivateStock*) capture within-firm changes in organizational form over time, given that all models include insurer-fixed effects. The coefficient on *I*(*Mutual*) is positive and significant at the 90th percentile of *RGL,* while the coefficients on *I*(*PrivateStock*) are generally positive and significant for the lower quantiles (10th and 20th). These inconsistent patterns are likely due to the rarity of changes in organizational forms.[30]

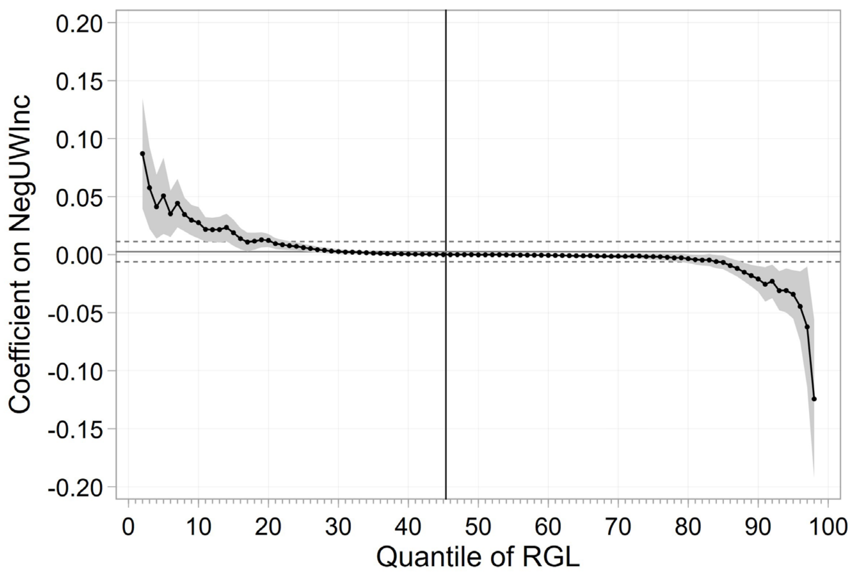
The tabulated results provide a general snapshot of gains trading patterns, but two questions arise. First, where exactly in the *RGL* distribution is there significant evidence of gains trading? The results in Table 3 provide only a general idea that firms gains trade somewhere at the upper end of the *RGL* distribution; we report results of only select quantiles. Second, where in the distribution of *RGL* do we observe realized gains versus losses? This second question is especially important to differentiate

[30]Only 18 unique insurers change to mutual from private stock, or vice versa (3% of firms), and another 46 unique insurers go public or are taken private (8% of firms). No insurers change from mutual to public or vice versa. The coefficient on *I*(*Mutual*) shows that firms trade differently when they change organizational form, but follow-up analyses indicate that this is an average effect for reorganizing firms rather than extreme behavior by only a few firms.

gains trading behaviors from other earnings management (i.e., big bath) patterns. We answer both questions by plotting the coefficient estimates on *NegUWInc* across the entire *RGL* distribution in increments of 1 percentile.

Figure 1 illustrates the estimated coefficient on *NegUWInc* at each quantile of *RGL*, with the shaded area representing the 95% confidence interval at each quantile. The vertical line denotes the quantile where *RGL* = 0, so quantiles to the left are realized losses and those to the right are realized gains. In contrast to the OLS result (denoted by the horizontal gray lines), there is significant evidence of gains trading for a subset of the *RGL* distribution. Above the 75th quantile of *RGL*, the coefficient on *NegUWInc* is negative and significant, consistent with realizing larger capital gains to offset underwriting losses. That is, those with large realized gains appear to have offset their operating losses by gains trading.[31]

Figure 1: Quantile regressions of *RGL* on *NegUWInc*



Note: The solid black line with circular markers is the coefficient estimate at each quantile of *RGL*, while the gray shaded area denotes the 95% confidence interval for each multivariable quantile regression. These regressions include all control variables summarized in Table 2. Left of the black vertical line are quantiles where *RGL* < 0. The gray horizontal solid (dotted) lines represent the coefficient (95% confidence intervals) on *NegUWInc* in the OLS regression. The 95% confidence intervals of the OLS and quantile regressions no longer overlap starting at the 89th percentile of RGL.

31The positive coefficients on *NegUWInc* below the 25th quantile of *RGL* are evidence of big bath earnings management– the largest realized losses are positively associated with large operating losses. In a supplementary analysis where we estimate quantile regressions separately for asset-class-specific RGLs, we find that this pattern is largely driven by derivatives transactions, which are not directly relevant to gains trading. This is because while exercising derivatives is a discretionary action that affects *RGL*, expiration, maturity, or termination of derivatives also contribute to *RGL* under SAP rules (*SSAP No. 86—Derivatives*). We discuss the results of other asset-class RGL that better capture the managerial discretion on gains trading, bonds, and common stocks, in Section 4.2.

4.2 Asset class-specific RGL

Next, we conduct the same analyses as outlined in Equations (1) and (2) and illustrated in Figure 1, but with asset-specific RGL as the dependent variable. Any difference in managerial behavior with respect to *BondRGL* compared to *CommStockRGL* will provide insight into how managers account for the IMR rule's amortization requirement when gains trading.[32] The IMR rule applies to sales of most fixed-asset investments, namely bonds, and thus selling bonds to manage earnings comes with inefficiencies created by the IMR rule. Managers who wish to gains trade could effectively circumvent the IMR rule by gains trading with stocks, but stocks comprise a relatively small part of life insurer portfolios (4% at the median compared to 66% for bonds, see Table 2).

We report the OLS and quantile regression estimates for bond and common stock *RGL* in Table 4. We tabulate only the main variables of interest, positive and negative underwriting income, to conserve space. In Panel A, the dependent variable is *BondRGL*. In the OLS model (column (1)), the coefficient estimate for positive underwriting income (*PosUWInc*) is positive and significant, while the coefficient on underwriting losses (*NegUWInc*) is negative and significant. For both *PosUWInc* and *NegUWInc*, the quantile regressions show that the average effects are driven by the most extreme traders. In both regressions, the relationship is much smaller for *PosUWInc* than *NegUWInc*; this is partially due to the large scale of *PosUWInc*, but *BondRGL* is also larger for those with *NegUWInc* (*mean* = 0.13) than for those with *PosUWInc* (*mean* = 0.09). In Panel B, we report the results when *CommStockRGL* is the dependent variable. Across all columns, we do not find statistically significant coefficients on *NegUWInc* except for those in the 20th and 50th percentiles. The coefficients in these quantile regressions are small.

We illustrate the results of our quantile regression estimates in Figure 2. Panel (a) reports the estimated coefficient on *NegUWInc* at each quantile of *BondRGL*. Despite the inefficiencies created by the IMR rule, life insurance managers appear to gains trade in bonds to offset operating losses. Similar to Figure 1, this begins around the 80th quantile of the *BondRGL* distribution. The association becomes stronger as we move to higher quantiles of *BondRGL*.[33] In contrast to the *RGL* analyses, however, there are no offsetting effects on the low end of the *BondRGL* distribution, and thus the OLS estimate is negative and significant. In the upper quantiles of *BondRGL*, coefficient sizes on *NegUWInc* are also slightly larger than when *RGL* is the dependent variable.

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[32]We note that there are other asset classes in life insurers' portfolios. Similar to derivatives as discussed in footnote 31, however, other asset types face identification issues (e.g., policy loans are driven primarily by policyholder behaviors, real estate investments are relatively illiquid and are impractical for gains trading purposes). Therefore, we see our analysis of *RGL* as motivating a deeper look into the asset-specific *RGL,* which involves discretionary trades of liquid assets.

[33]Our results are robust to aggregating individual life insurers to the life insurance groups (using either the NAIC group code or AM Best group code as shown in Online Appendix Tables A.11 and A.12). We also investigate whether tax incentives affect our results, due to the offset of net capital gains when a firm reports net operating losses; we find consistent results among insurers that report positive ordinary income tax or those who cannot take advantage of the small insurer tax rules (Online Appendix Table A.13).

We illustrate how to interpret these coefficients with an example using an arbitrary quantile. The 95th quantile of *BondRGL* is 0.63 (percent of total assets). The regression coefficient at this quantile is -0.06, denoted by the circled marker in Figure 2(a). On average, firms with *BondRGL* in the top 5% of the distribution realize 0.06 percentage points more bond gains (as a proportion of total assets) when operating losses are 1 percentage point worse. This represents a 10% increase (0.06/0.63) in *BondRGL* at this point in its distribution. If we instead consider a one-standard-deviation increase,

Table 4: Regressions of asset-specific RGL

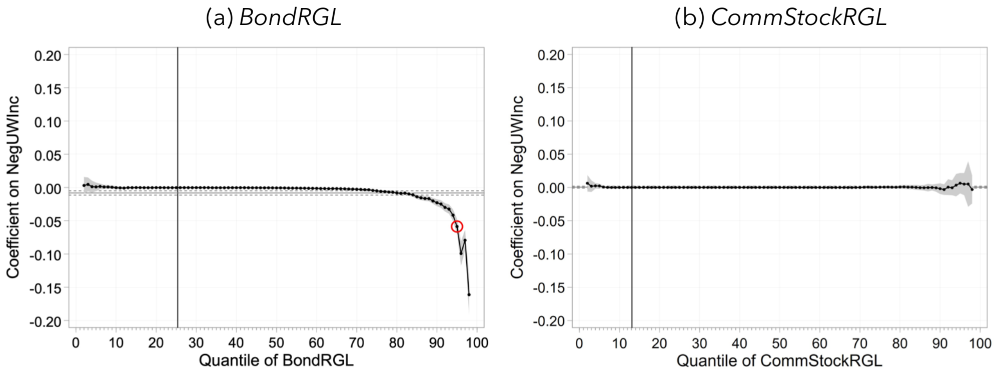
		RGL Quantile				
	OLS	0.10	0.20	0.50	0.80	0.90
Panel A: Bond RGL	(1)	(2)	(3)	(4)	(5)	(6)
PosUWInc	0.001**	-0.000	-0.000	0.000	0.001**	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
NegUWInc	-0.008***	-0.000	-0.000	-0.001**	-0.008***	-0.023***
	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.366	0.247	0.286	0.378	0.334	0.309
N	5,544	5,544	5,544	5,544	5,544	5,544
Panel B: Common Stock RGL	(1)	(2)	(3)	(4)	(5)	(6)
PosUWInc	-0.000	-0.000	-0.000	-0.000	-0.001	-0.002
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
NegUWInc	0.000	0.000	0.000**	0.000**	0.001	-0.002
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.004)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.434	0.231	0.210	0.210	0.461	0.440
N	5,544	5,544	5,544	5,544	5,544	5,544

Note: The dependent variable is *Bond RGL* for firm *i* in year *t* in Panel A and *Common Stock RGL* in Panel (b). Column (1) reports OLS estimates of Equation (1). Columns (2)-(6) report quantile regression estimates as outlined in Equation (2), with the specified quantiles reported in the header row. Standard errors are clustered at the firm level to adjust for within-firm correlations and are reported in parentheses. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

the effect size would be 0.411 (6.849×0.06). Importantly, this marginal effect is measured *after* the IMR rule is applied and the gains are amortized; the actual trades made to offset these losses must be larger to overcome the diluting effect of the IMR rule. We quantify the broader implications of these trades in Section 5.2.

Panel (b) reports quantile regression estimates for *NegUWInc* with *CommStockRGL* as the dependent variable. Even though gains and losses from stock trades are not subject to the IMR rule, we do not observe any consistent patterns that indicate managers gains trade in stocks to avoid the costs associated with the IMR rule. The wide confidence intervals at the upper end of the distribution suggest that companies selling large volumes of stock may do so for a multitude of reasons unrelated to earnings management. The summary statistics in Table 2 also indicate substantial heterogeneity

Figure 2: Quantile regressions of asset-specific RGL



Note: The solid line with circular markers is the coefficient estimate at each quantile of the specified *RGL*. The shaded area denotes the 95% confidence interval. These multivariate regressions include all control variables summarized in Table 2. Left of the vertical line are quantiles where the asset-class *RGL* < 0. The gray horizontal solid (dotted) lines represent the coefficient (95% confidence intervals) on *NegUWInc* in an OLS regression. The 95% confidence intervals of the OLS and quantile regressions no longer overlap, starting at the 87th percentile of *BondRGL*. The 95th quantile marker in Panel (a) is circled for a discussion of coefficients in the text.

in stock investment. The coefficient of variation for *CommStockRGL* is higher than for *BondRGL*. In addition, common stocks are marked to market, limiting the amount of capital gains a life insurer can realize. Life insurers also face limits to investments in risky assets such as common stocks, implying that insurers with operating losses might not be holding sufficient amounts of common stock to realize capital gains (NAIC 2017). Overall, the results in Figure 2 indicate that the gains trading we observe in the upper quantiles of total *RGL* can be attributed to sales of bonds rather than common stocks.[34]

[34] To see whether common stocks ever play a significant role in gains trading, we conducted quantile regressions of *CommStockRGL* as in Figure 2(b) on subsamples of firms with large common stock holdings (e.g., common stocks comprising more than 10%, 15%, 20%, 25%, 30%, or 35% of the insurer's portfolio). The null result remains. In Online Appendix Figure A.1, we illustrate quantile regression results for firm-years where stocks comprise at least 25% of the portfolio.

4.3 Comparing SAP reporters to GAAP reporters

The IMR rule exists only under SAP, which is prepared by all insurance firms to report to state insurance regulators. Implicit in the previous analysis is that all firms report their SAP earnings to investors, and thus, the IMR rule would always be relevant in a manager's gains trading strategy. Some firms, however, also prepare GAAP earnings for reporting to investors. This is required for publicly traded insurers and voluntary for privately owned insurers. Appendix Table A.1 shows that many of the twenty largest privately owned life insurers report only SAP earnings to their investors and policyholders by posting them on their website. We believe that, due to the cost of preparing an entirely separate set of financials under different rules, smaller firms are even less likely to prepare financials under GAAP. Under this assumption, SAP rules are binding for most private insurers; thus, the IMR rule is relevant with respect to gains trading behaviors.

To test how sensitive our results are to this assumption, we expand the search for GAAP financials to all privately owned firms in our data.[35] Rather than manually checking each firm, we use Python to scrape company websites and search for certain keywords. We begin by determining each company's website from the jurat page of their 2021 SAP financials. Some firms did not report a website, so we also check the reported email address for a valid URL to a life insurance company. We also check AM Best's database and conduct web searches to fill in any missing web domains. Next, we scrape each website's homepage, sitemap, and "about" page for URLs that include financial terms such as investor, shareholder, or annual report.[36] We then search the resulting set of financial web pages for additional URLs that include those search terms. This results in a set of URLs where these insurers report financial information to the public. Finally, we scrape the pages of these financial URLs and count the number of times "GAAP" or related terms appear.

The result of this web-scraping procedure is a set of private firms where we can roughly delineate GAAP reporters from SAP reporters. Ultimately, we will compare gains trading behaviors between the groups. We code a firm as a GAAP reporter if any of the GAAP or related terms appear, and code it as a SAP reporter if the search is successful but none of the terms appear (i.e., the count is 0). Unsuccessful searches (i.e., count is missing) indicate that the website was invalid or no financial URLs could be found; we exclude those firms from our analysis. To be conservative, we also code a firm as a GAAP reporter if any of its siblings in the same NAIC group report

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[35]We define life insurers as privately owned if their parents are not publicly traded in stock exchanges, including the NYSE, NASDAQ, and international stock exchanges (e.g., TSX, Frankfurt Stock Exchange). Although publicly traded insurers also prepare GAAP financials for their investors, we exclude them from our analysis in this section because they do not serve as a homogeneous comparison group. The SAP reporters we identify are always private firms, so we compare them to a set of GAAP reporters who are also privately owned. See Appendix A.2 for details on how we construct the publicly traded insurance group variable.

[36]The full list of financial terms is extensive and available upon request. All search terms in this web-scraping process are determined by iterating our code over various terms and manually checking results.

GAAP financials. Overall, this process results in a set of 2,020 private insurer firm-year observations: 1,502 reporting SAP and 518 reporting GAAP. This split is consistent with our intuition that firms outside the twenty largest will be less likely to prepare GAAP financial statements.

A few important considerations about this process are necessary. First, this approach only examines what is publicly reported on a company's website. We are unable to determine whether firms prepare GAAP financials internally. Second, we scraped the websites in July 2023 and attributed the result to all years in our data. It is possible that the firm chose a different reporting method in a particular year, but we are unable to observe that choice. Third, our approach was designed to be conservative; if there is a chance that the firm reports GAAP financials, we code it as a GAAP reporter. This is why we code any firm with one or more GAAP search terms as a GAAP reporter and why we code all members of a group as GAAP reporters if any group member reports GAAP financials. Fourth, preparing and reporting GAAP financials is an endogenous choice by the firm; results should be interpreted with this in mind. We believe it is unlikely that a firm chooses to report GAAP specifically due to the IMR rule. Finally, there may be fundamental differences between SAP reporters and GAAP reporters with respect to the variables we use in our analysis. We test for differences in these variables and report results in Online Appendix Table A.8. While the groups differ in many dimensions, their *BondRGL* and *NegUWInc* are not significantly different. To account for other differences, we entropy-balance the groups (at the first and second moments of each variable) in our OLS and quantile regressions following Hainmueller (2012). After balancing, the groups do not significantly differ from each other in any of the variables in our analysis.[37]

We estimate Equations (1) and (2) using these data, interacting *NegUWInc* with dummies for SAP and GAAP reporting. We provide the results of these estimations in Table 5. For parsimony, we report coefficients of our variables of interest, *NegUWInc*, interacted with indicators for *SAP* and *GAAP* reporters. The regressions in Panel A use *RGL* as the dependent variable, while those in Panel B use *BondRGL* (we do not report *CommStockRGL*, but the results are null as in the main analysis). Controls, fixed effects, and standard errors are the same as those reported in Table 3.[38]

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[37]To ensure our balancing results are robust, we examine the distribution of weights in our sample (McMullin and Schonberger 2022). The maximum weight is 62.57, and the 99th percentile is 14.65. We tested the sensitivity of our reported results by estimating models that exclude observations with weights above the 99th percentile and find consistent results, suggesting that our findings are not driven by over-weighting.

[38]For robustness, we also create subsamples of GAAP reporters and SAP reporters and conduct the same quantile regressions as reported in Tables 3 and 4, as well as Figure 3. We report the results of those analyses in Online Appendix Tables A.9, A.10, and Figure A.2. Results are consistent with those reported here.

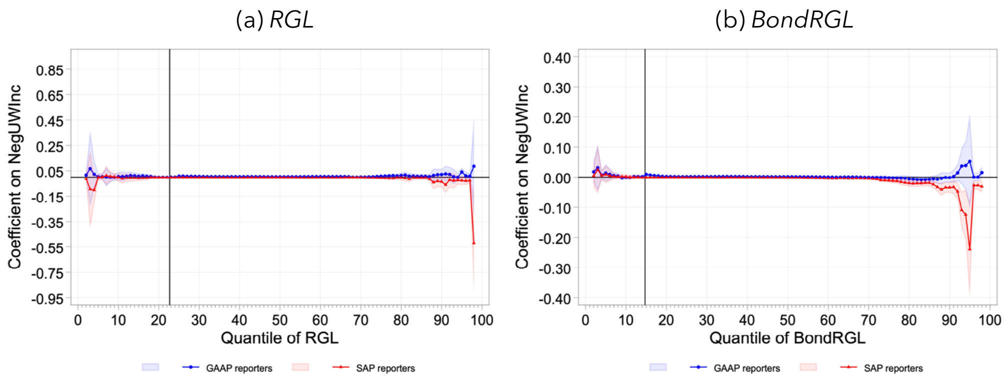
Table 5: Regressions of SAP reporters vs. GAAP reporters

		RGL Quantile				
	OLS	0.10	0.20	0.50	0.80	0.90
Panel A: RGL	(1)	(2)	(3)	(4)	(5)	(6)
NegUWInc × GAAP	0.012	0.008	0.001	0.004**	0.014	0.028
	(0.011)	(0.016)	(0.004)	(0.002)	(0.009)	(0.020)
NegUWInc × SAP	-0.014	-0.001	-0.001	-0.002	-0.008	-0.031
	(0.012)	(0.015)	(0.004)	(0.002)	(0.009)	(0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.482	0.418	0.487	0.415	0.491	0.470
N	2,020	2,020	2,020	2,020	2,020	2,020
Panel B: Bond RGL	(1)	(2)	(3)	(4)	(5)	(6)
NegUWInc × GAAP	0.002	-0.002	0.002**	0.002*	-0.008	-0.003
	(0.003)	(0.004)	(0.001)	(0.001)	(0.005)	(0.008)
NegUWInc × SAP	-0.010**	0.001	-0.001	-0.002*	-0.019***	-0.031***
	(0.005)	(0.003)	(0.001)	(0.001)	(0.005)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Insurer FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.573	0.447	0.366	0.423	0.467	0.519
N	2,020	2,020	2,020	2,020	2,020	2,020

Note: The table reports entropy-balanced regression estimates for privately-owned life insurance companies. The dependent variable is *RGL* in Panel A and *BondRGL* in Panel B. Column (1) reports OLS estimates of Equation (1). Columns (2)–(6) report quantile regression estimates as described in Equation (2), with the specified quantiles reported in the header row. See note to Table 3 for additional details about explanatory variables. Standard errors are clustered at the firm level to adjust for within-firm correlations and are reported in parentheses. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

The results in Table 5 indicate that managers of private companies who report SAP financials exhibit gains trading behavior, while those who report GAAP financials do not. The coefficient size is larger and more negative than those in our main results, indicating that SAP reporters drive the underlying result (though the tables are not directly comparable because the distributions of *RGL* and *BondRGL* differ between the samples). In Figure 3, we plot the quantile regression results as in Figure 1, comparing SAP reporters to GAAP reporters. The coefficient on *NegUWInc* is rarely significant when *RGL* is the dependent variable, regardless of the reporting method. There is, however, a negative and significant relationship between *BondRGL* and *NegUWInc* for SAP reporters starting around the 70th quantile of *BondRGL*. In contrast, the relationship is not significant at any quantile for GAAP reporters. This supports our hypothesis that insurers subject to the IMR rule engage in more extreme gains trading to overcome its diluting effects.

Figure 3: Quantile regressions, SAP vs. GAAP reporters



Note: The blue line with circular markers is the coefficient estimate at each quantile of the specified *RGL* for GAAP reporters. The red line with triangular markers is for SAP reporters. Shaded areas denote the respective 95% confidence intervals. These multivariable regressions include all control variables summarized in Table 2, except the indicator variable for Public Stock. Left of the vertical line are quantiles where the specified *RGL* < 0.

5 Additional analyses

5.1 RBC ratios

Statutory earnings affect the statutory capital of insurers, which in turn can affect the RBC ratios of insurers. We, therefore, estimate our models for subsamples of insurers that differ in their reported RBC ratios measured at the beginning of the year. Specifically, we create terciles of the RBC ratio separately for each year and estimate our Bond RGL regression models as reported in Table 4 Panel A for each tercile group. The results are shown in Table 6. Across all groups, we observe gains trading. In an OLS specification (Column (1)), insurers in the middle tercile of RBC ratios gains trade the most (Panel B). The degree of gains trading, however, is different for life insurers with different RBC ratios. In quantile regression models, focusing on the right-tail (Columns (5) and (6)), we find that gains trading is the largest for life insurers with low RBC ratios (Panel A). These results suggest that life insurers with low RBC ratios and negative underwriting earnings may engage in gains trading the most.

Table 6: Bond RGL by RBC Terciles

		RGL Quantile				
	OLS	0.10	0.20	0.50	0.80	0.90
Panel A: Low RBC Ratio$_{t-1}$	(1)	(2)	(3)	(4)	(5)	(6)
PosUWInc	0.002	-0.000	0.000	-0.000	0.002**	0.006**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.003)
NegUWInc	-0.009***	0.001	-0.000	-0.001	-0.012***	-0.035***
	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.006)
Median RBC Ratio$_{t-1}$	584.766	584.766	584.766	584.766	584.766	584.766
R^2	0.412	0.297	0.343	0.460	0.392	0.381
N	1,781	1,781	1,781	1,781	1,781	1,781
Panel B: Middle	(1)	(2)	(3)	(4)	(5)	(6)
PosUWInc	0.003**	0.000	0.001*	0.001**	0.002*	0.005**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)
NegUWInc	-0.012***	0.001	0.000	-0.001	-0.009***	-0.027***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.004)
Median RBC Ratio$_{t-1}$	911.571	911.571	911.571	911.571	911.571	911.571
R^2	0.424	0.312	0.358	0.398	0.386	0.351
N	1,766	1,766	1,766	1,766	1,766	1,766
Panel C: High	(1)	(2)	(3)	(4)	(5)	(6)
PosUWInc	0.001	0.001	-0.000	0.000	0.001	0.002
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)
NegUWInc	-0.005*	-0.004	-0.001	-0.001*	-0.002	-0.012**
	(0.003)	(0.003)	(0.000)	(0.000)	(0.002)	(0.005)
Median RBC Ratio$_{t-1}$	1656.551	1656.551	1656.551	1656.551	1656.551	1656.551
R^2	0.465	0.328	0.353	0.468	0.432	0.428
N	1,784	1,784	1,784	1,784	1,784	1,784

Note: The dependent variable is *BondRGL* for firm *i* in year *t*. Low/middle/high RBC ratio insurers are insurers that are at the bottom/middle/top tercile (33rd percentile) of RBC ratio in a given year. RBC ratios are measured at the beginning of the year. All regressions include the same controls as in Table 3, as well as year and insurer fixed effects. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

5.2 Economic effects

Thus far, we have measured *BondRGL* after gains have been amortized, which captures the net direct effect on an individual firm's net income after the IMR rule has been applied. We are also able to analyze the pre-amortized values, which we can use to quantify the total gains from investments sold as if there were no IMR rule diluting the proceeds. We call this measure the "economic" RGL (*BondEconRGL*), as it captures the gross proceeds of market trades before IMR amortization. The difference between *BondEconRGL* and *BondRGL* represents the proceeds that are deferred to future earnings periods because of the IMR rule.[39]

In Figure 4, we replicate the quantile regressions from Figure 2(a), adding a second plot with *BondEconRGL* as the dependent variable (the gray line). The vertical difference between the lines shows how much more extreme actual trading is compared to what appears on the income statement. The difference between the two lines increases at higher quantiles. We know from Section 4 that gains trading behaviors are most prevalent in this area; the increasing difference between the black and gray lines tells us that those managers are also the most penalized by the IMR rule.

We highlight several patterns in the upper quantiles on the right side of the plot. The coefficient on *NegUWInc* for *BondEconRGL* (gray line) is larger and more negative than when the *BondRGL* (black line) is the dependent variable. This illustrates that the actual gains traded to offset negative operating income are much larger than what appears after the IMR rule has been applied. Here, the relative difference is what matters. On average, the coefficient on *NegUWInc* when *BondEconRGL* is the dependent variable is 1.9 times larger than when *BondRGL* is the dependent variable. This highlights how the IMR rule obfuscates the actual gains trading being conducted: for every $1 in gains that appear on the income statement, there is almost $2 of actual trades being conducted.

How much does the IMR rule defer from current income to future years? We can answer this by taking the difference between *BondEconRGL* and *BondRGL*, which we call the "deferred" RGL. In total, $3.4 trillion in bond sales was deferred across our sample period to future years because of the IMR rule. Examining deferred *BondRGL* for a "gains trading" subsample of insurers with negative *UWInc* and *BondRGL* in the upper quartile, the deferred *BondRGL* for this group is smaller but still meaningful, as these 411 observations deferred $916 billion in bond gains. Converted to percentages, these numbers provide an interesting perspective on the interaction between gains trading and the IMR rule: likely gains traders comprised 7.4% of the sample but were responsible for 26.9% of deferred bond capital gains.

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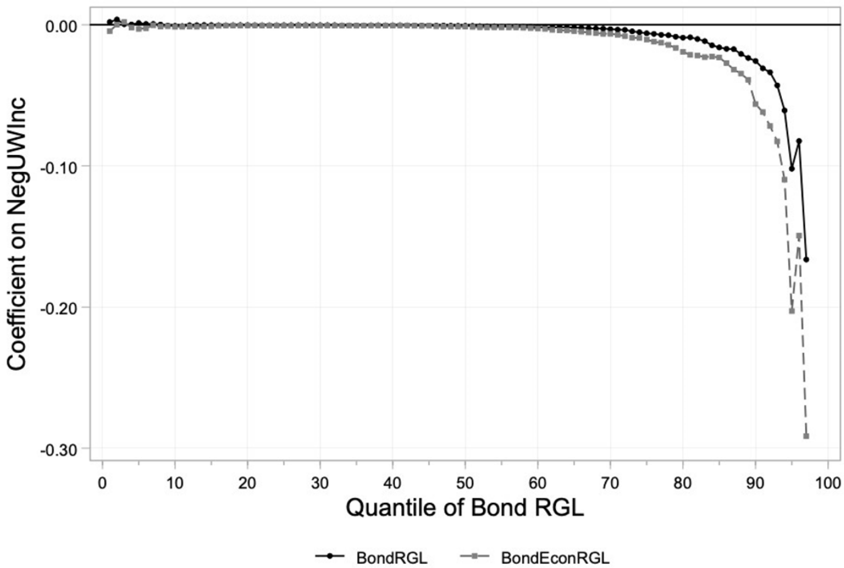
[39]It is important to note that gains trading by life insurers is endogenous to the existence of the IMR rule. Managers know their proceeds will be diluted by the IMR rule; thus, some managers may choose not to gains trade at all. As we show in Section 4, a subset of managers still exhibit gains trading behavior and must trade larger amounts than they otherwise would have because of the IMR rule. Our exercises in this section do not control for these behavioral changes, as there is no counterfactual to assess how those managers would have acted in the absence of the IMR rule. Our goal here is simply to document how much of the trading we observe is deferred to the future solely because of the IMR rule.

Figure 4: Quantile regressions of accounting versus economic RGL of bonds



Note: The black line with circular markers is the coefficient estimate at each quantile of *BondRGL*. This is the post-IMR "accounting" measure of RGL (i.e., the one analyzed in Section 4). The gray line with square markers is the "economic" version of RGL (*BondEconRGL*) (i.e., the gains from the market before being amortized per the IMR rule).

Conclusion

We evaluate earnings management behaviors under a unique accounting rule in the life insurance industry. Much of the existing literature on financial institutions' earnings management has focused on managerial incentives and management of insolvency risk. Less work has examined the accounting treatment of investment sales, even though investment proceeds are a potentially large and highly discretionary component of financial institutions' earnings. In our setting, we evaluate gains trading, which we define as offsetting operating losses by realizing capital gains, under an accounting rule that dilutes the impact of capital gain realizations on net income. This rule, known as the IMR rule, requires life insurers to amortize capital gains and losses from bond sales over the remaining life of the bond.

We find that, despite the inefficiencies caused by the IMR rule, a subset of managers appear to gains trade. Specifically, firms with realized capital gains above the 75th percentile tend to have larger operating losses—a pattern indicative of gains trading to offset such losses. Our quantile regression approach also allows us to see why ordinary linear regression models might fail to detect these trends, as managers in the lowest quantiles of RGL appear to engage in big bath earnings management. The big bath and earnings smoothing patterns cancel each other out, making it appear that there is no earnings management occurring.

We are able to look at the mechanism of gains trading. Managers gains trade using bonds, even though the IMR rule makes this an inefficient way to smooth earnings. Because they must amortize realized gains over time, managers must sell a large amount of bonds to affect current-year net income. We also document that gains trading with a large amount of bonds occurs in private firms that report earnings under SAP accounting standards, but not for those that prepare earnings under GAAP.

Our study contributes to the literature examining earnings management in general, but also specifically within financial institutions (e.g., Gaver and Paterson 1999; Lee et al. 2006; Barth et al. 2017). We also add to the evidence that accounting rules can affect the real activities of managers (e.g., Zhang 2009; Ng and Roychowdhury 2014; Ellul et al. 2015). Our findings have important policy implications for setting accounting standards: while this unique rule helps to reduce the efficiency of gains trading, it can also generate more extreme, undesirable behavior. In particular, regulators should closely monitor how the IMR rule incentivizes asset management decisions in changing interest-rate environments. For example, our sample period predominantly includes years with prolonged low interest rates, yet rising interest rates can manifest other extreme managerial behavior (e.g., Griffin and Perez 2022; Chacosky et al. 2023; MetLife Investment Management 2023).

This study is the first to directly examine strategic asset sales under the IMR rule, to the best of our knowledge. Here, we focus on the question of whether life insurance managers gains trade to offset losses, in spite of the consequences the IMR rule imposes on such behavior. We see this as a first step in exploring trading patterns under this unique accounting rule. Our study naturally leads to additional questions that may motivate future research. For example, what are the benchmarks of earnings management behavior that interact with the IMR? What is the effect of the IMR rule on bond acquisition decisions (i.e., portfolio allocations) with respect to bond maturities? The IMR rule imposes a larger penalty when selling bonds far from maturity, so managers must consider the balance between remaining maturity and available gains. We look forward to future research examining the effects of the IMR rule.

References

Armstrong, C. S., J. L. Blouin, A. D. Jagolinzer, and D. F. Larcker. 2015. "Corporate Governance, Incentives, and Tax Avoidance." *Journal of Accounting and Economics* 60: 1–17.

Barth, M. E., J. Gomez-Biscarri, R. Kasznik, and G. L´opez-Espinosa. 2017. "Bank Earnings and Regulatory Capital Management Using Available for Sale Securities." *Review of Accounting Studies* 22: 1761–1792.

Bartov, E. 1993. "The Timing of Asset Sales and Earnings Manipulation." *The Accounting Review* 68: 840–855.

Beatty, A., S. L. Chamberlain, and J. Magliolo. 1995. "Managing Financial Reports of Commercial Banks: The Influence of Taxes, Regulatory Capital, and Earnings." *Journal of Accounting Research* 33: 231–261.

Beatty, A., and D. G. Harris. 1999. "The Effects of Taxes, Agency Costs and Information Asymmetry on Earnings Management: A Comparison of Public and Private Firms." *Review of Accounting Studies* 4: 299–326.

Beatty, A. L., B. Ke, and K. R. Petroni. 2002. "Earnings Management to Avoid Earnings Declines Across Publicly and Privately Held Banks." *The Accounting Review* 77: 547-570.

Beaver, W. H., M. F. McNichols, and K. K. Nelson. 2003. "Management of the Loss Reserve Accrual and the Distribution of Earnings in the Property-Casualty Insurance Industry." *Journal of Accounting and Economics* 35: 347–376.

Becker, B., M. M. Opp, and F. Saidi. 2022. "Regulatory Forbearance in the US Insurance Industry: The Effects of Removing Capital Requirements for an Asset Class." *Review of Financial Studies* 35: 5438–5482.

Bhojraj, S., P. Hribar, M. Picconi, and J. McInnis. 2009. Making Sense of Cents: An Examination of Firms that Marginally Miss or Beat Analyst Forecasts." *Journal of Finance* 64: 2361–2388.

Borgen, N. T. 2016. "Fixed Effects in Unconditional Quantile Regression." *The Stata Journal* 16: 403–415.

Born, P. H., E. M. Eastman, and E. T. Sirmans. 2023. "Managed Care or Carefully Managed? Management of Underwriting Profitability by Health Insurers." *Geneva Papers on Risk and Insurance—Issues and Practice* 48: 5–31.

Chacosky, C., R. Malile, and Y. Tao. 2023. "Negative IMR Considerations in a Higher Interest Rate Environment." Society of Actuaries: The Financial Reporter, https://www.soa.org/sections/financial-reporting/ financial-reporting-newsletter/2023/june/fr-2023-06-tao/.

Chen, Y., R. Ge, H. Louis, and L. Zolotoy. 2019. "Stock Liquidity and Corporate Tax Avoidance." *Review of Accounting Studies* 24: 309–340.

Chiang, C.-C., and G. Niehaus. 2020. "Correlated Trading by Life Insurers and its Impact on Bond Prices." *Journal of Risk and Insurance* 87: 597–625.

Cobb, J. A., and K.-H. Lin. 2017. "Growing Apart: The Changing Firm-Size Wage Premium and its Inequality Consequences." *Organization Science* 28: 429–446.

Collins, J. H., G. G. Geisler, and D. A. Shackelford. 1997. "The Effects of Taxes, Regulation, Earnings, and Organizational Form on Life Insurers' Investment Portfolio Realizations." *Journal of Accounting and Economics* 24: 337–361.

Collins, J. H., D. A. Shackelford, and J. M. Wahlen. 1995. "Bank Differences in the Coordination of Regulatory Capital, Earnings, and Taxes." *Journal of Accounting Research* 33: 263–291.

Damette, O., and I. Kouki. 2022. Political Influence and Banking Performance: Evidence from the African Countries." *Quarterly Review of Economics and Finance* 84: 200–207.

Dechow, P. M., R. G. Sloan, and A. P. Sweeney. 1996. "Causes and Consequences of Earnings Manipulation: An Analysis of Firms Subject to Enforcement Actions by the SEC." *Contemporary Accounting Research* 13: 1–36.

Donohoe, M. P. 2015. "The Economic Effects of Financial Derivatives on Corporate Tax Avoidance." *Journal of Accounting and Economics* 59: 1–24.

Dube, A. 2019. "Minimum Wages and the Distribution of Family Incomes." *American Economic Journal: Applied Economics* 11: 268–304.

Eckles, D. L., and M. Halek. 2010. "Insurer Reserve Error and Executive Compensation." *Journal of Risk and Insurance* 77: 329–346.

Edwards, A., C. Schwab, and T. Shevlin. 2016. "Financial Constraints and Cash Tax Savings." *The Accounting Review* 91: 859–881.

Elgers, P. T., R. J. Pfeiffer Jr., and S. L. Porter. 2003. Anticipatory Income Smoothing: A Re-Examination." *Journal of Accounting and Economics* 35: 405–422.

Eling, M. 2021. "Insurance Regulation in Europe: An Analysis of Effectiveness and Efficiency." *Journal of Insurance Regulation* 40:.

Ellul, A., C. Jotikasthira, and C. T. Lundblad. 2011. "Regulatory Pressure and Fire Sales in the Corporate Bond Market." *Journal of Financial Economics* 101: 596–620.

Ellul, A., C. Jotikasthira, C. T. Lundblad, and Y. Wang. 2015. "Is Historical Cost Accounting a Panacea? Market Stress, Incentive Distortions, and Gains Trading." *Journal of Finance* 70: 2489–2538.

Epermanis, K., and S. E. Harrington. 2006. "Market Discipline in Property/Casualty Insurance: Evidence from Premium Growth Surrounding Changes in Financial Strength Ratings." *Journal of Money, Credit and Banking* 38: 1515–1544.

Erhemjamts, O., and J. T. Leverty. 2010. "The Demise of the Mutual Organizational Form: An Investigation of the Life Insurance Industry." *Journal of Money, Credit and Banking* 42: 1011–1036.

Erhemjamts, O., and R. D. Phillips. 2012. "Form Over Matter: Differences in the Incentives to Convert Using Full Versus Partial Demutualization in the U.S. Life Insurance Industry." *Journal of Risk and Insurance* 79: 305–334.

Firpo, S., N. M. Fortin, and T. Lemieux. 2009. "Unconditional Quantile Regressions." *Econometrica* 77: 953–973.

Fitzenberger, B., R. Koenker, and J. A. F. Machado. 2001 *Economic Applications of Quantile Regression*: Springer Science & Business Media.

Fitzenberger, B., R. Koenker, J. Machado, and B. Melly. 2022. "Economic Applications of Quantile Regression 2.0." *Empirical Economics* 62: 1–6.

Gaver, J. J., and J. S. Paterson. 1999. "Managing Insurance Company Financial Statements to Meet Regulatory and Tax Reporting Goals." *Contemporary Accounting Research* 16: 207–241.

Gleason, C. A., S. Kieback, M. Thomsen, and C. Watrin. 2021. "Monitoring or Payroll Maximization? What Happens When Workers Enter the Boardroom?" *Review of Accounting Studies* 26: 1046–1087.

Grace, M. F., and J. T. Leverty. 2010. "Political Cost Incentives for Managing the Property-Liability Insurer Loss Reserve." *Journal of Accounting Research* 48: 21–49.

Grace, M. F., and J. T. Leverty. 2012. "Property-Liability Insurer Reserve Error: Motive, Manipulation, or Mistake." *Journal of Risk and Insurance* 79: 351–380.

Griffin, K., and A. Perez. 2022. "How Life Insurers Account for Realized Losses May Cause Unnecessary Pain." Barings Insurance Solutions: Insights, https://www.barings.com/en-us/guest/perspectives/ viewpoints/how-life-insurers-account-for-realized-losses-may-cause-unnecessary-pain.

Hainmueller, J. 2012. "Entropy Balancing for Causal Effects: A Multivariate Reweighting Method to Produce Balanced Samples in Observational Studies." *Political Analysis* 20: 25–46.

Hanley, K. W., A. D. Jagolinzer, and S. Nikolova. 2018. "Strategic Estimation of Asset Fair Values." *Journal of Accounting and Economics* 66: 25–45.

Hanley, K. W., and S. Nikolova. 2021. "Rethinking the Use of Credit Ratings in Capital Regulations: Evidence from the Insurance Industry." *Review of Corporate Finance Studies* 10: 347–401.

Hodder, L. D., and A. G. Sheneman. 2022. "Fair Value Measurement Discretion and Opportunistic Avoidance of Impairment Loss Recognition." *The Accounting Review* 97: 243–268.

Khan, U., S. G. Ryan, and A. Varma. 2019. "Fair Value Versus Amortized Cost Measurement and the Timeliness of Other-Than-Temporary Impairments: Evidence from the Insurance Industry." *The Accounting Review* 94: 285–307.

Kim, K., and X. J. Lin. 2024. "Climate Risks in the Commercial Mortgage Portfolios of Life Insurers: A Focus on Sea Level Rise and Flood Risks." *Journal of Insurance Regulation* 42: 3–31.

Koijen, R. S. J., and M. Yogo. 2022. "The Fragility of Market Risk Insurance." *Journal of Finance* 77: 815–862.

Lee, S.-J., D. Mayers, and C. W. Smith Jr. 1997. "Guaranty Funds and Risk-Taking Evidence from the Insurance Industry." *Journal of Financial Economics* 44: 3–24.

Lee, Y.-J., K. R. Petroni, and M. Shen. 2006. "Cherry Picking, Disclosure Quality, and Comprehensive Income Reporting Choices: The Case of Property-Liability Insurers." *Contemporary Accounting Research* 23: 655–692.

Li, Q., E. L. Maydew, R. H. Willis, and L. Xu. 2022. "Taxes and Director Independence: Evidence from Board Reforms Worldwide." *Review of Accounting Studies* 28: 910–957.

Lim, S. C., and S. Lustgarten. 2002. "Testing for Income Smoothing Using the Backing Out Method: A Review of Specification Issues." *Review of Quantitative Finance and Accounting* 19: 273–290.

Linck, J. S., J. Netter, and T. Shu. 2013. "Can Managers Use Discretionary Accruals to Ease Financial Constraints? Evidence from Discretionary Accruals Prior to Investment." *The Accounting Review* 88: 2117–2143.

Mayers, D., A. Shivdasani, and C. W. Smith, Jr. 1997. "Board Composition and Corporate Control: Evidence from the Insurance Industry." *Journal of Business* 70: 33–62.

Mayers, D., and C. W. Smith, Jr. 1994. "Managerial Discretion, Regulation, and Stock Insurer Ownership Structure." *Journal of Risk and Insurance* 61: 638–655.

McMullin, J., and B. Schonberger. 2022. "When Good Balance Goes Bad: A Discussion of Common Pitfalls When Using Entropy Balancing." *Journal of Financial Reporting* 7: 167–196.

Merrill, C. B., T. D. Nadauld, R. M. Stulz, and S. M. Sherlun. 2021. "Were There Fire Sales in the RMBS Market?" *Journal of Monetary Economics* 122: 17–37.

MetLife Investment Management. 2023. "The Challenges of Interest Maintenance Reserve (IMR)." Published online, https://investments.metlife.com/insights/macro-strategy/the-challenge-of-interest-maintenance-reserve-imr/.

NAIC. 1998. Statutory Issue Paper No. 7: Asset Valuation Reserve and Interest Maintenance Reserve.

NAIC. 2012 Risk-Based Capital (RBC) for Insurers Model Act. Published online, https://content.naic.org/model-laws?combine=312&field_ml_category_target_id=All.

NAIC. 2015. Capital Markets Special Report. Published online, *https://content.naic.org/sites/default/files/naic_archive/The_9.pdf*.

NAIC. 2017. Investments of Insurers Model Act #280. Published online, https://content.naic.org/model-laws?combine=280&field_ml_category_target_id=All.

NAIC. 2019. Growth in U.S. Insurance Industry's Cash and Invested Assets Slows in 2018. Published online, https://content.naic.org/sites/default/files/ capital-markets-special-report-growth-cash-assets-slows.pdf.

NAIC. 2023. Capital Markets Special Report. Published online, https://content.naic.org/sites/ default/files/capital-markets-special-reports-asset-mix-ye2022.pdf.

NAIC. 2025. Capital Markets Special Report. Published online, https://content.naic.org/sites/ default/files/capital-markets-special-reports-asset-mix-ye2024.pdf.

Ng, J., and S. Roychowdhury. 2014. "Do Loan Loss Reserves Behave Like Capital? Evidence from Recent Bank Failures." *Review of Accounting Studies* 19: 1234–1279.

Petroni, K. R. 1992. "Optimistic Reporting in the Property-Casualty Insurance Industry." *Journal of Accounting and Economics* 15: 485–508.

Petroni, K. R., and D. A. Shackelford. 1995. "Taxation, Regulation, and the Organizational Structure of Property-Casualty Insurers." *Journal of Accounting and Economics* 20: 229–253.

Regele, F., and H. Gründl. 2024. "Sectoral Asset Concentrations and Insurance Solvency Regulations." *Journal of Insurance Regulation* 43: 3–43.

Rios-Avila, F. 2020. "Recentered Influence Functions (RIFs) in Stata: RIF Regression and RIF Decomposition." *The Stata Journal* 20: 51–94.

Rios-Avila, F., and M. L. Maroto. 2024. "Moving Beyond Linear Regression: Implementing and Interpreting Quantile Regression Models with Fixed Effects." *Sociological Methods & Research*, 53.2: 639-682.

Warfield, T. D., and T. J. Linsmeier. 1992. "Tax Planning, Earnings Management, and the Differential Information Content of Bank Earnings Components." *The Accounting Review* 67: 546–562.

Zhang, H. 2009. "Effect of Derivative Accounting Rules on Corporate Risk-Management Behavior." *Journal of Accounting and Economics* 47: 244–264.

Appendix

A SAP vs. GAAP reporting

A.1 Reporting methods of largest privately owned life insurers

Table A.1: Reporting methods of twenty largest private Life firms

Insurer	Total Assets ($000s, 2017)	SAP	GAAP
New York Life	329,800,536	Yes	Yes
TIAA	307,306,295	Yes	No
Northwestern Mutual	265,145,196	Yes	No
MassMutual	251,812,588	Yes	No
Nationwide	171,209,656	Yes	No
Talcott Resolution	144,621,919	Yes	No
Pacific Life	135,236,993	Yes	Yes
Sammons Enterprises Inc.	82,102,685	Yes	No
Guardian	76,640,193	Yes	No
State Farm	75,995,849	Unknown	Unknown
Venerable Insurance & Annuity Co	58,725,078	Yes	No
Western & Southern Financial	47,631,550	No	Yes
Securian	46,914,341	Yes	Yes
Delaware Life	40,205,844	Unknown	Unknown
Symetra	38,177,473	Yes	Yes
OneAmerica	37,150,839	Yes	Yes
Ohio National	35,834,956	Yes	Yes
Security Benefit	33,774,444	Yes	No
Fidelity Investments	32,385,322	Unknown	Unknown
Mutual of Omaha	30,222,055	Yes	No

A.2 Identifying publicly traded insurance groups

We identify publicly traded insurance groups using Schedule Y Part 1A, detailed organizational information filed by insurers since 2011. The page requires insurers to report the names of the controlling parent and indicate them as parents. For publicly traded parents, insurers also report the names of the stock exchanges. Using the schedule, we identify whether the parent company was publicly traded from 2011 to 2017. Since our observations are at the affiliated and unaffiliated single-firm level, none of our observations are publicly traded at the observation level. Instead, we treat all insurance affiliates of the parent company as being publicly traded.

- For companies not identified to be consistently belonging to the publicly traded insurance groups from 2011 to 2017, we verify the information with insurers' statutory filings of Schedule Y Part 1, an organizational chart. The inconsistency can arise from insurers not correctly filing the parent indicator or misreporting the stock exchange information.

- We also check the information by checking the statutory filings of insurers that are identified to have experienced changes in the publicly traded insurance group status, i.e., either change to public between 2011 and 2017 or change from public to private between 2011 and 2017, based on their Notes to Financial Statements item 10, "Information Concerning Parent, Subsidiaries, Affiliates, and Other Related Parties".

- We then manually collect the IPO dates of the publicly traded insurance groups in 2011 to verify publicly traded insurance groups from 2005 to 2010.

- It is possible that insurers either became public or became private between 2005 and 2010 due to their ownership changes. We verify if this is the case by checking the statutory filings of insurers that are identified to be publicly traded between 2005 and 2010, again focusing on their Notes to Financial Statements item 10, "Information Concerning Parent, Subsidiaries, Affiliates, and Other Related Parties".

- We acknowledge that all of the above procedures do not eliminate the possibility of omitting insurers that were public between 2005 and 2010 and became private in 2011. It is reasonable to assume that in such cases, insurers could continue reporting to their investors due to over-the-counter market transactions; hence, these cases could be treated similarly as public insurers and assumed not to follow the SAP standards.

B Sample IMR exhibits

This appendix provides examples of exhibits from a life insurer's statutory financial statement that relate to either realized capital gains/losses or the interest maintenance reserve (IMR). These exhibits are from Massachusetts Mutual Life Insurance Company's (NAIC Company Code 65935) 2015 annual filing. Below, we highlight key items that we use in our analysis.

Figure B.1: Liabilities and surplus for Mass Mutual, 2015

ANNUAL STATEMENT FOR THE YEAR 2015 OF THE Massachusetts Mutual Life Insurance Company

LIABILITIES, SURPLUS AND OTHER FUNDS

		1 Current Year	2 Prior Year
1.	Aggregate reserve for life contracts $ 99,942,257,473 (Exh. 5, Line 9999999) less $ ______ included in Line 6.3 (including $ 48,921,004 Modco Reserve)	99,942,257,473	90,679,671,843
2.	Aggregate reserve for accident and health contracts (including $ 59,944,781 Modco Reserve)	2,683,981,025	2,610,834,429
3.	Liability for deposit-type contracts (Exhibit 7, Line 14, Col. 1) (including $ ______ Modco Reserve)	10,491,117,975	9,044,956,553
4.	Contract claims:		
	4.1 Life (Exhibit 8, Part 1, Line 4.4, Col. 1 less sum of Cols. 9, 10 and 11)	420,273,237	328,774,184
	4.2 Accident and health (Exhibit 8, Part 1, Line 4.4, sum of Cols. 9, 10 and 11)	24,268,522	23,812,968
5.	Policyholders' dividends $ 10,210,995 and coupons $ ______ due and unpaid (Exhibit 4, Line 10)	10,210,995	10,327,990
6.	Provision for policyholders' dividends and coupons payable in following calendar year - estimated amounts:		
	6.1 Dividends apportioned for payment (including $ ______ Modco)	1,731,292,553	1,568,905,844
	6.2 Dividends not yet apportioned (including $ ______ Modco)		
	6.3 Coupons and similar benefits (including $ ______ Modco)		
7.	Amount provisionally held for deferred dividend policies not included in Line 6		
8.	Premiums and annuity considerations for life and accident and health contracts received in advance less $ ______ discount; including $ 9,839,834 accident and health premiums (Exhibit 1, Part 1, Col. 1, sum of lines 4 and 14)	30,048,083	27,972,242
9.	Contract liabilities not included elsewhere:		
	9.1 Surrender values on canceled contracts		
	9.2 Provision for experience rating refunds, including the liability of $ ______ accident and health experience rating refunds of which $ ______ is for medical loss ratio rebate per the Public Health Service Act	12,956,022	14,403,870
	9.3 Other amounts payable on reinsurance, including $ 19,139,935 assumed and $ 8,178,965 ceded	27,318,900	25,332,548
	9.4 Interest maintenance reserve (IMR, Line 6)	349,152,262	628,009,087

Figure B.1 reports the "Liabilities and Surplus" page (statement pp. 3). Line 9.4 is the full amount of the interest maintenance reserve. Conceptually, this represents the amount of unrealized gains and losses on securities that have already been sold, but have not yet been recognized in net income. Insurers report details on the calculation behind this item in the "Form for Calculating the Interest Maintenance Reserve" on line 6, which we report below (Figure B.4).

Figure B.2 reports the "Summary of Operations" page (statement pp. 4). Line 4 is the amortization of the IMR. This is the amount of previously realized gains/losses that will be recognized in net income in the current period. Insurers report details on the calculation behind this item in the "Form for Calculating the Interest Maintenance Reserve" on line 5, which we report below (Figure B.4).

We also use line 34 in our study. This line reports net realized capital gains/losses after accounting for IMR reporting requirements. This reported amount corresponds to our variable, *AcctRGL*, after scaling for beginning-of-year assets and multiplying by 100.

Figure B.3 reports the "Exhibit of Capital Gains (Losses)" page (statement pp. 8). This figure reports what we refer to as "economic" realized capital gains (i.e., actual sales of assets without considering IMR reporting requirements). The amount reported in column 1, line 10, corresponds to the variable, *EconRGL*, after scaling by beginning-of-year assets and multiplying by 100.

Figure B.2: Summary of operations for Mass Mutual, 2015

ANNUAL STATEMENT FOR THE YEAR 2015 OF THE Massachusetts Mutual Life Insurance Company

SUMMARY OF OPERATIONS

		1 Current Year	2 Prior Year
1.	Premiums and annuity considerations for life and accident and health contracts (Exhibit 1, Part 1, Line 20.4, Col. 1, less Col. 11)	21,530,383,076	18,367,394,338
2.	Considerations for supplementary contracts with life contingencies	12,366,075	15,205,660
3.	Net investment income (Exhibit of Net Investment Income, Line 17)	6,246,441,543	6,140,050,815
4.	Amortization of Interest Maintenance Reserve (IMR, Line 5)	140,397,231	191,749,804
31.	Net gain from operations after dividends to policyholders and before federal income taxes (Line 29 minus Line 30)	200,269,518	479,566,385
32.	Federal and foreign income taxes incurred (excluding tax on capital gains)	(153,275,542)	22,524,628
33.	Net gain from operations after dividends to policyholders and federal income taxes and before realized capital gains or (losses) (Line 31 minus Line 32)	353,545,060	457,041,757
34.	Net realized capital gains (losses) (excluding gains (losses) transferred to the IMR) less capital gains tax of $ 112,187,335 (excluding taxes of $ 38,732,312 transferred to the IMR)	58,635,533	166,082,947
35.	Net income (Line 33 plus Line 34)	412,180,593	623,124,704

Figure B.3: Exhibit of capital gains for Mass Mutual, 2015

EXHIBIT OF CAPITAL GAINS (LOSSES)

		1 Realized Gain (Loss) On Sales or Maturity	2 Other Realized Adjustments	3 Total Realized Capital Gain (Loss) (Columns 1 + 2)	4 Change in Unrealized Capital Gain (Loss)	5 Change in Unrealized Foreign Exchange Capital Gain (Loss)
1.	U.S. Government bonds	(15,495,071)		(15,495,071)	8,594,655	
1.1	Bonds exempt from U.S. tax					
1.2	Other bonds (unaffiliated)	205,237,183	(233,254,646)	(28,017,463)	(2,952,933)	(171,922,838)
1.3	Bonds of affiliates	3,140	(22,647,747)	(22,644,607)	(11,701,760)	(33,162,127)
2.1	Preferred stocks (unaffiliated)	13,469,644	(11,476,400)	1,993,244	155,884	(7,453,600)
2.11	Preferred stocks of affiliates					
2.2	Common stocks (unaffiliated)	65,809,106	(13,801,971)	52,007,135	(232,065,065)	(17,801,313)
2.21	Common stocks of affiliates	4,216,790		4,216,790	254,626,133	
3.	Mortgage loans	22,904	(8,054,003)	(8,031,099)		(92,566,108)
4.	Real estate	50,196,528		50,196,528		
5.	Contract loans	(264)		(264)		
6.	Cash, cash equivalents and short-term investments	35,285	2,900,375	2,935,660		
7.	Derivative instruments	(68,198,084)	4,434,058	(63,764,026)	203,277,957	248,513
8.	Other invested assets	(2,275,271)	(94,929,371)	(97,204,642)	(22,883,696)	(44,489,630)
9.	Aggregate write-ins for capital gains (losses)		212,187,068	212,187,068	15,417,236	15,057,955
10.	Total capital gains (losses)	253,021,890	(164,642,637)	88,379,253	212,468,411	(352,089,148)
	DETAILS OF WRITE-INS					
0901.	Miscellaneous gains		212,187,068	212,187,068	15,417,236	15,057,955
0902.						
0903.						
0998.	Summary of remaining write-ins for Line 9 from overflow page					
0999.	Totals (Lines 0901 thru 0903 plus 0998) (Line 9, above)		212,187,068	212,187,068	15,417,236	15,057,955

Figure B.4 reports the "Form for Calculating the Interest Maintenance Reserve" page (statement pp. 28). In addition to reporting the amortization schedule, the calculations on this page provide details for reporting the IMR liability account (line 6) and the amortization that will be recognized in current-year net income (line 5).

Figure B.4: IMR calculations and amortization schedule for Mass Mutual, 2015

ANNUAL STATEMENT FOR THE YEAR 2015 OF THE Massachusetts Mutual Life Insurance Company

FORM FOR CALCULATING THE INTEREST MAINTENANCE RESERVE

INTEREST MAINTENANCE RESERVE

	1 Amount
1. Reserve as of December 31, Prior Year	628,009,087
2. Current year's realized pre-tax capital gains/(losses) of $ (82,443,614) transferred into the reserve net of taxes of $ 38,732,312	(121,175,927)
3. Adjustment for current year's liability gains/(losses) released from the reserve	(17,283,670)
4. Balance before reduction for amount transferred to Summary of Operations (Line 1 + Line 2 + Line 3)	489,549,491
5. Current year's amortization released to Summary of Operations (Amortization, Line 1, Column 4)	140,397,231
6. Reserve as of December 31, current year (Line 4 minus Line 5)	349,152,262

AMORTIZATION

Year of Amortization	1 Reserve as of December 31, Prior Year	2 Current Year's Realized Capital Gains/(Losses) Transferred into the Reserve Net of Taxes	3 Adjustment for Current Year's Liability Gains/(Losses) Released From the Reserve	4 Balance Before Reduction for Current Year's Amortization (Cols. 1 + 2 + 3)
1. 2015	133,090,390	7,878,659	(571,820)	140,397,231
2. 2016	109,398,138	(13,280,933)	(1,165,367)	94,951,839
3. 2017	82,491,725	(11,262,671)	(1,221,660)	70,007,393
4. 2018	55,705,765	(9,547,878)	(1,275,733)	44,882,154
5. 2019	34,387,228	(7,798,496)	(1,316,964)	25,271,768
6. 2020	20,176,767	(5,999,898)	(1,375,479)	12,801,390
29. 2043	1,376,080	(2,475,078)		(1,098,998)
30. 2044	770,796	(1,502,726)		(731,930)
31. 2045 and Later		(530,374)		(530,374)
32. Total (Lines 1 to 31)	628,009,087	(121,175,927)	(17,283,670)	489,549,491

We use information from this page, as well as the "Summary of Operations" page, to calculate the variable IMR balance. Specifically, we take the amortization of the IMR (from either the "Summary of Operations" or "Form for Calculating the Interest Maintenance Reserve," row 5; $140,397,231) minus the current year's realized capital gains/losses transferred into the reserve net of taxes (from "Form for Calculating the Interest Maintenance Reserve," bottom "Amortization" table, column 2, row 1; $7,878,659): $140,397,231 − $7,878,659 = $132,518,572. We then scale by beginning-of-year assets and multiply by 100.[40]

[40]The IMR rule requires proceeds to be amortized into investment income over the "expected remaining life" of the investments sold. Firms have two options for calculating the amortization upon selling an asset. First, the "seriatim method" treats the amount amortized each year as the excess of the amount of income that would have been reported in that year (if it had been held) over the amount of income that would be generated if the asset had been repurchased at its sale price. Second, the "grouped method" allows firms to group capital gains in bands of five calendar years (except for those with less than one year to maturity). While the NAIC recommends the seriatim method as the preferred approach, it recognizes that this method may place an administrative burden on certain firms. Firms may use any allocation process as long as it is approved by the state insurance department.