Medical Loss Ratio Malpractice?

Abstract

Under the Affordable Care Act, health insurers are required to spend a certain portion of premium revenue on consumers. This spending requirement is measured by the medical loss ratio. However, rather than a simple ratio of outflows to inflows, the medical loss ratio allows health insurers to include *reserves*. Reserves include payments that are expected to be made for losses that have not been finalized, have not been reported, or even have not occurred. By definition, these components of reserves are estimated and lend themselves to managerial discretion. While it is too early to study how the behavior of health insurers has changed with the enactment of the Affordable Care Act, it is not too early to study the degree to which health insurers manage reserves based on other incentives. In this paper we find evidence of health insurers managing reserves to smooth income, in response to executive compensation incentives, and to achieve a target rating. We also show that use of a Big 4 auditor and accounting firm can help mitigate the management of reserves.

Keywords: Health Insurers; Affordable Care Act; Medical Loss Ratio; Accounting Discretion; Reserve Management; Accruals; Earnings Management; Audit Quality

JEL classification: G22, G24, I13, M41

1. Introduction

As part of the Patient Protection and Affordable Care Act (ACA), Section 2718 of the Public Health Service Act was modified to require health insurers spend at least 80% of their premiums on medical claims (including "non-claims costs") and improvements to health quality.[1] These spending requirements, commonly referred to as the medical loss ratio (MLR), are designed to promote spending on behalf of insureds. Additionally, if an insurer's MLR is below the appropriate standard, the insurer is required to issue premium rebates to insureds.[2]

While much discussion has surrounded the ACA as a whole, very little attention has been paid to the implementation and oversight of the MLR. In particular, no academic studies (of which we are aware), and only a few policy-based reports have mentioned the potential for insurers to manipulate the MLR. Manipulation of the MLR could allow insurers to avoid issuing rebates and effectively mitigate one of the more discussed purported advantages of the ACA.

The purpose of this study is not to question the motives, appropriateness, or implementation of the ACA. On the whole, we will remain agnostic as to the ACA. Rather, we seek to show that health insurers not only can manipulate accounting results (such as the MLR), but that health insurers appear to be doing so, even before the implementation of the ACA. We also show, however, auditor and actuarial external oversight can mitigate the manipulation.

The rest of our paper proceeds as follows. In Section 2 we provide background on insurer loss reporting, including a review of the previous literature on insurer loss manipulation. In Section 3 we examine our testable hypotheses and Section 4 describes our research design. Section 5, then, describes our data and provides our empirical results and Section 6 concludes.

[1] The 80% threshold applies to policies written in the individual market and "small group market." For those issued in the "large group market," a higher threshold, 85% applies. Additionally, these thresholds can be altered by regulation at the state level.

[2] The premium rebate is set at a level such that the insurer will meet the MLR standard.

2. Background

2.1. Loss Reporting

In all lines of insurance (including health insurance), insurers report losses from three sources. First, insurers report losses from actual claims payments made. Though some of these paid claims may ultimately be recouped by the insurer (through a process called subrogation), these paid claims are generally considered to be known. Second, even claims that are reported (and partially paid) can have aspects that cause the claim to extend into the future.[3] These unpaid, reported claims are generally referred to as incurred losses and are estimated by insurers. Finally, insurers also estimate losses from what are called incurred but not reported (IBNR) claims. With IBNR claims, insurers estimate expenses associated with claims which the insurer expects to be made but is not yet aware. The possibility for estimation error (and, therefore, manipulation) varies with these claim types and is greatest (lowest) with IBNR (paid) claims. The sum of insurer estimates for losses is referred to as the loss reserve. Both on a relative and absolute basis, losses reserves are economically significant and represent the single largest liability on an insurer's balance sheet.

As part of general regulatory oversight, state-level regulation requires that insurers report the evolution of claims estimates (referred to as claims development). In particular, insurers are required to report how loss reserves change over time for each reporting year. This reporting allows regulators (and academics) to observe the development of the claims and to observe the "error" in the reserves initially set.

2.2. Prior Literature

The idea that insurers manipulate reserves is not new. Indeed, a rather robust literature exists in the accounting and insurance literature using loss reserve errors as a measure of

[3]Claims can be re-opened or simply have a long payout duration (tail).

managerial discretion (e.g., Petroni, 1992; Grace and Leverty, 2010). In the property and liability insurance industry, loss reserve errors have been linked to various earnings-related incentives. Early studies utilizing insurer reserve error (e.g., Weiss, 1985; Grace, 1990; Beaver, McNichols, and Nelson, 2003) focused on earnings smoothing. In these studies insurers are found to manage earnings in a way that minimizes the variability of income, thereby minimizing tax liability. Later studies (e.g., Petroni, 1992; Gaver and Paterson, 2004; Grace and Leverty, 2012) show insurers to use reserving practices to avoid regulatory scrutiny. In particular, the Insurance Regulatory Information System (IRIS) ratios, used as a regulatory tool by the National Association of Insurance Commissioners (NAIC), can be manipulated with reserving practices. Petroni (1992), Gaver and Paterson (1999, 2004), and Grace and Leverty (2012) show that insurers do appear to manage reserves to avoid violating enough ratios (four) to trigger regulatory intervention.

More recent studies on reserving practices have focused on reserve management around executive compensation issues and ratings attainment. (Eckles and Halek, 2010; Eckles et al., 2011; Eastman et al., 2015) all show reserve management to be associated with managerial compensation, in particular, executive bonuses. Eckles et al. (2011) show that these results are affected by corporate governance and Eastman et al. (2015) show the effect to be most prominent in stock firms (relative to mutual firms). With respect to firm ratings, Eastman, Eckles, and Halek (2016) show insurers with a relatively low rating (relative to their "target") manage earnings upwards via reserves in an attempt to earn a higher rating.

In addition to the many studies showing various incentives to manipulate reserves, there also exists studies that suggest potential methods to mitigate the earnings management. Eckles et al. (2011) and Eastman et al. (2015) show that corporate governance and organizational form many also help mitigate earnings management, though organizational form and corporate governance changes are arguably difficult to accomplish in a short period of time. Other studies (e.g., Petroni and Beasley, 1996; Gaver and Paterson, 2001, 2007; Grace

and Leverty, 2013), however, show that other forms of external monitoring, particularly auditors and actuarial firms, may help mitigate earnings management through loss reserve manipulation.

The common theme in the entirety of the extant literature on reserve errors is that the samples examined are always firms in the broad property and liability insurance industry, none of which are primary health insurers.[4] Here, we examine these themes with a sample of health insurers.[5] Further, as a consequence of the dearth of studies on health insurer reserve errors, the specific issue of insurers managing reserves to meet a minimum MLR is also unstudied.[6]

3. Hypothesis Development

We take the majority of our hypotheses from the literature discussed earlier. While we will not hypothesize any differential effects, we do note that an overarching hypothesis of our analysis regards the existence of manipulation in health insurers. That is, if we find support for one (or more) of our individual hypotheses, we can conclude that earnings management through loss reserves occurs. As mentioned above, awareness of earnings management in health insurers is particularly important as the rules regarding minimum MLRs take effect with the enactment of the ACA. To that end, we will also attempt to show early evidence (or lack thereof) of earnings management resulting from the MLR requirements. However, since our measure of earnings management takes time (for losses to fully develop), our ability to fully test for these effects is limited.

We first examine the incentives for insurers to manage reserves to smooth earnings to minimize taxes. In particular, firms with positive profits have an incentive to reduce earnings

[4]Some insurers in the samples of these papers may have a small portion of business written in accident and health lines, but none are considered primarily health insurers.

[5]Again, some of the insurers may have some more general property and liability business, but the data we examine is specific to the health business written.

[6]Before the ACA there was no national-level MLR requirement, though there did exist some state-specific requirements.

to lower their tax liability. Firms may also have incentives to manage reserves to avoid losses (Weiss, 1985; Grace, 1990; Beaver, McNichols, and Nelson, 2003). Thus, our first hypothesis regards earnings smoothing and is formally written as:

H1: *Firms will manage reserves to smooth income (to both reduce taxes and avoid reporting losses).*

Next, we examine incentives for executives to manage earnings to maximize their compensation. Here we posit that reserving behavior will be affected by the bonus compensation schemes given to managers. Though we do not have access to the exact terms of the managerial bonus schemes, most bonuses have both a floor and a cap. That is, if a manager does not meet the minimum performance level to trigger the bonus, s/he usually receives nothing. Once the performance target is met the bonuses are usually paid subject to a bonus maximum. These two kinks in the bonus scheme create a non-monotonic incentive for reserve management. If a bonus is not being paid, or is capped, the manager has no incentive to undertake activities to further increase earnings (they receive no additional bonus). In fact, managers in these situations will be incentivized to reduce earnings via reserve management in hopes of "unwinding" the losses in later periods. However, if the bonus is in the payoff region the manager has an incentive to continue improving earnings to increase the bonus payout. Therefore there are differing incentives related to compensation. Formally our hypothesis surrounding earnings management and managerial compensation is written as:

H2a: *Managers with bonuses below (above) the minimum (maximum) performance threshold will be associated with income reducing earnings management.*

H2b: *Managers with bonuses between the minimum and maximum performance thresholds will be associated with income increasing earnings management.*

Additionally, we examine the incentives for insurers to manipulate earnings to achieve

a specific rating. In particular, if an insurer has ratings "target," achieving a rating below (above) that target may create an incentive for managers to manager earnings higher (lower) in an effort to move the rating closer to the insurer's target. Though prior literature suggests motivations in both directions (i.e., increasing or decreasing) for ratings, we will not attempt to parse the incentives, but rather test for both. To that end, we propose the following hypothesis:

H3a: *Firms below their target financial strength rating will be associated with income increasing earnings management.*

H3b: *Firms above their target financial strength rating will be associated with income decreasing earnings management.*

We also examine the ability of external monitors to mitigate earnings management by the insurers. In particular, we hypothesize that higher quality external monitors (e.g., Big 4 auditors and affiliated actuaries) will reduce the earnings management seen in firms. Formally stated, we propose the following hypothesis:

H4: *Insurers utilizing high quality external monitors (Big 4 audit firms and Big 4 actuaries) will be associated with less earnings management.*

When considering the results from prior literature, we expect to find support of one or more (if not all) of our hypotheses. Firms (not only insurers) have been shown to manage earnings for the reasons given above. Insurers are only different in that there exists a natural mechanism (loss reserves) for creating uncertainty in earnings.

Finally, in an attempt to examine the specific impact of general medical loss ratio regulation from the ACA, we study the relationship between reserving behavior and insurer participation in states with medical loss ratio regulation. Prior to the ACA, thirty four states had enacted some type of regulation surrounding medical loss ratios. We are able to

exploit this state-level heterogeneity to test the degree to which insurers operating in these states over-reserve. Insurers only have the incentive to over-reserve in order to inflate loss-related costs so that the medical loss ratio is met. That is, insurers are not penalized (by the state) for having a medical loss ratio that is "too high"; rather, insurers are penalized (e.g. required premium rebates) if the medical loss ratio is too low. We hypothesize that insurers with more significant operations (measured by premium volume) in states with medical loss ratio regulations are more likely to overstate their initial reserves:

H5: *Insurers with higher premium volumes in states with medical loss ratio regulations are associated with income decreasing earnings management.*

Finding a relationship between reserving and state-level medical loss ratio regulations will provide insight as to the likelihood of similar manipulations occurring in the context of regulations surrounding the ACA.

4. Research Design

4.1. Data

Our data are from annual statutory filings made by health insurers with the National Association of Insurance Commissioners between 2007 and 2014.[7] We exclude firms from our sample who have non-positive direct premiums written or surplus. Also, consistent with prior studies examining reserve bias (e.g., Petroni, 1992; Beaver, McNichols, and Nelson, 2003; Grace and Leverty, 2010) we exclude firms with extreme errors in their loss reserves. Specifically, we exclude firms where the revised reserve estimate differs from the initial estimate by more than 50 percent in absolute value. Our sample focuses on affiliated and unaffiliated individual firms. We focus on stock and mutual insurers. Our final sample

[7]The NAIC has several types of statutory statements depending on the operations of insurers. Here, we use the "Health" statement. There are also statements for "Property/Casualty," "Life/Accident & Health," "Title," and "Fraternal."

consists of 1,454 firm-year observations consisting of 454 unique firms from 2007 to 2010.[8]

For our supplemental tests of different incentives to manage the loss reserve we require additional data sources. For our tests of executive compensation incentives we require data from ExecuComp. ExecuComp reports executive compensation for top executives at S&P 1,500 firms. We manually match firms from the statutory filings to the data in ExecuComp. This analysis takes place at the group and unaffiliated single insurer level for publicly traded health insurers only. For our tests of reserve management to achieve a target rating we match the data in the statutory filings to financial strength ratings provided by A.M. Best.

4.2. Empirical Strategy

To test our hypotheses we perform multiple examinations of the determinants of insurer loss reserve errors. We describe our various empirical models in the following sections.

4.2.1. Main Model

We estimate a model controlling for discretionary and non-discretionary determinants of loss reserve error. In our main model we control for standard firm-level characteristics hypothesized to determine errors in reserve estimation. Specifically, we estimate the following model:

$$Error_{i,t} = \beta \mathbf{X}_{i,t} + \gamma \mathbf{I}_t + \epsilon_{i,t} \tag{1}$$

where $Error_{i,t}$ is firm i's four-year loss reserve error scaled by total assets in year t. $\mathbf{X}_{i,t}$ is a vector of firm i's characteristics hypothesized to determine loss reserve errors in year t. $\mathbf{I}_t$ is a vector of year indicator variables in year t.

We measure the loss reserve error using data from the "Underwriting and Investment

[8]Since we calculate four-year reserves we lose four lead years of data. For example, we require statement information from 2011 to calculate the 2007 loss reserve error. Additionally, most papers examining property and liability insurers use a five year error. Health insurers report only four years of development.

Exhibit Part 2C—Development of Paid and Incurred Health Claims, Section B—Incurred Health Claims" from the annual statutory statements. An example of this section is presented in Table 1. The boxed values in column (1) minus the boxed values in column (5) provide our measure of loss reserve error. We then scale this by total assets. A positive value for the loss reserve error indicates that the initial estimate was higher than the eventual development (over-reserving). A negative value indicates that the initial loss reserve estimate was lower than the eventual development (under-reserving).

In examining loss reserve errors it is important to control for both discretionary and non-discretionary determinants to isolate the marginal impact of each variable on the error (Grace and Leverty, 2012). We include a control for firm size to account for larger firms having the resources to employ more actuaries (Aiuppa and Trieschmann, 1987). We measure $Size_{i,t}$ as the natural log of firm i's total assets in year t. Harrington and Danzon (1994) suggest that firms attempting to grow can understate reserves in an attempt to improve firm growth (while also increasing insolvency risk). We control for this incentive by including $Growth_{i,t}$ which is the percentage change in firm i's net premium income from year $t-1$ to year t.[9]

We also account for differing levels of geographic and product diversification. Firms that write in more states can be exposed to a greater range of risk, increasing the difficulty of accurately reserving. Similarly, providing a more diverse array of product offerings can make it more difficult for firm's to reserve accurately. We measure $Geo\ Herf_{i,t}$ as a Herfindahl Index for firm i based on direct premiums written across the 51 U.S. states and Washington D.C. in year t.[10] We measure $Product\ Herf_{i,t}$ as a Herfindahl Index for firm i based on net premium income across eight lines of business in year t.[11] Harrington and Danzon

[9]Data on net premium income is from the "Statement of Revenue and Expenses" page of the annual statutory health statement.

[10]Data necessary to calculate $Geo\ Herf_{i,t}$ are from "Schedule T—Premiums and Other Considerations Allocated by States and Territories" in the annual statutory health filings. We use direct premiums written here as that is the only measure of premiums available in this statement page.

[11]The data we use to construct *Product Herf* are from the "Analysis of Operations by Lines of Business" page of the annual statutory health statements. The eight lines of business are "Comprehensive (Hospital

(1994) find that firms looking to grow will understate their reserves. These firms can hide this under-reserving using reinsurance. Accordingly, we control for reinsurance usage by including $Reinsurance_{i,t}$, which is firm i's reinsurance ceded, divided by the sum of direct premiums written and reinsurance assumed.[12]

We control for two aspects of a firm's ownership structure. First, we control for whether a firm is organized as a mutual or a stock firm. Mutual ownership structures can create different ownership structure that could impact reserving decisions (e.g., Mayers, Shivdasani, and Smith, 1997; Cummins, Weiss, and Zi, 1999). We include a binary variable, $Mutual_{i,t}$, that is equal to one if firm i is organized as a mutual in year t and zero otherwise. The second aspect relating to ownership structure is whether an insurer is under common ownership with other insurers (Powell, Sommer, and Eckles, 2008).[13] We include a binary variable, $Group_{i,t}$, which is equal to one if firm i is a group member in year t and zero otherwise.

Prior studies examining incentives to manage loss reserves have noted incentives related to minimizing taxes (e.g., Grace, 1990; Petroni, 1992; Nelson, 2000; Grace and Leverty, 2012). By overstating reserves an insurer reduces incurred losses which also reduces current tax liability. We measure this tax incentive using a binary variable, $Tax_{i,t}$ which is equal to one if firm i has a high tax rate in year t and zero otherwise. Consistent with prior studies (e.g., Petroni, 1992; Grace and Leverty, 2012) we define a firm as having a high tax rate if they pay any taxes.

Finally, we include a set of variables related to income smoothing. Income smoothing suggest that firms will manage reserves to keep (Weiss, 1985; Grace, 1990; Beaver, McNichols,

& Medical)," "Medicare Supplement," "Dental Only," "Vision Only," "Federal Employees Health Benefit Plan," "Title XVIII Medicare," "Title XIX Medicaid," and "Other."

[12]Data on reinsurance premiums are from the "Underwriting and Investment Exhibit Part 1—Premiums" page of the annual statutory filings.

[13]Group membership is common in the health insurance industry. 85 percent of our sample firms are affiliated with other firms. One example is Cigna Healthcare Group. In 2011, Cigna Healthcare Group was comprised of numerous subsidiaries, such as Allegiance Life & Health Insurance Company, Cigna Healthcare of Georgia, and Cigna Healthcare MidAtlantic. Annual statutory statements for health insurers are reported at the individual company level.

and Nelson, 2003). Insurers may have an incentive to reduce the variability of their income to make the firm appear less risky to potential shareholders (Froot, Scharfstein, and Stein, 1993). Alternatively, insurers could be incentivized to smooth income (and reduce apparent risk) to appeal to regulators (Grace, 1990). We first attempt to capture this incentive by including $Smooth_{i,t}$, which is insurer i's return on assets over years $t-1$, $t-2$, and $t-3$ (e.g., Grace, 1990; Grace and Leverty, 2012). The intuition behind this variable is that firms with three years of "good" performance will have an incentive to maintain this high level of performance and will, therefore, under-reserve.

We include a second set of variables related to income smoothing. Beaver, McNichols, and Nelson (2003) find empirical evidence suggesting that firms manage their reserves to avoid losses and across the entire earnings distribution. Notably, they find evidence that firms with small positive profits tend to under-reserve, suggesting that these firms only managed to avoid a loss due to under-stating losses. We, therefore, include a set of three binary variables to control for a firm's earnings in a given year (Beaver, McNichols, and Nelson, 2003; Grace and Leverty, 2012). $Small\ Loss_{i,t}$ is a binary variable equal to one if firm i's earnings fall in the top five percent of the negative earnings distribution in year t and zero otherwise. $Small\ Profit_{i,t}$ is a binary variable equal to one if firm i's earnings fall in the bottom five percent of the positive earnings distribution in year t and zero otherwise. $Profit_{i,t}$ is a binary variable equal to one if firm i's earnings fall in the top 85 percent of the positive earnings distribution in year t and zero otherwise.

Breusch-Pagan Lagrangean multiplier tests indicate that pooled cross-sectional models are not appropriate for our sample (p-value < 0.001). We, therefore, perform a Hausman specification test which suggests that random effects are appropriate for our data (p-value > 0.10). Prior studies find evidence that loss reserve errors for property-casualty insurers are positively serially correlated (Beaver and McNichols, 1998; Grace and Leverty, 2012). As in Grace and Leverty (2012) we perform a test for autocorrelation in panel data from

Wooldridge (2002). This test suggests the presence of first-order serial correlation within panels (p-value < 0.10). Additionally, Wald tests indicate that the residuals do not have a common variance across panels (p-value < 0.001). This indicates that heteroskedasticity is present in our data.

To account for the autocorrelation and heteroskedasticity in our data we use feasible generalized least squares. As noted by Grace and Leverty (2012), this allows us to correct standard errors for the panel-specific heteroskedasticity and serial correlation present in our data. This requires us to drop observations where there is only a single firm-year observations. All models include year fixed effects.

4.2.2. Executive Compensation

Prior studies have found evidence of reserve management to maximize executive compensation (Eckles and Halek, 2010; Eckles et al., 2011; Eastman et al., 2015). We examine whether chief executive officers (CEOs) of health insurers behave similarly. We use a set of variables similar to those use used in Eckles and Halek (2010). First, we test whether CEOs manage reserves to increase their incentive-based bonus compensation. CEOs have incentives to manage earnings upward when they can increase their bonus pay by doing so. However, they may not have an incentive to do so when they have already maximized their bonus compensation (good firm performance) or when they are not close to triggering their bonus compensation (poor firm performance). We, therefore, include $Bonus_{i,t}$ which is the percentage of total compensation of the CEO of firm i in year t that is a bonus. We interact $Bonus_{i,t}$ with three indicator variables that represent various levels of firm performance intended to capture the non-linearity of incentives to manage earnings.[14] We expect the estimated coefficients on $Bonus_{i,t}$*$Good_{i,t}$ and $Bonus_{i,t}$*$Poor_{i,t}$ to be positive and significant and the coefficient on $Bonus_{i,t}$*$Adequate_{i,t}$ to be negative and significant. We also include

[14]We define $Good_{i,t}$ as having a return on assets greater than 0.08, $Adequate_{i,t}$ as having a return on assets less than or equal to 0.08 and greater than 0, and $Poor_{i,t}$ as having a return on assets that is less than or equal to 0.

Salary Change$_{i,t}$ which is the percentage change in salary for the CEO of firm i from year $t-1$ to year t.

We also include several variables related to each CEOs equity-based compensation. We include *Long-Term Pay*$_{i,t}$ which is the long-term pay of the CEO of firm i in year t scaled by total compensation. *Res. Stk. Awarded*$_{i,t}$ is the amount of restricted stock awarded to the CEO of firm i in year t scaled by total compensation. *Res. Stk. Held*$_{i,t}$ is the amount of restricted stock held by the CEO of firm i in year t scaled by total compensation. *Stock Opt. Awarded*$_{i,t}$ is the dollar amount of stock options awarded to the CEO of firm i in year t scaled by total compensation. *Stock Opt. Exer.*$_{i,t}$ is the dollar amount of stock options exercised by the CEO of firm i in year t scaled by total compensation.

For consistency with Eckles and Halek (2010) we include two control variables in our models. We include *Size*$_{i,t}$ which is the natural log of firm i's assets in year t. *Net Income* is also include as a control for tax incentives (e.g., Petroni, 1992). This is defined as firm i's net income measured in millions. Since the CEO equity compensation variables are only reported by ExecuComp for certain years of our sample, we include one model including all of the variables (as in Eckles and Halek (2010)) and a second model only including variables reported for the entire sample period. We note that since ExecuComp includes only publicly traded health insurers the sample for these tests is significantly reduced. Also, firms are aggregated to the group level for this analysis. Both models include year fixed effects.

4.2.3. Target Rating

A final incentive to manage reserves we examine is whether firms manage reserves to achieve a target financial strength rating. Many insurance firms receive a financial strength rating from the ratings agency A.M. Best. This rating represents an insurer's ability to fulfill policyholder obligations. These ratings are important to regulators, consumers, and brokers as a signal of an insurer's financial strength. Prior studies have found evidence that

ratings are an important consideration in firm-level decisions (e.g., Doherty and Phillips, 2002). Studies have also found evidence that receiving a rating downgrade is associated with declines in premium growth and stock prices (e.g., Epermanis and Harrington, 2006; Halek and Eckles, 2010). There is also evidence that A.M. Best considers accounting quality when assigning their ratings (e.g., Carson, Eastman, and Eckles, 2015).

Prior studies have found evidence that firms manage earnings to attempt to achieve "target" rating (Alissa et al., 2013; Eastman, Eckles, and Halek, 2016).[15] We examine a similar hypothesis on a subset of health insurers with A.M. Best ratings. We use a research design similar to Alissa et al. (2013) and Eastman, Eckles, and Halek (2016).

We must first construct a proxy for a "target" financial strength rating. We do this by estimating an ordered probit model for each year in our sample (2007-2010).[16,17] We then use the estimated coefficients from these regressions to calculate each firm's target rating as the rating with the highest fitted probability. To allow for asymmetric reserve management for firms above and below their target ratings, we next construct two binary variables equal to one if firm i is above (below) their target rating in year t and zero otherwise, called *Above Target*$_{i,t}$ (*Below Target*$_{i,t}$) (Eastman, Eckles, and Halek, 2016).

We include all control variables from equation (1). Standard errors again control for panel-specific heteroskedasticity and serial correlation. All models include year fixed effects.

[15]Specifically, Alissa et al. (2013) examine a group of non-financial firms and examine the incentives to manage earnings to achieve a target corporate debt rating. Eastman, Eckles, and Halek (2016) examine reserve management by property-casualty insurers to attempt to achieve an A.M. Best financial strength rating.

[16]We estimate this by year to reduce look-ahead bias (Alissa et al., 2013))

[17]We include the following variables in our estimation of rating: natural log of size, one-year change in net premium income, a product-line Herfindahl index, net premium income divided by surplus, reinsurance ceded divided by the sum of direct premiums written and reinsurance assumed, net income divided by total assets, and an indicator variable representing group membership. The untabulated results of these models are available upon request.

4.2.4. External Monitoring

Prior studies have examined whether high quality external monitoring influences reserving practices (e.g., Petroni and Beasley, 1996; Gaver and Paterson, 2001, 2007; Gaver, Paterson, and Pacini, 2012). Gaver and Paterson (2001) note that in addition to considering external monitoring by auditors, insurers are subject to external monitoring by actuaries. Since actuaries possess an expertise in regard to establishing the loss reserve, it is important to consider high quality external monitoring by actuarial firms. Insurers are also required to to obtain an opinion from an actuary regarding the adequacy of a firm's loss reserve.[18]

To examine whether external monitoring influences a firm's reserving practices, we include two variables to control for high quality external monitoring (Gaver and Paterson, 2001). First, we include $Big4\ Both_{i,t}$, which is a binary variable equal to one if firm i had both a Big 4 auditor and a Big 4 actuarial firm in year t and zero otherwise.[19] We also include $Big\ 4\ Audit_{i,t}$, which is a binary variable equal to one if firm i had a Big 4 auditor in year t, but not a Big 4 actuarial firm, and zero otherwise.[20]

We estimate equation (1) including these two additional control variables. We expect the estimated coefficients of $Big4\ Both_{i,t}$ and $Big4\ Audit_{i,t}$ to be positive and significant, indicating that high quality external monitoring results in over-stating reserves. We also estimate equation (1) where the dependent variable is the absolute value of $Error_{i,t}$. This allows us to estimate the determinants of reserve accuracy instead of reserve error magnitude. This allows us to determine if high quality external monitoring induces firms to reserve more

[18]Gaver and Paterson (2001) note that although firms are not required to obtain this from an independent actuarial firm, most do so in practice.

[19]Consistent with Gaver and Paterson (2001), we define a Big 4 actuarial firm as one that is affiliated with a Big 4 auditor.

[20]Data on a firm's auditor and actuarial firm come from the "General Interrogatories" page of the health annual statutory statements. The auditor is identified from "9 What is the name and address of the independent certified public accountant or accounting firm retained to conduct the annual audit?" The actuary is identified from "10 What is the name, address and affiliation (officer/employee of the reporting entity or actuary/consultant associated with an actuarial consulting firm) of the individual providing the statement of actuarial opinion/certification?"

accurately in addition to more conservatively. We expect the estimated coefficients of *Big4 Both*$_{i,t}$ and *Big4 Audit*$_{i,t}$ to be negative and significant in this specification, which would indicate that high quality external monitoring results in more accurate reserving (i.e., a reserve error that is closer to zero).

4.2.5. Medical Loss Ratio Regulation

While MLR regulation is a major component of the ACA, many states had some form of MLR regulation in place prior to the passage of the ACA. This provides an excellent laboratory to examine the impact of MLR regulation on insurer reserve management. While it would be difficult to directly examine the effect of the ACA on reserving practices, as it simultaneously impacts all firms, by examining MLR regulation prior to the ACA allows us to examine firms that are under strict MLR regulation as well as firms subject to no MLR regulation.

To examine whether MLR regulation induces firms to reserve differently, we estimate equation (1) including *Percent MLR*$_{i,t}$, which is the percentage of direct premiums written by insurer i in states with some form of MLR regulation in year t.[21] This variable is similar to the variable used by Grace and Leverty (2010) in their examination of the impact of rate regulation on insurer reserving. In these models, we use a one-year reserve error as our dependent variable, to examine short-term reserve management. A positive estimated coefficient would be consistent with firms over-stating losses to meet minimum MLR requirements.

[21] According to America's Health Insurance Plans' (AHIP) April 2010 report "Thirty-four states...establish MLR guidelines, require the filing or reporting of loss ratio information with state regulators, or impose limitations on administrative expenses for comprehensive, major medical insurance." We use these thirty-four states in our calculation. These states are: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Iowa, Kansas, Kentucky, Maine, Missouri, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, and West Virginia.

5. Results

5.1. Summary Statistics

Summary statistics for our sample firms are presented in Table 2. The average reserve error for firms in our sample is 0.0042, indicating over-reserving. The 25th percentile for *Error* is also positive indicating that the majority of firms over-reserved. Approximately 75 percent of firms in the sample over-stated reserves (positive values of $Error_{i,t}$). This is consistent with studies examining reserving practices of property-liability insurers, where the majority of firms over-reserve (e.g., Grace and Leverty, 2010; Eastman, Eckles, and Halek, 2016).

5.2. Main Results

Results from our estimation of equation (1) are presented in Table 3. The dependent variable in all three specifications is $Error_{i,t}$, which is firm i's four-year loss reserve error scaled by total assets in year t. Positive coefficient estimates indicate over-reserving while negative coefficients indicate under-reserving. Standard errors are presented next to each coefficient estimate and account for autocorrelation and within-panel heteroskedasticity.

We find that the estimated coefficient of $Size_{i,t}$ is positive and significant in columns (1) and (2). This suggests that larger insurers reserve more conservatively which, while not consistent with smaller insurers maintaining a larger safety loading, is in line with results from prior empirical studies (e.g., Grace and Leverty, 2012). The estimated coefficient of $Growth_{i,t}$ is negative and significant in columns (2) and (3) which indicates premium growth is associated with under-reserving. This is consistent with firms under-reserving in an attempt to grow (Harrington and Danzon, 1994). Our results suggest that more geographically concentrated firms tend to over-state reserves, as the coefficient estimate of $Geo\ Herf_{i,t}$ is positive and statistically significant in two specifications. We find inconsistent results

for product diversification, as *Product Herf*$_{i,t}$ has a positive coefficient estimate in column (1) and a negative coefficient estimate in column (3). This could potentially be explained by lower opportunities for product diversification for health insurers relative to property-liability insurers. The estimated coefficient for *Reinsurance*$_{i,t}$ does not achieve significance in any specification in Table 3.

The estimated coefficient for *Mutual*$_{i,t}$ is significant and negative in all three models presented in Table 3. Prior literature has generally found evidence that mutual firms reserve more conservatively compared to stock firms. It is possible that health insurers organized as mutuals reserve differently compared to property-liability mutuals. Another possibility is that this result an artifact of having very few mutual firms in our sample. *Group*$_{i,t}$ has a positive estimated coefficient in column (1), suggesting that firms that are members of groups tend to over-reserve.

Tax$_{i,t}$ does not load significantly in either model where it is included. This provides a lack of evidence that firms manage reserves for tax-related incentives. The estimated *Smooth*$_{i,t}$ is positive and significant in column (1). This is the opposite sign we would expect if firms were managing reserves to smooth their income. However, as we noted previously, *Smooth*$_{i,t}$ is a weak proxy of earnings smoothing (Grace and Leverty, 2012). In columns (2) and (3) we include a set of binary variables to capture where a firm falls on the earnings distribution. The coefficient estimate of *Small Profit*$_{i,t}$ is negative and significant in both models where it is included. This provides some evidence that firms under-reserve when it can help them achieve a non-negative profit (Beaver, McNichols, and Nelson, 2003). The estimated coefficient of *Profit*$_{i,t}$ is also negative. This is not consistent with the findings presented in Beaver, McNichols, and Nelson (2003), who find evidence that property-liability insurers with "large" profits tend to over-reserve. This could highlight a difference in reserving behavior between property-liability and health insurers.

Overall, these results provide some evidence that health insurers manage their reserves for

both discretionary and non-discretionary results. While we fail to find evidence for reserve management related to tax incentives, we find evidence that growth firms manage reserves and that firms may manage reserves to avoid reporting losses. In short, we find limited evidence for our first hypothesis. In the next sections we examine additional incentives to manage reserves.

5.3. Executive Compensation Results

The results examining incentives to manage reserves related to executive compensation incentives are presented in Table 4. The dependent variable in all three specifications is $Error_{i,t}$, which is firm i's four-year loss reserve error scaled by total assets in year t. The results in column (1) include all of the control variables reported in Eckles and Halek (2010). The results in column (2) exclude the variables that are not reported for the full time series of data, resulting in a larger sample. Positive coefficient estimates indicate over-reserving while negative coefficients indicate under-reserving. Standard errors are presented next to each coefficient estimate and account for autocorrelation and within-panel heteroskedasticity.

Overall, we fail to find evidence of reserve management related to executive compensation incentives aside from the interaction term $Bonus_{i,t}{*}Adequate_{i,t}$. The estimated coefficient of $Bonus_{i,t}{*}Adequate_{i,t}$ is negative and significant, which is consistent with our hypothesis (H2b) that managers who can increase their bonus compensation by under-reserving (and, therefore increasing earnings) will do so. This is consistent with the empirical findings of Eckles and Halek (2010). Unlike Eckles and Halek (2010), however, we fail to find significance on any of the other $Bonus_{i,t}$ interactions.

$Size_{i,t}$ is negative and significant in column (1), which is consistent with larger firms not requiring a safety loading. $Net\ Income_{i,t}$ is positive and significant, which is consistent with managing reserves to minimize tax liability (e.g., Petroni, 1992; Eckles and Halek, 2010). While we do find some evidence of managing reserves to increase bonus compensation, we

caution over-interpreting these results due to the small sample.

5.4. Target Rating Results

Our results examining incentives to manage reserves to attempt to achieve a target rating are presented in Table 5. The dependent variable in all three specifications is $Error_{i,t}$, which is firm i's four-year loss reserve error scaled by total assets in year t. The sample is reduced to include only health insurers that receive a financial strength rating from A.M. Best. Positive coefficient estimates indicate over-reserving while negative coefficients indicate under-reserving. Standard errors are presented next to each coefficient estimate and account for autocorrelation and within-panel heteroskedasticity.

The estimated coefficient of $Above\ Rating_{i,t}$ fail to achieve significance in all three specifications. However, the estimated coefficients of $Below\ Rating_{i,t}$ are negative and significant in all three models. This provides evidence that firms below their target rating tend to understate reserves in an effort to improve their perceived performance. However, firms above their target rating do not tend to manage reserves. A potential explanation for this finding is that the costs for being below a target are significantly greater than any costs incurred for being above a target rating (Eastman, Eckles, and Halek, 2016).[22] Overall, these results provide evidence that firms manage their loss reserves if they are below their target financial strength rating, consistent with hypothesis H3a.

5.5. External Monitor Results

The results considering the impact of external monitoring on health insurer reserving errors are presented in Table 6. The dependent variable in Panel A., $Error_{i,t}$, is insurer i's four-year loss reserve error in year t scaled by total assets. Positive coefficient estimates indicate over-reserving while negative coefficients indicate under-reserving. The dependent

[22] Alissa et al. (2013) do not differentiate between firms above their target rating and firms below their target rating. Eastman, Eckles, and Halek (2016) allow for an asymmetric response, suggesting that the incentives to over-state reserves if firms are above rating are relatively weak (e.g., Kisgen, 2006)

variable in Panel B. is the absolute value of $Error_{i,t}$. Positive estimated coefficients indicate a reserve error farther from zero (i.e., less accurate reserving), while negative coefficients indiciate a reserve error closer to zero (i.e., more accurate reserving). Standard errors are presented next to each coefficient estimate and account for autocorrelation and within-panel heteroskedasticity.

The results in Panel A. of Table 6 provide empirical evidence supporting high quality external monitoring resulting in more conservative reserving, consistent with our fourth hypothesis. Specifically, the estimated coefficient of $Big4\ Both_{i,t}$ is positive and significant in all three specifications. This suggests that health insurers with both Big 4 audit firms and Big 4 actuarial firms tend to over-reserve. Additionally, $Big4\ Audit_{i,t}$ is also positive and significant, indicating that health insurers with a Big 4 auditor (but not a Big 4 actuary) tend to over-reserve as well. These empirical results are consistent with the findings of Gaver and Paterson (2001) and suggest that high quality external monitoring can result in more conservative reserve estimation.

The result in Panel B. of Table 6 examine whether high quality external monitoring influences reserving accuracy. The estimated coefficient of $Big4\ Both_{i,t}$ is negative and significant in all three specifications. This provides evidence that health insurers with both Big 4 audit firms and Big 4 actuarial firms tend to reserve more accurately. In addition, the estimated coefficient of $Big4\ Audit_{i,t}$ is significant in only one of the three specifications (column (1)). This suggests that the expertise of the actuarial firm is an important determinant in reserving accuracy. This is consistent with actuarial expertise playing a role in the audit quality of the loss reserve, since actuaries play a large role internally in establishing the initial loss reserve.

Overall, the results in Table 6 provide empirical evidence consistent with external monitoring playing a role in loss reserve estimation. Firms with high quality external monitoring tend to reserve more conservatively (i.e., over-reserve) and also tend to reserve more accu-

rately.

5.6. Medical Loss Ratio Regulation Results

The results examining the impact of medical loss ratio regulation on insurer reserving practices are presented in Table 7. The dependent variable in all three specifications is $Error_{i,t}$ which is firm i's one-year loss reserve error in year t. Positive coefficient estimates indicate over-reserving while negative coefficients indicate under-reserving. Standard errors are presented next to each coefficient estimate and account for autocorrelation and within-panel heteroskedasticity.

The estimated coefficient of $Percent\ MLR_{i,t}$ is positive and significant in all three specifications presented in Table 7. This suggests that firms are more likely to over-reserve as they write a larger proportion of business in states with some form of MLR regulation. This provides preliminary evidence that MLR regulation incentivizes firms to over-state reserves to meet these MLR requirements. This result also suggests that the MLR regulation present in the ACA could be subject to manipulation as reserves are considered in the calculation of the MLR.

6. Conclusion

The minimum MLR requirement of the ACA potentially provides incentives for insurers to manage their loss reserves to avoid paying a rebate. While it is too early to examine this incentive to manage reserves directly, we examine several other hypothesized incentives health insurers have to manage their loss reserves. Specifically, we find empirical evidence that health insurers manage reserves to improve apparent growth, to smooth income, to maximize bonus compensation, and to attempt to achieve a target financial strength rating. We additionally find that high quality external monitoring tends to result in more conservative as well as more accurate loss reserve estimation.

We contribute to the literature examining the potential impact of the ACA, by provide empirical evidence that health insurers manage reserves for discretionary purposes. Our results suggest that MLR requirements could potentially be circumvented through reserve management. In addition, we provide the first (to our knowledge) examination of loss reserve management outside of the property-liability insurance industry. As the ACA evolves further examination of its impact on insurer reserving practices is warranted.

Future versions of this paper will implement a more detailed investigation of how medical loss ratio regulation impacts the reserving practices of health insurers. Our current investigation provides only a preliminary examination of the impact of MLR regulation on insurer loss reserve errors. We plan to examine individual state insurance laws on MLR regulation and to further examine how MLR regulation influences reserving. There is significant variation across states as to how MLRs are regulated. By exploiting this variation, we can provide further evidence as to how firms can potentially use their discretion over reserves to avoid regulatory intervention.

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Table 1: Excerpt from Underwriting and Investment Exhibit—Part 2C

Section B—Incurred Health Claims

Year in Which Losses Were Incurred	*Sum of Cumulative Net Amount Paid and Claim Liability, Claim Reserve and Medical Incentive Pool and Bonuses Outstanding at End of Year*				
	1	2	3	4	5
	2010	2011	2012	2013	2014
Prior	1,737,378	1,737,651	1,737,651	1,737,651	1,737,651
2010	323,997	324,005	324,107	321,866	321,866
2011	XXX	322,410	322,654	320,508	320,508
2012	XXX	XXX	354,566	346,004	346,004
2013	XXX	XXX	XXX	367,855	367,901
2014	XXX	XXX	XXX	XXX	373,931

Note: This table is an excerpt from the National Association of Insurance Commissioner's annual statutory filing for ADVANTAGE Health Solutions, Inc. for the year 2014.

Table 2: Descriptive Statistics

				Percentiles					
Variable	Mean	Std.	Min	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}	Max
$Error_{i,t}$	0.0042	0.3200	-1.9069	-0.1822	0.0012	0.0306	0.0795	0.1476	1.1646
$Size_{i,t}$	17.6188	1.8824	12.0615	14.8923	16.3917	17.8172	18.9439	19.7743	23.2663
$Growth_{i,t}$	0.2087	0.8671	-0.6710	-0.1819	-0.0520	0.0518	0.1656	0.5045	6.6195
$Geo\ Herf_{i,t}$	0.9266	0.1836	0.0891	0.6656	1.0000	1.0000	1.0000	1.0000	1.0000
$Product\ Herf_{i,t}$	0.8330	0.2094	0.2362	0.5012	0.6453	0.9731	1.0000	1.0000	1.0000
$Reinsurance_{i,t}$	0.0185	0.0778	0.0000	0.0000	0.0000	0.0010	0.0084	0.0209	0.8465
$Mutual_{i,t}$	0.0444	0.2061	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
$Group_{i,t}$	0.8535	0.3537	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
$Tax_{i,t}$	0.6753	0.4684	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000
$Smooth_{i,t}$	0.0964	0.1852	-2.0274	-0.0525	0.0291	0.0864	0.1526	0.2342	1.2081
$Small\ Loss_{i,t}$	0.0060	0.0770	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
$Small\ Profit_{i,t}$	0.0252	0.1567	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
$Profit_{i,t}$	0.7170	0.4506	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000

Note: This table reports descriptive statistics for the years 2007 to 2010. The full sample is 1,454 firm-years, consisting of 411 unique firms. *Error* is the four-year loss reserve error scaled by total assets. *Size* is the natural log of total assets. *Growth* is the one year change in net premiums written. *Geo Herf* is the geographic Herfindahl index. *Product Herf* is a line-of-business Herfindahl index.*Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is a mutual and 0 otherwise. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Tax* is a binary variable equal to 1 if a firm has a high tax rate and 0 otherwise. *Smooth* is a three year average of a firm's return on assets. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the earnings distribution. *Small Loss* is a binary variable equal to 1 if a firm has earnings in the top 5 percent of the negative earnings distribution. *Profit* is a binary variable equal to 1 if a firm has earnings in the top 90 percent of the positive earnings distribution.

Table 3: Main Regression Results

Dependent Variable: $Error_{i,t}$

	(1)		(2)		(3)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$Size_{i,t}$	0.0040	0.0009***	0.0021	0.0008***	0.0012	0.0008
$Growth_{i,t}$	-0.0001	0.0014	-0.0063	0.0024***	-0.0056	0.0025**
$Geo\ Herf_{i,t}$	0.0174	0.0145	0.0441	0.0066***	0.0404	0.0080***
$Prod\ Herf_{i,t}$	0.0140	0.0081*	-0.0067	0.0072	-0.0179	0.0082**
$Reinsurance_{i,t}$	-0.0004	0.0518	0.0120	0.0424	0.0220	0.0456
$Mutual_{i,t}$	-0.0166	0.0047***	-0.0186	0.0030***	-0.0120	0.0044***
$Group_{i,t}$	0.0099	0.0042**	0.0047	0.0033	0.0049	0.0043
$Tax_{i,t}$	0.0003	0.0020			0.0041	0.0027
$Smooth_{i,t}$	0.0437	0.0132***				
$Small\ Loss_{i,t}$			-0.0037	0.0421	-0.0088	0.0414
$Small\ Profit_{i,t}$			-0.0130	0.0075*	-0.0151	0.0087*
$Profit_{i,t}$			-0.0048	0.0021**	-0.0076	0.0029***
Intercept	-0.0898	0.0266***	-0.0481	0.0198**	-0.0205	0.0219
Year FE	Yes		Yes		Yes	
Wald χ^2	54.63		199.18		95.54	
Observations	1,221		1,454		1,454	

Note: This table reports coefficient estimates from GLS estimation. The dependent variable, *Error* is a firm's loss reserve error scaled by total assets. *Size* is the natural log of total assets. *Growth* is the one year change in net premiums written. *Geo Herf* is the geographic Herfindahl index. *Product Herf* is a line-of-business Herfindahl index.*Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is a mutual and 0 otherwise. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Tax* is a binary variable equal to 1 if a firm has a high tax rate and 0 otherwise. *Smooth* is a three year average of a firm's return on assets. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the earnings distribution. *Small Loss* is a binary variable equal to 1 if a firm has earnings in the top 5 percent of the negative earnings distribution. *Profit* is a binary variable equal to 1 if a firm has earnings in the top 90 percent of the positive earnings distribution. All models include year fixed fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 4: Executive Compensation Regression Results

Dependent Variable: $Error_{i,t}$

	(1)		(2)	
	Coef.	S.E.	Coef.	S.E.
$Bonus_{i,t}$*$Good_{i,t}$	-0.9319	0.8118	-0.4144	0.2592
$Bonus_{i,t}$*$Adequate_{i,t}$	-1.5177	0.6690**	-0.8882	0.2843***
$Bonus_{i,t}$*$Poor_{i,t}$	2.6144	2.4631	0.1839	0.6945
Salary Change$_{i,t}$	0.0023	0.0026	-0.0001	0.0005
Long-Term Pay$_{i,t}$	0.3480	0.4831		
Res. Stk. Awarded$_{i,t}$	-0.2272	0.4966		
Res. Stk. Held$_{i,t}$	-0.0512	0.0687		
Stock Opt. Awarded$_{i,t}$	-0.2490	0.3085		
Stock Opt. Exer.$_{i,t}$	0.0057	0.0416		
$Size_{i,t}$	-0.2468	0.1250**	0.0116	0.0153
Net Income$_{i,t}$	0.8302	0.4478*	-0.0565	0.0772
Intercept	5.8358	2.7595**	0.5792	0.3333*
Year FE	Yes		Yes	
Wald χ^2	36.37		70.17	
Observations	47		139	

Note: This table reports coefficient estimates from GLS estimation. The dependent variable, *Error* is a firm's loss reserve error scaled by total assets. *Bonus* is the percent of total compensation awarded as a bonus. *Salary Change* is the percentage change in salary. *Long-Term Pay* is the percentage of total compensation awarded as long-term pay. *Res. Stk. Awarded* is the percentage of total compensation that is awarded restricted stock. *Res. Stk. Held* is the amount of restricted stock held scaled by total compensation. *Stock Opt. Awarded* is the amount of stock options awarded scaled by total compensation. *Stock Opt. Exer* is the amount of exercisable stock options held scaled by total assets. *Size* is the natural log of assets. *Net Income* is a firm's net income measured in millions. All models include year fixed fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 5: Target Rating Regression Results

Dependent Variable: $Error_{i,t}$

	(1)		(2)		(3)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$Above\ Target_{i,t}$	0.0051	0.0049	-0.0006	0.0048	0.0066	0.0057
$Below\ Target_{i,t}$	-0.0247	0.0044***	-0.0191	0.0038***	-0.0214	0.0041***
$Size_{i,t}$	0.0002	0.0013	-0.0004	0.0022	-0.0027	0.0015*
$Growth_{i,t}$	-0.0041	0.0079	0.0041	0.0071	0.0053	0.0078
$Geo\ Herf_{i,t}$	0.0559	0.0107***	0.0338	0.0174*	0.0362	0.0134***
$Product\ Herf_{i,t}$	0.0346	0.0085***	0.0578	0.0143***	0.0412	0.0119***
$Reinsurance_{i,t}$	-0.0384	0.0662	-0.0017	0.1041	-0.0267	0.0908
$Mutual_{i,t}$	-0.0349	0.0040***	-0.0378	0.0112***	-0.0375	0.0082***
$Group_{i,t}$	0.0286	0.0068***	0.0476	0.0134***	0.0486	0.0100***
$Tax_{i,t}$	-0.0204	0.0051***			0.0008	0.0049
$Smooth_{i,t}$	0.0793	0.0190***				
$Small\ Loss_{i,t}$			-0.0016	0.0124	-0.0005	0.0209
$Small\ Profit_{i,t}$			0.0032	0.0142	0.0105	0.0237
$Profit_{i,t}$			0.0014	0.0047	0.0013	0.0064
Constant	-0.0698	0.0285**	-0.0671	0.0528	-0.0221	0.0406
Year FE	Yes		Yes		Yes	
Wald χ^2	831.21		98.17		130.37	
Observations	388		413		413	

Note: This table reports coefficient estimates from GLS estimation. The dependent variable, *Error*, is a firm's loss reserve error scaled by total assets. *Above Target* is a binary variable equal to 1 if a firm's rating is above it's target and 0 otherwise. *Below Rating* is a binary variable equal to 1 if a firm's rating is below it's target and 0 otherwise. *Size* is the natural log of total assets. *Growth* is the one year change in net premiums written. *Geo Herf* is the geographic Herfindahl index. *Product Herf* is a line-of-business Herfindahl index.*Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is a mutual and 0 otherwise. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Tax* is a binary variable equal to 1 if a firm has a high tax rate and 0 otherwise. *Smooth* is a three year average of a firm's return on assets. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the earnings distribution. *Small Loss* is a binary variable equal to 1 if a firm has earnings in the top 5 percent of the negative earnings distribution. *Profit* is a binary variable equal to 1 if a firm has earnings in the top 90 percent of the positive earnings distribution. All models include year fixed fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 6: External Auditor Regression Results

Panel A.

	Dependent Variable: $Error_{i,t}$					
	(1)		(2)		(3)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$Big4\ Both_{i,t}$	0.0117	0.0051**	0.0145	0.0046***	0.0147	0.0053***
$Big4\ Audit_{i,t}$	0.0227	0.0046***	0.0235	0.0039***	0.0236	0.0044***
$Size_{i,t}$	0.0031	0.0008***	0.0018	0.0008**	0.0012	0.0008
$Growth_{i,t}$	0.0007	0.0025	-0.0057	0.0025**	-0.0051	0.0025**
$Geo\ Herf_{i,t}$	0.0200	0.0139	0.0333	0.0086***	0.0265	0.0098***
$Product\ Herf_{i,t}$	0.0119	0.0073	0.0002	0.0073	-0.0097	0.0081
$Reinsurance_{i,t}$	0.0176	0.0506	0.0178	0.0441	0.0259	0.0455
$Mutual_{i,t}$	-0.0185	0.0040***	-0.0197	0.0032***	-0.0117	0.0048**
$Group_{i,t}$	-0.0009	0.0050	-0.0031	0.0045	-0.0030	0.0052
$Tax_{i,t}$	-0.0019	0.0021			0.0010	0.0029
$Smooth_{i,t}$	0.0352	0.0117***				
$Small\ Loss_{i,t}$			-0.0065	0.0435	-0.0097	0.0424
$Small\ Profit_{i,t}$			-0.0074	0.0090	-0.0108	0.0094
$Profit_{i,t}$			-0.0047	0.0024*	-0.0065	0.0031**
Constant	-0.0784	0.0239***	-0.0488	0.0217**	-0.0246	0.0230
Year FE	Yes		Yes		Yes	
Wald χ^2	86.85		155.86		83.33	
Observations	1,221		1,454		1,454	

Panel B.

	Dependent Variable: Abs. Value $Error_{i,t}$					
	(1)		(2)		(3)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$Big4\ Both_{i,t}$	-0.0216	0.0076***	-0.0324	0.0094***	-0.0427	0.0088***
$Big4\ Audit_{i,t}$	-0.0246	0.0077***	-0.0066	0.0081	-0.0108	0.0076
$Size_{i,t}$	-0.0331	0.0039***	0.0094	0.0014***	0.0110	0.0012***
$Growth_{i,t}$	-0.0181	0.0037***	-0.0031	0.0024	-0.0001	0.0032
$Geo\ Herf_{i,t}$	-0.0258	0.0277	0.0179	0.0114	0.0180	0.0095*
$Product\ Herf_{i,t}$	0.0324	0.0160**	-0.0237	0.0118**	-0.0171	0.0111
$Reinsurance_{i,t}$	-0.2463	0.0669***	-0.0831	0.0606	-0.0532	0.0655
$Mutual_{i,t}$	-0.0149	0.0151	-0.0727	0.0053***	-0.0740	0.0047***
$Group_{i,t}$	-0.0050	0.0027*	-0.0141	0.0104	-0.0179	0.0094*
$Tax_{i,t}$	-0.0134	0.0016***			-0.0077	0.0039*
$Smooth_{i,t}$	0.0402	0.0171**				
$Small\ Loss_{i,t}$			-0.0258	0.0388	-0.0161	0.0503
$Small\ Profit_{i,t}$			-0.0014	0.0100	0.0087	0.0137
$Profit_{i,t}$			-0.0158	0.0035***	-0.0084	0.0040**
Intercept	0.3116	0.1237**	-0.0348	0.0389	-0.0661	0.0339*
Year FE	Yes		Yes		Yes	
Wald χ^2	762.55		323.99		437.16	
Observations	1,221		1,454		1,454	

Note: This table reports coefficient estimates from GLS estimation. The dependent variable in Panel A., *Error*, is a firm's loss reserve error scaled by total assets. The dependent variable in Panel B. is the absolute value of reserve error. *Big4 Both* is a binary variable equal to 1 if a firm had both a Big 4 auditor and a Big 4 actuary and 0 otherwise. *Big4 Auditor* is a binary variable equal to 1 if a firm had a Big 4 auditor and a non-Big 4 actuary and 0 otherwise. *Size* is the natural log of total assets. *Growth* is the one year change in net premiums written. *Geo Herf* is the geographic Herfindahl index. *Product Herf* is a line-of-business Herfindahl index.*Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is a mutual and 0 otherwise. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Tax* is a binary variable equal to 1 if a firm has a high tax rate and 0 otherwise. *Smooth* is a three year average of a firm's return on assets. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the earnings distribution. *Small Loss* is a binary variable equal to 1 if a firm has earnings in the top 5 percent of the negative earnings distribution. *Profit* is a binary variable equal to 1 if a firm has earnings in the top 90 percent of the positive earnings distribution. All models include year fixed fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 7: MLR Regression Results

Dependent Variable: $Error_{i,t}$

	(1)		(2)		(3)	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$Percent\ MLR_{i,t}$	0.0062	0.0037*	0.0081	0.0032**	0.0076	0.0034**
$Size_{i,t}$	0.0042	0.0008***	0.0038	0.0007***	0.0039	0.0007***
$Growth_{i,t}$	0.0136	0.0026***	0.0023	0.0011**	0.0021	0.0011*
$Geo\ Herf_{i,t}$	-0.0064	0.0097	-0.0071	0.0068	-0.0048	0.0072
$Product\ Herf_{i,t}$	-0.0230	0.0071***	-0.0377	0.0071***	-0.0322	0.0075***
$Reinsurance_{i,t}$	0.0024	0.0209	0.0175	0.0154	0.0155	0.0157
$Mutual_{i,t}$	-0.0088	0.0103	-0.0088	0.0094	-0.0078	0.0099
$Group_{i,t}$	0.0108	0.0031***	0.0060	0.0032*	0.0059	0.0034*
$Tax_{i,t}$	0.0018	0.0022			-0.0014	0.0023
$Smooth_{i,t}$	0.0214	0.0087**				
$Small\ Loss_{i,t}$			-0.0115	0.0148	-0.0104	0.0142
$Small\ Profit_{i,t}$			-0.0238	0.0060***	-0.0232	0.0063***
$Profit_{i,t}$			0.0030	0.0023	0.0023	0.0025
Constant	-0.0500	0.0219**	-0.0222	0.0185	-0.0293	0.0197
Year FE	Yes		Yes		Yes	
Wald χ^2	174.53		238.15		197.67	
Observations	2,096		2,293		2,293	

Note: This table reports coefficient estimates from GLS estimation. The dependent variable, *Error*, is a firm's loss reserve error scaled by total assets. *Percent MLR* is the percent of a firm's direct premiums written in states with MLR regulation. *Size* is the natural log of total assets. *Growth* is the one year change in net premiums written. *Geo Herf* is the geographic Herfindahl index. *Product Herf* is a line-of-business Herfindahl index.*Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is a mutual and 0 otherwise. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Tax* is a binary variable equal to 1 if a firm has a high tax rate and 0 otherwise. *Smooth* is a three year average of a firm's return on assets. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the earnings distribution. *Small Loss* is a binary variable equal to 1 if a firm has earnings in the top 5 percent of the negative earnings distribution. *Profit* is a binary variable equal to 1 if a firm has earnings in the top 90 percent of the positive earnings distribution. All models include year fixed fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.