Target Financial Strength Ratings and Insurer Loss Reserve Errors*

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Abstract

This study investigates whether firms manage earnings in an attempt to achieve a target financial strength rating. The U.S. property-liability insurance industry provides a unique testing ground since firms are required to report revisions to the initial estimates of loss reserves (made for future insurance claim payments). Comparing these revisions to the initial estimates allows for a direct measure of managerial manipulation. Additionally, insurers receive industry-specific financial strength ratings from A.M. Best, which are important measures of insolvency to consumers, regulators, and brokers. We find that firms with an actual rating below their expected rating use income-increasing earnings management, while firms with an actual rating above their expected rating use income-decreasing earnings management. We additionally find that firms with income-increasing (decreasing) earnings management tend to be upgraded (downgraded) in future periods, suggesting that loss reserve management is effective in helping firms achieve a target rating.

Keywords: Accounting Discretion; Insurance; Reserve Management; Ratings Agencies, Accruals; Earnings Management

JEL classification: G22, G24, M41

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Abstract

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1. Introduction

This study investigates the relationship between discretionary accruals and property-liability (P&L) insurer's financial strength ratings. Specifically, we are interested in whether firms manage earnings in order to achieve a target financial strength rating. For a number of reasons, the P&L insurance industry is an excellent laboratory to investigate this issue. First, it allows for the use of loss reserve errors as a measure of earnings management. Each year insurers accrue a liability for unpaid losses. Over time, they must disclose how these estimated losses develop as they reflect actual losses paid and changes in estimates. This allows for observability of the actual error made in the original accounting estimate. McNichols (2000) suggests that commonly used earnings management models based on model residuals (e.g., Jones, 1991; Dechow et al., 1995; Kothari et al., 2005) can be unreliable and instead recommends focusing on specific accruals that are material to a firm.[1] Loss reserve errors have been frequently used as a measure of managerial discretion, being linked to various incentives, such as income smoothing (Weiss, 1985; Beaver et al., 2003), financial weakness (Gaver and Paterson, 2004; Grace and Leverty, 2012), and executive compensation (Eckles and Halek, 2010; Eckles et al., 2011; Eastman et al., 2015).

A second advantage of focusing on the insurance industry is that there exists an industry-specific financial strength rating. A.M. Best (Best) has provided financial strength ratings of insurers since its incorporation in 1899. These ratings represent Best's opinion on an insurer's ability to continue to pay claims to policyholders in the future. Indeed, financial strength ratings have been shown to be positively associated with insolvency risk (Pottier, 1998). Unlike credit ratings, which focus on an individual security, financial strength ratings reflect the firm as a whole. Since ratings reflect an insolvency measure, they are important to an insurer as many corporate insurance purchasers have minimum ratings requirements and

[1] Loss reserves are material as they are generally the largest liability on an insurer's balance sheet.

personal-lines consumers are price sensitive with respect to ratings (Pottier and Sommer, 1999; Berger et al., 1992). Accordingly, losing a high rating is associated with significant costs (Doherty and Phillips, 2002). Stock markets also react negatively to ratings downgrades (Halek and Eckles, 2010; Wade et al., 2015). For these reasons insurers will have incentives to achieve a target rating.

Ratings are important to a firm as certain corporations will not purchase insurance from insurers that are below a certain rating (Pottier and Sommer, 1999). Accordingly, losing a high rating is associated with significant costs (Doherty and Phillips, 2002). Stock markets also react strongly to changes in ratings (Halek and Eckles, 2010). For these reasons insurers will have incentives to bias loss reserves in order to achieve a target rating.

Another advantage is that our sample consists of different organizational forms. The insurance industry has a variety of ownership structures including public and private stock firms, as well as mutual companies. All of these firms are required to report financial information. Therefore, our study is not restricted to only publicly traded firms. These differing organizational forms each have separate agency conflicts that may influence the incentives of managers to manipulate loss reserves (Mayers et al., 1997; He and Sommer, 2010).

We find evidence that firms manage earnings upward, through under-reserving (i.e. under-reporting losses), when they are below their target financial strength rating and manage earnings downward when they are above their target financial strength rating. This result is robust to alternative definitions of target rating. In addition to using an ordered probit model to estimate a target rating (as in Alissa et al. (2013)) we also focus on insurers writing predominantly commercial lines and measure their target as A-.[2] We also use past ratings as a proxy for target rating and adapt a model from the target leverage literature (e.g., Flannery and Rangan, 2006) to test our hypotheses that firms will manage reserves

[2]A rating of at least A- is particularly important for commercial writers, as many corporations will not purchase insurance from insurers with a rating below A-. Epermanis and Harrington (2006) and Halek and Eckles (2010) find evidence that maintaining a rating of A- is particularly important to insurers.

to attain a target rating. Our results are robust to these alternative definitions of a target rating.

In addition, we find evidence that firms can influence their financial strength rating through reserve manipulation. Specifically, we find evidence that firms with a positive change in reserve errors are more likely to receive subsequent ratings downgrades, while firms with negative changes in reserve errors are more likely to receive subsequent ratings upgrades. This is consistent with firms under- (over-)reserving in an attempt to achieve a higher (lower) financial strength rating.

Alissa et al. (2013) is the most similar study to ours. They find that firms use accruals-based and real activities earnings management in order to attempt to achieve a target S&P credit rating. Our study provides a significant extension, as we study the P&L insurance industry, which allows us to focus on a homogenous group of firms, so that we can more easily decompose accruals into discretionary and non-discretionary components (McNichols, 2000). Also, the use of insurer loss reserve errors provides a direct measure of managerial discretion (Petroni, 1992; Gaver and Paterson, 2004; Grace and Leverty, 2012). We additionally consider alternative definitions of target ratings that are not considered by Alissa et al. (2013). We also account for econometric issues created when there is a generated regressor present in our model.

Our study contributes to the literature on earnings management, in general, and loss reserve management, in particular. It also contributes to the literature on ratings, providing further evidence that ratings are highly important to firms (Kisgen, 2006, 2009). The findings in this paper complement the findings of Alissa et al. (2013) and provide further support for the idea that firms manage earnings in response to deviations from expected credit ratings and that they can use earnings management to achieve a ratings change.

Our paper proceeds as follows. In section 2 we provide background on insurer loss reserve errors and financial strength ratings, as well as a brief summary of prior literature. In section

3 we develop our testable hypotheses. In section 4 we describe our research design. In section 5 we describe our data and provide our empirical results. In section 6 we end with a brief conclusion.

2. Background

2.1. Loss Reserves

Insurer loss reserve errors are frequently used as a measure of managerial discretion in the accounting and insurance literature (e.g., Petroni, 1992; Beaver et al., 2003; Grace and Leverty, 2010). Loss reserves are usually the largest liability on a property-liability insurer's balance sheet representing the estimated cost of settling claims. In general, a firm's actuaries will present a recommended range of acceptable loss reserves, with management choosing the ultimate loss reserve. As claims occur over time, an insurer will revise their original loss reserve estimate. These revisions, called development, indicate whether the insurer initially under- or over-reserved. An insurer under-reserved if the original loss reserve was less than the developed reserve and over-reserved if the original loss reserve was greater than the developed reserve. This information, as well as information on the settlement of claims, is reported to the National Association of Insurance Commissioners (NAIC) in annual statutory filings on Schedule P.

An excerpt from Schedule P can be found in Table 1. These data are used to construct the loss reserve error as follows:

$$Error_{i,t} = Incurred\ Losses_{i,t} - Incurred\ Losses_{i,t+n} \tag{1}$$

This error is calculated as the initial loss reserve estimate in year t minus the total incurred losses in year $t+n$. The sum of the boxed values under column 6 in Table 1 are the incurred losses in year t and the sum of the boxed values under column 11 are the incurred losses

in year $t + n$. The error, used in previous studies (e.g., Beaver et al., 2003; Gaver and Paterson, 2004; Grace and Leverty, 2010), will be positive if the initial loss reserve estimate is overestimated and negative if the initial loss reserve is understated.[3] Consistent with the majority of prior literature (e.g., Petroni, 1992; Beaver et al., 2003; Grace and Leverty, 2010), we use a five year development horizon. To control for insurer size and to express the loss reserve error as a percentage, this difference is scaled by total assets.

According to McNichols (2000) there are several advantages to using loss reserve errors as a measure of earnings management compared to other accruals-based measures. For one, it is a material accrual, as the loss reserve is generally the largest liability on an insurer's balance sheet. Also, due to reporting requirements, the development of loss estimates over time is observable, allowing for the comparison of initial estimates to the original accounting estimate. The discretionary manipulation of loss reserves has been frequently studied in the literature as a result of its strength as a measure of earnings management. Loss reserve errors have been linked to various incentives such as earnings smoothing (Weiss, 1985; Grace, 1990; Beaver et al., 2003), financial weakness (Petroni, 1992; Gaver and Paterson, 2004; Grace and Leverty, 2012), executive compensation (Eckles and Halek, 2010; Eckles et al., 2011; Eastman et al., 2015), and auditing (Gaver and Paterson, 2001, 2007; Grace and Leverty, 2013).

2.2. Financial Strength Ratings

A.M. Best financial strength ratings reflect the agency's opinion on a firm's ability to meet its obligation to pay policyholders and to, therefore, remain solvent. Unlike debt ratings, financial strength ratings reflect the risk of the firm overall, as opposed to one security.

[3]There are other measures of reserve error that have also been used in the literature. Petroni (1992), Eckles and Halek (2010), and Eastman et al. (2015) use the initial estimate minus total incurred losses after 5 years. This produces the negative of the measure we use. Weiss (1985) and Grace and Leverty (2012) use the initial estimate minus losses paid after 5 years. Grace and Leverty (2013) use a measure based on stochastic loss reserving models as used in the actuarial science literature which they call the *full information reserve error*.

Insurers have numerous incentives to maintain a high financial strength rating as they are of interest to regulators, consumers (corporate or individual), and agents.

Pottier and Sommer (1999) examine the determinants of insurer financial strength ratings, and find evidence that factors related to firm insolvency probability, including insurer size, business diversification, growth in premiums written, and investment in stocks are significantly related to an insurer's rating. Doherty and Phillips (2002) examine whether rating standards have changed over time, and find evidence that increasing stringency of A.M. Best is one potential explanation for the capital buildup of P/L insurers in the 1990s. Pottier and Sommer (2002) find empirical evidence that A.M. Best ratings are better predictors of insolvency compared to measures used by regulators (e.g., RBC ratios). Epermanis and Harrington (2006) document that firms experience a decrease in premiums written following ratings downgrades. They find that this effect is stronger for firms that write primarily in commercial lines of insurance. Halek and Eckles (2010) examine market reactions to financial strength ratings changes. They document an abnormal reaction to ratings downgrades, though markets also respond positively to ratings upgrades. Additionally, Halek and Eckles (2010) find evidence that reactions are significantly higher in magnitude for firms that experience the loss of a rating of A-. Wade et al. (2015) find empirical evidence of abnormally high short selling for insurers prior to a ratings downgrade. This suggests that investors can anticipate ratings downgrades.

3. Hypothesis Development

Since A.M. Best financial strength ratings represent the overall ability of a firm to meet policyholder obligations, they are highly important to firms. Negative consequences of a low financial strength rating, such as not being able to sell to certain corporate customers, lower prices, and negative stock market reactions, provide an incentive for below-target-rating firms to take action to achieve a higher rating. However, there are also incentives

for above-target-rating firms to *reduce* their financial strength rating. Graham and Harvey (2001) survey CFOs and find that firms view a rating that is higher than expected as an unnecessary cost. Consistent with this notion, Alissa et al. (2013) find evidence that firms manage earnings not only when they are below their target rating, but will also make income-reducing earnings management decisions when they are above their target credit rating.

As firms are penalized by consumers and investors for having a low rating and they incur unnecessary costs for being above ratings, they have an incentive to manage reserves if they are not at their target rating. Therefore, firms below their target rating could make income-increasing earnings management decisions (under-reserving) in an effort to achieve a higher financial strength rating. Consistently, firms above their target rating could make income-decreasing earnings management decisions (over-reserving) in an effort to achieve a lower financial strength rating. This is consistent with the empirical findings of Alissa et al. (2013) on a sample of non-financial firms using credit ratings.

Since there is an information asymmetry between the firm and A.M. Best in the appropriate level of loss reserves, a firm's own management is likely better able to estimate the loss exposure of the firm compared to A.M Best. Firm's actuaries and managers have full access to information on the policies they have written. A.M. Best also relies on their own model to estimate loss reserves, which may differ from the one used by each firm (A.M. Best, 2014). Since changes in income are more observable than mistakes in reserving, firms can under- (over-)reserve to improve (reduce) performance in an effort to achieve a higher (lower) rating.

We, therefore, propose the following hypotheses:

H1(a): *Firms with actual financial strength ratings below target financial strength ratings will tend to under-reserve.*

H1(b): *Firms with actual financial strength ratings above target financial strength ratings will tend to over-reserve.*

If firms manage reserves in an effort consistent with trying to achieve a target financial strength rating, the next question is whether this reserve management is an effective means through which to achieve a ratings change. If firms are able to improve their performance through accruals management, we would expect A.M. Best to respond with a ratings change. Specifically, firms under their target rating who are under-reserving would see a subsequent ratings upgrade, while firms above their target rating who are over-reserving would experience a subsequent ratings downgrade.

We, therefore, propose the following hypotheses:

H2(a): *Over-reserving is associated with subsequent financial strength ratings downgrades.*

H2(b): *Under-reserving is associated with subsequent financial strength ratings downgrades.*

4. Research Design

In order to estimate a target financial strength rating, we use an ordered probit model. For non-insurers, Alissa et al. (2013) use an ordered probit to estimate Standard & Poor's long-term credit rating as a function of various firm characteristics such as size, profitability, operating risk, asset specialization, and future growth options, using the fitted values from this regression to create an expected rating. Using insurers, Pottier and Sommer (1999), Doherty and Phillips (2002), and Gaver and Pottier (2005) use ordered probit models to

estimate determinants of A.M. Best ratings for insurance firms. Using the strategy of Alissa et al. (2013) and the variables identified by Pottier and Sommer (1999), Doherty and Phillips (2002), and Gaver and Pottier (2005), we adopt the following ordered probit model:

$$\begin{aligned} Rating_{i,t} = {} & \gamma_1 Size_{i,t} + \gamma_2 Product\ Diverse_{i,t} + \gamma_3 Longtail_{i,t} + \gamma_4 Reinsurance_{i,t} \\ & + \gamma_5 Geo\ Herf_{i,t} + \gamma_6 Growth_{i,t} + \gamma_7 ROA_{i,t} + \gamma_8 ROI_{i,t} + \gamma_9 Kenny\ Ratio_{i,t} \\ & + \gamma_{10} Earthquake_{i,t} + \gamma_{11} Surplus_{i,t} + \gamma_{12} Group_{i,t} + \gamma_{13} Hurricane_{i,t} + u_{i,t} \end{aligned} \tag{2}$$

$i,t =$ Firm i in year t;

$Rating_{i,t} =$ Firm i's A.M. Best financial strength rating in year t, where 4 corresponds to ratings A++ and A+, 3 corresponds to rating A, 2 corresponds to rating A-, 1 corresponds to ratings B++ and B+, and 0 corresponds to all lower ratings;

$Size_{i,t} =$ The natural log of firm i's total assets in year t;

$Product\ Diverse_{i,t} =$ 1 minus a Herfindahl index based on firm i's net premiums written across 24 lines of business in year t;[4]

[4]Using net premiums written data from the Underwriting and Investment Exhibit (Part 1B-Premiums Written) in the annual statutory filings, we make the following adjustments as described in Berry-Stölzle et al. (2012). Fire and Allied Lines is defined as the sum of "Fire" and "Allied Lines." Accident and Health is defined as the sum of "Group Accident and Health," "Credit Accident and Health," and "Other Accident and Health." Medical Malpractice is defined as the sum of "Medical Malpractice—Occurrence" and "Medical Malpractice—Claims Made." Products Liability is defined as the sum of "Products Liability—Occurrence" and "Products Liability—Claims Made." Auto is defined as the sum of "Private Passenger Auto Liability," "Commercial Auto Liability," and "Auto Physical Damage." Reinsurance is defined as the sum of "Nonproportional Assumed Property," "Nonproportional Assumed Liability," and "Nonproportional Assumed Financial Lines." After these combinations we are left with 24 lines of business from which we construct the Herfindahl Index: Accident and Health, Aircraft, Auto, Boiler and Machinery, Burglary and Theft, Commercial Multi Peril, Credit, Earthquake, Farmowners', Financial Guaranty, Fidelity, Fire and Allied lines, Homeowners, Inland Marine, International, Medical Malpractice, Mortgage Guaranty, Ocean Marine, Other, Other Liability, Products Liability, Reinsurance, Surety, and Workers' Compensation.

$Longtail_{i,t}$ = The percentage of firm i's net premiums written in long-tailed lines of business.[5]

$Reinsurance_{i,t}$ = Firm i's reinsurance premiums ceded divided by the sum of direct premiums written and reinsurance assumed in year t;

$Geo\ Herf_{i,t}$ = A geographic Herfindahl index based on direct premiums written in the fifty U.S. states and Washington D.C. in year t;

$Growth_{i,t}$ = The percent change in firm i's net premiums written from $t-1$ to t;

$ROA_{i,t}$ = Firm i's net income divided by total assets in year t;

$ROI_{i,t}$ = Firm i's net investment income divided by total assets in year t;

$Kenny\ Ratio_{i,t}$ = Firm i's net premiums written divided by policyholder surplus in year t;

$Earthquake_{i,t}$ = The percentage of firm i's net premiums written in earthquake insurance in year t;

$Surplus_{i,t}$ = The ratio of firm i's policyholder surplus to total assets in year t;

$Group_{i,t}$ = A binary variable equal to 1 if firm i is a member of a group and 0 otherwise;

$Hurricane_{i,t}$ = The percentage of firm i's direct premiums written in hurricane-prone states in year t;[6]

Table 2 and Table 3 present results from ordered probit estimation as specified in equation 2. Table 2 presents results from 1992 to 1999 and Table 3 presents results from 2000 to 2006.[7] The results are generally consistent with expectations and consistent with prior literature. A

[5]We define the following lines as long-tailed lines of business: Farmowners', Homeowners, Commercial Multi Peril, Medical Malpractice, Workers' Compensation, Products Liability, Auto Liability, and Other Liability.

[6]These include the Gulf states—Texas, Louisiana, Mississippi, Alabama, and Florida—and the south Atlantic states—Georgia, South Carolina, and North Carolina (Cheng and Weiss, 2012).

[7]Since the reserve error calculation requires 5 lead years of data, we only calculate target ratings until 2006.

higher A.M. Best rating, which represents a lower probability of insolvency, is associated with larger firms, firms with less business in long-tailed lines, firms that use more reinsurance, firms with higher surplus, firms in groups, and firms with a higher return on assets. Consistent with Alissa et al. (2013), we use these results to construct a firm's target financial strength rating. This target rating is the rating that has the highest fitted probability from equation 2. We then construct *Difference*, which is *Rating* minus the target rating. *Difference* is positive for firms with actual rating above expected rating (over-rated firms) and negative for firms with actual rating below expected rating (under-rated firms).

Table 4 provides the distribution of actual ratings compared to target ratings. These results are generally as expected, as most ratings are at their target. Fewer firms are predicted to have low ratings (B+ or less) compared to the actual number of firms with these ratings. The largest deviation appears at B++, where only 39 firm-years have B++ at a target, while 2,084 firm-years have a rating of B++. A possible explanation for this is the importance for many firms of attaining a rating of at least A-. We note that the number of firms targeting an A- (9,855) is substantially larger than the number of firms with A- (6,100). If it is important for firms to have an A- this could explain the low number of firms targeting a B++.

Table 5 provides the average reserve error scaled by total assets by the intersection of actual and target rating. Positive values indicate over-reserving while negative values indicate under-reserving. While no clear trend appears in this table, one number to note is that firms targeting an A-, but with an actual rating of B++—the rating directly below A—tend to under-reserve to a large magnitude (-0.1634). However, the results in Table 5 do not provide strong evidence for or against our hypotheses.

Table 6 examines whether *Difference* provides an adequate measure of target rating for a firm. We would expect to see ratings move towards the target rating over time if this is a reasonable measure of target rating. As in Alissa et al. (2013), we estimate: $\Delta \mathit{Difference}_{i,t+k} = \theta_0 + \theta_1 \mathit{Difference}_{i,t} + \omega_{i,t}$. A negative estimated coefficient of θ_1 indi-

cates mean reversion and would provide evidence that ratings do trend towards the target rating. The results in Table 6 provide evidence that *Difference* mean reverts over $t+1$ and $t+3$, but not over $t+5$.

This method of measuring deviation from target rating captures a firm's target rating in that it is the rating a firm can expect to receive based on observable firm characteristics. Since A.M. Best does not make its exact rating formula public, firms cannot take actions to directly influence their rating. According to A.M. Best, they also take into account qualitative factors when assessing their rating (A.M. Best, 2014). Therefore, based on observable factors, this fitted value of a target rating proxies for the financial strength rating a firm is targeting. Additionally, we provide tests in Section 5.3 using different measures of target ratings.

In order to test for whether firms engage in earnings management activities when their current financial strength rating differs from their target financial strength rating, we employ the following ordinary least squares (OLS) regression:

$$RE_{i,t} = \beta_0 + \beta_1 Difference_{i,t} + \beta^j Firm_{i,t} + \sum_{F.E.}^{Year} + \epsilon_{i,t} \tag{3}$$

where $RE_{i,t}$ is reserve error scaled by total assets. $Difference_{i,t}$ is the difference between $Rating_{i,t}$ and a firm's target financial strength rating. $Firm_{i,t}$ is a vector of firm-level control variables to account for discretionary and non-discretionary determinants of a firms' loss reserve error.

We include variables beyond *Difference* to control for discretionary and non-discretionary incentives to manage the loss reserve. Long-tailed lines of business require more managerial discretion, which would provide managers more discretion over reserves (Miller, 2011). *Growth* controls for the incentive to under-reserve in an attempt to take advantage of growth opportunities. Harrington and Danzon (1994) find that firms will use reinsurance to attempt to hide this under-reserving, so we also include *Reinsurance*. *Net Inc* proxies for an insurer's

taxable income, as an insurer can over-reserve to delay its current tax liability (Petroni, 1992; Eckles and Halek, 2010). We include *Size* as larger insurers are likely to have advantages in accurately calculating reserves as they can, for example, hire more actuaries (Aiuppa and Trieschmann, 1987). *Product Diverse* and *Geo Herf* control for firm complexity, which is likely to increase the difficulty in correctly estimating the initial loss reserve. Managers of firms organized as mutuals are likely to have less discretion compared to managers of stock firms, so we include a mutual binary variable (Mayers et al., 1997; He and Sommer, 2010).[8] Firms organized as groups may also reserve differently compared to unaffiliated firms, so we include a group indicator variable (Powell et al., 2008). Firms may also have incentives to smooth earnings and could under-reserve in order to attain a positive profit (Beaver et al., 2003). We control for this incentive with *Small Profit*.

To test our second hypothesis, we examine how ratings change as a function of changes in other firm characteristics. Specifically, we are interested in whether changes in loss reserve errors will have an impact on subsequent ratings changes by A.M. Best. If firms are managing earnings to achieve a target financial strength rating, we would expect to observe changes in reserve errors resulting in a higher probability of a ratings change.

We, therefore, estimate the following OLS regression:

$$\begin{aligned}\Delta Rating_{i,t+1} = {} & \alpha_0 + \alpha_1 \Delta RE_{i,t} + \alpha_2 \Delta Size_{i,t} + \alpha_3 \Delta Reinsurance_{i,t} \\ & + \alpha_4 \Delta Geo\ Herf_{i,t} + \alpha_5 \Delta Product\ Diverse_{i,t} + \alpha_6 \Delta ROA_{i,t} \\ & + \alpha_7 \Delta Longtail_{i,t} + \alpha_8 \Delta Hurricane_{i,t} + \alpha_9 \Delta ROI_{i,t} \\ & + \alpha_{10} \Delta Kenny\ Ratio_{i,t} + \alpha_{11} \Delta Earthquake_{i,t} + \alpha_{12} \Delta Surplus_{i,t} \\ & + \sum_{F.E.}^{Year} + v_{i,t} \end{aligned} \tag{4}$$

[8]The insurance industry has multiple types of organizational forms, but stocks and mutuals are the most prominent. In firms organized as mutuals, policyholders act as the firms owners, whereas in stock firms the owners are the shareholders.

where $\Delta Rating_{i,t+1}$ is $Rating_{i,t+1} - Rating_{i,t}$. $\Delta RE_{i,t}$ is a firm's loss reserve error scaled by assets in year t minus $t-1$. All other variables are defined as they are above, but are measured as differences (i.e., the value in t minus the value in $t-1$). In this model we are looking to see whether changes in a firm's loss reserve error (RE) are associated with subsequent changes in a firm's financial strength rating. We anticipate that firms will under-reserve if they are below their target financial strength rating and over-reserve if they are above their target financial strength rating. Therefore, we would expect under-reserving (or, in this case, decreases in RE) to be associated with subsequent ratings upgrades. Additionally, we would expect over-reserving (or increases in RE) to be associated with subsequent ratings downgrades. Accoardingly, a negative estimated coefficient of $\Delta RE_{i,t}$ ($\alpha_1 < 0$) would be consistent with H2. We estimate this model with above-rating firms (positive *Difference*), below-rating firms (negative *Difference*), and all firms.

5. Results

5.1. Data

Our data on insurer financial strength ratings come from A.M. Best from 1992 to 2011.[9] Other insurer characteristics come from insurer's annual statutory filings with the NAIC from 1991 to 2011.[10] We include only property-liability insurers domiciled in the United States. Life and health insurers are excluded, as their managers have less discretion in reserving practices due to the existence of well-established actuarial tables (Petroni, 1992). Additionally, the statutory filings for life and health insurers do not contain sufficient data to calculate loss reserve errors.

Our final sample consists of firms who have been rated by A.M. Best and have data in

[9]We would like to thank A.M. Best for providing the ratings data in electronic form.

[10]The reserve error calculation requires five years of data. For example, the 2003 reserve error is calculated using data from 2007. Therefore, the most recent five years of available data (2007-2011) are excluded.

the statutory regulatory insurer filings. Our analysis is based on affiliated and unaffiliated individual insurers.[11,12] We keep only stock and mutual firms in our sample.[13] We exclude observations that are missing any of the variables needed for the analysis. Values of *Reinsurance*, *Geo Herf*, *Product Diverse*, and *Longtail* that are outside their theoretically possible range (i.e., less than zero or greater than one) are set equal to the bounded value. We exclude firms who have an A.M. Best financial strength rating that is lower than a "B-", as these firms are severely vulnerable to insolvency.[14] All continuous variables are winsorized at the 0.01 percent level.

Table 7 provides summary statistics for our sample. From 1992 to 2006, the sample consists of 16,821 firm-year observations which represents 1,870 unique firms. Using assets as a scaling factor, the average magnitude of RE is 0.87 percent. The median reserve error is positive, indicating that the majority of firms over-reserved in our sample, which is consistent with prior studies on reserve errors (e.g., Beaver et al., 2003; Gaver and Paterson, 2004; Grace and Leverty, 2010). Specifically, 60.5 percent of the firm-years in our sample had a firm over-reserving. The average firm in the sample has an A.M. Best financial strength rating between A- and A ($Rating$=2.54). The median rating is an A ($Rating$=3). The average value of *Difference* is -0.1551 which indicates that the average firm is below their expected financial strength rating.

[11]Some insurers are organized as a group, where they operate under common ownership with other insurance firms. For example, as of 2011, the Allstate Insurance Group is comprised of numerous subsidiaries, such as Allstate Fire and Casualty Insurance Company, Encompass Insurance Company, and Esurance Insurances Services. The NAIC statements provide financial information consolidated at the group level and also for each subsidiary. Approximately 80 percent of our sample firms are organized as groups, which is consistent with prior studies (Grace and Leverty, 2010, 2012)

[12]Eckles and Halek (2010), Eckles et al. (2011), and Eastman et al. (2015) conduct their analysis on groups and unaffiliated single insurers. Grace and Leverty (2010, 2012) conduct their analysis at the affiliated and unaffiliated single insurer level, but report that their results are robust to conducting analysis at the group and unaffiliated insurer level.

[13]This restriction results in the exclusion of Reciprocals, Lloyd's organizations, and Risk Retention Groups.

[14]This is consistent with Alissa et al. (2013), who find that their results do not change based on restricting their sample to firms with an S&P rating greater than B-.

5.2. Main Results

Table 8 provides the results from our OLS model examining whether deviation from a target financial strength rating is a significant determinant of insurer loss reserve errors. The dependent variable is loss reserve error scaled by total assets (RE). Standard errors are presented beneath each coefficient estimate in parentheses. Standard errors are bootstrapped and account for firm-level clustering. A potential issue with Alissa et al. (2013) is that they do not account for the presence of an estimated independent variable in their estimation. Since we follow their methodology, *Difference* contains an estimate (from our ordered probit models) of each firm's target rating. We perform 1,000 bootstrap replications to deal with any issues related to *Difference* being a generated regressor (Pagan, 1984).[15]

The variable of interest, *Difference*, is positive and statistically significant. This is consistent with H1, and suggests that firms above their target financial strength rating (positive *Difference*) will tend to over-reserve, while firms below their target financial strength rating (negative *Difference*) will tend to under-reserve. This provides evidence that firms manage loss reserves in an attempt to attain a target financial strength rating.

5.3. Additional Tests

One potential issue with the analysis in Alissa et al. (2013) and our prior analysis is whether we are accurately capturing a firm's actual target financial strength rating. We, therefore, in the following sections, consider three alternative measures of a firm's target financial strength rating.

[15]In untabulated results, we also perform feasible generalized least squares estimation of our model. Prior studies, such as Grace and Leverty (2012) and Eastman et al. (2015) use this methodology in estimating the determinants of reserve errors. Our results are statistically consistent with the results presented in the paper.

5.3.1. Commercial Insurers

A particular advantage of focusing on the P/L insurance industry is that we have a subset of firms where we can identify a particular target rating. Specifically, P/L insurers who write predominantly commercial lines have particularly strong incentives to target a rating of at least A-. Prior research, such as Epermanis and Harrington (2006) and Halek and Eckles (2010), find evidence that a rating of A- is particularly important for insurers. Epermanis and Harrington (2006) finds evidence that commercial insurers experience a significant decline in net premiums written following the loss of an A- rating. Halek and Eckles (2010) find evidence that publicly traded insurers suffer large negative abnormal returns following the loss of a rating of A-.

In order to test whether insurers particularly target a rating of A-, we employ the following ordinary least squares (OLS) regression:

$$RE_{i,t} = \psi_0 + \psi_1 Above\ A\text{-}_{i,t} + \psi_2 Below\ A\text{-}_{i,t} + \psi^j Firm_{i,t} + \sum_{F.E.}^{Year} + \epsilon_{i,t} \tag{5}$$

where $RE_{i,t}$ is reserve error scaled by total assets. $Above\ A\text{-}_{i,t}$ is a binary variable equal to one if a firm has an actual financial strength rating above A- and zero otherwise. $Below\ A\text{-}_{i,t}$ is a binary variable equal to one if a firm has an actual financial strength rating below A- and zero otherwise. $Firm_{i,t}$ is a vector of firm-level control variables to account for discretionary and non-discretionary determinants of a firms' loss reserve error. A positive estimate of ψ_1 would be consistent with over-reserving when a firm is above their target rating, while a negative estimate of ψ_2 would be consistent with under-reserving when a firm is below their target rating. In this case we are particularly focusing on firms operating in commercial lines, since a rating of A- is particularly important for these firms (Epermanis and Harrington, 2006; Halek and Eckles, 2010). Accordingly, we estimate this model for firms writing at least

a certain amount of commercial lines.[16] Specifically, we estimate equation (5) separately for firms writing at least 60, 70, 80, and 90 percent of net premiums written in commercial lines.

Table 9 provides OLS estimates of the determinants of reserve errors for firms writing at least 60, 70, 80, and 90 percent of net premiums in commercial lines in columns (1), (2), (3), and (4), respectively. The dependent variable is reserve error scaled by total assets (RE). The variables of interest are *Below A-*, where we predict a negative sign, and *Above A-*, where we predict a positive sign. Standard errors are presented beneath each coefficient estimate and are clustered at the firm level. All regressions include year fixed-effects.

In all four regressions, the estimated coefficient of *Below A-* is negative and statistically significant. This provides evidence that firms with a financial strength rating below A- tend to under-reserve. We suggest that this under-reserving is in an effort to attain a rating of at least A-. However, we do not find that the estimated coefficient of *Above A-* is statistically significant in any of the four regressions. One potential explanation for this is that firms below a target rating have a stronger incentive to manage reserves to achieve a higher rating compared to firms below their target rating. The penalties for having a lower rating are often more severe compared to those for having a higher rating. For example, Epermanis and Harrington (2006) finds that firms experiencing a ratings downgrade see a larger and statistically stronger decline in net premiums written compared to firms experiencing an upgrade. Similarly, Halek and Eckles (2010) find that there is an asymmetric response to ratings changes from the stock market, where downgrades experience a larger decline in stock price compared to ratings upgrades. Another potential explanation is that we are not accurately capturing a firm's target rating if it is above A-. We believe that A- is a good lower-bound as a target rating for insurers writing predominantly commercial lines.

[16] Consistent with Cummins and Xie (2013) we define the following lines as commercial: fire, allied lines, commercial multi peril, mortgage guaranty, ocean marine, inland marine, financial guaranty, medical malpractice, group accident and health, credit accident and health, workers' compensation, other liability, products liability, commercial auto liability, aircraft, fidelity, surety, burglary and theft, boiler and machinery, credit, international, and reinsurance.

However, if certain firms in the sample have targets that are above A-, we would not observe over-reserving to try to get to A-, since that is below their target. Overall, however, we provide evidence that firms below A- tend to under-reserve to achieve a rating of at least A-, which is consistent with our hypothesis.

5.3.2. Past Ratings as Target Ratings

Another potential way to measure a firm's target financial strength rating is to look at a firm's past rating. If a firm's target is relatively consistent over time and a firm generally is at its target rating, this measure should capture a firm's target rating and any deviation from it in the current period. Accordingly, we calculate five targets using a firm's past rating. Specifically, we use a firm's rating last year (*Rating* in $t-1$) as well as the firm's rolling average financial strength rating over the past two, three, four, and five years. For each of these measures of target, we construct *Difference* as before, where it is a firm's *Rating* minus target rating. We then re-estimate equation 3, again controlling for discretionary and non-discretionary determinants of a firm's loss reserve error.

Table 10 provides results for our OLS estimation of the determinants of insurer reserve error. Column (1) measures *Difference* as the difference between *Rating* and last year's financial strength rating. Columns (2), (3), (4), and (5) measure *Difference* as *Rating* minus the average of *Rating* over the past 2, 3, 4, and 5 years, respectively. Firm-level clustered standard errors are presented beneath each coefficient estimate.[17] A positive estimated coefficient for the *Difference* variables would support our hypothesis that firms under (above) their target rating tend to under- (over-)reserve.

Consistent with our main results, we find evidence that firms manage earnings to try to achieve a target rating. Specifically, we find that firms under (above) their target rating tend to under- (over-)reserve. These results using past ratings to measure a firm's target rating

[17] Unlike in our main results, we do not bootstrap these standard errors since *Difference* no longer contains an estimated component, as was the case when measuring target rating using an ordered probit model.

are consistent with our results and those of Alissa et al. (2013) which use an ordered probit model to estimate a target rating.

5.3.3. Alternative Target Rating Estimation

Prior empirical work in corporate finance has examined the speed with which firms adjust to their target capital structure (Flannery and Rangan, 2006). An alternative to measuring a target rating as in Alissa et al. (2013) is to use the methodology of studies examining adjustment towards target capital structure, but instead substitute a target rating. The limitation of this methodology is that leverage is a continuous variable, while rating is discrete. The methodology of calculating target leverage generally relies on using a lagged dependent variable (leverage normally, but financial strength rating in our case). An issue here would be that there is no well-established econometric method to include a lagged dependent variable in an ordered probit model, which is how studies would normally estimate a ratings-determinants model (Pottier and Sommer, 1999; Gaver and Pottier, 2005). We, therefore, run the model treating *Rating* as though it were continuous. While this has clear limitations, taken with our prior evidence, this can provide additional support for our hypotheses.

In adopting the Flannery and Rangan (2006) model, we first model a firm's target financial strength rating as a function of various firm characteristics related to firm insolvency risk:

$$Rating^{*}_{i,t} = \beta X_{i,t-1} \tag{6}$$

where $Rating^{*}$ is a firm's target financial strength rating and X is a vector of firm characteristics related to a firm's financial strength rating. We use the same variables in this model as we used previously in the ordered probit estimation.

In the absence of any frictions, we would expect a firm to always be at its target rating. However, in the presence of frictions, there is the potential for a firm to deviate. In this case,

we would expect a firm to make adjustments to move towards its target rating. Again, taking from the Flannery and Rangan (2006) model, the partial adjustment model is as follows:

$$Rating_{i,t} - Rating_{i,t-1} = \lambda \left(Rating^{*}_{i,t} - Rating_{t-1} \right) + \delta_{i,t} \tag{7}$$

where each year a firm closes a certain proportion of the gap between it's actual rating (*Rating*) and its target rating (*Rating**). This proportion of the gap is λ in equation (7). We can then substitute equation (6) into equation (7), which provides the following model:

$$Rating_{i,t} = \lambda \beta X_{i,t-1} + (1 - \lambda)\, Rating_{i,t-1} + \delta_{i,t} \tag{8}$$

We can now empirically estimate this model, where *Rating* is a function of a firm's past rating (at $t-1$) and a vector of firm-specific characteristics. We can specifically estimate the value of the speed of adjustment, λ. We can then rearrange equation (7), which will give us an empirical estimate of target rating as follows:

$$Rating^{*}_{i,t} = \frac{1}{\lambda} \left[Rating_{i,t} - Rating_{i,t-1} - \delta_{i,t} \right] + Rating_{i,t-1} \tag{9}$$

We can then calculate *Difference* as before, where *Difference* is defined as *Rating* minus *Rating** from equation (9). We then estimate equation (3) with this alternative definition of target rating.

Table 11 provides estimates from an OLS estimation of a firm's target rating in column (1), and the determinants of loss reserve errors in column (2). In column (1) the dependent variable is *Rating*. The independent variables are the same as used in the ordered probit models earlier in this paper. However, we include *Lag Rating*, which is a firm's financial strength rating at $t-1$. Based on the estimated coefficient of *Lag Rating*, we construct *Difference*, using the target rating defined in equation (9).

The dependent variable in column (2) is reserve error scaled by total assets. The main variable of interest, *Difference* is defined as *Rating* minus *Rating**, as defined in equation (9). Standard errors are presented beneath each coefficient estimate. The standard errors are bootstrapped from 1,000 replications. As mentioned previously, we have a generated regressor in this model, so we must account for that through bootstrapping (Pagan, 1984).

The estimated coefficient on *Difference* is positive and statistically significant at the one percent level. This provides evidence that firms above their target rating (positive *Difference*) tend to over-reserve, while firms below their target rating (negative *Difference*) tend to under-reserve. These results are consistent with Alissa et al. (2013) and prior sections of our study, and provide robust evidence that firms with deviations from their target rating manage reserves.

5.4. Subsequent Ratings Changes

We have, thus far, provided robust evidence that firms below their target rating tend to under-reserve. We have also provided some evidence that firm above their target rating tend to over-reserve. The next question that we address is whether A.M. Best responds to this reserve management with a subsequent ratings change. If below-rating firms are able to improve their perceived performance through reserve manipulation in a way that A.M. Best cannot detect, we would expect to see under-reserving associated with subsequent financial strength ratings upgrades. Similarly, if above-rating firms are able to worsen their perceived performance through reserve manipulation in a way that A.M. Best cannot detect, we would expect to see over-reserving associated with subsequent financial strength ratings downgrades.

Table 12 provides our OLS estimation of equation (4), examining how changes in firm characteristics impact subsequent financial strength ratings changes. The dependent variable, $\Delta Rating$ is a firm's financial strength rating in $t+1$ minus a firm's financial strength

rating in t. So, a positive value indicates a ratings upgrade, while a negative value indicates a ratings downgrade. The main variable of interest, ΔRE is a firm's loss reserve error scaled by total assets in period t minus reserve error scaled by total assets in period $t-1$. We estimate this model separately for firms above target rating (positive *Difference*), firms below target rating (negative *Difference*), and all firms. These results are presented in columns (1), (2), and (3), respectively. Robust standard errors are presented beneath each coefficient estimate and account for firm-level clustering.

We find that the estimated coefficient for ΔRE is negative and significant in all three regressions presented in table 12. This suggests that firms that have a positive change in RE are more likely to experience a ratings downgrade, while firms with a negative change in RE are more likely to experience a subsequent ratings upgrade. In other words, firms that over-reserve less, under-reserve more, or go from over- to under-reserving are more likely to observe a subsequent ratings upgrade. Similarly, firms that over-reserve more, under-reserve less, or go from under- to over-reserving are more likely to observe a subsequent ratings downgrade. This is consistent with our hypothesis that firms can manipulate reserves in order to achieve a target financial strength rating.

6. Conclusion

In this paper we provide evidence that firms manage their loss reserves in an effort to attain a target financial strength rating from A.M. Best. Specifically, firms that are above (below) their expected financial strength rating tend to over- (under-) reserve. This is consistent with the findings of Alissa et al. (2013) who find similar results using accruals and real activities measures of earnings management. Using loss reserve errors provides strong support for firms managing earnings in an attempt to achieve a target rating. We additionally provide several additional tests, where we consider alternative definitions of a target rating and find our results to be consistent.

We also find evidence that firms achieve subsequent ratings changes through reserve management. Looking at changes in reserve errors, we find evidence that a negative change in loss reserve error results in a higher probability of a subsequent ratings upgrade, while a positive change increases the probability that a firm is subsequently downgraded. This is consistent with firms' behavior of under-reserving when below their target rating and over-reserving when above their target rating. This evidence suggests that firms are able to manage reserves in a way that increases perceived performance, and results in ratings changes.

The results in this paper contribute to the literature on insurer reserve manipulation as well as financial strength ratings. We are the first to provide evidence of loss reserve management vis-à-vis financial strength ratings. The deviations from a target rating are found to provide a marginal incentive to manage reserves after controlling for other factors that are determinants of loss reserve errors. Additionally, we are the first study to apply the idea of a target rating to insurer financial strength ratings. We find evidence that firms have a target rating and that ratings converge to the target rating over time. We also provide evidence that loss reserve errors are a determinant in ratings changes and that firms can influence their rating through reserve management.

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Table 1: Excerpt from Schedule P—Part 2

Excerpt from the 2011 Annual Statement of ACE American Ins Co.

NAIC Property-Liability Annual Statement: Schedule P—Part 2—Summary

Incurred Net Losses and Defense and Cost Containment Expenses Reported at Year End ($000 omitted)

1	2	3	4	5	6	7	8	9	10	11
Accident Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Prior	5,078,038	5,071,351	5,797,589	6,254,020	6,226,103	6,196,693	6,272,376	6,319,513	6,380,162	6,556,014
2002	1,500,643	1,577,357	1,781,499	1,694,376	1,764,741	1,730,440	1,693,571	1,701,902	1,710,655	1,698,728
2003		2,287,425	2,070,036	2,193,082	2,128,955	2,009,994	2,005,987	1,950,893	1,965,579	1,922,897
2004			2,888,365	2,592,836	2,603,694	2,278,069	2,235,793	2,246,927	2,187,825	2,172,853
2005				3,435,994	3,284,263	2,962,984	2,845,413	2,812,629	2,784,845	2,774,656
2006					3,062,746	2,886,813	2,880,132	2,813,843	2,753,745	2,601,211
2007						3,285,381	3,003,720	2,927,313	2,893,535	2,896,689
2008							3,516,789	3,555,336	3,548,912	3,519,332
2009								2,782,336	2,690,015	2,637,746
2010									2,942,142	2,952,660
2011										3,452,200

Note: This table is an excerpt from the National Association of Insurance Commissioner's annual statutory filing. Schedule P—Part 2 data are used to construct loss reserve errors. Loss reserve errors are defined as $Error_{i,t} = IncurredLosses_{i,t} - IncurredLosses_{i,t+n}$. We use 5-year errors, so $n = 5$. For the firm-year represented in the above table, we sum the top 6 values in column 6, (which equal 19,070,502) and subtract from that the sum of values in column 11 (17,726,359). The loss reserve error equals 1,344,143. Here, the firm over-reserved by approximately $1.3 billion. In general, a negative number indicates under-reserving, while a positive value indicates over-reserving.

Table 2: Ordered Probit Regression Results: 1992-2001

Dependent Variable: *Rating*								
	1992	1993	1994	1995	1996	1997	1998	1999
Size	0.3148***	0.2950***	0.3415***	0.3405***	0.3266***	0.3264***	0.3500***	0.4097***
	(0.0280)	(0.0286)	(0.0299)	(0.0282)	(0.0296)	(0.0271)	(0.0277)	(0.0303)
Hurricane	-0.0818	-0.0951	-0.0955	-0.0873	-0.2042*	-0.3050***	-0.1679	-0.1998
	(0.1153)	(0.1110)	(0.1093)	(0.1090)	(0.1138)	(0.1155)	(0.1090)	(0.1216)
Product Diverse	0.0195	0.1839	0.0861	0.1797	0.2986**	0.3251***	0.3383***	0.2878**
	(0.1341)	(0.1304)	(0.1268)	(0.1158)	(0.1207)	(0.1162)	(0.1121)	(0.1168)
Longtail	-0.0913	0.0432	0.0306	0.0300	0.1023	0.0843	-0.0537	0.1223
	(0.1284)	(0.1231)	(0.1189)	(0.1149)	(0.1199)	(0.1178)	(0.1150)	(0.1245)
Reinsurance	0.3423**	0.3733***	0.6738***	0.5233***	0.4776***	0.6226***	0.8135***	1.0679***
	(0.1355)	(0.1354)	(0.1405)	(0.1353)	(0.1377)	(0.1404)	(0.1340)	(0.1444)
Growth	0.1046*	0.0025	0.1725**	0.2129***	0.0654	0.1109**	0.1405*	0.1299**
	(0.0619)	(0.0447)	(0.0691)	(0.0793)	(0.0559)	(0.0559)	(0.0733)	(0.0524)
Geo Herf	0.0127	-0.1007	-0.1295	-0.2181**	-0.1486	-0.2231**	-0.2475**	-0.1992*
	(0.1051)	(0.1020)	(0.1003)	(0.0995)	(0.1025)	(0.1075)	(0.1056)	(0.1101)
ROA	0.6090	4.5245***	3.4179***	4.4644***	3.6797***	3.9349***	2.6021***	3.5464***
	(0.7831)	(0.8443)	(0.8232)	(0.8892)	(0.9036)	(0.9011)	(0.7983)	(0.9066)
ROI	-1.1722	-5.1663***	4.7474**	-2.4201	-3.7648*	-1.9143	-2.0223	-4.4718*
	(1.7128)	(1.6974)	(2.1482)	(2.1381)	(2.1672)	(2.1163)	(1.8059)	(2.3352)
Kenny Ratio	-0.2165***	-0.1059	-0.1156*	-0.2085***	-0.0544	-0.1364*	-0.1460**	-0.0501
	(0.0632)	(0.0657)	(0.0645)	(0.0636)	(0.0664)	(0.0704)	(0.0742)	(0.0793)
Earthquake	2.8072	1.7007	5.3864	-1.6208	-1.2017	3.7460	2.3382	-6.4742**
	(4.0796)	(5.4041)	(4.0222)	(3.4265)	(3.1870)	(3.7413)	(4.2441)	(3.0605)
Surplus-to-Assets	1.8773***	1.8482***	2.0315***	1.8122***	2.0384***	1.4574***	0.9835***	1.8459***
	(0.2910)	(0.2994)	(0.3046)	(0.2838)	(0.3112)	(0.2897)	(0.2770)	(0.3162)
Group	0.2454***	0.2887***	0.2610***	0.3384***	0.3562***	0.3271***	0.3382***	0.4184***
	(0.0882)	(0.0857)	(0.0854)	(0.0799)	(0.0817)	(0.0830)	(0.0810)	(0.0876)
Observations	1,173	1,240	1,246	1,277	1,187	1,131	1,126	1,104
Wald χ^2	363.89	367.01	470.24	535.67	469.31	490.53	518.99	717.09
Model p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pseudo-R^2	0.0902	0.0927	0.1181	0.1151	0.1099	0.1191	0.1164	0.1467

Note: This table presents results from cross-section estimates of an ordered probit model for years 1992-2001. The dependent variable, *Rating* is a firm's A.M. Best financial strength rating, where 4 corresponds to ratings A++ and A+, 3 corresponds to rating A, 2 corresponds to rating A-, 1 corresponds to ratings B++ and B+, and 0 corresponds to all lower ratings.. *Size* is the natural log of a firm's assets. *Product Diverse* is 1 minus a line-of-business Herfindahl index. *Longtail* is the percentage of premiums written in long-tailed lines. *Reinsurance* is reinsurance ceded divided by the sum of reinsurance assumed and direct premiums written. *Geo Diverse* is a Herfindahl index of direct premiums written in the 50 U.S. states and Washington D.C. *Growth* is the change in net premiums written from year $t-1$ to year t. *ROA* is a firm's net income divided by total assets in year t. *ROI* is a firm's net investment income divided by total assets in year t. *Kenny Ratio* is net premiums written divided by policyholder surplus. *Earthquake* is the percentage of net premiums written in earthquake insurance. *Surplus* is policyholder surplus divided by total assets. *Group* is a binary variable equal to 1 if a firm is a member of a group and 0 otherwise. *Hurricane* is the percentage of direct premiums written in hurricane-prone states. Constants and threshold parameters are omitted. Robust standard errors are in parentheses beneath each coefficient estimate. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 3: Ordered Probit Regression Results: 2000-2006

Dependent Variable: *Rating*

	2000	2001	2002	2003	2004	2005	2006
Size	0.4134***	0.4468***	0.3923***	0.3583***	0.3730***	0.3851***	0.3683***
	(0.0291)	(0.0298)	(0.0279)	(0.0281)	(0.0279)	(0.0304)	(0.0293)
Hurricane	-0.1380	-0.0808	-0.1336	-0.0875	0.0691	-0.0365	-0.1037
	(0.1046)	(0.1075)	(0.1015)	(0.0995)	(0.1013)	(0.1034)	(0.1067)
Product Diverse	0.1383	0.3391***	0.1567	0.4006***	0.2469**	0.0904	0.1492
	(0.1090)	(0.1116)	(0.1099)	(0.1066)	(0.1177)	(0.1161)	(0.1106)
Longtail	-0.0154	-0.0531	-0.1392	-0.2481**	-0.0596	-0.0331	-0.1346
	(0.1125)	(0.1124)	(0.1113)	(0.1134)	(0.1215)	(0.1194)	(0.1223)
Reinsurance	0.7979***	0.5279***	0.4589***	0.3313***	0.5595***	0.8916***	0.8045***
	(0.1397)	(0.1383)	(0.1292)	(0.1266)	(0.1375)	(0.1446)	(0.1391)
Growth	0.1200*	0.0083	0.1566***	0.1908**	0.1134**	-0.0529	-0.0769
	(0.0637)	(0.0523)	(0.0417)	(0.0779)	(0.0450)	(0.0696)	(0.0630)
Geo Herf	-0.1625	-0.0224	0.0846	0.0396	-0.1136	-0.1521	-0.2115**
	(0.1082)	(0.1039)	(0.1021)	(0.1035)	(0.1035)	(0.1054)	(0.1042)
ROA	3.8348***	2.0846**	3.2730***	3.6092***	5.0442***	3.4309***	4.7123***
	(0.8198)	(0.8548)	(0.8366)	(0.9490)	(0.8706)	(0.9978)	(1.0103)
ROI	-5.7571***	0.0556	-2.7779	-2.9301	0.0999	1.5788	-8.1043***
	(1.9437)	(2.0256)	(1.7508)	(2.0175)	(2.3672)	(3.0043)	(2.6945)
Kenny Ratio	-0.0833	-0.1329*	-0.1763***	-0.0884	-0.0350	-0.0306	-0.1229
	(0.0712)	(0.0723)	(0.0673)	(0.0667)	(0.0755)	(0.0861)	(0.0953)
Earthquake	4.6685	6.3356	-4.8563	-5.8567**	-3.2972	-0.3391	1.6755
	(4.1863)	(4.4331)	(3.0033)	(2.6723)	(3.0965)	(4.4533)	(4.0110)
Surplus-to-Assets	1.3379***	1.7545***	1.2780***	1.5099***	1.9744***	1.9203***	1.7828***
	(0.2848)	(0.2945)	(0.3014)	(0.2739)	(0.3169)	(0.3392)	(0.3384)
Group	0.5241***	0.4416***	0.4740***	0.4403***	0.3526***	0.3350***	0.3785***
	(0.0820)	(0.0797)	(0.0759)	(0.0753)	(0.0777)	(0.0822)	(0.0786)
Observations	1,220	1,220	1,201	1,140	1,182	1,167	1,208
Wald χ^2	588.96	565.42	539.44	504.45	539.64	650.69	610.24
Model p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Pseudo-R^2	0.1239	0.1167	0.1203	0.1195	0.1259	0.1406	0.1362

Note: This table presents results from cross-section estimates of an ordered probit model for years 2002-2011. The dependent variable, *Rating* is a firm's A.M. Best financial strength rating where 4 corresponds to ratings A++ and A+, 3 corresponds to rating A, 2 corresponds to rating A-, 1 corresponds to ratings B++ and B+, and 0 corresponds to all lower ratings. *Size* is the natural log of a firm's assets. *Product Diverse* is 1 minus a line-of-business Herfindahl index. *Longtail* is the percentage of premiums written in long-tailed lines. *Reinsurance* is reinsurance ceded divided by the sum of reinsurance assumed and direct premiums written. *Geo Diverse* is a Herfindahl index of direct premiums written in the 50 U.S. states and Washington D.C. *Growth* is the change in net premiums written from year $t-1$ to year t. *ROA* is a firm's net income divided by total assets in year t. *ROI* is a firm's net investment income divided by total assets in year t. *Kenny Ratio* is net premiums written divided by policyholder surplus. *Earthquake* is the percentage of net premiums written in earthquake insurance. *Surplus* is policyholder surplus divided by total assets. *Group* is a binary variable equal to 1 if a firm is a member of a group and 0 otherwise. *Hurricane* is the percentage of direct premiums written in hurricane-prone states. Constants and threshold parameters are omitted. Robust standard errors are in parentheses beneath each coefficient estimate. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 4: Distribution of Actual Ratings compared to Target Ratings

	Target Rating								
Actual Rating	A++	A+	A	A-	B++	B+	B	B-	Total Actual
A++	223	485	585	124	0	0	0	0	1,417
A+	161	1,119	2,209	791	0	0	0	0	4,280
A	86	1,015	3,735	2,140	2	8	1	1	6,988
A-	25	428	2,370	3,231	4	38	2	2	6,100
B++	3	46	446	1,486	11	63	13	16	2,084
B+	1	34	210	1,179	10	153	25	42	1,654
B	0	2	84	655	8	67	9	27	852
B-	0	4	31	249	4	51	10	36	385
Total Expected	499	3,133	9,670	9,855	39	380	60	124	23,760

Note: This table shows the distribution of actual financial strength ratings by expected financial strength ratings. Expected ratings are calculated based on Equation 2 and the results from Table 3. Expected ratings are the rating level with the highest fitted probability from Equation 2. Actual ratings are presented by row and expected ratings are presented by column.

Table 5: Reserve Errors by Intersection of Actual and Target Ratings

	Actual Rating							
Target Rating	A++	A+	A	A-	B++	B+	B	B-
A++	-0.0182	0.0179	0.0089	0.0223				
A+	-0.0270	0.0136	0.0005	0.0056				
A	-0.0308	0.0003	0.0066	0.0234	0.1948	0.0015	0.0102	
A-	-0.0050	-0.0048	0.0075	0.0215	-0.1634	-0.0020	0.0369	-0.0246
B++	0.0026	0.0359	0.0097	0.0116	0.0669	0.0036	0.0114	0.0384
B+	-0.0855	-0.0117	-0.0260	0.0137	-0.0089	0.0212	0.0409	0.0005
B		-0.0094	-0.0054	-0.0161	0.0668	0.0058	0.0288	-0.1021
B-		0.1054	-0.0397	-0.0074	-0.0146	-0.0142	0.0445	-0.0735

Note: This table shows the average loss reserve error by the intersection of actual and target rating. Positive values indicate over-reserving while negative values indicate under-reserving.

Table 6: Reversion to Target Ratings

Dependent Variable: $\Delta Difference_{t+k}$

	t+1	t+3	t+5
$Difference_t$	-0.1747***	-0.0601***	-0.0492
	(-45.1175)	(-4.4773)	(-0.8626)
Intercept	-0.0200***	-0.0173	-0.0028
	(-3.9790)	(-1.0004)	(-0.0380)
R^2	0.0955	0.0016	0.0001
Observations	19,278	12,551	7,972

Note: This table reports results from ordinary least squares regressions.The dependent variable is $\Delta Difference_{t+k}$. *Difference* is *Rating* minus a firm's target rating. t-statistics are presented in parentheses beneath each coefficient estimate. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 7: Descriptive Statistics

				Percentiles					
Variable	Mean	Std.	Min	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}	Max
RE	0.0087	0.0926	-0.4675	-0.0818	-0.0181	0.0107	0.0479	0.0961	0.3346
Difference	-0.1551	1.0582	-4.0000	-1.0000	-1.0000	0.0000	0.0000	1.0000	3.0000
Rating	2.5403	1.1767	0.0000	1.0000	2.0000	3.0000	4.0000	4.0000	4.0000
Size	18.3496	1.7302	14.7288	16.2156	17.0808	18.2187	19.4862	20.6925	23.0220
Reinsurance	0.3778	0.2841	0.0000	0.0381	0.1298	0.3191	0.5916	0.8140	1.0000
Geo Herf	0.5287	0.3744	0.0434	0.0711	0.1472	0.4719	1.0000	1.0000	1.0000
Mutual	0.2453	0.4303	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000
Product Diverse	0.4676	0.3064	0.0000	0.0000	0.1489	0.5651	0.7127	0.8007	1.0000
Net Inc	0.0129	0.0422	-0.0404	-0.0009	0.0002	0.0017	0.0076	0.0281	0.3038
Longtail	0.6716	0.2806	0.0000	0.0859	0.6147	0.7331	0.8493	0.9896	1.0000
Group	0.7678	0.4223	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Growth	0.1748	0.6610	-1.0000	-0.1734	-0.0309	0.0596	0.1820	0.4499	4.8269
Small Profit	0.0331	0.1788	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Small Loss	0.0076	0.0866	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Profit	0.7598	0.4272	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Hurricane	0.2215	0.3175	0.0000	0.0000	0.0000	0.0653	0.2934	0.8990	1.0000
ROI	0.0465	0.0202	-0.0086	0.0233	0.0335	0.0452	0.0573	0.0693	0.1262
Earthquake	0.0018	0.0071	0.0000	0.0000	0.0000	0.0000	0.0004	0.0038	0.0626
Surplus-to-Assets	0.4250	0.1841	0.1173	0.2336	0.2905	0.3777	0.5191	0.7086	0.9996

Note: This table reports descriptive statistics for the years 1992 to 2006. The full sample is 16,821 firm-years, consisting of 1,870 unique firms. *RE* is the five-year loss reserve error scaled by total assets. *Rating* is a firm's A.M. Best financial strength rating, where 4 corresponds to ratings A++ and A+, 3 corresponds to rating A, 2 corresponds to rating A-, 1 corresponds to ratings B++ and B+, and 0 corresponds to all lower ratings. *Difference* is the difference between *Rating* and a firm's target rating. *Size* is the natural log of total assets. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Geo Herf* is the geographic Herfindahl index. *Product Diverse* is 1 minus the line of business Herfindahl index. *ROA* is a firm's net income scaled by total assets. *Longtail* is the proportion of premiums written in longtailed lines. *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. *Growth* is the one year change in net premiums written. *ROI* is a firm's net investment income divided by total assets in year t. *Kenny Ratio* is net premiums written divided by policyholder surplus. *Earthquake* is the percentage of net premiums written in earthquake insurance. *Surplus* is policyholder surplus divided by total 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 8: Main Regression Results

Dependent Variable: Reserve Error	
Difference	0.0023**
	(0.0011)
Size	-0.0028**
	(0.0011)
Reinsurance	-0.0371***
	(0.0049)
Geo Herf	0.0087*
	(0.0047)
Mutual	0.0089**
	(0.0038)
Product Diverse	-0.0041
	(0.0056)
Net Inc	0.0060
	(0.0273)
Longtail	0.0140**
	(0.0064)
Group	0.0015
	(0.0051)
Growth	-0.0015
	(0.0013)
Small Profit	0.0021
	(0.0052)
Small Loss	0.0143*
	(0.0083)
Profit	0.0215***
	(0.0026)
Constant	0.0457**
	(0.0212)
Year FE	Yes
R^2	7.61%
Wald χ^2	605.42
Observations	16,821

Note: This table reports coefficient estimates from OLS estimation. The dependent variable, *RE* is a firm's loss reserve error scaled by total assets. *Difference* is a firm's financial strength rating (*Rating*) minus a firm's target rating. Standard errors are presented beneath each coefficient estimate. Bootstrapped standard errors are from 1,000 replications and account for firm-level clustering. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 9: Commercial Lines Regression Results

Dependent Variable: Reserve Error

	>60%	>70%	>80%	>90%
Below A-	-0.0135**	-0.0162**	-0.0160**	-0.0137*
	(0.0064)	(0.0068)	(0.0075)	(0.0081)
Above A-	0.0014	-0.0004	-0.0011	-0.0002
	(0.0042)	(0.0045)	(0.0049)	(0.0055)
Size	-0.0063***	-0.0071***	-0.0076***	-0.0067***
	(0.0017)	(0.0018)	(0.0020)	(0.0023)
Reinsurance	-0.0415***	-0.0432***	-0.0447***	-0.0435***
	(0.0076)	(0.0083)	(0.0091)	(0.0102)
Geo Herf	0.0039	0.0043	0.0061	0.0108
	(0.0064)	(0.0069)	(0.0076)	(0.0084)
Product Diverse	-0.0003	0.0068	0.0114	0.0171*
	(0.0076)	(0.0081)	(0.0088)	(0.0093)
Net Inc	0.0217	0.0215	0.0203	0.0535
	(0.0407)	(0.0448)	(0.0510)	(0.0530)
Longtail	0.0233***	0.0241***	0.0231***	0.0238***
	(0.0069)	(0.0070)	(0.0073)	(0.0077)
Mutual	0.0186***	0.0216***	0.0257***	0.0255***
	(0.0063)	(0.0072)	(0.0082)	(0.0092)
Group	-0.0093	-0.0110	-0.0096	-0.0101
	(0.0067)	(0.0071)	(0.0076)	(0.0082)
Growth	-0.0006	-0.0008	-0.0003	-0.0003
	(0.0018)	(0.0019)	(0.0020)	(0.0022)
Small Profit	0.0101	0.0089	0.0093	0.0081
	(0.0088)	(0.0100)	(0.0108)	(0.0115)
Small Loss	0.0102	0.0122	-0.0006	-0.0019
	(0.0184)	(0.0200)	(0.0223)	(0.0249)
Profit	0.0326***	0.0370***	0.0398***	0.0400***
	(0.0041)	(0.0045)	(0.0051)	(0.0057)
Intercept	0.1031***	0.1094***	0.1139***	0.0972**
	(0.0326)	(0.0352)	(0.0393)	(0.0435)
Year FE	Yes	Yes	Yes	Yes
F-Stat	17.95	15.71	12.96	10.86
R^2	10.15%	10.11%	10.07%	9.83%
Observations	10,259	9,010	7,669	6,388

Note: This table reports results from OLS regressions. The dependent variable is loss reserve error scaled by total assets. Columns (1), (2), (3), and (4) are for firms writing at least 60, 70, 80, and 90 percent of net premiums in commercial lines, respectively. *Below A-* is a binary variable equal to 1 if a firm has a rating below A-, and 0 otherwise. *Above A-* is a binary variable that is equal to 1 if a firm has a rating above A-, and 0 otherwise. *Size* is the natural log of total assets. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Geo Herf* is the geographic Herfindahl index. *Product Diverse* is 1 minus the line of business Herfindahl index. *ROA* is a firm's net income divided by assets. *Longtail* is the proportion of premiums written in longtailed lines. *Mutual* is a binary variable equal to 1 if a firm has a mutual organization structure. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Growth* is the one year change in net premiums written. *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 regressions include year indicators. Standard errors are presented beneath each coefficient estimate in parentheses and account for firm-level clustering. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 10: Past Rating as Target Results

Dependent Variable: Reserve Error

	(1)	(2)	(3)	(4)	(5)
Difference: Last Year	0.0073***				
	(0.0020)				
Difference: 2 Years		0.0074***			
		(0.0022)			
Difference: 3 Years			0.0077***		
			(0.0023)		
Difference: 4 Years				0.0060**	
				(0.0025)	
Difference: 5 Years					0.0062**
					(0.0027)
Size	-0.0031***	-0.0029**	-0.0024*	-0.0019	-0.0012
	(0.0012)	(0.0012)	(0.0013)	(0.0015)	(0.0016)
Reinsurance	-0.0353***	-0.0336***	-0.0324***	-0.0318***	-0.0291***
	(0.0049)	(0.0054)	(0.0060)	(0.0068)	(0.0077)
Geo Herf	0.0054	0.0059	0.0070	0.0079	0.0093
	(0.0046)	(0.0049)	(0.0053)	(0.0059)	(0.0066)
Product Diverse	-0.0037	0.0002	0.0018	0.0047	0.0072
	(0.0060)	(0.0066)	(0.0074)	(0.0084)	(0.0097)
Net Inc	0.0195	0.0295	0.0182	0.0100	0.0074
	(0.0269)	(0.0273)	(0.0284)	(0.0313)	(0.0342)
Longtail	0.0210***	0.0220***	0.0210***	0.0218**	0.0223**
	(0.0063)	(0.0069)	(0.0075)	(0.0085)	(0.0099)
Group	-0.0010	0.0001	0.0012	0.0007	0.0000
	(0.0046)	(0.0048)	(0.0051)	(0.0056)	(0.0061)
Growth	-0.0001	0.0001	0.0009	0.0018	0.0026
	(0.0013)	(0.0015)	(0.0017)	(0.0018)	(0.0020)
Small Profit	0.0015	-0.0016	-0.0058	-0.0088	-0.0009
	(0.0051)	(0.0058)	(0.0070)	(0.0074)	(0.0077)
Small Loss	0.0106	0.0027	0.0073	0.0097	0.0069
	(0.0091)	(0.0093)	(0.0085)	(0.0107)	(0.0116)
Profit	0.0192***	0.0180***	0.0166***	0.0159***	0.0150***
	(0.0028)	(0.0029)	(0.0031)	(0.0035)	(0.0040)
Intercept	0.0577***	0.0538**	0.0445*	0.0383	-0.0272
	(0.0215)	(0.0228)	(0.0245)	(0.0278)	(0.0324)
Year FE	Yes	Yes	Yes	Yes	Yes
F-Stat	21.48	15.56	12.27	9.73	8.62
R^2	6.72%	6.13%	5.86%	6.17%	6.94%
Observations	15,235	12,901	10,985	8,767	6,861

Note: This table reports results from feasible generalized least squares regressions. The dependent variable is loss reserve error scaled by total assets. *Difference* is the difference between *Rating* and a firm's target rating. Each column uses a different lag of *Rating* as a measure of target rating, ranging from *Rating* at $t-1$ in column (1), to the average rating over the past five years in column (5). *Size* is the natural log of total assets. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Geo Herf* is the geographic Herfindahl index. *Product Diverse* is 1 minus the line of business Herfindahl index. *ROA* is a firm's net income divided by assets. *Longtail* is the proportion of premiums written in longtailed lines. *Mutual* is a binary variable equal to 1 if a firm has a mutual organization structure. *Group* is a binary variable equal to 1 for a group and 0 otherwise. *Growth* is the one year change in net premiums written. *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 regressions include year indicators. Standard errors are presented beneath each coefficient estimate in parentheses and account for firm-level clustering. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 11: Target Rating Model Results

	Rating	*RE*
Lag Rating	0.7767***	
	(0.0069)	
Difference		0.0022***
		(0.0008)
Size	0.0638***	-0.0023***
	(0.0097)	(0.0006)
Product Diverse	0.1566***	-0.0008
	(0.0342)	(0.0031)
Longtail	0.0273	0.0171***
	(0.0371)	(0.0033)
Reinsurance	0.0487*	-0.0375***
	(0.0258)	(0.0028)
Growth	0.0253***	-0.0002
	(0.0059)	(0.0013)
Geo Herf	-0.0191	0.0080***
	(0.0240)	(0.0024)
Group	0.0537**	0.0016
	(0.0241)	(0.0023)
Hurricane	0.0078	
	(0.0303)	
ROA	1.1208***	
	(0.1157)	
ROI	-1.0034***	
	(0.2471)	
Kenny Ratio	-0.0709***	
	(0.0122)	
Earthquake	-1.1701	
	(0.7448)	
Surplus-to-Assets	0.2214***	
	(0.0540)	
Mutual		0.0062***
		(0.0019)
Net Inc		0.0088
		(0.0172)
Small Profit		0.0016
		(0.0047)
Small Loss		0.0143
		(0.0095)
Profit		0.0197***
		(0.0021)
Intercept	-0.4344**	0.0400***
	(0.1820)	(0.0117)
Year FE	Yes	Yes
F-Stat	553.78	
Wald χ^2		1,090.64
Observations	20,461	14,230

Note: Column (1) presents an OLS regression where the dependent variable is *Rating*. Column (2) reports an OLS regression where the dependent variable is reserve error scaled by total assets. The results from column (1) are used to calculate a target rating, which is used to construct *Difference*, which is *Rating* minus target rating. Standard errors are presented in parantheses beneath each coefficient estimate. Standard errors are from 1,000 bootstrap replications. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 12: Ratings Change Regression Results

Dependent Variable: Ratings Change from t to $t+1$

	Difference>0	*Difference*<0	All Firms
ΔRE	-0.3272*	-0.1850*	-0.2382**
	(0.1702)	(0.0994)	(0.1114)
$\Delta Size$	0.1615***	0.1151**	0.1397***
	(0.0493)	(0.0504)	(0.0339)
$\Delta Reinsurance$	-0.0958	-0.0849	-0.1006
	(0.0880)	(0.0997)	(0.0656)
$\Delta Geo\ Herf$	0.1187	-0.1067	0.0093
	(0.1055)	(0.0799)	(0.0351)
$\Delta Product\ Diverse$	0.1519*	0.0648	0.0918**
	(0.0867)	(0.0964)	(0.0412)
ΔROA	0.9974**	-0.1306	0.3548*
	(0.4143)	(0.2593)	(0.2021)
$\Delta Longtail$	-0.0266	0.1234	0.0324
	(0.0700)	(0.1545)	(0.0736)
$\Delta Hurricane$	-0.1988***	0.1083	0.0031
	(0.0676)	(0.0971)	(0.0379)
ΔROI	-1.4960**	0.0817	-0.4945*
	(0.6207)	(0.4070)	(0.2867)
$\Delta Kenny\ Ratio$	-0.0574**	-0.1565***	-0.0857***
	(0.0283)	(0.0352)	(0.0177)
$\Delta Earthquake$	1.6622	3.4286**	2.0614***
	(1.2916)	(1.5271)	(0.7978)
$\Delta Surplus$	0.2989**	0.3048	0.3795***
	(0.1465)	(0.2134)	(0.1299)
Intercept	-0.0984***	0.1442***	0.0155***
	(0.0045)	(0.0057)	(0.0027)
Year FE	Yes	Yes	Yes
F-Stat	7.48	3.92	10.23
R^2	0.0598	0.0383	0.0329
Observations	3,720	4,257	12,451

Note: This table reports results from OLS regressions. The dependent variable is the change in *Rating* from t to $t+1$. *Rating* is a firm's A.M. Best financial strength rating, where 4 corresponds to ratings A++ and A+, 3 corresponds to rating A, 2 corresponds to rating A-, 1 corresponds to ratings B++ and B+, and 0 corresponds to all lower ratings. *Difference* is a firm's *Rating* minus target rating. All independent variables are measured as changes from $t-1$ to t. *Size* is the natural log of a firm's assets. *Product Diverse* is 1 minus a line-of-business Herfindahl index. *Longtail* is the percentage of premiums written in long-tailed lines. *Reinsurance* is reinsurance ceded divided by the sum of reinsurance assumed and direct premiums written. *Geo Diverse* is a Herfindahl index of direct premiums written in the 50 U.S. states and Washington D.C. *Growth* is the change in net premiums written from year $t-1$ to year t. *ROA* is a firm's net income divided by total assets in year t. *ROI* is a firm's net investment income divided by total assets in year t. *Kenny Ratio* is net premiums written divided by policyholder surplus. *Earthquake* is the percentage of net premiums written in earthquake insurance. *Surplus* is policyholder surplus divided by total assets. *Group* is a binary variable equal to 1 if a firm is a member of a group and 0 otherwise. *Hurricane* is the percentage of direct premiums written in hurricane-prone states. Standard errors are presented beneath each coefficient estimate and account for firm-level clustering. Year indicators are present in each regression. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively.