# Estimation Errors Among Insurers: The Case of Subrogation

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**Abstract:** Subrogation is the right to pursue responsible third parties to recover amounts paid out to settle claims. Subrogation recoveries can be substantial and represent an estimate potentially subject to management bias. This study investigates factors associated with subrogation estimation errors. In a sample of generally understated subrogation estimates, we find that lower (weaker) financial strength ratings are positively related to more optimistic subrogation estimates. We also find that publicly owned firms, on average, report higher subrogation estimation errors. This effect is less pronounced among public insurers with weak ratings. Overall, our results suggest that subrogation estimates are more optimistic when firms struggle financially or are publicly owned. [*Key words:* subrogation; earnings management; statutory accounting; accruals manipulation; insurance; A. M. Best ratings]

## INTRODUCTION

Do insurers systematically optimistically estimate subrogation, and if so, do regulators notice? This study investigates the relation between subrogation estimation errors and insurers' financial strength ratings. Further, this study examines the relation between subrogation estimation errors and corporate structure (i.e., public, private, and mutual) and how this relation varies when interacted with insurers' financial strength ratings. The purpose of these analyses is to draw inferences about insurers' propensity to misestimate subrogation.

Subrogation represents an insurer's right to indemnify a policyholder and subsequently act "against responsible third parties with a view to

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recovering the sums it has paid out" (N. Pengelley, 2013). In the property-casualty industry, subrogation represents a significant estimate ranging from 8 to 11 percent of estimated losses (Casualty Actuarial Society, 1988). The extent to which insurers choose to subrogate claims varies but can be a substantial source of recoveries (Levine and Ray, 2014) and can reduce claims expense (NAIC, 2014). While practitioners and academics agree that the claims loss reserve is the most significant estimate for insurers (Grace and Leverty, 2012), subrogation represents an estimate that has a direct and potentially significant impact on earnings. For example, in our sample, salvage[4] and subrogation estimates represent on average approximately 20 percent of reported net income.

When an insurer subrogates a claim, Generally Accepted Accounting Principles (GAAP) that prescribe financial reporting rules require insurers to estimate the amount of subrogation to be received and net it against claims loss reserves.[5] In making this estimate, the journal entry has a balance sheet component (perhaps "subrogation receivable"—a contra-liability) and an income statement component (whatever portion of the claim that is not subrogation receivable is claims expense—an expense account). The amount of subrogation to be received is an estimate, and the larger the subrogation estimate, the more positive the impact on both the income statement (by reducing claims expense) and the balance sheet (by increasing a contra-liability) for the insurer.

Prior research has shown that weaker financial firms have a greater incentive to optimistically report their estimates (Gaver and Paterson, 2004; Healy, 1985). This may be particularly true for publicly owned firms that may experience heightened litigation risk or be compelled to respond to myopic investors. Weak firms may also have heightened incentives to report optimistically in a highly regulated industry in which penalties up to and including regulatory takeover are threats (NAIC, 2010).

However, empirical research focuses exclusively on property-casualty insurers' use of claims loss reserves to manage earnings (Petroni, 1992;

[4]Salvage refers to the amount an insurer receives from salvaging an insured asset (e.g., auctioning a car deemed as a total loss) or the value of claimant vehicles paid for by the insurer and then sold. We are not able to separately observe data on salvage and subrogation; thus, references to proxies for subrogation such as *SubroErr* (as defined in Table 1) contain both salvage and subrogation figures. We do not believe that the inclusion of salvage with subrogation influences our inferences, as salvage is generally recovered very quickly and salvage and subrogation are both recoverable, which means our predictions do not change by using the combined figure.

[5]Subrogation estimation and accrual in financial statements is required by GAAP but is optional for Statutory Accounting Principles (SAP). Insurers who are publicly owned or who have public debt are required by the SEC to report in accordance with GAAP.

Beaver, McNichols, and Nelson, 2003; Gaver and Paterson, 2004) and does not provide evidence related to subrogation. Studying the property-casualty insurance industry provides unique benefits over a broader sample. First, insurers are required to report initial estimates and subsequent actual values. Thus, initial estimates can be compared to future actual received and paid amounts, which provides an unbiased, ex-post measure of reporting error (Petroni, 1992). Second, subrogation represents a particularly attractive accrual to study because it may be subject to less scrutiny than other accounting estimates given that oversight focuses primarily on the claims loss reserve. Third, a variety of ownership structures exist among insurers, allowing for comparison of subrogation estimates among public, private, and mutual companies.

Using statutory financial data from 734 property-casualty insurers from 2004 to 2008, we investigate the relation between subrogation estimation errors and insurer characteristics including financial health and ownership structure. We predict and find that subrogation estimation errors are positively related to weaker insurer financial strength ratings, consistent with managers making optimistic subrogation estimates, which results in the reporting of higher earnings. We find that publicly traded insurers are more optimistic in their subrogation estimates on average, although publicly traded firms with poor financial ratings report less optimistically relative to other publicly traded firms, consistent with stronger oversight for financially struggling firms. Overall, the results suggest, that insurer subrogation estimates are more optimistic when firms are struggling financially or publicly owned.

We contribute to the empirical literature in at least three ways. First, to the best of our knowledge, our paper is the first to examine the determinants of subrogation estimate errors. Prior research investigates estimation errors among insurers but only in the context of the claims loss reserve. We specifically study the effects of financial health ratings and insurer ownership structure on subrogation estimation errors, which provides unique empirical evidence to the literature. Second, our results suggest a potential need for standard setters to more clearly provide regulatory guidance with respect to subrogation estimation and reporting. Finally, our results suggest that financial statement users should be aware of the variance of subrogation estimates among insurers and its effect on the financial statements of insurers, particularly in light of prior research that has documented that aggressive estimates tend to be associated with inferior subsequent performance (Teoh, Welch, and Wong, 1998; Rangan, 1998).

# BACKGROUND AND LITERATURE REVIEW

## What Is Subrogation and How Is It Incorporated into the Financial Statements?

Subsequent to indemnifying a policyholder, insurers have the right to subrogate or act "against responsible third parties with a view to recovering the sums it has paid out" (N. Pengelley, 2013). To illustrate how the subrogation process unfolds in practice, consider this example from Esurance (2016):

> *Subrogation sounds tricky and serious, but it's actually just a way to protect you and your insurance company from paying for an accident that wasn't your fault.*
>
> *Say you got into an accident with a reckless driver and it's been officially determined that you weren't to blame. You call your insurer … report the accident, and file a claim.*
>
> *Typically, the at-fault driver's insurer would take care of the repair costs and any medical bills, but for one reason or another, it's delayed. So your own insurance steps in to help pay for repairs and other bills and—just like that—you're back on the road.*
>
> *Meanwhile, you had to shell out a deductible and your insurer had to pay for an accident that it wasn't liable for. Not fair, right?*
>
> *This is where subrogation enters the picture. Subrogation allows your insurance company to recoup the accident costs (medical payments, repairs, etc.), including your deductible, from the at-fault driver's insurer.*

Subrogating insurance claims can be a lengthy process. Similar to claims expenses, recoveries from subrogation efforts develop over time such that cash recoveries may occur multiple years after an accident claim. While insurers record cash receipts of subrogation recoveries regardless of ownership form, all publicly traded insurers additionally record "estimated [subrogation] recoveries" as a reduction of the claims liability and measure them at net realizable value for U.S. GAAP purposes (Accounting Standards Codification [ASC] Topic 944-40-30-2).

Because GAAP requires insurers to record an estimate for subrogation recoveries, the claims liability per GAAP is always stated net of subrogation. Additionally, accruing subrogation implies modified journal entries. Rather than debiting claims expense for the full amount of an estimated claim liability, the insurer debits a contra-liability account for estimated subrogation, then debits claims expense for the remainder of the estimated

claim. For presentation purposes, the claims liability is stated on the balance sheet net of the estimated subrogation contra-liability balance.

The potential for optimistic reporting of subrogation lies in the subrogation estimate. As previously discussed, when an insurance company pays a claim, the company estimates the portion of the claim it can recover through subrogation and the remaining amount, which is classified as claims expense. These calculations are derived from estimates on a case by case basis and rely significantly on the experience and judgment of management. The larger the portion of the claim attributed to subrogation recoverable, the smaller the amount attributable to claims expense, and thus, the more favorable the impact on the balance sheet and income statement.

Over time, information related to claims from prior periods becomes available as cases are resolved. Revisions in estimates are treated as a "change in accounting estimate" and result in revisions to operations in the current period (Petroni, 1992). Therefore, both subrogation receivable and claims loss expense include current period estimates and revisions from prior periods. Eventually, all claims from a given period are resolved, and the true subrogation amount from that period is observable. Specifically, statutory reporting principles for insurers require management to include the approximate level of estimation error in the claims report from five years ago (in Schedule P), allowing us to observe subrogation error with a high level of accuracy.[6]

## Earnings Management

This paper builds on three primary areas of extant literature—earnings management, risk management, and subrogation. Prior research has documented that firms across a variety of industries may intentionally bias estimates upwards in an effort to achieve some gain, such as for bonuses or other contingent compensation or to reach an earnings benchmark, such as reporting a small positive net income, or to meet or beat analysts' expectations (Healy, 1985; Gaver, Gaver, and Austin, 1995; Holthausen, Larcker, and Sloan, 1995; Burgstahler and Dichev, 1997; Abarbanell and Lehavy, 2003). Alternatively, prior research has documented that firms may intentionally bias estimates downwards to achieve specific benefits such as tax or regulatory relief (Jones, 1991; Burgstahler and Dichev, 1997).

In addition to accruals management, firms have other options for managing earnings. For example, firms may attempt to alter reported earnings through real activities manipulation (for example, actually

[6] Schedule P groups salvage and subrogation together in one figure.

changing the number of items sold or produced to achieve some gain, (Cohen, Dey, and Lys, 2008; Cohen and Zarowin, 2010). Another form of earnings management is classification shifting, where firms move certain expenses out of "core" earnings measures (McVay, 2006; Fan, Barua, Cready, and Thomas, 2010).

Within the insurance industry, managers are required to make many estimates. The largest of these estimates (and by far the most studied empirically) is associated with the claims loss reserve (Grace and Leverty, 2012). The claims loss reserve accrual, which represents an estimate for losses associated with the current period, requires a significant amount of judgment. Prior research has documented that property-casualty insurers are more likely to bias downward their claim loss reserves (a) when they are near violation of certain Insurance Regulatory Information System (IRIS) ratios than if they are not close to violating these ratios (Petroni, 1992; Gaver and Paterson, 2004) or (b) if they have small positive earnings instead of small negative earnings (Beaver et al., 2003). Thus, insurers' risk profile and risk-related indicators may impact their level of earnings management (Petroni, 1992).

## Risk Management and Ratings

One source of information related to an insurer's risk profile comes from the National Association of Insurance Commissioners. The National Association of Insurance Commissioners (NAIC) is a voluntary organization of state insurance regulatory officials and departments which promulgates insurance regulations in the U.S. (Vaughan, 2009; NAIC, 2013; Lindberg and Seifert, 2015). Consequently, the state insurance regulatory officials adopted the "Insurance Financial Solvency Framework," via an NAIC initiative, as the insurance industry's regulatory framework (NAIC, 2013). This regulatory framework is primarily rules-based, suggesting U.S. insurers have ample bright lines and little judgment in establishing capitalization requirements (Lindberg and Seifert, 2015).

U.S. insurers have "risk-based capital" (RBC) requirements to ensure the entity can meet the needs of its policyholders and maintain solvency (Ho, 2012). Essentially, the insurer's RBC, which is calculated using a standardized formula, is based on the inherent risks of the insurer's operations (NAIC, 2010). Therefore, the RBC addresses specific risks insurers face, such as asset risk, underwriting risk, and business risk. A company with higher amounts of risk is required to maintain higher levels of capital, and weakly capitalized insurers with inadequate capital face regulatory action (NAIC, 2010; Lindberg and Seifert, 2015).[7]

Rating agencies provide an external assessment of companies' risk management processes as they also assess companies' abilities to meet the needs of their owners and avoid business failure. Compared to other rating agencies, A.M. Best focuses on insurance companies. In fact, A.M. Best (2012) argues that their financial strength rating system is a global standard for independent assessments and comparisons of insurer financial strength. A.M. Best's property-casualty insurer ratings process uses analytical techniques based on several tests. These tests include profitability tests, leverage tests, liquidity tests, and loss reserve tests. Thus, similar to the RBC, they also address the core risks insurers face (A.M. Best, 2012). Consequently, financial strength ratings may also be an integral part of insurers' risk management. Furthermore, Ames, Hines, and Sankara (2014) find earnings quality, including accounting estimates, are associated with A.M. Best ratings.

## Subrogation

The third research stream associated with this study is subrogation. Subrogation represents a major accounting estimate for property-casualty insurers. Academic literature associated with subrogation is sparser than literature associated with claim loss expense. A vast majority of subrogation research focuses on optimal contracting (Perillo, 2009), the litigation process (Karpman, 2010; N. Pengelley, 2013; P. Pengelley, 2006; Sebok, 2014), or settlement (Greenblatt, 1997; Rinaldi, 1993). To date, extant research has not directly studied subrogation estimates or their relation to firm characteristics. Given that subrogation estimates can be significant and are relatively undocumented, we believe this study is unique to the literature.

# HYPOTHESES

Prior research argues and provides evidence consistent with financially weak firms managing claims loss reserve estimates (Gaver and Paterson, 2004; Petroni, 1992). Financially weak insurers may also have incentives to report subrogation estimates more optimistically. We argue that the most likely reason financially weak insurers report biased subrogation errors is to inflate reported earnings.[8] Therefore, in the context of subrogation, which is a potential recoverable amount, we expect that

[7]For example, firms falling below 200 percent of their RBC are subject to penalties such as reporting to regulators or regulatory takeover.

financially struggling insurers are likely to overestimate subrogation. Stated as a formal hypothesis:

*H1: Insurers report more-optimistic subrogation estimates when financial strength is low.*

We also argue that an important moderating factor is ownership structure. Insurers, either privately held, mutual, or public, face different incentive sets. Firms that are publicly traded face perhaps the strongest incentives to perform well in the short run in an effort to meet market expectations, such as those prescribed by analysts (Abarbanell and Lehavy, 2003) and prior year performance (Gunny, 2010). As a result, we expect that publicly traded insurers are more likely to bias subrogation estimates upwards and that these incentives are stronger when publicly traded insurers have weak financial ratings. Stated as formal hypotheses:

*H2a: Publicly traded insurers report more-optimistic subrogation estimates than their privately traded counterparts.*

*H2b: Publicly traded insurers report incrementally more-optimistic subrogation estimates than their privately traded counterparts when financial strength is low.*

# RESEARCH DESIGN

## Subrogation Estimation Error Models

We model the association between financial strength ratings of property-casualty insurers and optimistic subrogation estimates using ordinary least squares (OLS) regression models. We present our main subrogation estimation error models based on models used in prior research (e.g., Geiger and North, 2006) along with detailed variable definitions in Table 1:

$$\begin{aligned}\text{SubroErr}_{it} = {} & \alpha + \varphi_1\text{WeakRating}_{it} + \varphi_2\text{Public}_{it} + \varphi_3\text{Public}_{it}\ X\ \text{WeakRating}_{it} \\ & + \varphi_4\text{Mutual}_{it} + \varphi_5\text{Mutual}_{it}\ X\ \text{WeakRating}_{it} + \varphi_6\text{Lnta}_{it} + \\ & \varphi_7\text{LagSubrog}_{it} + \varphi_8\text{Growth}_{it} + \varphi_9\text{Reins}_{it} + \varphi_{10}\text{Short tail}_{it} + \\ & \varphi_{11}\text{ROAA}_{it} + \varphi_{12}\text{LargeLoss}_{it} + \sum \varphi_{13-15}\text{YearIndicators}_{t} + \\ & \sum\text{StateControls}_{it} + \kappa_{it} \qquad (1)\end{aligned}$$

[8]Alternative explanations for optimistic subrogation estimation errors include variance in managerial competence, tax incentives, income smoothing, and/or regulatory incentives (see conclusion section for further information).

**Table 1.** Variable Definitions

| Variable | Description |
|---|---|
| *SubroErr* | $\frac{(AnticipSubro_t + ReceivedSubro_t) - (AnticipSubro_{t+5} + ReceivedSubro_{t+5})}{NPW_t} \times 1,000$ |
| *WeakRating* | A.M. Best Financial Strength Ratings (FSR) following Petroni (1992). Ratings are as follows: A++=1; A+=2; A=3; A–=4; B++=5; B+=6; B=7; B–=8; C++=9; C+=10; C=11; C–=12; and D=13; Note: Higher rating = worse financial health. |
| $WeakRating_{t-1}$ | *WeakRating* from the prior period (year t–1). Note: Higher rating at year t–1 = worse financial health. |
| *Public* | Indicator variable = 1 if ultimate parent exchange is NYSE or NASDAQ and 0 otherwise. |
| *Mutual* | Indicator variable = 1 if NAIC ownership status is a mutual company and 0 otherwise. |
| *Lnta* | Natural log of total net assets. |
| *LagSubrog* | $\frac{(AnticipSubro_{t-1} + ReceivedSubro_{t-1}) - (AnticipSubro_{t+4} + ReceivedSubro_{t+4})}{NPW_{t-1}} \times 1,000$ |
| *Growth* | % growth in net premiums written. |
| *Reins* | Reinsurance ratio. This measure is computed as follows: Reins = reinsurance premiums ceded / (direct premiums written + reinsurance premiums assumed). |
| *Short tail* | Percent of losses incurred in short-tail lines of insurance. The following lines of business are considered "short tail": Fidelity and Surety, Auto Physical Damage, Special Property, Financial and Mortgage Guaranty, Warranty & Other Including Credit, Accident and Health. |
| *ROAA* | Return on average assets computed as income after taxes as a percentage of average net admitted assets. |
| *LargeLoss* | Indicator variable = 1 if the reported income in a given insurer-year falls in the lowest 90 percent of losses and 0 otherwise (following Grace and Leverty, 2010). |
| *NPW* | Net premiums written as reported on the SNL database. This is the insurer's retained premium income for all lines of business. |
| *NI* | Net income as reported on the SNL database. Net income is equal to net income, after dividends to policyholders, after all taxes. |
| *NetAssets* | Net admitted assets includes the sum of all assets in all lines reported. It excludes any valuation allowance and assets for which the state does not allow the company to take credit. |
| *SSEstimate* | Anticipated salvage and subrogation plus salvage and subrogation received. |

$$\begin{aligned}\text{SubroErr}_{it} = \alpha &+ \varphi_1\text{WeakRating}_{it\text{-}1} + \varphi_2\text{Public}_{it} + \varphi_3\text{Public}_{it}\ \text{X WeakRating}_{it-1} \\ &+ \varphi_4\text{Mutual}_{it} + \varphi_5\text{Mutual}_{it}\ \text{X WeakRating}_{it-1} + \varphi_6\text{Lnta}_{it} + \\ &\varphi_7\text{LagSubrog}_{it} + \varphi_8\text{Growth}_{it} + \varphi_9\text{Reins}_{it} + \varphi_{10}\text{Short tail}_{it} + \\ &\varphi_{11}\text{ROAA}_{it} + \varphi_{12}\text{LargeLoss}_{it} + \sum \varphi_{13-15}\text{YearIndicators}_{t} + \\ &\sum\text{StateControls}_{it} + \kappa_{it} \qquad (2)\end{aligned}$$

*Dependent variables*

We use a firm's subrogation estimation error ($\text{SubroErr}_t$) as the dependent variable. Using a process similar to Petroni (1992), we deduct salvage and subrogation received and estimated five years after the incident year from the salvage and subrogation received and estimated in the incident year. This difference is scaled by NPW and multiplied by 1,000.[9] Higher levels of this measure represent more-optimistic estimates. Table 2 provides an example of how the subrogation estimation error is computed using actual firm data.

*Explanatory variables*

We use A.M. Best financial strength ratings as our main explanatory variable (*WeakRating*). We convert the A.M. Best ratings into numeric ratings ranging from 1 to 13, where 1 represents the highest possible strength rating (i.e., strongest financial health) and 13 represents the lowest possible strength rating (i.e., weakest financial health). We expect companies with weaker financial health to optimistically estimate subrogation; therefore, we predict a positive association between *WeakRating* and the dependent variable. We also use A.M. Best financial strength ratings from the prior period ($WeakRating_{t-1}$) as an explanatory variable to address reverse causality concerns and predict a positive association between $WeakRating_{t-1}$ and the dependent variable (i.e., a weak rating in one period leads to optimistic subrogation estimates in the following period).

Our second explanatory variable is publicly traded insurers (*Public*). We use an indicator variable to represent publicly traded insurers. Prior research has found public companies have incentives to report greater income-increasing accruals (e.g., to meet or beat analyst forecasts or other earnings benchmarks); therefore, we expect a positive association between

[9]SubroErr is multiplied by 1,000 to eliminate the need to carry coefficients to several decimal places. We use this transformation for reader convenience only and this transformation does not impact our inferences from the data.

**Table 2.** Subrogation Estimation Error Computation Example: AIU Insurance Company

| | | Salvage and Subrogation Received + Salvage and Subrogation Anticipated Reported at Year End ($000) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Accident Year | 1<br>2003 | 2<br>2004 | 3<br>2005 | 4<br>2006 | 5<br>2007 | 6<br>2008 | 7<br>2009 | 8<br>2010 | 9<br>2011 | 10<br>2012 |
| 1 | 2003 | 4,873 | 4,856 | 4,648 | 4,685 | 4,908 | 3,510 | 3,432 | 3,432 | 3,431 | 3,433 |
| 2 | 2004 | | 5,440 | 4,944 | 4,901 | 5,180 | 4,055 | 3,647 | 3,650 | 3,655 | 3,657 |
| 3 | 2005 | | | 5,250 | 5,147 | 5,450 | 4,097 | 3,891 | 3,469 | 3,480 | 3,481 |
| 4 | 2006 | | | | 5,606 | 5,939 | 4,209 | 4,178 | 4,146 | 3,729 | 3,739 |
| 5 | 2007 | | | | | **6,314** | 4,711 | 4,541 | 4,439 | 3,999 | **4,007** |
| 6 | 2008 | | | | | | 6,243 | 8,891 | 6,636 | 6,518 | 6,513 |
| 7 | 2009 | | | | | | | 7,321 | 6,201 | 5,714 | 5,855 |
| 8 | 2010 | | | | | | | | 5,563 | 4,789 | 5,209 |
| 9 | 2011 | | | | | | | | | 3,648 | 3,934 |
| 10 | 2012 | | | | | | | | | | 3,623 |

Table 2 is based on SNL data for AIU Insurance Company. It shows excerpts from the insurer's Schedule P—Part 1: Current Valuation from 2003 to 2012. All U.S. Property and Liability insurers must compile Schedule P—Part 1 as part of their regulatory annual filings. Among other information, this statement shows salvage and subrogation (S&S) received and anticipated for loss claims. This table sums S&S received and anticipated (Total S&S) and shows the Total S&S revenue by the year in which the Total S&S revenue was incurred (rows 1 to 10), known as the accident year, and Total S&S by the years in which they are evaluated (columns 1 to 10). For example, in calendar year 2007, AIU insurance estimated approximately $6.3 million S&S revenue from loss claims during accident year 2007. This estimate of 2007 accident year was revised downward to approximately $4 million by 2012 (five years after the incident year). The accident year subrogation error is estimated as the difference between S&S estimated in a given accident year and the revised estimate of S&S received and estimated five years in the future. To capture the revised estimate five years in the future, annual statement data from 2012 are used. A positive subrogation error implies an initial estimate that is too high (over-reserving) whereas a negative subrogation error implies an initial estimate that is too low (under-reserving). For AIU Insurance Company in 2007, the accident year subrogation estimate error is $2.307 million ($6.314 million minus $4.007 million, indicated in bold type).

*Public* and *SubroErr*. In particular, we expect public companies with lower ratings to report the most optimistic subrogation estimates. We therefore predict a positive coefficient for the interaction of *Public* and *WeakRating*.

### *Control variables*

Our first control variable is mutually-owned companies (*Mutual*). Mutual companies are owned by their members and therefore may not have the same incentives to manipulate the subrogation account as stock companies. As a result, we do not predict whether mutually-owned companies will report more optimistic subrogation estimates, more pessimistic subrogation estimates, or similar subrogation estimates as privately owned stock companies. Furthermore, we are unable to predict how subrogation manipulation will change as the A.M. Best ratings change for mutual companies.

Next, we use the natural log of net assets (*Lnta*) to control for size. The political cost hypothesis predicts that larger companies may have less incentive to show greater earnings to avoid attention from regulators (Watts and Zimmerman, 1978). We therefore predict a negative association between *Lnta* and *SubroErr*.

Our next control variable is lagged subrogation (*LagSubrog*), which is scaled by net total assets and multiplied by 1000. Prior research uses prior year's accounting estimates to reflect the reversal of accruals over time (Ashbaugh, LaFond, and Mayhew, 2003). We expect *LagSubrog* to be negatively associated with *SubroErr* because prior period accruals make it more difficult to increase accruals in the future or even maintain the current level of accruals.

We also control for return on average assets (*ROAA*) and growth (*Growth*). Insurers that report better performance are expected to have higher accruals (Kothari, Leone, and Wasley, 2005). Thus, we predict a positive association between *ROAA* and *SubroErr*. Similarly, high growth firms are likely to have greater claims and subrogation activity. As a result, we also predict a positive association between *Growth* and *SubroErr*.

We use the reinsurance premiums ceded scaled by direct premiums written plus reinsurance premiums assumed (*Reins*) to proxy for reinsurance. Harrington and Danzon (1994) find insurers use reinsurance in an attempt to hide under-reserving. However, Grace and Leverty (2010) find a negative relationship between reinsurance and reserve errors whereas Grace and Leverty (2012) find mixed results between reinsurance and different definitions of reserve errors. Given these prior findings, we expect reinsurance to be correlated with subrogation errors. However, we do not make any empirical predictions about the sign of the relation between *Reins* and *SubroErr.*

Next, we compute the percentage of losses incurred in short tail lines of business (*Short tail*). Insurers with long tail lines of business have greater discretion over reserves, and prior research has found that larger ratios of long tail lines of business increase the loss reserve error (Grace and Leverty, 2010). Thus, insurers with a greater percentage of short tail lines may be less likely to report optimistic subrogation estimates. On the other hand, insurers that are unable to manipulate loss reserves may instead decide to manipulate subrogation. Therefore, we do not make any empirical predictions about the sign of the relation between *Short tail* and *SubroErr.*

*LargeLoss* is an indicator variable to control for factors that deter managers from meeting or beating earnings benchmarks (Frankel, Johnson, and Nelson, 2002; Ashbaugh et al., 2003). We expect insurers with large negative net income may not have incentives to increase earnings and, thus, predict a negative association between *LargeLoss* and *SubroErr.*

## SAMPLE AND DESCRIPTIVE STATISTICS

### Sample

We use statutory financial data for property-casualty insurers from the SNL database and A.M. Best ratings data from the A.M. Best database. Due to data availability for A.M. Best ratings, we begin the sample in 2004. Additionally, given the five-year look-ahead comparison required to compute our measure of subrogation estimation error, *SubroErr*, described in Table 1 (i.e., comparing subrogation in year $t$ and subrogation in year $t+5$), our sample period is limited to 2008. We report the sample selection process in Table 3.[10] There are 13,470 property-casualty insurer-year observations from 2004 to 2008. We exclude 1,801 observations without a rating, a further 2,998 observations with E, F, or NR (failing or non-existent) ratings, 763 observations with no subrogation and 3,628 observations with missing data or data lost due to lagged variables. Furthermore, we lose 1,728 observations related to firms that do not accrue subrogation and 128 observations related to insurers that are not stock or mutual companies. This process results in a final sample of 2,424 property-casualty insurer-year observations used in this study for insurers that accrue subrogation.

[10]Because A.M. Best ratings are assigned at the company level, we do not aggregate at the group level. This results in a relatively higher number of observations that are categorized as "public."

**Table 3.** Sample Selection Summary

| | Total obs. |
|---|---|
| SNL dataset (2004–2008)—Annual observations | 13,470 |
| Less: | |
| Missing A.M. Best Ratings data | –1,801 |
| A.M. Best Ratings observation = "NR" | –2,998 |
| Missing *SubroErr* data | –115 |
| Loss of Data due to *t*–1 regressions | –1,978 |
| No cumulative Subrogation in year *t*+5 | –763 |
| No cumulative anticipated subrogation in year *t*+1 | –1,728 |
| Other insurers that are not stock or mutual companies | –128 |
| Other missing SNL data | –1,535 |
| Observations used in *SubroErr* (period *t*) regressions | 2,424 |

Table 3 presents sample selection criteria used to arrive at the samples used in regression analyses.

## Descriptive Statistics

Table 4 presents summary statistics of the variables used in our multivariate analyses. For this table and our multivariate analyses, we winsorize all continuous variables at the 1-percent and 99-percent levels. As reported in Table 4, the mean (median) salvage and subrogation estimate (*SSEstimate*) in year *t* is less than the mean (median) *SSEstimate* in year *t*+5.[11] Consequently, *SubroErr* for year *t* has a negative median value close to zero and a negative mean of (6.12). In addition, the insurers in the sample have relatively strong financial ratings with a mean (median) of 3.25 (3.00) where 1 is the highest strength and 13 is the lowest strength. Forty-one percent of the sample consists of publicly traded insurers, fifteen percent of the sample are mutual companies, and the remainder are privately traded insurers.

[11]As established by Petroni (1992) and followed by Beaver et al. (2003), five years is considered a reasonable amount of time for estimates in the insurance industry to be resolved. Thus, we utilize SSEstimate in year *t*+5 as our approximation of actual salvage and subrogation received for the accident year.

**Table 4. Descriptive Statistics**

| Variable ($n$ = 2,424) | Mean | Std. dev. | Min. | Median | Max. |
|---|---|---|---|---|---|
| *NPW* | 352,220 | 718,332 | 33 | 81,166 | 3,488,869 |
| *NI* | 45,183 | 103,001 | (26,548) | 7,867 | 591,675 |
| *NetAssets* | 1,088,566 | 2,363,662 | 3,550 | 221,745 | 12,046,554 |
| $SSEstimate_t$ | 9,176 | 19,689 | 0.00 | 1,640 | 104,107 |
| $SSEstimate_{t+5}$ | 10,171 | 22,753 | 0.00 | 1,845 | 134,266 |
| $SubroErr_t$ | (6.12) | 67.87 | (1,716.79) | (0.63) | 1,458.82 |
| *WeakRating* | 3.25 | 1.66 | 1.00 | 3.00 | 13.00 |
| $WeakRating_{t-1}$ | 3.27 | 1.69 | 1.00 | 3.00 | 13.00 |
| *Public* | 0.41 | 0.49 | 0.00 | 0.00 | 1.00 |
| *Mutual* | 0.15 | 0.36 | 0.00 | 0.00 | 1.00 |
| *Private* | 0.44 | 0.50 | 0.00 | 0.00 | 1.00 |
| *Lnta* | 12.50 | 1.75 | 8.17 | 12.31 | 18.47 |
| *LagSubrog* | 14.33 | 20.24 | –10.92 | 7.73 | 290.45 |
| *Growth* | 0.05 | 0.39 | –0.87 | 0.01 | 5.08 |
| *Reins* | 0.43 | 0.30 | 0.00 | 0.42 | 1.00 |
| *Short tail* | 0.24 | 0.19 | 0.00 | 0.20 | 1.00 |
| *ROAA* | 0.04 | 0.03 | –0.15 | 0.04 | 0.23 |
| *LargeLoss* | 0.02 | 0.14 | 0.00 | 0.00 | 1.00 |

Table 4 presents descriptive statistics for the variables used in our regression analyses. Continuous variables are winsorized at the 1- and 99-percent levels. See Table 1 for detailed variable definitions.

## RESULTS

Table 5 reports the results of our primary hypothesis tests by testing the determinants of subrogation estimation errors.[12] The variable *WeakRating* has a positive and significant coefficient (2.217, p-value <.05), providing support for H1, that insurers report more-optimistic subrogation estimates when financial health is low. To control for endogeneity concerns, we also

[12]Our results are restricted to firms that accrue subrogation.

**Table 5.** Subrogation Accrual Error Model with Contemporaneous/Prior Period Rating (OLS) **Full Sample**

| Dependent Variable | | Model 1 (using $WeakRating_t$) $SubroErr_t$ | | Model 2 (using $WeakRating_{t-1}$) $SubroErr_t$ | |
|---|---|---|---|---|---|
| Variable | Pred | Coef. est. | Pr > \|t\| | Coef. est. | Pr > \|t\| |
| *WeakRating / WeakRating*$_{t-1}$ | H1 + | 2.217 | 0.0498 | 1.886 | 0.0670 |
| *Public* | H2a + | 13.585 | 0.0199 | 25.703 | <.0001 |
| *Public * WeakRating / WeakRating*$_{t-1}$ | H2b + | –2.802 | 0.0581 | –7.066 | <.0001 |
| *Mutual* | ? | 7.631 | 0.5975 | 6.727 | 0.5994 |
| *Mutual * WeakRating / WeakRating*$_{t-1}$ | ? | –1.174 | 0.7587 | –0.938 | 0.7741 |
| *Lnta* | – | 0.456 | 0.6749 | 0.218 | 0.8389 |
| *LagSubrog* | – | –1.145 | <.0001 | –1.154 | <.0001 |
| *Growth* | + | 0.820 | 0.8123 | 0.956 | 0.7811 |
| *Reins* | ? | 4.219 | 0.4283 | 3.077 | 0.5618 |
| *Short tail* | ? | 15.334 | 0.0437 | 14.883 | 0.0492 |
| *ROAA* | + | 34.246 | 0.5041 | 28.519 | 0.5755 |
| *LargeLoss* | – | 5.952 | 0.5674 | 5.350 | 0.6065 |
| *CONSTANT* | | –12.712 | 0.4497 | –7.960 | 0.6274 |
| *Year Dummies* | | Included | | Included | |
| *State Control Dummies* | | Included | | Included | |
| *F* Statistic | | <.0001 | | <.0001 | |
| *n* of observations used | | 2,424 | | 2,424 | |
| Adjusted $R^2$ | | 7.33% | | 7.94% | |

Table 5 presents coefficient estimates from Model (1) and Model (2) regressing subrogation estimation error on $WeakRating_t$ (left columns) and $WeakRating_{t-1}$ (right columns) as well as indicators of insurer legal organization and various controls. See Table 1 for detailed variable definitions. State control variables are based on the percentage of the state's direct premiums written. All 50 states and the 5 major territories included. T-statistics for predicted variables are one-tailed tests. All other t-statistics are two-tailed tests.

test the determinants of subrogation estimation errors using financial strength ratings from the prior period ($WeakRating_{t-1}$). In this specification of the model, the variable $WeakRating_{t-1}$ is positive and marginally significant (1.886, p-value <.1).

In addition, we test H2a, that public ownership is associated with more-optimistic subrogation estimates using the variable *Public*. *Public* is

positively associated with subrogation estimation errors (13.585, p-value <.05) as predicted and the relationship remains significant in the $WeakRating_{t-1}$ specification (25.703, p-value <.01). Finally, in Table 5 we test H2b, that subrogation estimates are most optimistic among public insurers when financial health is low. Contrary to expectations, the interaction of *Public* and *WeakRating* is negative and significant in the $WeakRating_t$ model (–2.802, p-value <.1), with an even more pronounced effect in the $WeakRating_{t-1}$ model (–7.066, p-value <.01). The negative coefficients indicate that insurer financial strength moderates the relation between subrogation estimation error and insurer ownership form. Summing coefficients from *Public* and $Public*WeakRating_t$ ($WeakRating_{t-1}$) indicates that the total effect of financially weak, publicly traded insurers on subrogation estimation errors is 10.783 (18.637). These results indicate that financially weak, publicly traded insurers continue to report over-estimated subrogation estimates, but the over-estimation is less pronounced than that of financially strong, publicly traded insurers.

Taken together, these results suggest that insurers may report more-optimistic subrogation estimates when financial health is low and when the firm is publicly owned. Moreover, publicly owned firms with poor financial health are slightly less optimistic in their estimates than their financially healthy counterparts, consistent with greater litigation risk or increased litigation risk and/or regulatory or auditor oversight for these firms.[13] An alternative explanation of this result could be that public firms utilize other mechanisms for boosting low ratings, such as issuing new equity, whereas private firms have fewer options and thus rely on over-estimating subrogation estimates.

## Sensitivity Analysis

We also test our hypotheses using a sample that includes both firms that accrue subrogation *and* the 1,728 firm-year observations of firms that accrue *no subrogation* to mitigate concerns about sample selection on the dependent variable producing a non-random sample.[14] These results appear in Table 6. As expected, we find that results are qualitatively similar to the main analysis in Table 5 with weaker statistical significance. The weaker statistical significance can be attributed to the addition of these

[13]Several similar models were employed for robustness and yielded qualitatively similar results. These alternative models included small profit/loss, lagged explanatory financial variables, and a subsample of auto insurers.

[14]We identify insurers as accruing no subrogation by examining salvage and subrogation (S&S) anticipated on Schedule P. Insurers reporting a zero value for S&S *anticipated* in the incident year and the following year ($t$+1) are coded as accruing no subrogation.

non-accruing firms, which has the effect of "diluting" the effects of ratings on subrogation errors. Although *WeakRating* is positively associated with subrogation estimation errors, contrary to our primary analysis in Table 5, *WeakRating* is not a significant predictor of these errors (at conventional significance levels) in the same period as the estimate, or when the rating was issued in the period prior to the estimate (.899, p-value <.11; .529, p-value <.20, respectively). Consistent with our main analyses, we find support for H2a, that publicly traded insurers report more-optimistic subrogation estimates than privately traded insurers in both models (5.228, p-value <.1; 10.963, p-value <.01, respectively). Also consistent with our main results, the interaction of *Public* and *WeakRating* is negative and significant in both model specifications (–1.323, p-value <.1; –3.231, p-value <.01, respectively). In summary, with the exception of our tests of H1 in Table 6, our inferences are unchanged as a result of these additional analyses.

## CONCLUSION

Subrogation represents an insurer's right to recover amounts from at-fault third parties for already paid out claims. Extant research has studied insurers' use of claims loss reserves to manage earnings (Petroni, 1992; Beaver et al., 2003; Gaver and Paterson, 2004) but does not provide evidence regarding the use of subrogation accrual estimates.

We investigate the association between subrogation estimation errors and insurers' financial strength ratings and insurer ownership structure. Our analyses provide several important results. Our analyses indicate that while subrogation estimates are conservative (underestimated) on average, subrogation error is positively related to weaker insurer financial strength ratings, consistent with managers using subrogation estimates to increase earnings. While we document that publicly traded insurers report significantly more optimistic subrogation estimates, publicly owned firms with poor financial ratings report *less* income-increasing estimation error than their financially healthy counterparts, consistent with stronger litigation risk or oversight for these firms. Taken together, the results provide evidence that insurers may use subrogation estimates to influence earnings.

It should be noted that managerial intent is impossible to observe and that some alternative explanations exist for accrual error. Examples of alternative explanations could be variance in managerial competence (Grace and Leverty, 2012), tax incentives (Grace, 1990), income smoothing (Weiss, 1985; Beaver et al., 2003), and/or regulatory incentives (e.g., Nelson, 2000; Grace and Leverty, 2010).

**Table 6.** Estimation Errors using Subrogation with Contemporaneous/Prior Period Rating
**Full Sample—Including Insurers That Do Not Accrue**

| | | Model 1 (using $WeakRating_t$) | | Model 2 (using $WeakRating_{t-1}$) | |
|---|---|---|---|---|---|
| Dependent Variable | | $SubroErr_t$ | | $SubroErr_t$ | |
| Variable | Pred | Coef. est. | Pr > \|t\| | Coef. est. | Pr > \|t\| |
| $WeakRating$ / $WeakRating_{t-1}$ | H1 + | 0.899 | 0.1093 | 0.529 | 0.2005 |
| *Public* | H2a + | 5.228 | 0.0869 | 10.963 | 0.0016 |
| *Public* * $WeakRating$ / $WeakRating_{t-1}$ | H2b + | –1.323 | 0.0859 | –3.231 | 0.0003 |
| *Mutual* | ? | 4.236 | 0.5068 | 3.003 | 0.6198 |
| *Mutual* * $WeakRating$ / $WeakRating_{t-1}$ | ? | –0.708 | 0.6591 | –0.377 | 0.7998 |
| *Lnta* | – | 0.240 | 0.6912 | 0.067 | 0.9111 |
| *LagSubrog* | – | –0.610 | <.0001 | –0.616 | <.0001 |
| *Growth* | + | –0.130 | 0.9444 | –0.096 | 0.9587 |
| *Reins* | ? | 2.553 | 0.3966 | 2.136 | 0.4805 |
| *Short tail* | ? | 5.599 | 0.1001 | 5.541 | 0.1023 |
| *ROAA* | + | 26.159 | 0.3005 | 23.727 | 0.3458 |
| *LargeLoss* | – | 3.014 | 0.5794 | 2.827 | 0.6031 |
| *CONSTANT* | | –7.127 | 0.4285 | –3.483 | 0.6943 |
| *Year Dummies* | | Included | | Included | |
| *State Control Dummies* | | Included | | Included | |
| *F* Statistic | | <.0001 | | <.0001 | |
| *n* of observations used | | 4,152 | | 4,152 | |
| Adjusted $R^2$ | | 4.11% | | 4.42% | |

Table 6 presents coefficient estimates from Model (1) and Model (2) for an expanded sample of insurer-years, including an additional 1,728 insurer-years for firms that did *not* accrue subrogation. The models regress subrogation estimation error on $WeakRating_t$ (left columns) and $WeakRating_{t-1}$ (right columns) as well as indicators of insurer legal organization and various controls. See Table 1 for detailed variable definitions. State control variables are based on the percentage of the state's direct premiums written. All 50 states and the 5 major territories included. T-statistics for predicted variables are one-tailed tests. All other t-statistics are two-tailed tests.

Our results are relevant to estimate-focused studies among insurers that have not previously examined the impact of subrogation. In addition, our paper highlights a context where insurers have discretion over an accrual amount directly related to earnings and balance sheet amounts. Our findings related to subrogation estimates suggest a need for regulatory standard setters to provide more specific guidance for subrogation accounting and financial reporting. Finally, our results are of interest to investors and financial statement users who may not fully incorporate subrogation estimation errors into projections and investment decisions.

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