Corporate Transparency and Reserve Management: Evidence from U.S. Property-Liability Insurance Companies

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ABSTRACT

This paper examines the relationship between corporate transparency and insurer's reserve management in U.S. publicly traded property-liability insurance companies over the period 1996-2009. We focus on the role of corporate transparency in the insurer's reserve estimate conservatism. The results show that more transparent insurers are related to more conservative loss reserve estimations, indicating that enhanced transparency enables outside stakeholders to better monitor the firm, and consequently, makes insurers take a more conservative approach to reserve management. A one standard deviation increase in corporate opacity is associated with a 21.83 percent increase in under-reserving error. We also find that firm-specific characteristics, such as insurer size, product diversification, financial condition, and reinsurance demand have substantial impacts on the relation between corporate transparency and insurer's loss reserving behavior. Our results suggest that additional regulatory mandates by the Sarbanes-Oxley Act (SOX) may be redundancy with existing regulations and insurer's reserve estimate conservatism is more pronounced during the period of the recent financial crisis. Further, the evidence shows that firms operating in transparent information environments tend to report more accurate reserve estimates, and are less likely to report small earnings surprises.

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1. Introduction

This study examines the relationship between corporate transparency and an insurer's reserve management in U.S. publicly traded property-liability insurance companies. Corporate transparency refers to the widespread availability of firm-specific information about publicly traded firms to outside investors (Bushman and Smith, 2003). Transparency in the business environment is an essential requirement for the efficient functioning of markets, since high levels of transparency improve the investment efficiency of firms and resource allocation across industries (Leuz and Wysocki, 2008), benefit firms through reduced cost of capital, greater stock liquidity, and increased firm value (Healy and Palepu, 2001), and play a crucial role in mitigating the agency problem by reducing the ability of insiders to expropriate minority shareholders' wealth (Bushman and Smith 2001).

Transparency of financial institutions, such as banks and insurance companies has been an important issue from the perspective of policy makers and market participants alike. Especially, the recent financial crisis highlighted the pivotal role of corporate transparency in assessing the true financial condition of the institutions[1]. Insurance companies have typically been considered less transparent than other firms in non-financial industries since they have a risky and complicated liability structure (Park, 2008). In particular, property-liability insurers are subject to the problems caused by a high degree of information asymmetry due to the subjective nature of managerial judgments about loss reserve estimates. Since insurer liabilities, dominated mainly by loss reserves, are subject to high degrees of managerial discretion, managers of property-liability insurers have substantial incentives to manipulate their loss reserves to avoid regulatory intervention (Beaver and McNichols, 1998; Nelson, 2000; Grace and Leverty, 2010), to smooth income in years experiencing unusual firm performance (Weiss, 1985;

[1] A lack of corporate transparency is regarded as one of the main causes for the collapse of a number of financial institutions and government bailouts of large financial institutions, such as American Insurance Group (AIG) during the recent financial crisis.

Grace, 1990; Beaver et al., 2003), or to mask solvency problems (Petroni, 1992; Gaver and Paterson, 2004; Grace and Leverty, 2012).

Given the importance of loss reserves as the main component of insurer's financial statements and the extent to which managerial discretion affects the estimation of loss reserves, a lack of corporate transparency could exacerbate the problems by preventing regulators and stakeholders from accurately checking the adequacy of insurer's loss reserves. On the other hand, managers of transparent firms cannot easily hide the firm's true financial condition, and thus high levels of corporate transparency may reduce the incentives of insurers to manipulate loss reserve estimates. In this sense, corporate transparency can help detect or mitigate insurer's inappropriate reserve management.

Prior literature has examined a variety of factors influencing insurer's reserve management. Surprisingly, the relationship between corporate transparency and insurer's loss reserving behavior has not yet been studied. This study attempts to fill the gap in the literature by providing new evidence on this issue. Based on Anderson et al. (2009), we construct a composite firm-level transparency index by combining five proxies for corporate opacity (earnings quality, bid-ask spread, trading volume, analysts' following, and analysts' forecasting error). For the measure of insurer's reserve management, we employ a direct measure of managerial accounting discretion, which is the loss reserve errors calculated as the difference between management's original loss estimates for a given year and subsequent revisions.

We investigate the impact of corporate transparency on insurer's reserve management using a sample of 451 U.S. publicly traded property-liability insurer firm-years over the period 1996-2009.[2] We employ two-stage least squares estimation method (2SLS) along with instrumental variables to deal with the possible endogeneity problems. The empirical results are summarized below. We find that corporate transparency is associated with conservative reserve management, indicating that

[2] The data used are from 1996 – 2014. The sample period is shorter because reserve error calculation.

enhanced transparency enables outside stakeholders to better monitor the firm, and consequently, makes insurers take a more conservative approach to loss reserve estimates. We also provide evidence that firm characteristics, such as insurer size, product diversification, financial condition, and reinsurance demand have a significant impact on the relationship between corporate transparency and insurer's loss reserving behavior. The results suggest that the positive effect of corporate transparency on insurer's reserve estimate conservatism is more pronounced for insurers with smaller size, more diversified lines of business, and weaker financial condition, and that higher usage of reinsurance mitigates the tendency of opaque insurers to under-reserve.

Our evidence also shows that the Sarbanes-Oxley Act (SOX) did not affect the relationship between corporate transparency and insurer's loss reserve estimates, implying that additional regulatory mandates by SOX may not be effective for management of loss reserves in the U.S. property-liability insurance industry which is a highly regulated industry. We also find that insurer's reserve estimate conservatism is more pronounced during the period of recent financial crisis possibly because firms report their reserves more conservatively to avoid litigation risk and regulatory scrutiny during the recession. Further, we present evidence that corporate opacity is negatively associated with the accuracy of loss reserve estimates and positively related to smaller earnings surprises. Overall, our results suggest that corporate transparency may be an important mechanism for reducing the incentives of insurers to inappropriately manipulate reserves even in a highly regulated environment like the insurance industry.

Our study adds to the literature in several ways. To our knowledge, we are the first to examine the effect of firm-level transparency on insurers' reserve management in the U.S. property-liability insurance industry. Specifically, we provide new insight into how corporate transparency constrains management discretion with regard to loss reserve estimation. Second, our results suggest that corporate transparency plays an important role in restraining managerial accounting discretion over loss reserves in the highly regulated insurance industry. Therefore, our findings have significant

implications for insurance supervisors whose primary role is to monitor the insurer's financial soundness. Third, we explore the impact of external shocks, such as SOX and recent financial crisis on the relationship between corporate transparency and reserve management. Thus, this study helps broaden our understanding of how insurers react to changes in the regulatory and economic circumstances. Finally, our study provides the first empirical evidence on the effect of corporate transparency on earnings surprises in both non-financial and financial industries by showing that firms operating in opaque information environments tend to report less negative earnings surprises and are more likely to exhibit smaller earnings surprises.

The paper is organized as follows. Section 2 reviews the literature on corporate transparency and insurer's loss reserve management. Section 3 develops our hypotheses about the expected associations between corporate transparency and an insurer's loss reserving behavior. Section 4 details the sample selection criteria, the model, and defines the variables. Section 5 provides descriptive statistics of the data and empirical results. Section 6 concludes the paper.

2. Literature Review

2. 1. Corporate Transparency

This study is primarily based on two streams of research: corporate transparency and insurer's reserve management. We first discuss the literature of corporate transparency. Corporate transparency is generally defined as the widespread availability of reliable and relevant information on firm performance, financial position, investment opportunities, governance, value, and risk profile of publicly traded firms (Bushman and Smith, 2003). The focus of prior literature has mainly been on the economic consequences of changes in corporate transparency and the impact of corporate transparency on corporate governance.

Specifically, previous studies have examined the relationship between corporate transparency and capital market consequences, such as liquidity and cost of capital. The literature finds that higher levels

of transparency reduce agency costs and estimation error, alleviate information asymmetry between the firm's insiders and outside investors, and lowers the risk premium due to the potential for managerial misbehavior, thus leading to lower transaction costs, greater stock liquidity, lower cost of equity capital (e.g., Diamond and Verrecchia, 1991; Healy et al., 1999; Bhattacharya et al., 2003; Bushman and Smith, 2003; Lang et al., 2012).

Second, greater transparency mitigates the agency problem in corporate governance by providing a more appropriate level of market discipline, facilitating more active monitoring of managerial misbehavior, and consequently inducing managers to perform in a manner consistent with shareholder interests. Patel et al. (2002) argue that corporate transparency offers necessary conditions for market discipline to be effective by allowing outside stakeholders to closely monitor the opportunistic behavior of insiders. Adams and Ferreira (2007) find that the effectiveness of outsiders in monitoring and advising insiders depends on the firm's information environment, such as the degree of information asymmetry and the cost of acquiring information. Anderson et al. (2009) point out that corporate transparency is an essential component of investor protection since it alleviates the agency conflicts between controlling shareholders and minority investors.

Lastly, corporate transparency enhances firm performance by disciplining corporate insiders in better selection of investments, more efficient management of assets in place, and reduced expropriation of minority shareholders' wealth (Bushman and Smith 2001). Thompson and Vaz (1990) document that insurers can increase their market value by reducing the level of uncertainty among outside parties regarding their financial strength. Several studies (e.g., Patel et al., 2002; Robinson and Burton, 2004; Anderson et al., 2009) show that firms with greater transparency earn positive abnormal returns and better performance compared to firms with a lower level of transparency.

Taken together, findings from this body of literature suggest that high levels of corporate transparency may benefit firms through increased liquidity, reduced cost of capital, better corporate governance, and consequently, better firm performance. The reason is that improved transparency not

only reduces information asymmetries between managers and outside investors but also fosters more effective monitoring of insiders' activities, thereby constraining opportunistic managerial behavior.

2. 2. Loss Reserve Management

This section discusses insurer's loss reserve management. Loss reserves are the largest liability on a property-liability insurer's balance sheet, representing about two-thirds of a typical property-liability insurer's liabilities (Zhang and Browne, 2013). U.S. property-liability insurers are required to regularly report estimated losses and loss expenses based on the expected cost of settling claims as well as revised estimates of those values based on subsequent experience to state insurance commissioners in Schedule P of insurers' financial statement filings following the Statutory Accounting Principles (SAP). In general, a firm's actuaries suggest an acceptable range for loss reserves, and managers make the final decision on originally reported loss reserve estimate. Thus, a substantial degree of managerial discretion can be reflected in the estimation of loss reserves.

Loss reserve errors occur when actual claims (settled several years later) are different from the initial estimate of loss reserves for future claims. Reserve errors are mainly driven by two factors: non-discretionary estimation errors and discretionary manipulation. Non-discretionary errors generally occur because there is always the possibility of misalignment between initially reported loss reserves and the revisions of those values due to the randomness of losses even without any earnings management. Specifically, non-discretionary errors stem from a variety of causes, including delay in reporting of claims, increase in claim settlement costs due to inflation, effect of new regulation on loss amounts, and limitations in actuarial modeling techniques (Zhang and Browne, 2013).

On the other hand, insurers may manipulate loss reserve estimate to achieve specific firm goals and to increase the personal benefits of managers. Frequent but non-random patterns in an insurer's reserve errors provide evidence of discretionary manipulation of loss reserves. Although under-reserving and

over-reserving can impact insurers differently[3], regulators seem to be more concerned about under-reserving than over-reserving because of their focus on insurers' solvency.

The literature has shown that insurers may strategically manage their loss reserves. First, income smoothing incentives have long been a much discussed topic in the insurance and other industry literature. Previous studies show that insurers tend to under-reserve (over-reserve) when profits are significantly low (high) (e.g., Anderson, 1971; Weiss, 1985; Beaver et al., 2003; Grace and Leverty, 2010). Second, insurers may manipulate their loss reserves to minimize their tax burden and conceal solvency problems in an effort to avoid regulatory scrutiny (e.g., Grace, 1990; Petroni, 1992; Nelson, 2000; Gaver and Paterson, 2004). Finally, some studies examine the effect of executive compensation structure on insurer's reserve management. Lin and Lai (2008) and Browne et al. (2009) provide evidence that managers with equity-based compensation tend to underestimate loss reserves to maximize their personal benefits. Eckles and Halek (2010) find that managers tend to over-reserve if their bonus is capped or they do not have any bonus at all, but under-report loss reserves if they can increase their incentive-based bonus or exercise stock options.

3. Hypothesis Development

3.1. Corporate Transparency and Insurer's Reserve Management

Earnings management generally occurs due to informational limitations when managers are apt to disclose less information or fake reported contents of financial statements in order to mislead stakeholders about the performance of the firm (Healy and Wahlen, 1999). Corporate opacity may increase managers' opportunistic behavior to maximize their private benefits through earnings management. Trueman and Titman (1988) point out that firms with more opaque information

[3] Over-reserving may bring more attention from regulators since it reduce insurer's income (at least in the short-run), whereas it enables insurers to hold more reserves, making them more financially stable. On the other hand, under-reserving can increase the level of current profits at the expense of future profits, allowing insurers to avoid regulatory interventions. However, it may lead to a high likelihood of insolvency if the insurer's surplus is depleted to meet the claim settlement obligations.

environments engage in more earnings management because shareholders cannot perfectly observe the firm's true financial position. Richardson (2000) finds that the degree of information asymmetry between managers and outside investors is positively related to earnings management behavior. Thus, the lack of corporate transparency can create a shield under which managerial opportunism prevails, thereby resulting in higher levels of earnings management.

Prior literature shows that increased corporate transparency improves the value relevance of accounting earnings through its monitoring and disciplining roles, limiting the extent of earnings management. Lobo and Zhou (2001) note that since shareholders of firms that disclose more information can easily detect managerial misbehavior, managers have less flexibility to distort their reported earnings. Hunton et al. (2006) find that a high level of financial reporting transparency is negatively associated with earnings management, suggesting that corporate transparency plays a vital role in constraining managers' opportunistic behavior. Jo and Kim (2007) posit that firms with more transparent information disclosure are less likely to engage in earnings management because the increased transparency reduces information asymmetry, and thus discourages managers from manipulating earnings.

In summary, the literature suggests that opaque information environments increase managers' incentives to engage in earnings management and that high levels of corporate transparency can mitigate the agency problem of earnings management. Following the above arguments and empirical results of the effect of corporate transparency on earnings management in non-financial industries, we expect that high levels of corporate transparency could help reduce insurer's inappropriate reserve management because reserve management is probably the most important part of earnings management for property-liability insurers. In addition, Zhang and Browne (2013) suggest that the degree of under-reserving is positively related to the likelihood of accounting manipulation. Therefore, we hypothesize that increased corporate transparency would restrict managerial discretion and make insurers overstate their loss reserves in favor of conservative reserve management. Given the above

arguments, we suggest the following hypothesis:

Hypothesis 1: There is a positive relationship between corporate transparency and insurer's reserve estimate conservatism.

3.2. Effect of Firm Size on the Relation between Transparency and Reserve Management

Agency theory suggests that larger firms attract more external monitoring, experience greater stakeholder pressures, and thus are likely to disclose more information than smaller firms. Specifically, previous studies find that firm size is positively related to the incidence of management disclosure, indicating that larger firms face a greater demand to be more transparent from investors (e.g., Kasznik and Lev, 1995; Khanna et al., 2004). The literature also argues that larger firms tend to disclose more information due to economies of scale in information dissemination and strong incentives to enhance their corporate standing and public representation (e.g., Lang and Lundholm, 1993; McKinnon and Dalimunthe, 1993). Pottier and Sommer (2006) report that larger insurers subject to greater monitoring are likely to reveal more information, thus reducing uncertainty about their financial strength.

With regard to the relationship between firm size and earnings management, the literature shows that larger firms are less likely to engage in earnings management because they are subject to more regulatory scrutiny and have strong and effective corporate governance mechanisms (Klein, 2002; Kim et al., 2003). Zhang and Browne (2013) show that large insurers tend to report more accurate loss reserve estimation. In summary, prior literature suggests that larger insurers are likely to be more transparent, and as a result, they may report their loss reserves more conservatively.

Based on the two streams of literature, we predict that the positive effect of corporate transparency on insurer's reserve estimate conservatism would be more pronounced for smaller firms, where the marginal benefits of additional transparency are higher. We thus propose the following hypothesis:

Hypothesis 2: Larger firm size weakens the positive impact of corporate transparency on insurer's reserve estimate conservatism.

3.3. Effect of Diversification on the Relation between Transparency and Reserve Management

The literature finds that product line and geographical diversification are associated with higher levels of managerial discretion because the complexity of diversified firms increases the degree of information asymmetry and the difficulty of monitoring managerial misbehavior (e.g., Gilson, et al., 2001; Bushman et al., 2004). Jiraporn et al. (2008) and Lim et al. (2008) suggest that diversification exacerbates earnings management because it is more difficult to scrutinize the earning reports of a firm that operates in multiple divisions and in different geographical regions. Rodríguez-Pérez and Van Hemmen (2010) present evidence that for diversified firms with high levels of information asymmetry, managers are more likely to engage in earnings management.

Several insurance studies have investigated the relationship between diversification and insurer's reserve management. Pottier and Sommer (2006) note that insurers with more diverse operations have greater discretion over various activities, such as permissible investments, operating and financing options, and face a wider range of regulatory and market environments, thereby making it more difficult for outside investors to detect earnings management. Brandt et al. (2013) report that highly diversified insurers tend to report their loss reserves in a less conservative manner than focused insurers because the greater the degree of product or geographical diversification, the more difficult it will be for outsiders to monitor and control insurer's inappropriate reserve management. Zhang and Browne (2013) find that high levels of product line and geographic concentration are positively related to conservative loss reserve estimates. Based on the above discussions, we predict that the positive effect of corporate transparency on insurer's reserve estimate conservatism would be stronger for diversified firms. The reason is that diversified firms are subject to larger asymmetric information problems than focused firms, and thus corporate transparency may help diversified insurers mitigate the problems of information asymmetry. This leads to the following hypothesis:

Hypothesis 3: Product or geographical concentration weakens the positive impact of corporate transparency on insurer's reserve estimate conservatism.

3.4. Effect of Insurer Financial Condition (WEAK) on the Relation between Transparency and Reserve Management

Poor financial condition can provide a strong incentive for managers to manipulate the financial statements in an attempt to reduce the negative impact of financial distress. DeAngelo et al. (1994) find that managers in firms with financial distress tend to make income-increasing accounting choices in order to keep their job or keep intervention of the board of directors at a minimum. Sweeny (1994) reports that financially distressed firms are more likely to engage in income-increasing earnings management in an effort to decrease the possibility of debt covenant violation. Habib et al. (2013) reveal that firms in financial distress are more prone to engage in earnings management than financially healthy firms. For insurance companies, Peroni (1992) and Gaver and Paterson (2004) show that financially weak insurers tend to underestimate their loss reserves relative to financially strong ones to avoid violating Insurance Regulatory Information System (IRIS) solvency boundaries[4].

Corporate transparency can help outside investors make a more accurate evaluation of the firm's true financial conditions by enhancing the credibility of financial statements, thereby reducing the propensity of financially struggling firms to manipulate earnings. Thus, we expect that financially weak insurers with higher levels of transparency would be less likely to manage earnings through the misstatement of loss reserves because the manipulation in financial statements is easily detected or revealed. Therefore, we suggest the following hypothesis:

Hypothesis 4: Corporate transparency weakens the tendency of financially weak insurer's

[4] The Insurance Regulatory Information System (IRIS) is a set of financial ratios used by National Association of Insurance Commissioners (NAIC) to assess an insurer's financial soundness. If an insurer has more than three ratios outside of the usual range set by NAIC, it may receive more intense regulatory intervention. Previous studies suggest that an insurer is defined as financially unhealthy if it has more than four unusual insurance Regulatory Information System (IRIS) ratios.

under-reserving.

3.5. Effect of Reinsurance Demand on the Relation between Transparency and Reserve Management

Reinsurance has been widely used by property-liability insurers to hedge against unexpected catastrophic losses. Reinsurance enables insurers to transfer risks among each other, thus alleviating insolvency risk and strengthening financial stability. By transferring or ceding risks through reinsurance, insurers can stabilize their loss experience (Cummins et al., 2008), and as a result, insurers with higher degrees of reinsurance utilization are less likely to under-report their loss reserves in order to avoid regulatory scrutiny.

Prior literature shows that reinsurance companies play an important role in mitigating the problems caused by asymmetric information, such as adverse selection and moral hazard, by monitoring primary insurers credibly (e.g., Doherty and Smetters, 2005; Plantin, 2006). Browne et al. (2012) provide evidence that insurers that purchase more reinsurance are likely to report more accurate loss reserve estimates because smaller reserve errors may help them get better terms from reinsurers. Veprauskaite and Adams (2014) point out that reinsurance companies are able to closely monitor the primary insurers' underwriting practices and claim settlement processes, and thus highly reinsured insurers may have less incentives to manipulate their loss reserves. Therefore, we hypothesize that more reinsurance purchase would reduce the tendency of insurers operating in opaque information environments to engage in improper reserve management.

Hypothesis 5: Increased usage of reinsurance mitigates the under-reserving of insurers in opaque information environments.

3.6. Effect of SOX on the Relation between Transparency and Reserve Management

The Sarbanes-Oxley Act of 2002 (SOX) was enacted to restore the integrity of financial statements, restrain earnings management and accounting fraud, and improve corporate governance and ethical behavior by imposing more personal liability on corporate executives. Section 302 of SOX (Corporate Responsibility for Financial Reports) directly addresses the personal responsibility for senior management to attest to the accuracy and transparency of the financial reporting of publicly traded companies.

The effect of SOX on the relation between corporate transparency and insurer's loss reserving behavior remains ambiguous. Bhattacharya et al. (2003) find that strong investor protection regimes are associated with greater financial transparency and less earnings management. Cohen et al. (2005) and Jain and Rezaee (2006) present evidence that adoption of SOX improves the quality of financial reporting, leading to increases in earnings quality and gradual declines in the level of earnings management. Lobo and Zhou (2006) show that firms exhibit greater conservatism in their financial reporting after SOX. Hsu (2012) reports that publicly traded property-liability insurers tend to report more conservative estimates of loss reserves post-SOX.

Conversely, there is some evidence to support the persistence of earnings management practices after the implementation of SOX. Cohen et al. (2008) document that while accrual-based earnings management decreased, real earnings management significantly increased after the enactment of SOX, suggesting that firms switched from accrual-based earnings management to real earnings management, which is more difficult for regulators to detect after SOX. DeBoskey and Jiang (2012) find that U.S. banks continue to smooth income using discretionary loan loss provisions (LLP) in the post-SOX period. Brandt et al. (2013) show that the patterns of setting loss reserves of public property-casualty insurers have not changed post-SOX. They argue that SOX did little more than restate existing regulations on insurer's financial reporting transparency and loss reserve management, concluding that

additional mandates by SOX may be unnecessary for the already highly regulated insurance industry. These findings imply that there would be no significant impact of SOX on insurer's reserve management.

It should be noted that SOX was meant to increase transparency of all publicly traded firms, and thus whether SOX improves reserve conservatism for highly regulated insurance companies is an empirical question. In light of above two competing views, we suggest the following null hypothesis:

Hypothesis 6: Sarbanes-Oxley Act (SOX) does not change the impact of corporate transparency on insurer's reserve management in property-liability insurance companies.

3.7. Effect of Financial Crisis on the Relation between Transparency and Reserve Management

Our last hypothesis examines whether the recent financial crisis in 2008-2009 affects the relationship between corporate transparency and insurer's loss reserve management. Prior studies suggest that the financial crisis may have different impacts on the relationship between corporate transparency and earnings management.

On the one hand, it is argued that managers are more likely to manipulate earnings to protect their financial position and to compensate for the decrease of operational performance during economic downturns. Berndt et al. (2011) find that managers engage in more earnings management during the financial crisis in an effort to slow, delay or soften the impact of the crisis on financial statement items. Ahmad-Zaluki et al.(2011) show that income-increasing earnings management in Malaysian IPOs primarily occurred during a period of East Asian financial crisis, which is a period of severe economic stress. Iatridis and Dimitras (2013) document that under the pressure of the economic crisis, firms tend to resort to earnings management practices in order to improve their financial profile and future financial prospects and to alleviate the adverse effects of financial distress.

On the other hand, financial crisis may have a mitigating effect on insurer's earnings management. Chia et al. (2007) note that increased monitoring from auditors, creditors and other stakeholders during

the Asian Crisis caused managers to engage in less earnings management. Jenkins et al. (2009) find that accounting conservatism and value relevance of current earnings are more pronounced during economic recessions because in difficult financial times, firms tend to report earnings more conservatively to avoid litigation risk and regulatory scrutiny. They contend that greater demand for more conservative accounting by market forces in periods of economic decline dissuades managers from engaging in earnings management. Filip and Raffournier (2014) suggest that earnings management has significantly decreased during the recent financial crisis, since higher market tolerance for poor performance in the crisis periods resulted in a substantial decline in the incentives of managers to manipulate earnings. Given the foregoing competing views, we suggest null hypothesis for the effect of financial crisis in 2008-2009 on the relationship between transparency and insurer's reserve management.

Hypothesis 7: Financial Crisis does not change the impact of corporate transparency on insurer's reserve management in property-liability insurance companies.

4. Data and Methodology

4.1. Sample

Our sample consists of 52 U.S. public property-liability insurers over the period 1996-2009. We construct our sample from the intersection of the several databases. Following prior literature (e.g., Anderson et al., 2009; Wang, 2011), we develop a composite opacity index based on five factors: earnings quality, bid-ask spread, trading volume, analysts' following, and analysts' forecasting error. Data on earnings quality, as measured by the absolute value of discretionary accruals are extracted from COMPUSTAT database. We obtain data on bid-ask spread and trading volume from the Center for Research in Security Prices (CRSP). The information on the number of analysts and analysts forecasting errors is collected from Thomson Financial's Institutional Brokers Estimate System (I/B/E/S). We also hand-collect data on board characteristics from SEC-filed annual proxy statements

(DEF 14A) in the EDGAR database. Insurance-specific data necessary to calculate loss reserve error as well as other control variables are obtained from the regulatory annual statements filed to National Association of Insurance Commissioners (NAIC).

Calculation of loss reserve error requires 5 years of data, and thus our original sample periods span from the 1996 to 2014 period to create a sample over the 1996-2009 period. For example, we use data from 2014 statements to calculate the 2009 reserve error. Therefore, the most recent five years of data (2010-2014) are not available in our sample. Following Kothari et al. (2005), we remove observations that do not have sufficient data to calculate discretionary accruals.

Initially, we have 1,041 firm-year observations for the five components of corporate opacity index over the period 1996-2014. After merging the data sets necessary to construct a corporate opacity index with the data required to calculate reserve error and control variables, we are left with a final sample consisting of an unbalanced panel of 451 firm-year observations of 52 publicly traded property-liability insurance companies for the years 1996 to 2009.

4.2. Empirical Model

We use regressions to analyze the relationship between corporate transparency and insurer's reserve management. The regressions are based on the unbalanced panel data to maximize the number of observations included in analysis and to avoid survivor bias. In order to determine which model to use between fixed effects or random effects, we perform the Hausman test of the null hypothesis that the firm-specific error term is uncorrelated with the residuals (Greene, 2011). The Hausman test rejects the null hypothesis for all the estimations, suggesting that we should use fixed effects rather than random effects models. We report the *t*-values corrected for heteroskedasticity.

We focus on signed reserve error to examine the relationship between corporate transparency and insurer's reserving behavior by estimating a regression model including corporate opacity index and other variables that control for firm-specific and corporate governance characteristics. Given a series

of pooled, cross-sectional and time-series data structure, the basic regression specification for our analysis can be written as follows:

$$\begin{aligned} ERROR_{i,t} = {} & \alpha_0 + \alpha_1 OPACITY_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Reinsurance_{i,t} + \alpha_4 ProdHHI_{i,t} + \alpha_5 GeoHHI_{i,t} \\ & + \alpha_6 WEAK_{i,t} + \alpha_7 ROA_{i,t} + \alpha_8 RISK_{i,t} + \alpha_9 MAL_{i,t} + \alpha_{10} Under \times Length_{i,t} \\ & + \alpha_{11} Over \times Length_{i,t} + \alpha_{12} Bsize_{i,t} + \alpha_{13} Busy_{i,t} + \alpha_{14} OWN_{i,t} + \alpha_{15} Meetings_{i,t} \\ & + \alpha_{16} Duality_{i,t} + \alpha_{17} Outsider_{i,t} + d_t + f_t + \varepsilon_{i,t} \end{aligned}$$

where *i* indexes the insurance company and *t* represents time (year) from 1996 through 2009. d_t is the time fixed-effects for year *t*, f_t is the firm fixed-effects for insurer *i*, and $\varepsilon_{i,t}$ is the error term.

The literature suggests that corporate transparency may be jointly endogenously determined with earnings management decisions (e.g., Lobo and Zhou, 2001; Degeorge et al., 2012). For example, firms with more conservative loss reserve estimates (i.e., firms which engage in less earnings management) may disclose more information, and thus, endogeneity may lead to violation of the consistency of the OLS estimator. To address this potential endogenous bias, we perform two-stage least squares method (2SLS) using instrumental variables. In the 2SLS model, we treat the corporate opacity variable as an endogenous variable.

We conduct regression-based Hausman tests (Wooldridge, 2002). In the first stage, we regress the corporate opacity variable against all the explanatory variables and instrumental variables. In the second stage, the residual of the endogenous variable is added to the original regression specification as an additional regressor. If the coefficient of the residual is statistically significant, we reject the null hypothesis of exogeneity. The instrumental variables must be correlated with the endogenous explanatory variable, and must not be correlated with the error term.

The lagged or historically averaged measures of firm characteristics, industry growth, and general economic growth are commonly used instrumental variables (Campa and Kedia, 2002). Therefore, we initially employ 5-year average of firm size, 5-year average of industry premium growth rate, 5-year

average of real GDP growth, and 5-year average of the firm characteristics included in our regression model as the potential instrumental variables for the corporate opacity variable. Finally, we choose 5-year average of industry premium growth rate and 5-year average of reinsurance usage as our instrumental variables[5].

4.3. Corporate Transparency Measure

In this study, we construct a composite corporate opacity index based on five factors: earnings quality, bid-ask spread, trading volume, analysts' following, and analysts' forecasting error in order to measure the overall quality of a firm's information environment (Anderson et al., 2009; Wang, 2011). Specifically, after computing five individual proxies for corporate opacity, we rank the values of each proxy into deciles with the most opaque firms taking a value of ten and the most transparent firms assuming a value of one. The individual ranks are then summed and scaled by 50 to derive an index that ranges from 0.1 to 1.0. Thus, lower value denotes more transparent firms or higher value indicates more opaque firms. The opacity index *(OPACITY)* provides a relatively robust measure of corporate opaqueness because it averages across multiple measures, and also includes inputs from market trades as well as analyst coverage. The details of the five individual proxies for corporate opacity can be summarized as follows.

First of all, we choose discretionary accruals as a proxy for financial reporting quality because it is widely used to measure managerial discretion over the earnings quality in the prior literature (e.g., Dechow et al., 1995; Leuz et al., 2003; Hutton et al., 2009; Lang et al., 2012). Jones (1991) reports that since managers can use discretionary accruals to manipulate reported earnings, firms with greater levels of discretionary accruals are more likely to have lower quality accounting. Thus, we use the

[5] We perform an *F*-test of the joint significance of the excluded instruments and Hansen's *J* test of over-identifying restrictions to examine whether the instruments are valid and are uncorrelated with the error term, respectively. The results show that only 5-year average of industry premium growth rate and 5-year average of reinsurance usage fulfill above two requirements for instrumental variables.

absolute value of discretionary accruals based on the modified Jones model derived from Dechow et al. (1995) as a proxy for earnings quality (*EARNOPACITY*). To compute discretionary accruals, we first estimate the expected level of total accruals, using a cross-sectional version of the modified Jones model. Then the discretionary accruals are calculated as the difference between a firm's actual level and the expected level of total accruals. Details of these procedures are provided in Appendix.

Second, bid-ask spread is a commonly used measure of information uncertainty and asymmetry among stock market participants (Diamond and Verrechia 1991). Leuz and Verrecchia (2000) find that greater firm-level financial reporting transparency is associated with lower bid-ask spreads and higher liquidity. To estimate bid-ask spreads (*SPREAD*), we calculate an average daily bid-ask spread as the daily ask price minus bid price divided by the average of daily bid and ask prices, and then the annual bid-ask spread is computed by averaging daily bid-ask spreads for the one-year period.

Third, trading volume is included in our opacity index as a proxy for information asymmetry among investors regarding firm value (Anderson et al., 2009; Lang et al., 2012). Bessembinder et al. (1996) document that trading volume captures the extent of firm-specific information flows, suggesting the positive relation between trading volume and corporate transparency. Leuz and Verrecchia (2000) point out that trading volume represents willingness to transact in firm shares, and thus it is inversely related to the level of information asymmetry. Wang (2011) posits that trading volume is positively associated with financial reporting transparency because it reflects both a firm's earnings and non-earnings information. Trading volume (*VOLUME*) is calculated as the natural logarithm of average daily trading volume during the fiscal year.

The two components used in our opacity index are based on the ability of more sophisticated investors (i.e., analysts). First, analysts' following has been shown to be related to greater transparency in the firm's information environment. Lang et al. (2004) find that financial analysts serve as external monitors to managers by providing important scrutiny over managers' opportunistic behavior. Yu (2008) shows that firms with a higher level of analyst coverage engage in less earnings management.

We use the natural logarithm of the number of analysts providing earnings forecasts 9 months prior to the end of fiscal year (*COVERAGE*).

The fifth variable for the opacity index is the analysts' forecasting error. Analysts' forecasting error is often used as a proxy for the uncertainty about a firm's future earnings (Anderson et al., 2009). Botosan (2004) notes that errors in stock analyst estimates measure the availability of firm-specific information. We measure analysts' forecasting error as the square of the difference between mean analysts' earnings forecast (9 months before the firm's fiscal year-end) and actual firm earnings scaled by firm's stock price (*ForecastError*).

4.4. Reserve Error Measure

The literature has shown that insurer's reserve error, as measured by the differences between the initial loss reserves set by management and the actual claim losses paid, provides a precise measurement of insurer's reserve management (e.g., Petroni, 1992; Beaver et al., 2003; Grace and Leverty, 2010). The raw error is calculated as the revised estimate of incurred losses at time $t+n$ minus total incurred losses at time t. This difference would be positive if insurers under-report their initial reserve estimate (under-reserve) and would be negative if the initial reserve estimate is overstated (over-reserve).

Thus, significant and positive coefficient estimates suggest that greater corporate opacity reduces insurer's reserve estimate conservatism in the signed reserve error models. Consistent with previous studies (Petroni, 1992; Gaver and Paterson, 2001; Grace and Leverty, 2012), we construct five-year errors, or n is 5. Gaver and Paterson (2004) provide evidence that five years of loss experience are sufficient to observe statistically significant reserve errors. To control for the variation in insurer size, we scale the 5-year loss reserve development by the insurer's total admitted assets in year t. The loss reserve error is defined as follows:

$$\text{Reserve Error } (ERROR_{i,t}) = (\text{RESERVE}_{i,t+5} - \text{RESERVE}_{i,t}) / \text{ASSETS}_t$$ [6]

where t is the year index from 1996 through 2009. $\text{RESERVE}_{i,t+5}$ is the developed reserves at year $t+5$ for insurer i for loss reserves reported in year t, and $\text{RESERVE}_{i,t}$ is insurer i's estimate of loss reserves reported in year t.

4.5. Other Variables of Interest

We also examine the effects of firm-specific and corporate governance characteristics on an insurer's reserve management. For firm-specific characteristics, we use insurer size (*Size*) to control for the impact of size on reserve error. *Size* is measured by the natural log of total net written premiums. Browne et al. (2012) document that insurers that purchase more reinsurance tend to report more accurate loss reserve estimates than other insurers. We include the ratio of reinsurance premium ceded to direct premiums written plus reinsurance assumed (*Reinsurance*) in our models. Grace and Leverty (2012) find that firms with a higher degree of line of business or geographical diversification under-report their loss reserves. Product line Herfindahl index (*ProdHHI*) and Geographical Herfindahl index (*GeoHHI*) are calculated as the sum of the squares of the value of net written premiums in line i (state i) divided by total net written premiums, respectively.

Prior literature shows that financially weak insurers tend to under-reserve (e.g., Petroni, 1992; Gaver and Paterson, 2004). We measure insurer financial condition by using an indicator variable (*WEAK*) that takes a value of one if a firm has more than four unusual IRIS ratios, and zero otherwise. Also, we use return on assets (ROA) as a proxy for taxable income to control for the effect of tax sheltering purposes on insurer's reserve management (Grace, 1990). ROA is the ratio of net income plus taxes and interest expenses divided by net admitted assets. Higher uncertainty in the claim process can provide insurers with more chances to conduct reserve manipulation. Thus, we control for the underwriting risk (*RISK*) in our model. *RISK* is computed as standard deviation of the firm's loss ratio

[6]Some previous studies (e.g., Kazenski et al., 1992; Grace and Leverty, 2012) calculate reserve errors as original reported reserve at t minus developed reserve at $t+5$ ($\text{RESERVE}_{i,t} - \text{RESERVE}_{i,t+5}$), but only difference between two measures is the sign of error.

using 5 year rolling periods of data where loss ratio is the percentage of claim loss reserve to total liabilities.

Petroni (1992) finds that reserve error is significantly related to the proportion of an insurer's revenue from malpractice insurance. Malpractice insurance (*MAL*) is defined as the percentage of net premiums written from malpractice insurance. Gaver and Paterson (2001) report that insurers with long-tailed business lines tend to have larger reserve error because it is more difficult to forecast total claims as the claim cycle becomes longer. The claim cycle (*LENGTH*) is defined as the percentage of claim loss reserve to total liabilities. Following Petroni and Beasley (1996), we use two interaction terms to control for the effect of the length of the claim cycle on reserve error: *UNDER* × *LENGTH* and *OVER* × *LENGTH*, where UNDER (OVER) is an indicator variable that takes a value of one if the reserve error is positive (negative), and zero otherwise.

We also include six corporate governance characteristics in our empirical model. First, we use the number of all directors (*Bsize*) to measure board monitoring power. The expected sign of board size may *a priori* be ambiguous. Larger boards may be less effective as monitors of managerial discretion because of coordination problem and free riding (Jensen, 1993), thus allowing managers to engage more in earnings management. However, CEOs on large boards tend to be more powerful (Cheng, 2008), and powerful CEOs with a large board may be conservative in loss reserve estimates if they want to protect their personal wealth as well as job security from unexpected losses. Busy board (*Busy*) is defined as the average number of directorship positions that board members hold in other public companies. The relationship between busy board and insurer's loss reserve behavior remains unclear. While busy directors can provide better monitoring (Elyasiani and Zhang, 2012), reducing the opportunities for earnings management, too many outsider directorships may prevent busy board members from carrying out effective monitoring activities.

Director stock ownership (*OWN*) is measured by the percentage of shares held by board directors as a proxy for board monitoring incentives. High stock ownership can lead directors to take actions to

preserve their equity stakes, resulting in conservative reserve management. Conversely, concern for their self-interest may outweigh the concern for the riskiness of their firm (Shleifer and Vishny, 2007). In that case, directors with high ownership would under-reserve.

The number of board meetings is used to measure board of director diligence (*Meetings*). More frequent board meetings may indicate stronger monitoring, leading to a more conservative loss reserve estimate. On the other hand, an unusual number of board meetings may imply the problems in other possibly risky issues necessitating a higher number of meetings (Eling and Marek, 2014).

Duality is defined as a dummy variable (*Duality*) that equals one if same person is the CEO and chairperson of the board, and zero otherwise. Duality can lead to under-reserving if powerful CEOs holding the board chair take on more risk (Adams et al., 2005), whereas CEO/Chair managers would be conservative in loss reserve estimates to protect their job security. Lastly, board independence (*Outsider*) is measured by the percentage of outside directors on the board. Brick and Chidambaran (2008) find that a higher percentage of outsiders on the board is negatively related to firm risk-taking, suggesting that higher levels of board independence may induce CEOs to report more conservative loss reserves. The definitions of all variables are summarized in Table 1.

5. Results

5. 1. Summary Statistics

We provide descriptive statistics for our sample in Table 2. The mean (median) for signed loss reserve error (*ERROR*) is -0.0088 (-0.0196) of total admitted assets, indicating that insurers in our sample, on average, report overstated loss reserves. The composite index of corporate opacity (*OPACITY*) has a mean (median) of 0.4507 (0.4600), which are comparable to those reported in Wang (2011)[7]. With respect to the five individual components of the corporate opacity index, we find that earnings quality (*EARNOPACITY*) has a mean (median) of 0.0412 (0.0260). Bid-ask spread has a mean

[7] The mean (median) firm has an opacity index value of 0.548 (0.550) in Wang (2011).

(median) of 0.0076 (0.0035), and trading volume has a mean of 15.3938 (15.4239). The mean (median) of analyst coverage is 1.3328 (1.3863). The mean (median) of firm's forecasting error defined as the square of the difference between the mean analysts' earnings forecast and actual earnings divided by stock price is 2.87% (2.00%) of price.

Table 3 displays the Pearson correlation matrix for all independent variables. The results show that the corporate opacity index is highly significantly correlated with three individual proxies out of five components of the opacity index. Specifically, the corporate opacity index has positive correlation with bid-ask spread (0.472 at less than the 1% level), and is negatively correlated with trading volume and analyst coverage (-0.515 and -0.598 at less than 1% level, respectively), suggesting that greater transparency is associated with lower levels of information uncertainty and asymmetry among investors. We also find that some independent variables are highly correlated each other. Given these high correlations, we perform a variation inflation factors (VIF) test to check for multicollinearity among independent variables in our regression design. We find that the VIFs of all independent variables in the regressions are lower than 4, and thus conclude that multicollinearity is unlikely to adversely affect our regression results.

5.2. Empirical Results

We report the empirical evidence of the signed loss reserve estimation error model in Tables 4 through 7. It should be noted that a positive (negative) value of reserve error indicates that insurer *i* reports understated (overstated) loss reserves. In other words, significantly negative coefficient estimates are associated with increased reserve estimate conservatism. As mentioned in section 4.3, corporate transparency may be jointly endogenously determined with earnings management decisions, leading to potential endogeneity problems. For this reason, we mainly report estimations using two-stage least square (2SLS) method in this section.

Table 4 provides the estimated coefficients from our 2SLS regression. The result of the Hausman test shows that corporate opacity variable is an endogenous variable because test statistics are significant at the 1% level. We find that the *F*-test of excluded instruments rejects the null hypothesis of weak instruments, and Hansen's *J*-test does not reject the null hypothesis that the instruments are uncorrelated with the error term, indicating that our two instrumental variables (5-year average of industry premium growth rate and 5-year average of reinsurance usage) are valid. The 2SLS estimate of the coefficient on corporate opacity index (*OPACITY*) is positive and significant at the 1% level, indicating that insurers with less transparency are likely to report understated reserves. In terms of economic significance, a rise in corporate opacity by one standard deviation leads to a 21.83 percent increase in under-reserving error [8]. The result implies that a higher level of corporate transparency enables outside stakeholders to better monitor the firm, and consequently, causes insurers to take a more conservative approach to reserve management. This is consistent with the notion in Lobo and Zhou (2001) that firms operating in transparent environments are less likely to engage in earnings management because managers of these firms have less flexibility and weaker incentives to manage reported earnings.

We also find that the coefficient on product concentration (*ProdHHI*) is negatively and significantly related to reserve error, implying that firms with a higher degree of business line concentration are more likely to have overstated reserves. The result is consistent with Grace and Leverty (2012) who state that highly diversified insurers under-report their loss reserves. Insurer financial condition (*WEAK*) is found to be positively related to reserve error, indicating that financially weak insurers tend to under-report loss reserves to avoid regulatory interventions as commonly found in the prior literature (e.g., Petroni, 1992). The coefficient on *ROA* is negative and significant, implying that insurers with a greater taxable income tend to overstate their initial loss reserve estimates to reduce

[8] The coefficient for corporate opacity index is 1.2610. Therefore, a one standard deviation change in corporate opacity results in a change in under-reserving error by 1.2610 × 0.1731= 0.2183 (0.1731 is the standard deviation of corporate opacity index).

their current tax liability (Grace, 1990). Underwriting risk (*RISK*) is significantly and positively related to reserve errors, implying that higher uncertainty in the claim process may motivate managers to manipulate their reserves. *Under* × *LENGTH* and *Over* × *LENGTH* are significant with a positive and a negative sign, respectively, suggesting that reserve error may increase with the length of the claim cycle, consistent with Gaver and Paterson (2004). Among the corporate governance variables, we find that there is only a statistically significant relationship between board size and reserve errors. The coefficient on board size is positive and significant at the 10% level, indicating that larger boards may be less effective in monitoring earnings management due to agency problems, such as coordination problem and free riding.

Table 5 presents the results of interaction effects between firm-specific characteristics and corporate transparency on insurer's loss reserving behavior. We incorporate all interaction terms of firm characteristics and corporate opacity index in Model 1. In Models 2 - 6, we examine the interaction effect of each firm characteristic and corporate opacity, separately. First, we find that the coefficient on the interaction term *Size* × *OPACITY* is negative and significant at the 1% level in both Model 1 and Model 2. The results imply that as insurer size increases, the positive effect of corporate transparency on reserve estimate conservatism is weakened, supporting our hypothesis that the marginal benefits of additional transparency to insurer's reserve management are greater for smaller firms than larger firms because larger firms already have a high level of transparency due to public and regulatory pressures.

The interaction term of *ProdHHI* × *OPACITY* is negatively and significantly related to reserve error in Model 1 and Models 3 at the 1% level. The result is consistent with our expectation that the positive effect of increased corporate transparency on conservative loss reserve estimation is more pronounced for diversified insurers that have higher levels of information asymmetry than focused ones. The coefficients on the interaction term *GEOHHI* × *OPACITY* are not significant in both model 1 and 4. The coefficients on the interaction term of *WEAK* × *OPACITY* are positively significant at the 1% level

in Models 1 and 5. The result shows that the degree of under-reserving by financially struggling insurers is reduced when the firms becomes more transparent. One possible reason is that more corporate transparency may mitigate insurer's inappropriate reserve management by allowing outside investors to easily evaluate the true financial position of the firm.

Finally, the interaction term of *Reinsurance*× *OPACITY* is negatively and significantly associated with reserve error in both models 1 and 6 at the 1% and 10% level, respectively. The finding supports our argument that increased usage of reinsurance reduces the tendency of opaque insurers to under-reserve because reinsurers provide close monitoring of primary insurer's various activities, thereby limiting the possibility for insurers to manage earnings to avoid the scrutiny from regulators.

Table 6 reports the results of the effect of SOX on the relationship between corporate transparency and insurer's reserve management. We add a SOX dummy variable that takes a value of one in the post-SOX period in the regression. The coefficient of the interaction term *SOX* × *OPACITY* is not statistically significant, implying that SOX does not have a significant impact on the relationship between corporate transparency and loss reserving behavior of public property-liability insurers. The results provides support for the finding of Bandit et al. (2013) that additional mandates to seek greater transparency of U.S. publicly traded firms by SOX may simply be redundant for the already highly regulated insurance industry. We next examine the effect of financial crisis on the relationship between corporate transparency and insurer's reserve management. Crisis is a dummy variable that equals to one if the observation occurs in 2008-2009, and zero otherwise. Table 7 shows that the coefficients of the interaction term *CRISIS* × *OPACITY* is negatively and significantly related to reserve errors at the 1% level, indicating that insurers operating in opaque information environments tend to report their reserves more conservatively during the period of the recent financial crisis. The result is consistent with the finding of Jenkins et al. (2009) that accounting conservatism increases during economic downturns because in difficult financial times, firms tend to report their earnings more conservatively in order to avoid litigation risk and regulatory scrutiny.

5.3. Corporate Opacity and Earnings Surprises

To obtain a deeper understanding of how corporate transparency affects the insurer's accounting practices, we examine whether transparent firms are more likely to report earnings surprises than their less transparent counterparts. Prior literature provides evidence that zero or small earnings surprises are closely related to earnings management (Burgstahler and Dichev, 1997; Brown, 2001; Burgstahler and Eames, 2006). Since earnings management behavior, such as an attempt to smooth earnings is easily predictable for analysts (Skinner and Sloan, 2002), we expect that firms with lower levels of transparency are associated with smaller earnings surprises. We calculate earnings surprises by the difference between actual reported earnings per share and the median analysts forecast based on the last one-year-ahead earnings per share forecast (Bouwman, 2014). The data used to compute earnings surprises are collected from I/B/E/S database.

Table 8 reports the results of regressions in which a particular type of earnings surprise (negative, positive, big, or small surprise[9]) is regressed on the corporate opacity variable plus control variables. We find that corporate opacity is significantly negatively related to negative surprises and positively associated with small surprises. The coefficients on the corporate opacity index are not significant for positive and big surprises. The results suggest that insurers with lower levels of transparency are less likely to report negative surprises and tend to exhibit smaller earnings surprises because they engage more in earnings management through the manipulations of loss reserves.

5.4. Robustness Checks

In this section we perform several additional tests to check the robustness of our main results. First, we conduct the regression analysis using a two-way fixed effects model. The (untabulated) results show that the coefficient on the corporate opacity index is significant and positive in reserve error at

[9] Following Bouwman (2014), we define a big (small) earnings surprise as the absolute value of earnings minus the median analysts forecast that exceeds (fails) at least 3 cents per share.

the 5% level, suggesting that corporate opacity is inversely associated with conservative loss reserve estimates. Although not tabulated[10], the results of the interaction effect of firm-specific characteristics (or SOX) and corporate opacity on reserve error generally confirm our previous findings. Thus, our main results remain unchanged with a different estimation method.

Second, we perform analyses similar to those above, but replace the corporate opacity index with each of the individual components of the opacity index to gain a deeper understanding of our main findings. We find that only the coefficients on bid-ask spread and analysts' forecasting error are positive and statistically significant (untabulated). The results indicate that our main results seem to be driven by bid-ask spread and analysts' forecasting error, implying that firms with higher information asymmetry and greater uncertainty in future earnings are more likely to engage in earnings management through the misstatement of loss reserves.

Lastly, we are interested in the accuracy of loss reserve estimates in addition to insurer's reserve estimate conservatism. To examine the relationship between corporate transparency and the magnitude of reserve error, we use the natural log of the absolute value of reserve error as the dependent variable instead of the value of signed loss reserve error, and perform separate regressions for the full sample and the subsamples of over-reserve and under-reserve panel, respectively. As seen in Table 9, corporate opacity is positively associated with the absolute value of reserve error in all three models at the 1% level, indicating that insurers operating in less transparent environments tend to make more reserve error or insurers with greater transparency are likely to estimate loss reserves more accurately. The potential explanation of the results is that managers of transparent firms do not use their discretion to manipulate loss reserves because of wider external monitoring of management decisions and more precise disclosure of financial information.

6. Conclusion

[10] Untabulated results are available from authors upon request.

Insurance companies are more opaque than other non-financial firms due to a risky and complicated liability structure (mainly reserve). Thus, corporate opaqueness can create an environment under which managers easily manipulate earnings through the misstatement of loss reserves. In this study, we examine how corporate transparency is associated with an insurer's loss reserving behavior. To measure the degree of corporate opacity, we construct a composite index of corporate transparency by combining five proxies for a firm's overall information environment (earning quality, bid-ask spread, trading volume, number of analysts, and analysts' forecasting error).

The results show that more transparent insurers tend to report overstated loss reserves, indicating that high levels of corporate transparency may help firms prevent or detect insurer's inappropriate reserve management, leading to more conservative loss reserve estimates. We also provide evidence that insurer-specific characteristics (firm size, product diversification, insurer financial condition, and reinsurance demand) have significant impact on the relationship between corporate transparency and an insurer's loss reserving behavior. Our evidence shows that the implementation of SOX is not associated with changes in the effect of corporate transparency on loss reserving patterns of public property-liability insurers. The results lend some support for the finding of Bandit et al. (2013), suggesting that additional mandates by SOX may not be effective for the highly regulated insurance industry. We also find that insurer's reserve estimate conservatism is more pronounced during the period of the recent financial crisis. Finally, our findings show that insurers operating in opaque information environments tend to report less accurate loss reserve estimates and are more likely to show smaller earnings surprises.

Our overall results suggest that although regulations provide monitoring and discipline for the management of regulated firms, corporate transparency still plays a crucial role in mitigating managerial accounting discretion even in a highly regulated environment such as the insurance industry. Therefore, our findings have important implications for regulators and a variety of stakeholders whose primary concern is to monitor insurer's financial soundness.

Appendix

To calculate discretionary accruals, we employ the modified Jones model derived from Dechow et al. (1995). First, we estimate the following cross-sectional regression equation for each fiscal year (1996-2009) to obtain parameters:

$$\frac{ACC_{j,t}}{ASSETS_{j,t-1}} = \alpha_0 \frac{1}{ASSETS_{j,t-1}} + \beta_1 \frac{\Delta SALES_{j,t}}{ASSETS_{j,t-1}} + \beta_2 \frac{GPPE_{j,t}}{ASSETS_{j,t-1}} + \varepsilon_{j,t} \quad (1)$$

Next, we calculate signed discretionary accruals ($DiscAcc_{j,t}$) as the difference between a firm's actual level and the expected level of total accruals by using equation (2). The parameters are estimated from Eq. (1). Finally, earnings quality (*EARNOPACITY*) is computed as the absolute value of the signed discretionary accruals.

$$\left|DiscACC_{j,t}\right| = \frac{ACC_{j,t}}{ASSETS_{j,t-1}} - \{ \widehat{\alpha_0} \frac{1}{ASSETS_{j,t-1}} + \widehat{\beta_1} \frac{\Delta SALES_{j,t} - \Delta RECEIVABLES_{j,t}}{ASSETS_{j,t-1}} + \widehat{\beta_2} \frac{GPPE_{j,t}}{ASSETS_{j,t-1}} \quad (2)$$

where Total accruals (ACC) = (Income before extraordinary items and discontinued operations – operating cash flows)/ lagged total assets, Change in sales (ΔSALES) = (Sales – lag Sales) / lag total asset, Gross property, plant, and equipment (GPPE) = (Gross property, plant, and equipment – lag Gross property, plant, and equipment) / lag total asset, Change in receivables (ΔRECEIVABLES) = (receivables – lag receivables) / lag total asset.

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Table 1. Variable Definitions

Variable	Definition
Corporate Transparency	
EARNOPACITY	Absolute value of discretionary accruals based on the modified Jones model derived from Dechow et al. (1995)
SPREAD	Annual bid-ask spread by averaging daily bid-ask spread for the one-year period. An average daily bid-ask is computed as the daily ask price minus daily bid price divided by the average of daily bid and ask prices
VOLUME	The natural logarithm of average daily trading volume during the fiscal year
COVERAGE	The natural logarithm of the number of analysts providing earnings forecast 9 months prior to the end of fiscal year
ForecastError	The square of the difference between mean analysts' earnings forecast (9 months prior) and actual firm earnings scaled by firm's stock price
OPACITY	An Index that ranks values of five transparency measures into deciles with the most opaque firms taking a value of ten and the least opaque firms taking a value of one, and scales the sum of the five subsidiary rankings by a factor of 50
Reserve Management	
ERROR	Claims loss reserve estimation error scaled by total admitted assets. Claims loss reserve estimation error is calculated as the difference between the original loss reserve estimate in year *t* and the developed loss reserve in period *t*+5 $ERROR_{i,t} = (RESERVE_{i,t+5} - RESERVE_{i,t}) / ASSETS_t$
Firm characteristics	
Size	Natural log of total net written premiums
Reinsurance	Ratio of reinsurance premium ceded to the sum of direct premiums written and reinsurance assumed
ProdHHI	Sum of the squares of the value of net written premiums in line *i* divided by insurer's total net written premiums

Table 1. (Continued)

Variable	Definition
GeoHHI	Sum of the squares of the value of net written premiums in state *i* divided by insurer's total net written premiums
WEAK	One if insurer has more than four unusual insurance Regulatory Information System (IRIS) ratios, and zero otherwise
ROA	Ratio of net income plus taxes and interest expenses to net admitted assets
RISK	Standard deviation of the firm's loss ratio over 5 year rolling periods where loss ratio is the percentage of claim loss reserve to total liabilities.
MAL	The percentage of net premiums written from malpractice insurance
LENGTH	The percentage of claim loss reserve to total liabilities
UNDER	One if the reserve error is positive, and zero otherwise
OVER	One if the reserve error is negative, and zero otherwise
Corporate Governance	
Bsize	The number of directors serving on the board
Busy	The average number of directorship position that board members hold in other public companies.
OWN	The percentage of shares held by board directors
Meetings	Natural log of number of board meetings
Duality	One if CEO is also the chair of the board and zero otherwise.
Outsider	The percentage of outside directors on the board

Table 2. Summary Statistics

Variables	N	Mean	Median	Std. Dev	Minimum	Maximum
ERROR	451	-0.0088	-0.0196	0.1344	-0.7819	1.7200
OPACITY	451	0.4507	0.4600	0.1731	0.1200	0.8975
EARNOPACITY	451	0.0412	0.0260	0.0479	0.0001	0.3463
SPREAD	451	0.0076	0.0035	0.0098	0.0002	0.0822
VOLUME	451	15.3938	15.4239	1.7145	9.8193	19.1853
COVERAGE	451	1.3328	1.3863	0.7528	0.0000	2.9957
ForecastError	451	0.0287	0.0200	0.1867	0.0000	3.1249
Size	451	21.5802	21.6234	1.3650	18.2984	24.6272
Reinsurance	451	0.1893	0.1078	0.1952	0.0000	0.8995
ProdHHI	436	0.3925	0.2801	0.2435	0.0709	1.0000
GeoHHI	441	0.1486	0.0743	0.1894	0.0351	1.0000
WEAK	451	0.0532	0.0000	0.2247	0.0000	1.0000
ROA	451	0.0398	0.0399	0.0462	-0.2570	0.1697
RISK	446	0.0856	0.0551	0.1783	0.0050	2.1677
MAL	437	0.0777	0.0012	0.2143	0.0001	1.0000
LENGTH	451	0.4497	0.4673	0.1699	0.0138	0.9363
UNDER	447	0.3400	0.0000	0.4742	0.0000	1.0000
OVER	450	0.6622	1.0000	0.4735	0.0000	1.0000
Bsize	451	10.4071	10.0000	2.6172	4.0000	19.0000
Busy	451	1.2298	1.0000	0.9505	0.0000	4.3333
OWN	451	0.1298	0.0515	0.2172	0.0000	0.7801
Meetings	451	5.9283	5.0000	2.8379	2.0000	18.0000
Duality	451	0.5549	1.0000	0.4776	0.0000	1.0000
Outsider	448	0.7700	0.8000	0.1431	0.1429	1.0000

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009.
See Table 1 for variable definitions.

Table 3. Pearson Correlation Matrix

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
1. OPACITY	1																						
2. EARNOPACITY	0.043 0.358	1																					
3. SPREAD	0.472 <0.0001	0.172 0.024	1																				
4. VOLUME	-0.515 <0.0001	-0.005 0.714	-0.575 <0.0001	1																			
5. COVERAGE	-0.598 <0.0001	-0.068 0.155	-0.428 <0.0001	0.738 <0.0001	1																		
6. ForecastError	0.019 0.735	0.193 <0.0001	0.068 0.151	-0.050 0.287	-0.245 0.603	1																	
7. ERROR	0.257 <0.0001	0.039 0.401	0.159 0.0007	-0.082 0.083	-0.043 0.367	0.009 0.853	1																
8. Size	-0.507 <0.0001	-0.114 0.016	-0.420 <0.0001	0.613 <0.0001	0.539 <0.0001	-0.087 0.065	-0.082 0.081	1															
9. Reinsurance	-0.077 0.162	-0.019 0.679	-0.036 0.452	0.018 0.005	0.017 0.720	-0.018 0.694	-0.042 0.073	0.013 0.784	1														
10. ProdHHI	-0.149 0.019	-0.043 0.361	-0.038 0.429	0.069 0.145	0.029 0.107	-0.032 0.116	-0.164 0.009	0.079 0.041	0.084 0.078	1													
11. GeoHHI	-0.043 0.318	-0.032 0.502	-0.047 0.323	0.030 0.525	0.118 <0.0001	-0.027 0.565	-0.051 0.285	0.421 0.377	0.054 0.259	0.040 0.072	1												
12. WEAK	0.262 0.005	0.084 0.459	0.010 0.836	-0.021 0.659	-0.021 0.792	0.147 <0.0001	0.055 0.243	-0.140 0.188	-0.047 0.319	-0.057 0.227	-0.063 0.080	1											
13. ROA	-0.376 0.019	-0.074 <0.0001	-0.059 0.213	0138 0.003	0.074 0.114	-0.018 0.877	-0.245 <0.0001	0.127 0.005	-0.194 <0.0001	0.092 0.005	0.006 0.832	-0.320 <0.0001	1										
14. RISK	0.650 <0.0001	0.256 0.233	0.101 0.015	-0.117 0.013	-0.047 0.312	0.028 0.553	0.134 0.004	-0.071 0.189	-0.359 0.191	0.172 <0.0001	0.032 0.510	0.405 <0.0001	-0.426 <0.0001	1									
15. MAL	-0.105 0.002	-0.063 0.185	-0.021 0.662	0.045 0.053	0.229 0.632	-0.036 0.783	-0.089 0.617	0.030 0.531	-0.101 0.032	-0.476 <0.0001	-0.005 0.447	0.078 0.103	-0.073 0.003	-0.362 0.453	1								
16. Under x LENGTH	0.649 <0.0001	0.073 0.194	0.183 0.074	-0.082 0.084	-0.036 0.449	0.049 0.297	0.471 <0.0001	-0.187 0.012	-0.128 0.007	-0.063 0.896	-0.026 0.059	0.097 0.069	-0.027 0.573	0.091 0.053	0.056 0.239	1							
17. Over x LENGTH	-0.068 0.832	-0.065 0.163	-0.121 0.010	0.052 0.265	0.042 0.098	-0.025 0.594	-0.389 <0.0001	0.132 0.005	0.069 0.139	0.035 0.472	0.087 0.069	-0.071 0.131	0.035 0.455	-0.046 0.332	-0.078 0.102	-0.763 <0.0001	1						
18. Bsize	0.078 0.133	0.154 0.727	0.080 0.089	-0.008 0.879	-0.014 0.758	0.069 0.141	0.067 0.152	0.007 0.879	0.045 0.825	-0.035 0.468	0.116 0.015	0.038 0.417	-0.046 0.318	-0.084 0.860	0.024 0.610	0.113 0.216	0.007 0.874	1					
19. Busy	-0.043 0.369	-0.003 0.992	-0.045 0.341	0.081 0.085	0.067 0.161	-0.038 0.413	-0.008 0.653	0.056 0.235	-0.067 0.158	0.751 0.117	-0.148 0.001	0.044 0.349	0.115 0.013	0.056 0.237	-0.138 0.422	-0.075 0.011	-0.774 0.119	-0.102 0.032	1				
20. OWN	0.070 0.135	0.030 0.521	0.092 0.050	-0.005 0.818	-0.423 0.370	0.007 0.880	0.021 0.854	-0.004 0.528	0.186 <0.0001	-0.059 0.013	0.074 0.018	-0.039 0.408	0.114 0.018	-0.203 0.278	-0.026 0.579	-0.017 0.720	-0.033 0.186	-0.067 0.162	-0.248 <0.0001	1			
21. Meeting	-0.068 0.152	-0.013 0.799	-0.159 0.735	0.065 0.067	0.027 0.523	-0.007 0.809	-0.039 0.546	-0.048 0.305	-0.075 0.113	0.054 0.294	-0.038 0.423	0.088 0.061	0.014 0.675	0.082 0.019	-0.021 0.165	-0.030 0.526	-0.026 0.589	-0.113 0.016	0.146 0.001	-0.173 0.0002	1		
22. Duality	-0.039 0.414	-0.103 0.029	-0.035 0.456	0.023 0.628	0.113 0.080	-0.015 0.735	-0.037 0.456	0.047 0.314	-0.137 0.004	-0.102 0.034	0.107 0.024	-0.047 0.342	-0.003 0.954	-0.078 0.802	0.075 0.115	0.018 0.699	0.045 0.336	0.182 0.001	0.097 0.043	-0.038 0.389	-0.168 0.0003	1	
23. Outsider	-0.112 0.018	-0.009 0.845	-0.023 0.632	0.115 0.745	0.253 0.256	-0.024 0.615	-0.076 0.104	0.076 0.574	-0.055 0.241	0.207 0.043	-0.046 0.331	0.038 0.443	0.024 0.659	0.025 0.020	0.052 0.056	0.106 0.026	0.051 0.183	0.126 0.008	0.407 <0.0001	-0.255 <0.0001	0.234 <0.0001	-0.148 0.002	1

The table reports the Pearson correlation matrix for all variables. See Table 1 for variable definitions.

Table 4. Regression Result of 2SLS of Loss reserve error (ERROR) on Corporate Opacity

Variables	Predicted Sign	Estimated Coefficient	*t*-statistics	*p*-value
Intercept		-0.3865	-1.38	0.169
OPACITY	+	1.2610	5.78	<0.0001***
Size	-	-0.0019	-0.41	0.684
Reinsurance	-	-0.0343	-1.10	0.272
ProdHHI	-	-0.0135	-1.93	0.054*
GeoHHI	-	-0.0596	-0.96	0.339
WEAK	+	0.0475	1.72	0.085*
ROA	-	-0.5528	-3.53	0.005***
RISK	+	0.1261	2.78	0.006***
MAL	?	-0.0245	-0.79	0.428
Under × *LENGTH*	+	0.2112	5.01	<0.0001***
Over × *LENGTH*	-	-0.0709	-1.90	0.058*
Bsize	?	0.0042	1.85	0.065*
Busy	?	-0.0041	-0.59	0.557
OWN	?	0.0011	0.04	0.968
Meetings	?	-0.0026	-1.26	0.210
Duality	?	0.0071	0.56	0.577
Outsider	-	-0.0134	-0.28	0.776
Hausman Test (*p-value*)		0.0003		
F-test *(P-value)*		0.0000		
Hansen's J-test (*P-value*)		0.2138		
Firm-Year Observations		451		
Adjusted R-square		0.3053		

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009. *significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. *t*-values corrected for heteroscedasticity are in parentheses. See Table 1 for variable definitions.

Table 5. Regression Result of 2SLS of Interaction Effects of firm-specific characteristics and Corporate Opacity on Loss reserve error (ERROR)

Dependent Variables: Reserve Error (ERROR)							
	Predicted Sign	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept		-0.3855	-0.5034***	-0.3927	-0.4007	-0.2848	-0.3967
		(-1.47)	(-4.38)	(-1.40)	(-1.46)	(-1.08)	(-1.42)
OPACITY	+	1.3039***	1.2961***	1.5567***	1.9058***	2.0978***	1.7277***
		(3.07)	(7.06)	(3.63)	(7.19)	(8.84)	(5.06)
Size	-	-0.0110**	-0.0217***	-0.0020	-0.0019	-0.0028	-0.0022
		(-2.06)	(-4.29)	(-0.44)	(-0.42)	(-0.64)	(-0.47)
Size x OPACITY	-	-0.2973***	-0.6524***				
		(-2.66)	(-6.52)				
Prod HHI	-	-0.0879***	-0.0070	-0.0117*	-0.0028	-0.0095	-0.0023
		(-3.54)	(-0.59)	(-1.96)	(-0.23)	(-0.80)	(-0.18)
Prod HHI x OPACITY	-	-2.3926***		-0.4280***			
		(-3.51)		(-2.91)			
GeoHHI	-	-0.0689	-0.0577	-0.0607	-0.1198	-0.0635	-0.0569
		(-1.37)	(-1.06)	(-0.80)	(-1.05)	(-1.04)	(-0.98)
Geo HHI x OPACITY	-	-0.0044			-0.0138		
		(-0.36)			(-0.60)		
WEAK	+	0.0656**	0.0679**	0.0491*	0.0536**	0.0564*	0.0443
		(1.97)	(2.57)	(1.78)	(1.98)	(1.89)	(1.61)
WEAK x OPACITY	+	2.6322***				2.3053***	
		(6.18)				(7.11)	
Reinsurance	-	-0.0359	-0.0339	-0.0389	-0.0209	-0.0492*	-0.0362
		(-0.74)	(-1.16)	(-1.23)	(-0.67)	(-1.68)	(-0.72)
Reinsurance x OPACITY	-	-0.9222***					-0.3256*
		(-3.02)					(-1.78)
ROA	-	-0.3999***	-0.5299***	-0.5711***	-0.5306***	-0.5348***	-0.5677***
		(-2.73)	(-3.55)	(-3.61)	(-3.45)	(-3.62)	(-3.63)
RISK	+	0.0389	0.0632	0.1189**	0.1165***	0.0443	0.1314***
		(0.91)	(1.45)	(2.57)	(2.62)	(1.00)	(2.90)
MAL	?	-0.0203	-0.0165	-0.0257	-0.0167	-0.0355	-0.0229
		(-0.72)	(-0.56)	(-0.83)	(-0.55)	(-1.22)	(-0.75)
Under x LENGTH	+	0.1725***	0.1670***	0.2113***	0.2012***	0.1996***	0.2059***
		(4.45)	(4.11)	(5.01)	(4.86)	(5.01)	(4.88)
Over x LENGTH	-	-0.0862**	-0.0993***	-0.0698*	-0.0751**	-0.0659*	-0.0754**
		(-2.52)	(-2.77)	(-1.87)	(-2.05)	(-1.87)	(-2.02)
Bsize	?	0.0029	0.0046**	0.0045*	0.0029	0.0051**	0.0043*
		(1.39)	(2.12)	(1.94)	(1.33)	(2.35)	(1.91)
Busy	?	-0.0058	-0.0059	-0.0036	-0.0050	-0.0049	-0.0032
		(-0.89)	(-0.88)	(-0.51)	(-0.07)	(-0.74)	(-0.45)
OWN	?	0.0065	0.0014	0.0006	0.0063	0.0109	0.0005
		(0.26)	(0.05)	(0.02)	(0.23)	(0.41)	(0.02)
Meetings	?	-0.0013	-0.0012	-0.0026	-0.0026	-0.0020	-0.0027
		(-0.67)	(-0.62)	(-1.26)	(-1.25)	(-1.04)	(-1.29)
Duality	?	0.0054	0.0111	0.0081	0.0114	0.0057	0.0047
		(0.46)	(0.91)	(0.63)	(0.90)	(0.47)	(0.37)
Outsider	-	-0.0211	-0.0021	-0.0162	-0.0138	-0.0020	-0.0142
		(-0.49)	(-0.05)	(-0.34)	(-0.30)	(-0.10)	(-0.30)
Hausman Test (*p-value*)		0.0000	0.0001	0.0000	0.0000	0.0000	0.0001
F-test *(P-value)*		0.0001	0.0002	0.0000	0.0000	0.0000	0.0000
Hansen's J-test (*p-value*)		0.2509	0.2647	0.2491	0.2624	0.2558	0.2364
Firm-Year Observations		451	451	451	451	451	451
Adjusted R-square		0.4289	0.3697	0.3047	0.3319	0.3812	0.3090

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009. *significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. *t*-values corrected for heteroscedasticity are in parentheses. See Table 1 for variable definitions.

Table 6. Regression Result of 2SLS of the Effects of SOX on the relation between Loss reserve error (ERROR) and Corporate Opacity

Variables	Predicted Sign	Estimated Coefficient	*t*-statistics	*p*-value
Intercept		-0.7902	-2.63	0.009***
SOX	?	-0.0323	-1.41	0.161
OPACITY	+	1.1235	5.68	<0.0001***
SOX x *OPACITY*	?	-0.6017	-1.44	0.151
Size	-	-0.0026	-0.58	0.567
Reinsurance	-	-0.0361	-1.17	0.241
ProdHHI	-	-0.0062	-1.76	0.079*
GeoHHI	-	-0.0537	-0.49	0.622
WEAK	+	0.0469	1.72	0.086*
ROA	-	-0.6096	-3.93	<0.0001***
RISK	+	0.1301	2.91	0.004***
MAL	?	-0.0175	-0.57	0.566
Under × *LENGTH*	+	0.1861	4.40	<0.0001***
Over × *LENGTH*	-	-0.0785	-2.12	0.034**
Bsize	?	0.0046	2.03	0.043**
Busy	?	-0.0045	-0.65	0.519
OWN	?	0.0046	-0.16	0.869
Meetings	?	-0.0029	-1.43	0.154
Duality	?	0.0032	0.26	0.798
Outsider	-	-0.0067	-0.13	0.885
Hausman Test (*p-value*)		0.0005		
F-test *(P-value)*		0.0000		
Hansen's J-test (*P-value*)		0.2327		
Firm-Year Observations		451		
Adjusted R-square		0.3245		

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009. *significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. *t*-values corrected for heteroscedasticity are in parentheses. See Table 1 for variable definitions.

Table 7. Regression Result of 2SLS of the Effects of Financial Crisis on the relation between Loss reserve error (ERROR) and Corporate Opacity

Variables	Predicted Sign	Estimated Coefficient	*t*-statistics	*p*-value
Intercept		-0.8324	-2.80	0.005***
CRISIS	?	-0.0043	-0.25	0.802
OPACITY	+	1.6148	6.69	<0.0001***
CRISIS x *OPACITY*	?	-1.3078	-3.64	0.0003***
Size	-	-0.0013	-0.30	0.767
Reinsurance	-	-0.0256	-0.67	0.503
ProdHHI	-	-0.0055	-1.54	0.125
GeoHHI	-	-0.0463	-0.45	0.656
WEAK	+	0.0395	1.47	0.142
ROA	-	-0.5760	-3.76	0.0002***
RISK	+	0.1529	3.44	0.0006***
MAL	?	-0.0194	-0.64	0.519
Under × *LENGTH*	+	0.1943	4.65	<0.0001***
Over × *LENGTH*	-	-0.0746	-2.04	0.042**
Bsize	?	0.0037	2.47	0.014**
Busy	?	-0.0034	-0.50	0.621
OWN	?	0.0083	-0.30	0.723
Meetings	?	-0.0031	-1.53	0.126
Duality	?	0.0019	0.15	0.877
Outsider	-	-0.0032	-0.07	0.943
Hausman Test (*p-value*)		0.0003		
F-test *(P-value)*		0.0000		
Hansen's J-test (*P-value*)		0.2475		
Firm-Year Observations		451		
Adjusted R-square		0.3427		

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009. *significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. *t*-values corrected for heteroscedasticity are in parentheses. See Table 1 for variable definitions.

Table 8. Regression Result of 2SLS of Earnings surprises (SURPRISE) on Corporate Opacity

Dependent Variable:	Negative surprise	Positive surprise	Big surprise	Small surprise
Intercept	1.7469**	0.7026**	0.0477	0.2507
	(2.29)	(2.16)	(0.36)	(1.13)
OPACITY	-1.3215**	-0.7463	0.1322	1.1673**
	(-2.25)	(-1.41)	(1.51)	(2.26)
Size	-0.2551**	-0.0096	-0.0018	-0.1935**
	(-2.14)	(-0.37)	(-1.11)	(-2.45)
Reinsurance	0.9278	0.0689	-0.0040	0.3569
	(1.16)	(1.29)	(-0.43)	(0.33)
ProdHHI	-0.2266	-0.0322	-0.0117	0.8625
	(-0.36)	(-0.54)	(-1.51)	(0.79)
GeoHHI	-0.2920	-0.0705	0.0675	-0.1922
	(-0.33)	(-0.45)	(1.29)	(-0.94)
WEAK	-1.8864**	-0.0181	-0.0050	0.3936
	(-2.37)	(-0.63)	(-0.46)	(0.63)
ROA	0.7259	0.3872	0.1036	-0.6059
	(0.45)	(0.41)	(1.44)	(-1.38)
RISK	0.5029	0.1179*	0.0739	-0.6638
	(1.50)	(1.94)	(0.42)	(-1.52)
MAL	-0.1718	0.0090	0.0238*	0.5439
	(-1.19)	(0.06)	(1.92)	(0.94)
Under × LENGTH	-0.0787*	0.0774***	-0.0739	0.9429**
	(-1.81)	(3.05)	(-0.42)	(2.27)
Over × LENGTH	0.0878	0.3547	0.0614	-2.8355**
	(0.95)	(1.60)	(0.35)	(-2.02)
Bsize	0.0337	0.0113	0.0001	-0.0527
	(0.59)	(0.91)	(0.17)	(-1.34)
Busy	-0.0889	0.0748*	0.0023	-0.0247
	(-0.47)	(1.96)	(0.90)	(-0.62)
Ownership	0.5979	0.0779	-0.0028	0.0145
	(0.95)	(0.43)	(-0.22)	(0.43)
Meetings	0.0224	0.0070	-0.0004	-0.0643***
	(0.50)	(0.48)	(-0.47)	(-2.72)
Duality	-0.4046	0.0117	0.0165*	-0.5055
	(-1.22)	(0.17)	(1.65)	(-1.15)
Outsider	-0.0913	-0.1921	-0.0017	-0.0928
	(-1.08)	(-0.77)	(-1.11)	(-0.21)
Hausman Test (*p-value*)	0.0000	0.0050	0.0133	0.0016
F-test *(P-value)*	0.0000	0.0000	0.0000	0.0000
Hansen's J-test (*P-value*)	0.2336	0.2874	0.2724	0.2732
Firm-Year Observations	219	232	344	107
Adjusted R-square	0.2413	0.2145	0.1783	0.1819

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009. *significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. *t*-values corrected for heteroscedasticity are in parentheses. See Table 1 for variable definitions.

Table 9. Regression Result of 2SLS of Absolute reserve error (ABSError) on Corporate Opacity

Dependent Variable:	Model (1)	Model (2)	Model (3)
	Full sample	Under-reserve (ERROR>0)	Over-reserve (ERROR<0)
Intercept	0.5529**	0.1627	0.0429
	(2.03)	(1.64)	(0.22)
OPACITY	1.0292***	1.0413***	1.9680***
	(4.85)	(4.91)	(6.51)
Size	-0.0017	-0.0038	-0.0025
	(-0.26)	(-0.89)	(-0.31)
Reinsurance	-0.0629**	-0.0442	-0.0959
	(-2.07)	(-1.47)	(-1.32)
ProdHHI	-0.0014	-0.0018	-0.0075
	(-0.11)	(-0.15)	(-0.31)
GeoHHI	-0.0135	-0.0093	-0.0436
	(-0.45)	(-0.31)	(-0.65)
WEAK	0.0677**	0.0726***	0.0138*
	(2.52)	(2.69)	(1.76)
ROA	-0.5641***	-0.5514***	-0.6982*
	(-3.70)	(-3.68)	(-1.74)
RISK	0.0179	0.0225	0.0352
	(0.41)	(0.51)	(0.25)
MAL	-0.1490	-0.0242	-0.0503
	(-0.50)	(-0.82)	(-0.68)
Under × LENGTH	0.0324***	0.0483*	
	(2.84)	(1.93)	
Over × LENGTH	-0.0188***		-0.0254***
	(-2.68)		(-2.73)
Bsize	0.0030	0.0031*	0.0094**
	(1.36)	(1.74)	(2.09)
Busy	-0.0019	-0.0032	-0.0161
	(-0.27)	(-0.48)	(-1.12)
Ownership	0.0119	0.0179	0.0249
	(0.43)	(0.65)	(0.45)
Meetings	-0.0015	-0.0011	-0.0038
	(-0.77)	(-0.56)	(-0.63)
Duality	0.0205	0.0229*	0.0382
	(1.65)	(1.83)	(1.30)
Outsider	-0.0667	-0.0596	-0.0272
	(-1.46)	(-1.30)	(-0.95)
Hausman Test (*p-value*)	0.0002	0.0000	0.0030
F-test *(P-value)*	0.0000	0.0000	0.0000
Hansen's J-test (*P-value*)	0.2643	0.2164	0.2966
Firm-Year Observations	451	152	299
Adjusted R-square	0.1563	0.1418	0.3709

The sample includes 451 U.S. publicly traded property-liability insurer-years during 1996-2009. *significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level. *t*-values corrected for heteroscedasticity are in parentheses. See Table 1 for variable definitions.