

Cash Holdings between Public and Private Insurers

– A Partial Adjustment Approach

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Abstract

Cash holdings of financial institutions, especially private firms, have been under-studied in the existing literature. This paper fills the gap by examining the cash holdings of US property-liability (P-L) insurers in order to analyze the difference in cash holding and cash adjustments between public and private insurers and between mutual and stock insurers within the private insurers category. We find that the cash holdings of insurers are mean-reverting. Different from the findings for industrial firms but consistent with the argument that public firms have a lower cost of financing than private firms, we find that public insurers hold less cash than private insurers. Consistent with the managerial discretion argument, we find mutual insurers tend to hold less cash than private stock insurers. In regard to excess cash, public insurers tend to hold more excess cash than private insurers, supporting the agency theory that managers of public firms like more free cash flows to reduce firm risk and increase managerial discretion. Mutual insurers also hold more excess cash than private stock insurers due to their limited access to the capital market. In addition, public insurers are found to adjust cash holdings faster toward their target cash levels when there is a cash shortfall and slower when there is cash excess than private insurers would. Mutual insurers adjust cash holdings slower toward their target cash levels than private stock insurers in the cases of both cash shortfall and cash excess.

JEL classification: G22

Keywords: cash holding, excess cash, property-liability insurance, private firm, mutual insurers, stock insurers, partial adjustment

Introduction

As US companies are holding a lot more cash in recent decades than they used to do (Casselmann, 2013; Lahart, 2010), academic interest in understanding corporate cash holding policies has increased (Bates, Kahle and Stultz, 2009; Gao, Harford and Li, 2013). However, due to the lack of data for private firms, most studies only focus on public firms. Only recently have we observed some efforts to collect data on certain types of private firms and analyze their cash holding policies. Representative work includes Gao, Harford and Li (2013), which investigates the determinant of cash holding policy for a set of US private firms with public debt issues, and Bigelli and Sánchez-Vidal (2012), which examines cash holdings of Italian private firms in particular. However, these studies have excluded financial firms from their sample because they believe that financial firms' cash holdings can be subject to some forms of regulatory supervision.

This study intends to examine the difference in cash holding strategies of public and private companies in the US property-liability insurance industry. The major reason that financial firms are excluded from existing cash holding studies is that financial firms are highly regulated in regard to their cash reserve levels. Therefore, these firms' cash holding behaviors differ from firms of other industries in general. Within the financial services industry, however, differences still exist between public and private firms due to the possible variation in agency conflicts and other infrastructure differences across these two groups of firms, but this issue is under-explored in academic research. In this paper, we use the data from the US

property-liability insurance industry to investigate the cash holding differences between public and private firms. As all insurance firms in the US are required to report their financial data to regulators, we are able to obtain complete data for all insurers in the industry, regardless of their public trading status or public debt issue status. This helps eliminate sample selection bias and offers us the opportunity to explore the differences between public and private insurers. This research is the first study that we are aware of that investigates the differences in cash policies between public and private financial institutions.

Cash liquidity is important for property-liability insurers. As the industry operates on debt, with consumers paying in advance in exchange for insurance companies' promise to pay claims in the future, withholding sufficient funds to pay claims quickly is important to the reputation and continuous operation of insurers. Additionally, sufficient cash holdings will provide a cushion for insurers when unexpected events, such as catastrophic losses, which tend to lead to drastic increase of cash outflows, deplete liquidity, and increase the probability of insolvency of insurers, occur. These are the major benefits of holding "adequate" cash. However, holding excessive amount of assets in cash is costly as well. Cash holding does not generate investment returns. The insurance industry's profits come from two sources: underwriting profits and investment profits. It is well recognized by the industry that insurance firms heavily depend on the profits from investments,¹ and holding cash means missing

¹ Insurance companies profit from both underwriting business and investment returns. But in recent years, returns from investments are the major source of profits. Warren Buffett explains this business model as earning investment profits with "float" (the difference between the money ("collect-now") and the amount ("pay-later")) (See Warren Buffett's annual letter 2009).

valuable investment opportunities. Riddick and Whited (2009) theoretically show that “firms lower cash reserves to invest after receiving positive cash-flow shocks, and vice versa.” The above-mentioned tradeoff between costs and benefits of cash for insurance companies provides an ideal environment to test the tradeoff model of cash holdings (Kim, Mauer and Sherman, 1998).

In addition to differences between public and private insurers, the US insurance industry provides an ideal testing-ground to examine cash holding policies within the private firm category – mutual and stock ownership form, which is usually absent in nonfinancial industries. In the US, mutual² and stock insurance companies coexist in the market. As pointed out by Harrington and Niehaus (2002), one major disadvantage of the mutual organizational form is that they are more restricted in raising new capital as compared to stock insurers. There has been rich literature investigating the difference in operation, corporate governance, and performance of the two types of ownership structures (Mayers and Smith, 1981, 1988, 2004; Cummins and Xie, 2015), but none of them focus on the cash management policies of the two types of firms, and this research will bridge that gap.

In sum, this research expands the cash flow literature by investigating cash management policies in the US property-liability insurance industry. The paper focuses on using financing frictions and agency conflicts theory to explain cash policies between public and private insurers and to test the theories regarding private insurers by distinguishing between private stock insurers and mutual insurers.

² A mutual insurance company is a private company owned by its policyholders.

The rest of the paper is organized as follows. The next section introduces related literature and presents the tested hypotheses, followed by the discussion of data and methodology. We then report the empirical results and draw our conclusions.

Literature Review and Hypotheses Tested

Literature review

There is considerable literature regarding public firms' cash management. It is argued that the primary motivations for a company to hold more cash include facilitating transactions (Mulligan, 1997), for precautionary purposes (Opler et al., 1999), for taxation avoidance (Foley et al., 2007), or because of agency conflicts (Jensen, 1986; Dittmar and Mahrt-Smith, 2007). In particular, Harford, Mansi, and Maxwell (2008) provide the evidence from the perspective of agency problems that firms with poor governance tend to spend more cash than firms with better governance. Bates, Kahle, and Stulz (2009) find that public US firms hold more cash over time primarily for precautionary reasons.

As data for private firms has become increasingly available in recent years, more research has shifted from studying only public firms to including both public and private firms. Gao, Harford, and Li (2013) compare cash policies in public and private U.S. firms (SEC-filing private firms) and find that private firms on average hold less cash than public firms do. They attribute this difference to the higher agency costs in public firms. Farre-Mensa (2015) documents that the average public US firm holds twice as much cash as the average private firm (the paper includes non-SEC filing private US firms). The paper argues that the difference can be mostly explained by an

unexplored benefit of being privately-held: private firms can choose to disclose confidential information to selected investors to minimize information asymmetry between the firms and their investors. In this way, private firms do not need to hold large precautionary cash reserves like their public counterparts do. Bigelli and Sánchez-Vidal (2012) examine the determinants for cash holdings for Italian private firms only and find that smaller firms, firms with riskier cash flows, and firms with lower effective tax rates hold significantly more cash. All of these papers have excluded financial firms from their study sample for the regulatory reason.

The insurance industry is heavily regulated, due to its unique features of operation and its important role in social and economic stability. Insurance companies have to meet (implicit) regulated cash reserve requirements and thus have limited room in cash management compared to other corporations. These requirements are applied equally to publicly traded and private insurance firms, which makes it even more interesting for us to investigate the difference in cash management policies between these two types of insurance firms.

There are a couple of reasons that academic studies on cash policy in the insurance industry are needed. First, compared to other industries, cash plays an even more important role in the insurance industry. Insurance companies collect premiums first and pay out claims to policyholders when a loss occurs. There are more uncertainties involved in this operating model than in other industries. It is likely that premium collected may not be adequate to pay future claims due to unexpected catastrophic events, dynamic development of risks, or pricing errors. Additionally,

there is randomness regarding the timing of cash payout, as losses could occur randomly and could be settled over a long period of time. Meanwhile, insurance companies will face greater difficulties if they fail to have adequate cash to pay out claims, which will result in complaints from customers, pressure from regulators, fire sale of assets, damage of reputation, and, in the worst-case scenario, bankruptcy. Therefore, other than general rules from regulators, it is very important for each insurance company to set its own cash policies based on its own operations.

Second, the various ownership forms in the insurance industry provide rich information to test various levels of agency problems, access to capital issues, and precautionary motivation for cash reserves. Like in many other industries, one type of ownership variation in the US insurance industry is public vs. private ownership. How cash policies vary between these ownership forms are unclear to the market. Besides the private/public dichotomy, in the US, insurance companies can be formed either in mutual ownership form, where there are no shareholders, with policyholders/customers being the residual claimants, and the stock ownership form, where shareholders of the firm are the residual claimants. Unlike stock firms (public or private), in which conflicts reside both between shareholders and managers and between shareholders and policyholders (customers), mutual insurance companies only have one type of conflict: interest conflicts between managers and policyholders (customers). The economic theory of agency (see Cummins, Weiss, and Zi, 1999; Mayers and Smith, 1988) suggests that the stock ownership form provides better mechanisms for owners to control the firm's managers than the mutual ownership

form. To the extent that poor control mechanisms lead to sub-optimal performance, the expense preference hypothesis predicts that mutuals will perform more poorly than stocks overall. The managerial discretion hypothesis, on the other hand, predicts that mutuals will focus on less complex and less risky lines of business; in this case, managers would need less discretion, and owners' control over managers would be less important. Because mutual insurers and stock insurers may target different lines of business, have different operating strategies, and have differences in ability to access the capital market, their cash management policies may also vary.

Little research has been done on the cash policies of insurers. An important paper we document is Colquitt, Sommer, and Godwin (1999), which studies the determinants of cash holdings of US P-L insurers. However, that paper does not distinguish between public and private ownership and does not touch the cash increase and speed of cash adjustments. The paper studies the cash policy for the period of 1993-1995. As documented by the finance literature, cash policies of industrial firms have changed significantly in the past two decades (Bates, Kahle, and Stultz, 2009; Gao, Harford, and Li, 2013). Whether the insurance industry experiences a similar change is still unknown; therefore, our research will serve as a much-needed update. A recent article by Hsu, Huang, and Lai (2015) studies the impact of boards and finance committees on US property-liability insurers' cash holdings over the period 1997-2006, but that paper focuses on public firms only. Our paper intends to provide a rather complete and updated picture of cash holdings by US P-L insurers and the variation among various types of ownership.

Hypotheses on cash holdings and cash increase

Literature on corporate finance has provided plentiful arguments regarding the costs and benefits of public listing (Pagano et al., 1998; Brau and Fawcett, 2006; and Xie, 2010). One important benefit is that public firms have greater ability to raise equity capital and overcome capital constraints. Thus, when there is a shortage in cash to pay claims, they can quickly raise capital from the capital market at a relatively lower cost. In contrast, private insurance firms are more opaque, have restricted access to the capital market, and thus have more difficulties in raising capital as compared to publicly-traded insurance firms. In this sense, the precautionary demand for cash for private insurance firms should be stronger.

On the other hand, Farre-Mensa (2015) argues that private firms can disclose confidential information to selected investors when needed, which will reduce information asymmetry between the firms and their investors and reduce the risk of being misvalued. In addition, private firms do not need to optimize the timing of their equity issues and thus may hold lower levels of precautionary cash than similar-sized public firms.

It is also argued that managers may have a greater preference for cash because rich cash holdings can reduce firm risk and increase managerial discretion (Opler et al., 1999; Harford, Mansi, and Maxwell, 2008). In this sense, managers of public firms may also overvalue the importance of the precautionary motive for holding cash because public firms are more sensitive to adverse market sentiments than private firms. Also, if certain types of ownership forms bring higher agency costs to the firm,

we will also observe more (excess) cash holdings in that type of firm.

Literature on agency problems between public and private firms is mixed. Some argue that agency issues are much less prevalent among private firms (Bhide, 1993; Ang, Cole, and Lin, 2000; Badertscher, Shroff, and White, 2013; Gao, Harford, and Li, 2013; and Asker, Farre-Mensa, and Ljungqvist, 2014). Private firms have closely-held ownership, the owners are not as diverse as in public firms, and these firms often have large private lenders. This mechanism may actually create lower agency conflicts between owner-managers and more effective monitoring effect of debt-holders. If the more concentrated ownership of private firms makes these firms less vulnerable to shareholder-manager agency conflicts than public firms, we expect that cash holdings of private firms will be less prone to the distortions created by shareholder-manager agency conflicts.

Others argue that public firms may have less severe agency problems than private firms (e.g., Jensen, 1993; Holmstrom and Tirole, 1993; and Edmans, 2009). Public firms can benefit from the closer scrutiny of the public equity markets, more rigorous regulations and disclosure requirements, available mechanisms for incentive contracting and hostile takeovers, all of which may mitigate agency problems in public firms.

We therefore predict that,

Hypothesis 1: Public insurers will hold less cash than private insurers (mutual and private stock insurers) if public insurers have a smaller precautionary demand to cash due to easier and cheaper access to capital market and/or if public insurers enjoy

lower agency costs.

Alternatively,

Hypothesis 1a: Public insurers may hold more cash reserves than private insurers (mutual and private stock insurers) if managers of public insurers overvalue the precautionary demand of cash and/or if an agency problem is greater in public insurers.

Because mutual insurers differ in various important aspects from stock insurers, including mutual insurers in the private insurer category may contaminate the analyses of public vs. private insurers. As a result, we also test the above hypotheses by excluding mutual firms from the analyses. We expect that the prediction will still hold for stock insurers only.

Within the private insurer category, we examine whether or not cash policy will vary between private stock insurers and mutual insurers. According to Harrington and Niehaus (2002), it is more costly for mutual insurers to raise capital than it is for stock insurers because mutual insurers have more difficulty to access the capital market. In addition, agency conflicts may be higher in mutual insurers, as mutual companies have the most diverse ownership, and managerial entrenchment is easier with the mutual charter than with the stock charter (Mayers, Shivdasani, and Smith, 1997; Mayers and Smith, 1986). In both cases, mutual insurers tend to hold more cash reserves than stock insurers.

Hypothesis 2: Mutual insurers hold more cash than private stock insurers either because of higher agency conflicts or because of higher cost in raising capital.

Alternatively, based on managerial discretion hypotheses, mutual insurers may well understand their disadvantage in the capital market and therefore engage in less risky business, favoring actions with more predictable payout patterns that are therefore less demanding on cash reserves. In addition, mutual insurers have no shares outstanding; it is very difficult to take over a mutual insurer. Therefore, managers of mutual insurers have less incentive to hold excess cash to avoid market discipline.

Hypothesis 2a: Mutual insurers hold less cash than stock insurers because mutual insurers may engage in less risky lines of business and therefore face less volatility in cash demand and/or because mutual managers have less of a need to use excess cash to reduce firm risk and increase managerial discretion.

Hypotheses on cash adjustment

While it is important to understand the difference in cash holdings of various ownership forms, it is also important to examine how fast these different types of insurers adjust to their cash targets, which can help us better understand the precautionary motivation of cash holdings and possible agency conflicts.

As publicly-traded insurers have easier access to outside capital, we expect that publicly-traded insurance firms will adjust faster to their target cash levels.

Hypothesis 3: Publicly-traded insurers adjust faster to their target cash levels than private insurers (mutual and private stock insurers) would.

Alternatively, public insurers may actually have less flexibility when they face huge liquidity problems, as adverse information can be delivered to investors rather quickly, and shareholders may vote with their feet. In such situations, it may become

more difficult or costly for an insurer to raise additional capital or turn other assets into cash if it incurs a fire sale. Consequently, public firms may adjust more slowly to their target cash levels than private insurers when there is a cash shortfall.

Hypothesis 3a: Publicly-traded insurers adjust more slowly to their target cash levels than private insurers (mutual and private stock insurers) would.

Similarly, the same prediction will hold when comparing public insurers and private stock insurers only.

In regard to the speed of adjustment for private stock insurers and mutual insurers, we predict that private stock insurers can adjust faster to the target cash levels, as stock insurers can have the choice of either issuing debts or expanding ownership by issuing shares, while mutual insurers can only issue debts to raise additional cash.

Hypothesis 4: Because they have more instruments to raise cash, private stock insurers will adjust faster to their target cash levels than mutual insurers.

Alternatively, mutual insurers may have more freedom than stocks in adjusting cash policies. Mutual insurers do not need to respond to shareholders, and policyholders have weak power over managers in deciding corporate operations and earnings distributions. Therefore, when facing a cash shortage, mutual insurers may be able to retain more cash from operations without being challenged by policyholders, while stock insurers attempting to retain cash may see opposition from shareholders who may deem it as excessive and hurting their interests.

Hypothesis 4a: Private stock insurers will adjust more slowly to their target cash levels than mutual insurers would, as extra retention of cash may conflict with their

shareholders' interests.

Data and Methodology

Sample

Our sample includes U.S. property-casualty insurance companies over the 1993-2010 period. Most of our insurer-specific data are obtained from the NAIC annual statements, with the exception of the financial strength ratings, which are obtained from the Best's Key Rating Guide. As in Xie (2010), we identify the list of publicly traded property-liability insurance groups/firms from SNL DataSource, Center for Research in Security Prices (CRSP), and A.M. Best, and then verify their primary insurance sector information and starting and ending date of listings using information from NAIC, A.M. Best, Factiva (Dow Jones), Hoover's online company profiles, and CRSP. Our analysis is at the firm level, consisting of unaffiliated and affiliated single insurers in the property-liability insurance industry. An insurer is defined as a public insurer as long as its parent company is publicly traded. Our sample includes 30,150 private firm-year observations and 12,889 public firm-year observations with cash ratio information available.

Methodology

Determinants of cash holdings of US P-L insurers

We first examine the determinants of cash holdings of US P-L insurers and the difference among various ownership forms. We adopted the following regression models:

$$\text{Log}(\text{Cash_ratio}) = \alpha + \beta * \text{ownership_dummy} + \gamma * \text{Controls} + \theta * \text{Year_dummies} + \varepsilon \quad (1),$$

where Cash_ratio= Cash and short-term assets/total assets.

As we investigate cash holdings of three sets of ownership differences, we created three ownership dummy variables for our analyses:

List1 =1 if an insurer (or its holding company) is publicly traded and 0 if an insurer is a private stock insurance company or mutual company,

List2 =1 if an insurer (or its holding company) is publicly traded and 0 if an insurer is a private stock insurance company, and

Mutual =1 if an insurer is a mutual insurance company and 0 if an insurer is a private stock insurance company.

The set of control variables are selected based on the cash holding literature (Opler et al., 1999; Bates, Kahle, and Stultz, 2009; and Gao, Harford, and Li, 2013) and insurance literature (Harrington and Niehaus, 2002; Colquitt, Sommer, and Godwin, 1999). We first include five variables in the regression to proxy for transaction motivation of cash: (1) Firm size–It is predicted that large firms will hold less cash mainly due to economies of scale in transaction (Mulligan, 1997; Colquitt, Sommer, and Godwin, 1999); (2) Financial strength rating–We expect transaction costs to be lower for firms with strong financial strength; (3) Diversification across geographical areas and (4) Diversification across business lines–According to Shleifer and Vishny (1992) and Opler et al., (1999), assets sales can serve as a way of financing, and a diversified firm can convert its assets into cash at a lower transaction cost by selling non-core segments or non-core product lines. Subramaniam et al. (2011) also find that diversified firms hold less cash. As such, we predict that diversified insurers will hold less cash as they have the choice to raise cash by selling non-core insurance lines or by selling business in other states; and (5) Dividends

payment to policyholders and stockholders—This variable is predicted to be negatively related to cash holding, as insurers currently paying dividends can raise funds at low costs by reducing their dividend payments, instead of using the more costly capital markets to raise funds.

We then include a set of variables proxying precautionary motive of holding cash. Literature on non-financial firms has shown that firms facing financial constraints, with riskier cash flows, or better investment opportunities tend to hold more cash (Opler et al., 1999; Almeida, Campello, and Weisbach, 2004; and Han and Qiu, 2007). As a result, we include in the regression financial leverage (defined as liability over policyholders' surplus), cash flow ratio, and volatility of cash flows.³

We expect cash flow ratio and volatility of net cash flow to carry a positive sign on cash holdings, but sign on leverage is ambiguous. On the one hand, higher leverage may suggest that an insurer is more likely to face financial constraints and has to resort to more costly ways to raise additional funds, resulting in holding more cash for precaution purposes; on the other hand, insurers with higher leverage may also suggest that these insurers grow faster in their business (which incurs more upfront expenses), increase loss reserves to cover higher than expected losses, or incur higher costs in providing the services to policyholders. All these situations will lead to lower cash holdings.

Other firm-specific variables are also included to control for firm-specific

³We also included average growth in total assets over the previous three years in the regression. The variable was insignificant. Because this variable creates ambiguous predictions and is an imperfect proxy for investment opportunity of insurers, as argued in Colquitt, Sommer, and Godwin (1999), we drop it from our model.

characteristics that may affect the level of cash holdings (Colquitt, Sommer, and Godwin, 1999; Gao, Harford, and Li, 2013). These variables include premium growth, age of firm, alternative liquid assets, profitability, underwriting leverage, percentage of business in short-tail lines, and group affiliation.

In contrast to industrial firms, for which greater sales growth leads to higher cash holdings, we have contradicting predictions regarding premium growth of insurers. On the one side, faster growth generates more revenue for insurers, leading to a possibility of greater cash accumulation; on the other side, insurance companies with faster growth means more cash outflow upfront, leading to a reduction in cash holdings.⁴ Firm age is used to control for a firm's ability to generate cash; older firms are expected to generate more cash.⁵

Insurers hold cash and short-term invested assets for liquidity purposes, but marketable securities such as bonds and common stocks are highly liquid as well and can be considered as substitutes for cash (to some extent), so we expect that firms with higher amounts of such assets will hold less cash. We also control insurers' profitability (return on assets), expecting that more profitable firms can generate more cash.

The prediction with underwriting leverage is ambiguous as well. Higher underwriting leverage means lower capacity for insurers to underwrite new business

⁴ Rapid growth may cause "surplus drain" for insurers because insurers must pay and recognize underwriting and acquisition expenses immediately but cannot treat premium revenues as fully earned at the same date.

⁵ An alternative argument is that young firms may tend to hold more cash and adjust cash holding more cautiously according to Dittmar and Duchin (2012).

in the future, resulting in lower demand for more cash. However, higher underwriting leverage itself indicates an insurer's higher underwriting risk, which may require the insurer to hold more liquid assets as a buffer to cover unexpected losses.

As one important reason for an insurer to hold cash is to pay out claims promptly, we expect that an insurer with higher percentage of business in lines that requires full payment in a short-period of time will hold more cash because liquidity demand for such products is the highest. Lastly, we expect that an insurer without any group affiliation will hold more cash because there is no internal market for such firms to raise funds when necessary. The definitions of our variables and their predicted signs are shown in Table 1.

[Insert table 1 here]

Excess cash holdings by ownership

Equation (1) presents a measure of the cash an insurer should have. We then calculate excess cash for each insurer from the model. Following Opler et al (1999), we rerun equation (1) using the Fama-MacBeth cross-sectional model year by year (Fama and MacBeth, 1973) to get the predicted value of insurer cash holding in a particular year. Excess cash is defined as the difference between an insurer's actual cash ratio and its predicted cash ratio in that year. If an insurer holds more cash than predicted, we call it "positive excess," and "negative excess" if it holds less. Using this, we analyze the excess cash holdings of insurers across ownership forms.

Target cash holdings and insurers' adjustment to target cash ratio

Opler et al. (1999) find that non-financial firms have target cash levels, and these

firms adjust their cash holdings to the target levels over time. To investigate whether the same thing is true for insurance firms, we first estimate a first order autoregressive model for each insurer with at least 15 years of data in our sample, following Opler et al. (1999)'s model:

$$\Delta Cash_ratio_t = Alpha + Beta * \Delta Cash_ratio_{t-1} + \zeta_t, \quad (2)$$

where Δ is the first difference operator. We plot the distribution of autoregressive coefficient $Beta$ from equation (2) to examine if cash holdings of insurers are mean-reverting.

We also provide analyses examining firms' speed of adjustment to cash targets by their ownership forms. The purpose is to further investigate how agency conflicts affect cash policies. We use the following partial adjustment model (Flannery and Rangan, 2006; Venkiteshwaran, 2011; and Gao, Harford, and Li, 2013) to estimate the speed of adjustment of cash holdings across public and private insurers, and across mutual and private stock insurers:

$$\Delta Cash_ratio_t = b_0 + b_1 * public * (Cash_ratio^* - Cash_ratio_{t-1}) + b_2 * (Cash_ratio^* - Cash_ratio_{t-1}) + b_3 * public + e_t \quad (3)$$

and

$$\Delta Cash_ratio_t = \lambda_0 + \lambda_1 * mutual * (Cash_ratio^* - Cash_ratio_{t-1}) + \lambda_2 * (Cash_ratio^* - Cash_ratio_{t-1}) + \lambda_3 * mutual + v_t, \quad (4)$$

where the dependent variable $\Delta Cash_ratio_t$ is the change of cash holdings from the prior year. $Cash_ratio^*$ is the predicted cash holdings from equation (1) but is estimated using Fama-MacBeth cross-sectional model year by year (Fama and MacBeth, 1973). Here, $Cash_ratio^* - Cash_ratio_{t-1}$ measures the target adjustment.

The coefficient $b_2(\lambda_2)$ captures the speed of adjustment, and the coefficient $b_1(\lambda_1)$ captures the difference in adjustment across public (mutual) and private (stock) firms.

To address the heterogeneity between public and private firms (stock and mutual firms) when their actual levels of cash holdings fall above or below their target cash levels, we also run equation (3) and (4) using a subsample of public and private firms (stock and mutual firms) whose actual cash holdings fall above and below target levels, respectively. Following the practice of Gao et al (2013), we define the “excess cash” subsample using the bottom quartile (Pctl_25) and define the “cash shortfall” subsample using the top quartile (Pctl_75) of the population by the measure of $(Cash_ratio^* - Cash_ratio_{t-1})$. Because it is more costly for private insurers with a cash deficit to seek help from external financing to build up their cash reserves, we expect that when the actual levels of cash holdings are below target cash levels, public insurers should be able to adjust their cash holdings to their target levels more rapidly than private insurers. Similarly, private stock insurers should be able to adjust cash holdings faster than mutual insurers when experiencing cash shortfalls.

Empirical Results

Summary Statistics

Table 2 presents the cash ratios of US property-liability insurers over time. We show separate panels to demonstrate the differences between public and private insurers and between stock and mutual insurers. In Panel A, we report the descriptive statistics for the sample of the public insurers vs. all private insurers. Private insurers hold a consistently higher percentage of cash than public insurers over time. The difference

is highest in 1995, about 9.7% higher, and lowest in 2004, about 4.1% higher. Overall, public insurers are found to hold more cash over time. Panel B reports the descriptive statistics for the sample of the public insurers vs. private stock insurers only. Private stock insurers have much higher cash holdings than public insurers, showing a difference even larger than that shown in Panel A. Panel C compares cash holdings of mutual insurers and private stock insurers. Private stock insurers consistently hold more cash than mutual insurers during our sample period. We observe a slightly downward trend in mutual insurers' cash holding over time.

[Insert table 2 here]

Table 3 presents the summary statistics of the explanatory variables of cash holding. Again, we distinguish between public and private insurers and between stock and mutual insurers as done in Table 2. Significant differences in these variables across ownership forms are found.

[Insert table 3 here]

Cash holdings of US P-L insurers by ownership

Table 4 presents the determinants of cash holdings for US property-liability insurers. We compare public insurers with all private insurers (mutual and private stock insurers). Model 1 and Model 2 include the full sample. Given the significant differences in explanatory variables across ownership form shown in table 3, we also run separate regressions for public insurers (Model 3) and private insurers (Model 4), and a chow test is performed to test model and variable difference.

Model 1 only includes two independent variables: List dummy and Size. The

coefficients of both are significantly negative. Consistent with the univariate analyses in Table 2, the regression result shows that public insurers hold less cash than private insurers, which supports our hypothesis 1, suggesting either that public insurers have smaller precautionary demand for cash than private insurers due to easier and cheaper access to capital market or that public insurers enjoy lower agency costs. The results hold in Model 2 when we control more variables on transaction costs, precautionary motive, and other firm specific variables. The signs of control variables are mostly consistent with the predicted signs. Our finding that public insurers hold less cash differs from what is found for industrial firms, where public firms hold more cash than private firms in those industries (Gao, Harford, and Li, 2013; and Farre-Mensa, 2015).

The chow tests of Model 3 and Model 4 suggest that the determinants of cash holdings for public and private insurers can differ significantly. For example, strong financial strength rating can help public insurers reduce their cash holdings to a greater extent than for private insurers. More diversification across business lines and geographical areas helps private insurers to reduce their cash holdings, but it increases the cash holdings of public insurers, which provides support for the “diversification discount” literature. As shown in Table 3, public insurers in the US are much more diversified than private insurers.

[Insert table 4 here]

Table 5 presents the determinants of cash holdings for public insurers and private stock insurers (mutual insurers are excluded from the sample). The coefficients on the

listed dummy are significantly negative, supporting the previous findings that public insurers hold less cash.

[Insert table 5 here]

Table 6 presents the determinants of cash holdings for private stock insurers and mutual insurers. We find that mutual insurers hold significantly less cash than stock insurers, which supports our hypotheses 2A and is consistent with the existing literature that mutual insurers engage in lines of business that are less risky and that require limited managerial discretion.

The chow tests of Models (3) and (4) of table 6 show that diversification (variables *Pwherf* and *Lbherfpw*) reduces cash holdings more dramatically for mutual insurers than for private stock insurers and that cash holdings of private stock insurers are more sensitive to the volatility of cash flows.

[Insert table 6 here]

Both table 4 and table 5 show that private insurers hold significantly more cash when they underwrite more business in short-tail lines. This result is driven by private stock insurers, as shown in table 6. In addition, profitable public insurers (with higher ROA) hold less cash, and profitable private insurers reserve more cash. Again, the result is driven by private stock insurers.

Excess cash holdings by ownership

Table 7 presents the excess cash holdings by ownership forms. Panel A of the table compares excess cash holdings by public insurers and all private insurers. We find that public insurers hold more excess cash than private insurers. Panel B compares public

insurers with private stock insurers only and finds that public insurers hold significantly more excess cash than private stock insurers. Panel C compares mutual insurers with private stock insurers and shows that mutual insurers exhibit no significant difference in excess cash holdings from private stock insurers. At the mean and median level, insurers of all types of ownership hold positive excess cash.

[Insert table 7 here]

Target cash holdings and insurers' adjustment to target cash ratio

Opler et al. (1999) document that cash holdings for industrial firms are mean-reverting, i.e., firms in nonfinancial industries have target cash levels. Using the same method, we examine whether US insurance companies have target cash levels as well. We run equation (2) for insurers with at least 15 years of data in our sample and plot the distribution of autoregressive coefficient *Beta* in Figure 1. The coefficient *Beta* lies between -1 and +1, with mean coefficients being negative. Therefore, we claim that firms in the United States insurance industry do have target cash levels, which provides a foundation for our partial adjustment analyses of cash holdings.

[Insert figure 1 here]

Table 8 presents the speed of adjustment to target cash ratios for US P-L insurers. We run the regressions for all sample firms regardless of their cash excess or cash shortfall status, and we also run separate regressions for “excess cash” sample (Pctl_25) and cash shortfall sample (Pctl_75) to adjust the heterogeneity in cash adjustment.

Panel A of table 8 demonstrates the cash adjustment speed for public insurers vs. all private insurers. The coefficients of both $(Cash_ratio^* - Cash_ratio_{t-1})$ and $List1 \times (Cash_ratio^* - Cash_ratio_{t-1})$ are significantly positive, suggesting that both public and private insurers actively adjust their cash holdings to the target level, with public insurers being able to adjust faster toward the target level. To address the concern that public and private insurers may also behave differently when facing cash shortfalls or cash redundancy, we run the regression with a subsample of firms with cash excess (Pctl_25) or cash shortfalls (Pctl_75). The coefficient of $List1 \times (Cash_ratio^* - Cash_ratio_{t-1})$ is significantly negative in the cash excess regression and significantly positive in the cash shortfall regression. This clearly demonstrates that public insurers adjust their cash holdings much faster toward their target levels than do private firms when there is a cash shortfall and adjust much slower towards their target levels than do private firms when there is a cash excess. This finding is consistent with the cost of external financing and access to capital market arguments and also provides some evidence that managers of public firms like to maintain more free cash flows.

Panel B of table 8 demonstrates the cash adjustment speed for public insurers vs. private stock insurers only. The findings are similar to what is presented in Panel A. In both panels, our hypothesis 3 is supported.

Panel C of table 8 compares the cash adjustment speed for mutual insurers and private stock insurers. The coefficient of $(Cash_ratio^* - Cash_ratio_{t-1})$ is significantly positive, suggesting that both mutual and private stock insurers actively adjust their cash holdings to the target level. The coefficient of $Mutual \times (Cash_ratio^* -$

$Cash_ratio_{t-1}$) is significantly negative, suggesting that private stock insurers are able to adjust faster toward the target cash level than mutual insurers. The finding holds regardless of the situation of cash excess or cash shortfall, which provides strong support for hypothesis 4 and is consistent with existing literature, such as Harrington and Niehaus (2002) which argue that mutual insurers adjust more slowly toward long-term capital ratio targets.

[Insert table 8 here]

Conclusions

Literature on cash holdings falls short of research on financial institutions and on private firms. This paper fills the void by examining the cash holdings of the US property-liability insurance industry. We answer the following questions in this paper: (1) Do US P-L insurers have a target cash level? (2) Do cash holdings differ between public and private insurers, and additionally, between mutual and stock insurers within the private insurer category? (3) Does the holding of excess cash differ with ownership form? (4) How do insurers adjust cash holdings toward their target cash level and does the speed of adjustment differ by ownership form and by the situation of cash slack or cash paucity?

Our findings for the insurance industry are different from the findings by studies of private firms in nonfinancial industries. Gao, Harford, and Li (2013) and Farre-Mensa (2015) both show that public firms hold more cash than private firms. We find that the cash holdings of insurance firms support the conventional theory of information asymmetry: private insurers have a higher cost of financing and therefore

hold more cash than public insurers. We also find that mutual insurers hold less cash than private stock insurers, which is consistent with the managerial discretion argument for the coexistence of mutual and stock insurers.

We find that the cash holdings of US P-L insurers are mean-reverting, suggesting that firms in this industry have a target cash level. In regard to excess cash, public insurers tend to hold more excess cash than private insurers, supporting the agency theory that managers of public firms prefer more free cash flows to reduce firm risk and increase managerial discretion. Mutual insurers and private stock insurers show no significant difference in excess cash holdings.

All insurers are found to actively adjust cash holdings toward their target cash level, but the speed of adjustment differs by ownership form. Public insurers are found to adjust cash holdings faster toward their target cash levels when there is a cash shortfall and slower when there is cash excess than private insurers do. Mutual insurers adjust cash holdings slower toward their target cash levels than private stock insurers in the cases of both cash shortfall and cash excess. This further confirms that mutual insurers have limited access to capital markets and therefore need to maintain more excess cash for precautionary motives.

Reference

- Almeida, Heitor, Murillo Campello, and Michael S. Weisbach. 2004. The Cash Flow Sensitivity of Cash. *The Journal of Finance* 59 (4):1777-1804.
- Ang, James S., Rebel A. Cole, and James Wuh Lin. 2000. Agency Costs and Ownership Structure. *The Journal of Finance* 55 (1):81-106.
- Asker, John, Joan Farre-Mensa, and Alexander Ljungqvist. 2014. Corporate Investment and Stock Market Listing: A Puzzle? *Forthcoming, Review of*

- Financial Studies*, Available at SSRN: <http://ssrn.com/abstract=1603484>.
- Badertscher, Brad, Nemit Shroff, and Hal D. White. 2013. Externalities of Public Firm Presence: Evidence from Private Firms' Investment Decisions. *Journal of Financial Economics* 109 (3):682-706.
- Bates, Thomas W., Kathleen M. Kahle, and René M. Stulz. 2009. Why Do U.S. Firms Hold So Much More Cash than They Used To? *The Journal of Finance* 64 (5):1985-2021.
- Bhide, Amar. 1993. The Hidden Costs of Stock Market Liquidity. *Journal of Financial Economics* 34 (1):31-51.
- Bigelli, Marco, and Javier Sánchez-Vidal. 2012. Cash Holdings in Private Firms. *Journal of Banking & Finance* 36 (1):26-35.
- Brau, James C., and Stanley E. Fawcett. 2006. Initial Public Offerings: An Analysis of Theory and Practice. *The Journal of Finance* 61 (1):399-436.
- Casselmann, Ben 2013. Number of the Week: Companies Holding Lots More Cash. *Wall Street Journal* September 28, 2013.
- Colquitt, L. Lee, David W. Sommer, and Norman H. Godwin. 1999. Determinants of Cash Holdings by Property-Liability Insurers. *The Journal of Risk and Insurance* 66 (3):401-415.
- Cummins, J. D., and X. Xie. 2015. Efficiency and Productivity in the US Property-Liability Insurance Industry: Ownership Structure, Product and Distribution Strategies. in Cooper, Seiford & Zhu ed. *Data Envelopment Analysis: A handbook of Empirical Studies and Applications*, forthcoming.
- Cummins, J. David, Mary A. Weiss, and Hongmin Zi. 1999. Organizational Form and Efficiency: The Coexistence of Stock and Mutual Property-Liability Insurers. *Management Science* 45 (9):1254-1269.
- Dittmar, A.K., and R. Duchin. 2012. The Concentration of Cash: Cash Policies of the Richest Firms. *Working paper. University of Michigan and University of Washington*.
- Dittmar, Amy, and Jan Mahrt-Smith. 2007. Corporate Governance and the Value of Cash Holdings. *Journal of Financial Economics* 83 (3):599-634.
- Edmans, Alex. 2009. Blockholder Trading, Market Efficiency, and Managerial Myopia. *The Journal of Finance* 64 (6):2481-2513.
- Fama, Eugene F., and James D. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy* 81 (3):607-636.
- Farre-Mensa, Joan. 2015. The Benefits of Selective Disclosure: Evidence from Private Firms. Available at SSRN: <http://ssrn.com/abstract=1719204>.
- Flannery, Mark J., and Kasturi P. Rangan. 2006. Partial Adjustment toward Target Capital Structures. *Journal of Financial Economics* 79 (3):469-506.
- Foley, C. Fritz, Jay Hartzell, Sheridan Titman, and Garry J. Twite. 2007. Why Do Firms Hold So Much Cash? A Tax-based Explanation. *Journal of Financial Economics* 86 (3):579-607.
- Gao, Huasheng, Jarrad Harford, and Kai Li. 2013. Determinants of Corporate Cash Policy: Insights from Private Firms. *Journal of Financial Economics* 109 (3):623-639.

- Han, Seungjin, and Jiaping Qiu. 2007. Corporate Precautionary Cash Holdings. *Journal of Corporate Finance* 13 (1):43-57.
- Harford, Jarrad, Sattar A. Mansi, and William F. Maxwell. 2008. Corporate Governance and Firm Cash Holdings in the US. *Journal of Financial Economics* 87 (3):535-555.
- Harrington, Scott E., and Greg Niehaus. 2002. Capital Structure Decisions in the Insurance Industry: Stocks versus Mutuals. *Journal of Financial Services Research* 21 (1-2):145-163.
- Holmstrom, B., and J. Tirole. 1993. Market Liquidity and Performance Monitoring. *Journal of Political Economy* 101:678-709.
- Hsu, Wen-Yen, Yenyu Huang, and Gene Lai. 2015. Corporate Governance And Cash Holdings: Evidence From The U.S. Property–Liability Insurance Industry. *Journal of Risk and Insurance*:n/a-n/a.
- Jensen, Michael C. 1986. Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review* 76 (2):323-329.
- . 1993. The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems. *The Journal of Finance* 48 (3):831-880.
- Kim, Chang-Soo, David C. Mauer, and Ann E. Sherman. 1998. The Determinants of Corporate Liquidity: Theory and Evidence. *The Journal of Financial and Quantitative Analysis* 33 (3):335-359.
- Lahart, Justin 2010. U.S. Firms Build Up Record Cash Piles. *Wall Street Journal* June 10, 2010
- Mayers, David, Anil Shivdasani, and Clifford W. Smith, Jr. 1997. Board Composition and Corporate Control: Evidence from the Insurance Industry. *The Journal of Business* 70 (1):33-62.
- Mayers, David, and Clifford W. Smith, Jr. 1981. Contractual Provisions, Organizational Structure, and Conflict Control in Insurance Markets. *The Journal of Business* 54 (3):407-434.
- . 1988. Ownership Structure across Lines of Property-Casualty Insurance. *Journal of Law and Economics* 31 (2):351-378.
- . 2004. Incentives for Managing Accounting Information: Property-Liability Insurer Stock-Charter Conversions. *The Journal of Risk and Insurance* 71 (2):213-251.
- Mayers, David, and Clifford W. Smith Jr. 1986. Ownership structure and control: The mutualization of stock life insurance companies. *Journal of Financial Economics* 16 (1):73-98.
- Mulligan, Casey B. . 1997. Scale Economies, the Value of Time, and the Demand for Money: Longitudinal Evidence from Firms. *Journal of Political Economy* 105 (5):1061-1079.
- Opler, Tim, Lee Pinkowitz, René Stulz, and Rohan Williamson. 1999. The Determinants and Implications of Corporate Cash Holdings. *Journal of Financial Economics* 52 (1):3-46.
- Pagano, Marco, Fabio Panetta, and Luigi Zingales. 1998. Why Do Companies Go Public? An Empirical Analysis. *The Journal of Finance* 53 (1):27-64.

- Riddick, Leigh A., and Toni M. Whited. 2009. The Corporate Propensity to Save. *The Journal of Finance* 64 (4):1729-1766.
- Shleifer, Andrei, and Robert W. Vishny. 1992. Liquidation Values and Debt Capacity: A Market Equilibrium Approach. *The Journal of Finance* 47 (4):1343-1366.
- Subramaniam, Venkat, Tony T. Tang, Heng Yue, and Xin Zhou. 2011. Firm Structure and Corporate Cash Holdings. *Journal of Corporate Finance* 17 (3):759-773.
- Venkiteswaran, Vinod. 2011. Partial Adjustment toward Optimal Cash Holding Levels. *Review of Financial Economics* 20 (3):113-121.
- Xie, Xiaoying. 2010. Are Publicly Held Firms Less Efficient? Evidence from the US Property-liability Insurance Industry. *Journal of Banking & Finance* 34 (7):1549-1563.

Table 1. Variables and predicted signs in cash holding regressions

Variable Name	Variable Description	Definition	Predicted Sign
Cash_ratio	Cash holdings	Cash and short-term assets / Total assets	
Key independent variables: ownership form dummies			
List	List1	Dummy variable equal to 1 if an insurer (or its holding company) is publicly traded; and 0 if an insurer is a private stock insurance company or a mutual company	+/-
	List2	Dummy variable equal to 1 if an insurer (or its holding company) is publicly traded; and 0 if an insurer is a private stock insurance company	+/-
Mutual	Mutual	Dummy variable equal to 1 if an insurer is a mutual company; and 0 if an insurer is a private stock insurance company	+/-
Variables proxying transaction costs			
Size	Firm size	ln (assets)	-
Rating	Financial strength rating	A.M. Best's rating, ranging from 1 to 5: 1=below B-; 2=B, B-; 3=B++, B+; 4=A, A-; 5=A++, A+	-
PWheref	Diversification across geographical areas	Herfindahl index by geographical areas	+
LBherfpw	Diversification across business lines	Herfindahl index by business lines	+
Div_pay	Dividends to policyholders and stockholders	Dummy variable equal to 1 if an insurer pays dividends to policyholders or stockholders; and 0 if not	-
Variables proxying precautionary motive			
Leverage	Financial leverage	Liability / policyholders' surplus	+/-
Oper_cf	Cash flow ratio	Net cash flow / total assets	+
Std_cf	Volatility of net cash flow	Standard deviation of Oper_cf over the previous four years	+
Other firm specific variables			
Prem_growth	Premium growth	Premium growth from year t-1 to year t	+/-
Lnage	Age of firm	Natural log value of number of years since a firm's incorporation	+
New_liquid	Alternative liquid assets of an insurer	(Bonds + common stock) / total assets	-
ROA	Return on assets	Net income after dividend & before tax/total assets	+
Capitalization	Underwriting leverage	Net premiums written / policyholders' surplus	+/-
Short_tail	Percentage of business in short-tail lines	Percentage of premiums in personal short-tail lines and commercial short-tail lines	+
Unaffiliated	Unaffiliated single firm	Dummy variable equal to 1 if an insurer is an unaffiliated single firm; 0 if an insurer has group affiliation	+

Table 2. Cash Holdings of US Property-Liability Insurers over Time, 1993-2010

Panel A: Public insurers vs. all private insurers

Year	List1=0 (Mutual and private stock insurers)				List1 =1 (Public insurers)				Mean Difference (1-0)	Median Difference (1-0)
	N	Mean	Median	Std	N	Mean	Median	Std	t-test	Wilcoxon test
1993	1578	15.33%	8.54%	17.62%	553	8.75%	4.24%	12.66%	-0.066***	-0.043***
1994	1834	16.52%	9.04%	18.99%	576	7.65%	4.28%	11.18%	-0.089***	-0.048***
1995	1758	18.45%	10.09%	20.39%	661	8.72%	3.79%	13.42%	-0.097***	-0.063***
1996	1712	17.38%	8.53%	19.86%	711	9.24%	4.85%	13.18%	-0.081***	-0.037***
1997	1701	17.59%	9.01%	20.27%	745	8.16%	3.66%	11.64%	-0.094***	-0.053***
1998	1696	17.64%	8.75%	20.63%	757	9.04%	4.54%	12.73%	-0.086***	-0.042***
1999	1686	16.45%	7.86%	19.71%	721	8.69%	4.31%	12.26%	-0.078***	-0.036***
2000	1634	17.24%	8.81%	19.70%	758	10.58%	5.86%	13.11%	-0.067***	-0.030***
2001	1618	17.65%	9.64%	19.50%	782	10.33%	5.44%	13.82%	-0.073***	-0.042***
2002	1629	18.54%	10.86%	19.53%	771	12.46%	6.77%	15.44%	-0.061***	-0.041***
2003	1564	18.00%	9.20%	20.30%	805	13.62%	6.46%	17.46%	-0.044***	-0.027***
2004	1561	16.86%	8.36%	19.59%	787	12.76%	6.62%	16.32%	-0.041***	-0.017***
2005	1594	16.62%	8.27%	19.44%	782	12.46%	5.59%	16.43%	-0.042***	-0.027***
2006	1627	17.93%	9.35%	20.34%	761	12.42%	5.94%	16.52%	-0.055***	-0.034***
2007	1660	18.17%	9.42%	20.21%	758	12.08%	4.94%	16.69%	-0.061***	-0.045***
2008	1749	18.37%	10.53%	19.45%	691	13.00%	6.79%	15.82%	-0.054***	-0.037***
2009	1799	17.09%	8.68%	19.10%	640	11.46%	5.20%	15.42%	-0.056***	-0.035***
2010	1750	16.05%	8.29%	18.50%	630	11.37%	4.63%	15.91%	-0.047***	-0.037***

Panel B: Public insurers vs. private stock insurers

Year	List2=0 (Private stock insurers only)				List2=1 (Public insurers)				Mean Difference (1-0)	Median Difference (1-0)
	N	Mean	Median	Std	N	Mean	Median	Std	t-test	Wilcoxon test
1993	1101	16.24%	9.07%	18.20%	553	8.75%	4.24%	12.66%	-0.075***	-0.048***
1994	1264	16.72%	9.41%	18.75%	576	7.65%	4.28%	11.18%	-0.091***	-0.051***
1995	1199	19.20%	10.93%	20.41%	661	8.72%	3.79%	13.42%	-0.105***	-0.071***
1996	1167	17.99%	9.54%	19.68%	711	9.24%	4.85%	13.18%	-0.087***	-0.047***
1997	1175	18.55%	9.69%	20.52%	745	8.16%	3.66%	11.64%	-0.104***	-0.060***
1998	1184	18.37%	9.63%	20.72%	757	9.04%	4.54%	12.73%	-0.093***	-0.051***
1999	1184	17.12%	8.76%	19.70%	721	8.69%	4.31%	12.26%	-0.084***	-0.044***
2000	1130	18.38%	10.07%	19.92%	758	10.58%	5.86%	13.11%	-0.078***	-0.042***
2001	1113	18.75%	10.74%	19.90%	782	10.33%	5.44%	13.82%	-0.084***	-0.053***
2002	1122	19.19%	11.51%	19.64%	771	12.46%	6.77%	15.44%	-0.067***	-0.047***
2003	1097	18.68%	9.73%	20.62%	805	13.62%	6.46%	17.46%	-0.051***	-0.033***
2004	1094	17.84%	8.90%	20.17%	787	12.76%	6.62%	16.32%	-0.051***	-0.023***
2005	1138	17.99%	9.08%	20.28%	782	12.46%	5.59%	16.43%	-0.055***	-0.035***

2006	1170	19.65%	10.55%	21.12%	761	12.42%	5.94%	16.52%	-0.072***	-0.046***
2007	1201	19.88%	10.61%	21.05%	758	12.08%	4.94%	16.69%	-0.078***	-0.057***
2008	1281	19.92%	11.73%	20.30%	691	13.00%	6.79%	15.82%	-0.069***	-0.049***
2009	1330	18.18%	9.52%	19.48%	640	11.46%	5.20%	15.42%	-0.067***	-0.043***
2010	1292	17.12%	9.06%	19.04%	630	11.37%	4.63%	15.91%	-0.058***	-0.044***

Panel C: For private insurers only: mutual vs private stock insurers

Year	Mutual=1 (Mutual insurers)				Mutual=0 (Private stock insurers)				Mean difference (S-M)	Median difference (S-M)
	N	Mean	Median	Std	N	Mean	Median	Std	t-test	Wilcoxon test
1993	477	13.21%	7.43%	16.02%	1101	16.24%	9.07%	18.20%	0.030***	0.016***
1994	570	16.08%	8.00%	19.54%	1264	16.72%	9.41%	18.75%	0.006	0.014*
1995	559	16.85%	7.93%	20.28%	1199	19.20%	10.93%	20.41%	0.023**	0.030***
1996	545	16.09%	7.54%	20.19%	1167	17.99%	9.54%	19.68%	0.019*	0.020***
1997	526	15.47%	7.21%	19.56%	1175	18.55%	9.69%	20.52%	0.031***	0.025***
1998	512	15.93%	6.96%	20.35%	1184	18.37%	9.63%	20.72%	0.024**	0.027***
1999	502	14.89%	6.15%	19.66%	1184	17.12%	8.76%	19.70%	0.022**	0.026***
2000	504	14.70%	6.73%	18.96%	1130	18.38%	10.07%	19.92%	0.037***	0.033***
2001	505	15.21%	7.57%	18.37%	1113	18.75%	10.74%	19.90%	0.035***	0.032***
2002	507	17.08%	9.65%	19.25%	1122	19.19%	11.51%	19.64%	0.021**	0.019**
2003	467	16.39%	8.11%	19.43%	1097	18.68%	9.73%	20.62%	0.023**	0.016*
2004	467	14.57%	7.61%	17.96%	1094	17.84%	8.90%	20.17%	0.033***	0.013**
2005	456	13.20%	6.55%	16.70%	1138	17.99%	9.08%	20.28%	0.048***	0.025***
2006	457	13.53%	6.92%	17.44%	1170	19.65%	10.55%	21.12%	0.061***	0.036***
2007	459	13.70%	7.34%	17.04%	1201	19.88%	10.61%	21.05%	0.062***	0.033***
2008	468	14.14%	8.25%	16.22%	1281	19.92%	11.73%	20.30%	0.058***	0.035***
2009	469	14.00%	6.96%	17.65%	1330	18.18%	9.52%	19.48%	0.042***	0.026***
2010	458	13.03%	6.73%	16.53%	1292	17.12%	9.06%	19.04%	0.041***	0.023***

Note: *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Table 3 Summary statistics of explanatory variables**Panel A: Public insurers vs. all private insurers**

Variables	List1=0 (Mutual and private stock insurers)			List1 =1 (Public insurers)			Mean Difference (1-0)	Median Difference (1-0)
	Mean	Median	Std	Mean	Median	Std	t-test	Wilcoxon test
Cash_ratio	0.173	0.091	0.196	0.108	0.052	0.148	-0.065***	-0.039***
Size	17.359	17.200	1.775	18.412	18.362	1.712	1.049***	1.160***
Rating	2.889	3.000	1.480	3.795	4.000	1.330	0.902***	1.000***
PWherf	0.682	0.937	0.364	0.420	0.268	0.364	-0.261***	-0.665***
LBherfpw	0.571	0.505	0.307	0.452	0.371	0.304	-0.119***	-0.134***
Div_pay	0.159	0.000	0.366	0.253	0.000	0.435	0.094***	0.000***
Leverage	1.419	1.192	1.178	1.518	1.394	1.236	0.099***	0.201***
Oper_cf	0.010	0.003	0.097	0.006	0.001	0.088	-0.003***	-0.003***
Std_cf	0.107	0.063	0.111	0.098	0.056	0.106	-0.009***	-0.007***
Prem_growth	0.116	0.042	0.373	0.105	0.037	0.383	-0.010**	-0.005***
Lnage	3.318	3.296	1.031	3.219	3.219	0.896	-0.099***	-0.077***
New_liquid	0.683	0.741	0.207	0.730	0.778	0.187	0.047***	0.037***
ROA	0.029	0.031	0.055	0.042	0.044	0.049	0.013***	0.013***
Capitalization	1.022	0.882	0.769	0.983	0.857	0.745	-0.039***	-0.026***
Short_tail	0.333	0.235	0.337	0.337	0.258	0.300	0.004	0.022***
Unaffiliated	0.424	0.000	0.494	0.011	0.000	0.103	-0.414***	0.000***

Panel B: Public insurers vs. private stock insurers only

Variables	List2=0 (Private stock insurers only)			List2 =1 (Public insurers)			Mean difference (1-0)	Median difference (1-0)
	Mean	Median	Std	Mean	Median	Std	t-test	Wilcoxon test
Cash_ratio	0.183	0.099	0.200	0.108	0.052	0.148	-0.075***	-0.047***
Size	17.360	17.198	1.682	18.412	18.362	1.712	1.052***	1.164***
Rating	2.860	3.000	1.487	3.795	4.000	1.330	0.935***	1.000***
PWherf	0.633	0.729	0.372	0.420	0.268	0.364	-0.213***	-0.461***
LBherfpw	0.597	0.536	0.308	0.452	0.371	0.304	-0.145***	-0.165***
Div_pay	0.127	0.000	0.334	0.253	0.000	0.435	0.126***	0.000***
Leverage	1.407	1.190	1.189	1.518	1.394	1.236	0.111***	0.204***
Oper_cf	0.011	0.004	0.104	0.006	0.001	0.088	-0.005***	-0.003***
Std_cf	0.123	0.077	0.118	0.098	0.056	0.106	-0.025***	-0.021***
Prem_growth	0.139	0.047	0.420	0.105	0.037	0.383	-0.034***	-0.010***
Lnage	3.002	3.045	0.911	3.219	3.219	0.896	0.217***	0.174***
New_liquid	0.670	0.729	0.215	0.730	0.778	0.187	0.060***	0.049***
ROA	0.031	0.033	0.056	0.042	0.044	0.049	0.011***	0.011***
Capitalization	1.026	0.884	0.785	0.983	0.857	0.745	-0.043***	-0.027***
Short_tail	0.347	0.240	0.349	0.337	0.258	0.300	-0.010**	0.018***
Unaffiliated	0.345	0.000	0.475	0.011	0.000	0.103	-0.334***	0.000***

Panel C: For private insurers only: mutual vs. private stock insurers

Variables	Mutual=1 (Mutual insurers)			Mutual=0 (Private Stock insurers)			Mean difference (M-S) t-test	Median difference (M-S) Wilcoxon test
	Mean	Median	Std	Mean	Median	Std		
Cash_ratio	0.150	0.074	0.186	0.183	0.099	0.200	-0.033***	-0.025***
Size	17.356	17.204	1.979	17.360	17.198	1.682	-0.004	0.006**
Rating	2.959	4.000	1.460	2.860	3.000	1.487	0.099***	1.000***
PWherf	0.785	1.000	0.324	0.633	0.729	0.372	0.152***	0.271***
LBherfpw	0.518	0.409	0.298	0.597	0.536	0.308	-0.079***	-0.127***
Div_pay	0.234	0.000	0.423	0.127	0.000	0.334	0.107***	0.000***
Leverage	1.446	1.194	1.150	1.407	1.190	1.189	0.039***	0.004***
Oper_cf	0.006	0.002	0.074	0.011	0.004	0.104	-0.005***	-0.002***
Std_cf	0.071	0.041	0.085	0.123	0.077	0.118	-0.052***	-0.036***
Prem_growth	0.070	0.036	0.252	0.139	0.047	0.420	-0.069***	-0.011***
Lnage	4.064	4.431	0.906	3.002	3.045	0.911	1.062***	1.386***
New_liquid	0.712	0.763	0.185	0.670	0.729	0.215	0.042***	0.034***
ROA	0.024	0.027	0.051	0.031	0.033	0.056	-0.007***	-0.006***
Capitalization	1.014	0.878	0.735	1.026	0.884	0.785	-0.012	-0.006
Short_tail	0.304	0.228	0.310	0.347	0.240	0.349	-0.043**	-0.012***
Unaffiliated	0.613	1.000	0.487	0.345	0.000	0.475	0.268***	1.000***

Note: *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Table 4. Regression – cash holdings between public P-L insurers and all private P-L insurers

Variable	Model (1) – All insurers	Model (2) – All insurers	Model (3) – Public only	Model (4) – Private only	Chow-test p -value (3) vs. (4)
List1	-0.2949*** [0.0000]	-0.1276*** [0.0000]			
Size	-0.3003*** [0.0000]	-0.0683*** [0.0000]	-0.0590*** [0.0000]	-0.0738*** [0.0000]	0.8240
Rating		-0.0698*** [0.0000]	-0.1836*** [0.0000]	-0.0149** [0.0158]	0.0000
Pwherf		0.0642*** [0.0004]	-0.1131*** [0.0025]	0.1666*** [0.0000]	0.0000
Lbherfpw		0.1795*** [0.0000]	-0.0912* [0.0799]	0.3336*** [0.0000]	0.0000
Div_pay		-0.0691*** [0.0301]	-0.0026 [0.9233]	-0.1389*** [0.0000]	0.0000
Leverage		-0.0196** [0.0301]	-0.0402** [0.0214]	-0.0101 [0.3241]	0.2241
Oper_cf		3.7283*** [0.0000]	5.2792*** [0.0000]	2.9885*** [0.0000]	0.0000
Std_cf		3.1701*** [0.0000]	4.5735*** [0.0000]	2.4072*** [0.0000]	0.0000
Prem_growth		-0.0503*** [0.0027]	-0.1157*** [0.0007]	0.0027 [0.8819]	0.0044
Lnage		0.0234*** [0.0003]	-0.0031 [0.8554]	0.0245*** [0.0003]	0.1218
New_liquid		-2.4113*** [0.0000]	-1.8145*** [0.0000]	-2.7496*** [0.0000]	0.0000
ROA		0.0492 [0.6653]	-0.8088*** [0.0014]	0.5269*** [0.0000]	0.0000
Capitalization		-0.1553*** [0.0000]	-0.2185*** [0.0000]	-0.0974*** [0.0000]	0.0000
Short_tail		0.0755*** [0.0002]	-0.0629 [0.2021]	0.1158*** [0.0000]	0.0006
Unaffiliated		0.2671*** [0.0000]	0.3387*** [0.0001]	0.2393*** [0.0000]	0.2804
Year Dummies	included	included	included	included	
Observations	43039	23700	7107	16593	
Adj R-square	0.8385	0.9221	0.9182	0.929	

Note: Standard errors are in brackets. *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Table 5. Regression – cash holdings between public P-L insurers and private stock insurers

Variable	Model (1) – All Stock insurers	Model (2) – All Stock insurers	Model (3) – Public only	Model (4) – Private stock only	Chow-test p value (3) vs. (4)
List2	-0.3838*** [0.0000]	-0.1638*** [0.0000]			
Size	-0.2774*** [0.0000]	-0.0653*** [0.0000]	-0.0590*** [0.0000]	-0.0714*** [0.0000]	0.9714
Rating		-0.0820*** [0.0000]	-0.1836** [0.0000]	-0.0160** [0.0423]	0.0000
Pwherf		-0.0060 [0.7765]	-0.1131*** [0.0025]	0.0919*** [0.0001]	0.0000
Lbherfpw		0.1546*** [0.0000]	-0.0912* [0.0799]	0.3314*** [0.0000]	0.0000
Div_pay		-0.0286* [0.0425]	-0.0026 [0.9233]	-0.1041*** [0.0000]	0.0039
Leverage		-0.0205** [0.0425]	-0.0402** [0.0214]	-0.0039 [0.7367]	0.1561
Oper_cf		3.8576*** [0.0000]	5.2792*** [0.0000]	2.9842*** [0.0000]	0.0000
Std_cf		3.2961*** [0.0000]	4.5735*** [0.0000]	2.4154*** [0.0000]	0.0000
Prem_growth		-0.0535*** [0.0026]	-0.1157*** [0.0007]	0.0078 [0.6885]	0.0040
Lnage		0.0125 [0.1544]	-0.0031 [0.8554]	0.0102 [0.2951]	0.4863
New_liquid		-2.2872*** [0.0000]	-1.8145*** [0.0000]	-2.6548*** [0.0000]	0.0000
ROA		-0.0462 [0.7279]	-0.8088*** [0.0014]	0.5604*** [0.0002]	0.0000
Capitalization		-0.1598*** [0.0000]	-0.2185*** [0.0000]	-0.0929*** [0.0000]	0.0000
Short_tail		0.0940*** [0.0000]	-0.0629 [0.2021]	0.1400*** [0.0000]	0.0002
Unaffiliated		0.2485*** [0.0000]	0.3387*** [0.0001]	0.2157*** [0.0000]	0.1888
Year Dummies	included	included	included	included	
Observations	34131	17763	7107	10656	
Adj R-square	0.8297	0.9163	0.9182	0.9208	

Note: Standard errors are in brackets. *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Table 6. Regression – cash holdings between private stock insurers and mutual insurers

Variable	Model (1) – All Private insurers	Model (2) – All Private insurers	Model (3) – Private stock only	Model (4) – Mutual only	Chow-test p-value (3) vs. (4)
Mutual	-0.2201*** [0.0000]	-0.0437*** [0.0049]			
Size	-0.3330*** [0.0000]	-0.0749*** [0.0000]	-0.0714*** [0.0000]	-0.0732*** [0.0000]	0.7069
Rating		-0.0153*** [0.0130]	-0.0160** [0.0423]	-0.0265*** [0.0060]	0.8979
Pwherf		0.1774*** [0.0000]	0.0919*** [0.0001]	0.3561*** [0.0000]	0.0000
Lbherfpw		0.3328*** [0.0000]	0.3314*** [0.0000]	0.3920*** [0.0000]	0.0615
Div_pay		-0.1325*** [0.2879]	-0.1041*** [0.0000]	-0.1149** [0.0000]	0.6914
Leverage		-0.0108 [0.2879]	-0.0039 [0.7367]	-0.0609** [0.0073]	0.7899
Oper_cf		2.9861*** [0.0000]	2.9842*** [0.0000]	3.0279*** [0.0000]	0.8455
Std_cf		2.3836*** [0.0000]	2.4154*** [0.0000]	2.0761*** [0.0000]	0.0000
Prem_growth		0.0020 [0.9099]	0.0078 [0.6885]	-0.0496 [0.3102]	0.0498
Lnage		0.0339*** [0.0000]	0.0102 [0.2951]	0.0561*** [0.0000]	0.6022
New_liquid		-2.7468*** [0.0000]	-2.6548*** [0.0000]	-3.0304*** [0.0000]	0.1614
ROA		0.5134*** [0.0000]	0.5604*** [0.0002]	0.2833 [0.1891]	0.0000
Capitalization		-0.0974*** [0.0000]	-0.0929*** [0.0000]	-0.0677** [0.0150]	0.5378
Short_tail		0.1085*** [0.0000]	0.1400*** [0.0000]	-0.0670 [0.1531]	0.0000
Unaffiliated		0.2454*** [0.0000]	0.2157*** [0.0000]	0.2630*** [0.0000]	0.0000
Year Dummies		included	included	included	
Observations	30150	16593	10656	5937	
Adj R-square	0.8352	0.9221	0.9208	0.9437	

Note: Standard errors are in brackets. *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Table 7. Excess cash holdings of US P-L insurers by ownership forms**Panel A: Public insurers vs. all private insurers**

	Public insurers	All Private insurers	Difference test
Mean	0.026	0.008	0.018***
Median	0.009	0.007	0.002***

Panel B: Public insurers vs. private stock insurers only

	Public insurers	Private stock insurers	Difference test
Mean	0.026	0.006	0.020***
Median	0.009	0.008	0.001***

Panel C: For private insurers only: mutual vs. private stock insurers

	Mutual	Private Stock insurers	Difference test
Mean	0.014	0.011	0.003
Median	0.007	0.01	-0.003

Note: *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Table 8. Speed of adjustment to target cash ratios for the US P-L insurers**Panel A: Public insurers vs. all private insurers**

Variable	Full Sample	Subsample with excess cash: (Cash_ratio* - Cash_ratio _{t-1}) ≤ Pctl_25	Subsample with cash shortfall: (Cash_ratio* - Cash_ratio _{t-1}) ≥ Pctl_75
Intercept	0.0008 [0.2487]	0.0334*** [0.0000]	0.0341*** [0.0000]
List1 × (Cash_ratio* - Cash_ratio _{t-1})	0.1849*** [0.0000]	-0.0724* [0.0652]	0.3893*** [0.0000]
Cash_ratio* - Cash_ratio _{t-1}	0.4140*** [0.0000]	0.6694*** [0.0000]	0.2599*** [0.0001]
List1	0.0153*** [0.0000]	-0.0098 [0.1081]	-0.0151*** [0.0001]
Observations	21697	5467	5432
Adj R-square	0.5397	0.4784	0.4026

Panel B: Public insurers vs. private stock insurers only

Variable	Full Sample	Subsample with excess cash: (Cash_ratio* - Cash_ratio _{t-1}) ≤ Pctl_25	Subsample with cash shortfall: (Cash_ratio* - Cash_ratio _{t-1}) ≥ Pctl_75
Intercept	-0.0006 [0.5222]	0.0303*** [0.0000]	0.0379*** [0.0000]
List2 × (Cash_ratio* - Cash_ratio _{t-1})	0.1762***	-0.0860*	0.3829***

	[0.0000]	[0.0421]	[0.0000]
Cash_ratio* - Cash_ratio _{t-1}	0.4170***	0.6673***	0.2578***
	[0.0000]	[0.0000]	[0.0005]
List2	0.0169***	-0.0088	-0.0161***
	[0.0000]	[0.2076]	[0.0005]
Observations	16271	4104	4077
Adj R-square	0.5458	0.4584	0.4054

Panel C: Mutual insurers vs. private stock insurers

Variable	Full Sample	Subsample with excess cash: (Cash_ratio* - Cash_ratio_{t-1}) ≤ Pctl_25	Subsample with cash shortfall: (Cash_ratio* - Cash_ratio_{t-1}) ≥ Pctl_75
Intercept	0.0040***	0.0398***	0.0291***
	[0.0000]	[0.0000]	[0.0000]
Mutual × (Cash_ratio* - Cash_ratio _{t-1})	-0.1008***	-0.0929*	-0.0985***
	[0.0009]	[0.0705]	[0.0077]
Cash_ratio* - Cash_ratio _{t-1}	0.5301***	0.7443***	0.3722***
	[0.0000]	[0.0000]	[0.8044]
Mutual	0.0011	-0.0011	-0.0010
	[0.4262]	[0.8897]	[0.8044]
Observations	15193	3828	3796
Adj R-square	0.5843	0.5594	0.3682

Note: Standard errors are in brackets. *, **, and *** denote significance level at the 10%, 5%, and 1% levels.

Figure 1. Distribution of Coefficients on Lagged Change in Cash/Assets

