

©The Journal of Risk and Insurance, 1999, Vol. 66, No. 3, 401-415

## **DETERMINANTS OF CASH HOLDINGS BY PROPERTY-LIABILITY INSURERS**

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### **ABSTRACT**

This study investigates the differences in cash holdings across property-liability insurers. We conclude that relative cash holdings are less for insurers with better access to cash through capital markets and/or other group members. We also conclude that larger insurers, higher quality insurers, insurers that write longer tail lines of business, and firms with higher degrees of leverage hold less cash. Also, we find that insurers with a higher variance of cash flows tend to hold more cash. Another interesting finding is that, contrary to what managerial discretion arguments might suggest, stock insurers tend to hold more cash than do mutuals.

### **INTRODUCTION**

This article examines the variation in cash holdings across property-liability insurers during the three-year period from 1993 to 1995. For the property-liability insurer, virtually all business transactions occur in cash. Premiums are received in cash, and claims are paid in cash. As a result, the insurer's decision regarding the amount of cash to hold is critical to its operations and therefore to its overall financial stability. In making that decision, an insurer may choose to hold a large amount of cash; such a strategy affords much flexibility to the insurer, but the flexibility gains are offset by the opportunity costs resulting from the lower returns generated by cash compared to less liquid assets (Amihud and Mendelson, 1986). On the other hand, an insurer may choose to hold a small amount of cash; such a strategy maximizes returns by investing the cash in higher yielding assets but exposes the insurer to transaction costs—and potentially unfavorable economic conditions—when assets must be liq-

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uidated to meet obligations. Because there are competing costs and benefits of holding cash, the insurer must compare the marginal costs of holding cash to the marginal benefits of holding cash when determining its optimal level of cash (Opler, Pinkowitz, Stulz and Williamson, 1999).

Cash holdings vary considerably across insurers.<sup>1</sup> Such differences can be expected for a number of reasons, including the degree of agency conflict among the insurer's management, owners, and policyholders; the ability of the insurer to generate cash from alternative sources; the nature of the insurer's operations; and the composition of the insurer's portfolio of non-cash assets. In order to determine which insurer characteristics affect the extent of cash holdings, we employ regression analysis on a large sample of property-liability insurers over a three-year period.

Our examination of cash holdings by property-liability insurers serves several purposes. First, it contributes to the large body of literature investigating corporate cash holdings (Chudson, 1945; Baumol, 1952; Meltzer, 1963; Frazer, 1964; Vogel and Maddala, 1967; Gertler and Gilchrist, 1994; Kim, Mauer and Sherman, 1998; Opler, Pinkowitz, Stulz and Williamson, 1999). Because prior literature has excluded the analysis of financial firms, investigation of insurer cash holdings provides the opportunity to evaluate the extent to which past findings hold for a totally different class of firms. Perhaps more importantly, the unique aspects of the insurance industry, such as the different organizational forms available to insurers and the phenomenon of insurer groups, provide the opportunity to generate additional insights into cash holdings. Additionally, the examination complements previous research investigating other components or aspects of insurer investment portfolios (Colquitt and Hoyt, 1997; Cummins, Phillips and Smith, 1997; Lee, Mayers and Smith, 1997; Cox, Gaver and Wells, 1998). Finally, the examination demonstrates that insurers choose cash balances systematically based on their organizational and operational characteristics. This information should benefit stakeholders, regulators, and academics in their attempts to understand and predict insurer behavior.

Consistent with our expectation that larger firms experience economies of scale in cash transactions, we find that larger insurers hold less cash. Also consistent with our expectations, we find that insurers with better access to cash from alternative sources (i.e., insurers with higher Best's ratings and insurers that belong to a group) hold less cash. In addition, we find that insurers whose investing and operating activities generate a greater short-term demand for cash or more uncertainty regarding the need for cash (i.e., insurers with shorter-tail liability durations, riskier cash flows, and greater future investment opportunities) hold more cash to meet those needs. Additionally, we find that highly levered insurers hold less cash. Finally, in a very interesting result, we find that stock insurers hold more cash than do mutuals. This result is consistent with agency theory arguments based on the agency costs of debt but is just the opposite of what would be anticipated based on the agency costs of managerial discretion.

<sup>1</sup> In fact, for our sample, cash holdings as a percent of invested assets ranged from 0 percent to 100 percent. A further analysis of the small number of firms at the extremes yielded no evidence that these firms had any unusual characteristics apart from their extreme cash positions.

The remainder of the article is organized as follows. The next section describes the research design, the hypotheses regarding the relation between various firm-specific characteristics and the level of cash holdings, and the variables used in the study. The next two sections describe the data and the empirical results of the study, respectively. The final section contains a brief summary.

## RESEARCH DESIGN, HYPOTHESES, AND VARIABLES

### Research Design

This study employs ordinary least squares regression analysis as well as a random effects model to test the relation between an insurer's level of cash holdings and numerous variables predicted to affect the insurer's decision regarding the level of cash to hold. The analytic model proposed in the study takes the following form:

$$\text{Cash holdings} = f(\text{firm size, financial strength, group membership, variance of cash flows, liability duration, organizational form, leverage, investment opportunity set, non-invested assets, common stock holdings})$$

### Measure of Cash Holdings

The measure of an insurer's cash holdings is the ratio of cash and short-term investments to total invested assets.<sup>2</sup> Summary statistics for this variable are presented in Table 1.

**TABLE 1**  
Summary Statistics for the Measure of Cash Holdings for 1995

	Mean	Standard Deviation	Minimum	Maximum	
(Cash + Short Term Investments) Total Invested Assets	0.1288	0.1747	0.0000	1.0000	
	< 0.10	0.10 - 0.20	0.20 - 0.40	0.40 - 0.50	> 0.50
Number of firms	924	297	158	27	73

The statutory annual statement separates an insurer's assets into two broad categories: invested assets and non-invested assets.<sup>3</sup> The investment allocation decision is made with respect to invested assets, although this allocation may be influenced by the insurer's relative proportion of invested and non-invested assets. For this reason, we chose to investigate the determinants of an insurer's level of cash holdings relative to its portfolio of invested assets rather than to its total assets.

<sup>2</sup> Cash and short-term investments are assets reported on lines 6.1 and 6.2, respectively, of the balance sheet of the statutory annual statement.

<sup>3</sup> Non-invested assets are reported on lines 9-20 of the asset side of the balance sheet of the statutory annual statement and include such items as agents' balances, reinsurance recoverables, interest income due and accrued, and electronic data processing equipment.

### Explanatory Variables<sup>4</sup>

The following variables are hypothesized to have an effect on the insurer's level of cash holdings. A listing of all variables and their definitions is found in Table 2.

**TABLE 2**  
Variables and Their Definitions

<i>Dependent Variable</i>	
CASH HOLDINGS	Ratio of the insurer's cash plus short-term investments to its total invested assets
<i>Explanatory Variables</i>	
SIZE	Natural log of total assets
FINANCIAL STRENGTH	Best's rating (0=C,C-,D,FPR2; 1=C++,C+,FPR3; 2=B,B-,FPR4; 3=B++,B+,FPR5,FPR6; 4=A,A-,FPR7,FPR8; 5=A++,A+,FPR9)
GROUP MEMBERSHIP	Dummy variable of 1 if the insurer is a member of a group and 0 otherwise
VARIANCE OF CASH FLOWS	Volatility of the insurer's asset-liability portfolio (see text for details)
DURATION OF LIABILITIES	Estimated average duration of liabilities for the insurer (see text for details)
ORG FORM	Dummy variable of 1 if the insurer is a stock firm (not owned by a mutual) and 0 if the insurer is either a mutual or a stock firm owned by a mutual
LEVERAGE	Ratio of the insurer's total liabilities to total assets
INVESTMENT OPPORTUNITY	Average growth in total assets over the previous three years
<i>Control Variables</i>	
NON-INVESTED ASSETS	Ratio of the insurer's total non-invested assets to its total assets
COMMON STOCK	Ratio of the insurer's common stock holdings to its total invested assets

*Size* The proxy for insurer size is the natural log of the insurer's total assets. Previous studies of cash holdings of non-financial firms have investigated whether economies of scale exist in cash transactions (Meltzer, 1963; Frazer, 1964; Vogel and Maddala, 1967; Opler, et al., 1999). In addition, Kim, et al. (1998) argue that larger firms

<sup>4</sup> In addition to the variables described below, we also included the following variables in our original regressions: a dummy variable indicating whether or not the insurer is licensed in New York, the ratio of total dividends to assets, the percentage of invested assets in real estate, and the percentage of premiums ceded to reinsurers. None of these variables was significant in any of the regressions. At the suggestion of an anonymous referee, these variables were dropped from our final regressions.

are likely to face lower costs of external financing and therefore will hold lower levels of liquidity. Consistent with these arguments, Vogel and Maddala (1967), Kim, et al. (1998) and Opler, et al. (1999) document that larger firms tend to have lower ratios of cash to assets. We hypothesize that these same factors are likely to influence the cash holdings of insurers. Therefore, the expected sign on the size variable is negative.

*Financial Strength* We use an insurer's rating from A.M. Best as a proxy for financial strength. The Best's ratings are grouped into six categories, with zero representing the lowest rating category and five representing the highest category. All else equal, firms in the weakest financial position are hypothesized to have the greatest need for cash holdings. If a liquidity crunch should occur, a financially weak firm has the most difficulty raising outside funds. By contrast, a strong insurer with short-term cash flow problems would have less difficulty raising outside funds at a reasonable cost. As a result, the expected sign on this variable is negative.

*Group Membership* As a proxy for group membership, we include a dummy variable in the regression model that equals one if the firm is a member of a group and zero otherwise. In the property-liability insurance industry, some insurers operate as single unaffiliated firms while others are members of insurer groups. A single unaffiliated insurer that faces liquidity problems may have few options available to solve these problems. A member of an insurer group, however, may have a ready option; namely, liquidity help from the parent or other group members. It seems likely that an insurer that is a member of a group would manage its liquidity with at least some recognition that a liquidity shortage could be addressed with help from other insurers within the group. The end result would be that the member firm is able to hold lower levels of cash than if it was operating as a single unaffiliated insurer. Consequently, the expected sign on the group membership variable is negative.

*Variance of Cash Flows* A proxy for the volatility of the insurer's cash flows is included in the model. Insurers with riskier cash flows are likely to hold more cash, since they are more likely to have an unanticipated need for it. For non-financial firms, Kim, et al. (1998) document a positive relation between cash holdings and the variance of cash flows. The measure of risk used here is the one developed in Cummins and Sommer (1996) and Sommer (1996). This risk measure uses historical quarterly return data on various categories of assets and liabilities over a fifteen-year period. These historical data are then combined with an insurer's actual weights in the various asset and liability categories to create theoretical quarterly returns for the insurer's portfolio over this period. The sixty returns then are used to calculate the estimated volatility (standard deviation) of the insurer's asset-liability portfolio.<sup>5</sup> The expected sign on this variable is positive.

<sup>5</sup> The variable was calculated exactly as in Cummins and Sommer (1996) and Sommer (1996), and interested readers should consult those papers for additional details. Just as in those papers, the asset categories used were long-term government bonds, intermediate-term government bonds, U.S. Treasury bills, and U.S. common stocks. Other asset categories were combined into the most appropriate of these categories. The liability categories used were fire, allied lines, homeowners and farmowners multiple peril, commercial multiple peril, inland marine, workers' compensation, medical malpractice, other liability, auto liability, auto physical damage, and all other lines. The period over which returns were calculated, dictated by the availability of A.M. Best quarterly loss data, was 1975-1989.

*Duration of Liabilities* An insurer's need for cash clearly depends on the payout tails for the lines of business that the insurer writes. Short tail lines of insurance require a high liquidity level, since most premium income is paid out as claims in a relatively short period of time. With long tail lines of insurance, however, the insurer generally is able to keep the premium dollars for a significant period of time, paying out claims from one year's premiums over many years. Thus, we expect that insurers with liabilities of shorter duration will maintain higher levels of cash holdings. As a result, the expected sign of the coefficient on the duration variable is negative.

Our proxy for liability duration is based on the results of Babbel and Klock (1994) and Cummins and Weiss (1991). Both of these papers report estimated durations for various lines of property-liability insurance. Our measure uses a weighted average of these reported durations, with the weights being based on each insurer's unpaid losses and loss adjustment expenses for the various lines.<sup>6</sup> This weighted average measure should provide a reasonable proxy for the average duration of each insurer's liabilities.

*Organizational Form* A dummy variable is included that equals one for stock firms not owned by a mutual and zero for mutuals and stock firms that are owned by a mutual. The two most common organizational forms in the property-liability insurance industry are the stock form and the mutual form. As has been widely discussed in the literature, the variety and extent of agency costs would be expected to vary between stock insurers and mutuals (e.g., Mayers and Smith, 1981, 1986, 1988, 1994; Fama and Jensen, 1983a, 1983b; Pottier and Sommer, 1997). Agency costs of debt arise when the interests of owners differ from the interests of debtholders (i.e., policyholders). Agency costs of equity, also known as agency costs of managerial discretion, arise when the interests of owners differ from the interests of managers. Since mutuals merge the owner and policyholder functions, mutual insurers are better able to minimize the agency costs of debt than are stock insurers. Stock firms, on the other hand, are better able to minimize the agency costs of managerial discretion because the market for corporate control helps reduce the problem of managers acting in their own interests rather than in the interests of the owners.<sup>7</sup>

The impact of agency conflicts on the relation between organizational form and cash holdings is ambiguous. On the one hand, managers may wish to hold more than the optimal level of cash because they are risk averse or because it provides them with the flexibility to pursue their own objectives at the expense of other stakeholders. Because there are opportunity costs to holding excess cash, owners (be they stockholders or mutual policyholders) would want to reduce excess cash. Since the stock

<sup>6</sup> Babbel and Klock (1994) was used as the initial source for durations. If no duration was reported for a particular line there, data from Cummins and Weiss (1991) were used. It should be noted that for lines analyzed by both articles, the reported durations are very similar in each. Although the major lines of insurance are covered by at least one of these sources, some of the less significant lines had no reported durations. For these lines, we simply used a duration equal to the average of the durations for the other lines. This is unlikely to make a meaningful difference in the results, since the lines reported in Babbel and Klock (1994) and Cummins and Weiss (1991) account for an average of over 94% of the sample insurers' liabilities.

<sup>7</sup> As Mayers and Smith (1981) point out, while mutual policyholders can, in principle, replace management through a proxy fight, this is a difficult and expensive process.

ownership form should be better able to effectively mitigate owner-manager conflicts, this argument would lead to an expectation that mutuals would hold more cash than stock insurers.

Agency theory arguments, however, also can lead to the expectation that stock insurers would hold more cash than would mutuals. Opler, et al. (1999) argue that when agency costs of debt are high, firms are likely to choose high levels of cash holdings to be able to take advantage of investment opportunities without having to raise additional outside funds.<sup>8</sup> Since the agency costs of debt tend to be higher for stock firms than for mutuals, this argument leads to the conclusion that stock insurers would tend to hold more cash than would mutuals.<sup>9</sup>

*Leverage* Leverage, defined as total liabilities divided by total assets, also is included in the regression. Opler, et al. (1999) provide conflicting predictions on the relation between leverage and cash holdings. First, they argue that because it is difficult and expensive for highly leveraged firms to raise additional funds, firms with high leverage may hold more cash in order to avoid the need to raise outside funding to take advantage of investment opportunities. They also provide an argument based on the agency costs of managerial discretion. As discussed previously, managerial discretion arguments imply that managers may wish to hold excess cash because they are risk-averse or because it allows them to pursue their own objectives. Managers are best able to hold excess cash in circumstances where they are less subject to outside monitoring. Opler, et al. argue that firms with low leverage are less subject to outside monitoring, so cash holdings may be inversely related to leverage.

This argument for a negative expected relation between cash and leverage seems weak, at least for the insurance industry. While more highly leveraged insurers may indeed be subject to more outside monitoring, this monitoring would seem most likely to come from policyholders, rating agencies, and regulators. If the reason for their heightened monitoring is concern about the insurer's solvency, they would not have much incentive to pressure management to reduce excess cash, the safest of assets. Therefore, we believe a negative relation between cash and leverage would likely be driven by other factors. For example, insurers with relatively more liabilities may face higher costs to service those liabilities, and thus may not be able to accumulate the same levels of cash as insurers with lower liabilities. In addition,

<sup>8</sup> Most insurance company "debt capital" is raised by the issuance of insurance policies. Phillips, Cummins and Allen (1998), Cummins and Danzon (1997), and Sommer (1996) have demonstrated that just as buyers of corporate debt demand compensation for increased risk through higher interest rates, buyers of insurance demand compensation for risk through lower prices. Thus, holding all else equal, an insurer with higher agency costs of debt would tend to receive lower prices for its insurance.

<sup>9</sup> Pinkowitz (1998) provides another possible reason to expect stock insurers to hold more cash than would mutuals. He studies the relation between corporate cash holdings and the probability of takeovers. Contrary to conventional wisdom, Pinkowitz finds that cash holdings actually reduce the likelihood of becoming a takeover target. He concludes that managers may hold excess cash in order to entrench themselves at the expense of shareholders and to avoid discipline from the market for corporate control. Because mutual managers, unlike managers of stock firms, have no need to worry about the market for corporate control, they have no incentive to hold excess cash in order to deter a takeover.

poor performance (e.g., higher than expected losses) could result both in high leverage and low levels of cash, while good performance could result in just the opposite. This, too, would lead to a negative relation between leverage and cash. Finally, John (1993) argues that a high debt ratio is a proxy for access to debt markets, and therefore highly leveraged firms have a lesser need to maintain high liquidity.

*Investment Opportunity Set* An insurer with greater future investment opportunities is likely to maintain higher levels of cash in order to take advantage of opportunities as they arise without having to go to external sources for capital. The most common proxies for investment opportunities (e.g., market-to-book ratio) rely on stock price data (Gaver and Gaver, 1993; Smith and Watts, 1992; Baber, Janakiraman, and Kang, 1996; Jung, Kim, and Stulz, 1996). Unfortunately, these proxies are not feasible for our sample, which contains a large proportion of mutuals and non-publicly traded stock firms. Another common proxy for investment opportunities is research and development expenditures (Skinner, 1993; Long and Malitz, 1985; Smith and Watts, 1992). Again, because of the nature of the industry being studied, this measure is not feasible. One measure that is feasible for our sample is proposed in Baber, Janakiraman, and Kang (1996). In addition to using measures such as market-to-book ratio and R&D, these authors also propose using past growth rates as a proxy for future investment opportunities. For our analysis, we alternately include the average over the prior three years of growth in assets, growth in direct premiums written, growth in net premiums written, and growth in surplus. We expect a positive relation between investment opportunities and cash holdings.<sup>10, 11</sup>

### Control Variables

*Non-Invested Assets* The measure of the insurer's non-invested assets is simply the insurer's total non-invested assets divided by its total assets. As mentioned above, the decision regarding the amount of cash an insurer holds likely is not made without some consideration of the amount of non-invested assets needed to conduct business. Given that non-invested assets are perhaps the least liquid of all corporate assets, the higher the percentage of non-invested assets the insurer holds, the greater

<sup>10</sup> Because these growth rate variables are subject to extreme outliers, we truncated them at their 1<sup>st</sup> and 99<sup>th</sup> percentiles.

<sup>11</sup> The above measures of investment opportunities are less than ideal. Obviously, using this approach assumes that past growth and future investment opportunities are related, which may or may not be accurate. However, it could be argued that controlling for investment opportunities is not critical in this study because the analysis focuses on a single industry. The investment opportunity set is likely to be relatively homogeneous across firms in the same industry compared to studies looking at firms across industries. In fact, in one of the seminal works in the investment opportunity set literature, Smith and Watts (1992) measure investment opportunity sets at the industry level and perform tests cross-sectionally across industries. This is only appropriate if investment opportunity sets are generally homogeneous within industries. Nonetheless, the lack of a strong proxy for investment opportunities is an acknowledged weakness of our study. Further research is certainly needed to develop good proxies for investment opportunity sets for insurance companies, or to prove that these opportunity sets are relatively homogenous within the industry.



the expected level of highly liquid assets, such as cash holdings. As a result, we expect a positive relation between the amount of non-invested assets and the cash holdings of the insurer.

*Common Stock Holdings* We measure an insurer's level of common stock holdings as the ratio of the insurer's common stock to its total invested assets. Given that common stock is an investment that is relatively liquid, we hypothesize that common stock holdings serve, to some degree, as a substitute for an insurer's cash holdings. Consequently, we expect a negative relation between an insurer's common stock holdings and its level of cash holdings.

### SAMPLE

The sample comprises more than 1,400 property-liability insurers for the years 1993, 1994, and 1995. All data were collected from the National Association of Insurance Commissioners (NAIC) data tapes except for the organizational form and Best's rating for each insurer. These variables were collected from a review of *Best's Insurance Reports - Property/Liability Edition*. All firms on the NAIC tapes for these years were included in the sample except those that had non-positive assets, capital or net premiums written; had an organizational form other than stock or mutual; or were not rated by A.M. Best. The sample firms comprise more than three-fourths of total industry assets for each year. Summary statistics for the 1995 sample are found in Table 3. Statistics for the 1993 and 1994 samples are similar.

### EMPIRICAL RESULTS

Table 4 reports four sets of empirical results. The first three columns present results of separate OLS regression estimations for the years 1993, 1994 and 1995, while the fourth column presents results from a two way random effects model using the data from all three years.<sup>12</sup> The results are similar across the models. Of the ten variables in the regressions, nine or ten are significantly different from zero at conventional levels in each of the annual regressions, while eight are significant in the random effects model.

As expected, the coefficient on the size variable is negative and statistically significant, indicating that larger firms hold less cash than do smaller firms. The negative coefficient is consistent with results of previous studies and suggests that the economies of scale affecting the cash holdings of non-financial firms affect cash holdings of insurers as well.

The coefficient on the variable representing an insurer's Best's rating is negative and statistically significant. This indicates that weaker insurers, as measured by a lower Best's rating, hold more cash than do stronger insurers. Such behavior is consistent with weaker insurers forsaking higher yielding non-cash investments in order to

<sup>12</sup> See Greene (1997) for an explanation of the two way random effects model. We also estimated a pooled OLS regression and a model with time fixed effects. With each of these methods, every model variable was significant and had a sign consistent with the single year OLS results. Two way fixed effects is not feasible for our data since two of our variables (group dummy and organizational form) do not vary over the time period within firms.

**TABLE 3**  
Summary Statistics of the Sample Insurers for 1995

<i>Variable</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
CASH HOLDINGS	0.1288	0.1747	0.0	1.0
SIZE (000,000)	456.9094	2175.8324	.7186	54755.65
FINANCIAL STRENGTH	3.7924	0.9964	0	5
GROUP MEMBERSHIP	0.6951	N/A	0	1
VARIANCE OF CASH FLOWS	0.1369	0.0600	0.0528	0.4764
DURATION OF LIABILITIES	2.0325	0.7670	0.6400	4.9900
ORG FORM	0.6829	N/A	0	1
LEVERAGE	0.5840	0.1925	0.0025	0.9224
INVESTMENT OPPORTUNITY	0.1361	0.2490	-0.1500	2.0001
NON-INVESTED ASSETS	0.1223	0.0927	0.0006	0.6502
COMMON STOCK	0.1106	0.1578	0.0	0.9725

CASH HOLDINGS = Ratio of cash and short-term investments to total invested assets; SIZE = Natural log of total assets; FINANCIAL STRENGTH = Best's rating (0=C,C-,D,FPR2; 1=C++,C+,FPR3; 2=B,B-,FPR4; 3=B++,B+,FPR5,FPR6; 4=A,A-,FPR7,FPR8; 5=A++,A+,FPR9); GROUP MEMBERSHIP = Dummy variable equal to 1 if the insurer is a member of a group, 0 otherwise; VARIANCE OF CASH FLOWS = Volatility of the insurer's asset-liability portfolio; DURATION OF LIABILITIES = Estimated average duration of liabilities for the insurer; ORG FORM = Dummy variable equal to 1 if the insurer is a stock firm (not owned by a mutual), and 0 if the insurer is a mutual or a stock firm owned by a mutual; LEVERAGE = Ratio of total liabilities to total assets; INVESTMENT OPPORTUNITY = Average asset growth; NON-INVESTED ASSETS = Ratio of total non-invested assets to total assets; COMMON STOCK = Ratio of common stock holdings to total invested assets.

maintain a level of cash sufficient to avoid the high costs of or the difficulty in raising additional cash given a liquidity crisis. The coefficient on the group dummy variable is significantly negative, suggesting that insurers that are part of a group tend to hold less cash because of the liquidity help that can be generated from a parent or other group member.

It was anticipated that insurers with riskier cash flows would hold greater levels of cash for precautionary reasons. The positive and significant coefficient on the variable measuring volatility of cash flows supports this hypothesis. Also as expected, the coefficient on the variable measuring the average duration of an insurer's liabilities is negative and significant. Thus, it appears that insurers that write more short-tailed business maintain higher cash balances due to the short period of time they are able to hold onto premiums before having to pay them out as claims payments.

Recall that the predicted sign on the organizational form variable was ambiguous. The results show a positive and significant coefficient on this variable, implying that

**TABLE 4**  
**Regression Results**  
 Dependent Variable: Cash Holdings

<i>Variable</i>	<i>Expected Sign</i>	<i>1993 Coefficient (P-value)</i>	<i>1994 Coefficient (P-value)</i>	<i>1995 Coefficient (P-value)</i>	<i>Random Effects Coefficient (P-value)</i>
INTERCEPT		0.6343 (.0001)	0.5443 (.0001)	0.5075 (.0001)	0.5929 (.0001)
SIZE	-	-0.0174 (.0001)	-0.0125 (.0001)	-0.0104 (.0025)	-0.0189 (.0001)
FINANCIAL STRENGTH	-	-0.0239 (.0001)	-0.0255 (.0001)	-0.0306 (.0001)	-0.0180 (.0001)
GROUP MEMBERSHIP	-	-0.0526 (.0001)	-0.0492 (.0001)	-0.0532 (.0001)	-0.0432 (.0001)
VARIANCE OF CASH FLOWS	+	0.1446 (.0667)	0.1575 (.0420)	0.1860 (.0246)	0.1333 (.0351)
DURATION OF LIABILITIES	-	-0.0199 (.0016)	-0.0190 (.0010)	-0.0135 (.0339)	-0.0213 (.0001)
ORG FORM	-/+	0.0514 (.0001)	0.0408 (.0001)	0.0561 (.0001)	0.0558 (.0001)
LEVERAGE	-/+	-0.1426 (.0001)	-0.1484 (.0001)	-0.1260 (.0001)	-0.0356 (.0888)
INVESTMENT OPPORTUNITY	+	0.0010 (.9419)	0.0229 (.0920)	0.0513 (.0018)	0.0054 (.5126)
NON-INVESTED ASSETS	+	0.2508 (.0001)	0.1777 (.0001)	0.1037 (.0274)	0.0229 (.4459)
COMMON STOCK	-	-0.1908 (.0001)	-0.1535 (.0001)	-0.1913 (.0001)	-0.1753 (.0001)
Model adjusted R <sup>2</sup>		.2486	.2418	.2178	.2224

CASH HOLDINGS = Ratio of cash and short term investments to total invested assets; SIZE = Natural log of total assets; FINANCIAL STRENGTH = Best's rating (0=C,C-,D,FPR2; 1=C++,C+,FPR3; 2=B,B-,FPR4; 3=B+,B+,FPR5,FPR6; 4=A,A-FPR7,FPR8; 5=A++,A+,FPR9); GROUP MEMBERSHIP = Dummy variable equal to 1 if the insurer is a member of a group, 0 otherwise; VARIANCE OF CASH FLOWS = Volatility of the insurer's asset-liability portfolio; DURATION OF LIABILITIES = Estimated average duration of liabilities for the insurer; ORG FORM = Dummy variable equal to 1 if the insurer is a stock firm (not owned by a mutual) and 0 if the insurer is a mutual or a stock firm owned by a mutual; LEVERAGE = Ratio of total liabilities to total assets; INVESTMENT OPPORTUNITY = Average asset growth; NON-INVESTED ASSETS = Ratio of total non-invested assets to total assets; COMMON STOCK = Ratio of common stock holdings to total invested assets.

stock insurers hold more cash than do mutuals. Note that this is true even holding constant factors such as the volatility of cash flows and the duration of liabilities.<sup>13</sup> These results are inconsistent with the managerial discretion argument that cash holdings would be the highest where owner-manager conflicts are the greatest. Rather, the results are consistent with the argument of Opler, et al. (1999) that firms with higher agency costs of debt (i.e., stock firms, all else being equal) are likely to hold more cash in order to avoid having to raise costly outside funds.

The predicted sign on leverage also was ambiguous. The results indicate a significant negative relation between leverage and cash holdings. This is the same result found by Kim, et al. (1998) and Opler, et al. (1999) in their studies of non-financial firms' cash holdings. As described earlier, a number of possible explanations exist for this result. Opler, et al. argue that it may be due to increased monitoring of highly leveraged firms. Alternatively, it may be that more highly leveraged insurers are simply less able to accumulate cash while also maintaining necessary payments on their liabilities, that low cash holdings and high leverage may both reflect recent poor performance, or that leverage is a proxy for access to debt markets.

In an attempt to measure investment opportunities, four alternative proxies were used, as described earlier. Each of the proxies was significant and positive in at least one of the four regressions. Regardless of the proxy used, though, its inclusion or exclusion had no meaningful impact on any of the other results.<sup>14</sup> If any of our alternative variables are reasonable proxies, this implies that our results are unaffected by controlling for investment opportunities. It may be that the reason the inclusion of the proxies did not make a meaningful difference, and the reason they were often insignificant, is that, as argued in an earlier section, the investment opportunity set is relatively homogeneous within a single industry. However, because it is possible that our proxies for investment opportunities do not adequately capture the variation that truly exists in investment opportunity sets across property-liability insurers, any conclusions regarding this variable should be made with caution.

Finally, the significant coefficients on the control variables are consistent with our expectations. The positive and significant coefficient on non-invested assets in three of the four regressions indicates that insurers with greater operational assets tend to place a larger portion of invested assets in highly liquid assets such as cash. The negative coefficient on common stock holdings suggests that common stock and cash are viewed to some degree by insurers as substitutes in terms of liquidity.

## SUMMARY

This article investigates the differences in cash holdings across property-liability insurers. Using three years of data, we examine whether the differences in cash holdings across insurers can be systematically explained by a number of insurer charac-

<sup>13</sup> Lamm-Tennant and Starks (1993) demonstrated that stock and mutual insurers have different risk profiles. Thus, in order to properly interpret the result for the organizational form variable, it is important to control for firm risk.

<sup>14</sup> For Table 4, we chose to present the results using average growth in total assets. Results using the other proxies do not qualitatively differ in that each of the proxies is significant in one or two of the regressions, and all other results are not meaningfully affected.

teristics. Our results contribute to the existing body of literature that has investigated various aspects of cash holdings by non-financial firms, as well as to the literature that has investigated other aspects of the investment portfolios of insurers.

We find that cash holdings as a percentage of invested assets are smaller for larger insurers and financially stronger insurers. We consider this evidence as a general indication that insurers with better access to cash through the capital markets choose to invest in higher yielding assets rather than hold cash. Similarly, we find that insurers that are members of a group hold less cash, presumably because other group members can provide liquidity if necessary.

We find that an insurer's variance of cash flows and product lines affect cash holdings. Insurers with greater cash flow variance hold more cash, as expected, because of the greater uncertainty with regard to cash needs. In addition, insurers writing shorter tail lines hold more cash since they pay out premiums as claims in a relatively short time period. More highly leveraged firms are found to hold less cash. We also find weak evidence to suggest that insurers with greater investment opportunities hold more cash, presumably to take advantage of these opportunities as they arise.

Interestingly, although managerial discretion arguments might suggest that stock insurers would hold less cash than would mutuals because of pressure from stockholders, we find that stock insurers actually hold more cash than do mutual insurers. Finally, insurers having a greater percentage of non-liquid assets such as non-invested assets hold more cash to increase their liquidity positions, and insurers with other highly liquid investments such as common stock hold less cash.

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