Precautionary Savings with Risky Assets: When Cash Is Not Cash

Ran Duchin, Thomas Gilbert, Jarrad Harford, and Christopher Hrdlicka*

February 10, 2014

ABSRACT

We study the investment securities that make up corporate cash holdings. Exploiting the 2009 accounting standard SFAS No. 157, which requires firms to report the composition and fair value of their financial instruments, we hand-collect detailed data on firms' investment securities and assess their risk. Our estimates show that, on average, the value of risky securities is 27% of that of corporate cash holdings and 6% of total book assets. Contrary to the precautionary savings motive, risky security investments are concentrated in firms traditionally thought to have a high demand for precautionary savings such as firms in the technology or health industries, firms with volatile cash flows, or firms with high Tobin's Q. Our evidence is consistent with a speculative motive for holding cash, which is particularly strong in firms with "excess" or "trapped" cash reserves, or in firms with managers who are overconfident or paid with stock options. Furthermore, we find that firms with riskier productive assets are choosing to increase the risk of their reserve assets, which is consistent with a reaching for yield explanation. We also find evidence that risky security investments are correlated with negative alphas, which shows that investors are not positively surprised by managers' ability, or lack thereof, to create value by investing in risky assets.

JEL classification: G32, G34

Keywords: Liquidity, Cash, Investment Securities, Risk, SFAS 157

---

* All authors are at the Michael G. Foster School of Business at the University of Washington. Email: duchin@uw.edu; gilbertt@uw.edu; jarrad@uw.edu; hrdlicka@uw.edu. We thank Aaron Burt, Harvey Cheong, Matthew Denes, John Hackney, Lucas Perin, and especially Rory Ernst for excellent research assistance. We also thank seminar participants at the University of Kentucky, Tulane University and the participants of the Pacific Northwest Finance Conference for helpful comments.

The precautionary savings motive has been central to understanding corporate cash policy in previous academic research. Starting with Keynes (1936), and extending through the models of Baumol (1956), Miller and Orr (1968), and more recently, Kim et al. (1998) and Almeida et al. (2013), most theoretical treatment begins with this primary objective of securing financing when the firm may not have sufficient funds to invest or meet its obligations due to external finance frictions. Indeed, this is the most common justification given by managers, as demonstrated by the survey evidence in Lins et al. (2010) and Campello et al. (2011).

Empirically, researchers have had considerable success explaining cash holdings by examining variation in firm characteristics tied to precautionary demand, such as cash flow volatility, growth opportunities, and information asymmetry (see, for example Opler et al. (1999) and Harford (1999)). Recent findings also support the importance of the precautionary savings motive in explaining the dramatic increase in average cash holdings (e.g., Bates et al. (2009) and Duchin (2010)) and underscore the importance of precautionary savings in mitigating the impact of the 2008-9 financial crisis (e.g., Campello et al. (2010) and Duchin et al. (2011)).

A key assumption in these studies is that corporate "cash" reserves are in fact invested in cash or highly liquid, risk-free near-cash securities, as would be necessary for them to form precautionary savings. Recent anecdotal evidence in the press, however, suggests that corporate treasuries have considerably broadened the scope of securities in which accumulated reserves are invested. For example, the article "Google's Latest Launch: Its Own Trading Floor", published in *Business Week* on May 27, 2010, reports that: "Google, it turns out, has launched a trading floor to manage its $26.5 billion in cash and short-term investments… One of the company's goals is to improve the returns on its money, which until now has been managed conservatively."

In this paper, we investigate the determinants and consequences of the investment policy for the firm's reserve assets. Note that because the focus of our paper is on the fact that these reserves are often not held in cash-like assets, we will refer to them throughout as "reserve assets" or "reserves." We start by providing a conceptual framework that links the firm's demand for precautionary savings and the composition of its reserves. We then provide one of the first detailed empirical analyses of the actual investments making up corporate reserves[1] with the aim of answering several research questions: What is the composition of firms' investment securities and what fraction of corporate reserve assets is held in risky securities? What are the characteristics of firms that take risk with their reserves? How do these risky securities co-vary with the firm's liquidity needs? What are the determinants and implications of the firm's investment in risky securities?

To answer these questions, we exploit the introduction of the 2009 accounting standard SFAS No. 157, which requires firms, for the first time, to report the composition and fair value of their investment securities. Using hand-collected data from annual report notes, we undertake a firm-by-firm analysis of the actual composition of reserves for industrial firms in the S&P 500 index. Our evidence suggests that the types of investments vary widely and include domestic and foreign corporate debt, foreign government debt, equity investments, mortgage and asset backed securities, and various other assets.[2] These securities are clearly exposed to covariance and liquidity risk and are therefore not risk-free, cash or near-cash securities. Hence, our findings

[1] Brown (2012a and 2012b) uses the Federal Reserve Flow of Funds Accounts to document aggregate changes in financial asset holdings of non-financial firms. He argues that corporate market investments are getting riskier over time and are not a good store of cash. Cardella, Fairhurst, and Klasa (2014) analyze the split between cash & cash equivalents and short-term investments, arguing that firms are taking more risk with their short-term investments. We complement and extend these papers by hand-collecting the actual holdings at the firm level so that we can test cross-sectional hypotheses about the characteristics, determinants and consequences of firms' holdings of risky assets.

[2] More exotic examples include student loan backed auction rate securities, accounts receivable conduits, and Venezuelan and Greek bonds.

question the standard measure of cash holdings, defined as the Compustat variable *Cash and short-term investments (CHE)*, which, as we show, does include risky investment securities. To illustrate this point, consider the extreme example of Apple's reserves as of the end of September 2012. Apple held $121.2 billion in cash, short-term investments, and long-term investments, our analysis indicates that 76.1% of this amount was held in risky securities, which included $46.8 billion in corporate securities (equities and bonds) and $12.0 billion in mortgage and asset backed securities.[3]

Our sample-wide estimates indicate that a surprisingly large fraction of reserves is held in risky and potentially illiquid securities. Relative to the standard measure of corporate cash holdings, the average firm in our sample held 26.8% of that value in risky securities. The magnitudes are even more impressive on a value-weighted basis, where the firms in our sample held a total of 48.7% in risky securities relative to traditional measures of their cash holdings. Overall, relative to its total book (market) value, the average firm in our sample held 5.6% (4.7%) of its value in risky securities.

Many of these risky investments performed particularly badly during the recent severe contraction in external financing associated with the global financial crisis. That is, at exactly the time firms would need to draw on their precautionary savings, those savings lost considerable value and often were held in illiquid assets that even sometimes simply had no buyers. Figure 1 demonstrates this point by analyzing the performance of investment indices corresponding to the typical investment securities of the firms in our sample. As Figure 1 clearly shows, the typical

[3] An additional measurement problem arises because the Compustat variable *CHE* does not necessarily include all the firm's investment securities that comprise its cash reserves. Based on the Compustat variable *CHE*, Apple held $29.1 billion in cash. This variable, however, does not include an additional amount of $92.1 billion held in long-term marketable securities, captured by the Compustat variable *Investment and Advances Other* (*IVAO)*. In subsequent analyses, we therefore also consider an alternative measure of cash, which comprises the sum of *CHE* and *IVAO*.

corporate investment securities would have lost a substantial fraction of their value during the crisis.

Next, we investigate which firms invest in risky securities. Our evidence suggests that risky securities are largely concentrated in the Technology and Health industries, which are characterized by intangible assets, volatile cash flows, and high growth opportunities. Even controlling for industry effects, we find that firms with more volatile cash flows, higher market-to-book ratios, and more foreign income hold more risky assets. Extant studies view the positive association between reserve holdings and cash flow volatility or market-to-book as evidence supporting the precautionary demand explanation of reserves. However, the fact that these reserves are actually invested in risky securities suggests a form of an agency conflict over reserve management policy. Furthermore, the finding that firms with more foreign income hold more risky assets is consistent with cash "trapped" abroad for repatriation tax reasons (Foley et al. (2007)) being invested in risky securities. If this "trapped" cash is invested in risky assets, then it might require an additional discount to that typically applied to these reserves for their associated tax liabilities. Furthermore, since most investment securities are domestic, our estimates indicate that from an economy-wide perspective, this cash is not "trapped" abroad since firms are investing it in the U.S. financial markets.

Given that investing in assets that positively co-vary with the firm's cash flows and become illiquid in crises would seem to be an unusually poor strategy for managing a stock of precautionary reserves, we test several hypotheses about risky asset holding. One hypothesis is that this is simply another manifestation of the basic agency problem between managers and shareholders. Typical characterizations of the agency conflict focus on top managers, overinvestment and perquisites. In this case, the agency conflict is further down in the

organization where treasury personnel prefer to invest in securities other than laddered U.S. Treasury portfolios, either to make their job more interesting or to develop human capital that can be valuable elsewhere in the asset management industry. The latter is an example of the conflict described in Holmstrom (1999) where an action's returns to the manager's human capital are not positively correlated with the financial returns to investors. This creates an agency conflict that is not mitigated by ex-post settling up in the labor market as described by Fama (1980).

An alternative hypothesis draws on Keynes' speculative motive, which he defines in the *general theory* as: "the object of securing profit from knowing better than the market what the future will bring forth." Under this hypothesis, the interests of management and shareholders are not necessarily misaligned, as shareholders may be reaching for yield, driven by confusion over the effect of low-yield investments on a firm's ability to meet its cost of capital.[4] This is essentially the flip-side of the fallacy that debt is a cheap source of capital. Furthermore, shifting cash reserves into risky investments may represent a type of asset substitution (Jensen and Meckling 1976), which, if unanticipated, transfers wealth from bondholders to shareholders.

To provide evidence on these hypotheses, we first estimate an empirical model of reserves and split firms into quintiles based on their excess reserve holdings. As Jensen (1986) originally proposed, excess liquidity may exacerbate the firm's agency costs. We find that firms in the highest quintile of excess reserves also hold the greatest fraction of reserves in risky assets. In particular, firms in the highest quintile hold, on average, 14.8% of their total assets in risky securities, more than 5 times the risky holdings of firms in the lowest quintile (2.7%), and more

[4] In discussing growing corporate cash reserves, one analyst remarked, "Corporations are flush with cash and that cash sitting in the corporate coffers is earning next to nothing. Companies have to do something with it." (Demos, T, Russolillo, S., and Jarzemsky, M. "Firms send record cash back to investors," *Wall Street Journal* online March 7, 2013).

than double the holdings of firms in the second-highest quintile (6.2%). Interestingly, the relation between excess reserves and risky investments is non-monotonic. Risky asset holdings rise in the bottom excess reserves quintile, potentially because the lowest quintile contains distressed firms that gamble for resurrection.

To further test our hypotheses, we investigate whether proxies for the severity of the agency problem between managers and shareholders help explain how much of a firm's reserves are invested in risky securities. Our proxies include the G-Index (Gompers et al. (2003)) and E-Index (Bebchuk et al. (2009)) of shareholder rights, previously found in the cash literature to affect the uses and value of cash reserves (e.g., Dittmar and Mahrt-Smith (2007) and Harford et al. (2008)). We also include proxies for the managers' overconfidence as well as managers' stock- and option-based compensation to proxy for the incentive alignment between managers and shareholders and for the incentive to speculate.

We find little evidence that the proxies for the severity of the agency conflict between managers and shareholders are correlated with risky investments. Consistent with the speculative motive hypothesis, however, we do find that overconfidence as well as stock- and option-based compensation is associated with investment in risky securities. The magnitude of these effects is nontrivial and persists across various measures of risky securities: an increase of one standard deviation in managers' stock-based (option-based) compensation corresponds to an increase of 1.7 (2.0) percentage points in risky security holdings as a fraction of total assets. These findings support the hypothesis that shareholders and managers attempt to increase the value of their equity stake by speculating or reaching for yield, possibly at the expense of the firm's bondholders.

In a final step, we examine the links between the firm's speculative behavior with its reserves and its market performance and risk. We find that the firm's investment in risky-securities is negatively correlated with its risk-adjusted stock market performance, as measured by its alpha. Notably, we establish that managers' choice of the risk of their reserve assets is positively correlated with the risk of the firm's underlying assets, which is consistent with the predictions of the reaching for yield explanation. An important caveat in interpreting these results is that the firm's shareholders may already price the firm's security investment strategy, in which case a negative alpha does not necessarily imply that investing in risky securities yields a negative risk-adjusted performance. Nonetheless, we find no evidence that the firms in our sample profit from their risky investments after accounting for risk and/or that investors are surprised by the potential abnormal performance generated by the treasurers' asset allocation and stock-picking skills.

We note, however, that this speculative use of excess reserves may be better than other alternatives. Investing in risky, but zero-NPV, financial assets rather than negative NPV acquisitions (Jensen (1986) and Harford (1999)) is arguably better for shareholders. The tradeoff depends on how often the suboptimal precautionary savings strategy leads to underinvestment.

Our results have implications for the literature on cash holdings as they challenge the precautionary savings explanation for an economically significant portion of corporate cash holdings. They highlight problems in using reported cash and short-term investments as a measure of cash reserves in empirical studies. They also are relevant to the debate over whether and when excess reserves should be returned to shareholders through a change in payout policy. They point to a further dimension on which lines of credit and cash reserves differ for liquidity provision (see, for example, Sufi (2009), Disatnik et al. (2013), and Acharya et al. (2013)) since

lines of credit cannot be invested in assets that positively co-vary with the firm's operating cash flows.

Overall, our findings open new questions into the explanations for and implications of what are essentially hedge funds operating within companies. Our estimates suggest that corporations do not tend to earn positive risk-adjusted returns on their portfolios of risky assets, as measured by Jensen's alpha, a measure typically used to assess the performance of investment funds. Thus, beside the inherent contradiction between risky securities and precautionary savings, due to the covariance risk of these securities, corporate treasury managers do not seem to earn positive abnormal returns while incurring potentially significant transaction costs and exposing the firm to additional covariance and liquidity risks. We conclude that they are probably better off avoiding speculation.

The remainder of the paper is organized as follows. Section 1 develops the implications of the precautionary savings motive for the characteristics of reserve assets. Section 2 discusses the data. Section 3 investigates the composition of corporate investment securities. Section 4 studies the determinants and implications of firms' risky investment securities. Section 5 concludes.

1. The Precautionary Savings Motive and the Composition of Reserve Assets

At the foundation of most academic research into cash reserve policy is the hypothesis that cash is held as precautionary savings. Empirical work has consistently found evidence that precautionary demand-factors explain a significant proportion of the cross-sectional and intertemporal variation in reserves. We therefore start by laying out a conceptual framework that links the firm's demand for precautionary savings, as determined by its exposure to aggregate

and firm-specific risks, and the composition of its reserve assets, their level of liquidity, and covariance risk.

Depending on how broadly one views the definition of precautionary savings, different implications arise. In particular, firms may hedge against both firm-specific and aggregate cash flow risks. Each type of risk has different implications for the optimal levels of covariance risk and liquidity of the firm's reserves.

If the reserves are held to mitigate the effects of aggregate cash flow shocks and varying costs of external finance, then holding any asset whose value positively covaries with aggregate cash flows is inconsistent with the precautionary savings motive. On the other hand, one can take the broader view that reserves are a means to move slack from states where the firm does not need it to states where it does. In that case, a firm may have more real options to exercise in aggregate good states and may value assets that payoff in those states. Real options are inherently hard to externally value and for insiders to credibly communicate to external capital suppliers, implying that internal financing of such options is less costly than external financing. Thus, assets whose payoffs positively covary with the aggregate state of the economy provide a poor hedge against aggregate adverse shocks, but may provide valuable financing in good states of the economy in which the firm has real options to exercise.

In contrast, if the reserves are held to hedge against idiosyncratic, or firm-specific, cash flow shocks, then the covariance risk of the assets held in reserve is less important. The reason is that as long as the payoffs of these assets are uncorrelated with the firm-specific shocks to cash flows and investment opportunities, then the firm's ability to use its reserves when it needs them the most is unaffected by the covariance risk of its assets.

While covariance risk is a key dimension on which to evaluate reserve policy, liquidity has potentially more power to identify the importance of the precautionary savings motive. Illiquid assets are inconsistent with both the aggregate and firm-specific precautionary savings motivations. While liquidity likely varies with the aggregate state of the economy, more illiquid assets impose a cost on a firm that wishes to use its reserves both in good and bad times. Thus, higher degrees of illiquidity will likely hamper the firm's ability to hedge against both aggregate and idiosyncratic shocks.

One empirical implication of the above discussion is that firms with either more aggregate or more firm-specific risk should hold assets that are more liquid. The implications are more nuanced for covariance risk. On the one hand, exposure to aggregate cash flow risk should lead firms to hold assets with lower covariance risk. On the other hand, firms with many growth options in expansions would be expected to invest in assets with covariance risk, balancing the need to provide some minimum slack in the bad times with the need to internally finance growth options in the good times. However, some asset classes, such as risky bonds, have asymmetric payoff functions, losing value in the bad times without having higher payoffs in the good times. Holding such assets is inconsistent with any version of the precautionary savings motive. Finally, the relation between covariance risk and firm-specific cash flow risk is not obvious.

One liquidity-related friction often faced by firms with substantial reserves is that a large fraction of the reserves are generated abroad and would be taxed if it were repatriated. Thus, in much the same way an illiquid asset can be converted quickly to readily available cash only at discount, so too would the foreign reserves only be available for general corporate purposes at a discount to its face value. This leads to two potential arguments for why investing the cash in risky and/or illiquid assets might be optimal: first, if it is already illiquid, then the opportunity

cost—in terms of potential losses when the firm needs the reserves—of investing it in risky or illiquid assets is low. One might even argue that since, from the firm's perspective, the reserves are already illiquid, it would be optimal to capture an illiquidity premium by investing in illiquid assets. Other than this latter argument, it is not clear, however, what benefit the firm gains from investing its foreign reserves in risky assets. The second argument is that if the reserves cannot (at no cost) be distributed to shareholders, the firm should invest it as they would want to invest it. In the absence of the ability to generate alpha, investors can adjust their own portfolios based on the risk of the firm's assets more efficiently. Regardless, it is in no way obvious how shareholders would want the reserves invested on their behalf or even that they would agree.

A related argument is that there are scale efficiencies in investing such that the investors gain when the firm invests on their behalf. For example, perhaps the firm can access certain private equity, hedge fund, or other alternative investments that the individual investors cannot access on their own. There are two problems with this argument: first, the majority of the typical firm's shares are held by institutions, and this is especially true of large firms with substantial reserves. Second, it is not clear what frictions make it more efficient for an operating firm to intermediate like this on behalf of individual investors rather than for a financial intermediary to directly do so.

The discussion above focuses on frictions that could make investing in risky and/or illiquid assets optimal. Additionally, in the presence of frictions that lead to agency problems, managers may engage in this behavior even if it is suboptimal. One agency problem could arise from career concerns. Financial managers in the treasury function within the firm who are interested in broader careers in money management would seek to show experience in more than just investing in laddered Treasury portfolios. This is a form of agency cost that stems from self-

interest by managers below the typical top level CEO. One might argue that in order to attract quality talent to the treasury function in the first place, the firm must allow them this opportunity to build their human capital. However, for this to be true, labor market frictions would have to large. Furthermore, this explanation does not match with the fact that many firms outsource their reserve management function.

Our final explanation for why managers invest cash reserves in risky assets is that they are reaching for yield. Reaching for yield could be due to agency costs, misunderstanding of the cost of capital, or could be optimal, depending on the circumstances. We discuss each in turn.

Managers prefer the company's assets to grow, if for no other reason than the fact that compensation is highly correlated with firm size. If the shareholders cannot identify ex-ante the quality of a firm's projects, then shareholders might find it optimal to ignore managers' investment in risky assets because they would at least not be losing on costly real asset waste. This is driven by the assumption that capital markets have low transaction costs and fair prices. Managers would prefer risky assets to just holding cash (or low return, safe assets) because firm value would continue to grow on average. Thus, this is the least worst outcome of the agency conflict over investment policy.

Managers and analysts make public statements that the cash is operating as a drag on the company's return, or other similar statements suggesting that cash does not earn the company's cost of capital and that this is a problem. This misunderstanding of the required return on the firm's cash reserves is related to the fallacy that debt is the cheaper source of capital. So, it is possible that managers invest their cash in risky assets purely out of ignorance.

However, under a relatively broad set of circumstances, investing the cash in riskier securities is optimal for shareholders. Firms typically issue risky, fixed-rate debt. Anything that

makes the firm safer lowers the required rate of return for equity holders, but more importantly raises the realized rate of return on the bonds because default risk is lowered. Thus, the firm creates a windfall for bondholders by holding as cash any assets not needed to buffer cash flow shocks. This lower default risk may be a small effect if the firm would only be holding the cash for a short period of time, but if the firm is going to hold the cash for a substantial amount of time then this effect could potentially be large.

To avoid giving bondholders a windfall, the company should invest its excess reserves in risky assets that earn at least the rate of return as their issued debt. Of course the firm could invest in riskier assets as well. However, in a repeated game, such substantial risk shifting would have a costly impact on the firm's reputation in the bond market. Hence the optimal risk level to invest in is assets with exactly the same rate of return as the firm's debt.

Whether such a strategy is optimal depends on what the bondholders knew and expected when the firm issued the bonds. It applies most directly to cash accumulated after the bonds were issued. As such, it also depends on how often the firm refinances the debt, because the firm's reserves policy will be priced at debt issuance. Empirically, this explanation can be tested by relating the maturity structure of the firm's debt to its reserves policy. Also, it does not apply to all equity firms.

2. Data

In this section, we discuss our data collection and classification processes. We describe the investment securities that firms hold and provide detailed examples of how firms report their investment securities.

2.1 Collection of Investment Security Data

We hand collect tabulated and free-text data on firms' holdings of financial instruments from the footnotes of the annual reports (10-K) available on the SEC's Edgar database. Primarily driven by the implementation of Financial Accounting Standards (FAS) statement No. 157, which became effective in 2009, most firms report a footnote labeled "fair value measurements/investments." This footnote typically includes the value of the firm's financial holdings broken down by asset class (bonds, equities, etc.) and valuation inputs (level 1, 2 or 3).

SFAS No. 157 requires firms to report the fair value of all financial assets broken down by the type of inputs necessary to assess the fair value: quoted prices in active markets for identical assets (level 1), significant other observable inputs (level 2), or significant unobservable inputs (level 3). While the statement suggests that a table format for such reporting may be adequate, there is no formal requirement for the form of the reporting. More information about SFAS No. 157 can be found in Appendix B.

Next, we explain how these data correspond to previous research on cash holdings and to the standard data items in Compustat. Virtually all prior studies of cash holdings used the Compustat item CHE, which is the sum of CH (cash) and IVST (short-term investments – total), to measure the firm's cash and cash equivalents. However, a significant portion of this "cash" need not be held in safe and liquid assets, and moreover, firms may report additional security holdings elsewhere on their balance sheets. Figure 2 illustrates these measurement issues using a hypothetical Venn diagram. The firm's total book value of assets (AT) comprises cash and short-term investments (CHE) in addition to various other assets. As noted above, CHE may include risky and illiquid assets. Furthermore, there can also be additional risky and illiquid assets reported as long-term investments or other assets. While the Compustat data item IVAO

(investments and advances – other) includes long-term investments, it can also include many other items such as long-term receivables.[5] Since our goal is to measure the firm's investment in risky securities, we cannot rely on Compustat data and must collect this information from the footnotes that provide a detailed breakdown of the firm's investment securities.[6] An unfortunate complication due to lack of data provided by firms is that we cannot always identify the size of the intersection of the two smaller circles in the Venn diagram. That is we cannot always uniquely identify how many risky assets a firm reports as cash even though we are able to measure all of a firm's risky assets.

2.2 Examples of Risky and Illiquid Security Holdings

The "cash" holdings of companies include the safe and liquid assets that we expect them to hold for precautionary savings: cash and cash equivalents such as Treasury bonds, money market funds, commercial paper, and certificates of deposits. However, these holdings turn out to also include a much wider range of assets that are both riskier and less liquid. At the firm level, these other assets are large both in proportional and absolute terms. We provide illustrative examples of firms' security holdings as of fiscal year 2012.

Apple invests in US agency securities ($19.6 billion) and mortgage backed and asset backed bonds ($12 billion). Pfizer holds Freddie Mac and Fannie Mae asset backed securities ($2.54 billion). Others such as First Data and Ashland invest in student loan backed auction rate securities ($38.8 and $10 million). Auction rate securities ($73 million) with unspecified backing

[5] The only other Compustat field with non-missing balance sheet data related to investments in 2012 is IVAEQ (investments and advances – equity). IVAEQ is about equity holdings in affiliates and subsidiaries where the firm has control. Since these are held for strategic reasons, they are not relevant for our analysis.

[6] Because firms have discretion over where on their balance sheet they report their financial assets, the information provided by most firms is not sufficient to perfectly reconcile the numbers reported in the fair value footnote with the values of CHE and/or IVAO reported in Compustat.

are held by EMC, who also holds a wide array of other debt securities: municipal obligations ($1 billion), US corporate debt ($1.47 billion), foreign debt securities ($1.26 billion), and even high yield corporate debt ($477 million). Even more exotic debt instruments, such as accounts receivable conduits ($1.14 billion), are reported by companies such as Dow Chemical.

Foreign debt holdings range from broad non-specific categories, such as those reported by EMC, to designations of supranational debt holdings by Pfizer ($562 million), foreign agency debt holdings by First Solar ($34 million), and country specific bond holdings. Colgate-Palmolive lists holdings in Venezuelan bonds ($618 million) and Biomet lists holdings of Greek bonds ($82 million).

Firms also hold equity securities. Ebay, for example, reported general equity holdings ($638 million). Companies occasionally provide a more detailed breakdown of their equity holdings. Applied Material has holdings in privately held companies ($70 million). Caterpillar lists holdings in large cap value stocks ($185 million) and smaller growth companies ($34 million).

The above risky securities can be highly illiquid. This illiquidity creates a measurement problem for firms, often requiring them to make difficult valuation assumptions (level 3 assets). There is wide variation in how firms characterize the choice not to sell their investments versus the illiquidity of their investments, and in how firms account for the temporary versus permanent loss in the value of their investments. Coca-Cola, for example, acknowledged not selling any of its available-for-sale securities and chose not to recognize its losses by classifying all assets with fair market values below their cost basis as "not other than temporary." Many other firms acknowledge the complete market freeze of their assets. This was particularly problematic for

auction rate securities whose market completely vanished during the 2008 financial crisis and has yet to recover.

Best Buy and Bed Bath & Beyond cite illiquidity directly as their reason for not selling their securities. Best Buy writes that "in February 2008, we have been unable to liquidate a portion of our ARS [auction rate securities]. The investment principal associated with our remaining ARS subject to failed auctions will not be accessible until successful auctions occur, a buyer is found outside the auction process… We do not intend to sell our remaining ARS until we can recover the full principal amount." Bed Bath & Beyond writes that there are "no observable market prices" for its auction rate securities and "the Company believes that the unrealized losses are temporary and reflect the investments' current lack of liquidity." Firms such as Bed Bath & Beyond that choose to disagree with the fair market value of their assets support their valuations with a discounted cash flow model based on their own assumptions about discount rates and future cash flows.

Some firms do realize the losses on their investments and these losses can be substantial. First Solar, for example, realized a one percent loss on their supranational debt holdings and they had a nearly five percent loss on their foreign debt holdings. Note that from an accounting standpoint, firms that realize a gain or a loss on their investments by selling their securities report these gains or losses on their income statement; hence, these gains or losses will have an effect on their earnings.

2.3 Asset Classification Methodology

Most firms have a footnote labeled "fair value measurements/investments" in their annual report where they provide a tabulated breakdown of the securities they hold. We collect all the

information available in these footnotes about the names of the security holdings as well as their fair values. Some firms do not provide such a footnote but specify elsewhere that all of their holdings are in cash or cash equivalents. For these firms, we stay conservative and obtain the value of their cash and cash equivalents directly from their balance sheets. A small number of firms neither provide such a footnote nor state anything explicit about their holdings. We drop these firms from our sample.

For our sample of 372 S&P 500 non-financial and non-utilities firms between 2009 and 2012, we collected more than 1,500 separate holding types and their associated fair values. Our classification proceeded in two separate steps. First, we proceeded to classify each individual asset holding by type using the following set of not-mutually-exclusive categories: cash, cash equivalents, money market fund, equity, debt, corporate, government, agency, U.S., foreign, municipal, asset or mortgage-backed securities, mutual fund, auction rate, time deposits, or commercial paper. For instance, a domestic equity mutual fund would get classified into three categories: equity, U.S. and mutual fund.

Second, and most important for our analysis, we classified each asset holding as either safe or risky. Almost all assets are clearly either in the safe category (cash, cash equivalents, U.S. Treasury securities, time deposits, money market funds) or in the risky category (mutual funds, municipal securities, corporate bonds, foreign government and agency securities). However, some asset holdings are more ambiguous in terms of their riskiness: trading securities, other investments, etc. In our classification, we operated under the assumption that a firm has no incentive to hide the fact that it is holding cash if it is indeed holding cash. As a result, if it chooses to name a portion of its holdings as “other”, we assume that it cannot be cash or cash equivalent and hence that it is risky.

The required reporting of asset levels (levels 1, 2, and 3) is not fully informative about the riskiness of the securities since it pertains to the type of input required to assess fair value. Hence, a small cap equity mutual fund would be a level 1 asset since its price is easy to obtain even though it is clearly a risky holding. However, the level breakdown can in some cases help us ascertain the appropriate risk classification: for instance, a level 3 asset does not have a clear available market price and hence is more likely to be risky.

In Table I, we report a selection of asset categories we collected in the fair value footnotes as well as how we classified each of these as either safe or risky. Panel A shows how each category falls in an asset level (level 1, 2 or 3) and panel B shows how we classified each asset. Some categories can appear in multiple levels for the same firm. Furthermore, different firms may report the same category as a different asset level. As explained above, we focus on the name of the category itself in to determine its riskiness, in some cases using the level as additional information. Next, we give a few examples to illustrate our classification process.

Apple provides a particularly clear and thorough breakdown of their financial assets in footnote 2 of their 2012 annual report (see Appendix C). Based on their balance sheet, the company holds $10,746 million in cash and cash equivalents, $18,383 million in short-term marketable securities, and $92,122 million in long-term marketable securities. The total fair value of their financial instruments therefore is $121,251 million, which is the number frequently quoted in the financial media.

The values reported in Compustat for Apple match these numbers. CH (cash) equals $10,746 million and CHE (cash and short-term investments) equals $29,129 million, which is

indeed the sum of $10,746 and $18,383. The $92,122 million in long-term investments can be found under IVAO (investment and advances – other).[7]

Even though CHE is a severely under-estimated measure of Apple's "cash", Panel A of Appendix C provides a breakdown of all $121,251 million into asset classes and level 1, 2, and 3. For instance, $3,109 million is reported as cash, which we label as safe. $2,462 million is reported under level 1 as mutual funds, which we label as risky. $20,108 million is reported under level 2 as U.S. Treasury securities, which we label as safe. The other categories classified as safe are certificates of deposit and time deposits, and commercial paper. The remaining categories are classified as risky: money market funds, U.S. agency securities, non-U.S. government securities, corporate securities, municipal securities, mortgage- and asset-backed securities.

As an example of a firm that does not have a footnote detailing the breakdown of its asset holdings, FedEx only specifies that the $4,917 million on its balance sheet is in cash and cash equivalents, which we label as safe.

Target reports $784 million on its balance sheet under cash and cash equivalents – a number that is equal to CHE in Compustat. However, in its fair value footnote, the firm only discloses that $130 million is held in short-term investments (level 1), which we classify as risky. Note that the exact nature of the difference between $784 million and $130 million ($654 million) is not specified in the footnote. If that amount is held in cash, then our cash category will be under-estimated. But since we do not make any assumption about that amount, we do not over-estimate the amount held in risky assets. In our analysis, we normalize all asset categories by total book assets (AT in Compustat), which does account for the $654 million.

[7] Compustat also reports aggregate values for the asset levels for some firms, but not all. For example, Apple's AQPL1 (assets level 1 – quoted prices) reports $3,922 million, AOL2 (assets level 2 – observable) reports $114,370 million, and AUL3 (assets level 3 – unobservable) reports $0.

In Appendix C, we also report the tables from the fair value footnotes of Carnival Corporation (CCL) and Health Management Associates (HMA). These examples demonstrate that the tables can be presented very differently across firms, with some even reporting the fair value of their liabilities (debt) in the footnote. CCL reports assets that are measured on a recurring basis in one table and assets that are not in a different table. HMA first reports an aggregate table with the level 1, 2 and 3 breakdown followed by a separate table with the asset categories and fair values.

2.4 Sample

Our sample includes all firms that have been members of the S&P 500 Index at any point between 2009, the year in which SFAS 157 became effective, and 2012, the most recent year for which complete annual reports data exists. Following the literature, we drop all financial and utility firms. We do not collect data on derivatives used for hedging purposes, pension assets, and assets held for strategic reasons (e.g. majority shareholding in a subsidiary).

We obtain monthly stock returns from CRSP and firm-level accounting data from Compustat. Table II reports summary statistics on the 1,364 firm-years in our sample. On average, the firms in our sample have a market-to-book ratio of approximately 2, foreign income that equals 4.1% of book assets, and total cash flows that equal 6.6% of book assets.

3. Risky Investment Securities

In this section, we study how much firms invest in risky securities and which firms tend to invest in risky assets. We also investigate the behavior of these asset classes and calibrate the loss that firms may have incurred during the recent global financial crisis due to the investment of their reserve assets in risky securities.

3.1 The Properties of Risky Investment Securities

Table III reports the breakdown of the fair value of firms' investment securities according to the asset labels assigned by the firms and our classification of asset risk explained in the previous section. We report the total dollar values in column 2 as well as ratios of these dollar values with respect to total book assets (AT, column 3), market value of equity (PRCC*CSHO, column 4), cash and short-term investments (CHE, column 5), and cash, short-term investments, and other investments (CHE + IVAO, column 6). Panel A reports firm-level averages and Panel B reports aggregate, sample-wide numbers. Note that the asset categories listed in Table II are not mutually exclusive since, for instance, foreign corporate bonds will be in the non-government debt category, the corporate debt category, and the foreign securities category.

Based on panels A and B, firms invest a substantial portion of their holdings in risky assets. Indeed, averaged across firms, about $1.4 billion is invested in risky assets, which represents an aggregate amount of $592 billion. Scaled by total assets or market equity value, the amount held in risky securities is 5-6% of firm value. As a fraction of the commonly used measure of cash and short-term investments (CHE), the average firm holds about 31% in risky assets. At the aggregate level, 50% of CHE is held in risky assets. Scaled by cash, short-term investments, and other investments (CHE + IVAO), corporate risky investment securities amount to approximately 20-35%.

These large estimates represent a substantial departure from a pure precautionary savings motive, which implies holding highly-liquid, cash or near-cash, risk-free or near risk-free, securities that can be used instantaneously to invest or meet obligations when external financing is not frictionless.

More granularly, firms have substantial holdings of debt securities (U.S. and foreign). About 2% of firm value is invested in government debt, almost 4% of firm value is invested in non-government debt (including agency and municipal debt), and more than 2% of firm value is invested in corporate debt. About 0.5% of firm value is invested in equity securities and another 0.4% is invested in asset-backed and mortgage-backed securities. Firms seem to be diversifying internationally, with about 0.4% of firm value invested in foreign securities, perhaps due to reserves being trapped overseas for tax reasons.

As discussed in the previous section, the separation of investment securities into the level 1, 2, or 3 asset classes does not give precise information about the riskiness of firms' holdings. Panel C of Table III shows the breakdown of the investments by asset levels. As expected, almost all equity and mutual fund holdings are in level 1 since the fair value of these funds is easily and clearly available from their market price, i.e., no additional observable or unobservable inputs are required to assess fair value. However, it is obvious that equity and mutual funds are risky assets. Thus, panel C reinforces the argument that asset levels are not sufficient statistics for the nature and risk of the investment securities. To study investment securities, one needs to collect the individual asset holdings in the footnotes of the annual reports as we do.

3.2 Who Invests in Risky Securities?

Next, we provide evidence on the firms that tend to invest in risky securities. Panels A and B of Table IV report the holdings of risky securities across the Fama-French 5-industry classification. Similar to Table III, panel A reports firm-level averages, while panel B reports aggregate numbers. The estimates in Table IV suggest that there are significant industry effects. Firms in the Technology and Health sectors invest significantly more in risky securities than do firms in the other sectors: Technology firms invest 11.7% of their total assets in risky securities and Health firms invest 6.9% of their assets in risky securities. These values are substantially higher than those of firms in other industries, which, on average, invest approximately 2-3% of their assets in risky securities. These estimates suggest that contrary to the precautionary savings motive, which implies that firms in growing, risky industries should hold cash and cash equivalents, firms in the Technology and Health industries, which are characterized by volatile cash flows and high growth opportunities, tend to invest in risky, non-cash securities.

Panel C of Table IV shows the top 20 firms that invest in risky securities based on absolute dollar amounts as well as fractions of total book assets. Based on the dollar amounts, the concentration of risky investment securities in the Technology and Health industries is clear: out of the top 20 firms, 10 firms are in the Technology sector and 5 firms are in the Health sector, with GE, Berkshire Hathaway, GM, Ford, and Coca-Cola being the exceptions.

The estimates of risky investment securities as a fraction of total assets further suggest that some firms hold an extremely large percentage of their total assets in risky securities: 70% for Verisign and Microsoft, and around 50% for Apple, Nvidia and Sandisk.

Taken together, our evidence indicates that risky investment securities are concentrated in the Technology and Health sectors. These findings seem inconsistent with the precautionary savings motives. The assets of firms in these industries are primarily intangible: human capital

and intellectual property. Pharmaceutical firms rely heavily on their drug patents and Technology firms rely heavily on their patented electronic innovations. These firms do not have significant tangible assets such as land, manufacturing plants (e.g., Apple outsources manufacturing), etc., which could be pledged as collateral. Moreover, firms in these industries operate in a volatile business environment, with high growth opportunities and many long-term R&D investments. Thus, these firms have a strong precautionary savings motive, which is inconsistent with their large investments in risky securities. By exposing themselves to covariance risk, these firms run the risk of both losing significant amount of their precautionary savings in a downturn and being unable to raise funds at exactly that time due to their lack of tangible assets that can be pledged as collateral.

In addition, it is worth noting that a significant portion of firms' investment in risky securities is concentrated in risky debt-like securities (corporate bonds, asset-backed securities, etc.). If the reason for taking risk with the firm's reserves is to hedge against growth opportunities (Carlson, Fisher, and Giammarino (2004)), then one would expect the firm to hold equity-like securities. Hence the observed holdings of firms appear inconsistent with them hedging future growth opportunities.

4. The Determinants and Implications of Risky Investment Securities

In this section, we investigate what determines firms' investment in risky securities. We test the hypothesis that risky investments are related to "excess" reserve holdings, that is, that firms with large, "excessive" reserves tend to invest more in risky securities. This hypothesis is consistent with Jensen's (1986) argument that "excess" reserves may push managers to spend corporate resources inefficiently. Harford (1999), among others, provides empirical support for this claim

by showing that large reserve balances are correlated with inefficient acquisition behavior. Related to this idea, we also examine whether investment in risky securities can be explained by large reserves that are trapped overseas for repatriation tax reasons (e.g., Foley et al. (2007)).

In addition, we test whether investment in risky securities is correlated with empirical variables that proxy for a firm's precautionary savings motive, such as cash flow volatility and investment opportunities. We do so for a number of reasons. First, the precautionary savings motive is the predominant approach to understanding corporate reserves (e.g., Opler et al. (1999)). Second, managers may use this motivation to justify to shareholders the "excessive" reserves and their investment in financial securities. Third, we argue that risky investment securities contradict the very essence of the precautionary savings motive by definition, and therefore, finding that they are correlated with firm's precautionary demand is even more puzzling and exacerbates the potential negative implications of this investment strategy.

We conclude this section with an investigation of corporate governance and managerial incentives. We consider two hypotheses. The first hypothesis is that the firm's investment in risky securities represents an agency conflict between shareholders and managers, who choose to invest in risky securities either to make their job more interesting, or to develop human capital that can be valuable elsewhere in the asset management industry (e.g., Holmstrom (1999)). The second hypothesis is that both shareholders and managers choose to speculate in the financial market to "juice" their profits, potentially at the expense of bondholders that fail to recognize this risky behavior and even long-term shareholders if the absence of precautionary savings causes positive NPV projects to be foregone and shareholders are unaware of the risky asset holdings.

4.1 Excess Reserves

We begin our analysis in this section by investigating whether firms that invest in risky securities tend to hold more reserves and/or more excess reserves. In Panel A of Table V, we report the average ratio of different classes of asset holdings over book assets across reserves quintiles, as defined by CHE in Compustat. In Panel B of Table V, we report the same ratios of different asset holdings across excess reserves quintiles, as defined by a standard empirical model of corporate cash holdings. More precisely, we estimate excess reserves as the residual from the following regression model:

$$Reserves_{it} = a_0 + \beta_1 \cdot CF_{Vol_{it}} + \beta_2 \cdot MktToBook_{it} + \beta_3 \cdot CF_{it} + \beta_4 \cdot ForeignIncome_{it} + \beta_5 \cdot Size_{it} + \delta_{FF} + \epsilon_{it} \quad (1)$$

where $Reserves_{it}$ is firm i's reported cash, cash equivalents and short-term investment holdings (Compustat variable CHE), normalized by book assets, *CF_VOL* is the 10-year rolling window volatility of cash flow/assets, *MktToBook* is the market-to-book ratio, *CF* is cash flow/assets, *ForeignIncome* is foreign income over assets, *Size* is the natural logarithm of book assets, and δ_{FF} are indicators for the 5 Fama-French industries.

The main message from panels A and B of Table V is that risky investments are largely concentrated in firms with the largest reserve *and* excess reserve holdings. Note that Panels C and D of Table V show similar results event after having excluded the cash-richest firms. Focusing on excess cash (Panel B), firms in the top quintile of excess reserves hold, on average, 14.9% of their book assets in risky securities. In contrast, firms in the second highest quintile hold 5.8% in risky securities, and firms in the lowest quintile only hold 3.4% in risky securities. These effects hold across most individual categories of risky investments. For example, firms in the highest quintile hold 11.4% of their assets in non-government debt, compared to 2.1% in the lowest quintile, respectively. Similarly, there is a ten-fold increase in asset and mortgage-backed

securities, a 14-fold increase in foreign securities, and a seven-fold increase in mutual fund holdings from the lowest excess reserves quintile to the highest quintile.

Panels A and B of Table V also show that there is a non-monotonic relationship between risky investment securities and excess reserve holdings in the bottom excess reserve quintiles. Firms in the lowest quintile actually exhibit larger risky security holdings relative to firms in the second quintile. This increase may be for risk shifting reasons (or gambling for resurrection) when firms experience difficulties.

Taken together, these results indicate a nonlinear relation between excess reserve holdings and risky investment securities. Firms with the largest excess reserve holdings invest 5-10 times more in risky securities than firms with the smallest excess reserve holdings. There is also some evidence suggesting that firms with very little excess reserve holdings, which might be distressed, also tend to invest more in risky securities, potentially in an attempt to gamble for resurrection. However, investing mainly in risky debt-like securities does not seem to be the optimal way to gamble for resurrection since the payoffs of such securities lack convexity.

Panel E of Table V reports the firms' reserve holdings by level (as defined by SFAS 157 and reported by the firms), which is a proxy of the liquidity of the asset (presence/absence of a market price) as well as by level intersected with our risky classification. As before, these breakdowns are reported across cash or excess cash quintiles. We see that the firms with the most (excess) cash invest their reserves much more in illiquid as well as risky and illiquid assets compared to the firms with the least amount of (excess) cash. These result are supportive of the speculative motive to take risk with one's reserves. Firms that have the most reserves (probably more than they need in the short- to medium-term) take more risk and in particular more risk in illiquid securities.

While the positive relation between large excess reserve balances and investment in risky securities may be interpreted as an inefficient, agency-driven investment of the firm's reserves, it is worth noting that the investment of corporate assets in risky securities via the financial markets may be a less destructive form of agency costs than empire building by CEOs through acquisitions or capital expenditures (e.g., Harford (1999)). Given the presence of excess cash in the firm, shareholders and the board of directors would rather see management invest this excess liquidity in efficient financial markets at fair prices than attempt to spend it on potentially highly negative NPV projects. Investment in risky asset holdings could therefore be viewed as a lesser evil in terms of agency problems within the firm. Moreover allowing management to invest "excess" liquidity in risky financial assets with impunity may be an efficient outcome if shareholders and boards of directors cannot distinguish ex-ante good real asset purchases from poor real asset purchases.

4.2 The Determinants of Risky Securities

In this subsection, we examine the potential determinants of the holdings of risky securities on corporate balance sheets, focusing on the firm's demand for precautionary savings and on the repatriation tax-based explanation of large cash balances trapped abroad. Note that all results below hold if we drop the top 10 firms, the top 20 firms, or the top decile of firms in terms of cash (CHE) holdings, i.e., our results are not driven solely by Apple, Microsoft, and other extremely cash-rich firms.

In Table VI, we regress firm-level investments in risky securities (normalized by total assets) on the firm's cash flow, cash flow volatility, market-to-book, foreign income, size, and industry dummies. We find that that the firm's risky investments are significantly positively

related to its cash flow volatility and market-to-book ratio. These results suggest that firms with a higher demand for precautionary savings, with more volatile cash flow and better investment opportunities, tend to invest a larger fraction of their assets in risky securities. While previous studies show that consistent with the precautionary savings motive, a firm's cash holdings increase with cash flow volatility and investment opportunities, our findings indicate that risky investments also go up with these indicators, suggesting that the precautionary savings motive does not fully explain the firm's behavior.

We also find that the firm's investment in risky securities increases with its foreign income, suggesting that risky investments are related to the cash balances trapped abroad due to the repatriation tax. While firms cannot distribute or spend this cash, they are able to invest it in the financial market. Our results that they invest some of it in risky securities highlights a backdoor through which the money may flow back into the U.S.; indeed, our analysis in Table III reveals that the firms' investment securities are mostly domestic. Thus, the seemingly-trapped cash is invested in the U.S. and therefore, from an economy-wide perspective, this cash is *not* trapped abroad.

We conclude this subsection with an investigation of corporate governance and managerial incentives. To proxy for agency conflicts between shareholders and managers, we use the G-index (Gompers et al. (2007) and E-index (Bebchuk et al. (2009)) of minority shareholder rights. To measure the incentive alignment between shareholders and managers and their motivation to speculate, we use the fraction of stock-based and option-based compensation of the top managers in the firm, as well as a proxy for manager overconfidence. Table VII reports the regression estimates explaining the firm's investment in risky securities using the above proxies, as well as the same set of firm-level determinants used in Table VI.

In panel A, we find little evidence that the G- and E-indices, which proxy for the severity of the agency conflict between managers and shareholders, are correlated with risky investments. While this non-result for the G- and E-indices may at first seem surprising, we hypothesize that such behavior may be viewed by shareholders and directors as a lesser agency cost than reckless spending on large and permanent negative NPV mergers and acquisitions, for instance. If markets are at least fairly efficient, then treasury offices are buying these risky securities at fair prices and thereby earning the securities' expected rates of return. While these actions do expose the firm to potentially large covariance and illiquidity risks, it may be a less inefficient way of wasting the firm's resources.

In panel B, consistent with the speculative motive hypothesis, however, we do find that managerial overconfidence as well as stock- and option-based compensation are associated with investment in risky securities. The magnitude of these effects is nontrivial and persists across various measures of risky securities: an increase of one standard deviation in managers' stock-based (option-based) compensation corresponds to an increase of 1.7 (2.0) percentage points in risky security holdings as a fraction of total assets. These findings support the hypothesis that shareholders and managers attempt to increase the value of their equity stake by speculating or reaching for yield, possibly at the expense of the firm's bondholders.

4.3 The Implications of Risky Securities for Systematic Risk and Mispricing

In a final step, we examine the implications of the firm's speculative behavior for risk and performance. In columns (1), (3) and (5) of Table VIII, we estimate the link between the firm's

investment in risky securities and the firm's systematic risk, as measured by its market equity beta estimated from the CAPM (column 1), Fama-French three-factor (column 3), and Fama-French five-factor (column 5) pricing models. The regression equation for the equity betas is obtained by equating the following two asset beta equations:

$$\beta_A = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D \quad \text{and} \quad \beta_A = \frac{R}{R+F}\beta_R + \frac{F}{R+F}\beta_F \tag{2}$$

where A stands for Asset, E stands for Equity, D stands for Debt, R stands for Risky, and F stands for Firm. The second equation splits the firm's assets between the risky financial/investment assets (R), which is the focus of this paper, and the rest of the rest of the firm's (productive) assets (F), which are not necessarily safe. By equating the above equations and solving for the beta of equity, we can write:

$$\beta_E = \frac{R}{E}\beta_R + \frac{A-R}{E}\beta_F - \frac{D}{E}\beta_D \tag{3}$$

which can allow us to estimate the marginal beta of the risky assets with respect to the firm's other assets. Note that the three terms on the right-hand-side of the above equation are perfectly collinear. As a result, we drop the middle term and regress the firm's equity beta (estimated via the CAPM or the Fama-French three- or five-factor model using five years of historical monthly returns) on the ratio of risky assets to equity and on the ratio of debt to equity. We can then use the two estimated coefficients (assuming that the intercept should be zero, per the above equation) to calculate the above (true) coefficients on all three terms.

At the same time, this regression allows us to test for a link between the firm's cost of capital, as partially proxied by its equity beta, and the propensity of managers to take risk with the firm's reserve assets. The reaching for yield hypothesis suggests that managers take risk with

their reserve assets in order to lower their cost of debt, which is equivalent to the misconception that holding cash that earns 1% is a drag on the firm's cost of capital.

The results in Table VIII (columns (1)) indicate that the average beta on the firms' productive assets (excluding the risky assets) is 1.014, which is reasonable given our S&P 500 sample. The estimated average beta on the firms' risky assets is 0.482 + 1.014 = 1.496, which is extremely high given that most of the risk is taken in fixed income securities. Lastly, the estimated average beta on the firms' debt is –(0.041 – 1.014) = 0.973, which is implausibly high. The above derivation and econometric setup assumes that all firms have the same risks, which is clearly incorrect. So the fact that we obtain implausible coefficients for the risky assets beta and debt beta tells us that the orthogonality assumption between the independent variables and the residuals is violated, i.e., we need firm-specific treatment effects for each right-hand-side variable. One likely reason for the failure of the above "average firm" model is that the riskiness of each firm's assets is correlated with how they choose to invest their reserves in risky assets. We investigate this possibility in panel B.

In panel B, we present the results of the second stage of a Heckman self-selection model. The first stage is column (6) from panel A of Table VI augmented with the manager's stock and option compensation as right-hand-side variables, consistent with Table VII's findings. The coefficient on the inverse Mills ratio is positive and significant in the main CAPM beta specification (column (1)), confirming the concern that the riskiness of the underlying assets is correlated with choices the managers make about the risk of their reserve asset investments. Nonetheless, we still obtain estimates of the risky asset beta of approximately 1.3.

In columns (2), (4) and (6) of Table VIII, we analyze the link between the firms' investment in risky securities and the firms' risk-adjusted returns, as measured by Jensen's alpha,

a measure typically used to assess the performance of investment funds. The significant negative coefficients on alpha suggests that corporate treasuries do not seem to earn positive abnormal returns. Note that, in columns (7) and (8) of Table VIII, we document a significant positive correlation between the firms' investments in risky securities and their stocks' total and (CAPM) idiosyncratic volatilities.

An important caveat in interpreting these results is that the firm's shareholders may already price the firm's reserve assets investment strategy, in which case a negative alpha does not necessarily imply that investing in risky securities yields a negative risk-adjusted performance. Rather, it suggests that investors are not surprised by the potential (positive or negative) risk-adjusted abnormal returns generated by the firms' active management strategies of their reserve assets.

One possible interpretation of these results is that managers suffer from the flipside of the fallacy that debt is a cheap source of capital. More precisely, we suspect that managers view cash on their balance sheet in part as precautionary savings and in part as constraining their ability to earn their cost of capital since it is earning a near-zero rate of return. If managers discount cash at the firm's cost of capital, then holding cash appears to have a highly negative NPV. There is also much anecdotal evidence reported in the financial media that large shareholders are asking management to put the "cash to work."[8] If managers use an incorrect discount rate to discount their cash holdings or seek to appease activist shareholders, they might invest in risky securities despite the inherent contradiction between risky investments and the precautionary savings motive.

[8] For example, hedge fund manager David Einhorn engaged in a proxy fight with Apple, Inc. in 2013 over its cash policy.

5. Conclusion

This paper uses the introduction of a new accounting standard to offer some of the first evidence on the investment securities that make up corporate reserve assets. We estimate that firms hold an average of 31% (and a total of 50%) of their reserves in risky securities such as corporate and foreign debt, and equity securities, whose payoffs co-vary with the firm's operating cash flows. These estimates question our standard measures of corporate cash reserves, which lump together cash or near-cash securities and risky assets, and are inconsistent with the primary use of cash for precautionary savings. This inconsistency is further emphasized by our findings that risky investment securities are held by firms with high cash flow risk and growth opportunities that operate in risky and growing industries, whose demand for precautionary savings is arguably high.

We also find that investment in risky securities is highly concentrated in firms with excess liquidity, whose reserves may be "trapped" due to repatriation tax considerations. These findings suggest a form of an agency problem exacerbated by excess liquidity, which may push managers to pursue private benefits at the expense of shareholders, or push both shareholders and managers to speculate in an attempt to reach for yield, possibly at the expense of bondholders. While we find little evidence pointing to a shareholder governance failure, we find a positive relation between investment in risky securities and executive compensation tied to the firm's stock and stock options as well as managerial overconfidence.

In a final step, we examine the links between the firm's risky investment securities and the firm's performance and risk. We find that this speculating behavior is correlated with the firm's systematic risk (beta) and is associated with a lower risk-adjusted performance (alpha). Furthermore, we find that firms with riskier assets are choosing to increase the risk of their reserve portfolios, which is consistent with the reaching for yield explanation.

References

Acharya, V., H. Almeida, and M. Campello, 2013, "Aggregate Risk and the Choice between Cash and Lines of Credit," *Journal of Finance,* forthcoming.

Almeida, H., M. Campello, I. Cunha, and M. Weisbach, 2013, "Corporate Liquidity Management: A Conceptual Framework and Survey," Working paper: University of Illinois.

Azar, J., J.-F. Kagy, and M. C. Schmalz, 2014, "Can changes in the cost of cash resolve the corporate cash puzzle?," Working paper: University of Michigan.

Bates, T., K. Kahle, and R. Stulz, 2009, "Why Do U.S. Firms Hold so Much More Cash than They Used to?" *Journal of Finance,* Vol. 64, pp. 1985-2021**.**

Baumol, W. J., 1952, "The Transactions Demand for Cash: An Inventory Theoretic Approach, *Quarterly Journal of Economics,* Vol. 66, pp. 545–556.

Bebchuk, L., A. Cohen, and A. Ferrell, 2009, "What Matters in Corporate Governance?" *Review of Financial Studies,* Vol. 22, pp. 783-827.

Brown, C., 2012, "Corporate Market Investments: An Examination of the Cash Storage View", Working paper: National University of Singapore.

Brown, C., 2012, "Corporate Market Investments: Risk, Returns and Governance", Working paper: National University of Singapore.

Campello, M., E. Giambona, J. R. Graham, and C. R. Harvey, 2011, "Liquidity Management and Corporate Investment During a Financial Crisis," *Review of Financial Studies,* Vol. 24, pp. 1944-1979.

Campello, M., J. R. Graham, and C. R. Harvey, 2010, "The Real Effects of Financial Constraints: Evidence from a Financial Crisis," *Journal of Financial Economics,* Vol. 97, pp. 470–487.

Cardella, L., D. Fairhurst, and S. Klasa, 2014, "What determines the composition of a firm's total cash reserves?," Working paper: Texas Tech University.

Carlson, M., A. Fisher, and R. Giammarino, 2004, "Corporate Investment and Asset Price Dynamics: Implications for the Cross-Section of Returns," *Journal of Finance,* Vol. 59, pp. 2577-2603.

Disatnik, D., R. Duchin, and B. Schmidt, 2013, "Cash Flow Hedging and Liquidity Choices," *Review of Finance,* forthcoming.

Dittmar, A. and J. Mahrt-Smith, 2007, "Corporate Governance and the Value of Cash Holdings," *Journal of Financial Economics*, Vol. 83, pp. 599-634.

Duchin, R., 2010, "Cash Holdings and Corporate Diversification," *Journal of Finance, Vol.* 65, pp. 955–992.

Duchin, R., O. Ozbas, and B. A. Sensoy, 2010, "Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis," *Journal of Financial Economics,* Vol. 97, pp. 418–435.

Fama, E., 1980, "Agency Problems and the Theory of the Firm, *Journal of Political Economy,* Vol. 88, pp. 288–307.

Foley, F., J. Hartzell, S. Titman, and G. Twite, 2007, "Why Do Firms Hold So Much Cash? A Tax-Based Explanation," *Journal of Financial Economics*, Vol. 86, pp. 579–607.

Gompers, P., J. Ishii, and A. Metrick, 2003, "Corporate Governance and Equity Prices," *Quarterly Journal of Economics*, Vol. 118, pp. 107–155.

Harford, J., 1999, "Corporate Cash Reserves and Acquisitions," *Journal of Finance,* Vol. 54, pp. 1969–1997.

Harford, J., S. Mansi and W. Maxwell, 2008, "Corporate Governance and Firm Cash Holdings," *Journal of Financial Economics*, Vol. 87, pp. 535-555.

Holmstrom, B., 1999, "Managerial Incentive Problems: A Dynamic Perspective," *The Review of Economic Studies*, Vol. 66, pp. 169-182.

Jensen, M., 1986, "Agency Costs of the Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review,* Vol. 76, pp. 323–329.

Jensen, M. and W. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, Vol. 3, pp. 305–360.

Keynes, J.M., 1936, "The General Theory of Employment, Interest, and Money," Harcourt Brace, London.

Kim, C., D. Mauer, and A. Sherman, 1998, "The Determinants of Corporate Liquidity: Theory and Evidence," *Journal of Financial and Quantitative Analysis,* Vol. 33, pp.335–359.

Krueger, P., A. Landier, and D. Thesmar, 2011, "The WACC fallacy: The real effects of using a unique discount rate," Working paper: University of Geneva.

Lins, K., H. Servaes, and P. Tufano, 2010, "What Drives Corporate Liquidity? An International Survey of Cash Holdings and Lines of Credit," *Journal of Financial Economics,* Vol. 98, pp.160–76.

Milbradt, K., 2012, "Level 3 Assets: Booking Profits and Concealing Losses," *Review of Financial Studies,* Vol. 25, pp. 55-95.

Miller, M. and D. Orr, 1966, "A Model of the Demand for Money by Firms," *Quarterly Journal of Economics,* Vol. 80, pp. 413–435.

Opler, T., L. Pinkowitz, R. Stulz and R. Williamson, 1999, "The Determinants and Implications of Cash Holdings," *Journal of Financial Economics,* Vol. 52, pp. 3-46.

Sufi, A., 2009, "Bank Lines of Credit in Corporate Finance: An Empirical Analysis," *Review of Financial Studies,* Vol. 22, pp. 1057–1088.

Appendix A: Variable Definitions
Note: Compustat data items are given in parentheses

Cash flow is measured as earnings (ebitda) less interest and taxes (txt+xint), divided by total assets (at)

Cash flow volatility is the 10-year rolling window volatility of cash flow

E-Index is an alternative antitakeover index to the G-Index, which is based on a subsample of relevant variables shown by Bebchuk, Cohen, and Ferrell (2009) to impact shareholder value

Excess cash is the residual from regressing the firm's cash holdings on cash flow volatility, cash flow, market to book, foreign income, size, and Fama-French 5 industry dummies.

Foreign income is pretax foreign income (pifo), divided by total assets (at)

G-Index is the Gompers, Ishii, and Metrick (2003) index of shareholder rights, backfilled with the most recent observation to maximize the number of observations

Market to book is the market value of assets, defined as total assets (at) minus book equity (ceq) plus market value of equity (csho*prcc), divided by total assets (at)

One factor beta = market beta computed from monthly returns, with the CRSP value-weighted index used as the market proxy, assuming the CAPM.

One-factor alpha = annualized alpha estimated from a regression of monthly excess stock returns on the monthly market excess return estimated over the trailing one year.

Option compensation is the ratio of the value of the top managers' stock options to their total compensation

Size is the natural logarithm of the book value of total assets (at)

Stock compensation is the ratio of the value of the top managers' insider holdings of common stocks to their total compensation

Three factor beta = market beta computed from monthly returns, with the CRSP value-weighted index used as the market proxy, assuming the Fama-French three factor model.

Three-factor alpha = annualized alpha estimated from a regression of monthly excess stock returns on the monthly market excess return, the HML factor, and the SMB factor estimated over the trailing one year.

Appendix B: SFAS No. 157

The Statement of Financial Accounting Standards No. 157 entitled "Fair Value Measurements" requires corporations to disclose the fair value of all the financial assets held on their balance sheet. More precisely, SFAS No. 157 has three main objectives: defining fair value, establishing a framework for measuring fair value, and expanding disclosure requirements about fair value measurements, all within the generally accepted accounting principles (GAAP). As stated, "fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date." If a market price for an asset is not easily available in the market, then the fair value must be estimated and the valuation assumptions must be disclosed in a transparent way.

Based on the availability and reliability of a market price, and the potential assumptions and inputs needed to estimate a price, every asset falls into an asset level hierarchy that is divided into three levels (1, 2, and 3). A level 1 asset is an asset for which a reliable market price is easily available and no other inputs are required to assess fair value. Two examples are cash and large-cap U.S. equity mutual funds. Such assets are typically highly liquid instruments traded on an exchange. A level 2 asset is an asset for which the assessment of fair value requires another observable input besides an easily available price. An example is an interest rate swap based on a specific bank's prime rate. A level 3 asset is an asset for which unobservable inputs are required in order to assess fair value. If there is no market price for a given asset-backed security, for instance, then a valuation model must be used, requiring a number of assumptions. These inputs must be disclosed along with the estimated asset value.

SFAS No. 157 was first issued in September 2006 and was first implemented for financial statements issued for fiscal years starting after November 15, 2007. After a year of

transition, it became fully effective for fiscal year 2009. While it is obviously not the first statement about fair value measurements (others are SFAS No. 107, 133, and 155), SFAS No. 157 greatly increases the disclosure requirements and puts a lot of emphasis on market-specific measurement and not firm-specific measurement. This therefore forces corporations to disclose a clear breakdown of their assets based on the assumptions they make when assessing fair value.

Appendix C: Examples of Tables in the Fair Value Footnotes

Panel A: Apple (AAPL)

Apple reports one of the most detailed and clear breakdown of investment securities, all in one concise table.

	2012						
	Adjusted Cost	Unrealized Gains	Unrealized Losses	Fair Value	Cash and Cash Equivalents	Short-Term Marketable Securities	Long-Term Marketable Securities
Cash	$ 3,109	$ 0	$ 0	$ 3,109	$ 3,109	$ 0	$ 0
Level 1:							
Money market funds	1,460	0	0	1,460	1,460	0	0
Mutual funds	2,385	79	(2)	2,462	0	2,462	0
Subtotal	3,845	79	(2)	3,922	1,460	2,462	0
Level 2:							
U.S. Treasury securities	20,088	21	(1)	20,108	2,608	3,525	13,975
U.S. agency securities	19,540	58	(1)	19,597	1,460	1,884	16,253
Non-U.S. government securities	5,483	183	(2)	5,664	84	1,034	4,546
Certificates of deposit and time deposits	2,189	2	0	2,191	1,106	202	883
Commercial paper	2,112	0	0	2,112	909	1,203	0
Corporate securities	46,261	568	(8)	46,821	10	7,455	39,356
Municipal securities	5,645	74	0	5,719	0	618	5,101
Mortgage- and asset-backed securities	11,948	66	(6)	12,008	0	0	12,008
Subtotal	113,266	972	(18)	114,220	6,177	15,921	92,122
Total	$120,220	$1,051	$ (20)	$121,251	$10,746	$18,383	$92,122

Panel B: Carnival Corporation (CCL)

Carnival presents one table containing their assets and liabilities that are not measured on a recurring basis as well as second table containing their assets and liabilities that are measured on a recurring basis.

	November 30, 2012			November 30, 2011		
	Carrying Value	Fair Value		Carrying Value	Fair Value	
		Level 1	Level 2		Level 1	Level 2
Assets						
Cash and cash equivalents (a)	$ 269	$269	$ -	$ 358	$358	$ -
Long-term other assets (b)	39	1	36	42	2	39
Total	$ 308	$270	$ 36	$ 400	$360	$ 39
Liabilities						
Fixed rate debt (c)	$5,195	$ -	$5,825	$6,251	$ -	$6,715
Floating rate debt (c)	3,707	-	3,706	3,102	-	3,057
Total	$8,902	$ -	$9,531	$9,353	$ -	$9,772

	November 30, 2012		November 30, 2011	
	Level 1	Level 2	Level 1	Level 2
Assets				
Cash equivalents (a)	$196	$ -	$ 92	$ -
Restricted cash (b)	28	-	11	-
Marketable securities held in rabbi trusts (c)	104	16	98	18
Derivative financial instruments (d)	-	48	-	6
Total	$328	$64	$201	$24
Liabilities				
Derivative financial instruments (d)	$ -	$43	$ -	$12
Total	$ -	$43	$ -	$12

Panel C: Health Management Associates (HMA)

HMA first presents a table with the level 1, 2 and 3 breakdown and then presents a second table with the asset breakdown.

	Level 1	Level 2	Level 3	Totals
Available-for-sale securities, including those in restricted funds	$ 226,553	$ 46,610	$ -	$ 273,163
Interest rate swap contract	$ -	$ (93,045)	$ -	$ (93,045)

	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Values
As of December 31, 2012:				
Debt securities and debt-based mutual funds				
Government	$ 120,415	$ 692	$ (321)	$ 120,786
Corporate	85,843	3,271	(10)	89,104
Equity securities and equity-based mutual funds				
Domestic	37,825	4,307	(234)	41,898
International	18,005	1,766	(219)	19,552
Commodity-based fund	1,823	-	-	1,823
Totals	$ 263,911	$ 10,036	$ (784)	$ 273,163

TABLE I

Classification of Corporate Security Investments

This table summarizes how firms classify their investment holdings into level 1, 2, or 3 following the guidelines in SFAS No. 157, as well as how we classify these holdings as safe or risky. Panel A shows a sample of the broad asset categories found in the footnotes of annual reports that disclose and explain the fair value of the assets held by firms. Panel B shows our classification of this sample of assets as safe or risky.

.

Panel A: Asset Classification into Levels 1, 2, or 3

Level 1	Level 2	Level 3
Cash	U.S. Treasury Securities	Venture capital investments
Cash equivalents	Commercial paper	Corporate bonds – non U.S.
Mutual funds	Corporate bonds	Available-for-sale securities
U.S. Treasury securities	Time deposits	Closed-end municipal bonds funds
Equity securities	Corporate bonds – non U.S.	Mortgage-backed securities
Corporate bonds – non U.S.	Asset-backed securities	
Available-for-sale securities	Available-for-sale securities	
Bank deposits	U.S. Agency securities	
Money market funds	Government bonds – non U.S.	

Panel B: Asset Classification into Risky and Safe Assets

Safe Assets	Risky Assets
Cash	Mutual funds
Cash equivalents	Venture capital investments
U.S. Treasury securities	Equity securities
Commercial paper	Corporate bonds
Time deposits	Corporate bonds – non U.S.
Bank deposits	Asset-backed securities
Money market funds	Available-for-sale securities
	Closed-end municipal bond funds
	Mortgage-backed securities
	U.S. Agency securities
	Government bonds – non U.S.

TABLE II

Summary Statistics

This table reports summary statistics for the sample, which comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings. *Cash flow* is measured as earnings less interest and taxes, divided by total assets. *Cash flow volatility* is the 10-year rolling window volatility of cash flow. *Market to book* is the market value of assets, defined as total assets minus book equity plus market value of equity, divided by total assets. *Foreign income* is pretax foreign income, divided by total assets. *Size* is the natural logarithm of the book value of total assets. All variable definitions are given in Appendix A.

Variable	Mean	25th percentile	Median	75th percentile	Standard deviation
Cash flow	0.066	0.033	0.069	0.109	0.085
Cash flow volatility	0.053	0.018	0.032	0.069	0.057
Market-to-book	1.979	1.267	1.629	2.289	1.127
Foreign income	0.041	0.000	0.024	0.063	0.048
Size	9.299	8.443	9.160	10.026	1.188

TABLE III

Breakdown of Security Investments

This table reports the breakdown of the fair value of firms' investment securities. The values reported in Panel A are firm-level averages. Panel B reports aggregate (sample-wide) values as of 2012, the most recent year in our sample. Panel C reports the fraction of security investments classified as level 1, level 2, and level 3 assets. The sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings. All variable definitions are given in Appendix A.

Panel A: Firm-level averages

Security	Amount ($M)	Fraction of book assets	Fraction of MV of equity	Fraction of cash	Fraction of cash and other investments
Equity	108.01	0.41%	0.56%	5.43%	2.69%
Non-government debt	872.45	4.30%	3.18%	18.69%	12.88%
Government debt	599.04	1.91%	1.48%	7.19%	5.75%
Other	204.57	0.67%	0.67%	5.68%	4.19%
Asset & Mortgage backed securities	113.23	0.42%	0.33%	1.68%	1.15%
Corporate debt	483.30	2.29%	1.68%	8.69%	6.57%
Foreign securities	137.59	0.38%	0.38%	1.55%	1.22%
Mutual funds	35.33	0.17%	0.12%	0.91%	0.75%
Cash and cash equivalents	709.73	6.08%	5.23%	34.00%	29.35%
Risky securities	1,407.24	5.88%	4.71%	31.10%	20.65%

Panel B: Aggregate analysis

Security	Amount ($M)	Fraction of book assets	Fraction of MV of equity	Fraction of cash	Fraction of cash and other investments
Equity	39,960.86	0.44%	0.44%	3.36%	2.32%
Non-government debt	350,416.60	3.90%	3.84%	29.42%	20.35%
Government debt	272,894.20	3.03%	2.99%	22.91%	15.85%
Other	81,387.30	0.90%	0.89%	6.83%	4.73%
Asset & Mortgage backed securities	57,524.31	0.64%	0.63%	4.83%	3.34%
Corporate debt	200,094.00	2.22%	2.19%	16.80%	11.62%
Foreign securities	75,107.25	0.83%	0.82%	6.31%	4.36%
Mutual funds	18,885.97	0.21%	0.21%	1.59%	1.10%
Cash and cash equivalents	249,745.70	2.78%	2.74%	20.97%	14.50%
Risky securities	592,282.50	6.58%	6.49%	49.73%	34.40%

Panel C: Asset levels

Security	Level 1	Level 2	Level 3
Equity	84.57%	9.77%	5.66%
Non-government debt	11.71%	70.77%	17.52%
Government debt	48.19%	50.72%	1.08%
Other	66.50%	24.93%	8.57%
Asset & Mortgage backed securities	3.31%	84.51%	12.18%
Corporate debt	12.01%	86.20%	1.79%
Foreign securities	21.82%	76.28%	1.90%
Mutual funds	80.75%	16.08%	3.17%
Cash and cash equivalents	81.04%	18.94%	0.02%
Risky securities	44.41%	43.67%	11.92%

TABLE IV

Who Holds Risky Securities?

Panels A and B report firms' holdings of risky securities by Fama-French industries. The values reported in Panel A are firm-level averages. Panel B reports aggregate (sample-wide) values as of 2012, the most recent year in our sample. Panel C reports the top 20 firms on risky securities as of 2012. In panel B, the reported values are based on average annual dollars amounts (Columns 1-2) and average fractions of total book assets (Columns 3-4). The sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings. All variable definitions are given in Appendix A.

Panel A: Industry analysis (firm-level averages)

Fama-French Industry	Amount ($M)	Fraction of book assets	Fraction of MV of equity	Fraction of cash	Fraction of cash and other investments
Consumer	611.09	2.83%	3.26%	26.94%	14.11%
Manufacturing	263.76	2.05%	2.17%	19.07%	13.10%
Hi-tech	2,316.12	11.71%	7.80%	41.44%	31.27%
Health	2,039.95	6.90%	4.26%	40.76%	25.60%
Other	1,924.44	2.61%	4.45%	24.97%	14.67%

Panel B: Industry analysis (aggregate analysis) as of 2012

Fama-French Industry	Amount ($M)	Fraction of book assets	Fraction of MV of equity	Fraction of cash	Fraction of cash and other investments
Consumer	56,007.18	3.52%	3.19%	30.29%	26.33%
Manufacturing	22,397.57	1.17%	1.34%	14.50%	11.52%
Hi-tech	334,403.50	11.96%	9.65%	68.66%	48.87%
Health	90,778.65	9.60%	7.11%	54.64%	43.74%
Other	88,695.60	5.08%	9.31%	44.68%	20.97%

Panel C: Top 20 firms on risky securities as of 2012

Rank	Risky securities (millions of dollars)		Risky securities (over total assets)	
	Name	Amount	Name	Fraction
1	APPLE INC	92,271	VERISIGN INC	70.58%
2	MICROSOFT CORP	83,730	MICROSOFT CORP	69.04%
3	GENERAL ELECTRIC CO	44,945	ANALOG DEVICES	66.15%
4	BERKSHIRE HATHAWAY	32,291	INTUITIVE SURGICAL INC	56.30%
5	PFIZER INC	30,553	LINEAR TECHNOLOGY CORP	54.24%
6	QUALCOMM INC	23,227	QUALCOMM INC	54.00%
7	GOOGLE INC	21,959	XILINX INC	53.97%
8	GENERAL MOTORS CO	18,056	APPLE INC	52.41%
9	FORD MOTOR CO	16,517	F5 NETWORKS INC	51.03%
10	AMGEN INC	15,637	NVIDIA CORP	48.37%
11	CISCO SYSTEMS INC	14,676	SANDISK CORP	47.57%
12	MEDTRONIC INC	10,499	LEUCADIA NATIONAL CORP	47.42%
13	MERCK & CO	8,052	QLOGIC CORP	43.62%
14	LILLY (ELI) & CO	7,746	KLA-TENCOR CORP	36.05%
15	INTEL CORP	6,939	GARMIN LTD	34.06%
16	EMC CORP/MA	6,642	MICROCHIP TECHNOLOGY INC	33.95%
17	ORACLE CORP	4,935	AKAMAI TECHNOLOGIES INC	33.94%
18	SANDISK CORP	4,918	WATERS CORP	33.39%
19	COCA-COLA CO	4,859	TELLABS INC	33.18%
20	YAHOO INC	4,579	NETAPP INC	32.12%

TABLE V

Security Investments and Cash or Excess Cash

This table reports the average ratio of investment securities to book assets for the firms in our sample, sorted into quintiles on their cash (Panel A) and excess cash (Panel B) holdings. Excess cash is estimated from a regression of a firm's cash holdings as reported in Compustat, and defined as cash and short term investments divided by book assets, on the following set of explanatory variables: cash flow volatility, the market-to-book ratio, cash flow over assets, size, and year and industry fixed effects. Panels C and D report the same estimates for the subsample of firms that excludes the cash-richest firms, defined as the ten largest firms each year in terms of their total cash reserves and other investments. The baseline sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings. All variable definitions are given in Appendix A.

Panel A: Cash

	Cash quintiles				
Security	Low	2	3	4	High
Equity	0.48%	0.43%	0.33%	0.27%	0.53%
Non-government debt	0.33%	0.55%	1.75%	4.34%	14.42%
Government debt	0.10%	0.21%	0.71%	2.09%	6.37%
Other	0.28%	0.30%	0.46%	0.71%	1.58%
Asset & Mortgage backed securities	0.01%	0.08%	0.18%	0.32%	1.49%
Corporate debt	0.08%	0.27%	0.89%	2.32%	7.83%
Foreign securities	0.01%	0.04%	0.18%	0.50%	1.16%
Mutual funds	0.03%	0.07%	0.07%	0.07%	0.62%
Cash and cash equivalents	0.74%	2.44%	4.12%	8.31%	14.66%
Risky securities	1.10%	1.34%	2.55%	6.02%	18.27%

Panel B: Excess Cash

	Excess cash quintiles				
Security	Low	2	3	4	High
Equity	0.61%	0.26%	0.33%	0.36%	0.37%
Non-government debt	2.13%	1.61%	2.44%	4.52%	11.37%
Government debt	0.43%	0.88%	1.11%	1.13%	6.31%
Other	0.60%	0.47%	0.33%	0.99%	1.13%
Asset & Mortgage backed securities	0.13%	0.14%	0.15%	0.48%	1.27%
Corporate debt	1.06%	1.00%	1.26%	2.09%	6.87%
Foreign securities	0.09%	0.06%	0.13%	0.36%	1.38%
Mutual funds	0.07%	0.06%	0.07%	0.20%	0.53%
Cash and cash equivalents	2.60%	2.89%	4.22%	6.55%	12.53%
Risky securities	3.35%	2.69%	3.47%	5.76%	14.91%

Panel C: Cash – Excluding the Cash-Richest Firms

	Cash quintiles				
Security	Low	2	3	4	High
Equity	0.49%	0.38%	0.34%	0.32%	0.35%
Non-government debt	0.34%	0.52%	1.44%	3.78%	13.87%
Government debt	0.10%	0.20%	0.60%	1.79%	5.20%
Other	0.28%	0.29%	0.35%	0.52%	1.44%
Asset & Mortgage backed securities	0.01%	0.07%	0.15%	0.25%	1.42%
Corporate debt	0.08%	0.25%	0.76%	1.95%	7.65%
Foreign securities	0.02%	0.03%	0.11%	0.40%	1.13%
Mutual funds	0.03%	0.07%	0.07%	0.07%	0.51%
Cash and cash equivalents	0.71%	2.41%	4.15%	8.15%	15.09%
Risky securities	1.12%	1.26%	2.06%	5.23%	17.09%

Panel D: Excess Cash – Excluding the Cash-Richest Firms

	Excess cash quintiles				
Security	Low	2	3	4	High
Equity	0.62%	0.27%	0.30%	0.27%	0.29%
Non-government debt	1.80%	1.83%	2.37%	4.00%	10.66%
Government debt	0.31%	0.75%	1.17%	1.03%	4.77%
Other	0.46%	0.30%	0.36%	0.87%	1.10%
Asset & Mortgage backed securities	0.10%	0.12%	0.17%	0.50%	1.10%
Corporate debt	0.97%	1.12%	1.17%	1.72%	6.59%
Foreign securities	0.07%	0.05%	0.12%	0.34%	1.19%
Mutual funds	0.06%	0.07%	0.07%	0.15%	0.43%
Cash and cash equivalents	2.34%	3.21%	4.09%	6.61%	12.87%
Risky securities	2.84%	2.65%	3.51%	5.14%	13.44%

Panel E: Liquidity and Cash or Excess Cash

	Quintiles				
Liquidity	Low	2	3	4	High
Cash quintiles					
Liquid (level 1)	68.24%	73.10%	68.52%	60.76%	43.33%
Illiquid (levels 2-3)	31.76%	26.90%	31.48%	39.24%	56.67%
Risky & Liquid (level 1)	60.88%	63.99%	50.56%	36.63%	17.82%
Risky & Illiquid (levels 2-3)	39.12%	36.01%	49.45%	63.37%	82.18%
Excess cash quintiles					
Liquid (level 1)	70.19%	69.04%	65.90%	56.50%	45.98%
Illiquid (levels 2-3)	29.81%	30.96%	34.10%	43.50%	54.02%
Risky & Liquid (level 1)	61.89%	49.56%	49.61%	41.09%	21.26%
Risky & Illiquid (levels 2-3)	38.11%	50.44%	50.39%	58.91%	78.74%

TABLE VI

The Determinants of Corporate Risky Securities

This table reports OLS regression evidence on the determinants of corporate risky securities. The dependent variable in Panel A is the fair value of risky securities divided by total assets. The dependent variable in Panel B is the fair value of risky securities divided by the sum of cash, short term investments, and other investments. Column (7) of Panels A and B excludes the top decile of firms on cash/assets. The sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings. All variable definitions are given in Appendix A. The regressions include year and industry fixed effects, as well as an intercept, which are not shown. The standard errors (in brackets) are heteroskedasticity consistent and clustered at the firm level. Significance levels are indicated as follows: * = 10%, ** = 5%, *** = 1%.

Panel A: Risky securities/total assets

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cash flow	0.265*** [0.076]					0.023 [0.050]	0.048 [0.057]
Cash flow volatility		0.364** [0.152]				0.238*** [0.078]	0.218** [0.107]
Market to book			0.027*** [0.007]			0.021*** [0.003]	0.019** [0.008]
Foreign income				0.458*** [0.137]		0.265*** [0.064]	0.114** [0.053]
Size					-0.001 [0.006]	-0.001 [0.003]	0.002 [0.004]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.155	0.148	0.199	0.170	0.135	0.216	0.195
N_obs	1,364	1,364	1,364	1,364	1,364	1,364	1,226

Panel B: Risky securities/cash and other investments

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cash flow	0.372*** [0.121]					0.235* [0.137]	0.299 [0.182]
Cash flow volatility		0.661*** [0.210]				0.522** [0.212]	0.554** [0.246]
Market to book			0.024*** [0.007]			0.018** [0.008]	0.020** [0.009]
Foreign income				0.123** [0.060]		0.155** [0.075]	0.111** [0.052]
Size					0.020*** [0.007]	0.020*** [0.007]	0.027** [0.011]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.084	0.085	0.086	0.083	0.084	0.099	0.075
N_obs	1,364	1,364	1,364	1,364	1,364	1,364	1,226

TABLE VII

Managerial Incentives and Overconfidence

Panel A: Managerial Incentives

This table reports OLS regression evidence on corporate governance and managerial compensation. The dependent variable in columns 1-2 is the fair value of risky securities divided by total assets. The dependent variable in columns 3-4 is the fair value of risky securities divided by the sum of cash, short term investments, and other investments. The dependent variable in columns 5-6 is the fair value of risky securities divided by the sum of cash and short term investments. The sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings, as well as available data on executive compensation and the G- and E-indices. All variable definitions are given in Appendix A. The regressions include year and industry fixed effects, as well as an intercept, which are not shown. The standard errors (in brackets) are heteroskedasticity consistent and clustered at the firm level. Significance levels are indicated as follows: * = 10%, ** = 5%, *** = 1%.

Dependent variable	Risky securities / total assets	Risky securities / total assets	Risky securities / cash and other investments	Risky securities / cash and other investments	Risky securities / cash	Risky securities / cash
Model	(1)	(2)	(3)	(4)	(5)	(6)
G-index	-0.004 [0.003]		-0.010 [0.007]		-0.029 [0.020]	
E-index		-0.003 [0.006]		-0.008 [0.016]		-0.020 [0.037]
Stock compensation	0.052* [0.027]	0.053* [0.028]	0.110** [0.054]	0.113** [0.055]	0.244*** [0.094]	0.251** [0.100]
Option compensation	0.083** [0.033]	0.084** [0.034]	0.137* [0.074]	0.142* [0.077]	0.470* [0.261]	0.481* [0.276]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.177	0.172	0.105	0.101	0.059	0.049
N_obs	1,183	1,183	1,183	1,183	1,183	1,183

Panel B: CEO Overconfidence

This table reports OLS regression evidence on CEO overconfidence. *CEO overconfidence* is an indicator equal to one if the CEO at least twice during his tenure in the Execucomp sample (1992-2012) was holding options with average moneyness greater than 67% at the end of a fiscal year, starting in the first year the CEO displays the behavior. The dependent variable is the fair value of risky securities divided by total assets. The sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings, as well as available data on executive compensation. All variable definitions are given in Appendix A. The regressions include year and industry fixed effects, as well as an intercept, which are not shown. The standard errors (in brackets) are heteroskedasticity consistent and clustered at the firm level. Significance levels are indicated as follows: * = 10%, ** = 5%, *** = 1%.

Dependent variable	Risky securities / total assets	Risky securities / total assets	Risky securities / cash and other investments	Risky securities / cash and other investments	Risky securities / cash	Risky securities / cash
Model	(1)	(2)	(3)	(4)	(5)	(6)
CEO overconfidence	0.014** [0.003]	0.011** [0.003]	0.024** [0.012]	0.015 [0.011]	0.059** [0.026]	0.035 [0.025]
CEO age		<0.001 [0.001]		-0.002** [0.001]		<0.001 [0.002]
Stock compensation		0.057*** [0.009]		0.103*** [0.015]		0.212*** [0.016]
Option compensation		0.070** [0.015]		0.118** [0.022]		0.276*** [0.036]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.152	0.204	0.103	0.151	0.064	0.099
N_obs	1,258	1,222	1,258	1,222	1,258	1,222

TABLE VIII

The Risk and Performance Implications of Corporate Risky Securities

This table reports regression evidence on the risk and performance implications of corporate risky securities. Panel A reports estimates from OLS regressions. Panel B reports estimates from a two-stage Heckman selection model. The first stage selection equation (not shown) explains the firm's propensity to invest in risky securities using the following set of independent variables: *Cash flow, Cash flow volatility, Market to book, Foreign income, Size, Stock compensation,* and *Option compensation*. In columns (1) and (2), we compute the betas and alphas assuming the market model, with the CRSP value-weighted index used as the market proxy. In columns (3) and (4), we assume the Fama-French three factor model. In columns (6) and (7), we augment the Fama-French three factor model with the momentum and liquidity factors. Betas and alphas are calculated for each fiscal year using monthly returns. All variable definitions are given in Appendix A. All regressions include year fixed effects. The sample comprises all industrial companies in the S&P 500 index from 2009-2012 with available information in their annual reports (10-K) on the fair value of their financial assets holdings. The standard errors (in brackets) are heteroskedasticity consistent and clustered at the firm level. Significance levels are indicated as follows: * = 10%, ** = 5%, *** = 1%.

Panel A: OLS

Dependent variable	One-factor market beta	One-factor alpha	Three-factor market beta	Three-factor alpha	Five-factor market beta	Five-factor alpha	Total return volatility	Idiosyncratic volatility
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Risky securities/Equity	0.482** [0.219]	-0.017*** [0.004]	0.414* [0.221]	-0.020*** [0.004]	0.365* [0.193]	-0.021*** [0.004]	0.083*** [0.016]	0.030*** [0.011]
Debt/equity	0.041 [0.070]		-0.006 [0.061]		-0.094* [0.050]			
Intercept	1.014*** [0.061]	0.007*** [0.001]	1.022*** [0.049]	0.006*** [0.001]	0.990*** [0.037]	0.005*** [0.001]	0.100*** [0.002]	0.060*** [0.002]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.102	0.024	0.053	0.033	0.035	0.030	0.031	0.024
N_obs	1,153	1,158	1,153	1,158	1,153	1,158	1,158	1,158

Panel B: Two-stage Heckman Selection Model

Dependent variable	One-factor market beta	One-factor alpha	Three-factor market beta	Three-factor alpha	Five-factor market beta	Five-factor alpha	Total return volatility	Idiosyncratic volatility
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Risky securities/Equity	0.425** [0.211]	-0.018*** [0.004]	0.311 [0.214]	-0.021*** [0.004]	0.232 [0.186]	-0.023*** [0.004]	0.096*** [0.018]	0.037*** [0.013]
Debt/equity	0.302*** [0.080]		0.190*** [0.058]		0.110*** [0.032]			
Inverse Mills ratio	0.604*** [0.107]	-0.005** [0.002]	0.157 [0.099]	-0.008*** [0.002]	0.023 [0.087]	-0.009*** [0.002]	0.042*** [0.008]	0.034*** [0.006]
Intercept	0.852*** [0.055]	0.009*** [0.001]	1.008*** [0.051]	0.009*** [0.001]	1.027*** [0.044]	0.008*** [0.001]	0.084*** [0.004]	0.047*** [0.003]
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.113	0.030	0.043	0.045	0.018	0.046	0.062	0.060
N_obs	1,153	1,158	1,153	1,158	1,153	1,158	1,158	1,158

FIGURE 1

The Performance of Investment Indices during the Recent Financial Crisis

This figure reports the performance of nine investment indices that correspond to different asset classes from August 2007 to July 2009. The levels of all indices are normalized to 100 in August 2007.

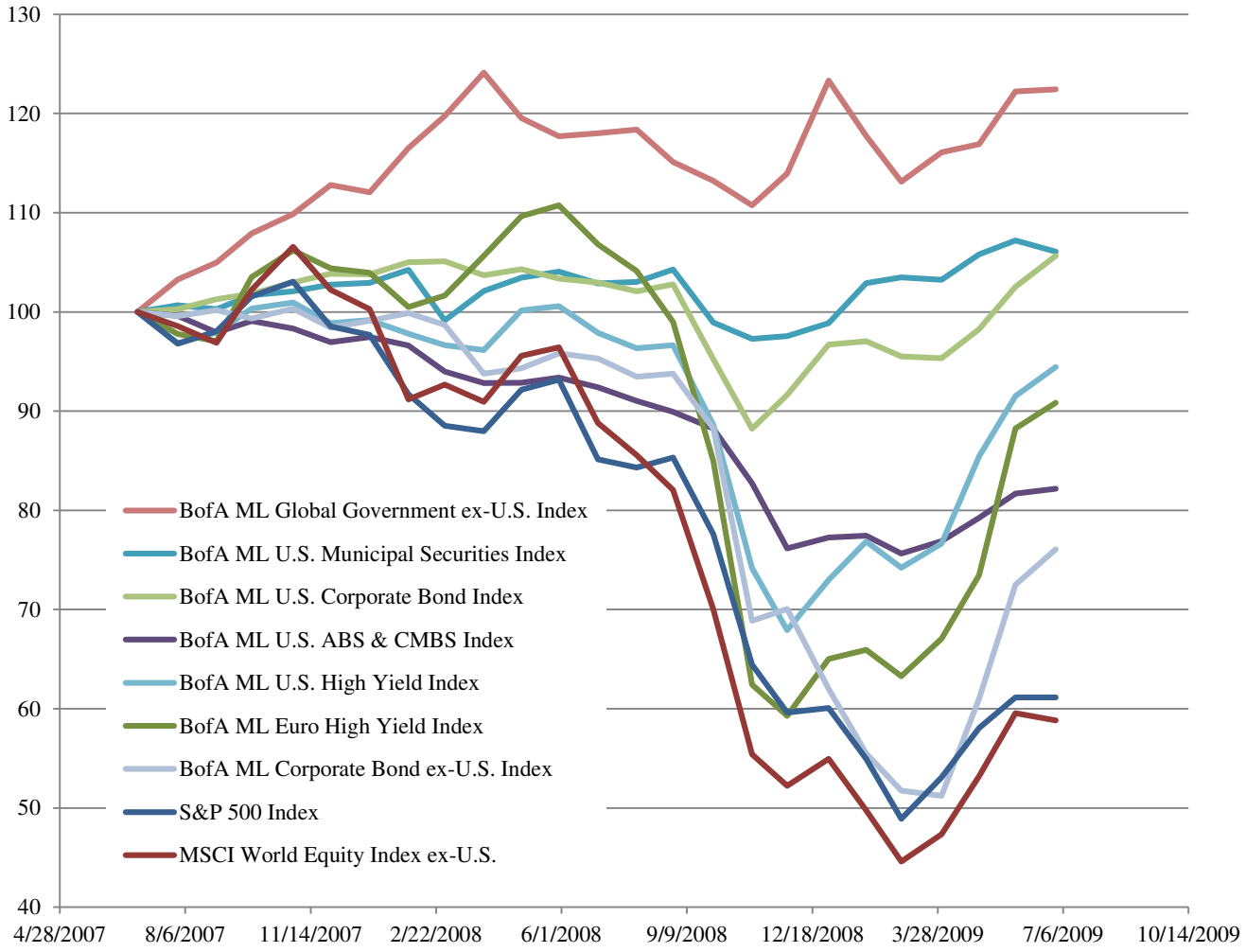

FIGURE 2

Venn Diagram of the Breakdown of Financial Assets

This figure shows a hypothetical breakdown of a firm's financial assets (not to scale and purely for illustrative purposes). Out of the total book value of assets (AT), a certain percentage is held as cash and short-term investments (CHE = CH + IVST). A certain percentage of CHE may be invested in risky and illiquid assets. In addition, the firm may hold more risky and illiquid assets elsewhere on its balance sheet, for instance under long-term investments or other assets, some of which may be listed under IVAO in Compustat.