The Journal of FINANCE
The Journal of THE AMERICAN FINANCE ASSOCIATION

THE JOURNAL OF FINANCE • VOL. LXXII, NO. 2 • APRIL 2017

Precautionary Savings with Risky Assets: When Cash Is Not Cash

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ABSTRACT

U.S. industrial firms invest heavily in noncash, risky financial assets such as corporate debt, equity, and mortgage-backed securities. Risky assets represent 40% of firms' financial portfolios, or 6% of total book assets. We present a formal model to assess the optimality of this behavior. Consistent with the model, risky assets are concentrated in financially unconstrained firms holding large financial portfolios, are held by poorly governed firms, and are discounted by 13% to 22% compared to safe assets. We conclude that this activity represents an unregulated asset management industry of more than $1.5 trillion, questioning the traditional boundaries of nonfinancial firms.

A KEY ASSUMPTION IN STUDIES of corporate cash holdings is that industrial firms invest in actual cash or risk-free, near-cash securities. Recent anecdotal evidence in the press, however, suggests that corporate treasuries have considerably broadened the scope of securities in which they invest. For example, the article "Google's Latest Launch: Its Own Trading Floor," published in *Business Week Online* 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."

*All authors are at the Michael G. Foster School of Business, University of Washington. We are grateful to two anonymous referees, an Associate Editor, Michael Roberts (the Editor), David Cordova (tax partner at Deloitte), Harry DeAngelo, Dave Denis, Amy Dittmar, Mike Faulkender, Laurent Fresard, Ron Giammarino, Todd Gormley, Jay Hartzell, Carolin Pflueger, Lee Pinkowitz, Bill Resler, Martin Schmalz, Terry Shevlin, Jake Thornock, and Jeff Zwiebel for insightful discussions and comments. 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 Carnegie Mellon, City University–Hong Kong, Emory University, Erasmus University, the Interdisciplinary Center Herzliya (IDC), the University of Amsterdam, the University of Copenhagen, the University of Hong Kong, the University of Kentucky, the University of Utah, Tilburg University, Tulane University, and Washington University in St. Louis and participants of the ASU Sonoran Winter Finance Conference 2014, the 9th Annual FIRS meetings, the 2014 SFS Cavalcade, the Pacific Northwest Finance Conference, the 2014 LBS Summer Finance Symposium, and the 2014 Western Finance Association Meetings for helpful comments. The authors declare that they have no potential conflicts of interest, as identified in the *Journal of Finance* Disclosure Policy, and have received no outside financial support for the research and writing of this paper.

DOI: 10.1111/jofi.12490

In this paper, we investigate both empirically and theoretically the composition, determinants, and implications of financial assets held by nonfinancial firms. We show that firms hold large portfolios, which comprise a wide range of financial assets. Apple, for example, holds \$121 billion, or 70% of its book assets, in financial assets, placing it among the largest hedge funds in the world. Collectively, the firms in our sample manage over \$1.5 trillion in financial assets. Despite the similarity to the traditional asset management industry, the regulation and disclosure requirements of this shadow asset management industry are minimal.

Our empirical analysis exploits the implementation of Statement of Financial Accounting Standards (SFAS) No. 157 in 2009, which requires all firms to report the fair value of major asset classes on their balance sheet.[1] We collect data on firms' nonoperating financial assets that comprise: (1) the balance sheet accounts "cash and cash equivalents" and "short-term investments," which constitute Compustat's data item *CHE*, the standard measure of cash holdings in the literature, and (2) any additional financial assets reported as "long-term investments" or "other assets," not considered by prior studies.[2] We hand-collect these detailed data on the asset classes that constitute firms' financial portfolios from the footnotes of annual reports for all industrial firms in the S&P500 Index from 2009 to 2012.

Our findings shed new light on both the size and the composition of industrial firms' financial asset holdings. First, we find that the total value of firms' financial asset portfolio is 24.6% larger than the traditional measure of corporate cash holdings. This difference stems from the inclusion of long-term financial assets. Critically, the existing cash literature has implicitly ignored these financial assets, which can be held to fund real investment opportunities and mitigate adverse shocks that may arise in the more distant future.

Second, our estimates indicate that firms invest heavily in noncash securities that are both risky and illiquid. These securities are frequently included in the balance sheet accounts "cash and cash equivalents" and "short-term investments," which make up *CHE*. This traditional measure of cash holdings is composed of at least 23.2% risky securities on average.

Third, we show that risky securities represent 38.3% of aggregate financial asset portfolios, or 5.8% (5.6%) of the aggregate book value (market value of equity) of industrial firms in the S&P 500 Index. The vast majority of risky securities (roughly 79%) are also illiquid. They include a wide array of securities, such as corporate debt (23.6%), equity (8.6%), asset-backed or mortgage-backed securities (8.4%), and government debt excluding U.S. Treasuries (15.3%), both domestic and foreign. In contrast, safe assets, which represent 61.7% of aggregate portfolios, comprise money-like securities with minimal risk and

[1] See paragraph 32 of SFAS No. 157, paragraph 19 of SFAS No. 115, and Appendix A for more information.

[2] We exclude restricted assets, pension assets, and deferred executive compensation since they can be viewed as operating assets invested in a particular project or labor payments. We also exclude derivative hedging, which is studied extensively in a separate literature (e.g., Guay and Kothari (2003) and Jin and Jorion (2006)).

illiquidity: time deposits, bank deposits, money market funds, commercial paper, and U.S. Treasury securities.

To assess the motivations and optimality of this behavior, we present a formal model of a firm's demand for risky or illiquid financial assets. The model is a parsimonious representation of a dynamic problem in which the firm has both present and future real investment projects, and in which the firm has limited access to external finance. The model can be viewed as an extension of standard cash models such as Almeida, Campello, and Weisbach (2004). The main innovation in the model is allowing firms to invest in an array of financial assets, which include liquid and illiquid assets as well as safe and risky assets.

The model delivers several predictions. First, investing in illiquid or risky financial assets is suboptimal for financially constrained firms. Second, financially unconstrained firms benefit from having access to illiquid financial assets and are at best indifferent to investing in risky financial assets. Importantly, firms become increasingly indifferent to investing in risky assets as their financial portfolios grow. Consequently, firms with larger portfolios invest more in risky assets and exhibit higher variation in their portfolio allocations. Third, an additional layer of agency problems or managerial overconfidence may tilt firms toward investing more in risky financial assets. Fourth, there are no uniform tax incentives to invest in risky financial assets.

Our empirical findings are consistent with the predictions of our theory. We find that both risky and illiquid financial asset holdings increase substantially as the firm becomes more financially unconstrained and holds a larger financial asset portfolio. Our univariate estimates indicate that firms in the lowest portfolio size quintile invest 10% of their portfolio in risky securities, whereas firms in the top quintile invest 40% of their portfolio in risky securities. Further, the variation in portfolio allocation within the top size quintiles is also significantly higher.

We find similar results in multivariate regressions. To mitigate endogeneity concerns about the joint determination of the size and composition of the financial asset portfolio, we provide estimates from a two-stage least squares (2SLS) model, which exploits unexpected operating cash flow innovations. Our 2SLS estimates suggest that an increase of one percentage point in the size of the asset portfolio leads to an increase of 30 basis points in the portion of the portfolio invested in risky assets.

Having established the link between the size of the asset portfolio and its composition, we investigate the effects of additional firm- and manager-level attributes. Our estimates reveal a number of systematic patterns. First, consistent with Opler et al. (1999) and Bates, Kahle, and Stulz (2009), the size of the asset portfolio increases in firm-level proxies for the demand for precautionary savings, such as cash flow volatility, investment opportunities, and firm size. In contrast, holding constant the size of the asset portfolio, risky financial assets are concentrated in large, low cash-flow volatility firms, with only average investment opportunities. These findings are consistent with the prediction that more financially constrained firms, with a stronger precautionary savings motive, will avoid risky financial assets.

Second, in the analysis of taxes, we employ hand-collected data on firms' permanently reinvested earnings (PRE). As expected, we find that total financial asset holdings are positively related to PRE. In contrast, we find an insignificant relation between PRE and risky financial assets. This result is consistent with our theoretical analysis, which shows that the immediate taxation of foreign investment earnings mutes the (nonuniform) incentives to take risk with foreign financial assets. We obtain similar results when we consider an alternative specification that relies on Compustat data to calculate the implied tax cost of repatriating earnings as in Foley et al. (2007) and Faulkender and Petersen (2012).

Third, we find evidence that poorly governed firms invest more in risky financial assets. Following Dittmar and Mahrt-Smith (2007), we measure the quality of corporate governance using the E-index (Bebchuk, Cohen, and Ferrell (2009), based on Gompers, Ishii, and Metrick (2003)), institutional block holdings, and pension fund holdings. Our estimates indicate that a decrease of one standard deviation in the quality of governance is associated with an increase of 1.2% to 2.2% in risky financial asset holdings. This evidence is consistent with the hypothesis that the manager may derive private benefits from investing in risky assets because it makes her job more interesting or helps develop human capital that can be valuable elsewhere (e.g., in the asset management industry).

Fourth, we find that proxies for managerial overconfidence are associated with more risky financial assets, consistent with managers' belief that they are benefiting themselves and shareholders by "putting their money to work" and generating positive alphas. We also find that increased managerial risk-taking preferences, measured by option-based compensation and gender, are associated with more risky financial assets.

Fifth, we consider the possibility that firms generate positive alphas from investing in risky financial assets. The poor disclosure requirements surrounding firms' financial assets do not allow us to measure their returns directly. Thus, to assess whether there is any net value creation from investing in risky securities, we measure the marginal value to shareholders of investing in risky financial assets and investigate how firms finance these assets. We find that the value of a marginal dollar invested in risky securities is 12.9% to 21.5% lower than if it were invested in safe securities. In addition, we find that firms finance risky financial assets from operating cash flows. In contrast, they invest funds from external financing in safe securities. Since industrial firms are unable to obtain financing to invest in risky financial assets, we conclude that there is little support that their performance as a financial intermediary is value-creating for shareholders. These findings are consistent with the large literature on the inability of professional money managers to earn positive abnormal returns after fees (see Fama and French (2010) and references therein).

Our paper is related to two recent studies by Cardella, Fairhurst, and Klasa (2015) and Brown (2014). These papers use Compustat data to investigate the properties of corporate cash holdings. We complement these papers in two important ways: (1) we study the asset composition of a firm's *entire* financial asset portfolio, including financial assets outside the standard Compustat-based measure of cash holdings, and (2) we study *detailed* asset allocations rather than aggregate data. Thus, our empirical approach allows us to study firm-specific portfolio allocation across various dimensions such as risk and illiquidity.

More broadly, our results have implications for the literature on corporate cash holdings, as they challenge the dominance of the precautionary savings motive for an economically significant portion of firms' perceived "cash" holdings (see, for example, Lins, Servaes, and Tufano (2010)). They are also relevant for the debate over whether and when cash should be returned to shareholders through a change in payout policy. In addition, since undrawn lines of credit cannot be invested in risky financial assets, they point to a further dimension on which lines of credit and cash holdings differ (see, for example, Sufi (2009), Acharya, Almeida, and Campello (2013), Disatnik, Duchin, and Schmidt (2014)).

Overall, our findings open new questions into the explanations for, and policy implications of, what are essentially hedge funds operating within nonfinancial firms. An investment company managing more than \$100 million of other people's money is heavily regulated and faces disclosure requirements around its holdings and performance. In contrast, U.S. industrial companies manage more than \$1.5 trillion on behalf of their shareholders, with very minimal disclosure requirements. Thus, shareholders can neither assess the strategy and performance of this growing shadow asset management industry, nor adjust the rest of their portfolio appropriately.

I. Data and Classification

A. Sample Selection and Financial Asset Data

We hand-collect data on firms' financial assets from the footnotes of annual reports (10-K) available on the Securities and Exchange Commission's Edgar database. SFAS No. 157, implemented in 2009, requires firms to disclose the process used to calculate the fair value of their assets. Most firms report this information in a footnote labeled "fair value measurements." In Appendix A, we provide additional details about our collection and classification process, including examples of firms' financial asset reporting.

Our sample includes all firms that have been members of the S&P500 Index at any point between 2009, the year in which SFAS No. 157 became effective, and 2012, the most recent year for which data were available when we collected the data. Following the literature, we drop all financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). Our final sample includes 446 firms and 1,727 firm-year observations spanning four fiscal years.[3] We obtain monthly stock returns from CRSP and all other firm-level accounting data from Compustat.

[3] We exclude the payroll processing firms ADP and Paychex since they behave as financial firms and hold large amounts of deposits on behalf of their customers.

We focus on firms' nonoperating financial assets, which comprise the balance sheet accounts "cash and cash equivalents," "short-term investments," and additional assets reported as "long-term investments" or "other assets." We exclude restricted assets, pension assets, and deferred executive compensation since they can be viewed as operating assets invested in a particular project or labor payments. We also exclude derivative hedging, which is studied in a separate literature (e.g., Guay and Kothari (2003) and Jin and Jorion (2006)).

It is useful to compare the asset portfolio that we study to the traditional measure of cash holdings (Compustat item *CHE*), defined as the sum of the balance sheet accounts "cash and cash equivalents" (Compustat item *CH*) and "short-term investments" (Compustat item *IVST*). These accounts include financial assets with maturity of up to 90 days at issuance and financial assets that the firm intends to liquidate within a year, respectively. In contrast, we identify the firm's entire portfolio of financial assets, which typically includes additional financial assets outside "cash and cash equivalents" and "short-term investments," held in the balance sheet accounts "long-term investments" and "other assets."[4]

Importantly, firms hold similar financial assets across these different accounts. In particular, "short-term investments," "long-term investments," and "other assets" all include financial assets such as corporate bonds, stocks, and mortgage-backed securities. The only distinction is the firm's "intention" to liquidate some positions within a year and hold on to the others for more than a year. Therefore, one conclusion that we draw from our data collection process is that the standard approach to measuring corporate cash holdings implicitly assumes that cash holdings are held for no more than a year. We believe that the previous literature has not recognized this limitation. Our estimates indicate that, compared to the standard measure of cash holdings, which only includes financial assets held in "cash and cash equivalents" and "short-term investments," the total amount of financial assets held by corporations is 25% larger.

B. Asset Classification

Our hand-collected data allow us to group similar financial assets across different balance sheet accounts. Specifically, our approach is to sort the firm's financial assets based on their asset classes, irrespective of the balance sheet account in which they are reported. We further distinguish financial asset classes along two dimensions: illiquidity and risk. In this subsection, we describe our classification method.

To measure asset illiquidity, we exploit the requirement in SFAS No. 157 to report each asset as levels 1, 2, or 3 based on the inputs necessary to assess its fair value. Level 1 includes assets with quoted prices in active markets for

[4] Note that while "cash and cash equivalents" and "short-term investments" only include financial assets, "long-term investments" and "other assets" include both financial and nonfinancial assets.

identical assets; examples are equities and on-the-run U.S. Treasury bonds. Level 2 includes assets without quoted prices in active markets, where other observable inputs are required; examples are municipal bonds and other fixed income securities that trade in over-the-counter markets. Level 3 includes the remaining assets where other unobservable inputs are required; examples are auction rate securities and Greek bonds (Milbradt (2012)).

Less liquid assets therefore fall within higher level asset categories. Importantly, asset levels are not a good measure of risk. For example, equity securities, which are typically risky, are liquid, level 1 assets. Conversely, corporate bonds, which are typically safer, are less liquid, level 2 or level 3 assets.[5]

To measure risk, we classify assets as either safe or risky.[6] We use this dichotomous method because firms only disclose broad financial asset classes, such as government bonds, corporate bonds, equities, etc. An advantage of this dichotomous classification scheme is that it mitigates measurement issues that may arise due to perverse situations where, for example, a junk bond fund has more systematic risk than a conservatively invested equity fund.[7]

Our definition of safe and risky assets follows the Federal Reserve's classification of securities as money-like and nonmoney-like (Anderson and Kavajecz (1994)). This classification provides a natural break point between safe and risky assets because an asset is money-like when it acts as a store of value and a unit of account, which together imply a stable value. Therefore, we classify securities that the Federal Reserve deems to be money-like as safe assets. More specifically, safe assets comprise money-like securities with minimal risk, which the Federal Reserve labels M4 (and L): cash, cash equivalents, time deposits, bank deposits, money market funds, commercial paper, and U.S. Treasury securities.[8] The money-like nature of these safe assets fits closely with the existing literature's implicit assumption about the nature of corporate "cash" holdings.

We classify the remaining, non-money-like assets, as risky. These assets include corporate debt, equity, asset- and mortgage-backed securities,

[5] In the context of fixed income securities, increasing illiquidity comes with the benefit of increasing interest (see Azar, Kagy, and Schmalz (2016) for an analysis of the changing cost of carry for liquid holdings). Importantly, this interest is compensation for illiquidity, not risk, and is called a liquidity premium (Opler et al. (1999)).

[6] We use the term risk to refer to systematic risk. We do not separately model or empirically investigate idiosyncratic risk since the firm gains no benefit from holding a poorly diversified portfolio of financial assets and the available data do not allow us to measure the idiosyncratic risk of firms' holdings.

[7] Just as more illiquid assets earn a higher (risk-free) interest rate, riskier securities earn a higher expected return. Sources of this risk premium include market risk, size, book-to-market, and momentum, among others. Importantly, one systematic risk factor is liquidity risk (e.g., Pástor and Stambaugh (2003) and Sadka (2006)). However, this liquidity risk factor is different from the illiquidity level of a security previously discussed. Liquid stocks, for example, can have high liquidity risk exposure (Sadka (2014)).

[8] We recognize that there is no absolutely risk-free security, and, in particular, that our safe assets may include interest rate and inflation risk. However, the magnitude of these risks, as well as the risk premia they earn, are small compared to the risk exposures of the remaining assets.

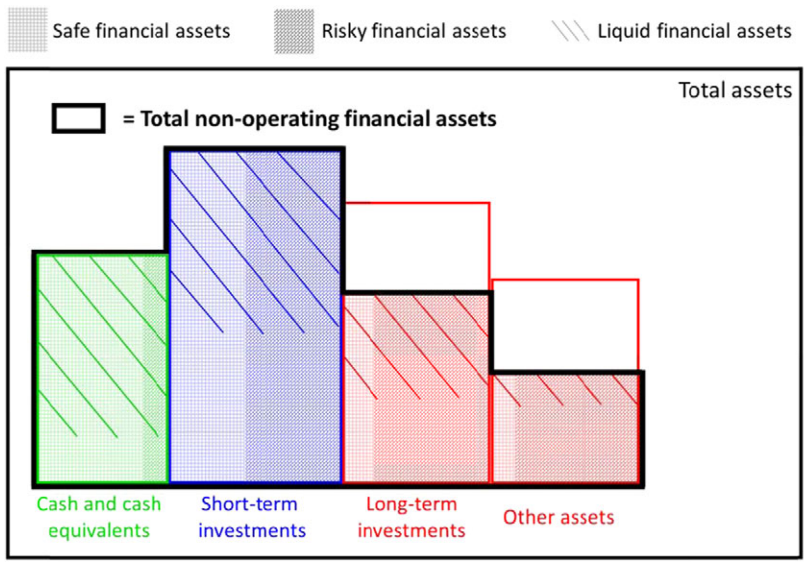

Figure 1. Breakdown of corporate financial assets. This figure shows a hypothetical breakdown of a firm's total financial assets (not to scale and purely for illustrative purposes). Out of the total book value of assets, a certain percentage is held in the balance sheet accounts: "cash and cash equivalents" and "short-term investments." A certain percentage of these accounts may be invested in risky and/or illiquid financial assets. In addition, the firm may hold more risky and/or illiquid financial assets elsewhere on its balance sheet, for instance, under "long-term investments" or "other assets." [Color figure can be viewed at wileyonlinelibrary.com]

government debt excluding U.S. Treasuries, and other securities. Figure B1 in Appendix B illustrates how our classification method and the Federal Reserve's definition of money-like securities align with illiquidity and risk.

Figure 1 presents a Venn diagram that provides a breakdown of balance sheet accounts by risk and illiquidity. The figure illustrates two key points:

(1) Contrary to the common view, firms may hold risky or illiquid assets in the balance sheet accounts "cash and cash equivalents" and "short-term investments." Therefore, the traditional measure of corporate cash holding may be overstated by including non-money-like financial assets.
(2) Firms may hold additional financial assets in other accounts, including "long-term investments" and "other assets," which can be either safe or risky, and liquid or illiquid. Therefore, the traditional measure of cash holdings may underestimate a firm's money-like financial assets.

Thus, the traditional measure of corporate cash holdings is neither a consistent lower bound nor a consistent upper bound of a firm's money-like financial assets.

II. The Composition of Corporate Financial Assets

In this section, we investigate the asset composition of firms' financial assets. For each category and asset class, Panel A of Table I shows the fair dollar value and the fair value normalized by (1) total book assets (*AT*), (2) market value of equity, (3) the standard Compustat-based measure of cash holdings (*CHE*), or (4) total financial assets. These normalizations adjust for the scale of the firm and its financial assets, facilitating the comparison of our results to existing literature. Here, we report aggregate (value-weighted) sample-wide statistics. We provide analogous equally weighted statistics in Table BI of Appendix B. Our statistics are based on 2012, the most recent year in our sample. However, we obtain similar estimates for the other sample years (2009 to 2011).

Panel A shows that firms hold a substantial percentage of their financial assets in risky assets. Specifically, the total value of risky assets held by our sample firms in 2012 was $611 billion, collectively accounting for 5.8% of total book assets and 5.6% of the market value of equity. Aggregated across all our sample firms, the value of risky financial assets is 38.3% that of total financial assets.

We compare our measure of firms' total financial assets to the standard measure of cash holdings in the literature, *CHE*. Our findings indicate that the value of risky financial assets is 47.8% that of *CHE*. Furthermore, total financial assets are 24.6% larger than *CHE*.

Consistent with Figure 1, these numbers show that, in aggregate, at least 23.2% (= 47.8% − 24.6%) of the traditional cash measure (*CHE*) comprises risky financial assets. Individual firms do not always reconcile their disclosure of financial assets with their balance sheet accounts. It is therefore impossible to determine the exact split of *CHE* between safe and risky financial assets. Also consistent with Figure 1, the reconciliations that some firms do report show that safe assets are held outside of *CHE*.

More granularly, firms invest heavily in debt securities. Panel A shows that 2.3% of firm book assets is invested in non-Treasury government debt, including municipal and agency debt, 1.6% is invested in corporate debt, and more than 0.7% is invested in other debt securities, with the majority invested in asset-backed and mortgage-backed securities. Firms also invest 1.1% in other securities, including 0.3% in equity securities. The majority of corporate financial assets are held in domestic securities. In fact, foreign security holdings are negligible for all asset classes but government debt, where they amount to 0.6% of book assets.

Panel B of Table I shows how assets are classified by asset level. Recall that level 1 assets are the most liquid and level 3 assets are the most illiquid. Overall, Panel B shows that 63% of firms' financial assets are liquid (level 1) and the remaining 37% are illiquid (levels 2 and 3). Thus, a substantial fraction of firms' financial assets are illiquid, in contrast to the common view of firms' cash holdings.

Panel B also shows that 86% of firms' safe financial assets are liquid assets and the remaining 14% are illiquid assets. Of total risky assets, 21% are liquid and 79% are illiquid. These numbers show that firms' safe financial assets can

Table I

The Composition of Corporate Financial Assets

Panel A shows the fair value of corporate financial assets by asset class. Panel B shows the liquidity of corporate financial assets by asset class. Both panels report aggregate sample-wide values for 2012, the most recent year in our sample. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Note that cash and cash equivalents are not further specified by firms, that is, are not broken down into finer asset classes. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. To compare these values with traditional Compustat data, we also report the size of each asset class relative to the following items (Compustat data items are in parentheses): (1) total book assets (*AT*), (2) market value of equity (*PRCC_F* × *CSHO*), and (3) cash and short-term investments from the balance sheet (*CHE*). Finally, we also provide the size of each asset class relative to the total financial assets we construct from the footnotes and balance sheets. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999).

Panel A: Fair Value

Security	Amount ($M)	Percent of Book Assets	Percent of MV of Equity	Percent of CHE	Percent of Financial Assets
Cash and cash equivalents	720,914	6.78	6.56	56.36	45.23
Deposits	57,451	0.54	0.52	4.49	3.60
Commercial paper	32,071	0.30	0.29	2.51	2.01
Money market funds	78,063	0.73	0.71	6.10	4.90
U.S. Treasuries	94,337	0.89	0.86	7.37	5.92
Total safe financial assets	982,837	9.24	8.95	76.83	61.67
Government debt ex. U.S. Treasuries	243,675	2.29	2.22	19.05	15.29
Municipal	27,358	0.26	0.25	2.14	1.72
Agency	139,336	1.31	1.27	10.89	8.74
Other	76,981	0.72	0.70	6.02	4.83
Domestic	178,032	1.67	1.62	13.92	11.17
Foreign	65,643	0.62	0.60	5.13	4.12
Corporate debt	173,570	1.63	1.58	13.57	10.89
Domestic	165,260	1.55	1.50	12.92	10.37
Foreign	8,309	0.08	0.08	0.65	0.52
ABS and MBS	56,634	0.53	0.52	4.43	3.55
Other debt	20,297	0.19	0.18	1.59	1.27
Equity	33,031	0.31	0.30	2.58	2.07
Mutual funds	1,612	0.02	0.01	0.13	0.10
Other	31,419	0.30	0.29	2.46	1.97
Domestic	31,667	0.30	0.29	2.48	1.99
Foreign	1,363	0.01	0.01	0.11	0.09
Other securities	83,781	0.79	0.76	6.55	5.26
Total risky financial assets	610,987	5.75	5.56	47.76	38.33
Total financial assets	1,593,824	14.99	14.51	124.60	100.00

(*Continued*)

Table I—*Continued*

Panel B: Liquidity			
Security	Level 1 (%)	Level 2 (%)	Level 3 (%)
Cash and cash equivalents	95.53	4.47	0.00
Deposits	71.75	28.25	0.00
Commercial paper	4.42	95.58	0.00
Money market funds	92.34	7.66	0.00
U.S. Treasuries	42.27	57.44	0.29
Total safe financial assets	86.12	13.85	0.03
Government debt ex. U.S. Treasuries	32.03	67.90	0.06
Municipal	0.26	99.40	0.33
Agency	42.33	57.67	0.00
Other	20.28	79.62	0.09
Domestic	39.56	60.30	0.14
Foreign	12.25	87.66	0.09
Corporate debt	1.06	95.37	3.57
Domestic	0.98	96.15	2.87
Foreign	4.14	62.92	32.96
ABS and MBS	0.13	87.78	12.09
Other debt	23.14	75.99	0.88
Equity	89.79	6.85	3.36
Mutual funds	92.56	7.44	0.00
Other	89.64	6.82	3.54
Domestic	92.07	7.15	0.78
Foreign	37.47	0.00	62.53
Other securities	20.40	77.39	2.20
Total risky financial assets	21.23	75.97	2.80
Total financial assets	63.21	35.78	1.01

be either liquid or illiquid, as can firms' risky assets. Moreover, these numbers show that while risk and illiquidity are positively correlated in the sample, the correlation is imperfect, indicating that it is important to separate between risk and illiquidity empirically. Thus, asset levels alone are insufficient to determine the riskiness of firms' financial assets.

In Table BII of Appendix B, we provide additional descriptive analyses of the industry-level breakdown of financial asset holdings (Panels A and B), and list the 20 largest holders of risky assets (Panel C). Firms in the technology and healthcare sectors hold more risky financial assets on average, and represent most of the top-20 list. We therefore control for industry effects in subsequent analyses.

Taken together, the results in this section show that firms invest heavily in risky and illiquid financial assets, and moreover, that financial assets are substantially larger than traditional measures of cash holdings.

III. Theory

We open this section with a review of existing theoretical models of cash holdings. We then provide an overview of the key ingredients and implications of our model, which is formally derived in an Internet Appendix.[9] We conclude this section with a summary of the tax implications of investing in risky financial assets, which we analyze in detail in Appendix C.

A. Related Literature

In frictionless capital markets, corporate cash holdings are irrelevant. In such a world, holding cash has no benefits or opportunity costs because external finance is costless and there is no liquidity premium. However, frictions give rise to costs and benefits, such that, as originally posited by Keynes (1936), firms have a precautionary savings motive. The marginal benefits are determined by the additional value-creating actions that an extra dollar of cash allows the firm to undertake. The marginal costs are determined by the opportunities a firm must forgo to retain that dollar.

These ideas are formalized by the seminal work of Baumol (1952) and Miller and Orr (1966, 1968). These papers present an inventory model of corporate money demand in which cash balances held by firms depend upon (i) the opportunity cost of holding cash, (ii) the cost of making transfers between cash and interest-bearing cash-like asset holdings, and (iii) the exogenously determined variability (or lack of synchronization between receipts and payments) in the firm's cash flows. However, these papers do not model the risk or illiquidity of firms' financial assets. In particular, they do not consider the variation in the payoffs of firms' financial assets, or how this variation interacts with real investments or external financing to affect firms' value.

More recent theoretical work by Bolton, Chen, and Wang (2011) and Décamps et al. (2011) extends the framework in these models in two important ways. First, they introduce real investment decisions, thereby increasing the action space of financial managers. Second, they jointly consider the codetermination of cash management and these real investments. Nevertheless, these models still treat cash as a state-independent security that yields less than the risk-free rate of return due to either tax disadvantages or reduced-form agency costs. In these models, firms hold cash as a simple hedge. These models, however, do not consider the allocation of this cash across financial assets with varying degrees of illiquidity and risk. The only financial assets that firms are allowed to hold are assets that covary negatively with their cash flows, that is, hedging derivatives.

Bolton, Wang, and Yang (2014) and Hugonnier, Malamud, and Morellec (2015) provide cases in which firm value is a convex function of its cash holdings. While in these papers, firms continue to have access to only safe

[9] The Internet Appendix is available in the online version of the article on the *Journal of Finance* website.

financial assets, this convexity implies that at times it may be optimal to invest in risky financial assets. Hugonnier, Malamud, and Morellec (2015) consider cash policy in the presence of real investments that are lumpy relative to the scale of the firm. When the firm is close to having enough cash to finance its next real investment, the firm can become risk-loving in the amount of internal cash, since its value becomes locally convex in the amount of internal capital. Bolton, Wang, and Yang (2014) produce an additional zone in which firm value is convex in the amount of cash holdings. This case arises when firms have (1) a positive net present value (NPV) project that currently generates negative cash flows, (2) low cash balances that cannot finance the project long enough without tapping external capital markets, and (3) fixed costs of issuing equity. However, neither model readily applies to the largest firms in the economy, as they require having real investments that are lumpy relative to the scale of the firm, regions where the firm is close to being forced to pay fixed costs of issuing equity, or being close to bankruptcy.

B. Summary of Formal Model

To understand the forces determining a firm's optimal financial portfolio size and composition, we provide a formal model in the Internet Appendix. In this subsection, we describe the key ingredients and implications of the model.

Our model is a parsimonious representation of a dynamic problem in which a firm with limited access to external finance allocates its internal capital across both present and future real investment projects. The model can be viewed as an extension of the models in Almeida, Campello, and Weisbach (2004) and Gilbert and Hrdlicka (2015).[10] The main innovation in our model is allowing the firm to invest in an array of financial assets, which include liquid and illiquid assets as well as safe and risky assets.

The model has two states (up and down) and three dates (0, 1, and 2). The firm begins as a going concern with an exogenous amount of capital inside the firm, which can be used to invest in real projects as well as financial assets. The firm has two decreasing-returns-to-scale real investment projects, a date 0 project and a date 1 project, both paying off at date 2.

B.1. Liquid Financial Assets

As a starting point, we consider the case in which the firm has access to only a liquid, risk-free financial asset and cannot raise external finance. Under the assumption that the manager and shareholders are risk-neutral, the manager maximizes the expected payoffs from investing in the firm's real projects and in the risk-free asset. The solution to the manager's problem equates the marginal benefit from investing in the date 0 project with the marginal benefit from

[10] See also the survey by Almeida et al. (2014) and references therein. Gilbert and Hrdlicka (2015) study the size and allocation of financial portfolios in the context of university endowments.

investing in the risk-free financial asset and using the proceeds to fund the date 1 project. Notice that the marginal benefit of the date 0 project is the marginal cost of investing in the date 1 project. The firm is unconstrained when it can make the first-best investments in both projects.

This formulation generates the well-known result that firms retain capital to invest in their future projects as long as the initial return on these projects is sufficiently high. In the case of an unconstrained firm, the amount of retained cash is indeterminate. When the firm is financially constrained, the optimal amount of cash equates the marginal returns across projects.

B.2. Illiquid Financial Assets

To consider the implications of financial asset illiquidity (but not risk), we introduce an illiquid, risk-free financial asset that matures at date 2 and pays a rate of return that is higher than the risk-free rate, that is, an illiquidity premium. We model the illiquidity by allowing the asset to be liquidated at date 1 only, and at a loss relative to investing in the liquid risk-free asset. Because there is no uncertainty in the problem, the manager can perfectly forecast that the amount he needs in liquid assets equals the amount he plans to invest in the date 1 project. Therefore, the manager will never liquidate the illiquid asset at date 1. It follows immediately from this that the firm only invests in illiquid assets if it is unconstrained.

Overall, when the firm is unconstrained, it is better off when the illiquid asset is available since that asset's liquidity premium raises the firm's outside option. When the firm is constrained, however, it does not invest in the illiquid asset and is therefore indifferent to having access to it.

B.3. Risky Financial Assets

Next, we consider the role of risk by allowing firms to invest in state-dependent risky financial assets. In this case, the manager considers the payoffs across states for both the financial portfolio and the real investments.

If the manager and shareholders are risk-neutral, the decision to invest in the risky financial asset depends on the size of the risk premium and the concavity (decreasing returns to scale) of the firm's real project. This concavity determines the rate at which production increases in the good state and decreases in the bad state as a result of investing in the risky financial asset. If the risk premium is large relative to this concavity, the manager will invest in the risky asset, and vice versa. This behavior arises because the cost of capital is not adjusted for the risk of the firm's financial portfolio.[11]

Next, we consider the case in which the manager and shareholders are risk averse. Moreover, we assume that they have the same stochastic discount factor

[11] This analysis assumes that, while the firm's shareholders are risk-neutral, capital markets still yield a positive risk premium. This can be rationalized under the assumption that the firm's shareholders have limited capital.

as the market. If the firm is financially constrained, we prove that the manager never invests in the risky financial asset. When the firm is unconstrained across all states, the manager is indifferent to investing in the risky asset. The intuition behind this result is straightforward. Due to risk aversion, the change in the firm's cost of capital induced by the risky financial portfolio exactly offsets the benefit from earning the risk premium.[12] Consequently, constrained firms avoid investing in the risky financial asset.

An implication of this model is that firms invest more in risky assets as their portfolio becomes endogenously larger. This behavior occurs because a larger portfolio indicates that the firm is less financially constrained. Furthermore, the model also predicts that the variation in firms' portfolio allocations increases as their financial portfolios become larger.

For robustness, we consider extensions of the model in which the returns on the risky financial asset covary positively with the firm's real investment opportunities and negatively with the firm's costs of external finance. These extensions capture the real-world features that (1) the firm's real investment opportunities tend to be higher when market conditions are better, and (2) the costs of external finance tend to be higher when market conditions are worse.[13]

Intuitively, the positive covariation between financial returns and real investment opportunities makes risky financial assets more attractive, since these financial assets tend to pay more when the marginal product of real investment capital is higher. However, the negative covariation between financial returns and the costs of external finance makes such assets less attractive because they tend to pay less exactly when the firm needs capital more. The firm's financial investment decisions depend on the balance between these two forces. When financial frictions are more important, the firm continues to avoid investing in the risky financial asset.

B.4. Agency, Overconfidence, and Confusion

Overall, the model produces regions of indifference across the firm's financial portfolio allocation. This indifference occurs only when the firm is unconstrained. There are many ways to break this indifference from the point of view of the manager. One way is to introduce a private benefit from investing in risky assets. Such a private benefit would arise if gaining experience in managing multiasset portfolios is valued in the asset management labor market. Such human-capital building, leading to higher external salaries, decouples the manager's future salary and the returns to investors (Holmström (1999)), thereby lessening the incentives from ex-post settling up in the labor market

[12] This is equivalent to the standard assumption underlying the weighted average cost of capital. Conversely, failure to adjust the cost of capital is analogous to the fallacy that debt is a cheap source of capital.

[13] This positive covariation is essentially the definition of aggregate good times (see Berk, Green, and Naik (1999) and Carlson, Fisher, and Giammarino (2004)). Countercyclical financing frictions are discussed in Eisfeldt and Rampini (2006), Brown and Petersen (2011), and Eisfeldt and Muir (2016), among others.

(Fama (1980)). If this private benefit is big enough, the manager will tilt the firm's financial portfolio toward risky assets.

Additionally, the manager may believe he can generate alpha but must take on systematic risk to do so. This would arise if the manager's beliefs about returns are optimistic. Such overconfidence would push the manager toward investing in risky assets, provided that the manager believes he can generate enough alpha to overcome the concavity in the date 1 project. Of course, this would be suboptimal for the firm because it only receives the true returns.

Alternatively, the manager may be overconfident about the firm's prospects. Under this scenario, the manager underestimates the need for precautionary savings, since he perceives the firm to be unconstrained due to high free cash flows (Jensen (1986)).

The manager can also be driven by confusion over the effect of low-yield financial assets (e.g., money-like securities) on the firm's ability to meet its cost of capital. This confusion is similar to the fallacy that debt is a cheap source of capital (Krüger, Landier, and Thesmar (2015)). In the same vein, the manager (and shareholders) may choose to speculate in financial markets in an attempt to "juice" profits or "reach for yield."[14]

C. Tax Implications

For simplicity, our model does not consider taxes. In Appendix C, we present a detailed analysis that explores the tax implications of investing domestic and foreign balances in financial assets.

The current tax code creates a wedge between the after-tax investment income that a shareholder receives by investing on her own and the after-tax investment income the shareholder receives if a U.S. C-corporation invests on her behalf. This wedge implies that the higher returns from a riskier allocation of financial assets may not be exactly offset by the increase in the firm's cost of capital. Importantly, the sign and magnitude of this wedge varies with both the type of the security and the form of the investment gain (e.g., capital gains versus dividends). Table CI in Appendix C shows the federal tax treatment of prevalent risky securities and gain types for both corporations and individuals.

In general, the net marginal benefit of riskier asset allocations increases when the corporation has a lower tax rate than the individual's tax rate on a given security or gain type (e.g., U.S. equity dividends). When the tax rates are equivalent, the marginal benefit does not change (e.g., interest payments from fixed income securities). And when the corporation faces a higher tax rate than the individual investor, the net marginal benefit decreases (e.g., equity and fixed income long-term capital gains). Importantly, securities do not

[14] While the manager may be mistaken as to the source of the benefit from reaching for yield, if enough risk is taken, value may actually be created at the expense of bondholders through the standard risk-shifting channel. Furthermore, increasing the risk of the firm's financial assets may limit any windfall transfers to bondholders that would occur if the firm's financial assets were held in a way that made the firm safer than originally expected.

come in arbitrary combinations of their potential sources of gains (cash flows versus returns). It is thus overly simplistic to view investors (and corporations) as having the option of increasing risk in a financial security by exclusively increasing expected returns in one particular form, say, dividends without an increase in capital gains.[15] Therefore, taxes can motivate firms to invest in particular securities with favorable combinations of cash flows and capital gains, but they do not favor riskier financial assets in general.

A multinational firm enjoys an additional tax advantage that may increase the net marginal benefit of risky asset allocations. In particular, firms can defer paying the difference between the U.S. tax rate and the foreign tax rate on foreign earnings until they are repatriated.[16] This tax advantage, however, is limited to the earnings that serve as the principal for financial investments, and does not apply to gains from financial investments, which qualify as Subpart F income and are taxed immediately. The immediate taxation of foreign investment earnings mutes the (nonuniform) incentives to take risk with foreign financial assets (see Appendix C for details).[17,18]

D. Empirical Implications

Overall, our theoretical analysis delivers several important and intuitive predictions that can be summarized as follows:

- *Illiquidity*
    - Investing in illiquid financial assets is suboptimal for financially constrained firms.
    - It is optimal for financially unconstrained firms to invest retained capital, not to be used for real investment, in illiquid assets. The illiquidity premium makes them better off.

[15] For example, dividend-paying value stocks tend to be riskier than non-dividend-paying growth stocks. Even dividend-capture strategies remain exposed to capital gains risk. However, characterizing all the feasible splits of expected returns into cash flows and capital gains is beyond the scope of this work.

[16] Repatriation costs are discussed by Foley, et al. (2007), Faulkender and Petersen (2012), and Faulkender and Smith (2016). These studies show that firms with higher repatriation tax costs hold more “cash.”

[17] This argument relies on the assumption that corporate tax rates are constant. If the firm expects tax rates to fall, or expects a repatriation tax holiday, its incentives to invest in risky assets may increase, as described in Appendix C.

[18] Repatriation taxes imply that domestic and foreign-held financial assets are imperfect substitutes. It is therefore possible that the firm has high marginal benefits and costs for domestic financial assets, but low marginal benefits and costs for foreign-held financial assets (e.g., Yang (2015) and Harford, Wang, and Zhang (2017)). In the extreme, the firm may act as nearly unconstrained with its foreign-held financial assets, making it indifferent to their risk composition.

- *Risk*

    - ◦ If the firm's cost of capital is unadjusted for the risk of its financial portfolio (risk-neutral manager and shareholders), it may be optimal for the firm to invest in risky assets. The optimality depends on the size of the risk premium and the rate of decreasing returns to scale of the firm's real projects.
    - ◦ However, if the cost of capital is adjusted for financial risk,
        - Investing in risky financial assets is suboptimal for financially constrained firms.
        - Unconstrained firms are at best indifferent to investing in risky financial assets.
        - Firms become increasingly indifferent as they hold larger financial portfolios. As these portfolios grow:
            - ◦ The average level of investment in risky financial assets increases.
            - ◦ The dispersion in allocations to risky financial assets increases.

- *Breaking the indifference*

    - ◦ Firms with more agency problems or poorer governance will invest more in risky financial assets.
    - ◦ Overconfident managers will invest more in risky financial assets.
    - ◦ Risk-averse managers who fail to properly adjust the cost of capital for financial risk will invest more in risky financial assets.

- *Taxes*

    - ◦ Tax considerations, including those of multinational firms, do not create broad incentives to take risk with financial assets.

IV. Determinants of Financial Asset Composition

A. Univariate Evidence

In this subsection, we present univariate evidence on the link between the size of the firm's portfolio of financial assets and its composition.[19] Table II sorts our sample into quintiles formed on the size of the asset portfolio. For each size quintile, Panel A reports the average fair value of liquid (level 1) and illiquid (levels 2 and 3) financial assets, Panel B reports the average fair value of safe and risky financial assets, and Panel C reports the standard deviation in risky asset allocation.

[19] Consistent with our model, where the endogenous size of the financial portfolio (retained capital) indicates the level of the firm's financial constraints, the size of the financial asset portfolio is the most relevant measure of financial constraints. Other measures of financial constraints are more ambiguous, as noted by Kaplan and Zingales (1997), Hadlock and Pierce (2010), and Farre-Mensa and Ljungqvist (2016).

Table II

The Composition of the Financial Asset Portfolio and Portfolio Size Quintiles

This table provides evidence on the relation between the composition of corporate financial assets and the size of the asset portfolio. Panel A focuses on the liquidity of financial assets. Panels B and C focus on their risk. In the top portion of each panel, we sort firms into annual quintiles based on the dollar amount of their financial assets. In the bottom portion of each panel, we sort firms on the book asset-adjusted size of their financial assets. In Panels A and B, we report, for each quintile, the average fraction of safe and risky or liquid and illiquid assets in the firm's book assets and its total financial assets. In Panel C, we report, for each quintile, the standard deviation of the fraction of risky assets in the firm's book assets and its total financial assets. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Liquid financial assets are defined as level 1 assets. Illiquid financial assets are defined as level 2 and level 3 assets. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999).

Panel A: Average Liquidity

Quintile	Low	2	3	4	High
Total financial assets ($)					
Liquid financial assets/book assets	0.058	0.125	0.136	0.162	0.144
Illiquid financial assets/book assets	0.008	0.015	0.042	0.066	0.096
Liquid financial assets/financial assets	0.942	0.943	0.881	0.819	0.727
Illiquid financial assets/financial assets	0.058	0.057	0.119	0.181	0.273
Total financial assets/book assets					
Liquid financial assets/book assets	0.023	0.062	0.112	0.179	0.248
Illiquid financial assets/book assets	0.001	0.004	0.007	0.027	0.187
Liquid financial assets/financial assets	0.958	0.945	0.943	0.874	0.594
Illiquid financial assets/financial assets	0.042	0.055	0.057	0.126	0.406

Panel B: Average Risk

Quintile	Low	2	3	4	High
Total financial assets ($)					
Safe financial assets/book assets	0.057	0.122	0.136	0.169	0.151
Risky financial assets/book assets	0.010	0.020	0.047	0.064	0.098
Safe financial assets/financial assets	0.899	0.908	0.843	0.820	0.701
Risky financial assets/financial assets	0.101	0.092	0.157	0.180	0.299
Total financial assets/book assets					
Safe financial assets/book assets	0.023	0.062	0.111	0.180	0.260
Risky financial assets/book assets	0.002	0.006	0.013	0.032	0.186
Safe financial assets/financial assets	0.901	0.917	0.899	0.853	0.603
Risky financial assets/financial assets	0.099	0.083	0.101	0.147	0.397

Panel C: Dispersion of Risk

Quintile	Low	2	3	4	High
Total financial assets ($)					
Risky financial assets/book assets	0.041	0.058	0.102	0.120	0.133
Risky financial assets/financial assets	0.197	0.167	0.225	0.258	0.283

(*Continued*)

Table II—*Continued*

Panel C: Dispersion of Risk					
Quintile	Low	2	3	4	High
Total financial assets/book assets					
Risky financial assets/book assets	0.004	0.011	0.023	0.051	0.156
Risky financial assets/financial assets	0.176	0.158	0.175	0.227	0.289

We start with the evidence on asset illiquidity reported in Panel A. Our model predicts that as firms hold larger financial asset portfolios and are therefore less constrained, they invest more in illiquid assets. Consistent with this prediction, the estimates in Panel A of Table II reveal a strong monotonic relation between the size of the asset portfolio and the proportion invested in illiquid securities.

Panel B of Table II provides evidence on asset risk. Our model predicts that, while financially constrained firms should not invest in risky financial assets, unconstrained firms are indifferent to risky assets and therefore, on the margin, choose to invest more in risky assets. Consistent with this prediction, Panel B shows that the size of the asset portfolio is positively related to the proportion invested in risky assets.

Panel C compares the dispersion in firms' financial asset allocations across portfolio size quintiles. Our model predicts that as firms hold larger financial portfolios, they become more indifferent to their portfolio allocation across safe and risky assets. Consequently, we expect that the standard deviation of firms' portfolio allocations is higher within subsamples of firms with larger financial portfolios. The results in Panel C, which reveal a strong positive relation between portfolio size and the standard deviation of portfolio allocations, are consistent with this prediction.

B. Empirical Design

Next, we present regression evidence explaining the composition of a firm's financial asset portfolio. For comparison with prior research, we first present an Ordinary Least Squares (OLS) estimation of a standard empirical cash model based on Bates, Kahle, and Stulz (2009). In addition, we provide evidence from a Two-Stage Least Squares (2SLS) regression model to mitigate endogeneity concerns due to the joint determination of the size of the portfolio and its composition.

The 2SLS model exploits the variation in the size of the portfolio due to unexpected operating cash flow shocks. To calculate unexpected cash flow shocks, we need to control for the persistence in cash flows. We therefore focus on the differences in cash flow as the correct measure of shocks. As the residuals of the differences can still exhibit some persistence as well as business cycle variation, we estimate the following pooled cross-sectional time-series model:

$$
\begin{aligned}
CF_{i,t} - CF_{i,t-1} = {} & \alpha + \beta_1 \left(CF_{i,t-1} - CF_{i,t-2}\right) + \beta_2 \left(CF_{i,t-2} - CF_{i,t-3}\right) \\
& + \beta_3 \left(CF_{i,t-3} - CF_{i,t-4}\right) + e_{i,t}, \qquad (1)
\end{aligned}
$$

where the residuals e_{it} are vectors of *unexpected* shocks to a firm's cash flow scaled by assets (CF_{it}). The dependent variable is the difference between the current year's cash flow and the cash flow that was reported in the preceding year.

Next, we use these unexpected cash flows to estimate the firm's total investment in financial assets scaled by the book value of assets. This gives the first-stage model

$$Financial\ assets_{i,t} = \alpha_0 + \alpha_1 Unexpected\ cash\ flow_{i,t} + \beta' X_{i,t} + \sum_s year_s + \sum_j ind_j + \varepsilon^T_{i,t}. \tag{2}$$

Our identifying assumption is that unexpected cash flow shocks affect the overall size of the firm's portfolio of financial assets (inclusion restriction), but does not directly affect the composition of the portfolio (exclusion restriction). In particular, following unexpected cash flow innovations, the cost of adjusting financial investments is significantly lower than the cost of adjusting real investments or shareholder distributions. Therefore, cash flow innovations mechanically increase the size of the firm's financial asset portfolio and can lead to changes in the allocation of its financial portfolio.[20]

We caution that a limitation of this approach is that while these cash flow shocks appear unexpected to the econometrician, they may be expected by the manager and shareholders. It is therefore difficult to account for unobservable firm-level variables that could drive these cash flow shocks.

In equation (2), X is a vector of baseline regressors that proxy for a firm's fundamental, time-varying economic indicators that may affect its financial investments. In particular, following the literature on corporate cash holdings (e.g., Bates, Kahle, and Stulz (2009)), X includes a firm's market-to-book ratio, size, cash flow, net working capital (excluding cash), capital expenditure, leverage, industry cash flow volatility, a dividend dummy, R&D expenditure, and acquisition expenditure.[21] Table BIII in Appendix B gives detailed definitions and summary statistics for all the firm-level variables included in our regression models.

[20] In all subsequent analyses, we report the results of the first-stage estimation (Equation (2) above) and verify that the inclusion restriction holds.

[21] In the empirical cash literature, the left-hand-side variable is a stock measure that equals the ratio of cash holdings (based on Compustat data) to total assets. This choice is driven by the focus of the literature on the *level* of cash holdings. The right-hand-side variables comprise a combination of stock measures (e.g., *size* and *leverage*) and flow measures (e.g., *cash flow* and *capital expenditures*). The independent variables are chosen to proxy for various economic motives that may drive cash holdings, including the precautionary savings motive, the speculative motive, economies of scale, and agency theory. Importantly, these models use flow variables such as *cash flow* and *capital expenditures* because often there are no comparable stock variables that proxy for the underlying economic motives. We follow this specification in our baseline regression models to facilitate meaningful comparisons with the standard findings in the cash literature.

In the second stage, we estimate the portfolio composition equation

$$Risky\ financial\ assets_{i,t} = \alpha_0 + \alpha_1 Financial\ assets^*{}_{i,t} + \beta' X_{i,t} + \sum_s year_s + \sum_j ind_j + \varepsilon^R_{i,t}, \tag{3}$$

where $Financial\ assets^*{}_{i,t}$ is the predicted value from the first-stage estimation, and *Risky financial assets* are defined as the fraction of risky financial assets in the firm's total financial portfolio.

Finally, to control for economy-wide shocks and industry-specific effects, the regression models described in equations (2) and (3) include year and industry fixed effects. To account for the time-series correlation within firms, the standard errors are clustered by firm.

C. Baseline Regression Evidence

Table III reports OLS and 2SLS estimates from the regression models discussed above. Column (1) reports estimates from an OLS regression model explaining the firm's portfolio allocation to risky financial assets. Consistent with the univariate evidence and the predictions of our theory, we find that the size of the financial asset portfolio is positively related to the fraction invested in risky assets. This relation is highly statistically significant at the 1% level and implies that, for every percentage point increase in the size of the portfolio (relative to book assets), risky financial assets increase by 68 bps.

The 2SLS estimates are qualitatively similar. Column (2) reports the results from the first-stage estimation. The coefficient on *Unexpected cash flow* is both economically and statistically significant (at the 1% level), suggesting that the inclusion restriction holds, that is, unexpected cash flow shocks affect the size of the firm's financial portfolio. Indeed, the instrument passes the standard test for a weak instrument with an F-statistic of 12.87.

Column (3) reports the second-stage estimation results. Based on column (3), the proportion of the overall portfolio invested in risky assets is higher when the financial asset portfolio is larger. This effect is also statistically significant at the 1% level and implies an increase of 30 bps in risky financial assets for a one-percentage-point increase in portfolio size.

Our first-stage regression of firms' total financial assets (column (2)) allows us to compare the determinants of our comprehensive measure with the determinants of corporate cash holdings, traditionally measured by *CHE*. Similar to previous studies, we find that the overall size of the financial asset portfolio is positively related to the firm's market-to-book ratio and cash flow volatility, and negatively related to spending on capital expenditures and acquisitions. Together, these estimates are consistent with the precautionary savings motive and suggest that firms use these funds to finance (real) corporate investment. Further, consistent with prior cash studies, we find that there are economies of

Table III

Baseline Determinants of Corporate Financial Assets

This table reports estimates from panel regressions explaining industrial firms' financial investment policy. Column (1) reports OLS estimates. Columns 2 and 3 report 2SLS estimates. In the first stage, we estimate the following equation:

$$Financial\ assets_{i,t} = \alpha_0 + \alpha_1 Unexpected\ cash\ flow_{i,t} + \beta'\mathrm{X} + \sum_t year_t + \sum_j ind_j + \epsilon^T_{i,t},$$

where *Unexpected cash flow* is the residual from regressing a firm's annual change in cash flow on the annual cash flow changes over the past three years, and X is a vector of baseline regressors, which include a firm's market-to-book ratio, size, cash flow, net working capital (excluding cash), capital expenditure, leverage, industry cash flow volatility, a dividend dummy, R&D expenditure, and acquisition expenditure (Bates, Kahle, and Stulz (2009)). In the second stage, we estimate the following equation:

$$Risky\ financial\ assets_{i,t} = \alpha_0 + \alpha_1 Financials\ assets^*{}_{i,t} + \beta'\mathrm{X} + \sum_t year_t + \sum_j ind_j + \varepsilon^R_{i,t},$$

where *Financial assets** is the predicted value from the first-stage estimation. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). The regressions include year and industry fixed effects, 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%.

		2SLS	
Model	OLS	First Stage	Second Stage
Dependent Variable	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets
Column	(1)	(2)	(3)
Financial assets	0.681***		
	[0.102]		
Unexpected cash flow		0.178***	
		[0.065]	
Financial assets*			0.296***
			[0.062]
Market to book	0.001	0.035***	0.022
	[0.010]	[0.008]	[0.021]
Size	0.044***	−0.016***	0.035***
	[0.009]	[0.006]	[0.013]
Cash flow	0.303*	0.159	0.416**
	[0.165]	[0.126]	[0.193]
Net working capital	0.103	−0.286***	−0.045
	[0.088]	[0.058]	[0.162]
Capital expenditure	0.560**	−0.590***	0.230
	[0.226]	[0.116]	[0.338]
Leverage	0.039	−0.162***	−0.036
	[0.065]	[0.036]	[0.106]

(*Continued*)

Table III—*Continued*

Model	OLS	2SLS First Stage	2SLS Second Stage
Dependent Variable	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets
Column	(1)	(2)	(3)
Cash flow volatility	−0.377*	0.433**	−0.120**
	[0.211]	[0.213]	[0.055]
Dividend dummy	−0.017	−0.024*	−0.031
	[0.020]	[0.013]	[0.025]
R&D expenditures	0.730***	0.821***	1.184**
	[0.160]	[0.151]	[0.460]
Acquisition expenditures	0.089	−0.374***	−0.119
	[0.113]	[0.068]	[0.218]
Year fixed effects?	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes
Adjusted R^2	0.330	0.525	0.268
N_obs	1,727	1,727	1,727

scale in firms' financial portfolio management and that both leverage and net working capital substitute for financial investments.

These determinants predict not only the level but also the composition of a firm's financial portfolio. Importantly, column (3) shows that their effect on a firm's safe and risky financial assets is different. Consistent with the precautionary savings motive, we find that risky financial assets are negatively related to a firm's cash flow volatility. Consistent with our model's predictions about unconstrained firms, firm size and cash flows are positively related to investing in risky financial assets.

Taken together, these results highlight the importance of decomposing firms' total financial assets into safe and risky assets. In particular, we find that the effects of key determinants on safe and risky financial assets are significantly different.

D. Tax Costs of Repatriating Foreign Earnings

In Table IV, we investigate the relation between corporate financial investments and the tax implications of foreign earnings. We use hand-collected detailed data on firms' permanently reinvested earnings (PRE) as follows. If a firm wants to utilize the indefinite reversal exception, it has to disclose in its financial statements the cumulative amount of foreign undistributed earnings for which no expected taxes of repatriation are recorded, as well as the associated incremental tax if those earnings are no longer permanently reinvested. A PERL script scans each firm's 10-K filings for variants of "permanently (re)invest(ed)," "indefinitely (re)invest(ed)," "undistributed," "unremitted," and "unrepatriated." The PRE disclosure amount can be manually collected from

Table IV
Tax Costs of Repatriating Foreign Earnings

This table reports estimates from panel regressions explaining firms' financial investment policy. In columns (1) to (3), we use hand-collected data on permanently reinvested earnings (*PRE*). In columns (4) to (6), we use Compustat data to calculate the Foley et al. (2007) measure *Tax cost of repatriating earnings*. Columns (1) and (4) report OLS estimates and columns (2), (3), (5), and (6) report 2SLS estimates. In the first stage, we estimate the following equation:

$$Financial\ assets_{i,t} = \alpha_0 \ + \alpha_1 Unexpected\ cash\ flow_{i,t} + \beta' \mathrm{X} + \sum_t year_t + \sum_j ind_j + \varepsilon^T_{i,t},$$

where *Unexpected cash flow* is the residual from regressing a firm's annual change in cash flow on the annual cash flow changes over the past three years. The control variables *X* include a firm's market-to-book ratio, size, cash flow, net working capital (excluding cash), capital expenditure, leverage, industry cash flow volatility, a dividend dummy, R&D expenditure, and acquisition expenditure (Bates, Kahle, and Stulz (2009)). In the second stage, we estimate the following equation:

$$Risky\ financial\ assets_{i,t} = \alpha_0 \ + \alpha_1 Financials\ assets^*{}_{i,t} + \beta' \mathrm{X} + \sum_t year_t + \sum_j ind_j + \varepsilon^R_{i,t},$$

where *Financial assets** is the predicted value from the first-stage estimation. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). The regressions include year and industry fixed effects, 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%.

		2SLS			2SLS	
Model	OLS	First Stage	Second Stage	OLS	First Stage	Second Stage
Dependent Variable	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets
Column	(1)	(2)	(3)	(4)	(5)	(6)
PRE	−0.001	0.052*	−0.003			
	[0.035]	[0.028]	[0.036]			
Financial assets	0.722***			0.708***		
	[0.101]			[0.107]		

(*Continued*)

Table IV—*Continued*

		2SLS			2SLS	
Model	OLS	First Stage	Second Stage	OLS	First Stage	Second Stage
Dependent Variable	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets
Column	(1)	(2)	(3)	(4)	(5)	(6)
Unexpected cash flow		0.245*** [0.066]			0.144** [0.062]	
Financial assets*			0.365*** [0.092]			0.280*** [0.084]
Pretax foreign income				−0.252 [0.188]	−0.081 [0.116]	−0.296 [0.200]
Pretax domestic income				0.173 [0.132]	0.075 [0.080]	0.249 [0.158]
Tax cost of repatriating earnings				0.587 [1.300]	4.916*** [0.769]	4.544 [3.834]
Control variables?	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.345	0.546	0.321	0.399	0.613	0.284
N_obs	1,534	1,534	1,534	1,727	1,727	1,727

the relevant extracted paragraphs.[22] Overall, we have data for our variable *PRE* for 89% of our sample (1,534 firm-year observations).

We report these results in columns (1) to (3) of Table IV. As expected, we find that total financial assets are positively related to PRE (column (2)). In contrast, we find an insignificant relation between PRE and risky financial assets. The coefficient on *PRE* in column (3) is close to zero and statistically insignificant. This result is consistent with our theoretical analysis in Appendix C, which shows that the immediate taxation of foreign investment earnings mutes the (nonuniform) incentives to take risk with foreign financial assets.

In columns (4) to (6), we present an alternative specification that relies on Compustat data to calculate the implied tax cost of repatriating earnings as in Foley et al. (2007). This specification has the advantage of maintaining our full sample and allowing comparisons to the previous literature. We calculate the *Tax cost of repatriating earnings* by first subtracting foreign taxes paid from the product of a firm's foreign pretax income and its marginal effective tax rate as calculated in Graham (1996). We then scale the maximum of this difference or zero by total firm assets.

The results in columns (3) to (6) indicate that while the tax costs of repatriating earnings are significantly related to the firm's total financial assets, they are not significantly related to the composition of financial assets. These findings are consistent with those based on *PRE*.[23]

E. Agency Problems

In Table V, we investigate the relation between a firm's financial investment policy and corporate governance. Following Dittmar and Mahrt-Smith (2007), we use the following three measures of corporate governance: the E-index, the sum of the 5% institutional block holdings, and the sum of public pension fund holdings.

Our first-stage regressions suggest that the overall size of firms' financial portfolios is positively related to the quality of corporate governance. This is consistent with Harford, Mansi, and Maxwell (2008), who argue that, in poorly governed firms, managers overinvest, which reduces the size of the firm's financial portfolio. The point estimates are directionally equivalent for all measures of corporate governance, but are only statistically significant for the E-index. Recall that the E-index is negatively correlated with good governance.

More importantly, in the second-stage regressions, we find strong evidence that poor corporate governance is associated with larger investments in risky financial assets. These findings hold across all regression models and

[22] For a small portion of firms that only report the incremental tax instead of the exact amount of PRE, PRE is estimated as the incremental tax divided by U.S. statutory tax rate following Faulkender and Petersen (2012).

[23] In Internet Appendix Table IA.I, we show that the findings in columns (4) to (6) are unchanged when we calculate an alternative tax cost of repatriating earnings using U.S. statutory rates.

Table V

Agency Problems

This table reports OLS and 2SLS estimates from panel regressions explaining firms' financial investment policy. In the first stage, we estimate the following equation:

$$Financial\ assets_{i,t} = \alpha_0 + \alpha_1 Unexpected\ cash\ flow_{i,t} + \alpha_2 Governance_{i,t} + \beta' X + \sum_t year_t + \sum_j ind_j + \varepsilon^T_{i,t},$$

where *Unexpected cash flow* is the residual from regressing a firm's annual change in cash flow on the annual cash flow changes over the past three years, X is a vector of baseline regressors, which include a firm's market-to-book ratio, size, cash flow, net working capital (excluding cash), capital expenditure, leverage, industry cash flow volatility, a dividend dummy, R&D expenditure, and acquisition expenditure (Bates, Kahle, and Stulz (2009)), and *Governance* is measured using three proxies following Dittmar and Mahrt-Smith (2007): the *E-index* (which decreases in governance strength), the sum of the 5% institutional block holdings, and the sum of public pension fund holdings. In the second stage, we estimate the following equation:

$$Risky\ financial\ assets_{i,t} = \alpha_0 + \alpha_1 Financial\ assets^*{}_{i,t} + \alpha_2 Governance_{i,t} + \beta' X + \sum_t year_t + \sum_j ind_j + \varepsilon^R_{i,t},$$

where *Financial assets** is the predicted value from the first-stage estimation. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). The regressions include year and industry fixed effects, 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%.

		2SLS			2SLS			2SLS	
Model	OLS	First Stage	Second Stage	OLS	First Stage	Second Stage	OLS	First Stage	Second Stage
Dependent Variable	Risky Financial Assets/ Financial Assets	Financial Assets/ Book Assets	Risky Financial Assets/ Financial Assets	Risky Financial Assets/ Financial Assets	Financial Assets/ Book Assets	Risky Financial Assets/ Financial Assets	Risky Financial Assets/ Financial Assets	Financial Assets/ Book Assets	Risky Financial Assets/ Financial Assets
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial assets	0.713*** [0.114]			0.689*** [0.104]			0.656*** [0.112]		
Unexpected cash flow		0.220*** [0.077]			0.189*** [0.067]			0.176** [0.068]	

(*Continued*)

Table V—*Continued*

Model	OLS	2SLS First Stage	2SLS Second Stage	OLS	2SLS First Stage	2SLS Second Stage	OLS	2SLS First Stage	2SLS Second Stage
Dependent Variable	Risky Financial Assets/ Financial Assets	Financial Assets/ Book Assets	Risky Financial Assets/ Financial Assets	Risky Financial Assets/ Financial Assets	Financial Assets/ Book Assets	Risky Financial Assets/ Financial Assets	Risky Financial Assets/ Financial Assets	Financial Assets/ Book Assets	Risky Financial Assets/ Financial Assets
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial assets*			0.274*** [0.082]			0.291*** [0.087]			0.290*** [0.084]
E-index	0.022* [0.013]	−0.013** [0.006]	0.025** [0.011]						
Block holdings				−0.053*** [0.019]	0.011 [0.011]	−0.047** [0.021]			
Pension holdings							−0.086*** [0.030]	0.004 [0.021]	−0.084** [0.033]
Control variables?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.334	0.554	0.326	0.337	0.522	0.264	0.313	0.508	0.255
N_obs	1,436	1,436	1,436	1,502	1,502	1,502	1,553	1,553	1,553

measures of corporate governance, and are statistically significant at conventional levels.

The effects are also economically significant. Based on column (3), an increase of one standard deviation in the E-index (worsening governance) is associated with an increase of 2.21% in the portfolio fraction invested in risky financial assets. Similarly, based on columns (6) and (9), a one-standard-deviation increase in block holdings or pension holdings is associated with a decrease in risky financial asset holdings of 1.19% and 1.48%, respectively.[24]

These findings are consistent with our model, which predicts that a broad array of agency problems can tilt the manager toward investing in risky financial assets. We note that holding risky financial assets may be viewed by shareholders and directors as a lesser agency cost than reckless spending on large negative NPV mergers and acquisitions (e.g., Harford (1999) and Hanlon, Lester, and Verdi (2015)). If markets are efficient, treasury offices are buying risky financial assets at fair prices and thereby earning the assets' expected rates of return. Moreover, allowing management to invest 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 ones.

Another caveat regarding the governance measures is that they attempt to measure the typical characterizations of the agency conflict with a focus on top managers. However, in the case of risky financial assets, the agency conflict could be further down in the organization (e.g., treasury personnel).

F. CEO Compensation and Overconfidence

Next, we investigate the relation between CEO overconfidence, compensation contracts, and firms' financial investments. Following Malmendier, Tate, and Yan (2011), CEO overconfidence is measured based on option exercising behavior. Specifically, we use the option package-level data on CEO option holdings available in Execucomp beginning in 2006 to calculate *Overconfidence* as an indicator for all CEOs who, at any point during the sample period, hold an option until the year of expiration even though the option is at least 40% in the money entering its final year. Using data from Execucomp, we also calculate the percentage of the CEO's stock and option holdings in his total compensation. Finally, we include in our regressions the CEO's age, gender, and tenure with the company.

These tests are reported in Table VI. As shown in column (2), we find that, with the exception of CEO gender, none of these CEO-related measures explain total financial asset holdings. In contrast, column (3) shows that all these

[24] A potential concern is that our governance measures are correlated with overseas operations. In Internet Appendix IA.II, we reestimate the regressions after controlling for pretax foreign income and find similar results.

Table VI

CEO Compensation and Overconfidence

This table reports OLS and 2SLS estimates from panel regressions explaining firms' financial investment policy. In the first stage of the 2SLS model, we estimate the following equation:

$$\textit{Financial assets}_{i,t} = \alpha_0 + \alpha_1 \textit{Unexpected cash flow}_{i,t} + \gamma' \textit{CEO Characteristics}_{\mathrm{i,t}} + \beta' \mathrm{X} + \sum_t \textit{year}_t + \sum_j \textit{ind}_j + \varepsilon^T_{i,t},$$

where *Unexpected cash flow* is the residual from regressing a firm's annual change in cash flow on the annual cash flow changes over the past three years, X is a vector of baseline regressors, which include a firm's market-to-book ratio, size, cash flow, net working capital (excluding cash), capital expenditure, leverage, industry cash flow volatility, a dividend dummy, R&D expenditure, and acquisition expenditure (Bates, Kahle, and Stulz (2009)), and *CEO Characteristics* include stock and option holdings, overconfidence (measured based on option exercising behavior following Malmendier, Tate, and Yan (2011)), age, tenure, and gender. In the second stage, we estimate the following equation:

$$\textit{Risky financial assets}_{i,t} = \alpha_0 + \alpha_1 \textit{Financial assets}^*{}_{i,t} + \gamma' \textit{CEO Characteristics}_{i,t} + \beta' \mathrm{X} + \textstyle\sum_t \textit{year}_t + \sum_j \textit{ind}_j + \varepsilon^R_{i,t},$$

where *Financial assets** is the predicted value from the first-stage estimation. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). The regressions include year and industry fixed effects, 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%.

		2SLS	
Model	OLS	First Stage	Second Stage
Dependent Variable	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets
Column	(1)	(2)	(3)
Financial assets	0.632***		
	[0.105]		
Unexpected cash flow		0.190***	
		[0.067]	
Financial assets*			0.266***
			[0.084]
Stock ownership	0.021***	−0.003	0.028***
	[0.005]	[0.014]	[0.005]
Options	0.057**	0.003	0.059***
	[0.024]	[0.017]	[0.014]
Overconfidence	0.013**	−0.008	0.014**
	[0.005]	[0.008]	[0.006]
Age	−0.002**	0.001	−0.002**
	[0.001]	[0.001]	[0.001]
Tenure	0.001	0.001	0.001
	[0.001]	[0.000]	[0.001]

(*Continued*)

Table VI—*Continued*

		2SLS	
Model	OLS	First Stage	Second Stage
Dependent Variable	Risky Financial Assets/Financial Assets	Financial Assets/Book Assets	Risky Financial Assets/Financial Assets
Column	(1)	(2)	(3)
Female	−0.037**	0.042*	−0.049***
	[0.017]	[0.023]	[0.013]
Control variables?	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes
Adjusted R^2	0.326	0.533	0.218
N_obs	1,338	1,338	1,338

measures, with the exception of CEO tenure, are statistically and economically significant predictors of a firm's financial portfolio allocation to risky assets. This further highlights the importance of decomposing firms' total financial assets into safe and risky components.

An overconfident CEO increases the fraction of total financial assets held in risky assets by 1.4%. Similarly, managers' stock- and option-based compensation is also positively related to risky assets. A one-standard-deviation increase in managers' stock-based (option-based) compensation corresponds to a 0.7% (1.35%) increase in the fraction of total financial assets held in risky assets. These findings are consistent with our prediction that managerial overconfidence and risk-taking incentives can tilt the manager toward investing in risky financial assets.

An analysis of the other variables reveals that while female managers hold larger financial portfolios overall, they invest less in risky financial assets. Thus, separating between safe and risky financial assets provides stronger evidence that females are more risk averse than males (e.g., Byrnes, Miller, and Schafer (1999) and Eckel and Grossman (2008)).

V. The Value of Risky Financial Assets

While we, and presumably investors, would like to be able to directly assess the net-of-fees performance of industrial firms' financial asset holdings, limited disclosure requirements are such that it is impossible to do so.[25] We can, however, indirectly assess the net value creation across all motives for investing in risky financial assets using two methods. First, following Fama and French (1998), Faulkender and Wang (2006), and Dittmar and Mahrt-Smith (2007),

[25] Since the firm's shares are publicly traded, the alpha from any asset pricing model will not, in general, be a measure of the corporate manager's investment skill. Any expectation of this skill will have been incorporated into the share price immediately upon learning that investing in financial assets is possible.

we estimate the marginal value of safe and risky financial assets. Second, we investigate the sources of financing for firms' investments in risky financial assets. If investing in risky financial assets is sufficiently profitable, firms should be able to raise external financing to support these investments.

In Table VII, we estimate the value of a marginal dollar of cash holdings. Columns (1) and (2) present the Faulkender and Wang (2006) approach, based on the following regression model:

$$\begin{aligned} r_{i,t} - r_{i,t}^{B} = {} & \gamma_0 + \gamma_1 \Delta \mathit{Financial\ assets}_{i,t} + \gamma_2 \Delta \mathit{Risky\ financial\ assets}_{i,t} + \gamma_3 \Delta E_{i,t} \\ & + \gamma_4 \Delta NA_{i,t} + \gamma_5 \Delta RD_{i,t} + \gamma_6 \Delta I_{i,t} + \gamma_7 \Delta D_{i,t} + \gamma_8 \mathit{Financial\ assets}_{i,t-1} \\ & + \gamma_9 L_{i,t} + \gamma_{10} NF_{i,t} + \gamma_{11} \mathit{Financial\ assets}_{i,t} \times \Delta \mathit{Financial\ assets}_{i,t} \\ & + \gamma_{12} L_{i,t} \times \Delta \mathit{Financial\ assets}_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{4}$$

where $r_{i,t} - r_{i,t}^{B}$ is a firm's abnormal return, defined as the stock's return during the fiscal year less the return on the matching Fama-French size and book-to-market portfolio, ΔX indicates a change in X from year $t-1$ to t, $E_{i,t}$ is earnings before extraordinary items, $NA_{i,t}$ is net assets, $RD_{i,t}$ is R&D expenses, set to zero if missing, $I_{i,t}$ is interest expenses, $D_{i,t}$ is common dividends, $L_{i,t}$ is leverage, defined as book debt divided by book debt plus the market value of equity, and $NF_{i,t}$ is the net financing (including net equity issues and net debt issues). All variables except leverage and excess return are deflated by the lagged market value of the firm's equity. The regression in column (1) includes year fixed effects, whereas the regression in column (2) includes both year and firm fixed effects. Following the critique in Gormley and Matsa (2014), columns (3) to (4) control for the unobserved heterogeneity in returns by including annual dummies for the Fama-French size and book-to-market portfolios. Therefore, in these columns, the dependent variable is the raw return.

Because the dependent variable in columns (1) to (4) is a return and the variables are scaled by the lagged market value of equity, the coefficients γ_1 and γ_2 can be interpreted as the marginal value of safe financial assets and the difference in the marginal value between risky and safe financial assets. The point estimates in columns (1) to (4) suggest that the marginal value of a dollar invested in safe financial assets is slightly over a dollar (ranging from \$1.072 to \$1.114). The marginal value of a dollar invested in risky assets, however, is 13.8 to 23.9 cents lower, implying an overall negative NPV for marginal investments in risky financial assets.

Columns (5) and (6) present the Fama and French (1998) approach:

$$\begin{aligned} MV_{i,t} = {} & \gamma_0 + \gamma_1 \mathit{Financial\ assets}_{i,t} + \gamma_2 \mathit{Risky\ \ financial}\ \mathrm{assets}_{i,t} + \gamma_3 E_{i,t} \\ & + \gamma_4 \mathrm{d}E_{i,t} + \gamma_5 \mathrm{d}E_{i,t+2} + \gamma_6 RD_{i,t} + \gamma_7 \mathrm{d}RD_{i,t} + \gamma_8 \mathrm{d}RD_{i,t+2} + \gamma_9 D_{i,t} \\ & + \gamma_{10} \mathrm{d}D_{i,t} + \gamma_{11} \mathrm{d}D_{i,t+2} + \gamma_{12} I_{i,t} + \gamma_{13} \mathrm{d}I_{i,t} + \gamma_{14} \mathrm{d}I_{i,t+2} + \gamma_{15} \mathrm{d}NA_{i,t} \\ & + \gamma_{16} \mathrm{d}NA_{i,t+2} + \gamma_{16} \mathrm{d}MV_{i,t+2} + \varepsilon_{i,t}, \end{aligned} \tag{5}$$

Table VII

The Value of Corporate Financial Assets

This table presents estimates from panel regressions explaining annual excess stock returns (columns (1) and (2)), raw returns (columns (3) and (4)), and market-to-book ratios (columns (5) and (6)). In columns (1) and (2), we estimate the following regression model:

$$\begin{aligned} r_{i,t} - R^B_{i,t} = \gamma_0 &+ \gamma_1 \Delta \textit{Financial assets}_{i,t} + \gamma_2 \Delta \textit{Risky financial assets}_{i,t} + \gamma_3 \Delta E_{i,t} + \gamma_4 \Delta NA_{i,t} + \gamma_5 \Delta RD_{i,t} + \gamma_6 \Delta I_{i,t} + \gamma_7 \Delta D_{i,t} + \gamma_8 \textit{Financial assets}_{i,t-1} \\ &+ \gamma_9 L_{i,t} + \gamma_{10} NF_{i,t} + \gamma_{11} \textit{Financial assets}_{i,t} \times \Delta \textit{Financial assets}_{i,t} + \gamma_{12} L_{i,t} \times \Delta \textit{Financial assets}_{i,t} + \varepsilon_{i,t}, \end{aligned}$$

where $r_{i,t} - R^B_{i,t}$ is a firm's excess return, defined as the stock's return during the fiscal year less than the return on the matching Fama-French size and book-to-market portfolio, ΔX indicates a change in X from year $t - 1$ to t, $E_{i,t}$ is earnings before extraordinary items, $NA_{i,t}$ is net assets, $RD_{i,t}$ is R&D expenditures set to zero if missing, $I_{i,t}$ is interest expense, $D_{i,t}$ is common dividends, $L_{i,t}$ is leverage, defined as book debt divided by book debt plus the market value of equity, and $NF_{i,t}$ is net financing (including net equity issues and net debt issues). All variables except leverage and excess return have been deflated by lagged market value of equity. In columns (3) and (4), the dependent variable is raw return and the regressions include annual dummies for the Fama-French size and book-to-market portfolios. In columns (5) and (6), we estimate the following regression model:

$$\begin{aligned} MV_{i,t} = \gamma_0 &+ \gamma_1 \textit{Financial assets}_{i,t} + \gamma_2 \textit{Risky financial assets}_{i,t} + \gamma_3 E_{i,t} + \gamma_4 \mathrm{d}E_{i,t} + \gamma_5 \mathrm{d}E_{i,t+2} + \gamma_6 RD_{i,t} + \gamma_7 \mathrm{d}RD_{i,t} + \gamma_8 \mathrm{d}RD_{i,t+2} + \gamma_9 D_{i,t} + \gamma_{10} \mathrm{d}D_{i,t} \\ &+ \gamma_{11} \mathrm{d}D_{i,t+2} + \gamma_{12} I_{i,t} + \gamma_{13} \mathrm{d}I_{i,t} + \gamma_{14} \mathrm{d}I_{i,t+2} + \gamma_{15} \mathrm{d}NA_{i,t} + \gamma_{16} \mathrm{d}NA_{i,t+2} + \gamma_{16} \mathrm{d}MV_{i,t+2} + \varepsilon_{i,t}, \end{aligned}$$

where $MV_{\mathrm{i,t}}$ is the market value of equity plus the book value of liabilities and $\mathrm{d}X_t$ indicates a change in X from time $t - 2$ to t. All variables are divided by net assets (book assets minus cash). Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). 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	Abnormal Return		Raw Return		Market-to-Book Ratio	
Column	(1)	(2)	(3)	(4)	(5)	(6)
ΔFinancial assets	1.080**	1.072**	1.114**	1.085**		
	[0.456]	[0.466]	[0.497]	[0.508]		
ΔRisky financial assets	−0.218**	−0.138*	−0.239**	−0.158**		
	[0.103]	[0.067]	[0.115]	[0.073]		
Financial assets					2.219***	1.602***
					[0.399]	[0.424]

(*Continued*)

Table VII—*Continued*

Dependent Variable	Abnormal Return		Raw Return		Market-to-Book Ratio	
Column	(1)	(2)	(3)	(4)	(5)	(6)
Risky financial assets					−0.514**	−0.475**
					[0.241]	[0.196]
Year fixed effects?	Yes	Yes	No	No	Yes	Yes
Firm fixed effects?	No	Yes	No	Yes	No	Yes
Size-book-to-market-year fixed effects?	No	No	Yes	Yes	No	No
Adjusted R^2	0.334	0.550	0.449	0.567	0.769	0.979
Number of observations	1,071	1,071	1,071	1,071	661	661

where $MV_{i,t}$ is the market value of equity plus the book value of liabilities and dX_t indicates a change in X from time $t - 2$ to t. In columns (5) and (6), all variables are deflated by net assets (book assets minus cash). In the Fama and French (1998) regressions, the variables of interest, γ_1 and γ_2, capture the value of safe financial assets and the difference in value between risky and safe financial assets, respectively. The inferences using the alternative approach in columns (5) and (6) are similar. The point estimates suggest that the value of risky financial assets is 23.2% to 29.7% lower than the value of safe financial assets. These findings continue to hold after including firm fixed effects (column (6)).

Overall, the results from these analyses suggest that investors recognize the downside of investing in risky assets. The results also suggest that a few vocal investors and analysts notwithstanding, investors are not fooled into thinking that safe assets are not earning their cost of capital and must be invested in risky assets to reach for yield.

If safe financial assets are held to fund real investments, our results are consistent with the finding in Faulkender and Wang (2006) that funds likely to be used for real investments have higher values. Additionally, if risky financial assets are correlated with financial asset holdings overseas, our findings can arise, in part, because foreign financial assets are still subject to repatriation tax, whereas domestic assets are not (Yang (2015), Harford, Wang, and Zhang (2017)). We note, however, that in Table IV we find no correlation between risky financial assets and either *PRE* or pretax foreign income.

In Table VIII, we further assess the value of financial asset holdings by investigating the funding source for safe and risky financial assets. Specifically, Table VIII follows the empirical model in Kim and Weisbach (2008) and McLean (2011) and estimates panel regressions explaining the sources of corporate financial assets. The dependent variable is the natural logarithm of the annual change in financial assets, defined as

$$\ln\left[\frac{(\textit{Financial assets}_t - \textit{Financial assets}_{t-1})}{\textit{Book assets}_{t-1}} + 1\right]. \tag{6}$$

The explanatory variables, which proxy for the potential sources of corporate financial assets, include: (1) cash flow-net income plus amortization and depreciation, (2) debt and equity issue—the cash proceeds from debt sales and share issuance, and (3) other—all other cash sources, which include the sale of property and the sale of investments. All three variables are scaled by lagged book assets. The regressions also include year and industry fixed effects.

To facilitate the comparison of our results with previous findings, column (1) uses cash holdings measured by Compustat's *CHE* as the dependent variable. Columns (2) to (4) use our measure of total financial assets (column (2)) as well as total financial assets decomposed into safe financial assets (column (3)) and risky financial assets (column (4)). Based on columns (1) and (2), the sources of corporate cash or total financial assets include both internally generated cash

Table VIII

The Sources of Corporate Financial Assets

This table presents estimates from panel regressions explaining the sources of corporate financial assets. The dependent variable is the annual change in financial assets, defined as

$$\ln\left[\frac{(\textit{Financial assets}_t - \textit{Financial assets}_{t-1})}{\textit{Book assets}_{t-1}} + 1\right].$$

Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding U.S. Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. *Cash flow* is net income plus amortization and depreciation. *Debt and equity issue* is the cash proceeds from debt sales and share issuance. *Other* is all other cash sources, including the sale of property and the sale of investments. These measures are scaled by lagged book assets. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999) All regressions include year and industry fixed effects, 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	△Compustat Cash (CHE)	△Financial Assets	△Safe Financial Assets	△Risky Financial Assets
Column	(1)	(2)	(3)	(4)
Cash flow	0.306***	0.211**	0.072	0.334***
	[0.047]	[0.098]	[0.060]	[0.049]
Debt and equity issues	0.045**	0.042**	0.058***	−0.016
	[0.018]	[0.021]	[0.017]	[0.012]
Other	0.057	0.177***	0.073**	0.101**
	[0.043]	[0.039]	[0.034]	[0.041]
Year fixed effects?	Yes	Yes	Yes	Yes
Industry fixed effects?	Yes	Yes	Yes	Yes
Adjusted R^2	0.108	0.166	0.088	0.123
*N*_Obs	1,165	1,165	1,165	1,165

flows and funds raised externally through debt and equity issuance. Interestingly, when we investigate the sources of total financial assets, which include cash and noncash securities, we find that other sources of funds, such as the sale of property and the sale of investments, also contribute to the accumulation of corporate financial assets.

More importantly, the main results in Table VIII suggest that the sources for safe and risky financial assets are different. When firms raise outside capital and do not immediately use it to finance real investments, that capital is more likely to be invested in safe financial assets. Conversely, free cash flow is more likely to be invested in risky financial assets. This can be interpreted as further evidence in support of an agency cost explanation. Easterbrook (1984) points out that when firms raise external capital, they submit themselves to monitoring and certification by capital providers and bankers. This leaves them with less flexibility to invest precautionary savings in risky financial assets. Conversely, free cash flow exacerbates agency conflicts in general and, based on the results in column (4), free cash flow not being put into real investments is often diverted into risky financial assets.

These results suggest that outside investors do not provide firms with external capital to fund investment in risky financial assets. Thus, our evidence is inconsistent with explanations based on the ability of industrial firms to generate a positive alpha for investors, or run an efficient investment fund that avoids the regulatory burden put on mutual funds and other financial firms. If these explanations were true, we would expect outside investors to fund industrial firms' risky financial investments.

These findings are consistent with a vast literature documenting the absence of alpha in the money management industry (e.g., Jensen (1969), Carhart (1997), Fama and French (2010), and references therein). Many of the larger firms in our sample outsource their portfolio management to the same pool of money managers studied in this literature. For those that manage their money internally (such as Google and Apple), it would be surprising to find that managers who can generate alpha are hiding inside nonfinancial firms (and not charging enough for their alpha-generating skills to bring the net excess return to zero).[26]

A related argument is that there are scale efficiencies when the firm invests on behalf of its shareholders. For example, the firm may be able to access certain private equity, hedge funds, or other alternative investments that its individual investors cannot access on their own. We note, however, that the majority of the typical firm's shares are held by institutions, which is especially true of large firms with substantial asset portfolios. Moreover, it is not clear what frictions make it more efficient for a nonfinancial firm, rather than a financial institution, to act as an intermediary on behalf of individual investors. Finally, even if nonfinancial firms were good intermediaries, a shareholder would still want to know what specifically they are investing in so that she could adjust the rest of her portfolio accordingly.

VI. Conclusion

We document the complexity of corporate financial assets by hand-collecting firm-level data on the financial asset portfolios of all industrial firms in the S&P 500 Index between 2009 and 2012. We acknowledge that our sample comprises the largest listed firms in the United States and leave the study of financial assets in small and private firms for future research.

We find that U.S. nonfinancial firms are heavily invested in risky financial assets, including corporate debt, equity, and asset-backed securities. These

[26] Aggregate data collected by Clearwater Analytics and published by the *Wall Street Journal*, which represent about 20% of U.S. corporate cash assets, show that, for the sample of Clearwater clients, firms did not increase their holdings of risky assets at the bottom of the financial crisis in 2009. This suggests that firms were not able to successfully time the market. See http://blogs.wsj.com/cfo/tag/corporate-cash/.

investments run contrary to the common view that industrial firms mainly hold cash and cash equivalents, and challenge the view of the traditional boundaries of nonfinancial firms.

Moreover, the disclosure requirements governing corporate financial asset portfolios are very limited. Firms are not required to disclose their asset composition (only broad asset classes), or the performance of these investments. This lack of disclosure raises questions about, and has policy implications for, what is essentially a $1.5 trillion shadow hedge fund industry operating within U.S. industrial firms.

Initial submission: August 7, 2014; Accepted: May 12, 2016
Editors: Bruno Biais, Michael R. Roberts, and Kenneth J. Singleton

Appendix A: Data Collection

We hand-collect the data on firms' financial assets from the footnotes of their annual reports (10K) available on the Securities and Exchange Commission's Edgar database. SFAS No. 157 and the related SFAS No. 115 stipulate that firms must report the aggregate fair value, gross unrealized gains or losses, and amortized cost basis for at least the following major security types: equity securities, U.S. government and agency debt securities, U.S. municipal debt securities, foreign government debt securities, corporate debt securities, mortgage-backed securities, and other debt securities. In addition to the type and fair value of the securities held, we also collect data on asset levels (levels 1, 2, or 3), which firms are required to report by SFAS No. 157.[27] Table AI provides a sample of asset classes reported as levels 1, 2, or 3.

Overall, we collect detailed data on more than 7,000 individual asset holdings, which comprise more than 2,500 distinct financial assets, for our sample of firms from 2009 to 2012. Tables AII through AIV provide examples of firms' reporting of financial assets for fiscal year 2012. Google (Table AII) has all of its assets in cash and short-term investments: $14,778 million in cash and cash equivalents and $33,310 million in short-term marketable securities. The assets include safe assets such as Treasury bonds, money market funds, commercial paper, and certificates of deposit. However, as Google's tabulated fair value footnote makes clear, not all of its financial assets in *CHE* are safe. For instance, it holds $8,017 million in mortgage- and asset-backed securities and over $2,266 million in municipal securities.

In contrast to Google, Apple (Table AIII) is an example of a firm whose financial assets are in accounts other than cash and short-term investments. Based on its balance sheet, Apple holds $10,746 million in cash and cash

[27] Compustat also reports aggregate values for the SFAS No. 157 asset levels for some firms, but not all: *AQPL1* (assets level 1: quoted prices), *AOL2* (assets level 2: observable), and *AUL3* (assets level 3: unobservable).

Table AI
Asset Classification into Levels 1, 2, or 3

This table lists a sample of the types of assets found in the footnotes of annual reports, which, following the guidelines in SFAS No. 157, are classified into levels 1, 2, or 3 depending on the input(s) required to determine their fair value.

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 bond funds
Equity securities	Corporate bonds: non-U.S.	Mortgage-backed securities
Corporate bonds: non-U.S.	Asset-backed securities	Auction rate securities
Available-for-sale securities	Available-for-sale securities	Long-term Venezuelan bonds
Bank deposits	U.S. Agency securities	Convertible debt securities
Money market funds	Government bonds: non-U.S.	
	Municipal bonds and notes	
	Other securities	

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 tabulated fair value footnote provides a breakdown of all \$121,251 million into asset classes. For instance, \$3,109 million is reported as cash, \$2,462 million is reported as level 1 mutual funds, and \$20,108 million is reported as level 2 U.S. Treasury securities.

Not all reports are as transparent and easy to understand as those of Google and Apple. Table AIV shows that, in the case of Intel, not all its financial assets are reported in the fair value footnotes. Indeed, its cash and cash equivalent assets do not sum up to the amount on the balance sheet, since actual cash is missing from the footnote. Reconciling these data with the balance sheet information is necessary in order to map out all of the firm's financial assets.

Table AII

Google (GOOG)

As can be seen in this table reproducing Google's financial asset disclosure, they comprise $14,778 million in cash and cash equivalents and $33,310 million in marketable securities.

	As of December 31, 2012					
	Adjusted Cost	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value	Cash and Cash Equivalents	Marketable Securities
Cash	$ 8,066	$ 0	$ 0	$ 8,066	$ 8,066	$ 0
Level 1:						
Money market and other funds	5,221	0	0	5,221	5,221	0
U.S. government notes	10,853	77	(1)	10,929	0	10,929
Marketable equity securities	12	88	0	100	0	100
	16,086	165	(1)	16,250	5,221	11,029
Level 2:						
Time deposits	984	0	0	984	562	422
Money market and other funds	929	0	0	929	929	0
U.S. government agencies	1,882	20	0	1,902	0	1,902
Foreign government bonds	1,996	81	(3)	2,074	0	2,074
Municipal securities	2,249	23	(6)	2,266	0	2,266
Corporate debt securities	7,200	414	(14)	7,600	0	7,600
Agency residential mortgage-backed securities	7,039	136	(6)	7,169	0	7,169
Asset-backed securities	847	1	0	848	0	848
	23,126	675	(29)	23,772	1,491	22,281
Total	$47,278	$840	$(30)	$48,088	$14,778	$33,310

Table AIII

Apple (AAPL)

This table reproduces Apple's financial assets. As can be seen, beyond cash and short-term investments, Apple has an additional $92,122 million in long-term marketable securities.

	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

Table AIV

Intel (INTC)

This table reproduces Intel's financial asset disclosure. Intel's fair value footnote includes its liabilities as well as some derivative assets and loans receivable, which we exclude. However, it is missing parts of its cash and cash equivalents, namely, cash, which we reconcile using the balance sheet. The footnote only tabulates $7,885 million of cash equivalents, which implies that the firm has $593 million in cash in order to sum up to the $8,478 million of cash and cash equivalents on the balance sheet.

	December 29, 2012			
	Fair Value Measured and Recorded at Reporting Date Using			
(In Millions)	Level 1	Level 2	Level 3	Total
Assets				
Cash equivalents:				
Bank deposits	$ —	$ 822	$ —	$ 822
Commercial paper	—	2,711	—	2,711
Government bonds	400	66	—	466
Money market fund deposits	1,086	—	—	1,086
Reverse repurchase agreements	—	2,800	—	2,800
Short-term investments:				
Bank deposits	—	540	—	540
Commercial paper	—	1,474	—	1,474
Corporate bonds	75	292	21	388
Government bonds	1,307	290	—	1,597
Trading assets:				
Asset-backed securities	—	—	68	68
Bank deposits	—	247	—	247
Commercial paper	—	336	—	336
Corporate bonds	482	1,109	—	1,591
Government bonds	1,743	1,479	—	3,222
Money market fund deposits	18	—	—	18
Municipal bonds	—	203	—	203
Other current assets:				
Derivative assets	12	208	1	221
Loans receivable	—	203	—	203
Marketable equity securities	4,424	—	—	4,424
Other long-term investments:				
Asset-backed securities	—	—	11	11
Bank deposits	—	56	—	56
Corporate bonds	10	218	26	254
Government bonds	59	113	—	172
Other long-term assets:				
Derivative assets	—	20	18	38
Loans receivable	—	577	—	577
Total assets measured and recorded at fair value	$ 9,616	$ 13,764	$ 145	$ 23,525
Liabilities				
Other accrued liabilities:				
Derivative liabilities	$ 1	$ 291	$ —	$ 292
Long-term debt	—	—	—	—
Other long-term liabilities:				
Derivative liabilities	—	20	—	20
Total liabilities measured and recorded at fair value	$ 1	$ 311	$ —	$ 312

Appendix B: Miscellaneous Evidence

In Figure B1, we provide an illustration of the risk and illiquidity combinations that correspond to various financial assets. In Table BI, we provide panel-wide, equally weighted estimates of the fair value and illiquidity of corporate financial assets. These estimates complement the value-weighted analyses reported in Table I. In Table BII, we provide additional descriptive analyses of the industry-level breakdown of financial asset holdings (Panels A and B) and list the 20 largest holders of risky assets (Panel C). Table BIII provides summary statistics for our main explanatory variables.

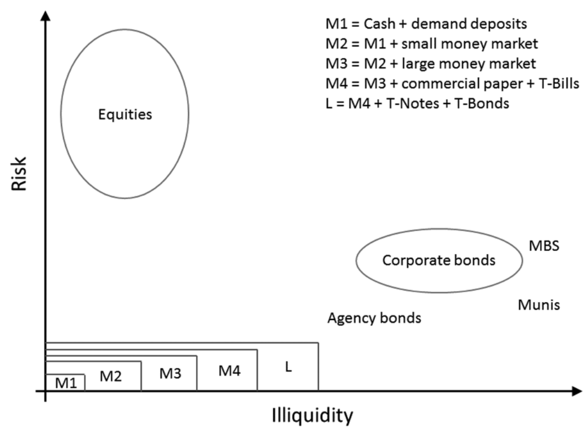

Figure B1. The risk and illiquidity of financial assets. This figure illustrates the risk and illiquidity combinations that correspond to different financial assets. Risk is measured on the vertical axis, whereas illiquidity is measured on the horizontal axis. L is consistent with our classification of safe financial assets.

Table BI

The Composition of Corporate Financial Assets: Equally Weighted Analysis

Panel A shows the fair value of corporate financial assets by asset class. Panel B shows the liquidity of corporate financial assets by asset class. Both panels report equally weighted firm-level averages over the entire sample period 2009 to 2012. Safe financial assets are defined as assets that fall into the following asset classes: cash, cash equivalents, and U.S. Treasuries. Note that cash and cash equivalents are not further specified by firms, that is, are not broken down into finer asset classes. Risky financial assets are defined as assets that fall into the following asset classes: government debt excluding Treasuries, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. To compare these values with traditional Compustat data, we also report the size of each asset class relative to the following items (Compustat data items are in parentheses): (1) total book assets (*AT*), (2) market value of equity (*PRCC_F*×*CSHO*), and (3) cash and short-term investments from the balance sheet (*CHE*). Finally, we also provide the size of each asset class relative to the total financial assets we construct from the footnotes and balance sheets. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999).

Panel A: Fair Value

Security	Amount ($M)	Percent of Book Assets	Percent of MV of Equity	Percent of CHE	Percent of Financial Assets
Cash and cash equivalents	1,511.49	8.79	10.80	75.41	68.97
Deposits	153.69	1.22	0.97	5.11	4.71
Commercial paper	82.55	0.44	0.39	1.58	1.39
Money market funds	192.41	1.72	1.25	7.26	6.45
U.S. Treasuries	157.37	0.57	0.49	2.14	1.90
Total safe financial assets	2,097.50	12.73	13.75	91.49	83.42
Government debt ex. U.S. Treasuries	496.56	1.93	1.35	7.60	5.33
Municipal	54.00	0.45	0.28	1.93	1.21
Agency	271.57	1.15	0.79	4.13	2.87
Other	171.00	0.34	0.34	1.54	1.25
Domestic	373.52	1.68	1.13	6.64	4.52
Foreign	123.04	0.26	0.28	0.96	0.81

(Continued)

Table BI—*Continued*

Panel A: Fair Value

Security	Amount ($M)	Percent of Book Assets	Percent of MV of Equity	Percent of CHE	Percent of Financial Assets
Corporate debt	317.09	1.41	1.15	5.58	3.91
Domestic	298.78	1.37	1.12	5.29	3.66
Foreign	18.32	0.04	0.04	0.29	0.26
ABS and MBS	93.20	0.42	0.31	2.03	1.40
Other debt	57.11	0.19	0.22	1.38	0.90
Equity	70.06	0.25	0.29	2.96	1.43
Mutual funds	3.91	0.02	0.02	0.14	0.12
Other	66.15	0.23	0.27	2.82	1.31
Domestic	68.37	0.24	0.28	2.86	1.36
Foreign	1.69	0.01	0.01	0.10	0.07
Other securities	139.23	0.58	0.51	5.90	3.62
Total risky financial assets	1,173.25	4.79	3.79	25.45	16.58
Total financial assets	3,270.76	17.52	17.22	116.93	100.00

Panel B: Liquidity

Security	Level 1 (%)	Level 2 (%)	Level 3 (%)
Cash and cash equivalents	98.26	1.74	0.00
Deposits	61.43	38.57	0.00
Commercial paper	16.00	84.00	0.00
Money market funds	88.20	11.62	0.18
U.S. Treasuries	71.58	27.09	1.32
Total safe financial assets	94.13	5.81	0.06

(*Continued*)

Table BI—*Continued*

Panel B: Liquidity

Security	Level 1 (%)	Level 2 (%)	Level 3 (%)
Government debt ex. U.S. Treasuries	25.99	72.88	1.13
Municipal	10.33	87.67	2.01
Agency	31.34	68.60	0.07
Other	17.27	81.87	0.86
Domestic	44.06	54.99	0.95
Foreign	15.49	83.65	0.86
Corporate debt	9.60	88.05	2.35
Domestic	9.24	88.37	2.39
Foreign	10.97	79.09	9.94
ABS and MBS	3.23	49.86	46.91
Other debt	21.59	68.96	9.45
Equity	86.69	8.83	4.49
Mutual funds	86.70	13.30	0.00
Other	85.90	8.66	5.44
Domestic	86.81	8.92	4.27
Foreign	91.67	0.00	8.33
Other securities	62.82	26.82	10.36
Total risky financial assets	43.28	45.13	11.59
Total financial assets	86.23	12.83	0.94

Table BII

Risky Financial Assets: Industries and Firms

This table analyzes the fair value of risky financial assets by the Fama and French (1997) five-industry classification (Panels A and B) and lists the top 20 firms on risky financial assets as of 2012 (Panel C). Panel A reports aggregate values as of 2012, the most recent year in our sample. Panel B reports firm-level averages over the entire sample period 2009 to 2012. Risky financial assets are defined as assets that fall into the following asset classes: non-U.S. government debt, corporate debt, asset- and mortgage-backed securities (ABS and MBS), other debt, equity, and other securities. Each financial asset is manually assigned into a unique asset class based on hand-collected data from footnotes of annual reports. In Panels A and B, we also report the size of each asset class relative to the following items (Compustat data items are in parentheses): (1) total book assets (*AT*), (2) market value of equity (*PRCC_F*×*CSHO*), and (3) cash and short-term investments from the balance sheet (*CHE*). Finally, we also provide the size of each asset class relative to the total financial assets reported by the firm. The sample comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999).

Panel A: Aggregate Analysis of Risky Financial Assets by Industry

Fama-French Industry	Amount ($M)	Percent of Book Assets	Percent of MV of Equity	Percent of CHE	Percent of Financial Assets
Consumer	65,537.26	3.24	2.75	30.74	27.23
Manufacturing	28,198.26	0.94	1.03	13.62	12.87
Technology	322,928.30	11.53	9.22	66.61	50.35
Health	106,364.10	11.12	8.22	63.55	51.83
Other	87,959.34	4.75	8.20	42.54	30.60

Panel B: Firm-Level Analysis of Risky Financial Assets by Industry

Fama-French Industry	Amount ($M)	Percent of Book Assets	Percent of MV of Equity	Percent of CHE	Percent of Financial Assets
Consumer	492.35	2.21	3.07	20.08	11.12
Manufacturing	233.42	1.44	1.46	15.87	10.12
Technology	2,088.67	11.07	6.85	36.25	26.86
Health	2,418.28	7.35	4.45	42.56	26.41
Other	1,681.09	1.88	3.18	21.03	12.34

(*Continued*)

Table BII

Risky Financial Assets: Industries and Firms

Panel C: Top 20 Firms on Risky Financial Assets in 2012						
	Risky Financial Assets ($ millions)		Risky Financial Assets (over Book Assets)		Risky Financial Assets (over Financial Assets)	
Rank	Name	Amount	Name	Percent	Name	Percent
1	APPLE INC	92,271	VERISIGN INC	70.58	MICROSOFT CORP	97.14
2	MICROSOFT CORP	69,480	ANALOG DEVICES	66.19	LEUCADIA NATIONAL CORP	95.83
3	GENERAL ELECTRIC CO	45,779	MICROSOFT CORP	57.29	ANALOG DEVICES	95.40
4	BERKSHIRE HATHAWAY	32,291	INTUITIVE SURGICAL INC	56.30	CF INDUSTRIES HOLDINGS INC	95.39
5	PFIZER INC	29,314	QUALCOMM INC	54.00	VERISIGN INC	93.26
6	QUALCOMM INC	23,227	XILINX INC	53.97	MEDTRONIC INC	92.38
7	GOOGLE INC	21,959	APPLE INC	52.41	TEXAS INSTRUMENTS INC	89.50
8	GENERAL MOTORS CO	18,056	F5 NETWORKS INC	51.03	WHOLE FOODS MARKET INC	87.44
9	FORD MOTOR CO	16,543	NVIDIA CORP	48.37	SANDISK CORP	86.11
10	JOHNSON & JOHNSON	15,945	SANDISK CORP	47.57	QUALCOMM INC	85.92
11	AMGEN INC	15,637	QLOGIC CORP	43.62	BIOGEN IDEC INC	84.87
12	CISCO SYSTEMS INC	14,676	LINEAR TECHNOLOGY CORP	41.27	NVIDIA CORP	83.19
13	INTEL CORP	12,396	LEUCADIA NATIONAL CORP	35.91	HELMERICH & PAYNE	83.09
14	MEDTRONIC INC	10,499	GARMIN LTD	34.06	HEALTH MANAGEMENT ASSOC	82.19
15	COCA-COLA CO	9,876	MICROCHIP TECHNOLOGY INC	33.95	F5 NETWORKS INC	81.61
16	MERCK & CO	8,052	AKAMAI TECHNOLOGIES INC	33.94	AKAMAI TECHNOLOGIES INC	80.59
17	LILLY (ELI) & CO	7,746	WATERS CORP	33.39	QLOGIC CORP	79.03
18	EMC CORP/MA	6,642	TELLABS INC	33.18	INTUITIVE SURGICAL INC	78.25
19	ORACLE CORP	4,935	KLA-TENCOR CORP	32.30	APPLIED MICRO CIRCUITS CORP	77.70
20	SANDISK CORP	4,918	NETAPP INC	32.12	LEXMARK INTL INC-CL A	77.54

Table BIII

Summary Statistics

This table provides summary statistics for the sample, which comprises all firms in the S&P500 Index from 2009 to 2012, excluding financial firms (SIC 6000-6999) and regulated utilities (SIC 4900-4999). *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_F*) divided by total assets (*AT*). *Size* is the natural logarithm of the book value of total assets (*AT*). *Cash flow* is measured as earnings (*EBITDA*) less interest and taxes (*TXT+XINT*) divided by total assets (*AT*). *Net working capital* is current assets (*ACT*) – current liabilities (*LCT*) divided by total assets (*AT*). *Capital expenditure* is capital expenditures (*CAPX*) divided by total assets (*AT*). *Leverage* is debt in current liabilities (*DLC*) + long-term debt (*DLTT*) divided by total assets (*AT*). *Cash flow volatility* is the 10-year rolling window volatility of cash flow. *Dividend dummy* is an indicator equal to one if the firm paid cash dividends (*DV*) that year, and zero otherwise. *R&D expenditure* is research and development expense (*XRD*), set to zero where missing, divided by total assets (*AT*). *Acquisition expenditure* is acquisitions (*AQC*) divided by total assets (*AT*). *Pretax foreign income* is pretax foreign income (*PIFO*) divided by total assets (*AT*). *Pretax domestic income* is pretax domestic income (*PIDOM*) divided by total assets (*AT*). *Tax cost of repatriating earnings* is computed by first subtracting foreign taxes paid from the product of a firm's foreign pretax income and its marginal effective tax rate as calculated in Graham (1996). We then scale the maximum of this difference or zero by total firm assets. *Alternative tax cost of repatriating earnings* is computed in the same way as the *Tax cost of repatriating earnings*, but with U.S. statutory tax rates used in place of marginal tax rates. *E-Index* is the Bebchuk, Cohen, and Ferrell (2009) governance index. *Block holdings* is the sum of all ownership positions greater than 5% held by institutional investors. *Pension holdings* is the sum of all ownership positions by public pension funds. *Stock ownership* is the ratio of the value of the insider holdings of common stocks of the top five executives to their total compensation. *Options* is the ratio of the value of the stock options of the top five executives to their total compensation. *Overconfidence* is a binary variable equal to one if the CEO at some point during his tenure held an option package until the last year before expiration, provided that the package was at least 40% in the money entering its last year. *Age* is the age of the CEO. *Tenure* is the number of years the CEO has worked in the company. *Female* equals one if the CEO is a female.

Variable	Mean	25th Percentile	Median	75th Percentile	SD
Market-to-book	1.965	1.284	1.644	2.287	1.067
Size	9.189	8.359	9.081	9.935	1.190
Cash flow	0.093	0.061	0.088	0.123	0.061
Net working capital	0.021	−0.039	0.019	0.083	0.111
Capital expenditure	0.044	0.018	0.031	0.054	0.043
Leverage	0.250	0.124	0.223	0.336	0.199
Cash flow volatility	0.037	0.017	0.027	0.043	0.035
Dividend dummy	0.676	0.000	1.000	1.000	0.468
R&D expenditure	0.042	0.000	0.006	0.050	0.074
Acquisition expenditure	0.021	0.000	0.001	0.016	0.049
Pretax foreign income	0.044	0.001	0.035	0.071	0.056
Pretax domestic income	0.048	0.011	0.043	0.087	0.085
Tax cost of repatriating earnings	0.006	0.000	0.001	0.008	0.010
Alternative tax cost of repatriating earnings	0.008	0.000	0.002	0.011	0.012

(*Continued*)

Table BIII—*Continued*

Variable	Mean	25th Percentile	Median	75th Percentile	SD
E-index	3.201	3.000	3.000	4.000	0.913
Block holdings	0.109	0.000	0.073	0.166	0.134
Pension holdings	0.085	0.011	0.057	0.124	0.113
Stock ownership	0.458	0.294	0.453	0.624	0.259
Options	0.273	0.079	0.260	0.398	0.227
Overconfidence	0.396	0.000	0.000	1.000	0.489
Age	56.740	52.000	57.000	61.000	6.389
Tenure	18.653	9.000	16.000	28.000	11.485
Female	0.032	0.000	0.000	0.000	0.175

Appendix C: Tax Effects

We first consider the case in which the firm invests funds generated from domestic income (or repatriated foreign income). We then consider the case in which the firm invests unrepatriated foreign income. For each case, we begin by considering financial assets for which the corporation or individual investor can defer recognition of the taxable return for T years, for example, capital gains. We next consider financial assets that generate taxation each year on the return, for example, dividends or interest payments, though the investment horizon remains T years.[28]

A. Domestic: Deferred Gains Taxation

Let τ_D be the corporate distribution tax rate (e.g., dividend tax rate), τ_C be the corporate earnings tax rate, and τ_I be the individual investment earnings tax rate (e.g., capital gains rate). Consider a financial asset, the security, with its only gain realized at a horizon of T years with annual expected gross return R.

The future value of each (posttax) dollar within the firm that is immediately distributed to the individual investor and invested by the individual in this security is

$$(1-\tau_D)[\,R^T-(R^T-1)\tau_I]. \tag{C1}$$

In the brackets, the first term is the gross investment return and the second term is the taxes paid on the net return.

The future value of each dollar that the firm instead invests in the security for T years before distributing is

$$[R^T-(R^T-1)\tau_C](1-\tau_D). \tag{C2}$$

[28] For conciseness, we only consider investment gains. Investment losses may create additional tax advantages and disadvantages that are beyond the scope of this paper since such treatment would require a formal state-contingent model.

Table CI

Federal Tax Rules and Marginal Tax Rates for Financial Assets

This table reports the federal tax rules and marginal tax rates of the major risky asset classes we analyze. Note that interest on agency bonds is not taxable at the state level for both individuals and corporations. Interest on municipal bonds is not taxable for individuals if the state of residence is the same as the state of issuance and is not taxable for corporations if the state of incorporation is the same as the state of issuance. Interest on all other types of bonds is taxable at the state level for both individuals and corporations.

Type of Security	Type of Cash Flow	Type of Owner	Federal Tax Rule and Marginal Tax Rate
Equity	Dividend	Individual	Ordinary: same as short-term capital gain Qualified: same as long-term capital gain
		Corporation	• Domestic account: ordinary corporate income tax rate (35% maximum) with a 70% deduction for dividends from U.S. corporations (80% if own more than 20% of the dividend-paying U.S. corporation) • Foreign account: flows through Subpart F, so like domestic account
	Capital gain	Individual	Short-term (< 1 year): ordinary income tax rate (35% maximum in 2008 to 2012) Long-term (> 1 year): 15% maximum in 2008 to 2012
		Corporation	• Domestic account: ordinary corporate income tax rate • Foreign account: flows through Subpart F, so like domestic account
Agency bond	Interest	Individual	Ordinary individual income tax rate
		Corporation	• Domestic account: ordinary corporate income tax rate • Foreign account: flows through Subpart F, so like domestic account
	Capital gain	Individual	Same rates as equity
		Corporation	• Domestic account: ordinary corporate income tax rate • Foreign account: flows through Subpart F, so like domestic account
Municipal bond	Interest	Individual	Not taxable
		Corporation	• Domestic account: not taxable • Foreign account: flows through Subpart F, so like domestic account
	Capital gain	Individual	Same rates as equity
		Corporation	• Domestic account: ordinary corporate income tax rate • Foreign account: flows through Subpart F, so like domestic account
Corporate bond or other fixed income security (MBS, ABS, international, etc.)	Interest	Individual	Ordinary individual income tax rate
		Corporation	• Domestic account: ordinary corporate income tax rate • Foreign account: flows through Subpart F, so like domestic account
	Capital gain	Individual	Same rates as equity
		Corporation	• Domestic account: ordinary corporate income tax rate • Foreign account: flows through Subpart F, so like domestic account

The difference in future value between the firm investing, equation (C2), and the individual investing, equation (C1), is

$$(1-\tau_D)[(R^T-1)(\tau_I-\tau_C)]. \tag{C3}$$

If we assume that an individual facing marginal tax rate τ_I is the marginal investor, that is, the discount rate that makes the present value of equation (C1) equal to $(1-\tau_D)$, then the appropriate compounded risk-adjusted discount rate is

$$1+(R^T-1)(1-\tau_I). \tag{C4}$$

Using this discount rate, the present value of the difference between the firm investing and the individual investing is

$$\frac{(1-\tau_D)\left[\left(R^T-1\right)(\tau_I-\tau_C)\right]}{1+\left(R^T-1\right)(1-\tau_I)}. \tag{C5}$$

If the corporate tax rate and individual tax rate are equal, as in the case of short-term capital gains (both equities and fixed income), this present value is zero. Thus, there is no tax advantage or disadvantage of the firm investing in risky assets.

However, if the corporate tax rate is greater than the individual investment tax rate, such as the case of long-term capital gains on both equities and fixed income securities, there is a loss in present value when the firm invests rather than the individual. By taking partial derivatives, we can see that this loss is increasing in both the investment horizon and the riskiness (return) of the investment undertaken. Investing in low return, low risk assets, that is, the risk-free asset, minimizes this loss. The limit of this present value, equation (C5), as the riskiness or investment horizon goes to infinity is

$$(1-\tau_D)\frac{(\tau_I-\tau_C)}{(1-\tau_I)}. \tag{C6}$$

When the corporate tax rate is higher than the individual rate, the absolute value is the maximum loss the firm can create by investing in risky assets. With the tax rates from the numerical example in the main text, this maximum loss is 20% of the value that an investor would receive from an immediate distribution.

B. Domestic: Intermediate (Immediate) Gains Taxation

If the taxability of investment gains cannot be delayed to the terminal period, for example, investments in interest-bearing securities or dividend-paying stocks, the present value of the difference between the firm investing and the individual investing changes.

The future value of each dollar within the firm that is immediately distributed to the individual investor and invested by the individual in a security with gains taxed annually and then reinvested is

$$(1 - \tau_D)[1 + (R - 1)(1 - \tau_I)]^T. \tag{C7}$$

Taxes thus reduce the return each year, lowering the rate of compounding.

Similarly, the future value of each dollar that the firm invests in that security (with annual reinvestment) before distributing the proceeds to the individual in year T is

$$[1 + (R - 1)(1 - \tau_C)]^T(1 - \tau_D). \tag{C8}$$

If we assume that an individual facing a marginal tax rate τ_I is the marginal investor, then the appropriate compounded risk-adjusted discount rate is

$$\big(1 + (R - 1)(1 - \tau_I)\big)^T. \tag{C9}$$

Using this discount rate, the present value of the difference between the firm investing and the individual investing is

$$(1 - \tau_D)\left(\left(\frac{1 + (R - 1)(1 - \tau_C)}{1 + (R - 1)(1 - \tau_I)}\right)^T - 1\right). \tag{C10}$$

When the corporate and individual tax rates are equal, as in the case of fixed income interest, this present value is zero, meaning the two investment methods are equivalent. However, when the corporate tax rate is less than the individual tax rate, as in the case of U.S. dividends, this present value is positive, meaning firms can create value by delaying distributions and investing on the individual's behalf. This gain is increasing in both the rate of return (risk taken) and the horizon of the investment.

C. Foreign: Deferred Repatriation of Reserves

We now consider reserves held by foreign subsidiaries. To understand the consequences of investing foreign reserves, one must distinguish actual tax payments from the accounting recognition of these payments. Taxes on the earnings that are the source of these reserves are paid in the foreign jurisdiction at the time the revenue is earned. The difference between those taxes paid and the typically higher U.S. tax rate is owed upon repatriation.[29] U.S. companies often choose the *accounting* designation of PRE for reserves earned and held in their foreign subsidiaries. The delayed repatriation of the reserves, not the designation as PRE, alters the timing of the tax payments. The designation as PRE only alters the firm's accounting recognition of the additional U.S. taxes owed. Thus, when firms designate foreign reserves as PRE, they carry them

[29] If repatriation occurs in a period when a firm has an operating loss, this loss may be used to offset the repatriated foreign earnings.

on their books at their prerepatriation tax amount, ignoring the eventual tax liability due.

The investment of foreign reserves has a separate tax treatment from that of the principal and is unrelated to the designation of the principal as PRE. Foreign reserves can be invested in any kind of securities, both foreign and domestic. Importantly, realized earnings on such financial assets are almost always considered passive and are immediately taxable at the time of recognition, just as investment earnings on U.S.-based reserves are, at the level of the U.S. parent as "Subpart F" income, *regardless of the source of the investment*.[30,31] This taxation occurs regardless of the timing of the repatriation of the investment gains.

D. Foreign: Deferred Gains Taxation

We first consider the potential benefit or cost when the firm or investor is able to delay recognition of gains for T years. We continue with the same notation and assumptions as in the previous calculations. For obvious reasons, we only consider the case in which the foreign corporate tax rate, τ_F, is less than the U.S. corporate tax rate: $\tau_C > \tau_F$.

The future value of the firm immediately repatriating and distributing a *pretax* dollar of foreign earnings, and the individual investing it, is

$$(1 - \tau_F - (\tau_C - \tau_F))\{(1 - \tau_D)[R^T - (R^T - 1)\tau_I\ ]\}. \tag{C11}$$

The first part of equation (C11) is the taxation of the earnings: first foreign taxes are paid, and then U.S. taxes are paid with a credit for foreign taxes paid. The second part of equation (C11) is the distribution tax and investment earnings, which is identical to equation (C1).

The future value of the firm delaying repatriation and investing the reserves is

$$\{(1 - \tau_F)[R^T - (R^T - 1)\tau_C] - (\tau_C - \tau_F)\}(1 - \tau_D). \tag{C12}$$

The first part of this equation is the payment of foreign taxes. The next part represents the U.S. taxation of the investment income at the time of recognition as Subpart F income (identical to equation (C2)). The third part represents the eventual payment of U.S. taxes on the original earnings (principal) less the foreign tax credit. The last term is the distribution tax.

[30] Firms can avoid investment income being classified as Subpart F income if their foreign subsidiary is not classified as a controlled foreign corporation (CFC), by having less than a 50% stake in the subsidiary. Even if classified as a CFC, the investment income can avoid being classified as Subpart F income if (1) the CFC resides in a jurisdiction with a tax rate at least 90% that of the United States or (2) the investment income is less than the lesser of (a) \$1 million per year or (b) 5% of the total income of the CFC that year.

[31] For further information on the taxation of foreign reserves, see chapter 10 of Scholes et al. (2015).

The difference in future value between the firm investing, equation (C11), and the individual investing, equation (C12), is

$$(R^T - 1)(1 - \tau_C)(1 - \tau_D)(\tau_I - \tau_F). \tag{C13}$$

With the assumption that the marginal investor is the individual (discount rate is equation (C4)), we can calculate the present value of this difference as

$$\frac{\left(R^T - 1\right)(1 - \tau_C)(1 - \tau_D)(\tau_I - \tau_F)}{1 + \left(R^T - 1\right)(1 - \tau_I)}. \tag{C14}$$

By taking partial derivatives, we see this present value is increasing in magnitude in both the expected rate of return and the investment horizon. Furthermore, the limit of this present value with delayed recognition of gains as the horizon or expected return goes to infinity is

$$\frac{(1 - \tau_C)(1 - \tau_D)(\tau_I - \tau_F)}{(1 - \tau_I)}. \tag{C15}$$

The present value is positive when the foreign corporate tax rate is lower than the U.S. *individual* investment tax rate (τ_I), and negative otherwise.[32] This lower foreign tax rate occurs in the case of short-term capital gains, for which the U.S. individual and corporate tax rates are equal. However, for long-term capital gains, the U.S. individual tax rate is substantially lower than the corporate tax rate. Thus, the foreign rate may fall between the two ($\tau_C > \tau_F > \tau_I$), making the firm's investment of reserves in risky assets a negative NPV project. However, if the firms' reserves are in extremely low tax jurisdictions ($\tau_C > \tau_I > \tau_F$), investing in securities paying long-term capital gains can yield positive NPV.

E. Foreign: Intermediate (Immediate) Taxation of Gains

If the recognition of investment gains cannot be delayed as with dividends or interest, the conditions for investments being positive NPV change.

The future value of the firm immediately repatriating and distributing a *pretax* dollar of foreign earnings, and the individual investing it, is

$$\left(1 - \tau_F - (\tau_C - \tau_F)\right)\left\{(1 - \tau_D)\left[1 + (R - 1)(1 - \tau_I)\right]^T\right\}. \tag{C16}$$

The first part of equation (C16) is the taxation of the earnings: first foreign taxes are paid, and then U.S. taxes are paid with a credit for foreign taxes

[32] Since we assume that $\tau_C > \tau_F$ throughout, the condition for positive NPV is met if the U.S. corporate tax rate is less than the individual tax rate (e.g., U.S. equity dividends). As an aside, note that if $\tau_C < \tau_F$, the firm would most likely repatriate its foreign earnings immediately. Such immediate repatriation reduces the foreign reserve case to the already considered domestic reserve case, where the firm can create value by investing in risky financial assets whenever it has a lower tax rate than that of the individual.

paid. The second part of equation (C16) is the distribution tax and investment earnings, which is identical to equation (C7).

The future value of the firm delaying repatriation and investing the reserves in assets whose gains are recognized yearly and reinvested until distribution at the end of year T is

$$\left\{(1-\tau_F)\left[1+(R-1)(1-\tau_C)\right]^T-(\tau_C-\tau_F)\right\}(1-\tau_D). \tag{C17}$$

The first part of this equation is the payment of foreign taxes. The next part represents the U.S. taxation of the investment income at the time of recognition as Subpart F income, compounded annually. The third part represents the eventual payment of U.S. taxes on the original earnings (principal) less the foreign tax credit. The last term is the distribution tax.

The present value of the difference in future value between the firm investing, equation (C17), and the individual investing, equation (C16), discounted under the assumption that the marginal investor is the individual (equation (C9)) is

$$\begin{aligned}(1-\tau_D)\Bigg[(1-\tau_F)&\left\{\left(\frac{1+(R-1)(1-\tau_C)}{1+(R-1)(1-\tau_I)}\right)^T-1\right\}\\ -(\tau_C-\tau_F)&\left\{\left(\frac{1}{1+(R-1)(1-\tau_I)}\right)^T-1\right\}\Bigg].\end{aligned} \tag{C18}$$

The magnitude of this present value is increasing in both the rate of return and the investment horizon.

The present value is positive whenever the corporate tax rate is less than or equal to the individual tax rates, as is the case with interest payments, short-term capital gains, or U.S. equity dividends.

If the corporate tax rate is greater than the individual tax rate, as is the case for long-term capital gains, the sign of this present value depends on the foreign tax rate. The breakeven foreign tax rate is obtained by setting equation (C18) equal to zero:

$$\tau_F=\frac{\left\{\left(\frac{1+(R-1)(1-\tau_C)}{1+(R-1)(1-\tau_I)}\right)^T-1\right\}-\tau_C\left\{\left(\frac{1}{1+(R-1)(1-\tau_I)}\right)^T-1\right\}}{\left(\frac{1+(R-1)(1-\tau_C)}{1+(R-1)(1-\tau_I)}\right)^T-\left(\frac{1}{1+(R-1)(1-\tau_I)}\right)^T}. \tag{C19}$$

One can see that the foreign tax rate must be strictly (and often much) smaller than the individual tax rate to create a tax benefit for investing in risky financial assets. For instance, with the given tax rates on long-term capital gains, an investment of five years, and a rate of return of 10%, the foreign tax rate must be less than 11.54% for the corporate investment to have a positive present value; with a 10-year horizon, this breakeven tax rate falls to 6.55%. This breakeven rate is decreasing in the investment horizon and expected rate of return. For a large enough value of either (e.g., 10 years with a 20% rate of return), there is no positive foreign tax rate that creates a tax advantage for the firm to delay repatriation in order to invest in financial assets. The intuition is that the delayed taxation of the principal from foreign reserves offsets the tax disadvantage of the gains being taxed at the higher U.S. corporate rate.

F. Potential Changes Tax Code Changes

The preceding argument relied on the assumption of constant corporate tax rates. If corporations expect tax rates to fall in the future, their incentives to invest in risky securities increase only in some cases.

If they expect corporate tax rates to fall on all sources of earnings, then the corporations will have increased incentives to invest in risky securities with gains whose recognition can be deferred until after the tax decrease. However, their willingness to invest in securities that accrue taxable gains in the interim, for example, bonds and dividend-paying stocks, will remain unchanged as they will incur taxation on those gains at the current rate. After the tax reduction, firms may choose to invest in riskier securities with intermediate gains.

If corporate tax rates on all earnings remain constant, but firms expect another repatriation tax holiday, firms have no incentive to increase their investments in risky securities. The intuition is that the repatriation tax holiday reduces the tax liability on the principal of their investments (the unrepatriated foreign earnings), but does not reduce the tax liability on their investment gains, which qualify as subpart F income.

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Supporting Information

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Appendix S1: Internet Appendix