Aggregate corporate liquidity and stock returns*

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Abstract

Aggregate investment in cash and liquid assets as a share of total corporate investment negatively predicts U.S. stock market returns between 1947 and 2003. The share of cash in total investment is a more stable predictor of returns than scaled price variables and performs well in out-of-sample predictability tests. Increases in cash are uncorrelated with planned increases in investment and current or lagged changes in profitability, but are negatively related to other known predictors that are positively related to subsequent returns. Cash investment is a stronger predictor of market returns in years in which external financing is also high. The results support a theory of active market timing, in which cash accumulation is the consequence of overvalued firms issuing external finance that cannot be spent productively and which they do not immediately return to investors.

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This paper studies the relation between aggregate corporate investment in cash and liquid assets and subsequent market returns. Cash has a dual role on corporate balance sheets. On the one hand, firms may accumulate cash to take advantage of investment opportunities as they come along, without having to rely on costly external capital markets (Holmstrom and Tirole (1998, 2000), Opler, Pinkowitz, Stulz and Williamson (1999), Almeida, Campello, and Weisbach (2003)). On the other hand, changes in cash may just be a sideshow: the difference between funds that firms raise and the funds that they spend on productive assets. If corporate financing activity is not perfectly correlated with investment opportunities, firms that raise external funds without investing will accumulate cash (Greenwood and Jenter (2004). If the price at which firms can raise capital varies significantly, changes in cash should be linked with future stock returns.

There is substantial evidence that corporate financing activity is not driven entirely by investment opportunities, but rather by managers' motivation to time equity and debt markets. Ritter (1991), Loughran and Ritter (1995), and Speiss and Affleck-Graves (1995) find low returns after initial and seasoned equity offerings. Baker and Wurgler (2000) find that when the share of equity issues in total new equity and debt issues is high, subsequent market returns are low. These findings also carry over to debt markets. Baker, Greenwood, and Wurgler (2003) find that when the term spread is high, the maturity of new debt issues is low and subsequent bond returns are low. Richardson and Sloan (2003) show that returns are low following *both* equity and debt issues.

Although financial economists have devoted considerable attention to the relation between financing choices and subsequent returns, not much is known about the way these funds are spent, or whether the use of funds raised in external capital markets bears any relation to subsequent returns. I use data reported in the Federal Reserve *Flow of Funds* to construct a measure of aggregate corporate investment in cash and financial securities. The main result is that this measure is significantly negatively related to subsequent equity market returns. Put simply, firms raise cash prior to episodes of low market returns, and spend cash prior to episodes of high returns. In terms of simple univariate predictive power, the cash investment share is a more stable and more powerful predictor of future market returns than the dividend price ratio, the aggregate book-to-market ratio, and the share of equity issues in total equity and debt issues.[1] Its ability to predict returns remains even after controlling for known predictors of market returns, and for financing and investment variables such as the equity share in total equity and debt issues and changes in planned investment. It significantly reduces the explanatory power of these variables for future stock market returns.

I next relate the predictive ability of cash investment to the original source of cash. That is, I ask whether the low market returns observed after increases in cash coincide with periods in which the corporate sector also raised significant external financing. I find that the predictive ability of the cash investment share is stronger during years in which firms also raised a large amount of external finance, or when the share of equity issues in total debt and equity issues was high. Put simply, subsequent returns are lowest when firms both raise external funds and accumulate cash.

Cash investment joins a crowded arena of stock market return predictors. The emergence of any variable that successfully predicts 57 years of returns, *in-sample*, should be regarded with a certain amount of skepticism. I consider the two common criticisms levied against predictive variables. First, the first-order asymptotics used in significance tests are poor approximations in

[1] See Campbell and Shller (1988) for the dividend-price ratio, Kothari and Shanken (1997) for the aggregate book-to-market ratio, Baker and Wurgler (2000) for the equity share, and Lamont (2000) for planned investment.

finite samples when the predictive variable is highly persistent (Mankiw and Shapiro (1986), Stambaugh (2000), Nelson and Kim (1993), Lewellen (2002)). Second, predictive variables are typically selected for their ability to successfully account for the *in-sample* variation in stock returns and may be of little use in *out-of-sample* forecasting (Ferson and Sarkissian (2003), Stambaugh (2000), Goyal and Welch (2003), and Lewellen and Shanken (2002)). My cash investment variable shows a low degree of autocorrelation, such that conventional t-tests will lead to correct inference. However, even if one accounts for the correlation between innovations in my predictor variable and returns, the results remain virtually unchanged. I also examine the out-of-sample predictive power of the cash share by comparing its forecasting ability to the forecasting ability of a model in which expected returns are constant. The cash investment share performs well as an out-of-sample predictor.

An important question is whether my results are consistent with efficient capital markets. An efficient markets explanation of these results has two distinct features. First, it must explain why expected returns are rationally low following increases in corporate liquidity. Second, it must explain why firms optimally, or accidentally, accumulate cash prior to low market returns. A seemingly plausible story that satisfies both criteria says that both changes in cash holdings and low subsequent returns are driven by increases in planned investment. The mechanism is as follows. When the discount rate falls, firms increase planned investment and future stock returns fall. Because of lags in the investment process, firms raise funds and build up cash before the actual spending. Lamont (2000) collects data from the Commerce Department on aggregate investment plans and shows that this variable is significantly negatively related to subsequent returns. Consistent with this explanation, I find that cash is negatively correlated with other variables that are positively related to subsequent market returns, such as the dividend-price ratio

(Campbell and Shiller, 1988), the aggregate book-to-market ratio (Kothari and Shanken, 1998), and the cross-sectional price of risk (Polk, Thompson and Vuolteenaho, 2003). I also find that firms increase investment plans *after* raising cash. However, this explanation has two further distinct predictions, both of which I reject. First, increases in cash should at least be associated with lagged or current increases in planned investment, neither of which holds. Second, the cash investment share should lose its predictive ability, after controlling for investment plans, itself a powerful predictor of future market returns (Lamont, 2000). On the contrary, the cash investment share is a significant predictor of equity returns in both univariate and multivariate specifications, and even retains its predictive ability for stock returns after controlling for a set of leads and lags of investment and planned investment.

I consider a second more mechanical explanation. By reducing net debt, increases in cash reduce aggregate leverage and correspondingly lower expected returns on equity via a Modigliani and Miller (1958) effect. This explanation can be firmly rejected on the grounds that time series variation in cash balances does not contribute significantly to changes in overall corporate leverage.

Although the results are not consistent with either of these two simple corporate finance explanations, one could construct more complicated stories that link corporate holdings of liquid assets to future expected stock returns. The trouble is that these theories must also explain why investors *expect* lower returns following accumulation of cash. At the very least, any rational model is likely to imply positive expected returns for any value of the predictive variable. I follow the approach in Fama and Schwert (1977), Fama and French (1988), Kothari and Shanken (1997), and Baker and Wurgler (2000) and ask whether the data predict negative returns, or returns lower than the risk-free rate. Using the full sample of data, the model predicts eight years of negative expected real returns, and eight years of negative expected excess returns. Curiously, realized (excess) returns turn out to be negative in six (five) of these years. In several of these cases, I reject the null hypothesis that predicted returns are positive.

Although one can stop at the question of whether the results are consistent with market efficiency, it is worthwhile to distinguish between alternate explanations. The first theory I consider is that the relationship between cash holdings and subsequent returns represents inefficiency on the part of investors, but not opportunism on the part of managers. This works as follows. Optimistic managers raise money for investment, only to realize that opportunities have disappeared. They therefore accumulate cash in the short-run. If investors are unable to recognize this at the moment when the cash is accumulated—perhaps believing that investment has been delayed rather than cancelled—then subsequent returns will be negative as the news about declining opportunities is released. In this theory, cash acts as a sideshow: cash holdings should be temporarily high when actual investment is lower than planned investment. Empirically, cash holdings and returns should be negatively related to the difference between actual investment and planned investment. The data contradict this prediction: cash holdings are unrelated to the difference between actual and planned investment, and also unrelated to the lagged difference between actual and planned investment. Moreover, controlling for the entire set of leads and lags of investment and planned investment does not eliminate the predictive ability of the cash share.

This leaves a final explanation, in which changes in aggregate cash holdings are the consequence of overvalued firms issuing external finance that they cannot spend productively. Since I rule out the possibility that managers *planned* to spend the funds productively, it implies that managers issued funds without intending, in the short-run, to invest those funds in hard assets. Thus the accumulation of cash represents a form of arbitrage: when physical capital is overvalued, firms purchase liquid assets. When valuations of physical capital are low, managers spend cash. The motivation for this behavior is straightforward and intuitive. Managers generally prefer internal finance, but access capital markets when prices are temporarily advantageous. When external capital is expensive, cash raised during good times acts as a buffer.

The market timing theory is supported by three facts. First, the cash investment share is a stronger predictor of returns during years in which external financing was also high. Second, firm-level evidence in Greenwood and Jenter (2004) confirms that most cash on corporate balance sheets can be traced to the proceeds of equity issues, confirming the broad intuition of the market timing theory. Third, to the extent that I can measure investment plans, changes in cash cannot be fully explained by lags in the investment process. Thus the data offer little evidence that managers planned to spend the money they raised and kept in cash.

The results in this paper have some implications for models that link asset prices to aggregate liquidity demand (e.g. Diamond (1997), Holmstrom and Tirole (1996, 1998, 2001), Aiyagari and Gertler (1991). Holmstrom and Tirole (1998) develop a model in which firms hold liquid reserves to protect against the risk that they must terminate a project midstream even though it has positive continuation value. The amount of liquid reserves is determined by the tradeoff between the benefits of a higher initial investment and the costs that would be incurred should the project be terminated early. The key insight from these models is that corporate liquidity acts as insurance for missed investment opportunities during bad times. It is difficult to square my results with this general message, since I find that liquidity is high before market declines. Holding constant the discount rate, one might expect the opposite: liquidity should decline before low stock returns because the market has reduced its assessment of investment opportunities, which in turn reduces optimal liquid asset holdings. The apparent contradiction can be reconciled if one allows for exogenous and possibly irrational variation in the cost of external capital. Thus, even if the primary motivation for holding liquid assets relates to insurance for missed opportunities, firms will hold more if those funds can be acquired cheaply, and less if those funds are excessively expensive.

The paper proceeds as follows. Section I describes the basic data. Section II examines the time series determinants of aggregate cash investment. Section III analyzes the relationship between corporate investment in cash and subsequent market returns. Section IV considers statistical issues. Section V asks whether the results are consistent with efficient markets, and discusses various other explanations. Section VI concludes.

I. Data

A. Changes in cash and other forms of corporate investment

I set out to construct a measure of the fraction of total corporate investment committed to the accumulation of cash. After collecting profits, paying taxes and dividends, and raising external financing in equity and debt markets, firms must allocate funds between a variety of possible investment activities. They may invest in working capital, fixed capital such as land, plant or equipment, or they may keep these funds in cash.[2] Aggregate corporate level data obey the identity

$$Profits - Dividends + e + d = \Delta WC + \Delta Fixed + \Delta C + \Delta Other \qquad (1)$$

[2] Research and Development may be considered a form of investment but as it comes out of corporate profits, I am unable to adjust for it in the *Flow of Funds* data.

where *e* denotes equity issues, *d* denotes net debt issues, *ΔWC* denotes increases in working capital, *ΔFixed* denotes increases in fixed assets, *ΔC* denotes increases in cash, and *ΔOther* is a residual term. Note that this identity does not hold at the firm level, where mergers and acquisitions for stock significantly complicate the decomposition.

I define internal funds as profits net of dividends, and total sources of investable funds as internal funds plus equity and debt issues. I then define my variable of interest, the cash share, as the change in cash and liquid assets, divided by total sources. Intuitively, this is the share of corporate funds that managers do not invest or return to shareholders.

I collect data on each of the items in (1) from Table L102 and F102 in the Federal Reserve Board's *Flow of Funds* accounts between 1945 and 2001.[3] These tables list the level and changes in financial assets and liabilities of nonfarm nonfinancial corporate business in the United States.

Table I summarizes the main data. Internal funds (*y*) are profits net of dividends scaled by total sources. The table shows that in a typical year, internal funds finance 74 percent of corporate investment. This number varies dramatically over the time series, from a minimum of 54.10 percent in 1973 to a maximum of 108.77 percent in 1991. Surprisingly, net equity issues are only 2.6 percent of total investment in the typical year, while debt issues typically finance 25 percent of investment. The low average share of equity is because the Flow of Funds appropriately nets out equity repurchases and retirements.

I define the level of cash holdings (*C*) as checkable deposits and currency, plus time and savings deposits, plus money market mutual fund shares, plus short-term security repurchase

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[3] L102 contains levels and F102 contains flows. For balance sheet variables, flows are equal to the change in the level.

agreements, plus commercial paper.[4] I exclude foreign deposits, holdings of U.S. Treasury securities, and holdings of U.S. government agency securities. I exclude foreign deposits because I expect them to be linked to the liquidity needs of offshore subsidiaries. Ideally one would include holdings of U.S. Treasuries because they are liquid financial assets that are heavily used by U.S. corporations, especially in the early part of the sample. However, I exclude them because they introduce severe distortions between 1945 and 1950, when U.S. business received tax refunds in the form of wartime bonds. More importantly, this component of liquid assets is of declining importance during the sample period as most corporations now hold professionally managed money market accounts. Appendix A provides more detail on the share of each of the components of liquid assets, and replicates the main results using various alternative measures of cash investment.

Panel A of Figure 1 plots the time series of aggregate cash holdings on a log scale. The series displays a strong upward trend, consistent with a growing transactions demand for cash as the economy grows. I also plot the time series of cash deflated by the Consumer Price Index (CPI) of that year. This series also shows a strong upward trend, though there appears to be significantly more variation in the year-on-year changes.

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[4] Levels are computed based on flows from the Table F102 in the Flow of Funds. The *Guide to the Flow of Funds Accounts* provides a detailed description of the sources of each of these components. Checkable deposits are cash and demand deposits in the U.S., multiplied by the most recent benchmark ratio of cash held by nonfarm nofinancial corporations reported in the Internal Revenue Service *Statistics of Income* Source Book. Time and savings deposits are calculated similarly and do not include foreign deposits. Money market mutual fund shares come from the Mutual Fund Fact Book, Section 5, Institutional Investors, table Assets of Fiduciary, Business, and Institutional Investors in Taxable Money Market Funds, Business corporations; plus table Assets of Fiduciary, Business, and Institutional Investors in Tax-exempt Money Market Funds, Business corporations. Commercial paper includes commercial and finance company paper of U.S. issuers, multiplied by the most recent benchmark ratio plus the ratio of total assets of nonfarm nonfinancial corporations in the service industry reported in the Sources of Income Source Book, Corporation Income Tax Returns, Returns with and without net income, table Services , line 2, Total assets, to QFR, table 16.1. All variables except for money market shares are also available in the Quarterly Financial Review, in Tables 16.1, 16.1, and 45.1.

The cash investment share (*ΔC/Sources)* is defined as the change in the level of cash divided by total sources of funds. Panel B of Figure 1 plots the time series of this measure. The series shows a high degree of variation and low persistence. Changes in cash appear particularly high in 1973 before the CRSP value-weighted portfolio fell by 28 percent in 1974. Cash balances were again high during the late 1990s before the market declined between 2000 and 2002. The figure also plots alternate time-series measures of cash investment, including the percentage change in nominal cash balances and the percentage change in CPI deflated cash balances. These series show a high degree of correlation with the main series. Note that although nominal cash investment is rarely negative, real cash investment frequently drops below zero during high inflation years (e.g. 1946, 1975, 1979 and 1980).

Panel B and Panel C of Table I summarize these cash investment variables. In a typical year, about 4 percent of corporate investment is in cash, though it ranges from –1.95 percent to 11.58 percent. In percentage terms, nominal cash holdings increase by an average of 6.96 percent per year, or 2.8 percent in real terms.

For comparison, I construct an alternate series of aggregate cash investment using firm-level data from Compustat. I measure the change in cash balances of firms with fiscal years between June and December and aggregate these changes each year to form a time series. The advantage of this data is that it is entirely publicly traded firms, thus eliminating any concern that my results are picking up an IPO effect.[5] However, this advantage is offset by its relatively short time series coverage (1964-2001). Whatever its merits, the Compustat variable behaves similarly to the Flow of Funds measure of cash investment. Percentage changes in cash are 55

[5] There is some concern that firms raise significant amounts of cash during their IPO. If the Flow of Funds does not include the firm in its aggregate series until after the IPO, there is a risk that my predictability results are picking up a "hot markets" IPO effect rather than a pure cash effect. This is not an issue in Compustat because I compute changes in cash holdings at the firm level, conditional on each firm being listed in Compustat the previous year.

percent correlated with the equivalent Flow of Funds measure between 1964 and 2001. A discussion of the advantages of the Compustat data and detailed description of the construction of this variable are left for the Appendix.

There are two caveats on data construction. First, the *Flow of Funds* levels data are only available beginning in 1945. In an effort to collect a longer time-series, however, I obtain data from an early attempt by the Federal Reserve to construct the *Flow of Funds* between 1939 and 1944. This provides an additional 6 observations.[6] The drawback of these data is that cash holdings are not disaggregated between different classes of liquid assets to the same extent as later publications. Therefore, it is not possible to construct an identical measure of the change in cash and I do not include it in my main tests. However, in unreported results I find that the basic predictability holds in the extended sample.

Second, before 1974, the Flow of Funds relies on original SEC data for aggregate checkable deposits and corporate holdings of government liabilities. In 1975, the data source was changed to IRS. This year coincides with the middle of my sample. The reader should bear in mind that split sample results serve two purposes: to verify parameter stability and to demonstrate that the change in the original data source did not significantly affect the performance of my predictive variable.

B. Other predictors and controls

My tests also require data on investment and other well-known predictors of stock returns. I collect the dividend yield (Campbell and Shiller (1988), Fama and French (1988)) for both the CRSP value-weighted (*D/P* VW) and equal-weighted (*D/P* EW) portfolios. Kothari and

[6] Page 96, Flow of Funds in the United States, 1939-1953, Board of Governors of the Federal Reserve System, Published December 1955.

Shanken (1997), Pontiff and Schall (1998) and Vuolteenaho (2000) analyze the aggregate book-to-market ratio (*B/M*) as a predictor of stock returns. I follow Kothari and Shanken (1997) and construct the book-to-market ratio for the Dow Jones Industrial Average between 1945 and 2001. Baker and Wurgler (2000) show that the equity share in total equity and debt issues is a good predictor of market returns between 1928 and 1997. I collect the equity share (*S*) from Jeffrey Wurgler's web page.

I also collect a measure of investment plans, both as a control and because it has been shown to be a good predictor of stock returns. Lamont (2000) shows that investment plans, collected from a U.S. government survey of firms, are informative measures of expected investment and have substantial forecasting power for excess stock returns. The bottom four lines in Panel D summarize his measures of investment (g), planned investment ($\hat{g}$), and the change in the ratio of corporate profits to GDP ($\Delta profits$).[7]

Finally, I obtain estimates (λ^{SRC}) of the equity premium from Polk, Thompson and Vuolteenaho (2003). They perform repeated cross-sectional regressions of valuations ratios on beta. They show that the slope of this regression – the cross-sectional price of risk – is also a significant predictor of future stock returns.

The last panel of Table I summarizes data on stock returns, interest rates, and inflation. I collect one-year-ahead returns on the CRSP value-weighted (R_{t+1} CRSP VW) and equal-weighted portfolios (R_{t+1} CRSP EW). I alternately calculate stock returns net of inflation or net of the annualized return on short-term Treasury bills (unreported), although I use the former primarily. The risk-free return (*BILL*) is measured net of inflation, the term spread (*tspread*) is

[7] One might question whether this is the right measure of corporate profitability. I create a second measure from the *Flow of Funds*, defined as the ratio of nonfinancial corporate profits to beginning-of-year balance sheet assets. This measure is 92% correlated with my baseline measure between 1949 and 1993, and performs similarly in all of the tests that follow.

the difference between the December yield on the long-term government bond and the short-term Treasury bill, and inflation (π) is the percentage change in the Consumer Price Index.

II. The time series determinants of cash accumulation

Before I analyze the relationship between the cash share and subsequent returns, in this section I examine the basic properties of the time series of cash investment. This is an important task because most theories of cash holdings relate optimal liquid asset holdings to time-varying investment opportunities, not time varying discount rates. Therefore, I check whether these theories can account for any of the time series variation in corporate cash investment. To organize the analysis, I connect theories of cash holdings that have been previously applied at the firm-level to the time series. Readers only interested in the predictability results may skip to the next section.

First, I check whether cash holdings vary mechanically with other sources or uses of investment funds. If, for example, equity issues and cash balances were highly correlated, then one could question whether the mechanical relation between equity issues and cash drives the time-series relationship that I document between the cash investment share and subsequent returns. By definition, the cash share is related to the other investment shares by the identity between sources and uses of funds in (1). What is relevant for this study is not whether the other investment shares *jointly* explain the cash share – which must be true by definition – but whether any one of the other variables *individually* accounts for most of the variation in cash. Table II shows the results of time series regressions of changes in cash on corporate profits, equity issues, debt issues, changes in working capital, and changes in fixed investment. Each of these variables is standardized to zero mean and unit variance. The residual represents net investment not in working capital, fixed assets, or cash. As expected, the table shows that the share of investment in cash is negatively related to the other shares. However, the other investment variables fail to account for even 10 percent of the time series variation in cash. In specification (2), I also include the share of external financing in total investment (equity and debt issues/ total investment) with similar results.

I next proceed with theoretically motivated determinants of the time-series of changes in cash. I follow Opler, Pinkowitz, Stulz and Williamson (1999) and consider three broad theories of cash holdings: The transactions costs model, agency-based models, and information models. The transactions costs model of cash holdings says that in equilibrium, the benefits of holding cash for transactions are offset by the costs of holding the cash. The benefits of an additional dollar are straightforward. Liquid assets can finance investments when external funding is expensive, or when there are fixed costs associated with the use of external capital markets. Thus firms may accumulate cash to finance current transactions, or as a precaution for future transactions (Keynes (1936)). The costs of holding cash include interest paid and investment opportunities foregone. The transactions costs model therefore implies that cash holdings should increase when cash flows or investment opportunities are volatile, or when raising debt or equity is expensive, and should decrease with the ease of selling assets, and with interest rates and the term structure. In the time series, one would expect changes in cash to be high when interest rates or inflation are low, or when equity or debt prices are high.

Table II shows the results of time-series estimations of changes in nominal cash holdings on inflation, and the nominal short-term return. Specification (3) shows that changes in cash are insignificantly negatively related to inflation and the real short-term rate. Controlling for the other forms of investment funds strengthens this relation somewhat (specification 4), though the relationship remains statistically insignificant.

Table II also shows the results of time-series estimations of changes in cash holdings on instruments for the level of asset prices. The transactions costs model implies that if raising external finance is costly, cash balances should be high. Therefore, changes in cash should be positively related to variables that have a positive relationship with subsequent returns. Table II considers four candidate predictors for stock returns. The aggregate book-to-market ratio and dividend-price ratio are both positively related to subsequent returns. The table shows that, contrary to the predictions of the transactions costs model, they are negatively related to changes in cash, though insignificantly. Similarly, the equity share (S) and planned investment ($\hat{g}$) both negatively predict subsequent returns but are positively related to changes in cash. Finally, I construct a composite predictor using the predicted returns from a regression of CRSP value-weighted returns on the lagged dividend-price ratio, the lagged book-to-market ratio, the equity share, and planned investment. Changes in cash are negatively related to this predictor, inconsistent with the transactions costs model.

The second class of theories I consider is related to information asymmetries associated with debt. Myers and Majluf (1984) argue that information asymmetries make outside funds more expensive. The cost of raising outside funds increases as the securities sold are more information sensitive. Myers and Majluf argue that because information asymmetries vary over time, managers may find it valuable to build up cash when the asymmetries are small. In a dynamic setting, Holmstrom and Tirole (1998) show that firms hold liquid reserves to protect against the risk that a project must be terminated midstream even though it has positive continuation value. The amount of reserves is determined by the tradeoff between the benefits of a higher initial investment and the costs that would be incurred should the project be terminated early. To connect these predictions to the time series, I study the relation between changes in cash and indicators of business cycle activity, under the assumption that information asymmetries worsen during recessions.[8] The table shows that changes in cash are unrelated to lagged or current measures of corporate profits, and are uncorrelated with current indicators for recessions. However, firms tend to spend cash (one year) in advance of recessions. This last result, although not statistically significant, is at-odds with the theory, since one would expect firms to accumulate cash in preparation for the worsening information asymmetries during the recession.

Finally, I consider agency models. When the interests of shareholders differ from those of debtholders, leveraged firms may find it difficult to raise additional funds because the benefits will accrue to the existing debtholders (e.g. Myers (1977)). The basic predictions of these models are the same as asymmetric information models: managers hope to avoid situations where they cannot raise funds to invest in positive NPV projects. Controlling for the cost of raising outside funds, firms should invest in cash when investment opportunities are higher. The final specifications of Table II look at the time series relation between cash investment and subsequent investment. The results show that changes in cash are uncorrelated with current and future planned investment.

The bottom line of this analysis is that changes in the costs or benefits of cash holdings that might come out of a transactions theory, or an agency or asymmetric information theory of cash holdings, have very little ability to explain time series variation in cash investment. The only variables that come out of Table II as having any explanatory power at all are related to

[8] See for example Bernanke, Gertler, Gilchrist (1996).

future market returns, and in a direction opposite to what would be predicted by a transactions cost theory. The next section asks whether cash investment has any predictive power for returns beyond these known predictor variables.

III. Cash accumulation and subsequent market returns

This section describes the predictive power of the cash investment share for market returns. First, I show that firms raise cash prior to low market returns, and spend cash prior to high returns. One might expect this to be true given that the cash investment share lines up with other predictors of subsequent returns, but I show that cash retains its predictive ability even after controlling for these other variables. I then show that the predictive ability of cash is stronger in years during which firms raise significant external financing. Finally, I replicate the basic predictability results using an alternative measure of cash accumulation computed with Compustat data.

A. Cash investment as a predictor of market returns

Firms tend to raise cash prior to low market returns, and spend cash prior to high returns. Figure 2 shows average calendar year real returns on the market portfolio following years of high or low cash accumulation. I split the sample of 56 years into quintile according to the cash share in the previous year. As before, I define the cash share as the change in cash holdings divided by total sources of corporate funds. Panel A shows these results for subsequent returns on the CRSP value-weighted and equal-weighted portfolios. In the year after the bottom quintile cash share, the average one-year real return is 21.13 percent (31.89 for the equal weighted portfolio, and 49.28 percent for two-year buy-and-hold value-weighted returns, not shown on the figure) compared with –3.16 percent (-2.6 percent for the equal weighted portfolio, and –1.94 percent for two-year buy-and-hold value weighted returns, not shown on the figure) for the year after the top quartile cash share.

Panel B shows these results sorting by an alternate definition of the cash investment share. In the year after the bottom quintile cash share, the average one-year real return is 22.6 percent compared with –6.57 percent for the year after the top quintile cash share.

Table III shows the results of univariate time-series regressions of stock returns on the prior-year cash share

$$R_t = a + bX_{t-1} + u_{t+k} \qquad (2)$$

Panel A presents the results for each measure of cash investment. In the first four lines, the independent variable is the change in nominal cash holdings, divided by total sources of funds. This variable is a strong predictor of value-weighted stock returns between 1947 and 2003 and separately in both the 1947-1974 and 1975-2003 subsamples. Note the degree of parameter stability over the different periods. In the first half of the sample, a one standard deviation increase in cash is associated with a fall in real market returns of 8.06 percent, while in the second half, a one standard deviation increase is associated with a fall in real market returns of 8.93 percent. The cash share explains a substantial degree of the time series variation in returns, with an R^2 of 0.21 in the full sample, and 0.17 and 0.29 in the two subsamples.

The second line of Panel A repeats this regression for the CRSP equal-weighted portfolio, with similar results: a one standard deviation increase in the cash share is associated with 10.83 percent lower real returns on the equal-weighted index.

The next four lines of results show the results of univariate regressions using alternate definitions of the cash share. I first calculate the percentage change in nominal cash balances.

This proves to be a successful predictor of stock returns on the equal-weighted and value-weighted portfolio. I then calculate the percentage change in CPI deflated cash balances. This also turns out to be a successful predictor of stock returns, though the statistical significance weakens in the second half of the sample. Note that these slightly weaker results appear to be driven by two high unexpected inflation years (1946 and 1981). If these two years are removed from the sample, the results remain as before.

The remainder of Table III compares the ability of cash as a predictor of stock returns to the predictive ability of previously known variables, and some others. I start with corporate finance predictors related to the sources of investment funds. The first variable, net external financing, is the sum of equity and debt issues divided by total sources of corporate funds. The converse of this variable is the share of sources supplied by corporate profits net of dividends. Although this variable has not been used before to predict equity returns, it is closely related to the equity share in total equity and debt issues.[9] The table shows that net external financing is a somewhat successful predictor of stock returns, though only at the beginning of the sample. One might expect this predictability to be driven by equity issues, but the next two lines of Panel B show this not to be the case. Net equity issues, scaled by total sources, are insignificantly related to future stock returns. The final variable I consider in Panel B is the equity share (S) from Baker and Wurgler (2000). This is a very strong predictor of returns in the first half of the sample but is statistically unrelated to stock returns between 1975 and 2002.

Panel C repeats the exercise of Panel B with other more common predictors of stock returns. I start with the Lamont (2000) planned investment variable ($\hat{g}$). I use February measures of this variable to predict returns between January and December of the same year.

[9] These two series are 53 percent correlated between 1946 and 2002.

Planned investment is a strong predictor of returns between 1947 and 1974, and a somewhat weaker predictor between 1975 and 2002.

The aggregate book-to-market ratio is positively related to subsequent returns, though the parameter estimates do not appear to be stable across the two subperiods. Moreover, it is only statistically significant between 1947 and 1974, or for equal weighted returns between 1975 and 2002. The next four lines show that the dividend-price ratio performs better as a predictor of returns, though parameter estimates are again not stable across the two subperiods. I also study the predictive ability of a cross-sectional estimate of the equity premium λ^{SRC}, from Polk, Thompson and Vuolteenaho (2004). This variable has some success predicting returns early in the sample but is not successful in the second half. Finally, I check the predictive ability of the lagged risk-free return (*BILL*). This variable has a negative relationship to subsequent returns in the first half of the sample, but not related to returns after that.

To summarize the univariate results, with the exception of the Lamont (2000) planned investment variable, cash investment share is a stronger and more stable predictor of stock returns than scaled price variables. It is also a stronger and more stable predictor of returns than measures of aggregate external financing activity, such as the equity share or the share of equity and debt issues in total financing.

B. Multivariate results including other known predictors

This section studies the incremental predictive power of cash investment over other known predictors of returns, considered individually in Table III.

Table IV shows the results of the regression of CRSP value- and equal-weighted returns on changes in cash, and other predictors of stock returns

$$R_t = a + b_1 X_{t-1} + Z_{t-1} B_2 + u_t \qquad (3)$$

where X denotes the cash investment share, defined as the change in aggregate cash balances scaled by total sources of funds. Z denotes the set of control variables, including external financing (*(e+d)/Sources*), the equity share in new issues (*S*) from Baker and Wurgler (2000), planned investment ($\hat{g}$) from Lamont (2000), the book-to-market ratio of the Dow Jones Industrial Average (*B/M*), the dividend-price ratio (*D/P*), the cross-sectional price of risk (λ^{SRC}) from Polk, Thompson and Vuolteenaho (2004), and the lagged annual return on treasury bills (*BILL*).

The left hand panel of Table IV shows these results estimated on the CRSP value-weighted portfolio. The first specification includes only the cash share and a measure of external financing. Measuring net external financing (*(e+d)/Sources*) as net equity plus net debt issues scaled by total sources, I find that this variable has partial incremental ability to predict stock returns, though the coefficient is not statistically significant. The coefficient on cash falls slightly to –7.62 compared with –8.31 from the univariate regression in Table III. The next specification adds the equity share, and finds that this has incremental ability to predict stock returns on the value-weighted portfolio. Specification (3) adds the Lamont (2000) investment plans variable, which comes in significantly as a predictor of stock returns. The next four specifications show that out of the aggregate book-to-market ratio, the dividend-price ratio, the cross-sectional price of risk, and the lagged treasury bill return, only the dividend-price ratio and the cross-sectional price of risk add to the explanatory power of the cash share, and insignificantly. Finally, I perform the kitchen sink regression with all predictors. Only the cash investment share and the Lamont planned investment variable come in with any explanatory power.

The second panel of Table IV repeats these regressions for the CRSP equal-weighted portfolio. As before, cash retains incremental predictive ability for stock returns, even after controlling for all of the known predictors.

C. Cash and external finance

I next relate the predictive ability of cash investment to the original source of cash. That is, I ask whether the cash investment share is an unconditionally good predictor of stock returns, or whether its predictive power is stronger during years in which firms raised more external funding. Intuitively, for a market timing theory of cash balances to be correct, it must be true that cash accumulation before low market returns is accompanied by heavy issuance of external finance.

To take a first look at this prediction, I sort the 56 years of data into two groups by the prior-year cash investment share. I then sort each set of observations by the share of external finance in total investment. The external financing share is defined as the sum of equity and debt issues divided by total investment. Figure 3 plots the time series averages of returns for each of these four groupings.

Panel A shows average one-year ahead returns for the CRSP value-weighted and equal-weighted portfolios. When both the cash investment share and the external financing share are low, subsequent real returns average 18.4 percent (24.7 percent equal-weighted). When both are high, subsequent real returns average –1.9 percent (-3.65 percent equal-weighted). The figure shows that the difference in average returns between high cash investment share years and low cash investment share years is greatest when external financing is high. Similarly, the figure shows that the difference in average returns between high external financing years and low external financing years is greatest when the cash investment share is high. In summary, subsequent returns are lowest when both external financing and the cash investment share are high.

Panel B shows average one-year ahead returns sorting on an alternate measure of cash accumulation – the percentage change in cash holdings. When both the cash investment share and the external financing share are low, subsequent real returns are high, and when both are high, subsequent returns are negative.

A crude way to test the interaction between cash holdings and external finance is to sort the sample according to external financing, and then estimate univariate predictive regressions of returns on the cash investment share in each of those samples. Table V estimates the univariate regression of stock returns on the prior-year cash investment share separately for years in which external financing was low and for years in which external financing was high. I first sort the sample into two groups by the share of external financing in investment and then run the predictive regression for each sample

$$R_t = a + bX_{t-1} + u_{t+k}$$

restricting the constant term a to be the same across the two groups. The table shows OLS estimates of b for high and low external financing years. Results are shown for both the CRSP value-weighted and equal-weighted portfolio. In both cases, the coefficient on the cash investment share in the high prior-year external financing years is approximately double the coefficient in the low prior-year external financing years.

The table repeats this exercise by pre-sorting by equity issues (*e/Sources*) and by the Baker and Wurgler (2000) equity share (*S*), then estimating the baseline predictive regression. The results weaken somewhat, although in each case, predictability is stronger after conditioning on years during which financing activity was high.

An alternative (unreported) approach to obtaining these results is to estimate multivariate regressions of returns on the prior-year cash share, external financing share, and the interaction.[10] The interaction term is highly significant, thereby returning the same result. Another possibility is to redefine the predictor as the cash investment share scaled by the internal financing share. This also yields the result that cash is a better predictor when internal funds are relatively low.

D. Alternative Compustat data sample

One of the drawbacks of the *Flow of Funds* data is that as firms enter the economy, their cash balances are included as changes in my aggregate data. During periods of high economic growth, new firms raise funds in external capital markets, perhaps through IPOs, and may briefly store the proceeds in cash. This phenomenon may affect the aggregate time series of cash holdings. Although this behavior might be consistent with a market timing story, I want to be sure that the relation between hot IPO markets and subsequent returns does not drive the predictability results.

I collect a second sample for which the IPO bias can be eliminated. The Compustat data contains firm-level balance sheet information for a wide cross-section of publicly traded firms beginning in 1963. I measure the change in cash balances of firms with fiscal years between June and December and aggregate these changes each year to form a time series. These

[10] Because both variables can be negative, I interact (1+ΔCash/Sources) with (1+(e+d)/Sources). A consequence is that although one can interpret the regression coefficient on the interaction, this is no longer possible with the individual coefficients on the cash share and the external financing share.

measures are summarized in Panel C of Table I. The Compustat variable behaves similarly to the *Flow of Funds* measure of cash investment. Percentage changes in cash are 55 percent correlated with the equivalent *Flow of Funds* measure between 1964 and 2001.

Table VI shows the basic predictability results using aggregates from the Compustat. In each column, I report results from OLS regressions of the real percentage return on the CRSP value-weighted or equal-weighted portfolio on the change in cash, or the CPI deflated change in cash (denoted "*Real*"). The univariate results show that nominal and real changes in cash are significant predictors of future stock returns between 1964 and 2002. As before, these results hold for both the equal-weighted and value-weighted portfolio. The multivariate results show that even after controlling for known predictors of stock returns (and losing 9 observations) cash is a significant predictor of stock returns. In unreported results, I verify that the buy-and-hold two-year returns are significantly negatively related to each of the Compustat measures of cash investment.

Taken together with the results in Table III and Table V, the results with the Compustat data confirm that the basic predictability results hold irrespective of the way in which cash variable is computed, and irrespective of the original data source. The next section turns to possible statistical concerns.

IV. Statistical issues and robustness

This section considers statistical issues arising in predictive regressions. First, coefficients on persistent predictors may be subject to an upward small-sample bias if innovations in the predictor are correlated with the residuals in the predictive regression (Kendall (1954), Nelson and Kim (1993) and Kothari and Shanken (1997)). Second, predictive variables are typically selected for their ability to successfully account for the *in-sample* variation in stock returns but may have poor *out-of-sample* properties. I examine each of these issues in turn.

A. Persistence of the predictive variable

Coefficients on persistent predictors may be subject to an upward small-sample bias if innovations in the predictor are correlated with the residuals in the predictive regression (Kendall (1954), Nelson and Kim (1993) and Kothari and Shanken (1997)). This problem is particularly important for predictive variables with a high degree of persistence, such as the dividend-price ratio and the aggregate book-to-market ratio. In the system

$$\begin{aligned} R_t &= a + bX_{t-1} + u_t \\ X_t &= c + dX_{t-1} + v_t \end{aligned} \tag{4}$$

the OLS estimate of b is biased if u and v are contemporaneously correlated. Kothari and Shanken (1997) show that the bias in the OLS estimate of b is given by

$$E[b - \hat{b}] = \frac{\sigma_{uv}}{\sigma_v^2}(1 + 3p_A)/T \tag{5}$$

where $p_A = (T\hat{d} + 1)/(T - 3)$.

A priori, it seems unlikely that the slope coefficients in my baseline predictive regressions are significantly biased. Changes in cash are not highly autocorrelated (Table I). Nevertheless, to be conservative I compute corrected estimates of b computed following equation (5). These results are shown in Table VII. In contrast to the dividend-price ratio and the book-to-market ratio, innovations in cash are *negatively* correlated with the residuals from the predictive regression. The coefficient on the change in cash increases negligibly from (unadjusted) –7.71 to (adjusted) –7.58. Alternatively, if I measure the cash share as the percentage change in cash, the coefficient *b* changes from –7.81 to –7.63. The right-hand-side panels of Table VII show that these results are similar for the CRSP equal-weighted portfolio.

One may also be concerned that the Newey-West (1987) t-statistics that I report may be misleading because of the persistence of the cash share. Campbell and Yogo (2002) develop a pretest to determine whether the conventional t-test will lead to correct inference. Table 1 of their paper reports regions of the parameter space where the actual size of the 5% t-test is greater than 7.5%. The cash investment share has an autocorrelation less than 0.25, putting it will outside of the problem range.

B. Out-of-sample sample tests

Thus far, the results are based on in-sample tests. However, a number of recent papers raise concerns about the use of in-sample methodology in predictive regressions. Stambaugh (1999), Goyal and Welch (2003), Ferson and Sarkissian (2003), and others argue that in-sample estimates may lead to a look-ahead bias. Butler, Grullon and Weston (2003) show that if one accounts for the look-ahead bias in predictive regressions using the equity share, there is no longer any real-time predictive ability. They argue that one cannot therefore reject the hypothesis that in real-time, managers are not successful at timing the market.

Parameter estimates from the univariate regressions in Table III suggest that the look-ahead bias is not problematic for the cash investment share. In the univariate regression of one-year-ahead CRSP value-weighted on the change in cash, the coefficient on changes in cash is –7.54 in the first half of the sample and only changes marginally to –8.41 in the second half of the sample. The similarity in the slope coefficients means that if one predicts values of subsequent returns using parameter estimates from the first half of the sample, they will be close to the predicted values from the entire sample. If they are close enough, the model exhibits real-time forecasting ability.

To account for the look-ahead bias more formally, I compare the forecasting power of my model

$$R_t = a + bX_{t-1} + u_t$$

where X denotes the cash share, to the forecasting ability of the unconditional model

$$R_t = c + v_t$$

where *c* is a constant. For each model, the forecast at year *t* is based on parameter estimates using observations through *t-1,* following a blackout period that ends at *t**. I follow McCracken (2000), White (2000) and Butler, Grullon and Weston (2003) and calculate the out-of-sample forecast error in each period for the conditional model

$$f_{ct} = R_t - a_{t-1} + b_{t-1}X_{t-1}$$

and for the unconditional model

$$f_{ut} = R_t - c_{t-1}$$

Using these forecast errors estimated between period *t** and *T*, I calculate differences in squared and absolute errors between the conditional and unconditional model. Table VIII reports the time-series average of these series. If the change in cash is a good predictor of future returns, the time series average of both the squared errors (MSE) and absolute errors (MAE) should be negative. Panel A reports these results for the value-weighted CRSP portfolio with pre-estimation periods of 20 and 30 years. The time series average of mean squared errors is –0.005

and is significant at the 5 percent level. P-values are calculated by bootstrap.[11] The table shows that this result holds whether the forecast metric is mean absolute errors or mean squared errors, and irrespective of the length of the pre-estimation window. Since the conditional model has statistically significant lower average forecast error, I conclude that it has real-time forecasting ability.

Panel B of Table VIII repeats the tests given in Panel A for the CRSP equal-weighted portfolio. The change in cash is a good predictor of returns if we use 1947-1966 as the pre-estimation window, but not as strong if we use 1947-1976.

The bottom line of this analysis is that even if one accounts for the look-ahead bias embedded in in-sample time-series regressions, the change in cash retains real-time predictive power for forecasting market returns.

V. Discussion

I consider the following explanations of the results:

1. The rational discount rate falls. Firms accumulate cash to finance an increase in planned investment. Ex-post, returns are low.
2. Increases in cash reduce the total leverage of the corporate sector. The reduction in leverage is mechanically associated with lower required returns on equity through a Modigliani and Miller (1958) effect.

[11] I randomly select observations from the sample of differences in squared errors or absolute errors, with replacement. For each sample, I calculate the time-series average of differences from the bootstrapped sample, and repeat. I use the simulated distribution of test statistics to calculate the p-value.

3. An unspecified theory connects leverage and expected returns through an unobserved third variable. Investors rationally expect lower returns following accumulation of cash.

4. The predictability results represent inefficiency on the part of investors, but not opportunism on the part of managers. Managers raise money for investment; only to realize that investment opportunities have disappeared, accumulating cash in the short-run. Investors do not recognize this at the moment when the cash is accumulated. Subsequent returns are low as news about declining opportunities is released.

5. Aggregate cash holdings are the consequence of overvalued firms issuing external finance without having associated investment opportunities. When external finance is expensive, firms spend cash. The accumulation of cash thus represents a form of managerial arbitrage vis-à-vis capital markets.

Explanation 1.

When the discount rate falls, investment should increase. If discount rates are time varying, investment and future stock returns should exhibit negative time-series correlation. Post-war US data on stock returns and aggregate investment run counter to this basic prediction. Lamont (2000) argues that the apparent contradiction can be explained once one allows for lags between the decision to invest and the actual investment expenditure. Using data on investment plans reported by the U.S. Commerce Department between 1947 and 1993, he finds that investment plans are strongly negatively related to future market returns.

One implication of the time varying discount rate with investment lags is that following a fall in the discount rate, firms will raise financing for (planned) investment. Because investment occurs with a lag, firms may accumulate cash in the short-run. Ex-post, one should observe a negative correlation between increases in corporate cash holdings and subsequent market returns.

To test whether this theory satisfactorily explains the data, I focus on two distinct predictions. First, cash investment should be positively related to increases in past increases in planned investment. Table IX tests this basic prediction. I use Lamont's data to estimate a regression of cash investment on leads and lags of planned investment and actual investment. The table shows that none of these three variables has any explanatory power for changes in cash. However, *after* increasing cash holdings (specification (5)), firms increase investment.

The second prediction is that to the extent that changes in cash are driven by investment plans, the cash share should lose its predictive ability for stock returns once I control for changes in investment plans. Recall that Table IV firmly rejects this proposition: cash is a significant predictor of stock returns, even after controlling for several known predictors of stock returns. Specifications (8) and (9) of Table IX perform more comprehensive checks: even if one controls for the increase in planned investment occurring after the increase in cash, cash retains most of its predictive ability for stock returns.

Explanation 2

Explanation (2) says that changes in cash predict returns through a mechanical leverage effect. In Modigliani and Miller (1958), an increase in leverage increases the expected return on equity. Increases in cash are reductions in net debt. Therefore, increases in cash reduce leverage and correspondingly lower expected returns. Baker and Wurgler (2000) consider a similar effect operating through the equity share, and conclude that it is an order of magnitude too small to explain their predictability results.

The expected return on equity is related to the expected return on assets and the expected return on debt by

$$E(R_E) = E(R_A) + \frac{D-C}{E} E(R_A - R_D)$$

where D denotes the market value of debt, C denotes cash, and E denotes the market value of equity, R_A is the return on assets and R_D is the return on debt. In the time-series, the *maximum* year-on-year change in the ratio of cash to the market value of equity (C/E) is 0.01. Even with an aggressive estimate of 10 percent for $E(R_A-R_D)$, the Modigliani and Miller model would yield a maximum change in expected returns of 0.1 percent. This can be contrasted with the true explanatory power of cash in Table III, where a one standard deviation increase in cash is associated with a reduction in expected returns of 7.71 percent. Put simply, changes in cash are too small to change leverage enough to have a noticeable effect on expected returns.

Explanation 3

Although I can rule out explanation 1 and 2, perhaps there exists a rational theory in which optimal liquidity is linked with expected returns in the observed direction. For example, perhaps expected returns and optimal cash holdings are related to a third variable related to business cycle conditions.

At the very least, any rational model must imply positive expected returns for *any value* of the predictive variable. I follow the approach in Fama and Schwert (1977), Fama and French (1988), Kothari and Shanken (1997), and Baker and Wurgler (2000) and ask whether the data predict negative returns, or returns lower than the risk-free rate.

Table X lists the years during which predicted returns from the univariate regression model are negative, sorted in order of the predicted return. In the full sample of 57 years, 8 years are predicted to be negative. The table shows that out of these 8 years, realized returns were negative in 6 of them. For each of the years during which expected returns are negative, I report the associated t-statistic, computed using Newey-West (1987) standard errors. In 1 of these, I reject the null hypothesis that expected returns are positive.

The second panel of Table X repeats this exercise with the CRSP equal-weighted portfolio. Expected returns are negative in six years, out of which 5 turn out to be negative *ex-post*. In 4 of the 6 observations, I reject the null hypothesis that expected returns are positive.

The bottom two panels of Table X repeat this exercise for excess returns. I compute the simple excess return as the difference between the nominal return on the CRSP (value-weighted or equal-weighted) portfolio minus the nominal risk free return, and estimate regressions of this series on the lagged cash investment share. Panel C and Panel D list negative values of predicted excess returns coming from this regression. The table shows two years in which I can reject the null hypothesis that expected excess returns are positive. It turns out that realized excess returns were extremely low (- 17 percent and - 19 percent) in both years.

Explanation 4

The fourth explanation says that the results represent inefficiency on the part of investors, but do not reflect managerial opportunism. This works as follows. Managers raise money for investment; only to realize too late that investment opportunities have disappeared. Agency costs and information asymmetries between firms and outside investors prevent firms from returning the money immediately. Firms thereby accumulate cash in the short-run. Investors do not immediately recognize that investment opportunities have disappeared, and are surprised as news about declining opportunities is released, resulting in low subsequent returns.

This explanation is equivalent to relaxing the investor rationality requirement from Explanation 1. It should still be true that cash investment is positively related to increases in planned investment, and negatively related to the difference between actual investment and planned investment. Recall from Table IX that the cash investment share has no statistical relation to current or lagged investment, planned investment, or measures of corporate profits.

A reasonable critique in favor of Explanation 4 says that the time series measures of investment plans are unreliable proxies for actual investment. Lamont (2000) shows that the Commerce Department survey measures explain more than half of the time-series variation in investment. Nevertheless, one could argue that the cash investment share is a superior proxy for planned investment. To test this, table IX shows the results of regressions of future investment on the cash investment share and on reported planned investment. It turns out that the cash investment share is slightly positively correlated with future investment, though it does not improve substantially on the predictive power of the planned investment variable. To check that it does not affect my results in a meaningful way, I redo the multivariate predictive regressions including both current investment and the cash investment share on the right-hand-side (also unreported). Cash investment retains its predictive power and current total investment is insignificant.

Explanation 5

This leaves a final explanation, in which changes in aggregate cash holdings are the consequence of overvalued firms issuing external finance that they cannot spend productively. Since I rule out the possibility that managers *planned* to spend the funds productively, it implies that managers issued funds without intending, in the short-run, to invest those funds in hard assets. Thus the accumulation of cash represents a form of arbitrage. Managers raise funds when valuations are high, hoarding cash, and spend cash when valuations are low. The motivation for this behavior is straightforward and intuitive. Managers generally prefer internal finance, but access capital markets when prices are temporarily advantageous. When external capital is expensive, cash raised during good times acts as a buffer.

The market timing theory is supported by three facts. First, the cash investment share is a stronger predictor of returns during years in which external financing was also high. Second, firm-level evidence in Greenwood and Jenter (2004) confirms that most cash on corporate balance sheets can be traced to the proceeds of equity issues, confirming the broad intuition of the market timing theory. Third, to the extent that I can measure investment plans, changes in cash cannot be fully explained by lags in the investment process. Thus the data offer little evidence that managers planned to spend the money they raised and kept in cash.

If one accepts this view, the paper has important implications for models in which the primary motivation for firms to hold cash is to insure against states of the world in which there is a liquidity shortage. There is scope in these models for exogenous and possibly irrational variation in the cost of external capital. Thus, even if the primary motivation for holding liquid assets relates to insurance for missed opportunities, firms will hold more if those funds can be acquired cheaply, and less if those funds are excessively expensive.

VI. Conclusions

This paper studies the link between investment in cash and liquid assets as a share of total investment, and subsequent market returns. In aggregate data, I find that firms accumulate cash prior to episodes of low stock returns. Changes in cash are negatively related to predictors of positive returns, and negatively related to predictors of negative returns. Additionally, changes in cash possess significant incremental predictive power. Cash investment is a more stable predictor of returns than scaled price variables and performs well in out-of-sample predictability tests. Increases in cash are uncorrelated with planned increases in investment and cannot be explained by current or lagged changes in profitability.

There does not appear to be much hope for an efficient markets explanation of these findings, since changes in cash are not related to aggregate measures of investment or investment plans. Furthermore, changes in cash frequently predictive negative returns. Forced to accept investor irrationality, I ask whether the results can be benignly explained by systematic common errors by investors and firms. Using aggregated data on investment plans, I find little to support this view, though it cannot be dismissed entirely.

The final explanation comes from a theory of active market timing, in which cash accumulation is the consequence of overvalued firms issuing external finance that cannot be spent productively and which they do not return to investors. Consistent with the theory, subsequent returns are the lowest when both the cash investment share and the share of external financing in investment are high.

Appendix A. Components and coverage of liquid assets in the Flow of Funds sample.

A. Components

Ideally, one would include in the definition of cash all assets that can be easily converted into cash with low or no transactions costs. The range of such assets has been growing substantially between 1947 and 2001. The market for commercial paper did not exist in 1947 but by the mid-1970s it was a commonplace way of maintaining liquid reserves. Similarly, money market mutual funds and time deposits have grown in importance through the sample.

If my definition of cash is too narrow, I risk the possibility that the results are driven by shifts between different classes of liquid assets, rather than by aggregate corporate demand for liquidity. On the other hand, if my definition of cash is too broad, I risk including investment items that are held for purposes other than maintaining liquidity. I settle on a definition of cash that includes checkable deposits and currency, time and savings deposits, money market fund shares, and security repurchase agreements. I omit government securities for reasons discussed below.

There are several interesting episodes in the time series of corporate holdings of U.S. government securities. First, there is a marked decline between 1945 and 1946, attributable to corporate holdings of wartime bonds. Corporate business sector holdings of U.S. government financial assets fell from $18.5 billion in 1945 to $12.8 billion in 1946. They fell a further $1.2 billion in 1947. This drop is almost entirely do to excess profits tax refund bonds, issued during World War II and redeemable for cash in 1945 and 1946 (*Flow of Funds 1939-1953* p. 88 and Childs p. 342). Measured as a fraction of previous holdings, these two years represent significant outliers. Specifically, including holdings of government securities in the aggregate measure of cash makes 1946 a 5 standard deviation outlier. This leaves me with two alternatives. Either I begin the time series of cash holdings at a later date, or I omit U.S. government financial obligations as a component of cash holdings. I choose the latter approach, but verify that the results hold with the broader measure of cash in the 1951-2002 subsample. Running the baseline predictability regressions from Table 3 with this expanded definition of cash gives a coefficient of –7.70 (t-stat -1.67) for the 1951-2002 sample, and –18.8 (t-stat –4.15) for the 1975-2002 sample.

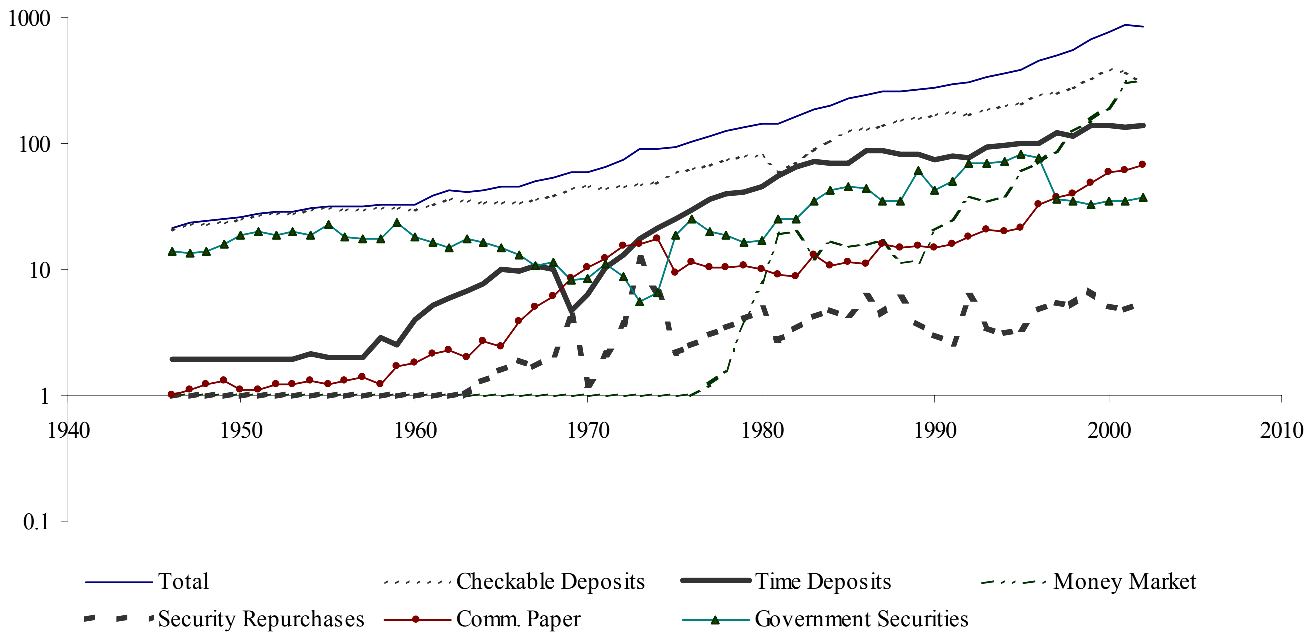
It is worthwhile to examine the component shares of cash holdings in more detail. Figure A1 studies the time series of each component of corporate cash holdings. For completeness, I include government securities in this measure. Panel A plots the time series of these aggregates on a log scale. The components of cash include checkable deposits, security repurchase agreements, commercial paper, time deposits, government securities and money market funds. Panel B plots the time series of the share of each of these components in total cash balances. The figure reveals the declining importance of government securities during the sample period, and the increasing share of time deposits and money market funds. Checkable deposits show some time series variation, while time deposits show a dip during the early 1980s, possibly attributable to Paul Volcker.

B. Time series coverage

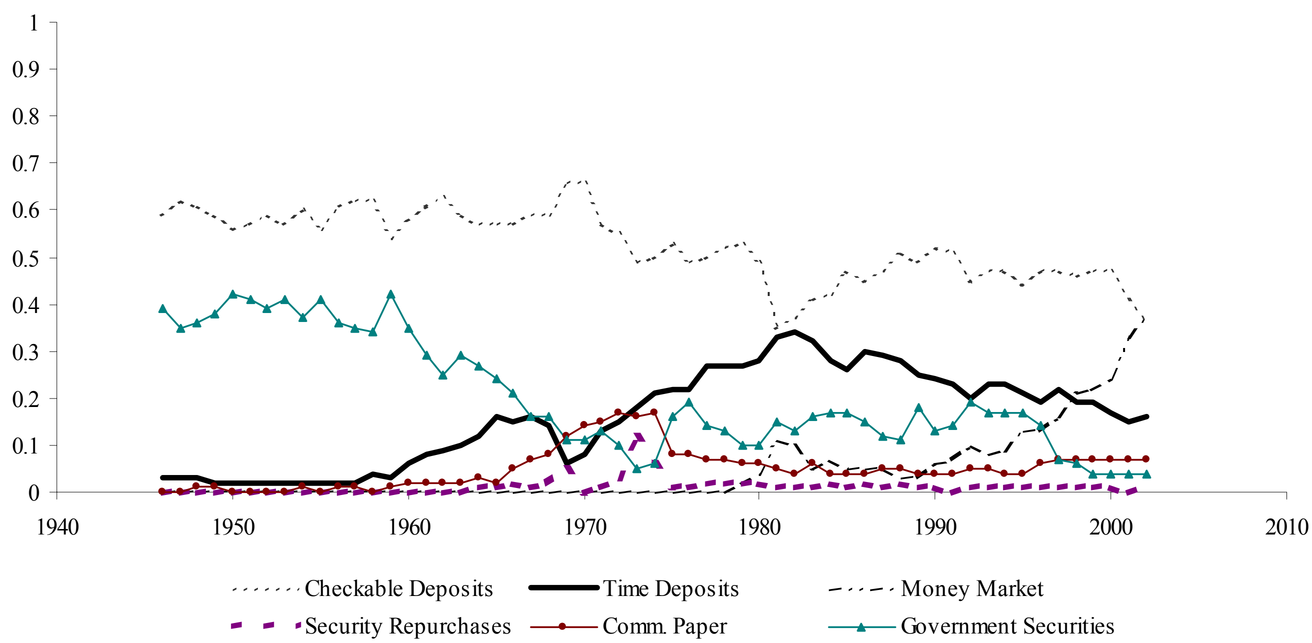
The Flow of Funds data begin in 1945. However, the Federal Reserve commissioned an early study of the Flow of Funds accounts that covers 1939 through 1945. The methodology used in constructing these early numbers is similar to the methodology used in later editions. However, the early study does not report levels of cash balances and only reports changes in "currency and deposits," "federal obligations," and "corporate securities." Second, the study does not report equity issues and debt issues separately; nor does it report operating profits net of dividends in the same form as the later editions. Third, and most importantly, corporations appear to have substituted government bonds for currency and deposits during the war because of the tax refund bonds. Despite these shortcomings, it is possible to match the changes in currency and deposits with the level of currency and deposits taken from my data. I then calculate percentage changes in currency and deposits between 1940 and 1945 and merge this series with the series of percentage changes in aggregate cash balances. The CRSP value-weighted portfolio fell in 1940 and 1941 and rose between 1942 and 1945. These returns can be compared with buildup of cash between 1939 and 1940, and virtually no investment in cash between 1941 and 1942. Thus the wartime data are partially consistent with the later results. When I merge this series with my later data, I find that the predictability results hold as before.

Figure A1. Components of corporate liquid asset holdings. Total liquid assets are defined as the sum of

Panel A. Time series of components ($ billions, log scale)



Panel B. Time series of components ($ billions, log scale)



Appendix B. Comparison of *Flow of Funds* and Compustat data samples.

The *Flow of Funds* series of corporate cash balances begins in 1945, thus annual percentage changes can be computed starting in 1946. The Compustat sample begins in 1963, thus annual percentage changes can be computed starting in 1964. To be included in the Compustat aggregate in year *t*, a firm must report cash balances and total assets in years *t* and *t-1*. Thus cash holdings by new firms, or cash reduction coincident with delisting is not captured in the Compustat measure. Unfortunately, this feature is unavoidable in the *Flow of Funds* data because I only have access to their aggregates.

The *Flow of Funds* sample includes more firms than Compustat, but the ratio of total cash in Compustat to total cash reported by the Flow of Funds is quite stable between 1964 and 2002, ranging between 70 and 76 percent. Some of this is explained by the fact that I omit direct holdings of government securities from the Flow of Funds measure.

Figure A2 shows that the behavior of the series is quite similar between 1964 and 2001. The correlation between these two series is 55 percent.

Figure A2. Percentage change of aggregate cash holdings (*Flow of Funds*- solid; Compustat- dashed)

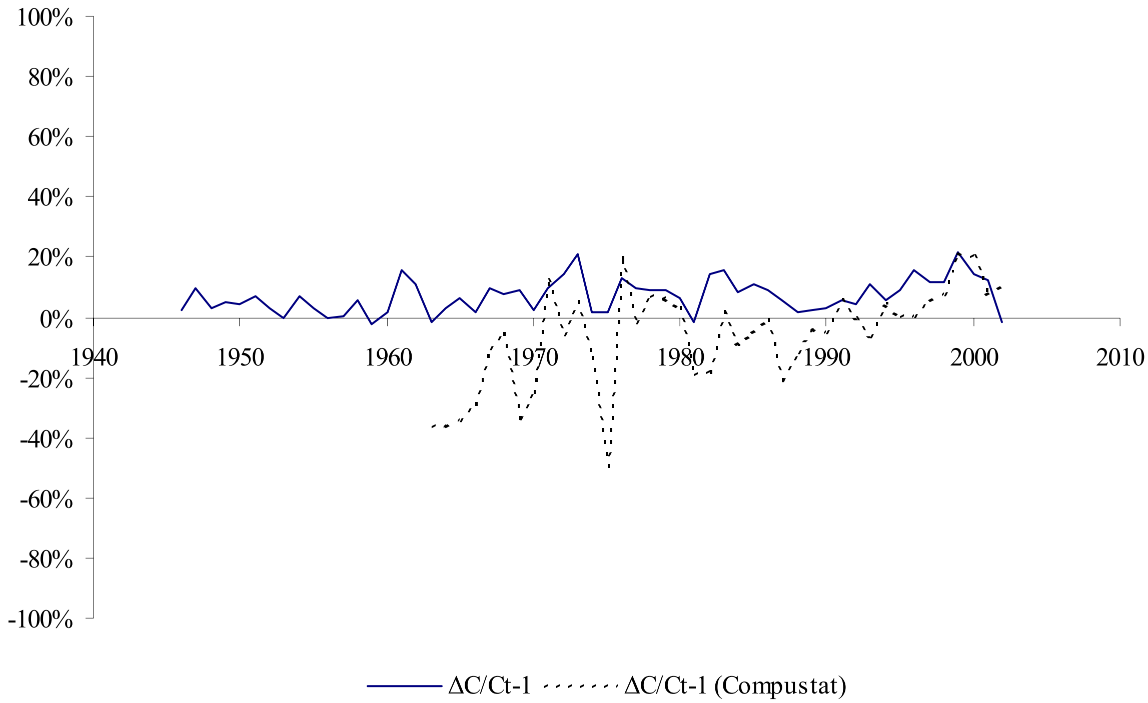


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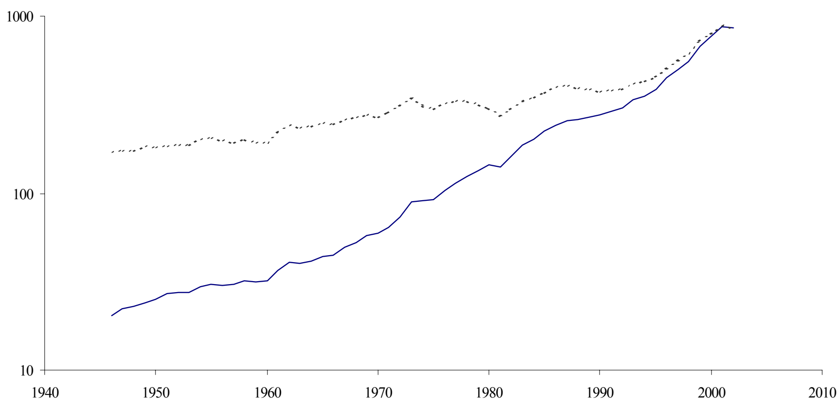
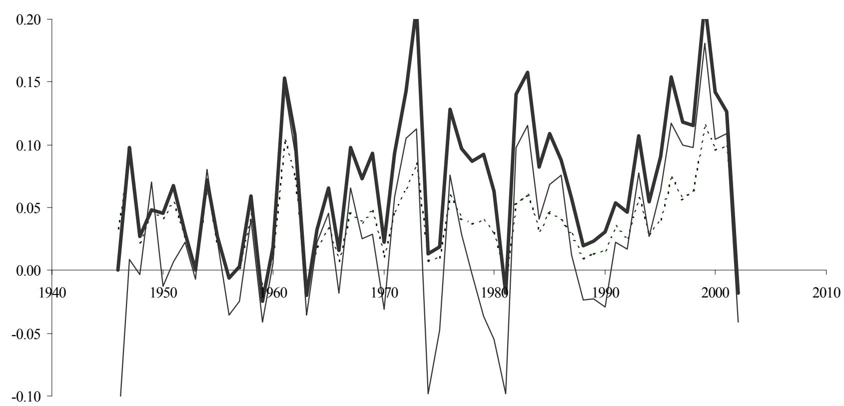
Figure 1
Investment in cash and other uses of corporate funds

Panel A plots the time series of nominal and real cash holdings of the nonfinancial corporate sector. Real cash holdings are deflated by the CPI and expressed in 2002 dollars. Panel B plots the changes of these two series, each scaled by the level in the previous period. Panel B also plots the change in cash divided by total sources of funds, defined as corporate profits minus dividends plus net equity and net debt issues. Panel C plots Fixed investment, inventory investment, and working capital investment, all scaled by total sources of funds. Working capital is defined as trade receivables minus trade payables minus taxes payable. All data are from the Federal Reserve *Flow of Funds*.

Panel A. Aggregate cash holdings (Log scale, $nominal billions- solid, 2002$ billions- dashed)



Panel B. Changes in aggregate cash holdings (As a fraction of sources of funds- thin solid, as a percentage of previous cash holdings- dashed, real change as a percentage of previous real cash holdings- thick solid)



Panel C. Other components of corporate investment (fixed investment- thick solid, inventory- thick dashed, other working capital- thin solid, other- thin dashed)

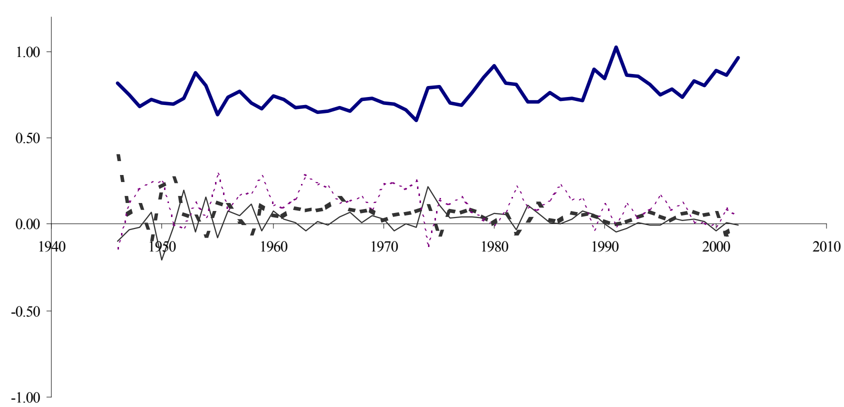
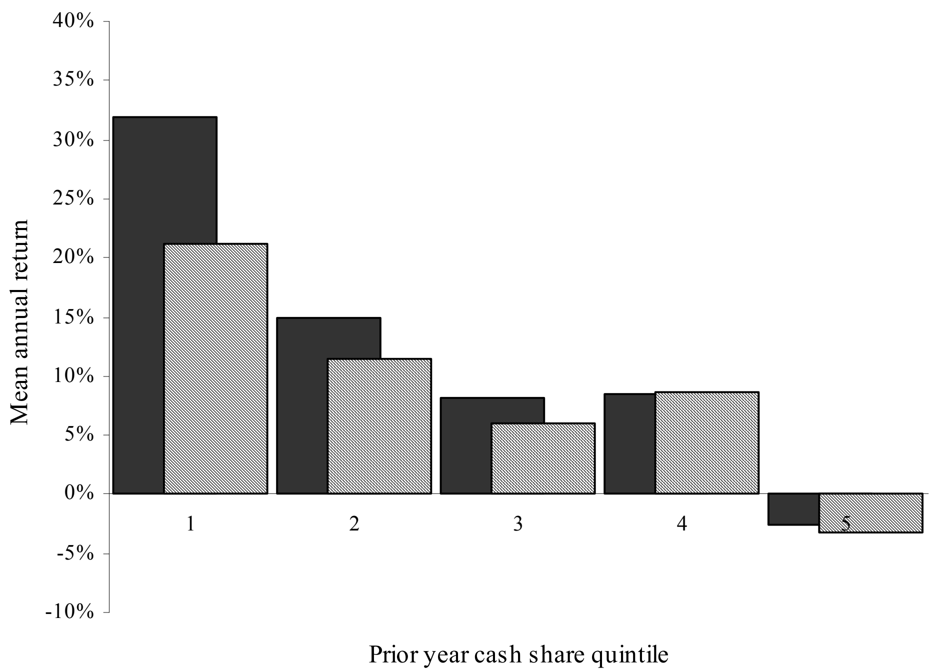


Figure 2
Equity returns by prior-year share of cash investment 1947-2003

Returns are sorted into quintiles according to cash investment share in the previous year. In Panel A, the cash share is defined as the change in aggregate cash balances scaled by total sources of corporate funds. In Panel B, the cash share is defined as the percentage change in aggregate cash balances. Both panels show average real CRSP value-weighted returns (thatched) and average real CRSP equal weighted returns (solid).

Panel A. Cash share = $\Delta C/\text{Sources}$



Panel B. Cash share = $\Delta C/C_{t-1}$

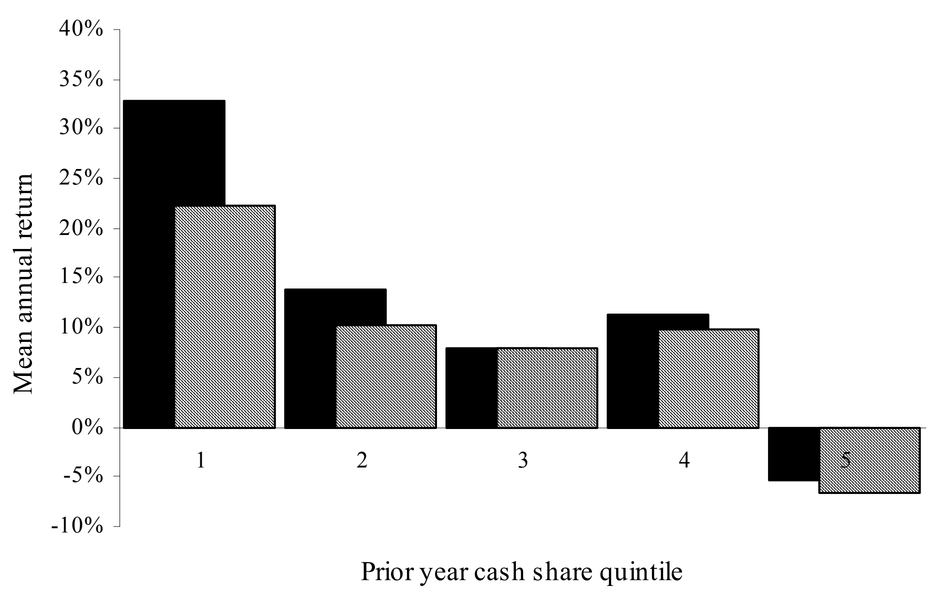
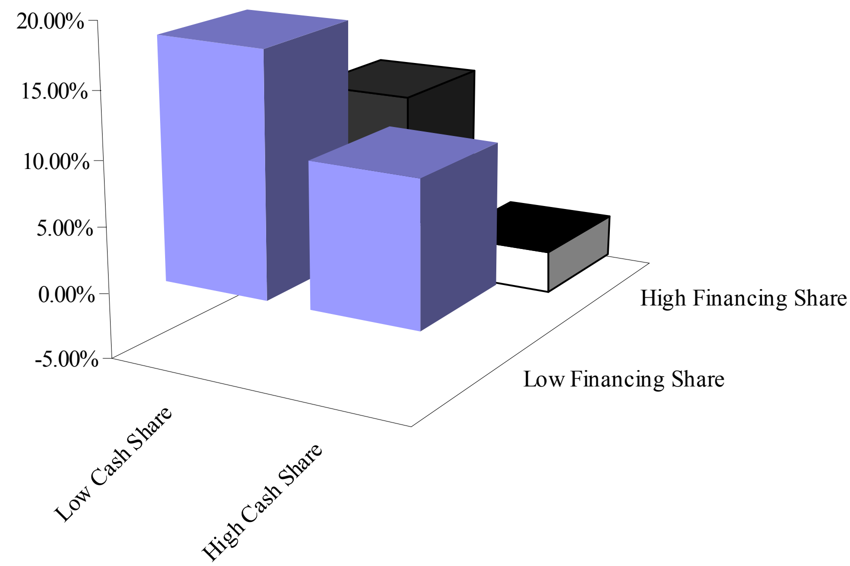


Figure 3
Equity returns by prior-year share of cash investment and share of external finance in aggregate corporate funds

Returns are sorted first according to prior-year investment in cash; next, each set of years is sorted according to prior-year external financing. Cash investment is measured as the change in cash scaled by total sources of funds. External financing is measured as the sum of net debt and net equity issues, scaled by total sources of funds. Panel A shows average one-year-ahead returns on the CRSP value-weighted portfolio. Panel B shows average one-year-ahead returns on the CRSP equal-weighted portfolio. Colors are inverted for negative values.

Panel A. CRSP Value-weighted



Panel B. CRSP Equal-weighted

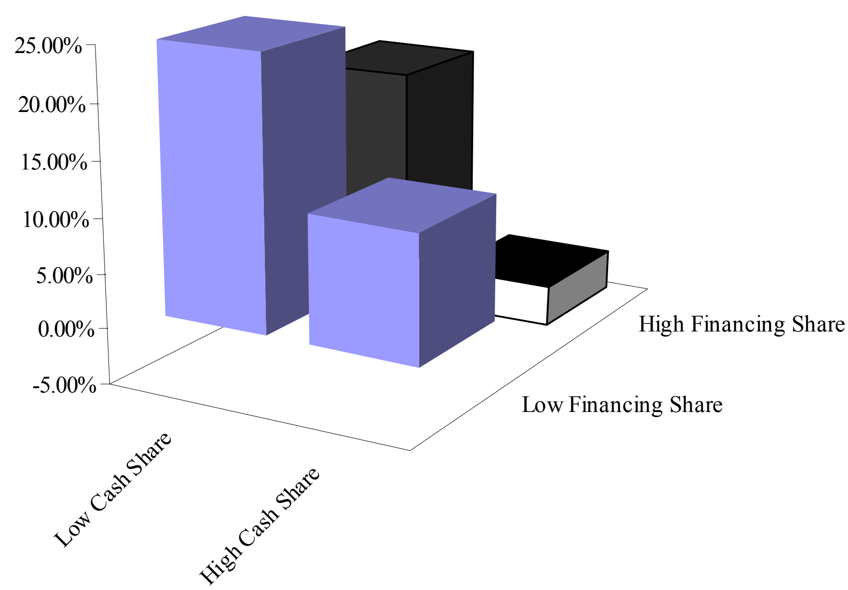


Table I
Summary statistics

Time-series mean, median, standard deviation, extreme values, and autocorrelation for sample variables. Panel A lists the sources of corporate funds, including profits net of dividends (y), equity issues (e), and debt issues (d), each scaled by total sources, which is defined as the sum of these three items. Panel B lists uses of corporate funds, including changes in cash (*ΔC*), fixed investment (*ΔFixed*), inventory investment (*ΔInv*), changes in working capital (*ΔWC*), and a residual (*ΔOther*). All are scaled by total sources of corporate funds. Data in Panel A and B are from the Federal Reserve *Flow of Funds*. Panel C lists alternate measures of cash investment, including the percentage change in nominal cash balances and the percentage change in CPI deflated cash balances. I also compute these measures by aggregating Compustat firm-level data between 1963 and 2001. Panel D lists other common predictors of stock returns and control variables. These include the dividend-price ratio for the value-weighted and equal-weighted CRSP portfolios, the book-to-market ratio of the Dow Jones Industrial Average, and the equity share in total equity and debt issues (*S*) from Baker and Wurgler (2000). The last four variables in the panel are the change in the ratio of pre-tax profits to GDP (*Δprofits*), realized percentage growth in real investment (*g*), planned percentage growth in investment ($\hat{g}$), and the difference between realized and planned changes in investment. These data are collected by Lamont (2000) from the *Survey of Current Business*. $\boldsymbol{\lambda}^{SRC}$ is a December measures of the cross-sectional price of risk from Polk, Thompson and Vuolteenaho (2003). Panel E summarizes data on stock returns, bond returns, and inflation. Real returns are defined as the difference between the return on the CRSP value-weighted or equal-weighted portfolio and the return on the CPI. The risk free return (*BILL*) is the nominal return on the short-term Treasury bill, the term spread (*tspread*) is the difference between the end-of-year yield on the long-term government bond and the short-term Treasury bill yield. Inflation ($\boldsymbol{\pi}$) is the percentage change in the Consumer Price Index. All of these data are collected from Ibbotson. Variable means, medians, standard deviations, and extreme values are given in percentage terms.

	N	Mean	Median	SD	Min	Max	ρ
			Panel A: Sources of Funds (1946-2001)				
y/Sources	57	75.92	74.52	9.60	54.10	108.77	0.59
(e+d)/Sources	57	24.08	25.48	9.60	-8.77	45.90	0.59
e/Sources	57	-1.15	2.64	8.96	-27.38	9.75	0.78
d/Sources	57	25.23	24.97	11.04	-13.22	45.81	0.52
			Panel B: Uses of Funds (1946-2001)				
ΔC/Sources	57	3.86	3.83	3.08	-1.95	11.58	0.17
ΔFixed/Sources	57	75.89	73.52	8.63	60.08	102.26	0.56
ΔInv/Sources	57	6.16	5.80	7.63	-8.62	39.33	0.04
ΔWC/Sources	57	2.28	1.61	6.70	-20.31	22.05	-0.10
ΔOther/Sources	57	11.81	12.06	9.71	-14.00	29.06	0.18
			Panel C: Other measures of cash investment				
$\Delta C/C_{t-1}$	57	6.96	6.52	5.61	-2.48	21.27	0.28
$\Delta C/C_{t-1}$ *(Real)*	57	2.80	2.31	6.41	-13.22	18.10	0.29
$\Delta C/C_{t-1}$ *(Compustat)*	40	-6.11	-2.78	16.82	-49.67	21.33	0.39
$\Delta C/C_{t-1}$ *(Compustat Real)*	40	-5.83	-2.64	16.14	-46.44	20.77	0.40
			Panel D: Controls and other predictors of returns (1946-2001)				
D/P VW	57	3.59	3.43	1.28	1.10	6.69	0.90
D/P EW	57	3.03	2.60	1.56	1.31	6.93	0.94
B/M	57	61.96	61.00	25.45	12.00	121.00	0.87
S	57	20.20	20.20	7.74	7.80	43.00	-0.04
Δprofits	45	-0.17	-0.07	1.18	-2.40	3.91	0.58
g	45	4.33	5.56	7.67	-17.53	16.82	-0.18
$\hat{g}$	45	2.92	3.47	6.41	-13.24	17.15	0.10
$g-\hat{g}$	45	1.41	0.81	3.77	-7.56	13.86	0.05
λ^{SRC}	57	-17.93	-20.12	16.27	-50.25	30.54	0.61
			Panel E: Returns, interest rates, and inflation (1947-2002)				
R_{t+1} CRSP VW	57	8.08	12.44	18.48	-40.13	50.76	0.02
R_{t+1} CRSP EW	57	11.06	14.40	25.30	-44.39	74.39	-0.05
BILL	57	4.80	4.68	3.02	0.35	14.71	0.85
tspread	57	1.20	1.20	1.56	-4.87	4.41	0.36
π	57	4.17	3.32	3.64	-1.80	18.17	0.58

Table II

Time series determinants of corporate cash investment 1946-2002

Time series regressions of the cash investment share on the share of other sources and uses of funds, inflation and interest rates, measures of expected returns, and profits, investment plans, and business conditions. The dependent variable in all regressions is the cash investment share, defined as the change in corporate cash holdings scaled by total sources of funds. The first set of independent variables includes the share of sources devoted to fixed investment (*ΔFixed/Sources*), the share of sources devoted to inventory investment (*ΔInv/Sources*), the share of sources devoted to working capital (*ΔWC/Sources*), and the share of sources raised by equity and debt issues (*(e+d)/Sources*). The next set of independent variables includes inflation (π), the lagged nominal Treasury bill return (*BILL*), the dividend price ratio on the value weighted CRSP index (*D/P*), the aggregate book-to-market ratio (*B/M*), and the predicted real return on the CRSP value-weighted index ($\hat{R}_{t+1}$). Inflation is calculated as the percentage change in the consumer price index. Predicted real returns are the fitted values from an OLS regression of real CRSP value-weighted returns on the lagged dividend price ratio, the lagged book-to-market ratio and the cross-sectional price of risk from Polk, Thompson and Vuolteenaho (2004). The last set of variables includes current and lagged changes in profits (*Δprofits*),), investment growth (g), planned investment growth ($\hat{g}$), and recession dummies (Rec_t). Heteroskedasticity robust t-statistics are in brackets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Other sources and uses of corporate funds:												
ΔFixed/Sources	-0.001	0.003					0.005					
	[-0.12]	[-0.66]					[0.54]					
ΔInv/Sources	-0.006	-0.008					-0.005					
	[-1.79]	[-2.18]					[-1.46]					
ΔWC/Sources	-0.007	-0.01					-0.013					
	[-2.08]	[-2.53]					[-2.16]					
(e+d)/Sources		0.009					0.014					
		[-1.72]					[1.96]					
Inflation and interest rates:												
π			-0.001				0.006					
			[-0.31]				[0.63]					
BILL			-0.003				-0.01					
			[-0.64]				[-1.98]					
Measures of expected returns:												
D/P				-0.008								
				[-1.66]								
B/M					-0.01							
					[-2.69]							
$\hat{R}_{t+1}$						-0.172	-0.23					
						[-2.29]	[-2.97]					
Profits, Investment plans, business conditions:												
Δprofits								0.036	0.03			
								[0.14]	[0.11]			
$\Delta profits_{t-1}$									-0.032			
									[-0.09]			
g										-0.062	-0.064	
										[-1.50]	[-0.83]	
$\hat{g}$											0.002	
											[0.02]	
Rec_t												-0.001
												[-0.09]
Rec_{t+1}												-0.015
												[-1.43]
Constant	0.04	0.04	0.041	0.037	0.039	0.051	0.057	0.033	0.033	0.036	0.036	0.045
	[9.83]	[10.04]	[8.85]	[9.45]	[10.31]	[7.63]	[8.84]	[8.28]	[8.18]	[8.60]	[8.64]	[9.58]
N	56	56	56	57	56	56	56	45	45	45	45	56
$\mathbf{R^2}$	0.05	0.11	0.01	0.06	0.11	0.1	0.28	0	0	0.03	0.03	0.06

Table III
Univariate predictors of annual stock market returns

Univariate OLS regressions of stock market returns on lagged predictors

$$R_t = a + bX_{t-1} + u_{t+k}$$

The dependent variable is the real percentage return on the CRSP value-weighted or equal-weighted portfolio. In Panel A, the independent variable is the cash investment share, defined alternately as the change in cash over total sources of corporate funds, the percentage change in nominal cash balances, or the percentage change in CPI deflated cash balances. In Panel B, the independent variable is the sum of equity and debt issues scaled by total sources of funds, total equity issues scaled by sources of funds, or the equity share in total debt and equity issues (*S*), from Baker and Wurgler (2000). In Panel C, the independent variable is alternately the book-to-market ratio of the Dow Jones Industrial Index (*B/M*), the market dividend-price ratio (*D/P*), the planned change in investment ($\hat{g}$) from Lamont (2000), the December cross-sectional price of risk (λ^{SRC}) from Polk, Thompson and Vuolteenaho (2003), or the return on treasury bills (*BILL*). All independent variables are standardized to zero mean and unit variance. Heteroskedasticity robust t-statistics are in brackets.

		1947-2003			1947-1974			1975-2003		
R_{t+k}	X_{t-1}	**b**	**[t-stat]**	R^2	**b**	**[t-stat]**	R^2	**b**	**[t-stat]**	R^2
				Panel A: Measures of cash accumulation						
CRSP VW	*ΔC/Sources*	-8.31	[-3.64]	0.21	-8.06	[-2.05]	0.17	-8.93	[-3.82]	0.29
CRSP EW	*ΔC/Sources*	-10.83	[-3.49]	0.18	-12.49	[-2.52]	0.20	-9.83	[-2.78]	0.20
CRSP VW	$\Delta C/C_{t-1}$	-8.44	[-3.37]	0.22	-11.80	[-3.27]	0.33	-6.95	[-2.63]	0.18
CRSP EW	$\Delta C/C_{t-1}$	-11.02	[-3.40]	0.19	-15.71	[-3.38]	0.29	-9.45	[-2.44]	0.18
CRSP VW	$\Delta C/C_{t-1}$ (Real)	-5.61	[-2.16]	0.10	-6.22	[-1.20]	0.08	-5.51	[-2.04]	0.14
CRSP EW	$\Delta C/C_{t-1}$ (Real)	-8.68	[-2.45]	0.12	-8.76	[-1.28]	0.08	-9.25	[-2.57]	0.22
				Panel B: Measures of financing						
CRSP VW	*(e+d)/Sources*	-5.41	[-1.96]	0.09	-12.10	[-3.04]	0.26	-1.36	[-0.47]	0.01
CRSP EW	*(e+d)/Sources*	-6.21	[-1.76]	0.06	-14.12	[-3.14]	0.18	-0.24	[-0.05]	0.00
CRSP VW	*e/Sources*	-1.73	[-0.72]	0.01	1.68	[0.13]	0.00	-1.52	[-0.55]	0.01
CRSP EW	*e/Sources*	0.50	[0.15]	0.00	-14.03	[-0.68]	0.02	4.93	[1.25]	0.06
CRSP VW	*S*	-7.10	[-2.00]	0.08	-17.51	[-3.00]	0.25	-1.71	[-0.48]	0.01
CRSP EW	*S*	-11.75	[-2.42]	0.11	-29.87	[-4.08]	0.36	-1.81	[-0.30]	0.00
				Panel C: Other known market return predictors						
CRSP VW	$\hat{g}$	-8.96	[-5.02]	0.25	-10.00	[-4.15]	0.30	-7.06	[-3.42]	0.17
CRSP EW	$\hat{g}$	-13.52	[-5.46]	0.26	-13.71	[-4.15]	0.28	-14.70	[-5.56]	0.30
CRSP VW	*B/M*	2.79	[1.22]	0.02	9.28	[1.20]	0.06	2.14	[0.93]	0.03
CRSP EW	*B/M*	5.42	[2.00]	0.05	6.13	[0.61]	0.01	5.89	[2.22]	0.14
CRSP VW	*D/P*	5.15	[2.22]	0.07	9.36	[2.88]	0.19	3.11	[0.86]	0.03
CRSP EW	*D/P*	4.52	[1.61]	0.03	8.22	[1.79]	0.09	18.89	[2.40]	0.17
CRSP VW	λ^{SRC}	3.85	[1.33]	0.03	6.48	[1.74]	0.08	3.94	[0.54]	0.01
CRSP EW	λ^{SRC}	2.80	[0.73]	0.01	6.51	[1.15]	0.04	4.14	[0.51]	0.01
CRSP VW	*BILL*	-0.62	[-0.28]	0.00	-11.91	[-1.83]	0.12	1.48	[0.45]	0.01
CRSP EW	*BILL*	0.45	[0.15]	0.00	-8.90	[-0.99]	0.03	0.00	[0.00]	0.00

Table IV
Multivariate predictive regressions of annual stock market returns

Multivariate OLS regressions of stock market returns on the change in cash and other predictors

$$R_t = a + b_1 X_{t-1} + Z_{t-1} B_2 + u_t$$

where R_t denotes the real percentage return on the CRSP value-weighted (VW) or equal-weighted (EW) portfolio. X denotes the cash investment share, defined as the change in aggregate cash balances scaled by total sources of funds. Z denotes the set of control variables, including external financing, (*(e+d)/Sources*), the equity share in new issues (*S*) from Baker and Wurgler (2000), planned investment ($\hat{g}$) from Lamont (2000), the book-to-market ratio of the Dow Jones Industrial Average (*B/M*), the dividend-price ratio (*D/P*), the cross-sectional price of risk (λ^{SRC}) from Polk, Thompson and Vuolteenaho (2004), and the lagged annual return on treasury bills (*BILL*). Specifications (3), (4), (8), (11), (12) and (16) have fewer than 57 observations because the Book-to-Market ratio is not yet available for 2002 and the investment plans data spans the period 1949-1993. The independent variables are standardized to have zero mean and unit variance. Heteroskedasticity robust t-statistics are reported in brackets.

	CRSP VW 1947 - 2003								CRSP EW 1947 - 2003							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
ΔC/Sources	-7.62	-7.87	-7.71	-8.13	-7.54	-8.38	-8.41	-6.18	-10.07	-10.06	-10.90	-9.37	-10.38	-10.88	-10.86	-9.56
	[-3.41]	[-3.46]	[-2.48]	[-2.97]	[-3.47]	[-3.65]	[-3.59]	[-2.40]	[-3.25]	[-3.53]	[-2.85]	[-2.58]	[-3.37]	[-3.42]	[-3.40]	[-2.99]
(e+d)/Sources	-4.14							-3.73	-4.52							-6.92
	[-1.73]							[-1.56]	[-1.50]							[-2.01]
S		-5.92						-3.50		-10.25						-6.52
		[-1.94]						[-0.89]		[-2.40]						[-0.90]
$\hat{g}$			-8.21					-5.79			-12.46					-9.14
			[-4.91]					[-3.02]			[-5.66]					[-3.06]
B/M				0.26				1.59				2.49				15.81
				[0.11]				[0.40]				[0.83]				[2.55]
D/P					3.18			6.92					2.90			-5.90
					[1.68]			[1.33]					[1.22]			[-0.84]
λ^{SRC}						4.11		-1.90						3.13		1.77
						[1.66]		[-0.32]						[0.91]		[0.27]
BILL							-1.32	-0.94							-0.46	-5.17
							[-0.61]	[-0.24]							[-0.16]	[-0.74]
Constant	8.98	8.88	7.84	8.94	9.79	10.52	9.39	8.00	12.42	12.25	11.18	12.21	12.94	13.60	12.56	11.35
	[4.27]	[4.22]	[3.40]	[4.04]	[4.71]	[4.58]	[4.12]	[3.43]	[4.12]	[4.20]	[3.57]	[3.92]	[4.29]	[4.58]	[4.03]	[3.59]
N	57	57	45	56	57	57	57	45	57	57	45	56	57	57	57	45
R^2	0.26	0.26	0.38	0.20	0.24	0.24	0.22	0.50	0.22	0.27	0.38	0.17	0.20	0.19	0.18	0.50

Table V

Cash investment and annual stock returns by external financing share

Univariate OLS regressions of stock market returns on prior-year cash investment share

$$R_t = a + bX_{t-1} + u_t$$

I first sort the sample into two groups by the share of external financing, equity issues, or the equity share, and then run the predictive regression for each sample, restricting the constant term to be the same across the two groups. The table reports the regression coefficient *b* for each subsample, together with the associated t-statistic in brackets. The top panel shows these results estimated using real returns on the CRSP value-weighted portfolio. The bottom panel shows these results estimated on the CRSP equal-weighted portfolio.

External financing			Equity issues			Equity Share		
Low	High	High-Low	Low	High	High-Low	Low	High	High-Low
				CRSP VW				
-4.86	-10.54	-5.68	-6.61	-8.91	-2.30	-7.18	-8.26	-1.08
[-1.40]	[-3.35]	[-1.21]	[-2.70]	[-2.17]	[-0.48]	[-2.88]	[-2.09]	[-0.23]
				CRSP EW				
-6.61	-12.58	-5.96	-7.26	-12.16	-4.91	-8.40	-10.84	-2.44
[-1.71]	[-2.54]	[-0.95]	[-1.96]	[-2.39]	[-0.78]	[-2.14]	[-2.24]	[-0.39]

Table VI

Predictability in the Compustat sample 1964-2002

OLS regressions of stock returns on lagged changes in cash and other predictors computed from Compustat data

$$R_t = a + bX_{t-1} + u_t$$

where R_t denotes the real percentage return on the CRSP value-weighted (VW) or equal-weighted (EW) index portfolio *X* denotes the percentage change in total cash holdings for all firms in the Compustat database. In the first specification in each panel, the change is computed using nominal cash balances. In the second specification in each panel, cash balances are deflated by the CPI before computing the change. The table also reports results from predictive regressions that include other known stock market predictors as independent variables. *S* denotes the equity share in new issues from Baker and Wurgler (2000), $\hat{g}$ denotes planned investment from Lamont (2000), *BILL* is the return on treasury bills, *B/M* denotes the book-to-market ratio of the Dow Jones Industrial Average, and *D/P* is the dividend-price ratio. All independent variables are standardized to have zero mean and unit variance. Heteroskedasticity robust t-statistics are reported in brackets.

	CRSP VW 1964 - 2002				CRSP EW 1964 – 2002			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta C/C_{t-1}$	-4.79		-5.24		-6.92		-7.05	
	[-2.05]		[-1.96]		[-1.80]		[-1.97]	
$\Delta C/C_{t-1}$ (Real)		-4.76		-5.25		-6.90		-7.18
		[-2.01]		[-1.94]		[-1.78]		[-1.97]
(e+d)/Sources			-2.37	-2.41			-6.83	-6.90
			[-1.23]	[-1.25]			[-2.19]	[-2.21]
S			-39.80	-39.44			-36.49	-36.00
			[-0.93]	[-0.92]			[-0.64]	[-0.63]
$\hat{g}$			-5.16	-5.26			-13.81	-13.92
			[-1.40]	[-1.43]			[-3.09]	[-3.10]
BILL			-1.19	-1.15			-12.36	-12.28
			[-0.22]	[-0.21]			[-1.55]	[-1.54]
B/M			-2.91	-2.80			4.16	4.33
			[-0.81]	[-0.78]			[-0.69]	[-0.72]
D/P			17.55	17.36			23.83	23.56
			[-2.17]	[-2.15]			[-2.15]	[-2.14]
N	39	39	30	30	39	39	30	30
R^2	0.07	0.07	0.49	0.49	0.07	0.07	0.55	0.55

Table VII
Corrections for serial correlation of predictor variable

OLS regressions of equity market returns on the predictor, and an autoregression for predictor

$$R_t = a + bX_{t-1} + u_t$$
$$X_t = c + dX_{t-1} + v_t$$

R is the annual real return on the CRSP value-weighted or equal-weighted portfolio, and *X* denotes the change in cash holdings divided by total sources of corporate funds, or the change in cash holdings divided by previous cash holdings. Panel A shows OLS estimates of *a*, *b*, *c* and *d*. Panel B calculates the correlation between the two residuals, u and v, and uses this correlation together with estimates of the standard deviation of the residuals to correct a bias-adjusted estimate of *b*, following the procedure described in Kothari and Shanken (1997).

	CRSP VW 1964 - 2003		CRSP EW 1964 – 2003	
	X = *ΔC/Sources*	X = $\Delta C/C_{t-1}$	X = *ΔC/Sources*	X = $\Delta C/C_{t-1}$
Panel A: Regression results				
a	8.98	8.98	12.42	11.47
	[4.17]	[4.19]	[4.08]	[3.91]
Unadjusted *b*	-8.31	-8.44	-10.83	-9.89
	[3.64]	[-3.37]	[-3.49]	[-3.13]
c	-0.04	-0.02	-0.04	-0.02
	[-0.23]	[-0.17]	[-0.23]	[-0.17]
d	0.18	0.30	0.18	0.30
	[1.08]	[2.02]	[1.08]	[2.02]
Panel B: Corrected estimates				
ρ_{uv}	0.28	0.31	0.26	0.29
σ_v^2	1.04	0.95	1.04	0.95
Adjusted *b*	-8.19	-8.25	-10.72	-9.71

TableVIII
The out-of-sample predictive power of changes in cash

The table compares the out-of-sample forecasting ability of the conditional model of one-year-ahead stock returns on the change in cash:

$$R_t = a_t + bX_{t-1} + u_t$$

to the forecasting ability of the unconditional model

$$R_t = c_t + v_t$$

R is the annual return on the CRSP value-weighted or equal-weighted portfolio, and *X* denotes the change in cash holdings divided by total sources of corporate funds. Each period, the parameters of each model are re-estimated. Thus, the forecast in each year *t* is based on parameter estimates using observations through *t-1*. Predicted values from these rolling regressions start in the year after the pre-estimation period, alternately 1947-1966 or 1947-1976. The table reports the mean annual differences in squared deviations (MSD) and absolute deviations (MAD) between the conditional (C) and unconditional model (U). Bootstrapped p-values are reported in brackets.

Panel A: *R* = CRSP VW			
Pre-estimation period		**Difference in Mean forecast error**	**[p-value]**
1947-1966	MSD_C-MSD_U	-0.0087	[0.01]
	MAD_C-MAD_U	-0.0217	[0.01]
1947-1976	MSD_C-MSD_U	-0.0053	[0.05]
	MAD_C-MAD_U	-0.0160	[0.04]

Panel B: CRSP EW			
Pre-estimation period		**Difference in Mean forecast error**	**[p-value]**
1947-1966	MSD_C-MSD_U	-0.0140	[0.03]
	MAD_C-MAD_U	-0.0164	[0.16]
1947-1976	MSD_C-MSD_U	-0.0098	[0.05]
	MAD_C-MAD_U	-0.0079	[0.30]

Table IX
Cash, investment, planned investment and corporate profits 1946-2001

OLS regressions of cash investment on planned investment, realized investment, and corporate profits (*Δprofits*). In specifications (1) through (7), the dependent variable is the cash investment share, defined as the change in corporate cash holdings scaled by total sources of funds. In the last two columns, the dependent variable is the real return on the CRSP value-weighted portfolio. Realized Investment (*g*) is the change in expenditures on plant and equipment deflated by the nonresidential fixed investment deflator, planned investment ($\hat{g}$) in period t is the reported planned change in investment during that period and is reported in February of that year. Corporate profits (*Δprofits)* are the change in the the ratio of profits to GDP for private industry. All investment, investment plans, and profits data are provided by Owen Lamont on his webpage. Independent variables have been standardized to zero mean and unit variance. Heteroskedasticity and autocorrelation consistent t-statistics are reported in brackets.

	$\Delta C/Sources_t$							CRSP R_{t+1}	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\Delta C/Sources_t$								-9.62	-7.81
								[-2.68]	[-2.42]
g_{t-1}		-0.85	-0.59				-1.7		
		[-0.92]	[-0.56]				[-1.38]		
g_t	-0.49		-0.29				-0.5	-2.36	4.62
	[-0.83]		[-0.40]				[-0.42]	[-0.59]	[0.98]
g_{t+1}					1.82		2.62		-1.18
					[2.20]		[2.14]		[-0.32]
$\hat{g}_{t-1}$		0.84	0.59				1.70		
		[0.84]	[0.50]				[1.33]		
$\hat{g}$	0.01		-0.03				0.22	-1.71	-7.17
	[-0.02]		[-0.04]				[0.18]	[-0.38]	[-1.26]
$\hat{g}_{t+1}$				0.30	-1.29		-1.74		-8.44
				[0.88]	[-1.70]		[-1.44]		[-2.43]
$\Delta profits_t$						0.04	-0.40		
						[0.11]	[-0.56]		
$\Delta profits_{t-1}$						-0.04	0.44		
						[0.09]	[0.68]		
Constant	3.32	3.3	3.31	3.25	3.25	3.32	3.32	7.23	8.06
	[8.49]	[8.23]	[8.10]	[8.37]	[8.83]	[8.35]	[7.98]	[2.81]	[3.40]
R_2	45	44	44	45	45	45	43	44	44
N	0.03	0.03	0.04	0.01	0.13	0.00	0.24	0.22	0.42

Table X
Tests for nonnegative returns

The table reports years and predicted returns in which predicted values from the regression model

$$R_t = a + bX_{t-1} + u_t$$

are negative, together with the realized return in that year and the t-statistic on the test of the null hypothesis that predicted returns are zero. The independent variable is the prior-year cash investment share. The dependent variable is alternately the real return on the CRSP VW portfolio (Panel A), the real return on the CRSP EW portfolio (Panel B), the excess return on the CRSP VW portfolio (Panel C), or the excess return on the CRSP EW portfolio (Panel D). Standard errors are computed following Newey and West (1987).

Year	Actual Return (%)	ΔCash/Sources (%)	Predicted Return (%)	[t-stat]
Panel A: R = CRSP VW Real Return				
2000	-14.58	11.58	-11.90	[-1.96]
1962	-11.52	10.38	-8.66	[-1.65]
2002	-23.35	9.88	-7.29	[-1.48]
2001	-12.81	9.56	-6.45	[-1.37]
1948	-0.39	9.30	-5.74	[-1.27]
1974	-40.13	8.53	-3.65	[-0.90]
1997	28.64	7.35	-0.48	[-0.14]
1963	19.24	7.29	-0.29	[-0.09]
Panel B: CRSP EW Real Return				
2000	-14.53	11.58	-14.77	[-1.96]
1962	-17.75	10.38	-10.55	[-1.64]
2002	-13.33	9.88	-8.77	[-1.46]
2001	20.57	9.56	-7.68	[-1.34]
1948	-4.89	9.30	-6.75	[-1.23]
1974	-38.29	8.53	-4.03	[-0.83]
Panel C: CRSP VW Excess Return				
2000	-17.08	11.58	-12.22	[-2.11]
1962	-13.03	10.38	-9.07	[-1.82]
2002	-22.59	9.88	-7.75	[-1.66]
2001	-15.08	9.56	-6.93	[-1.55]
1948	1.51	9.30	-6.24	[-1.45]
1974	-35.93	8.53	-4.21	[-1.10]
1997	25.08	7.35	-1.13	[-0.36]
1963	17.77	7.29	-0.95	[-0.30]
Panel D: CRSP EW Excess Return				
2000	-17.03	11.58	-15.09	[-2.05]
1962	-19.26	10.38	-10.97	[-1.75]
2002	-12.57	9.88	-9.23	[-1.59]
2001	18.30	9.56	-8.15	[-1.47]
1948	-2.99	9.30	-7.25	[-1.36]
1974	-34.09	8.53	-4.58	[-0.98]
1997	14.90	7.35	-0.55	[-0.14]
1963	12.71	7.29	-0.31	[-0.08]