Excess Cash and Mutual Fund Performance

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I document a positive relationship between excess cash holdings of actively managed equity mutual funds and future fund performance. The difference in returns of portfolios of high and of low excess cash funds amounts to over 2% annually, or approximately 3% after standard risk adjustment. I study whether this difference in performance can be explained by the differences in managerial stock selection skills, market-timing abilities, fund liquidity needs, and operating costs. I show that managers of high excess cash funds make more profitable stock purchasing decisions, while low excess cash fund managers make better sell decisions. Neither high nor low excess cash groups exhibit significant market-timing skills; however, funds with volatile excess cash holdings are successful market timers. The difference in returns between high and low excess cash groups is particularly pronounced during periods of low fund flows, suggesting that high excess cash funds are better able to anticipate fund outflows. Finally, I show that high excess cash funds incur significantly lower operating expenses than do their low excess cash peers. I additionally document new important determinants of mutual fund cash balances, showing that funds with riskier or less liquid shareholdings, as well as those with higher return gap measures hold more cash. The determinants I consider jointly explain three times more cross-sectional variation in cash positions than variables studied in prior literature.

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I document a positive relationship between excess cash holdings of actively managed equity mutual funds and future fund performance. The difference in returns of portfolios of high and of low excess cash funds amounts to over 2% annually, or approximately 3% after standard risk adjustment. I study whether this difference in performance can be explained by the differences in managerial stock selection skills, market-timing abilities, fund liquidity needs, and operating costs. I show that managers of high excess cash funds make more profitable stock purchasing decisions, while low excess cash fund managers make better sell decisions. Neither high nor low excess cash groups exhibit significant market-timing skills; however, funds with volatile excess cash holdings are successful market timers. The difference in returns between high and low excess cash groups is particularly pronounced during periods of low fund flows, suggesting that high excess cash funds are better able to anticipate fund outflows. Finally, I show that high excess cash funds incur significantly lower operating expenses than do their low excess cash peers. I additionally document new important determinants of mutual fund cash balances, showing that funds with riskier or less liquid shareholdings, as well as those with higher return gap measures hold more cash. The determinants I consider jointly explain three times more cross-sectional variation in cash positions than variables studied in prior literature.

1. Introduction

Cash holdings of mutual funds can differ dramatically even for seemingly comparable funds. For example, at the end of 2007 close to one tenth of U.S. actively managed mutual funds with a growth objective held more than 10% of their total net assets in cash. For another tenth of the funds, this number was below 0.4%. Such striking differences in cash positions of funds competing with each other and pursuing the same objective are puzzling, yet the sources of these differences and the effects they have on future fund performance have received limited attention in the literature.[1]

In this paper, I document new important determinants of mutual fund cash holdings and study how cash balances in excess of the level needed to conduct normal operations ("*excess cash*") impact fund performance. I emphasize excess cash because, as a discretionary amount, it has the potential to capture information about otherwise unobservable fund characteristics that affect fund performance. Information captured by excess cash may reflect, among other things, stock-picking skills, market-timing abilities, the investment opportunity set of the manager, and managerial expectations about liquidity needs of the fund.

I define excess cash both (i) empirically, as the residual from cross-sectional regressions of cash-to-total net assets ratio on fund characteristics, and (ii) theoretically, as the difference between actual cash position and the target balance predicted by a model of optimal fund cash holdings that I develop. Using either definition, I find that while *raw* cash relates only weakly to future fund returns, funds with high *excess* cash holdings outperform those with low excess cash by statistically significant and economically important 2% per year. After standard risk-adjustment (e.g., controlling for the three factors of Fama and French, 1993), this difference in returns reaches nearly 3% annually.

To understand why high excess cash funds outperform their low excess cash peers, it is helpful to recognize that fund cash holdings are affected by exogenous flows, which include withdrawals, deposits and dividends, and by endogenous managerial decisions about purchases and sales, which

[1] The two main exceptions are Chordia (1996) and Yan (2006) who study the link between cash holdings and a number of fund characteristics. Yan additionally focuses on the relationship between aggregate cash holdings of mutual funds and future market returns.

in turn affect expenses incurred by the fund. Because I control for the differences in recent fund flows in defining excess cash, it is unlikely that the positive relationship between excess cash and fund performance is due to fund flow shocks. Instead, I conjecture that it is attributable to managerial decision to adjust the fund's cash holdings. Adjustments to cash positions may reflect (i) managerial proficiency at controlling transaction costs of the fund, (ii) the manager's stock-picking abilities and investment opportunities, (iii) managerial market-timing skills, and (iv) the manager's aptitude at anticipating future fund flows. I develop these four hypotheses in detail and find empirical evidence supporting each conjecture.

I first explore whether high excess cash proxies for the ability to control fund expenses. I develop a model of costly stock trading which suggests that relative to a manager who either invests all sales proceeds immediately and/or who transacts more frequently than is optimal, a cost-minimizing manager tends to carry a higher cash balance. The intuition behind this result is straightforward: to reduce price pressure, a cost-minimizing manager has to make more trips to the market when purchasing an illiquid stock than when selling a liquid stock. As a result, he carries excess cash during the course of adjusting portfolio composition. The model can thus justify the positive link between high cash positions and performance: managers carrying greater cash balances may be doing so as a result of their efforts to minimize transaction costs, and therefore they outperform their low excess cash peers. Consistent with the model, I find that future fund expenses decline with excess cash.

I also consider the hypothesis that excess cash proxies for manager's stock-picking abilities. Cash tends to earn a lower return than equities, and therefore unskilled managers may prefer to remain fully invested in stocks to attempt to match benchmark returns. On the other hand, a skilled manager who cannot presently find any attractive investment opportunities may carry a higher cash balance. In the future the manager will invest the excess cash as such opportunities become available.[2] It is thus natural to expect that shares bought by high excess cash funds outperform

[2] One can conjecture that skilled manager will allocate excess cash into stocks or exchange-traded funds while waiting for better investment opportunities. However, buying opportunities can arguably be more easily found following market dips, and thus not only will the this allocation fall in value due to the dip but it may also suffer as the manager

those purchased by their low excess cash counterparts. I explore stock purchases and sales by mutual funds and find that high excess cash funds do in fact purchase stocks that significantly outperform purchases of the low excess cash group. Additions to the positions already held by high excess cash funds outperform those of the low excess cash group by 2% per year. The relationship between excess cash and future fund performance is thus consistent with superior ability of high excess cash fund managers to identify undervalued stocks that generate higher future returns.

Interestingly, stocks sold by the high excess cash funds also outperform those sold by their low excess cash peers, suggesting that low excess cash fund managers are more skilled at identifying overvalued stocks. The managers of such funds may purposefully carry low excess cash because they are convinced that they can raise funds to cover cash shortfalls by disposing of those shares that are likely to underperform in the future. Thus, excess cash does not just relate to broad stock-picking skills, but specifically proxies for the ability to identify overvalued or undervalued equities. Alternatively, managers with high (low) excess cash may realize that they will need to reduce (increase) their cash positions to some target level, and may thus find it optimal to invest in applying the stock buying (selling) skills, which is reflected in the performance of their future trades.

I also explore whether the positive relationship between excess cash and fund performance additionally relates to market-timing abilities. A skillful market-timer will naturally build up the fund's cash position prior to a market downturn, but will at the same time carry a low cash balance before a period of strong market performance. If market-timing skills are mainly concentrated in the ability to predict market downturns, market timing may explain the strong performance by high excess cash funds relative to the low excess cash group. I use the traditional techniques of Treynor and Mazuy (1966) and Henriksson and Merton (1981) to find that market-timing skills are worse for the low excess cash group. As a result, the portfolio that is long the high excess cash

tries to convert it back into cash. It is also important to distinguish this concept of identifying attractive investment opportunities from a related idea of timing the overall market. For example, Warren Buffett, whose company always carries a high cash position, is routinely praised for his ability to make successful investments in individual companies, but he has repeatedly denied that he attempts to time the market.

funds and short the low excess cash group exhibits positive but statistically insignificant market timing. However, I find strong evidence of market-timing skills among funds with volatile excess cash holdings: managers of such funds actively adjust their excess cash positions in response to their changing expectations about future market returns.

Finally, the positive link between excess cash and future fund performance may also relate to liquidity needs of the fund, in particular to future fund flows. If a manager fails to anticipate fund outflows and does not have sufficient cash on hand to meet such outflows, he will be forced to liquidate some of his shareholdings at a potentially disadvantageous time and price.[3] Thus, it is conceivable that the difference in future performance of high and low excess cash funds relates to the superior ability of managers of high excess cash funds to anticipate fund outflows. I find that the difference in performance of top and bottom excess cash groups is particularly pronounced when future fund flows are low and is somewhat weaker when fund flows are high. This evidence is consistent with the notion that low excess cash funds do not carry sufficient cash on hand to cover outflows and are likely forced to liquidate some of their holdings, damaging fund performance. The high excess cash group, on the other hand, is well positioned to meet fund outflows and generates better returns.

To determine whether the positive relationship between excess cash and mutual fund performance relates to the superior ability of the high excess cash fund managers to anticipate fund outflows, it is natural to explore whether high excess cash *closed-end* funds outperform their low excess cash peers. Unlike their open-end counterparts, closed-end funds rarely issue or retire shares, and shares are not normally redeemable until the fund liquidates. Thus, uncertainty about fund flows do not motivate closed-end funds to carry cash balances. Empirically, I find no relationship between excess cash of closed-end funds and their performance.

Central to my analysis is the definition of excess cash. To calculate excess cash, I thoroughly

[3] In the model of optimal cash holdings that I develop, managers take into account expected fund flows when determining their cash balances, and thus there are no differences in managerial abilities to anticipate flows. Empirically, however, managers can certainly differ in such abilities; in particular, some managers may be able to forecast the level of fund outflows more accurately than others by making use of unobservable fund characteristics.

explore the determinants of cash holdings of mutual funds. Chordia (1996) and Yan (2006) show that fund cash holdings relate to factors such as load fees, fund size, level and volatility of fund flows, and prior performance. I complement their work by identifying additional important determinants of fund cash holdings. In particular, I show that funds holding riskier stocks, as proxied for by the average market beta of their shareholdings, carry more cash. This evidence can be interpreted as consistent with the notion that mutual funds manage the overall risk of their portfolio by adjusting their cash position: managers who have a preference for holding riskier stocks decrease total fund risk by carrying more cash. I also find that funds holding illiquid stocks tend to hold more cash. The cost of selling their holdings to cover unexpected cash shortfalls is potentially large for such funds, justifying the need to maintain larger cash balances. I additionally show that finds with higher return gap, the difference between realized fund returns and the returns on a passive portfolio of fund's recently reported holdings (Kacperczyk, Sialm, and Zheng, 2008), carry less cash. On the whole, compared to the determinants of fund cash holdings studied in the prior literature, the characteristics I consider explain three times more cross-sectional variation in cash positions.

The rest of the paper proceeds as follows. Section 2 summarizes the related literature. Section 3 describes the data and summary statistics. In Section 4, I explore the determinants of fund cash holdings. Section 5 provides details of excess cash estimation and documents the positive relationship between excess cash and future fund performance. In Section 6, I present a model of optimal cash holdings and study the link between excess cash defined relative to a model-based target level and fund performance. Section 7 analyzes the sources of the positive relationship between excess cash and fund performance. Section 8 concludes.

2. Related Literature

In the vast literature exploring the factors affecting mutual fund performance, surprisingly little research has been devoted to studying the role played by fund cash holdings. Chordia (1996) develops a model of mutual fund fee structures and empirically links fund cash holdings to load fees and uncertainty about redemptions. Yan (2006) identifies additional determinants of fund cash positions and focuses on studying the relationship between aggregate cash holdings and market returns. He finds no link between raw cash balances and future fund performance. By contrast, I focus on excess cash holdings and document a positive relationship between excess cash and fund performance. I study the sources of this relationship, linking it to managerial stock-picking and market-timing skills, liquidity needs and operating costs of the funds. I additionally document a number of new important determinants of fund cash holdings, relating cash balances to, among other things, risk and liquidity of fund shareholdings and to fund return gap. In related work, Dellva and Olson (1998) study a 1987-1992 sample and obtain a significantly positive coefficient when regressing fund returns on – among other fund characteristics – cash holdings. Their focus, however, is on the effects of fund expenses, rather than cash holdings, on performance. More recently, Baker, Haslem, and Smith (2009) find a positive link between cash holdings of institutional funds (i.e., funds investing on behalf of endowments and other institutions) and future returns. Methodologically, my paper builds on the work of Simutin (2009) who documents a positive relationship between corporate excess cash holdings and future stock returns, and on the studies analyzing the link between excess CEO compensation and firm performance (e.g., Brick, Palmon, Wald, 2006).

This paper also contributes to the literature studying market-timing skills (e.g., Treynor and Mazuy, 1966; Henriksson and Merton, 1981; Chang and Lewellen, 1984; Henriksson, 1984; Cumby and Glen, 1990; Becker, Ferson, Myers, and Schill, 1999; Jiang, Yao, and Yu, 2007) and stock-picking abilities of the managers (e.g., Chen, Jegadeesh, Wermers, 2000; Kacperczyk, Sialm, and Zheng, 2005; Cremers and Petajisto, 2009), as well as to the literature exploring the importance of mutual fund liquidity and fund flows (e.g., Sirri and Tufano, 1998; Edelen, 1999).

3. Data and Summary Statistics

3.1. Data and Sample

I obtain fund returns, cash holdings, investment objectives, fees, total net assets (TNA), and other fund characteristics from the Center for Research in Security Prices (CRSP) Survivor-Bias-Free

Mutual Fund Database. I use Wharton Research Data Services (WRDS) mflink file to merge this database with Thomson Financial Mutual Fund Holdings, which contains information on fund stock portfolios.[4]

I restrict my analysis to diversified domestic equity mutual funds with aggressive growth, long-term growth, or growth and income objectives. I exclude international, balanced, sector, bond, money market, and index funds from the analysis.[5] The CRSP database details fund asset compositions including cash balances annually until the end of 1998 and quarterly thereafter, but as Yan (2006) notes, the exact asset composition dates are not available prior to the 1990s. Furthermore, the CRSP database does not report monthly total net assets prior to 1992, complicating calculations of level and volatility of fund flows, and certain variables (e.g., 12b-1 fees) are not reported prior to 1992. For these reasons, I focus my analysis on the 1992-2008 period.

I limit my sample to funds with at least 50% of fund's assets invested in equities, and to keep the focus on the funds that do not borrow heavily to invest, I require all funds to have positive cash holdings. I also exclude funds with TNA less then $15 million as Elton, Gruber, and Blake (2001) show that the returns of such small funds tend to be biased upwards in the CRSP database. I additionally remove the first 18 months of returns for each fund in the sample to reduce the effect of an incubator fund bias documented by Evans (2006). Relaxing either of these restrictions does not qualitatively affect the results of this paper.

Many mutual funds have multiple share classes, which typically differ only in fee structure (e.g., load vs. no load) and target clientele (e.g., institutional vs. retail). These share classes represent claims on the same underlying assets, have the same gross returns and the same cash and stock holdings; however, they are identified as separate funds in the CRSP database. For the purposes of this study, I combine such share classes into a single fund. In particular, I calculate TNA of each fund as the sum of TNAs of all share classes of that fund and define fund age as the maximum age of its share classes. For all other fund characteristics, I use the TNA-weighted average over the

[4]Wermers (2000) describes the databases and the merge procedure in great detail.
[5]Appendix A provides details of determining investment objectives of the funds.

share classes. My final sample contains 17,242 fund-year observations representing 3,009 distinct funds.

3.2. Summary Statistics

Table 1 presents summary statistics for selected fund characteristics. The average fund holds 5% of assets in cash, with median cash holdings of 3.3%. There are considerable cross-sectional differences in cash holdings: over the entire sample period, the average 10th percentile of holdings was just 0.66%, while the funds in the 90th percentile held over 11% in cash. Fund cash holdings have also been changing dramatically over time. Figure 1 plots the time series of average and median fund holdings. Assets held in cash have been steadily declining over the sample period: in early 1990s average (median) cash holdings amounted to nearly 10% (8%), while in 2007 the corresponding values were just 3.3% (2%). Exploring the reasons for this reduction in cash holdings over the last two decades is an interesting topic but is beyond the scope of this paper. Factors contributing to this decline likely include technological innovation in cash management, changes in risk of fund holdings or other fund characteristics, changes in risk preferences of managers caused by increased competition, and other factors.[6]

Average fund has $1.68 billion in total net assets, expense ratio of 1.29%, 12b-1 fee of 0.41%, front load of 1.4%, deferred load of 0.5%, and turnover of 83%. In a given month, an average fund receives a flow equivalent to 0.5% of its assets, although a median fund sees an outflow.[7] Kacperczyk, Sialm, and Zheng (2008) show that return gap, the difference between realized fund returns and the returns on a passive portfolio of fund's reported holdings, is an important determinant of future fund performance. I follow their methodology in calculating a 12-month return gap and find it to

[6] It is interesting to note that *corporate* cash holdings have risen nearly two-fold over the same period. Bates, Kahle, and Stulz (2009) attribute this increase to higher volatility of cash flows and changes in firm characteristics.

[7] I estimate fund flows (FF) over N-month period ending in month t as

$$\mathrm{FF}N_t = \frac{TNA_t - TNA_{t-N}\,(1 + R_{t-N:t})}{TNA_{t-N}},$$

where TNA_t is total net assets as of the fund at the end of month t and $R_{t-N:t}$ is the fund return over the N-month period ending in month t. Berk and Green (2004) recommend using TNA_t as the denominator to fully capture the percentage change in new funds. My empirical results are not sensitive to using this alternative estimation method.

be marginally negative at -0.18% per year. A typical fund earns approximately 1.6% dividend yield, somewhat below the dividend yield of the U.S. stocks of 2.0% over the sample period.

Market beta of the funds, $\beta^{\text{Mkt}}_{\text{Fund}}$, calculated from market model regression using realized fund returns over the prior 12 months, is on average below one (0.96), which is due to the presence of low-risk assets such as cash in fund portfolios. Average market beta of fund *holdings*, $\beta^{\text{Mkt}}_{\text{Hold}}$, at 1.05, is actually above one. There is considerable variation in fund betas: a tenth of the funds have loadings below 0.63 (0.70 when estimating betas of holdings), while market betas of another tenth of the funds exceeds 1.34 (1.46). I also estimate the liquidity beta of holdings, $\beta^{\text{Liq}}_{\text{Hold}}$, to find that while average loading on the liquidity factor is close to zero, there are large cross-sectional differences in average liquidity of fund holdings.[8]

I also compute a measure of change in cash attributable to purchases and sales of stocks, PRCDS. To calculate this measure, I obtain contemporaneous (time t) fund holdings and holdings from six months ago, and for each fund compute it as $[100 \cdot \sum_i p_{i,t-3} \cdot (-N_{i,t} + N_{i,t-6})] \,/\, [\sum_i p_{i,t-6} N_{i,t-6}]$, where $N_{i,t}$ is the number of shares of stock i held by the fund at time t and $p_{i,t}$ is the price of this stock at time t. PRCDS thus represents the dollar amount of inflows from sales of stocks less the dollar amount spent on purchasing new securities during the prior six months, scaled by the value of stock holdings at time $t-6$. I assume that stocks are purchased and sold at the price prevalent at the end of month $t-3$. The negative average PRCDS of -6.6 is mainly due to the fact that this measure does not account for fund flows but is strongly and negatively related to them.

The bottom panel of Table 1 reports correlation coefficients. Cash holdings are negatively correlated with fund size, 12b-1 fees, deferred load, return gap, dividend yield of holdings, fund market beta, and net proceeds from stock sales and purchases. Cash is positively related to expense ratio, front load fee, turnover, past return, fund flows, volatility of fund flows, and market and liquidity betas of fund holdings.

[8] To calculate beta of the holdings, for each stock the fund holds I obtain market beta from the market model regression and liquidity beta from a two-factor model with market and Pastor and Stambaugh (2003) liquidity factors. $\beta^{\text{Mkt}}_{\text{Hold}}$ and $\beta^{\text{Liq}}_{\text{Hold}}$ are weighted average loadings using the dollar value of investment in each stock as weights. I use prior 12 months of monthly data for estimation. Using Sadka (2006) liquidity factor instead of Pastor and Stambaugh factor does not affect the results of the paper.

4. Determinants of Fund Cash Holdings

Cash holdings represent a substantial component of the mutual fund portfolios, and ample anecdotal evidence suggests that fund managers actively adjust their cash holdings in response to market conditions and investment opportunities.[9] Yet, despite their importance, the determinants of mutual fund cash holdings have received little attention in the literature. To the best of my knowledge, the only two exceptions are Chordia (1996) who links cash holdings to fund loads and uncertainty about redemptions, and Yan (2006) who shows that fund size, fund fees, and other characteristics relate to fund cash holdings. In this Section, I complement their findings by documenting additional important determinants of fund cash holdings.

Table 2 presents the results of cross-sectional regressions of fund cash holdings on a number of characteristics. Regression (1) shows that cash is negatively related to size, which is likely attributable to economies of scale. However, consistent with the findings of Yan (2006), controlling for the expense ratio in specification (2), there is a positive link between fund size and cash holdings. Regressions (3) shows that cash positions are related positively to fund expenses and negatively to 12b-1 fees. These two variables alone explain over 2% of cross-sectional variation in cash balances. Expenses are paid with cash on hand, leading funds with higher expenses to hold more cash. Jain and Wu (2000) and Barber, Odean, and Zheng (2004) find that fund flows are positively related to marketing 12b-1 fees, and thus funds spending more on advertising tend to hold less cash.

Barber, Odean, and Zheng (2004) also observe that fund flows are higher for funds with lower front load fees. It is thus natural to expect that funds with high front load fees hold more cash to cushion against a potential cash shortfall. Deferred loads, on the other hand, discourage fund outflows, and it is natural to expect a negative relationship between deferred loads and cash holdings. Results of specification (4) are consistent with both of these observations, but the coefficient on deferred load fee is not statistically significant.

[9] For recent examples, see "Fund's Extra Cash Holds Opportunities", Wall Street Journal, April 8, 2009, page C13; "More Stocks Funds Declare Cash King", Wall Street Journal, April 9, 2009, page C9; "Cash Regains Its Asset Status", Barron's, August 17, 2009, page 24; "Harvard, Yale Are Big Losers in 'The Game' of Investing", Wall Street Journal, September 11, 2009, page A1.

Regression (5) shows that funds with higher turnover tend to hold more cash. Turnover is positively related to the expense ratio (see Table 1), which may in part explain this observation. Furthermore, as a fund turns over its portfolio, it may sometimes dip into its current cash holdings to finance purchases of new securities if it has not yet sold enough shares to obtain sufficient funds to make such purchases (i.e., in situations when buys occur prior to sells). This is arguably more likely to happen in high turnover funds, causing them to carry larger cash balances.

Specification (6) confirms the finding of Yan (2006) that cash relates positively to past fund returns. This relationship is in part driven by the fact that fund flows follow past performance (e.g., Sirri and Tufano, 1998; see also Table 1), so funds with high returns receive higher inflows and temporarily hold more cash while deciding where to invest it.[10] Related, regression (7) shows that funds with high past flows tend to hold more cash. Prior research has used 12-month fund flow as a determinant of cash. While statistically important when used as the only explanatory variable, it becomes insignificant once more recent fund flows are taken into account. Regression controlling for lagged 1-, 6-, and 12-month fund flows shows that it is the more recent flows that are more important in explaining cash holdings (t-statistic on one-month flow is 6.78 compared to 2.58 for six-month, and 1.74 for 12-month flows). Managers have sufficient time to invest most of the cash inflow that happened over the previous year, but those inflows that occurred most recently may not yet be fully invested. Consistent with the findings of Yan (2006), past fund flow volatility in specification (8) is positively related to cash holdings. In the sample studied in this paper, however, the relationship is not significant at conventional levels.

Regression (9) combines the variables that prior researchers found to relate to mutual fund cash holdings. Each of the regressors except deferred load fee is statistically significant, but jointly they explain only 5% of the cross-sectional variation in cash holdings. Interestingly, volatility of fund flows relates negatively to cash holdings in this multivariate specification.

I next consider how managerial skill relates to cash holdings. It is natural to conjecture that

[10] At the same time, if funds with better past performance expect higher future flows, they may decide to hold less cash. The positive relationship between past returns and cash holdings observed empirically, however, indicates that this effect is weak.

skilled managers capable of identifying profitable investments, tend to generate better returns and have lower fund outflows, and thus carry less cash than poorly skilled managers. Kacperczyk, Sialm, and Zheng (2008) suggest that return gap, the difference between realized fund returns and the returns on a passive portfolio of fund's reported holdings, may reflect managerial abilities, and I use this measure as a proxy for skill. Consistent with the argument above, regression (10) shows that return gap relates significantly and negatively to fund cash holdings. In fact, return gap alone explains 3% of the cross-sectional variation in cash positions.

Specification (11) shows that funds whose portfolio of stocks earns a higher dividend yield hold less cash. Mutual funds receive dividend payments throughout the year but make payments to their shareholders only infrequently. Thus, higher cash flows from dividends received by funds holding higher yielding stocks represent a form of protection against cash shortfalls, and such funds allocate a smaller fraction of their assets to cash.

Regression (12) illustrates that fund beta, calculated from the market model using realized fund returns over the previous 12 months, relates negatively to cash holdings. Cash is a component of the fund's overall portfolio, and it is not surprising that funds with more cash are less risky as proxied for by market beta. Fund beta is an important determinant of cash holdings, explaining 2.4% of variation in cash positions among mutual funds.

Average market beta of shareholdings (rather of the fund) is another important characteristic affecting fund cash holdings. Regression (13) shows that funds with risky stock portfolios hold more cash. This can be interpreted as evidence of funds managing average beta of their holdings. If a manager chooses to hold a portfolio of high-beta stocks, he will at the same time tend to hold more cash to decrease the risk over the fund's overall portfolio. Regression (13) shows that fund's liquidity beta also relates positively to fund cash holdings.[11] It may be costly to adjust the composition of illiquid stocks quickly in case of sudden withdrawals, leading the funds holding such stocks to carry more cash.

[11] Using different proxies for liquidity of the holdings, Yan (2008) observes a similar relationship. His focus, however, is on the impact of liquidity on the link between fund size and fund performance.

Specification (14) studies the relationship between fund cash holdings and proceeds from share sales less spending on share purchases during the previous six months ('proceeds'). If no new money flowed into the fund and no withdrawals were made, higher proceeds would translate into higher cash holdings. However, in presence of fund inflows that are invested by the manager, proceeds may relate negatively to cash holdings. Regression (14) shows that this is indeed the case: without controlling for other determinants of cash holdings, there is a negative relationship between proceeds and cash holdings, which is in part attributable to a negative correlation between fund flows and proceeds (see Table 1). Only when other fund characteristics are controlled for does the proceeds measure turn positive.

The last three regressions combine important determinants of fund cash holdings. Specification (15) illustrates that controlling for fund return runup, fund flow over the previous month, and fund beta explains a comparable fraction of cross-sectional variation in cash holdings than a set of variables of regression (9) studied thus far in the literature. Regression (17) that uses the full set of explanatory variables explains three times as much variation in cash holdings as regression (9), illustrating the importance of the determinants of cash holdings that I document. Coefficients on all variables except loads, turnover, return runup, 12-month fund flow, and proceeds are significant. Excluding these variables in regression (16) results in an adjusted R^2 that is two percent lower, which motivates me to keep them in the regression used to define excess cash.

5. Excess Cash Holdings and Fund Performance

In this Section, I describe the methodology used to estimate excess cash and discuss the characteristics of funds with different excess cash measures. I next study the relationship between fund excess cash holdings and future returns. I define performance measures used in the analysis, and show that while raw cash is unrelated to future returns, funds with higher excess cash earn greater returns in the future.

5.1. Excess Cash Estimation Methodology

To define excess cash holdings of mutual funds, I use the last specification of Table 2 that combines all of the considered fund characteristics and that achieves the highest adjusted R^2. At every point in time when the data on fund cash holdings are available (annually prior to 1998 and quarterly thereafter), I estimate the following cross-sectional regression:

$$
\begin{aligned}
\text{CASH} = \; & \gamma_0 + \gamma_1\text{LNTNA} + \gamma_2\text{EXP} + \gamma_3\text{FL} + \gamma_4\text{DL} + \gamma_5\text{12B1} + \gamma_6\text{TURN} + \gamma_7\text{RU12} + \gamma_8\text{FF1} + \gamma_9\text{FF6} + \gamma_{10}\text{FF12} \\
& + \gamma_{11}\sigma_{\text{FF}} + \gamma_{12}\text{RG} + \gamma_{13}\text{DY} + \gamma_{14}\beta^{\text{Mkt}}_{\text{Fund}} + \gamma_{15}\beta^{\text{Mkt}}_{\text{Hold}} + \gamma_{16}\beta^{\text{Liq}}_{\text{Hold}} + \gamma_{17}\text{PRCDS} + \varepsilon, \qquad (1)
\end{aligned}
$$

where time and fund suffixes are suppressed for brevity. CASH is the percentage of fund total net assets held in cash; LNTNA is log of total net assets; EXP is the expense ratio; 12B1 is actual 12b-1 expenses; FL and DL are front and deferred loads; TURN is fund turnover ratio; RU12 is the 12-month fund return runup; FF1, FF6, and FF12 are prior 1-, 6-, and 12-month fund flows; σ_{FF} is the volatility of one-month fund flows over the previous 12 months; RG is the Kacperczyk, Sialm, and Zheng (2008) annual return gap; DY is fund dividend yield; $\beta^{\text{Mkt}}_{\text{Fund}}$ is market beta of the fund; $\beta^{\text{Mkt}}_{\text{Hold}}$ and $\beta^{\text{Liq}}_{\text{Hold}}$ are market and liquidity betas of fund holdings; and PRCDS is proceeds from fund stock sales less stock purchases, scaled by dollar value of all stock holdings.[12] I define excess cash for a given fund as the residual ε from this regression and assign funds into quintiles on the basis of this value.[13]

The results of this paper are robust to reasonable alternative excess cash definitions. In fact, in settings where the determinants of cash include lagged fund flow (FF1), past returns (RU12) and lagged fund beta ($\beta^{\text{Mkt}}_{\text{Fund}}$), the positive relationship between excess cash and future fund performance emerges. Appendix B provides more details and discusses the results obtained using a simplified excess cash definition.

[12] All independent variables are winsorized at 1% and 99% in each cross-section.

[13] I can alternatively calculate excess cash holdings using a fixed effects model. In untabulated results, I find that the empirical conclusions of this paper are similar under this estimation approach. However, I later focus on the predictability of fund performance, and it is more appealing to use a method that calculates excess cash at a given time using only data available up to that point. Thus, I report the results based on the cross-sectional regression approach.

5.2. Characteristics of Excess Cash Portfolios

Table 3 presents average (in Panel A) and median (in Panel B) characteristics of funds in different excess cash groups. As is natural to expect, funds with higher excess cash hold a higher fraction of total net assets in cash: while funds in the highest quintile hold on average 11.6% of assets in cash, the comparable figure for funds in the lowest group is just 1.5%.

The remaining fund characteristics are used as regressors in explaining fund cash holdings. It is thus not surprising that there is no monotonic relationship between excess cash and any of the variables, regardless of whether averages or medians are considered. Several characteristics exhibit a U-shaped relationship with excess cash (e.g., expense ratio or fund flows), but for all characteristics average values of the top and bottom groups are comparable.

5.3. Performance Measures

To explore the relationship between fund excess cash holdings and future performance, I examine raw returns of the funds and consider several factor-based performance measures, which I now describe.

A. Market Model

The first measure I consider is the market model alpha, estimated as the intercept α_i^M from regression

$$R_{it} = \alpha_i^M + \beta_i^M R_{Mt} + \varepsilon_{it},$$

where R_{it} is the excess return of each of the five excess cash fund groups, or the difference in returns between high and low excess cash quintiles, and R_{Mt} is market excess return.

B. Fama-French Three-Factor Model

I next complement the market model with the value and size factors, and estimate the Fama and French (1993) 3-factor performance measure as the intercept from regression

$$R_{it} = \alpha_i^{FF} + \beta_i^M R_{Mt} + \beta_i^{HML} HML_t + \beta_i^{SMB} SMB_t + \varepsilon_{it},$$

where HML and SMB are value and size factors.

C. Carhart Four-Factor Model

To adjust for momentum in stock returns (Jegadeesh and Titman, 1993), I next consider the Carhart (1997) four-factor model

$$R_{it} = \alpha_i^{CAR} + \beta_i^M R_{Mt} + \beta_i^{HML} HML_t + \beta_i^{SMB} SMB_t + \beta_i^{MOM} MOM_t + \varepsilon_{it},$$

where MOM is the momentum factor.[14]

D. Multifactor Model with Liquidity Factors

The analysis of the determinants of cash holdings indicates that liquidity may be an important factor affecting fund cash levels. To adjust for potential differences in liquidity of funds in different excess cash groups, I complement the Carhart four-factor model with either Pastor and Stambaugh (2003) or Sadka (2006) liquidity factor obtained from WRDS.

E. Ferson-Schadt Conditional Model

Ferson and Schadt (1996) show that commonly used unconditional performance measures may be unreliable if risk premiums or betas are time-varying. They propose a model based on conditional performance that uses a pre-determined set of conditioning variables. As a robustness check, I consider the following conditional performance regression

$$R_{it} = \alpha_i^{FS} + \beta_i^M R_{Mt} + \beta_i^{HML} HML_t + \beta_i^{SMB} SMB_t + \beta_i^{MOM} MOM_t + \sum_F \beta_i^F \left(Z_{F,t-1} R_{Mt}\right) + \varepsilon_{it},$$

where $Z_{F,t-1}$ is the demeaned value of the macroeconomic variable F at $t-1$. Following previous studies, I include the following macroeconomic variables: dividend yield of the S&P 500 index, term spread (difference between 10-year Treasury note and three-month Treasury bill), default spread (difference between rates on AAA and BAA bonds), and the three-month Treasury bill rate.[15] The

[14] I obtain value, size, and momentum factors from Kenneth French's data library, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[15] Dividend yield is computed using CRSP files. Data on Treasury and corporate bond rates are obtained from the Federal Reserve, http://research.stlouisfed.org/fred2.

intercept α_i^{FS} from this regression is the conditional performance measure.

5.4. Future Fund Performance

To study the relationship between excess cash and future performance, I estimate excess cash at the end of each month t when cash holdings data are available and assign funds into quintiles on the basis of excess cash. I hold the resulting five TNA-weighted portfolios for 12 months beginning in month $t+4$. I skip three months between excess cash estimation and beginning of holding period to ensure that all data required for excess cash calculation (e.g., fund holdings) are publicly available.[16] The choice of 12-month holding period is motivated by the fact that prior to 1999 cash holdings are observed only annually.[17] The first estimation of excess cash in my sample happens at the end of 1992, and as a result, the return series start in April 1993. Prior to 1999, when cash holdings are available on an annual basis, no portfolios overlap, whereas starting in 1999, during any given month in quarter τ, the quintile q portfolio contains funds that were assigned to this group as of the end of quarters $\tau - 2$ through $\tau - 5$.

A. Raw Cash and Future Performance

I first show that there is no significant relationship between excess cash and future returns. To do this, I assign funds into quintiles on the basis of raw, rather than excess cash. Table 4 presents future raw and risk-adjusted returns of the five resulting groups. Consistent with the observations of Yan (2006), regardless of the performance measurement approach, there is no link between cash holdings and future returns.[18] In particular, funds in the low cash group earn on average 0.45% per month during the holding period compared to 0.47% for high-cash funds. Similarly, low-cash group earns an average Carhart four-factor alpha of −0.17% compared to −0.12% generated by the high-cash quintile. Conditional Ferson-Schadt alpha of the low and high-cash funds are −0.18% and

[16] Empirical relationship between excess cash and future returns is marginally stronger if instead I start holding the portfolios in month $t+1$ immediately following excess cash calculation.

[17] Considering shorter holding horizons using post-1998 data (when cash holdings are available on a quarterly basis) results in similar, and generally stronger relationship between excess cash and future fund performance.

[18] It appears that funds in the middle quintile (CASH3) earn the highest raw and risk-adjusted returns in the future. This can be interpreted as evidence of fund performance suffering when its cash holdings deviate from some average level. I find that assigning funds into groups on the basis of their absolute deviation from demeaned cash holdings leads to a negative, although insignificant relationship between this deviation measure and future returns.

-0.11%, respectively. In no case is the difference between returns of high- and low-cash quintiles significant. Negative average alphas across all cash groups are consistent with voluminous prior literature documenting poor risk-adjusted performance of actively managed mutual funds (e.g., Gruber, 1996; Carhart, 1997; Wermers, 2000; and others).

B. Excess Cash and Future Performance

Table 5 studies the relationship between excess cash and future returns. Regardless of which performance measure is used, there is a strong positive relationship between fund excess cash holdings and future returns. The difference between raw returns of high and low excess cash groups reaches 0.18% monthly (0.51% vs. 0.32%). Controlling for exposure to the market, value, and size factors, I find that the difference in Fama-French alphas amounts to 0.23% (-0.04% vs. -0.26%) per month. Accounting additionally for either momentum and liquidity factors results in the difference in alphas of high and low excess cash group of around 0.20%, whereas the difference in the conditional Ferson-Schadt performance measures stands at 0.22% (-0.04% vs. -0.26%). For each performance measure considered, the difference between high and low excess cash funds is both statistically significant (t-statistics between 2.42 and 3.04) and economically meaningful (difference in annual returns between 2% and 3%). It is also interesting to point out that although alphas of each excess cash group are negative, they are statistically indistinguishable from zero for the top two quintiles.

Figure 2 plots cumulative abnormal returns (based on the Ferson-Schadt performance measure) of the excess cash quintiles in event time during five years following portfolio assignment. Several observations related to this figure are particularly interesting. First, the difference in performance persists over the entire five-year period: the gap between cumulative abnormal returns of high and low excess cash groups actually widens during the first three years following portfolio assignment, and then appears to stabilize. Second, low-cash firms perform remarkably poorly: their abnormal returns average around -0.13% per month over the course of five years. Such performance may be attributable to costs associated with cash shortfalls. Funds with low excess cash may be forced to sell their holdings at a cost and at a disadvantageous time to raise cash to meet withdrawals or satisfy other outflows (e.g., fund expenses). Fund performance suffers, causing more withdrawals, further damaging fund performance, and thus possibly trapping low excess cash funds in a punishing cycle. Finally, it is also interesting to point out that two top excess cash quintiles perform comparably well, with the top group edging slightly ahead. The third quintile underperforms the top two over the first three years, and then surpasses the second highest quintile in the fifth year.[19]

To verify that the differences in performance between high and low excess cash funds are not limited to a particular time period, Figure 3 shows the time series of cumulative abnormal returns (based on the Ferson-Schadt conditional performance measure) from a portfolio that is long the high excess cash funds and short the low excess cash group. The plot illustrates the steadily increasing cumulative returns from this long-short position. The outperformance of the high excess cash group is particularly pronounced in 1999, near the peak of the dot-com bubble.

C. Excess Cash and Future Performance: Fama-MacBeth Regressions

Table 6 further confirms the robustness of the positive relationship between excess cash and fund performance by presenting the results of Fama-MacBeth (1973) regressions of annual fund returns from months $t + 4$ to $t + 15$ on selected fund characteristics, including excess cash, measured at the end of month t. Regression (1) confirms that excess cash relates positively to future fund performance, whereas specification (2) shows that raw cash is unrelated to future returns. The next three regressions demonstrate that return gap relates positively, while fund size and marketing and distribution 12b-1 expenses are related negatively to future performance.[20] Including them jointly alongside excess cash in regression (6) does not affect the significance of the excess cash measure.

Given that raw cash is unrelated to future fund performance while excess cash relates to it positively, it is interesting to ask which fund characteristics must be controlled for to achieve a statistically significant relationship between cash holdings and future fund returns. To determine

[19] Given the results described here, it is natural to ask whether low excess cash funds are more likely to shut down, merge with another fund, or be taken over. In unreported results, I find no relationship between excess cash and the likelihood of such events happening. This observation is in line with the finding in the prior literature that investors fail to flee the worst performing mutual funds (e.g., Sirri and Tufano, 1998).

[20] None of the other variables I considered were significantly related to future fund performance at conventional levels, and I do not include them in Table 6.

this, I consider cash in combination with selected fund characteristics as regressors. Specifications (7) through (9) show that including last month's fund flow, 12-month runup, or fund beta as explanatory variables in addition to cash, increases the t-statistic on cash but the coefficient remains insignificant. However, as long as one combines fund beta with either fund flow or runup, the coefficient on cash holdings becomes statistically significant. Thus, to obtain a positive relationship between cash and future fund performance, it is particularly important to control for fund beta, and additionally for either recent fund flow or fund performance. In particular, in regression (12) that includes cash, fund flow, runup, and fund beta as explanatory variables, the t-statistic on cash holdings coefficient reaches 2.52.

D. Excess Cash and Future Performance: Conditioning on Prior Market Return

Following a market downturn, financial press abounds with stories of managers who adjusted their cash position in response to poor recent market returns (see footnote 9). Surprisingly often, such moves by the managers tend to be portrayed as savvy even though the managers adjusted their cash holdings only after the period of low market returns, rather than prior to it. In untabulated results, I find that this tendency to increase cash holdings following a market downturn is particularly pronounced among unskilled managers (those with lower return gap). For the purposes of my analysis, this implies that following a downturn, the portfolio of high excess cash funds is likely to include the funds run by such managers who are likely to continue to underperform (see Kacperczyk, Sialm, and Zheng, 2008). In such times, the returns of high excess cash portfolio will be dragged down due to the fact that it includes these poorly-performing funds.

To account for this, I do not assign funds into excess cash groups if the prior 12-month market return was negative, and otherwise do not alter the procedure used to construct excess cash portfolios.[21] Table 7 reports the resulting future raw and risk-adjusted returns of different excess cash groups. Compared to the findings presented in Table 5, where funds are assigned into groups without conditioning on prior market performance, the difference in future returns between high

[21] I alternatively consider not including into a high excess cash portfolio those funds that increased their cash holdings by more than half following a 12-month period of negative market returns, and obtain similar results.

and low excess cash funds is approximately 50 percent larger. For example, the difference in the Ferson-Schadt conditional alphas reaches 0.32% per month (t-statistic of 3.95). What is even more interesting, alphas of the high excess cash group are in no case negative, regardless of which performance measure is used. Thus, the relationship between excess cash and future fund performance is particularly pronounced when high excess cash portfolio is less likely to include unskilled managers who increase their cash position in response to poor prior market returns.

6. A Model of Mutual Fund Cash Holdings

In this Section, I develop an infinite-horizon model of mutual fund cash holdings and show that cash position in excess of the level predicted by the model relates positively to future fund performance.[22]

Consider a manager who enters period t carrying a fraction C_t of total net assets in cash and decides what fraction X_t of net assets to sell and buy,

$$X_t = Amount\ sold\ per\ unit\ of\ TNA\ - Amount\ bought\ per\ unit\ of\ TNA.$$

Cash-to-total net assets ratio in the following period is affected by this decision and shock FF_{t+1}, a fund flow per unit of total net assets:

$$C_{t+1} = C_t + X_t + FF_{t+1}.$$

Fund flows per unit of total net assets can be thought of as a combination of mutual fund flows unrelated to purchase and sale decisions of the manager, and may incorporate new deposits, withdrawals, as well as flows from dividends:

$$FF_{t+1} = \mu_{FF} + \sigma_{FF}\varepsilon^{FF}_{t+1},$$

[22]The model in its current form is not designed to explain the empirically observed relationship between excess cash and future fund performance but rather to show that this relationship is robust to defining excess cash relative to a model-based target level.

where ε_{t+1}^{FF} is standard normal.

Manager's objective is to choose X_t to minimize the present value of the sum of opportunity, adjustment, and shortage costs associated with carrying cash.[23] Per-period cost of carrying cash is

$$\rho C_t + \frac{1}{2}\lambda X_t^2 + \frac{a}{C_t}.$$

The first component of this amount, ρC_t, captures the opportunity cost of holding cash. Equities tend to earn a higher return than cash holdings, and ρ can be thought of as average return foregone by carrying cash rather than investing in higher-yielding assets. The second component, $\frac{1}{2}\lambda X_t^2$, is the adjustment cost associated with buying or selling shares. Parameter λ may reflect both actual trading expenses and market impact costs. Finally, a/C_t captures the shortage cost, which decreases with cash holdings of the fund. When cash position is particularly low, any outflow shock can result in a high cost as the fund scrambles to obtain the necessary cash to cover the outflows. Additionally, holding particularly low cash balance may result in lower flexibility to act quickly to take advantage of profitable investment opportunities that might arise.

Bellman equation associated with this problem is

$$V_t(C_t) = \min_{X_t} \left\{ \rho C_t + \frac{1}{2}\lambda X_t^2 + \frac{a}{C_t} + \beta E_t \left[V_{t+1}(C_{t+1}) \right] \right\},$$

where β is the discount factor.

The model clearly abstracts from other potentially important factors affecting optimal cash positions, but it captures the key costs associated with holding cash and allows to obtain an estimate of a target cash level, and thus to compute a measure of excess cash that does not rely on regression estimation.

To solve the model, I make a simplifying assumption that adjustment and shortage cost parameters, λ and a, are equal across funds with similar risk characteristics. More specifically, to

[23]Cost-minimization goal of the manager is appropriate in a competitive mutual fund industry, where managers do not possess stock-selection, market-timing or other skills. The manager maximizes total assets under management by minimizing fund's costs.

estimate λ and a, in each cross-section I first assign funds into ten groups on the basis of their lagged market beta, $\beta_{\text{Mkt}}^{\text{Fund}}$, and for each group i obtain the empirical estimates of the remaining parameters $\left\{\rho_i, \mu_{FF,i}, \sigma_{FF,i}, \beta_i\right\}$. Specifically, I compute the opportunity cost parameter ρ_i as the product of average market beta of the funds in group i and quarterly risk premium of 1.5%. Pooling all fund-quarter observations of each beta group, I obtain the empirical estimates of the mean and volatility of fund flows and use the resulting values as $\mu_{FF,i}$ and $\sigma_{FF,i}$ parameters. Finally, I approximate the quarterly discount factor as $\beta_i = 1/1.015 = 0.985$.[24]

For each of the ten beta groups, I solve the model numerically using the set of parameters $\left\{\rho_i, \mu_{FF,i}, \sigma_{FF,i}, \beta_i\right\}$ and arbitrary values λ_i and a_i to obtain a policy function $X_t(C_t)$. I then compute the distance between vectors of empirical and model-predicted policy decisions:

$$D_i = \max\left(\text{abs}\left(\mathbf{X}_i^{model} - \mathbf{X}_i^{empir}\right)\right),$$

where for group i containing N fund-quarter observations, $\mathbf{X}_i^{model}$ is the $N \times 1$ vector of model-predicted policy decisions given cash holdings $\mathbf{C}_i$ of this group, and $\mathbf{X}_i^{empir}$ is the $N \times 1$ vector of empirically observed decisions taken by the fund managers of group i.[25] The values $\{\lambda_i, a_i\}$ that minimize the distance D_i for group i are used in the later analysis as parameter values λ_i^j and a_i^j for each fund j that falls into this group.

I next estimate the target cash level for each fund j and quarter t using the set of parameters $\left\{\rho_t^j, \mu_{FF}^j, \sigma_{FF}^j, \beta, \lambda_{it}^j, a_{it}^j\right\}$, where ρ_t^j is the product of quarterly risk premium of 1.5% and the lagged market beta of fund j computed using one year of data up to quarter t, μ_{FF}^j and σ_{FF}^j are mean and volatility of fund flows of fund j, $\beta = 0.985$, and λ_{it}^j and a_{it}^j are the adjustment and shortage

[24]I focus on the quarterly horizon because more fund-quarter observations are available in my sample than fund-year observations. This restricts the sample to the 1998-2008 period, which is also appropriate given that cash-to-total net assets ratios are not stationary prior to 1998 (see Figure 1).

[25]I compute each element of $\mathbf{X}_i^{empir}$ as

$$C_{i,t+1}^j - C_{i,t}^j - FF_{i,t+1}^j - DY_{i,t+1}^j,$$

where $C_{i,t}^j$ is cash-to-TNA ratio of fund j which belongs to beta group i as of the end of quarter t, and $FF_{i,t+1}^j$ and $DY_{i,t+1}^j$ are the ratios of quarter $t+1$ fund flows and dividends to TNA.

parameters of fund j given that it belongs to beta group i as of quarter t.[26] The model then yields a policy function and an estimate of the target cash level for each fund-quarter observation. The average model-predicted target cash position across all fund-quarter observations is 4.5% of total net assets compared to 4.0% cash-to-TNA ratio observed empirically for the set of funds used in the estimation.[27]

6.1. Model-Based Excess Cash and Future Fund Performance

The empirical results presented in the previous Section highlight a positive relationship between mutual fund excess cash positions and future fund performance. Excess cash in that analysis is defined as the residual from a cross-sectional regression of cash holdings on a number of fund characteristics. Defining excess cash in such manner is very appealing, as it accounts for a wide number of variables that affect cash holdings. I now show that the key empirical results of this paper do not depend on this particular way of estimating excess cash by demonstrating that the positive relationship between excess cash and future fund performance is robust to defining excess cash as the difference between actual and model-based target cash holdings.

More specifically, in each cross-section I assign funds into five groups on the basis of excess cash calculated as

$$EC_t^j = \frac{C_t^j - \hat{C}_t^j}{\hat{C}_t^j},$$

where C_t^j and $\hat{C}_t^j$ are actual and model-based target ratios of cash to total net assets of fund j at time t. In then calculate future raw and risk-adjusted returns of each of the five quintiles in the same manner as was done earlier. Table 8 shows a generally monotonic positive relationship between excess cash defined in this manner and future fund performance. Whereas raw and market-adjusted returns of high excess cash funds are only marginally higher than those of their low excess cash peers, the average difference between other measures of risk-adjusted returns of the two groups exceeds

[26] If fund j that belongs to beta group i at a given point in time has less than four quarterly observations available, I use as parameters the mean and volatility of the fund flows of the beta group, $\mu_{FF,i}$ and $\sigma_{FF,i}$, rather than of the fund itself, μ_{FF}^j and σ_{FF}^j.

[27] Average model parameters used are $\{\rho = 0.015, \mu_{FF} = 0, \sigma_{FF} = 0.1, \beta = 0.985, \lambda = 1.14, a = 0.00003\}$.

0.20% monthly. For example, the conditional Ferson-Schadt performance measure is -0.25% for the low excess cash group but reaches -0.02% for the high excess cash funds. The difference in future performance of funds with different excess cash levels is thus not specific to the regression-based definition of excess cash employed throughout this paper but is robust to defining excess cash relative to a target position predicted by a model of optimal cash holdings.

7. Sources of Relationship Between Excess Cash and Fund Performance

In this Section, I explore the driving forces behind the difference in future performance of funds with different excess cash holdings. I link the positive relationship between excess cash and future returns to manager's ability to control fund expenses, his stock-picking and market-timing skills, and managerial aptitude to anticipate fund flows.

7.1. Excess Cash and Ability to Control Fund Expenses

I now consider a framework of transacting in shares of a stock in a setting with fixed and variable costs. The model suggests that relative to a manager who either invests all sales proceeds immediately and/or who transacts more frequently than is optimal, a cost-minimizing manager will tend to carry a higher cash balance. The framework can thus justify the positive link between high cash positions and performance: managers carrying greater cash balances may be doing so in part to minimize transaction costs and as a result they outperform their low-cash peers. Consistent with the model, I show that future fund expenses decline with excess cash. I also demonstrate that excess cash is particularly valuable for large funds.

A. Model of Costly Stock Trading

Consider a fund that holds n_S shares in stock S, with current market price per share of p_S. The manager would like to sell all of his holdings in S and invest the proceeds in n_B shares of stock B, which trades at p_B per share. Costs associated with either buying or selling n_i shares of stock i at price p_i per share are

$$F_i + V_i(n_i p_i)^2,$$

where F_i and V_i are fixed and variable costs, respectively.

Suppose that the manager can only transact at discrete points in time, and for simplicity assume that price is not directly affected by manager's decisions. The manager's objective is to minimize the total cost associated with transacting in a given stock i:

$$N_i F_i + \sum_{r=1}^{N} V_i \left(n_i^r p_i\right)^2,$$

where N_i is the number of distinct trades the manager makes to either acquire or dispose of stock i, and n_i^r is the number of shares of stock i the manager buys or sells during his rth transaction.[28]

Given that the manager will make N_i transactions in stock i and that total variable costs increase with the dollar value of shares bought or sold in a given transaction, the number of shares n_i^r that will minimize the total cost is n_i/N_i, where n_i is the total number of shares of stock i that the managers would like to buy or sell.[29] Thus the manager's problem can be rewritten as

$$\min_{N_i} Cost_i\left(N_i\right) = \min_{N_i} N_i F_i + N_i V_i \left(\frac{n_i}{N_i} p_i\right)^2 = \min_{N_i} N_i F_i + \frac{1}{N_i} V_i \left(n_i p_i\right)^2.$$

The number of transactions that minimizes the total cost is

$$N_i^* = \sqrt{\frac{V_i}{F_i}} \left(n_i p_i\right)$$

if $\sqrt{V_i/F_i}\left(n_i p_i\right)$ is an integer, or

$$N_i^* = \underset{N_i \in \left\{\left\lfloor \sqrt{V_i/F_i}(n_i p_i)\right\rfloor, \left\lfloor \sqrt{V_i/F_i}(n_i p_i)\right\rfloor + 1\right\}}{\arg\min} Cost_i\left(N_i\right)$$

[28] This set-up implies that the manager does not face any costs of delaying his transactions (i.e., future costs are discounted at the rate of zero), but I assume that the manager prefers to conduct his transactions as soon as possible. A manager may prefer to conduct the transaction as soon as possible, for example, when he receives a signal about future performance of a stock.

[29] This can be readily seen by solving the problem $\min_{\{n_i^r\}} N_i F_i + \sum_{r=1}^{N_i} V_i \left(n_i^r p_i\right)^2$ s.t. $\sum_{r=1}^{N_i} n_i^r = n_i$. The derivative of the associated Lagrangian with respect to the jth choice variable n_i^j is $2 V_i n_i^j p_i = \lambda$, where λ is the Lagrange multiplier. This suggests that for every j and k, $n_i^j / n_i^k = 1$, or $n_i^j = n_i^k = n_i/N_i$.

otherwise, where $\lfloor x \rfloor$ denotes the integer part of x. Thus the optimal number of transactions N_i^* increases in variable cost V_i and decreases in fixed cost F_i.

Consider now again the problem of selling shares in stock S and investing the proceeds in stock B. Given that the manager minimizes total transaction costs, the change in fund's cash holdings associated with selling stock S and purchasing stock B during a period of time of length t is

$$\Delta C_t = \left\lfloor \frac{t}{N_S^*} + 1 \right\rfloor \left(\frac{n_S}{N_S^*} p_S - F_S - V_S \left(\frac{n_S}{N_S^*} p_S \right)^2 \right) - \left\lfloor \frac{t}{N_B^*} + 1 \right\rfloor \left(\frac{n_B}{N_B^*} p_B + F_B + V_B \left(\frac{n_B}{N_B^*} p_B \right)^2 \right).$$

If $\sqrt{V_S/F_S} < \sqrt{V_B/F_B}$, as for example might be the case if stock B is less liquid than S, then $N_S^* < N_B^*$. In other words, in such case the manager will take a longer time to purchase the desired amount of stock B than to sell his holdings in stock S, and as a results the change in cash unrelated to transaction costs will be non-negative at any point t. On the other hand, a non-optimizing manager who either invests all sales proceeds immediately and/or who transacts in the illiquid stock more frequently than is optimal will cause a change in cash that is not larger than the change in cash of a fund run by a cost-minimizing manager.

If one additionally requires that the managers can only use fund cash reserves to cover fixed and variable costs but not to finance stock purchases directly, then the managers will use the proceeds from the sale of stock S to cover the purchase of stock B. As a result, a cost-minimizing manager will carry a higher or similar cash balance than a manager who invests the sales proceeds quicker, even when $\sqrt{V_S/F_S} \geq \sqrt{V_B/F_B}$.

Figure 4 shows cumulative changes in cash holdings under two scenarios: when fund manager buys a less liquid stock than he sells (in Panel A), or when he finances the purchase of stock B by proceeds from the sale of stock S (in Panel B). In either case, at any point in time, the cumulative change in cash unrelated to transaction costs is non-negative. By contrast, a corresponding change in cash of a fund run by a manager who invests all sales proceeds immediately will be strictly non-positive.

High cash positions may thus proxy for managerial ability to control costs: cost-minimizing managers carry higher cash balances and generate better results than do those managers who make sub-optimal decisions by reinvesting the proceeds from sales of shares immediately or by otherwise transacting inefficiently.

B. Empirical Evidence

The framework outlined above implies that managers who are better able to control their transaction costs may carry higher cash balances. It additionally suggests that managers who purchase less liquid stocks may also carry higher cash positions than do their peers holding more liquid shares. To test these conjectures empirically, I now explore how excess cash holdings relate to future fund expenses and future liquidity of shareholdings.

Table 9 demonstrates a monotonic negative relationship between excess cash and several measures of future fund expenses. For example, high excess cash funds spend on average 0.21% of total net assets less on expenses during the twelve months following portfolio assignment than do their low excess cash peers (t-statistic of 4.94). Similar patterns emerge for 12b-1 marketing expenses, management fees, and turnover.

Table 9 also shows that average liquidity of fund shareholdings declines (loading on the liquidity factor rises) with excess cash: a year following portfolio assignment, high excess cash funds hold stocks that are on average the least liquid than holdings of any other group. This suggests that high excess cash funds buy stocks that are considerably less liquid than those purchased by the low excess cash group. The relationship between excess cash and both future expenses and liquidity of shareholdings is particularly striking given that I control for the differences in expenses and liquidity when estimating fund excess cash holdings.

If funds carry high excess cash in part due to lower liquidity of their shareholdings, it is natural to expect that excess cash is particularly valuable for large funds holding illiquid stocks. Small funds can adjust their shareholdings reasonably quickly without causing dramatic price pressure, whereas large funds – particularly those transacting in illiquid stocks – that try to minimize total trading costs may have to move slower and hold more cash as a results. To check this conjecture, I assign funds in each excess cash quintile into tertiles on the basis of their size, measured at the same time as excess cash. Within each excess cash-size group, I then sort funds into tertiles on the basis of liquidity of their shareholdings, $\beta_{\text{Liq}}^{\text{Hold}}$. Consistent with the hypothesis, Table 10 shows that the difference in future returns between high and low excess cash funds is particularly pronounced for large fund with illiquid holdings. Regardless of the performance measure used, the difference in returns between high and low excess cash funds exceeds 0.50% per month for large illiquid funds, and is generally lower for smaller and more liquid funds.

In light of the evidence presented in this section, the positive relationship between excess cash and fund performance can be interpreted as a link between excess cash holdings and the ability to control fund costs. Funds carry high excess cash as a result of minimizing total costs of transacting in stocks. In the future, high excess cash funds continue to manage their costs well, which contributes to their stronger performance relative to their low excess cash peers.

7.2. Stock Selection

Holding high cash balances can impose a significant cost on fund performance. Wermers (2000), for example, estimates that non-stock holdings drag fund returns down by 0.7% per year. Thus, any manager who rationally decides to carry high excess cash needs to be able to make good investments to compensate for the lower return cash tends to earn relative to equity benchmarks. It is natural to conjecture that such managers tend to make better stock purchasing decisions in the future. Managers of low excess cash funds, on the other hand, will tend to be comprised of those who find it unfavorable to hold high cash balances. This group is likely to include at least two subsets of managers: those with poor stock purchasing skills, and/or those skilled at identifying poorly performing stocks. The latter subset includes those managers who are able to raise cash quickly and at a low cost by selling those of their holdings that are likely to generate low returns in the future.[30] To check these conjectures, I now study the performance of stocks purchased and sold by different excess cash groups.

[30]Low excess cash group can certainly include managers with good stock purchasing skills who are fully invested and do not anticipate better buying opportunities to arrive in the near future. Later in the section, I discuss the effects they may have on the empirical results presented here.

I begin by comparing fund holdings at the time excess cash holdings are estimated with holdings a year later. I determine which stocks were bought and sold by each fund during this period, and note the number of shares acquired or disposed.[31] The time of purchases and sales is not directly observable, and I assume that all transactions take place six months after excess cash calculation. I then calculate returns of the shares bought and sold over the following six-month period. I estimate both raw returns as well as style-adjusted performance, calculated following Daniel, Grinblatt, Titman, and Wermers (1997).[32]

Table 11 shows average future returns earned by stocks bought and sold by each excess cash group. I separate all stock purchases made by a given fund into additions to already existing positions ('old' buys), and investment in those stocks not held by the fund at the beginning of the period ('new' buys). I first calculate the average returns earned by buys and sells of each fund in each cross-section (weighted by the dollar amount spent on buys or earned from sells), and then obtain a TNA-weighted cross-sectional average of these returns for each excess cash quintile. Table 11 shows time series means of raw and style-adjusted returns.

The 'All Buys' column of Table 11 shows that managers of high excess cash funds are considerably better at identifying investment opportunities. The stocks they buy earn on average 0.12% per month more than the shares purchased by the low excess cash funds. Interestingly, a lot of this outperformance is concentrated in the additions to the positions already held by the funds: future raw returns of the 'old' buys made by the high excess cash funds exceed those of the low excess cash group by 0.18% per month. The difference in returns of the 'new' buys is smaller but still sizeable, at 0.11% per month.

[31] To compute how many shares were bought and sold, I use CRSP files to adjust for events such as stock splits and stock dividends that affect the number of shares outstanding and share price. Visual examination of the Thomson holdings database reveals that while the number of shares reported by most funds is split-adjusted, there are observations where the number of shares of a given stock held by a fund does not change despite the fact that the stock underwent, e.g., a 2-for-1 split. In such cases, I do not perform any adjustments when calculating the number of shares bought and sold.

[32] An alternative approach is to estimate alphas from short-window regressions for individual stocks, and calculate their average for each fund/time observation. However, such a procedure is likely to produce biased performance measures, as Boguth, Carlson, Fisher, and Simutin (2009) demonstrate. This is particularly important given that most mutual funds follow momentum strategies. For example, Grinblatt, Titman, and Wermers (1995) find that 77% of mutual funds are momentum investors.

Stronger outperformance by the 'old' buys rather than by the 'new' buys of the high excess cash groups is intriguing. It is possible that managers of high excess cash funds realize the attractiveness of their existing holdings, and carry excess cash because they plan to add to these positions in the near future.[33] If the managers are able to invest an optimal amount in these stocks instantaneously, they may carry no excess cash; but they may be unable to do so, for example due to the risk of causing price pressure that will prevent them from buying at attractive prices. Thus, they carry excess cash and gradually invest it, focusing on investments in their existing holdings.[34]

The last two columns of Table 11 show that future performance of stocks sold by high excess cash funds is actually better than that of shares sold by the low excess cash group. The magnitude of the difference is substantial: 0.20% and 0.14% monthly for raw and style-adjusted returns, respectively.[35] Thus, consistent with the argument developed at the beginning of this section, managers of low excess cash funds are particularly skilled at identifying shares that will perform poorly in the future. It is therefore likely that at least a subset of those managers who choose to hold low excess cash do so because they are convinced that they will be able to meet any cash shortfall by selling those of their stock holdings that are likely to perform poorly in the future.

On the whole, the evidence presented here demonstrates that managers of high excess cash funds are skilled at stock purchasing (identifying undervalued stocks), whereas managers of low excess cash group are proficient at determining which stocks to sell (identifying overvalued stocks). The differences in returns of the buys and sells between the two groups are likely biased downwards by the presence in the low excess cash group of those managers who are skilled stock purchasers but who are already fully invested.

The results presented above can also be interpreted as consistent with the notion that managers of high and low excess cash funds invest in development of different sets of skills. In particular,

[33]Footnote 2 disusses why such manager may prefer to hold cash rather than exchange-traded funds or similar assets as they wait for buying opportunities.

[34]Lending further support to this argument, in untabulated results I find that relative to the low excess cash group, high excess cash funds spend proportionately more on purchases, in particular when adding to their existing holdings.

[35]'New' buys earn higher returns than 'old' buys, which in turn earn higher returns than sells (e.g., 0.99%, 0.43%, and 0.19%, respectively, for the low excess cash group). This is likely due to the fact that 'new' buys tend to be past winners, that sells tend to be past losers (e.g., Grinblatt, Titman, and Wermers, 1995), and that not all transactions take place in the middle of the examined 12-month period.

consider a setting where mutual fund managers can improve their ability to identify undervalued or overvalued equity by investing their effort into some form of a buy and sell 'technology'. The amount of effort they can expend, however, is limited (e.g., by the number of hours they can work productively or by the number of stocks they can analyze), and the managers must decide how to allocate it between the two technologies. Managers holding unusually large cash balances may realize that they need to bring their cash position down to some target level. To do so, they need to determine which purchase decisions to make, and thus they have a strong incentive to invest in the ability to identify which stocks to buy. Low excess cash fund managers, on the other hand, will find investing in the 'sell technology' more appealing. As a result of these allocations of effort, managers of high excess cash funds make better purchase decisions, whereas those running low excess cash funds are more skilled at identifying which stocks to sell, which is consistent with the results presented here.

The findings of this section are suggestive, but do not fully explain the positive relationship between excess cash and future fund returns. In particular, buys of high excess cash funds outperform those of low excess cash group, but their sells also outperform. Thus, high excess cash funds improve their returns by making better buy decisions, whereas low excess cash funds do so by making better sell decisions. Yet, if performance of the fund is driven mainly by the purchase rather than sales decisions, the results of this section points to one of the potential sources of the positive link between excess cash and future fund performance.

7.3. Market Timing

A mutual fund manager with market-timing ability may optimally increase the fund's cash position prior to a market downturn. At the same time, he will decrease cash holdings prior to a bull market. Thus, it is unlikely that the positive relationship between excess cash and fund performance proxies solely for the manager's ability to successfully anticipate major turns of the stock market. However, if market-timing skills are mainly concentrated in the ability to predict market downturns, market timing may at least in part explain the superior performance of high excess cash funds relative to the low excess cash group.[36] Additionally, if mutual fund managers possess any market-timing ability, one would expect to find stronger evidence of it among the funds in the extreme excess cash groups.

To test these conjectures, I begin by studying the market-timing skills of the funds in different excess cash groups. Table 12 presents the results of two commonly used approaches to test for market timing. First, I follow Treynor and Mazuy (1966) and estimate the regression

$$R_{it} = \delta_{0i} + \delta_{1i} R_{Mt} + \delta_{2i} R_{Mt}^2 + \eta_{it}$$

for each of the five excess cash quintiles and for the difference between high and low excess cash groups. Additionally, I use the Henriksson and Merton (1981) approach, estimating

$$R_{it} = \phi_{01} + \phi_{1i} R_{Mt} + \phi_{2i} \max(0, R_{Mt}) + \nu_{it}.$$

Significantly positive coefficient on δ_{2i} or ϕ_{2i} can be interpreted as indicative of successful market-timing abilities.

Contrary to the notion that funds in high and low excess cash groups possess better market-timing ability, coefficients δ_{2i} and ϕ_{2i} are actually the largest for funds in the second and middle excess cash quintiles. Portfolio of funds in both low and high excess cash groups exhibit insignificant market-timing skills: for example, when using the Henriksson-Merton measure, the coefficient ϕ_{2i} is -0.06 (t-statistic of -1.40) for the low excess cash group and -0.01 (t-statistic of -0.27) for the high excess cash group. Managers of low excess cash funds have somewhat worse market-timing abilities than their high excess cash peers, and as a result, the portfolio that is long high and short low excess cash funds exhibits positive but statistically insignificant market timing when either measure is used. On the whole, though, it appears that the relationship between excess cash and

[36] Most studies investigating the market-timing ability of mutual funds find insignificant or significantly negative market-timing performance (e.g., Treynor and Mazuy, 1966; Henriksson and Merton, 1981; Chang and Lewellen, 1984; Henriksson, 1984; Cumby and Glen, 1990; and Becker, Ferson, Myers, and Schill, 1999). Jiang, Yao, and Yu (2007) use portfolio holdings data to find evidence of managerial market-timing ability at six- and nine-month horizons.

future fund performance cannot be attributed entirely to the market-timing skills of the managers.[37]

A related and interesting question to ask is whether excess cash holdings of mutual funds predict market returns.[38] The results presented above show that the returns of neither of the excess cash groups considered provide robust evidence of market-timing skills. Yet, it is possible that at least some subset of mutual fund managers possess market-timing abilities. The funds run by such managers are likely to have more volatile excess cash holdings, as the managers adjust cash positions in response to their changing expectations about market returns. Thus, if managers possess any market-timing skills, the evidence will be more pronounced among the funds with high volatility of excess cash holdings.

To test this hypothesis, at the end of each quarter τ I calculate volatility of excess cash holdings as standard deviation of excess cash during the past 12 quarters (from $\tau - 11$ to τ), requiring at least eight observations to be present.[39] I assign funds into five groups on the basis of this measure, and for each quintile j, compute aggregate excess cash at of the end of quarter τ as

$$AEC_{j\tau} = \sum_{i \in j} EC_{i\tau} \cdot TNA_{i\tau},$$

where $EC_{i\tau}$ and $TNA_{i\tau}$ are excess cash and total net assets of fund i as of the end of quarter τ, and then estimate the regression

$$R^N_{M,\tau+1} = \psi_{0j} + \psi_{1j} AEC_{j\tau} + \varsigma^N_{j,\tau+1},$$

where $R^N_{M,\tau+1}$ is the market return during the N-month period starting in the first month of quarter $\tau+1$, $N \in (1, 3, 6, 12)$. A significantly negative coefficient ψ_{1j} can be interpreted as consistent with

[37] It may be tempting to interpret the statistically insignificant intercept from the Henriksson-Merton regression with the High-Low portfolio returns as the dependent variable as supporting the idea that the difference in returns between high and low excess cash funds in attributable to differential market-timing abilities. However, this intercept cannot be characterized as a performance measure; see for example, Boguth, Carlson, Fisher, and Simutin (2009) or Ferson (2009).

[38] In untabulated results, I confirm the finding of Yan (2006) of no relationship between aggregate *raw* cash holdings and future market returns.

[39] To obtain a meaningful measure of volatility of excess cash holdings, I limit the sample to post-1998 data, when cash holdings are available quarterly.

market-timing ability of group j, whereas a positive coefficient implies poor market-timing skills. The results of this regression are reported in Table 13. At each forecasting horizon, the bottom four groups exhibit either insignificant, or significantly negative market-timing abilities. However, aggregate excess cash holdings of the funds with high volatility of past excess cash holdings relate significantly and negatively to future three- and six-month market return.[40] This evidence can be interpreted as consistent with skillful market timing by those mutual fund managers who frequently adjust their excess cash holdings. Such managers increase their excess cash position prior to market downturns and reduce it prior to a period of strong market returns.

7.4. Liquidity Reasons

Edelen (1999) shows that fund flows have an adverse effect on fund performance. If a manager fails to anticipate fund outflows and does not have sufficient cash on hand to meet such outflows, he will be forced to liquidate some of his share holdings at a potentially disadvantageous time and price. Thus, it is possible that the difference in future performance between high and low excess cash funds may in part relate to superior ability of managers of high excess cash funds to anticipate fund outflows. To check this conjecture, I assign funds within each excess cash quintile into two groups on the basis of future realized fund flows. Table 14 demonstrates that excess cash proves particularly valuable for funds that experience low fund flows. For example, the difference between four-factor alphas of high and low excess cash funds is 0.30% per month when future fund flows are low, and just 0.10% when fund flows are high. This evidence provides support to the idea that at least a fraction of high returns earned by high excess cash funds is related to the fact that such funds are better positioned to meet future outflows. Low excess cash funds do not carry sufficient cash on hand to cover the outflows and are likely forced to liquidate some of their holdings, damaging fund performance. High excess cash group, on the other hand, is more skilled at anticipating future fund outflows and as a result is well positioned to meet such outflows, generating better returns.

[40]Insignificant evidence of market timing at one- and twelve-month horizons is consistent with the findings of Jiang, Yao, and Yu (2007) who use mutual fund holdings data to study market-timing abilities. They find no evidence of market-timing skills at one- and twelve-month horizons, but observe positive timing ability and three- and six-month horizons.

An alternative liquidity-based explanation that may justify outperformance of high excess cash funds relates to liquidity of their shareholdings. Mutual fund managers may choose to carry more cash if they are holding a portfolio of illiquid stocks, and thus their stronger performance may be due to higher returns earned by their illiquid positions.[41] To account for the differences in liquidity among excess cash groups, I control for exposure to a liquidity factor in defining excess cash. I also include Pastor and Stambaugh (2003) or Sadka (2006) liquidity factors when estimating performance. Inclusion of either factor in estimating fund abnormal returns in Table 5 has indistinguishable effect on the performance of either high or low excess cash groups. Thus, the difference in returns earned by high and low excess cash funds cannot be attributed to lower liquidity of stocks held by high excess cash funds.[42]

7.5. Excess Cash and Closed-End Fund Performance

The results discussed above suggest that the positive relationship between excess cash and mutual fund performance may relate to the better ability of high excess cash fund managers to anticipate fund outflows. To determine if this may indeed be the case, it is natural to explore whether high excess cash *closed-end* funds outperform their low excess cash peers. Unlike their open-end counterparts, closed-end funds rarely issue or retire shares, and shares are usually not redeemable until fund liquidation. Managers of closed-end funds are thus free from concerns related to fund flows, and any motives for carrying cash balances are not tied to uncertainty about fund flows. A positive relationship between excess cash of closed-end funds and future fund performance may thus be interpreted as consistent with the notion that the similar relationship that I document for open-end funds is not driven by fund flow-related reasons. On the other hand, absence of such a relationship can be viewed as supportive of the idea that fund flows play an important role in the stronger performance of high excess cash open-end funds relative to their low excess cash peers.

[41] Numerous studies document a negative relationship between stock liquidity and future returns. See, for example, Amihud (2002).

[42] In unreported results, within each excess cash quintile I assign funds into two groups on the basis of their exposure to liquidity factors (e.g., Pastor-Stambaugh, 2003, or Sadka, 2006), and study the returns of the resulting ten portfolios. The difference in returns between high and low excess cash funds is similar for high and low liquidity groups. Similar conclusion can be drawn from Table 10.

A. Data

To study the relationship between excess cash holdings of closed-end funds and their future performance, I begin by obtaining from CRSP the list of 608 closed-end funds that were in operation at some point between 1994 and 2008 (those with share code of 14).[43] Using the COMPUSTAT files, I retrieve Central Index Keys (CIKs) for 572 of these funds. Closed-end funds may report their portfolio composition in several different filings with the Securities and Exchange Commission (SEC): in N-30B, N-30D, and N-CSRS periodic reports mailed to fund shareholders, and in N-Q quarterly schedules of portfolio holdings. Out of the sample with valid CIKs, 537 funds have at least one of such reports on file with the SEC. I download all such filings of these funds using SEC's Edgar FTP server and hand-collect the data on fund objective, cash holdings, expenses, and net asset values. Unfortunately, only a minority of the closed-end funds in the sample have a domestic equity investment objective, while most others invest mainly in municipal or corporate bonds, and a number of funds focus on specific industries or on international markets. After restricting the sample to funds with at least 50% of their investments in U.S. equities, I arrive to a final sample of 54 funds or 833 fund-quarter observations.[44]

B. Summary Statistics

Table 15 reports summary statistics for the sample. Closed-end funds hold on average considerably less net assets in cash (1.79%) than do their open-end counterparts (4.83% during the 1994-2008 period), suggesting fund flow concerns play an important role in determining cash holdings of open-end funds. Closed-end funds have on average less assets under management (average net asset value of 557 million), lower fund market beta, and somewhat higher average but lower median expenses than do open-end funds (see Table 1). A median closed-end fund has been in operations for 15 years and its shares trade at 17.5% discount to the per share net asset value.[45] Cash holdings of

[43]Data in the Securities and Exchange Commission's Edgar system are not widely available prior to 1994, which leads me to focus on the 1994-2008 period.

[44]Cash holdings in the first and third calendar quarters are available for very few funds, and I restrict analysis to using only data from the second and fourth calendar quarters.

[45]I measure closed-end fund beta and return runup in the same manner as for open-end funds. Fund discount is calculated as the difference between net asset value per share and market price per share, scaled by net asset value per share.

the closed-end funds correlate positively with fund expenses and negatively with fund size, beta, and age, whereas correlations of cash with either recent fund returns or discount are statistically indistinguishable from zero.

C. Determinants of Closed-End Fund Cash Holdings

To calculate excess cash holdings of closed-end funds, I begin by first exploring the determinants of their cash positions. Following the methodology used in analyzing open-end funds, in each cross-section I regress cash-to-net asset values of closed-end funds on a number of fund characteristics.[46] Regression (1) of Table 16 shows that fund size plays a very important role in explaining fund cash holdings, with larger funds holding considerably less cash: average R^2 of this regression exceeds 24% whereas a comparable number in the case of open-end funds was just 0.2% (Table 2). After controlling for size, cash holdings of closed-end funds relate negatively to fund market beta and positively to expenses and prior returns, which is consistent with what Table 2 shows to be the cases for open-end funds, although the coefficients on beta and runup are not statistically significant in the case of closed-end funds (regressions 2 through 4). Older closed-end funds hold considerably more cash, which may be due to such funds preparing to deregister. Somewhat surprisingly, I find a strong negative relationship between cash holdings and fund discount, which remains significant even after controlling for all other considered characteristics (regressions 5 and 6).

D. Excess Cash Holdings and Closed-End Fund Performance

I define excess cash of the closed-end funds as the residual from cross-sectional regression (6) in Table 16. I then form quintile portfolios of the funds on the basis of their excess cash and calculate their average raw and risk-adjusted returns in the same manner as for the open-end funds. Table 17 shows that regardless of which performance measure is used, there is no statistically significant difference in performance of high and low excess cash funds. For example, the difference in Ferson-Schadt conditional alphas is just 0.02% monthly. While the sample is admittedly small, with on average less than 30 firms in each June and December cross-section, the lack of a relationship

[46] The regressions are run semiannually – at the end of June and December – using the most recently available fund data provided that this data are not older than six months.

between closed-end fund cash holdings and future fund performance can be viewed as consistent with the notion that a positive relationship between cash positions and future performance observed for the open-end funds is at least in part due to fund flow reasons. If better performance by high excess cash *open-end* funds does in fact proxy for managerial ability to anticipate fund outflows, it is not surprising that there is no difference in future returns of high and low excess cash *closed-end* funds since fund flows do not present any concerns for their managers.

7.6. Concealing Portfolio Composition

I now briefly explore an alternative and perhaps less conventional explanation for the positive relationship between excess cash and future fund performance.

Suppose a manager has superior information indicating that a subset of the stocks his fund holds will perform exceptionally well in the future. The manager would like to build up his position in those stocks. However, he is concerned that building up the position too quickly will cause price pressure, preventing him from acquiring the shares at advantageous prices. He is further concerned that managers of other funds may be able to infer his information from observing his holdings. Such manager might find it optimal to adjust his share holdings prior to making his portfolio composition public. More specifically, to prevent others from inferring his information, he will reduce the holdings in the set of stocks about which he has superior knowledge. As a result, the manager will hold excess cash around the time of disclosing his portfolio composition. In the future, he will use excess cash to re-build it and continue to add to that subset of stocks, outperforming low excess cash funds.

This setting can justify the positive relationship between excess cash and future fund performance. However, it is doubtful that most mutual fund managers will find it appealing to hide their portfolio composition by selling and then repurchasing certain stocks. Not only are there transaction costs associated with such strategy, but it is unlikely to provide a significant boost to fund performance for large funds. Yet, it may be more attractive for small funds who can adjust their positions quickly and may find it attractive to attempt to hide their portfolio composition. As Table 10 points out, however, the difference in returns between high and low excess cash funds is actually more pronounced for larger funds. It is therefore unlikely that the positive relationship between excess cash and future performance is related to the attempts of the managers of high excess cash funds to conceal their portfolio composition.

8. Conclusion

This study documents a positive relationship between excess cash holdings of actively managed equity mutual funds and future fund performance. Funds with high excess cash – that is, with cash holdings in excess of the level predicted by fund characteristics or by a model of optimal cash holdings – outperform their low excess cash peers by over 2% per year. This difference in returns cannot be explained by the commonly used factor models, and in fact increases to nearly 3% annually after controlling for the three risk factors of Fama and French (1993). I explore potential sources of the difference in future performance, providing evidence that it is related to managerial stock-selection and market-timing skills, as well as to ability to anticipate fund flows and control fund expenses.

I show that managers of high excess cash funds are skilled at making stock purchasing decisions: the stocks that they buy perform considerably better than those purchased by the low excess cash group. I also explore whether the positive relationship between excess cash and fund performance relates to market-timing abilities of the managers. I show that market-timing skills are worse for the low excess cash group. As a result, the portfolio that is long the high excess cash funds and short the low excess cash group exhibits positive although statistically insignificant market timing. I additionally find that managers of funds with volatile recent excess cash holdings appear to be successful in timing the market: these managers actively adjust their cash position in response to their changing expectations about future market returns, increasing it prior to market downturns and decreasing it before periods of strong market performance.

I also link the positive relationship between excess cash and future fund performance to superior ability of managers of high excess cash funds to anticipate fund outflows. The difference in performance of the top and bottom excess cash groups is particularly pronounced when future fund flows are low, and is somewhat weaker when fund flows are high, suggesting that low excess cash funds do not carry sufficient cash on hand to cover the outflows and are likely forced to liquidate some of their holdings, damaging fund performance. High excess cash group, on the other hand, is well positioned to meet fund outflows, and generates better returns. Finally, consistent with a model I develop, I show that high excess cash can also be interpreted as a proxy for the ability to control fund expenses, and find that managers of high excess cash incur significantly lower expenses in the future than do their low excess cash peers.

To define excess cash, I complement prior research by documenting new important determinants of mutual fund cash holdings. In particular, I show that funds holding riskier, less liquid, or low dividend-paying stocks, as well as those run by managers with lower return gap (cf. Kacperczyk, Sialm, and Zheng, 2008), carry more cash. Compared to the determinants of fund cash holdings studied in the prior literature, the characteristics I consider explain three times more cross-sectional variation in cash positions of the mutual funds.

The findings of this paper raise interesting questions about managerial abilities to determine optimal levels of cash holdings. Why do the managers of low excess cash funds hold very little cash? This decision may reflect manager's over-confidence: expectations of good future fund performance, low fund outflows, and ability to adjust quickly should a cash shortfall occur. Managers of low excess cash funds are indeed successful at identifying which stocks to sell, but all other evidence points to their lack of important skills: these managers generate very low returns for as long as five years following portfolio assignment, make poor stock purchasing decisions, do not exhibit market-timing abilities, and incur higher expenses in the future. The performance of funds run by such managers particularly suffers during periods of low fund flows, suggesting that these funds may benefit from maintaining a larger cash cushion and, more broadly, from a more thoughtful cash holdings policy.

Appendix

A. Determination of Fund Objectives

CRSP Survivor-Bias-Free Mutual Fund Database contains a number of codes that allow the determination of the investment objective of a given fund. These codes are assigned by different institutions and cover different time periods and different funds: Strategic Insight objective codes are widely available between 1992 and 1999, Lipper classifications are present from the end of 1999 through 2008, and Wiescat codes begin in early 2008.

To obtain the sample studied in this paper, I include only funds with AGG, GRI, GRO, and ING Strategic Insight objective codes, those with G, GI, LCGE, MCGE, MLGE, and SCGE Lipper codes, and those with AGG, GCI, and GRD Wiescat codes.

I identify as international funds all funds containing any of the words 'International', 'Global', 'Emerging Market', or 'Non-US' in their objective description. To identify index funds, I search for the words 'index' or 'S&P 500' in fund name. CRSP has recently added a flag variable identifying index funds. After all of the filters described here are imposed, only 78 funds in my sample are identified as index by this flag. It is not immediately obvious from exploring the fund names that those funds are indeed index, and I retain them in my sample. Excluding these funds has no qualitative effect on the empirical results.

B. Simplified Excess Cash Definition

Definition of excess cash as a residual from cross-sectional regression (1) is very appealing, as it accounts for a wide number of variables that affect corporate cash holdings. To address any concerns about the sensitivity of the results to this particular way of estimating excess cash, I now show that the main empirical conclusions of this paper are robust to an alternative measure of excess cash. More specifically, to obtain excess cash for fund i as of the end of month t, I run a simpler cross-sectional regression

$$\text{CASH}_{it} = \gamma_{0t} + \gamma_{1t}\text{RU12}_{it} + \gamma_{2t}\text{FF1}_{it} + \gamma_{3t}\beta^{\text{Mkt}}_{\text{Fund},it} + \varepsilon_{it},$$

where, as before, CASH_{it} is the percentage of total net assets of fund i held in cash as of the end of month t; RU12_{it} is the 12-month fund return runup ending at the end of month t; FF1_{it} is fund flow during month t; and $\beta^{\text{Mkt}}_{\text{Fund},it}$ is market beta of the fund estimated using realized fund returns from $t-11$ to t. Specification (15) of Table 2 details the results of this estimation.

I assign funds into excess cash quintiles in the same manner described in Section 4, and evaluate future performance of each group. Table A1 shows that controlling for prior return runup, recent fund flows, and fund market beta is sufficient to generate a positive relationship between excess cash and future fund returns.

C. Transition Probabilities

To determine the persistence of excess cash, I estimate the transition probabilities of the excess cash groups, shown in Table A2. Excess cash is rather transitory: for example, the likelihood of remaining in the low excess cash for two more years is just 9.7%. Furthermore, given that a fund was assigned to the middle excess cash group at the end of a year, it is almost equally likely to be in either of the five groups a year later. High excess cash funds have the highest probability among the five groups to remain in the same quintile a year later, yet almost 20% of such funds move to one of the bottom two excess cash groups within a year.

D. Temporary vs. Permanent Excess Cash

An interesting question to ask is whether funds carry excess cash because of a shock to their cash holdings, or whether excess cash is a persistent fund characteristic. To address this issue, I examine the differences in future performance of funds in the high and low excess cash groups conditional on their excess cash holdings being either transitory or permanent. I assign a fund that falls into a high excess cash group at time t into a permanent group if it also belonged to either high or next-to-high excess cash quintile in at least two thirds of the observations over the previous three years, and otherwise assign it to a transitory group. I similarly separate low excess cash funds into permanent and transitory groups.[47] This procedure results in approximately equal number of funds in both transitory and permanent (T and P) categories of high and low (H and L) excess cash quintiles.

Table A3 reports average returns of each of the resulting four groups (LP, LT, HP, HT), as well as the differences in returns between them. Funds in both transitory and permanent high excess cash groups outperform funds in the low excess cash group. Interestingly, funds in transitory groups perform better than those in the permanent groups. For example, LT funds outperform LP funds by 16 basis points monthly, whereas HT funds generate 15 basis points per month more than do HP funds.

[47] I require the funds to have at least three valid excess cash observations in at least two of the previous three years.

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Figures and Tables

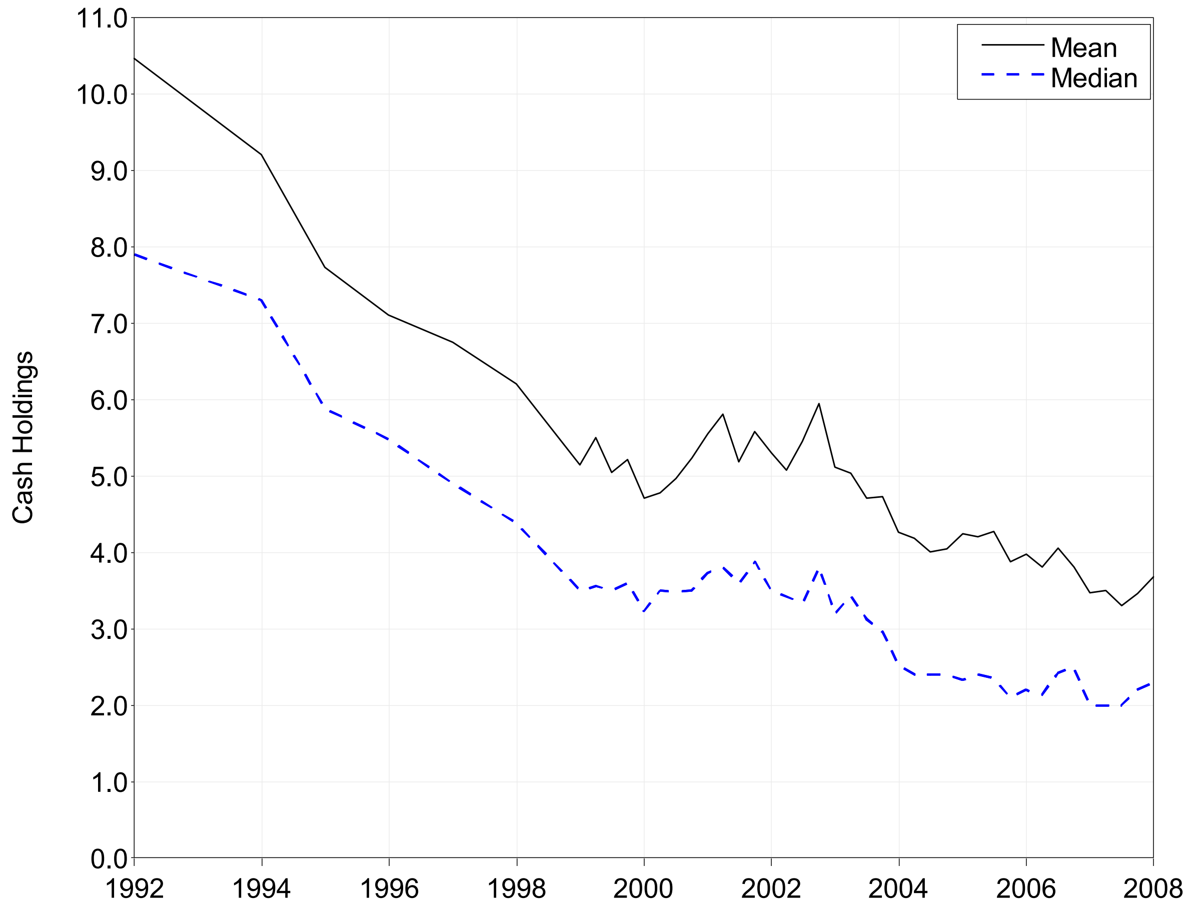

Figure 1. Fund Cash Holdings. This figure plots average and median fund cash holdings as a percentage of total net assets. The sample contains U.S. open-end mutual funds with growth objective. Cash holdings between 1992 and 1998 are annual, and quarterly thereafter.

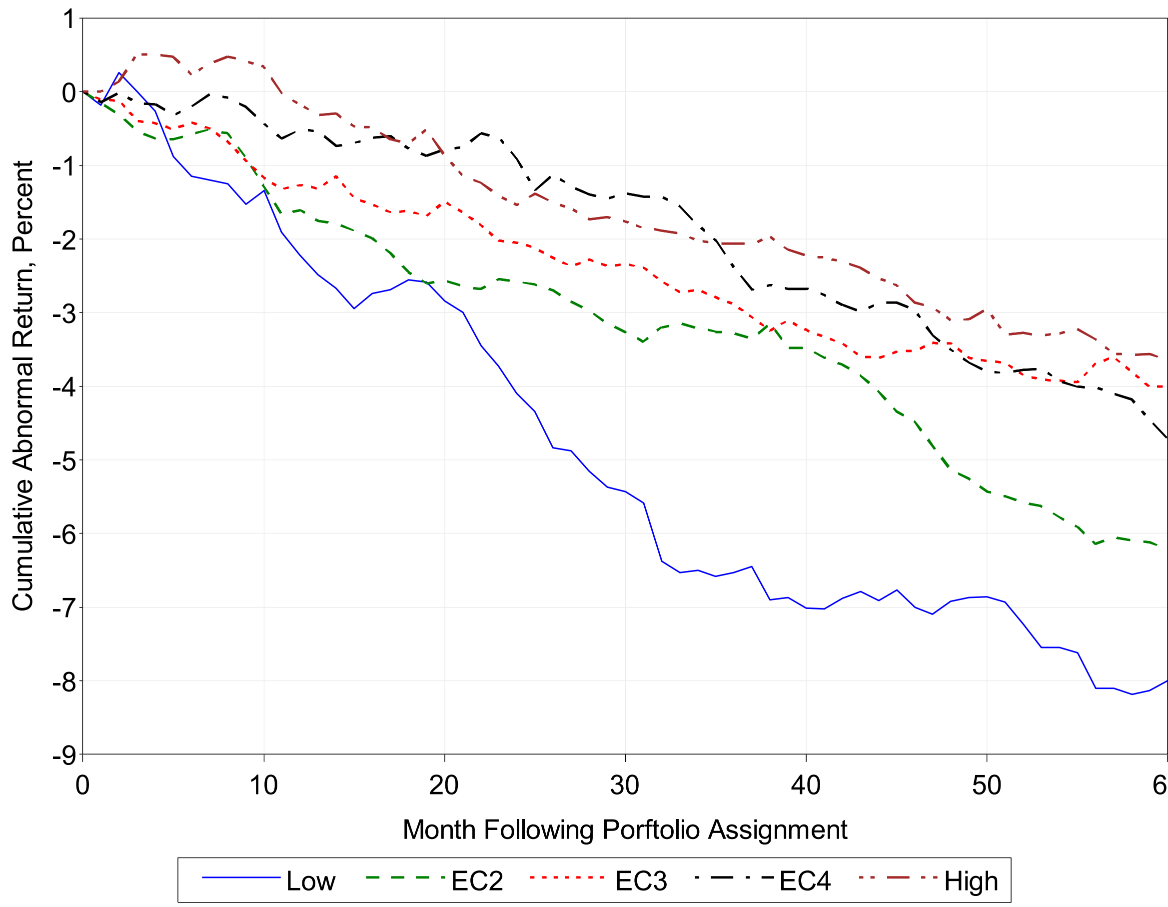

Figure 2. Cumulative Abnormal Returns of Excess Cash Groups. This figure plots cumulative abnormal returns of each excess cash quintile during five years following portfolio assignment. Abnormal returns are estimated from the conditional Ferson-Schadt (1996) performance regression

$$R_{it} = \alpha_i^{FS} + \beta_i^{M} R_{Mt} + \beta_i^{HML} HML_t + \beta_i^{SMB} SMB_t + \beta_i^{MOM} MOM_t + \sum_F \beta_i^{F} \left(Z_{F,t-1} R_{Mt}\right) + \varepsilon_{it},$$

where R_{it} is the excess return of each of the five excess cash fund groups, R_{Mt} is market excess return, HML, SMB, and UMD are value, size, and momentum factors, and $Z_{F,t-1}$ is the demeaned value of the macroeconomic variables F at $t-1$, which include dividend yield of the S&P 500 index, term spread, default spread, and the three-month Treasury bill rate.

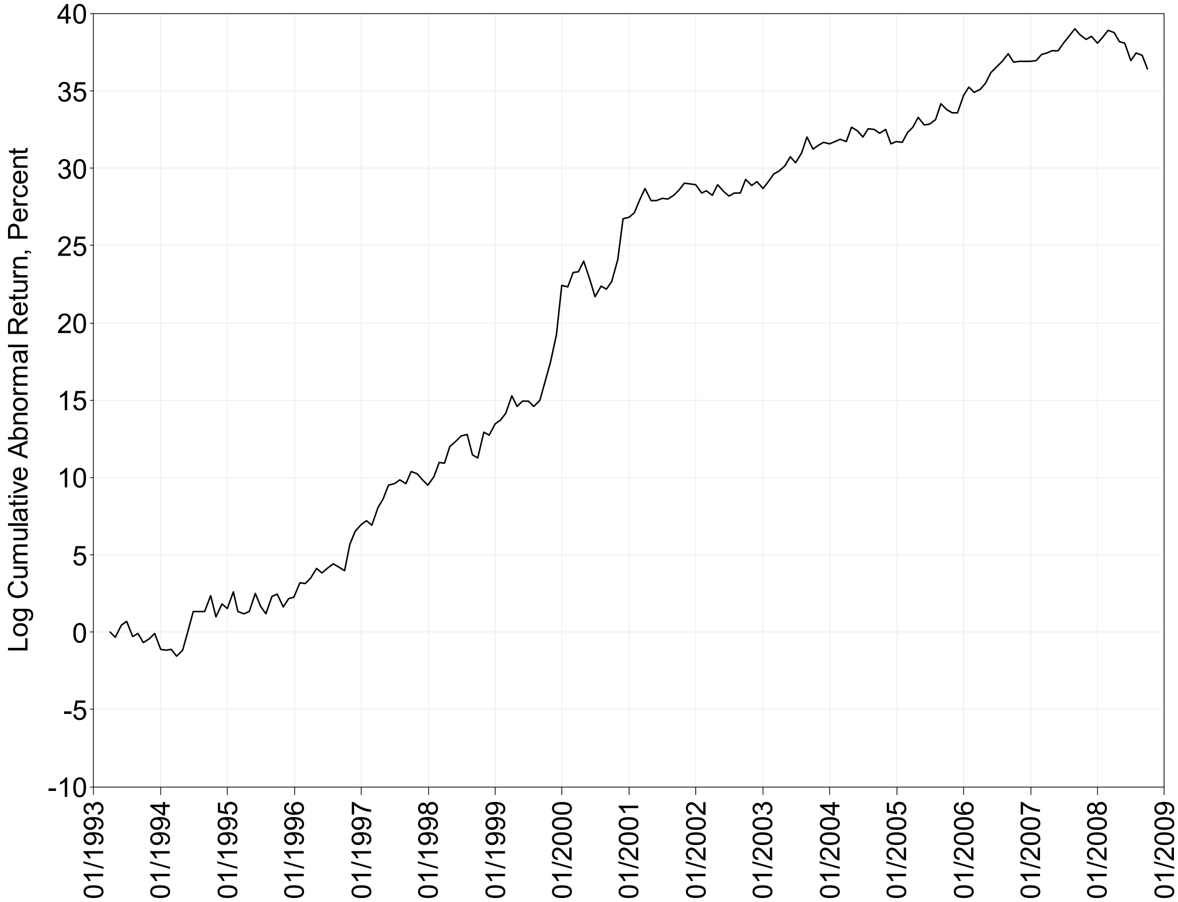

Figure 3. Performance of High–Low Excess Cash Portfolios. This figure plots log cumulative abnormal returns of a portfolio long the high excess cash funds and short the low excess cash funds. Abnormal returns are estimated from the conditional Ferson-Schadt (1996) performance regression

$$R_{it} = \alpha_i^{FS} + \beta_i^{M} R_{Mt} + \beta_i^{HML} HML_t + \beta_i^{SMB} SMB_t + \beta_i^{MOM} MOM_t + \sum_F \beta_i^{F} \left(Z_{F,t-1} R_{Mt} \right) + \varepsilon_{it},$$

where R_{it} is the difference in returns between high and low excess cash quintiles, R_{Mt} is market excess return, HML, SMB, and UMD are value, size, and momentum factors, and $Z_{F,t-1}$ is the demeaned value of the macroeconomic variables F at $t-1$, which include dividend yield of the S&P 500 index, term spread, default spread, and the three-month Treasury bill rate.

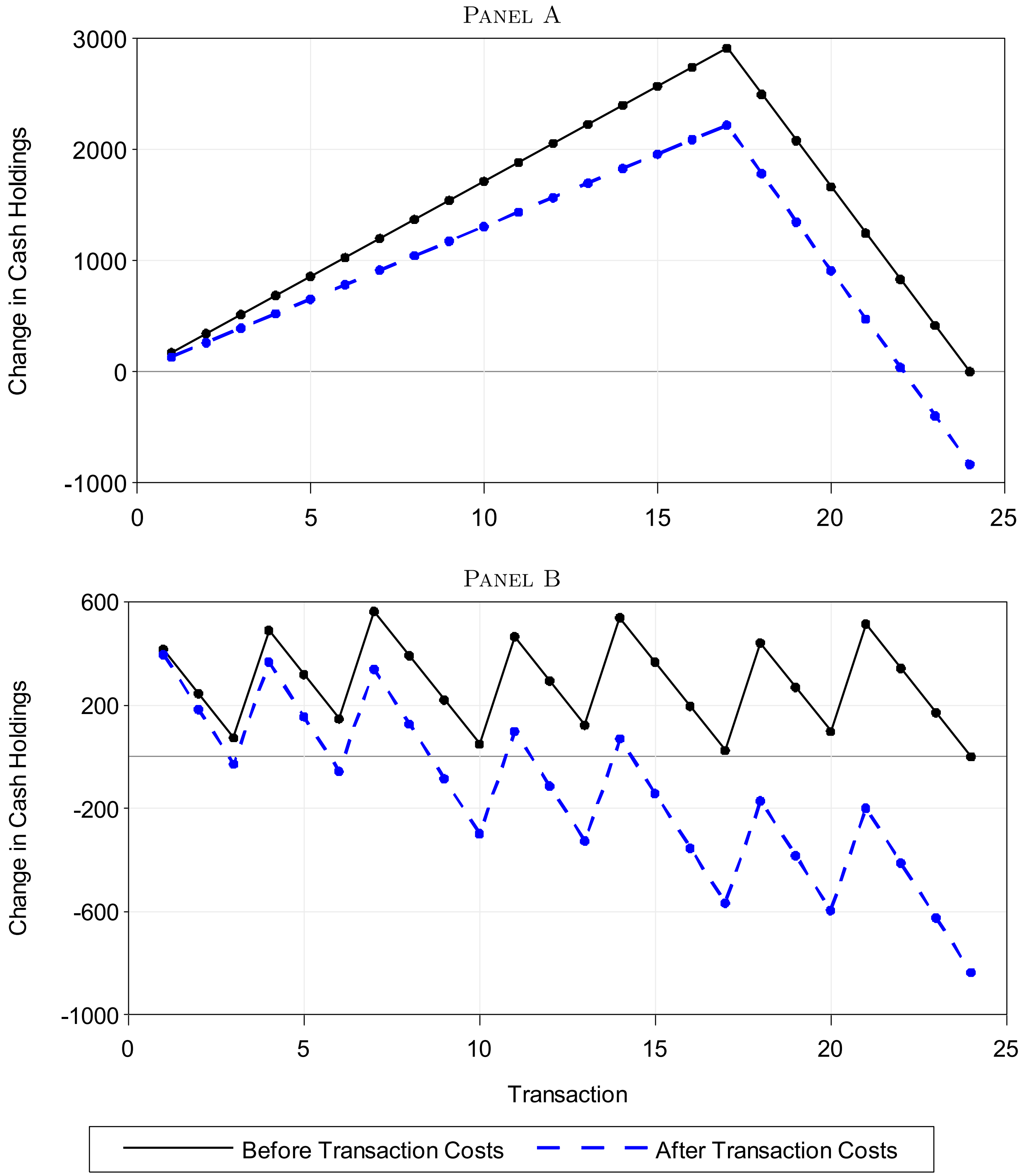

Figure 4. Effects of Costly Stock Trading on Cumulative Change in Cash. This figure plots cumulative changes in cash implied by the model developed in Section 7.1. Figure in Panel A is plotted assuming that $n_S = 100$ shares of stock S are being sold at price $p_S = 100$ with variable cost $V_S = 0.00006$ and fixed cost $F_S = 10$, and $n_B = 1000$ shares of stock B are being bought at price $p_B = 10$ with variable cost $V_S = 0.00003$ and fixed cost $F_S = 10$. In Panel B, $V_S = 0.00003$ and $V_B = 0.00006$ and it is assumed that purchase of stock B can only be financed by sales of stock S, i.e., cash reserves can only be used to cover transaction costs.

Table 1. Summary Statistics

	CASH	TNA	EXP	12B1	FL	DL	TURN	RU12	FF1	FF6	FF12	σ_{FF}	RG	DY	$\beta^{\mathrm{Mkt}}_{\mathrm{Fund}}$	$\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$	$\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$	PRCDS
Mean	5.029	1,682	1.287	0.408	1.389	0.480	0.826	8.219	0.005	0.083	0.178	0.748	-0.184	1.557	0.962	1.048	0.002	-6.638
Median	3.341	232	1.225	0.367	1.005	0.000	0.621	7.150	-0.004	-0.017	-0.017	0.056	-0.157	1.482	0.936	1.005	-0.009	0.358
10th Pctl	0.662	16.7	0.774	0.188	0.000	0.000	0.159	-3.604	-0.033	-0.138	-0.241	0.005	-0.594	0.650	0.626	0.695	-0.301	-33.408
90th Pctl	11.293	3,455	1.889	0.747	3.184	1.646	1.682	21.103	0.044	0.310	0.916	1.566	0.200	2.504	1.338	1.461	0.299	17.498
Stdev	5.416	5,682	0.464	0.242	1.476	1.037	0.772	10.792	0.065	0.447	0.577	2.030	0.384	0.817	0.313	0.349	0.300	35.217
								Correlations										
CASH	1.000																	
TNA	-0.046	1.000																
EXP	0.129	-0.423	1.000															
12B1	-0.022	-0.038	0.513	1.000														
FL	0.029	0.095	0.249	0.208	1.000													
DL	-0.019	-0.063	0.014	-0.058	-0.044	1.000												
TURN	0.033	-0.114	0.198	0.067	0.007	0.009	1.000											
RU12	0.060	0.092	-0.064	-0.040	-0.061	0.040	-0.002	1.000										
FF1	0.086	-0.033	0.049	0.031	0.011	0.001	0.000	0.242	1.000									
FF6	0.075	-0.048	0.073	0.057	0.022	0.011	0.027	0.233	0.541	1.000								
FF12	0.078	-0.040	0.077	0.074	0.035	0.010	0.004	0.237	0.478	0.705	1.000							
σ_{FF}	0.003	-0.157	0.071	0.023	0.057	0.006	0.102	0.050	0.243	0.475	0.562	1.000						
RG	-0.085	0.071	-0.167	-0.039	-0.030	0.011	-0.071	0.111	0.012	0.008	0.006	0.004	1.000					
DY	-0.020	0.037	-0.170	-0.005	-0.012	-0.013	-0.162	0.067	-0.008	-0.017	-0.013	-0.003	-0.006	1.000				
$\beta^{\mathrm{Mkt}}_{\mathrm{Fund}}$	-0.135	-0.016	0.107	0.024	0.015	-0.014	0.132	0.019	0.020	0.034	0.057	0.030	0.030	-0.414	1.000			
$\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$	0.017	-0.012	0.166	0.035	0.014	0.009	0.187	-0.002	0.041	0.055	0.063	0.022	0.000	-0.476	0.698	1.000		
$\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$	0.035	-0.002	0.003	0.003	-0.030	0.039	-0.018	0.167	0.013	0.008	0.023	-0.019	-0.015	0.078	-0.017	-0.127	1.000	
PRCDS	-0.078	0.039	-0.054	-0.012	-0.004	-0.010	-0.021	-0.216	-0.410	-0.628	-0.550	-0.296	-0.045	-0.021	0.025	-0.026	-0.038	1.000

Notes: This table reports summary statistics for fund characteristics. CASH is percentage of total net assets held in cash; TNA is total net assets (in million); EXP is expense ratio, in percent; 12B1 is actual 12b-1 expenses, in percent; FL and DL are front and deferred loads, in percent; TURN is fund turnover ratio; RU12 is the 12-month fund return runup, in percent; FF1, FF6, and FF12 are prior 1-, 6-, and 12-month fund flows; σ_{FF} is the volatility of one-month fund flows over the previous 12 months, scaled by 100; RG is annual return gap over the prior 12 months, in percent, calculated following Kacperczyk, Sialm, and Zheng (2008); DY is fund annual dividend yield, in percent; $\beta^{\mathrm{Mkt}}_{\mathrm{Fund}}$ is market beta of the fund, calculated from market model regression using realized fund returns over the prior 12 months; $\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$ and $\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$ are market and liquidity betas of the fund holdings, calculated using data from prior 12 months; PRCDS is proceeds from fund stock sales less stock purchases, scaled by dollar value of all stock holdings. To compute betas of fund holdings, for each stock the fund holds I obtain market beta from the market model regression and liquidity beta from a two-factor model with market and Pastor and Stambaugh (2003) liquidity factors. $\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$ and $\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$ are weighted average loadings using the dollar value of investment in each stock as weights. To calculate PRCDS, I obtain contemporaneous (time t) fund holdings and holdings from six months ago, and for each fund compute it as $100 \cdot [\sum_i p_{i,t-3} \cdot (-N_{i,t} + N_{i,t-6})] \,/\, [\sum_i p_{i,t-6} N_{i,t-6}]$, where $N_{i,t}$ is the number of shares of stock i held by the fund at time t and $p_{i,t}$ is the price of this stock at time t. Statistics are calculated in each cross-section and then averaged. Sample period is 1992-2008.

Table 2. DETERMINANTS OF FUND CASH HOLDINGS

	LNTNA	EXP	12B1	FL	DL	TURN	RU12	FF1	FF6	FF12	σ_{FF}	RG	DY	$\beta^{\text{Mkt}}_{\text{Fund}}$	$\beta^{\text{Mkt}}_{\text{Hold}}$	$\beta^{\text{Liq}}_{\text{Hold}}$	PRCDS	R^2
(1)	-0.109																	0.002
	[-6.34]																	
(2)	0.035	1.508																0.016
	[2.19]	[18.30]																
(3)		1.828	-2.181															0.021
		[14.63]	[-11.02]															
(4)				0.104	-0.028													0.003
				[3.69]	[-1.27]													
(5)						0.238												0.004
						[2.62]												
(6)							0.041											0.010
							[4.25]											
(7)								7.666	0.676	0.209								0.013
								[6.78]	[2.58]	[1.74]								
(8)											0.061							0.001
											[1.64]							
(9)	0.225	2.342	-2.581	0.077	-0.047	0.270	0.031			1.124	-0.237							0.054
	[13.81]	[17.86]	[-11.65]	[2.70]	[-0.81]	[3.01]	[3.11]			[11.97]	[-5.54]							
(10)												-1.740						0.030
												[-4.25]						
(11)													-0.098					0.001
													[-2.14]					
(12)														-2.643				0.024
														[-7.59]				
(13)															0.544	0.784		0.010
															[2.38]	[3.49]		
(14)																	-0.014	0.008
																	[-10.18]	
(15)							0.038	9.960						-2.729				0.047
							[5.19]	[9.43]						[-6.72]				
(16)	0.181	1.713	-1.947					7.034	0.786		-0.113	-1.499	-0.394	-5.866	3.846	1.545		0.138
	[9.68]	[11.12]	[-8.22]					[6.20]	[4.06]		[-2.34]	[-3.82]	[-4.81]	[-9.38]	[9.15]	[3.64]		
(17)	0.140	1.746	-2.100	-0.009	0.009	0.096	0.060	5.183	0.766	0.647	-0.228	-1.479	-0.383	-5.740	3.818	1.416	0.002	0.158
	[6.95]	[10.86]	[-7.68]	[-0.28]	[0.10]	[0.80]	[1.59]	[3.86]	[4.54]	[1.87]	[-4.04]	[-3.91]	[-4.89]	[-5.63]	[8.57]	[3.38]	[0.70]	

Notes: This table reports the results of cross-sectional regressions of fund cash holdings as a percentage of total net assets on fund characteristics. LNTNA is log of total net assets (TNA is in million); EXP is expense ratio, in percent; 12B1 is actual 12b-1 expenses, in percent; FL and DL are front and deferred loads, in percent; TURN is fund turnover ratio; RU12 is the 12-month fund return runup, in percent; FF1, FF6, and FF12 are prior 1-, 6-, and 12-month fund flows; σ_{FF} is the volatility of one-month fund flows over the previous 12 months, scaled by 100; RG is annual return gap over the prior 12 months, in percent, calculated following Kacperczyk, Sialm, and Zheng (2008); DY is fund annual dividend yield, in percent; $\beta^{\mathrm{Mkt}}_{\mathrm{Fund}}$ is market beta of the fund, calculated from market model regression using realized fund returns over the prior 12 months; $\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$ and $\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$ are market and liquidity betas of the fund holdings, calculated using data from prior 12 months; PRCDS is proceeds from fund stock sales less stock purchases, scaled by dollar value of all stock holdings. To compute betas of fund holdings, for each stock the fund holds I obtain market beta from the market model regression and liquidity beta from a two-factor model with market and Pastor and Stambaugh (2003) liquidity factors. $\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$ and $\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$ are weighted average loadings using the dollar value of investment in each stock as weights. To calculate PRCDS, I obtain contemporaneous (time t) fund holdings and holdings from six months ago, and for each fund compute it as $100 \cdot [\sum_i p_{i,t-3} \cdot (-N_{i,t} + N_{i,t-6})] \,/\, [\sum_i p_{i,t-6} N_{i,t-6}]$, where $N_{i,t}$ is the number of shares of stock i held by the fund at time t and $p_{i,t}$ is the price of this stock at time t. Reported are average slope coefficients, corresponding t-statistics, and average adjusted R^2 values. Sample period is 1992-2008.

Table 3. Characteristics of Funds in Different Excess Cash Groups

	CASH	LNTNA	EXP	12B1	FL	DL	TURN	RU12	FF1	FF6	FF12	σ_{FF}	RG	DY	$\beta^{\mathrm{Mkt}}_{\mathrm{Fund}}$	$\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$	$\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$	PRCDS
A. Means																		
Low	1.521	5.569	1.442	0.398	1.808	0.511	0.875	8.517	0.004	0.103	0.227	0.772	-0.229	1.525	0.934	1.069	0.019	-9.318
EC2	2.104	5.756	1.339	0.407	1.954	0.435	0.795	7.299	0.000	0.050	0.144	0.628	-0.165	1.602	0.976	1.044	0.006	-4.403
EC3	3.111	5.706	1.300	0.408	1.981	0.432	0.818	7.681	-0.001	0.057	0.138	0.769	-0.165	1.571	0.990	1.050	-0.013	-3.981
EC4	4.972	5.662	1.336	0.427	1.948	0.414	0.862	7.476	-0.001	0.083	0.175	0.865	-0.169	1.513	0.998	1.058	-0.015	-6.210
High	11.621	5.626	1.383	0.407	1.899	0.494	0.876	8.456	0.004	0.097	0.206	0.822	-0.197	1.534	0.979	1.080	-0.002	-7.463
B. Medians																		
Low	1.180	5.601	1.393	0.353	2.107	0.000	0.683	7.192	-0.005	-0.017	-0.008	0.051	-0.198	1.457	0.918	1.024	0.001	-0.459
EC2	1.783	5.713	1.296	0.365	2.324	0.000	0.641	6.712	-0.007	-0.029	-0.034	0.051	-0.150	1.570	0.947	1.003	-0.007	1.218
EC3	2.905	5.692	1.255	0.364	2.412	0.000	0.655	7.304	-0.006	-0.029	-0.034	0.059	-0.151	1.522	0.957	1.008	-0.023	1.342
EC4	4.815	5.708	1.302	0.391	2.304	0.000	0.673	6.334	-0.005	-0.018	-0.014	0.066	-0.160	1.447	0.962	1.013	-0.029	1.040
High	9.896	5.564	1.359	0.360	2.223	0.000	0.648	7.539	-0.003	-0.003	0.017	0.065	-0.187	1.428	0.945	1.042	-0.012	-0.964

Notes: This table reports average (in Panel A) and median (in Panel B) characteristics of funds in different excess cash groups. CASH is percentage of total net assets held in cash; LNTNA is log of total net assets (TNA is in million); EXP is expense ratio, in percent; 12B1 is actual 12b-1 expenses, in percent; FL and DL are front and deferred loads, in percent; TURN is fund turnover ratio; RU12 is the 12-month fund return runup, in percent; FF1, FF6, and FF12 are prior 1-, 6-, and 12-month fund flows; σ_{FF} is the volatility of one-month fund flows over the previous 12 months, scaled by 100; RG is annual return gap over the prior 12 months, in percent, calculated following Kacperczyk, Sialm, and Zheng (2008); DY is fund annual dividend yield, in percent; $\beta^{\mathrm{Mkt}}_{\mathrm{Fund}}$ is market beta of the fund, calculated from market model regression using realized fund returns over the prior 12 months; $\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$ and $\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$ are market and liquidity betas of the fund holdings, calculated using data from prior 12 months; PRCDS is proceeds from fund stock sales less stock purchases, scaled by dollar value of all stock holdings. To compute betas of fund holdings, for each stock the fund holds I obtain market beta from the market model regression and liquidity beta from a two-factor model with market and Pastor and Stambaugh (2003) liquidity factors. $\beta^{\mathrm{Mkt}}_{\mathrm{Hold}}$ and $\beta^{\mathrm{Liq}}_{\mathrm{Hold}}$ are weighted average loadings using the dollar value of investment in each stock as weights. To calculate PRCDS, I obtain contemporaneous (time t) fund holdings and holdings from six months ago, and for each fund compute it as $100 \cdot [\sum_i p_{i,t-3} \cdot (-N_{i,t} + N_{i,t-6})] \,/\, [\sum_i p_{i,t-6} N_{i,t-6}]$, where $N_{i,t}$ is the number of shares of stock i held by the fund at time t and $p_{i,t}$ is the price of this stock at time t. Excess cash is calculated as the residual from the cross-sectional regression (1) on page 14. Statistics are computed in each cross-section and then averaged. Sample period is 1992-2008.

Table 4. Fund Raw Cash Holdings and Future Performance

	Low	CASH2	CASH3	CASH4	High	High-Low	R^2
Raw	0.45	0.49	0.49	0.49	0.47	0.02	
	[1.31]	[1.49]	[1.45]	[1.48]	[1.51]	[0.23]	
α^{M}	-0.15	-0.08	-0.10	-0.08	-0.08	0.07	0.111
	[-2.75]	[-2.00]	[-1.76]	[-1.89]	[-1.00]	[0.92]	
α^{FF}	-0.16	-0.10	-0.06	-0.09	-0.08	0.07	0.149
	[-2.85]	[-2.31]	[-1.03]	[-1.95]	[-0.95]	[1.12]	
α^{CAR}	-0.17	-0.12	-0.08	-0.10	-0.12	0.04	0.193
	[-2.96]	[-2.76]	[-1.44]	[-2.08]	[-1.72]	[0.76]	
α^{PS}	-0.17	-0.10	-0.07	-0.08	-0.11	0.06	0.187
	[-2.93]	[-2.33]	[-1.20]	[-1.77]	[-1.49]	[0.76]	
α^{SD}	-0.16	-0.11	-0.08	-0.09	-0.12	0.04	0.183
	[-2.90]	[-2.61]	[-1.34]	[-2.01]	[-1.75]	[0.69]	
α^{FS}	-0.18	-0.11	-0.06	-0.09	-0.11	0.07	0.245
	[-3.36]	[-2.57]	[-1.22]	[-1.92]	[-1.49]	[1.04]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different raw cash quintiles (CASH) as well as for the difference between quintiles of high and low cash. At the beginning of month $t+4$, an investment is made in the funds that were assigned to a particular cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^{M}), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). R^2 is the adjusted R^2 from regressions using as dependent variable the difference in returns between high and low cash funds. Returns are weighted by total net assets. Sample period is 1992-2008.

Table 5. FUND EXCESS CASH HOLDINGS AND FUTURE PERFORMANCE

	Low	EC2	EC3	EC4	High	High-Low	R^2
Raw	0.32	0.43	0.46	0.56	0.51	0.18	
	[0.97]	[1.57]	[1.36]	[1.69]	[1.62]	[2.42]	
α^M	-0.25	-0.10	-0.11	-0.02	-0.02	0.23	0.072
	[-3.91]	[-1.97]	[-2.71]	[-0.33]	[-0.58]	[2.99]	
α^{FF}	-0.26	-0.09	-0.09	0.00	-0.04	0.23	0.112
	[-3.93]	[-1.57]	[-2.07]	[-0.09]	[-0.64]	[3.04]	
α^{CAR}	-0.26	-0.09	-0.12	-0.04	-0.05	0.20	0.140
	[-3.73]	[-1.57]	[-2.69]	[-0.89]	[-1.16]	[2.51]	
α^{PS}	-0.25	-0.08	-0.10	-0.03	-0.05	0.21	0.134
	[-3.62]	[-1.41]	[-2.29]	[-0.57]	[-1.03]	[2.51]	
α^{SD}	-0.26	-0.09	-0.12	-0.04	-0.06	0.20	0.131
	[-3.73]	[-1.46]	[-2.56]	[-0.77]	[-1.17]	[2.48]	
α^{FS}	-0.26	-0.09	-0.11	-0.04	-0.04	0.22	0.223
	[-3.90]	[-1.39]	[-2.60]	[-0.75]	[-0.91]	[2.93]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different excess cash (EC) quintiles as well as for the difference between quintiles of high and low excess cash. Excess cash is calculated as the residual from the cross-sectional regression (1) on page 14. At the beginning of month $t+4$, an investment is made in the funds that were assigned to a particular excess cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^M), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). R^2 is the adjusted R^2 from regressions using as dependent variable the difference in returns between high and low excess cash funds. Returns are weighted by total net assets. Sample period is 1992-2008.

Table 6. Fama-MacBeth Regression Results

	EC	CASH	RG	LNTNA	12B1	FF1	RU12	$\beta^{\text{Mkt}}_{\text{Fund}}$
(1)	0.097							
	[3.17]							
(2)		0.054						
		[1.22]						
(3)			1.023					
			[1.69]					
(4)				-0.224				
				[-2.48]				
(5)					-1.535			
					[-2.95]			
(6)	0.093		0.804	-0.236	-1.212			
	[3.21]		[1.42]	[-2.58]	[-2.35]			
(7)		0.056				1.990		
		[1.60]				[0.23]		
(8)		0.082					0.042	
		[1.85]					[0.71]	
(9)		0.070						1.587
		[1.74]						[0.41]
(10)		0.070				5.468		1.821
		[2.00]				[0.98]		[0.48]
(11)		0.076					0.101	3.512
		[2.38]					[2.13]	[1.03]
(12)		0.080				-0.784	0.102	3.595
		[2.52]				[-0.24]	[2.13]	[1.06]

Notes: This table reports the results of Fama-MacBeth regressions. Fund returns from month $t+4$ to $t+15$ (in percent) are regressed on the following variables measured at the end of month t: EC, excess cash; CASH, percentage of total net assets held in cash; RG, return gap, in percent, measured following Kacperczyk, Sialm, and Zheng (2008) over the 12-month period ending in month t; LNTNA, log of total net assets (TNA is in million); 12B1, actual 12b-1 expenses, in percent; FF1, prior 1-month fund flows; RU12, fund return runup during the 12 months ending in month t, in percent; and $\beta^{\text{Mkt}}_{\text{Fund}}$, fund's market beta, calculated from market model regression using realized fund returns from $t-11$ to t. Excess cash is estimated from the month t cross-sectional regression (1) on page 14. The regressions are run each period when cash holdings data are observed (annually prior to 1999 and quarterly thereafter). Reported are average coefficients and the corresponding t-statistics. Sample period is 1992-2008.

Table 7. Fund Excess Cash Holdings and Future Performance Conditional On Positive Market Runup

	Low	EC2	EC3	EC4	High	High-Low	R^2
Raw	0.32	0.56	0.56	0.63	0.58	0.26	
	[0.85]	[1.49]	[1.47]	[1.70]	[1.61]	[3.02]	
α^M	-0.28	-0.05	-0.06	0.03	0.00	0.28	0.027
	[-3.53]	[-0.74]	[-0.93]	[0.51]	[0.04]	[3.33]	
α^{FF}	-0.29	-0.06	-0.05	0.04	0.03	0.32	0.072
	[-3.51]	[-0.97]	[-0.74]	[0.63]	[0.42]	[3.73]	
α^{CAR}	-0.28	-0.09	-0.07	-0.01	0.00	0.28	0.108
	[-3.32]	[-1.39]	[-1.10]	[-0.22]	[0.02]	[3.29]	
α^{PS}	-0.27	-0.07	-0.05	0.01	0.01	0.28	0.100
	[-3.13]	[-1.06]	[-0.81]	[0.11]	[0.17]	[3.21]	
α^{SD}	-0.28	-0.08	-0.07	-0.01	0.00	0.28	0.098
	[-3.34]	[-1.30]	[-1.06]	[-0.16]	[0.00]	[3.28]	
α^{FS}	-0.30	-0.08	-0.06	-0.02	0.02	0.32	0.213
	[-3.54]	[-1.32]	[-0.96]	[-0.42]	[0.31]	[3.95]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different excess cash (EC) quintiles as well as for the difference between quintiles of high and low excess cash, conditional on the 12-month market return prior to cash measurement being non-negative. Excess cash is calculated as the residual from the cross-sectional regression (1) on page 14. At the beginning of month $t+4$, an investment is made in the funds that were assigned to a particular excess cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^M), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). R^2 is the adjusted R^2 from regressions using as dependent variable the difference in returns between high and low excess cash funds. Returns are weighted by total net assets. Sample period is 1992-2008.

Table 8. MODEL-BASED EXCESS CASH HOLDINGS AND FUTURE PERFORMANCE

	Low	EC2	EC3	EC4	High	High-Low
Raw	-0.25	-0.25	-0.08	-0.16	-0.12	0.13
	[-0.66]	[-0.66]	[-0.19]	[-0.40]	[-0.29]	[0.81]
α^{M}	-0.20	-0.20	-0.02	-0.11	-0.07	0.13
	[-2.18]	[-3.10]	[-0.35]	[-2.01]	[-0.82]	[0.89]
α^{FF}	-0.27	-0.20	0.01	-0.08	0.02	0.29
	[-4.24]	[-3.82]	[0.16]	[-1.38]	[0.28]	[2.67]
α^{CAR}	-0.28	-0.19	-0.02	-0.08	-0.02	0.26
	[-4.32]	[-3.63]	[-0.25]	[-1.45]	[-0.25]	[2.40]
α^{PS}	-0.28	-0.18	0.02	-0.07	-0.01	0.27
	[-4.29]	[-3.38]	[0.28]	[-1.28]	[-0.16]	[2.44]
α^{SD}	-0.23	-0.25	0.03	-0.08	-0.03	0.20
	[-2.92]	[-4.10]	[0.34]	[-1.06]	[-0.28]	[1.47]
α^{FS}	-0.25	-0.19	0.00	-0.07	-0.02	0.23
	[-4.14]	[-4.32]	[0.06]	[-1.27]	[-0.24]	[2.18]

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different excess cash quintiles (EC) as well as for the difference between quintiles of high and excess low cash. Excess cash is computed as the difference between actual cash-to-total net assets ratio and model-based target cash-to-total net assets ratio, scaled by the target ratio. At the beginning of month $t+4$, an investment is made in the funds that were assigned to a particular excess cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^{M}), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). Returns are weighted by total net assets. Sample period is 1998-2008.

Table 9. Future Expenses and Liquidity vs. Excess Cash

	12B1	EXP	MGMT	TURN	$\beta^{\text{Liq}}_{\text{Hold}}$
Low	0.396	1.144	0.564	0.589	-0.088
EC2	0.414	1.098	0.527	0.520	-0.117
EC3	0.398	1.075	0.536	0.468	-0.040
EC4	0.387	0.997	0.496	0.475	-0.016
High	0.358	0.934	0.444	0.450	0.089
High–Low	-0.038	-0.210	-0.120	-0.139	0.177
	[-1.59]	[-4.94]	[-3.67]	[-2.71]	[2.52]

Notes: This table reports average future expenses and average liquidity of holdings of funds in each of the five excess cash groups. Excess cash as of month t is calculated as the residual from the cross-sectional regression (1) on page 14, and expenses and liquidity betas are measured as of month $t+12$. 12B1 is actual 12b-1 expenses, in percent; EXP is expense ratio, in percent; MGMT is the management fee, in percent; TURN is fund turnover ratio; and $\beta^{\text{Liq}}_{\text{Hold}}$ is the liquidity beta of the fund holdings, calculated using data from months $t+1$ to $t+12$. To compute betas of fund holdings, for each stock the fund holds as of month $t+12$, I obtain the liquidity beta from a two-factor model with market and Pastor and Stambaugh (2003) liquidity factors. $\beta^{\text{Liq}}_{\text{Hold}}$ are weighted average loadings using the dollar value of investment in each stock as weights. The bottom two rows show the difference between values for high and low quintiles, and the corresponding t-statistic. Sample period is 1992-2008.

Table 10. Fund Excess Cash Holdings and Future Performance Conditional on Fund Size and Liquidity of Holdings

	Low Excess Cash			High Excess Cash			High–Low Excess Cash		
	High Liq	Med Liq	Low Liq	High Liq	Med Liq	Low Liq	High Liq	Med Liq	Low Liq
				A. Raw Returns					
Small	0.65	0.30	0.47	0.50	0.64	0.49	-0.15	0.34	0.02
	[1.74]	[0.89]	[1.26]	[1.46]	[1.63]	[1.45]	[-0.79]	[2.02]	[0.08]
Medium	0.44	0.27	0.51	0.58	0.46	0.70	0.13	0.19	0.19
	[1.32]	[0.82]	[1.41]	[1.72]	[1.39]	[1.66]	[1.02]	[2.46]	[1.03]
Big	0.19	0.17	0.10	0.38	0.53	0.66	0.09	0.36	0.55
	[0.55]	[0.51]	[0.29]	[1.16]	[1.66]	[2.07]	[0.75]	[3.54]	[3.77]
				B. 4-Factor Alpha					
Small	0.07	-0.34	-0.11	-0.10	0.02	-0.09	-0.17	0.36	0.02
	[0.39]	[-5.21]	[-0.68]	[-0.91]	[0.17]	[-0.64]	[-0.83]	[2.73]	[0.07]
Medium	-0.21	-0.28	-0.08	-0.03	-0.09	0.02	0.18	0.19	0.10
	[-2.28]	[-3.77]	[-0.57]	[-0.20]	[-1.28]	[0.15]	[1.41]	[2.34]	[0.59]
Big	-0.35	-0.39	-0.41	-0.20	-0.06	0.09	0.14	0.33	0.50
	[-3.94]	[-4.40]	[-3.57]	[-1.58]	[-0.68]	[0.92]	[1.20]	[3.24]	[3.74]
				C. 5-Factor Alpha (Pastor-Stambaugh)					
Small	0.03	-0.35	-0.07	-0.11	0.03	-0.07	-0.15	0.38	-0.01
	[0.17]	[-5.25]	[-0.40]	[-1.03]	[0.22]	[-0.49]	[-0.70]	[2.80]	[-0.03]
Medium	-0.23	-0.27	-0.05	-0.03	-0.08	0.04	0.20	0.19	0.10
	[-2.49]	[-3.57]	[-0.39]	[-0.20]	[-1.12]	[0.28]	[1.56]	[2.28]	[0.57]
Big	-0.35	-0.38	-0.39	-0.21	-0.05	0.11	0.15	0.34	0.50
	[-3.95]	[-4.25]	[-3.38]	[-1.59]	[-0.52]	[1.14]	[1.21]	[3.25]	[3.72]
				D. Ferson-Schadt Conditional Alpha					
Small	0.10	-0.34	-0.17	-0.11	0.07	-0.05	-0.21	0.41	0.13
	[0.59]	[-5.16]	[-1.07]	[-0.95]	[0.48]	[-0.32]	[-1.02]	[3.16]	[0.56]
Medium	-0.17	-0.32	-0.11	0.00	-0.08	0.06	0.17	0.24	0.17
	[-1.91]	[-4.52]	[-0.86]	[-0.01]	[-1.13]	[0.43]	[1.30]	[3.03]	[1.07]
Big	-0.35	-0.36	-0.44	-0.19	-0.04	0.07	0.16	0.32	0.51
	[-4.06]	[-4.11]	[-3.81]	[-1.46]	[-0.49]	[0.78]	[1.33]	[3.15]	[3.80]

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for high and low excess cash (EC) quintiles as well as for the difference between quintiles of high and low excess cash, conditional on both size and liquidity of fund holdings. Excess cash as of month t is calculated as the residual from the cross-sectional regression (1) on page 14. Fund size is measured as of month t, and liquidity is computed as the average loading of fund's holdings on the Pastor-Stambaugh (2003) liquidity factor as of month t. At the beginning of month $t + 4$, an investment is made in the funds that were assigned to a particular excess cash/size/liquidity group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from Carhart 4-factor model, 4-factor model with added Pastor-Stambaugh liquidity factor, and the conditional Ferson-Schadt model. Returns are weighted by total net assets. Sample period is 1992-2008.

Table 11. Future Performance of Stocks Bought and Sold by Funds in Different Excess Cash Groups

	All Buys		'Old' Buys		'New' Buys		Sells	
	Raw	DGTW	Raw	DGTW	Raw	DGTW	Raw	DGTW
Low	0.85	0.31	0.43	0.02	0.99	0.41	0.19	-0.23
2	0.85	0.30	0.50	0.04	0.97	0.39	0.30	-0.18
3	0.97	0.41	0.60	0.15	1.08	0.51	0.28	-0.19
4	0.88	0.32	0.56	0.10	0.97	0.40	0.31	-0.15
High	0.98	0.43	0.61	0.16	1.09	0.52	0.39	-0.09
High-Low	0.12	0.12	0.18	0.15	0.11	0.11	0.20	0.14
	[1.69]	[2.14]	[1.88]	[2.55]	[1.41]	[1.73]	[2.91]	[3.91]

Notes: This table reports average monthly returns, in percent, of stocks bought and sold between months $t+1$ and $t+12$ (inclusive) by funds assigned to each excess cash quintile at the end of month t. Returns are calculated separately for four categories: (i) All Buys, which includes all share purchases; (ii) 'Old' Buys, which includes additions to the stocks already held at the beginning of the period; (iii) 'New' Buys, which includes purchases of stocks not held at the beginning of the period; and (iv) Sells, which includes shares sold. Purchase and sale transactions are assumed to take place at prices prevalent at the end of month $t+6$. Reported are raw returns and style-adjusted returns (DGTW, calculated following Daniel, Grinblatt, Titman, and Wermers, 1997), as well as t-statistics for the difference in returns of high and low excess cash groups (in square brackets). Sample period is 1992-2008.

Table 12. Market Timing of Excess Cash Groups

	Treynor-Mazuy			Henriksson-Merton		
	δ_{0i}	δ_{1i}	δ_{2i}	ϕ_{0i}	ϕ_{1i}	ϕ_{2i}
Low	-0.233	0.955	-0.141	-0.154	0.986	-0.062
	[-3.52]	[69]	[-0.69]	[-1.67]	[42]	[-1.40]
EC2	-0.134	0.968	0.238	-0.192	0.936	0.060
	[-2.48]	[86]	[1.43]	[-2.53]	[49]	[1.66]
EC3	-0.114	0.965	0.056	-0.117	0.960	0.008
	[-2.29]	[93]	[0.36]	[-1.67]	[54]	[0.23]
EC4	0.010	0.945	-0.145	0.015	0.960	-0.027
	[0.21]	[91]	[-0.95]	[0.43]	[54]	[-0.82]
High	-0.047	0.896	-0.059	-0.039	0.902	-0.011
	[-0.78]	[70]	[-0.32]	[-0.46]	[42]	[-0.27]
High-Low	0.186	-0.059	0.082	0.115	-0.083	0.051
	[2.58]	[-3.92]	[0.37]	[1.14]	[-3.25]	[1.06]

Notes: This table reports the coefficients and the corresponding t-statistics of the market timing regressions. Treynor-Mazuy and Henriksson-Merton specifications are

$$\begin{aligned} R_{it} &= \delta_{0i} + \delta_{1i} R_{Mt} + \delta_{2i} R_{Mt}^2 + \eta_{it} \text{ and} \\ R_{it} &= \phi_{0i} + \phi_{1i} R_{Mt} + \phi_{2i} \max(0, R_{Mt}) + \nu_{it}, \end{aligned}$$

respectively, where R_{it} is the excess return on a portfolio of five excess cash quintiles or the difference in returns of high and low excess cash quintiles, and R_{Mt} is the market excess return. Intercepts are in percent. Excess cash is computed as the residual from regression (1) on page 14. Sample period is 1992-2008.

Table 13. Market Timing Conditional on Volatility of Excess Cash

	Low Var(EC)	Var(EC)2	Var(EC)4	Var(EC)4	High Var(EC)
1 month	0.105	0.014	0.017	0.004	-0.009
	[2.11]	[0.52]	[1.09]	[0.56]	[-0.56]
3 months	0.121	0.107	0.066	0.055	-0.021
	[1.14]	[2.20]	[2.18]	[1.81]	[-2.00]
6 months	0.013	0.171	0.076	0.059	-0.034
	[0.09]	[2.59]	[1.76]	[1.36]	[-2.04]
12 months	-0.034	0.219	0.005	0.007	-0.021
	[-0.13]	[1.80]	[0.06]	[0.09]	[-0.67]

Notes: This table reports slope coefficients and t-statistics from the regression of N-month market return beginning in month $t+1$, $N \in (1,3,6,12)$, on aggregate excess cash holdings of five portfolio that are formed on the basis of volatility of past excess cash holdings, Var(EC), which is computed for each fund at time t as standard deviation of excess cash holdings from twelve quarterly observation in months $t-33$, $t-30$, ..., $t-3$, and t. Sample period is 1998-2008.

Table 14. Fund Excess Cash Holdings and Future Performance Conditional on Future Fund Flows

	Low	EC2	EC3	EC4	High	High-Low	R^2
			A. Low Future Fund Flows				
Raw	-0.02	0.22	0.15	0.21	0.21	0.23	
	[-0.04]	[0.84]	[0.42]	[0.59]	[0.69]	[1.61]	
α^{M}	-0.62	-0.34	-0.44	-0.39	-0.30	0.32	0.143
	[-5.75]	[-2.88]	[-4.78]	[-5.03]	[-2.72]	[2.45]	
α^{FF}	-0.57	-0.40	-0.43	-0.39	-0.43	0.25	0.304
	[-5.17]	[-4.03]	[-4.78]	[-4.99]	[-3.81]	[2.12]	
α^{CAR}	-0.55	-0.30	-0.36	-0.34	-0.25	0.30	0.370
	[-4.82]	[-3.11]	[-4.07]	[-4.36]	[-2.80]	[2.52]	
α^{PS}	-0.50	-0.26	-0.32	-0.32	-0.20	0.30	0.366
	[-4.44]	[-2.70]	[-3.65]	[-4.07]	[-2.37]	[2.44]	
α^{SD}	-0.55	-0.29	-0.37	-0.35	-0.26	0.29	0.364
	[-4.96]	[-3.01]	[-4.24]	[-4.47]	[-3.06]	[2.45]	
α^{FS}	-0.51	-0.30	-0.37	-0.34	-0.26	0.25	0.423
	[-4.49]	[-3.14]	[-4.10]	[-4.37]	[-3.06]	[2.16]	
			B. High Future Fund Flows				
Raw	0.67	0.78	0.74	0.86	0.77	0.10	
	[2.06]	[2.32]	[2.08]	[2.52]	[2.05]	[1.02]	
α^{M}	0.12	0.18	0.14	0.29	0.22	0.11	-0.005
	[1.40]	[2.11]	[1.45]	[2.91]	[1.24]	[1.08]	
α^{FF}	0.07	0.23	0.21	0.32	0.22	0.15	0.175
	[0.78]	[2.54]	[2.21]	[3.20]	[1.32]	[1.65]	
α^{CAR}	0.02	0.06	0.10	0.19	0.11	0.10	0.213
	[0.22]	[1.28]	[1.13]	[2.10]	[0.17]	[1.04]	
α^{PS}	-0.01	0.05	0.11	0.19	0.12	0.13	0.244
	[-0.12]	[1.17]	[1.27]	[2.15]	[0.28]	[1.47]	
α^{SD}	0.02	0.08	0.11	0.20	0.12	0.10	0.219
	[0.21]	[1.43]	[1.25]	[2.28]	[0.21]	[1.09]	
α^{FS}	0.01	0.09	0.13	0.21	0.12	0.11	0.296
	[0.12]	[1.52]	[1.50]	[2.48]	[0.28]	[1.30]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different excess cash (EC) quintiles as well as for the difference between quintiles of high and low excess cash, conditional on future fund flows. Excess cash as of month t is calculated as the residual from the cross-sectional regression (1) on page 14. Fund flow is for the 12-month period from $t+4$ to $t+15$. Within each excess cash quintile, funds are assigned into 'Low' or 'High' fund flow groups. At the beginning of each month $t+4$, an investment is then made in the funds that were assigned to a particular excess cash / fund flow group, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^{M}), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). R^2 is the adjusted R^2 from regressions using as dependent variable the difference in returns between high and low excess cash funds. Returns are weighted by total net assets. Sample period is 1992-2008.

Table 15. Summary Statistics: Closed-End Funds

	CASH	NAV	BETA	RUNUP	EXP	AGE	DISC
Mean	1.79	557	0.79	9.54	1.65	23.90	20.96
Median	0.06	358	0.79	9.12	1.02	15.12	17.50
10th Pctl	0.00	64.5	0.19	-7.76	0.41	4.16	-1.86
90th Pctl	5.24	1,354	1.38	26.90	3.34	68.87	49.64
Stdev	4.86	602	0.48	14.52	2.09	23.46	22.31
				Correlations			
CASH	1.00						
LNNAV	-0.25	1.00					
BETA	-0.10	0.09	1.00				
RUNUP	-0.03	0.08	0.04	1.00			
EXP	0.23	-0.33	0.01	-0.02	1.00		
AGE	-0.07	0.68	0.05	0.11	-0.28	1.00	
DISC	-0.01	-0.22	-0.06	-0.13	-0.16	-0.12	1.00

Notes: This table reports summary statistics for closed-end fund characteristics. The sample contains funds with at least 50% of their net assets invested in U.S. equities. CASH is percentage of total net assets held in cash; NAV is net asset value (in million); BETA is market beta of the fund, calculated from market model regression using realized fund returns over the prior 12 months; RUNUP is the 12-month fund return runup, in percent; EXP is expense ratio, in percent; AGE is fund age, in years; and DISC and discount of net asset value per share relative to market share price, in percent. Statistics are calculated semiannually in June and December cross-sections and then averaged. Sample period is 1994-2008.

Table 16. Determinants of Closed-End Fund Cash Holdings

	LNNAV	BETA	RUNUP	EXP	AGE	DISC	R^2
(1)	-0.023						0.242
	[-5.89]						
(2)	-0.023	-0.010	0.028				0.259
	[-6.02]	[-1.75]	[0.58]				
(3)	-0.025			0.816	0.057		0.307
	[-5.48]			[2.81]	[6.12]		
(4)	-0.024	-0.006	0.035	0.888	0.048		0.287
	[-5.53]	[-0.95]	[0.71]	[3.18]	[5.42]		
(5)	-0.027					-0.036	0.285
	[-6.49]					[-5.50]	
(6)	-0.025	-0.004	0.028	0.707	0.044	-0.027	0.315
	[-4.59]	[-0.65]	[0.56]	[1.73]	[4.48]	[-2.29]	

Notes: This table reports the results of the cross-sectional regressions of closed-end fund cash holdings as a percentage of net asset value on fund characteristics. LNNAV is log of net asset value (NAV is in million); BETA is market beta of the fund, calculated from market model regression using realized fund returns over the prior 12 months; RUNUP is the 12-month fund return runup, in percent; EXP is expense ratio, in percent; AGE is fund age, in years; and DISC and discount of net asset value per share relative to market share price, in percent. Reported are average slope coefficients, corresponding t-statistics, and adjusted R^2 values. Coefficient on AGE is multiplied by 100. Sample period is 1994-2008.

Table 17. Excess Cash Holdings and Future Performance of Closed-End Funds

	Low	EC2	EC3	EC4	High	High-Low	R^2
Raw	0.29	0.27	0.36	0.32	0.23	-0.06	
	[0.19]	[0.36]	[1.10]	[1.31]	[0.41]	[0.36]	
α^M	0.02	-0.01	0.08	0.04	-0.07	-0.09	0.021
	[-0.68]	[-0.49]	[0.66]	[1.22]	[-0.79]	[0.22]	
α^{FF}	-0.29	-0.20	-0.09	-0.10	-0.27	0.02	0.065
	[-1.67]	[-1.80]	[-0.16]	[0.36]	[-1.95]	[0.59]	
α^{CAR}	-0.13	-0.11	-0.07	-0.04	-0.12	0.01	0.059
	[-1.02]	[-1.15]	[0.19]	[0.66]	[-1.25]	[0.32]	
α^{PS}	-0.12	-0.09	-0.02	-0.06	-0.15	-0.04	0.066
	[-1.07]	[-1.12]	[0.14]	[0.84]	[-1.21]	[0.40]	
α^{SD}	-0.11	-0.11	-0.06	0.00	-0.09	0.03	0.060
	[-0.96]	[-1.00]	[0.31]	[0.78]	[-1.14]	[0.33]	
α^{FS}	0.08	0.00	-0.03	0.02	0.10	0.02	0.074
	[0.02]	[-0.58]	[-0.01]	[1.22]	[0.05]	[0.01]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different excess cash quintiles (EC) of closed-end funds as well as for the difference between quintiles of high and low excess cash. Excess cash is computed as the residual from cross-sectional regressions of cash-to-net asset value of closed-end funds on fund size, lagged market beta of the fund, prior 12-month return, expense ratio, age, and fund discount. At the beginning of month $t + 4$, an investment is made in the funds that were assigned to a particular excess cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^M), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). R^2 is the adjusted R^2 from regressions using as dependent variable the difference in returns between high and low excess cash funds. Returns are weighted by net asset value. Sample period is 1994-2008.

Table A1. Fund Excess Cash Holdings and Future Performance: Simplified Excess Cash Definition

	Low	EC2	EC3	EC4	High	High-Low	R^2
Raw	0.36	0.51	0.56	0.56	0.55	0.19	
	[1.13]	[1.56]	[1.64]	[1.69]	[1.72]	[1.71]	
α^{M}	-0.18	-0.06	-0.03	-0.02	0.00	0.18	-0.006
	[-2.35]	[-1.06]	[-0.56]	[-0.33]	[-0.03]	[1.71]	
α^{FF}	-0.28	-0.08	0.03	0.01	0.00	0.28	0.193
	[-4.59]	[-1.63]	[0.48]	[0.14]	[0.03]	[3.27]	
α^{CAR}	-0.21	-0.08	-0.03	-0.02	-0.03	0.18	0.278
	[-3.73]	[-1.53]	[-0.64]	[-0.46]	[-0.88]	[2.16]	
α^{PS}	-0.20	-0.07	-0.03	-0.01	-0.02	0.18	0.277
	[-3.55]	[-1.25]	[-0.50]	[-0.31]	[-0.64]	[2.20]	
α^{SD}	-0.21	-0.08	-0.03	-0.02	-0.03	0.18	0.276
	[-3.66]	[-1.52]	[-0.50]	[-0.39]	[-0.91]	[2.08]	
α^{FS}	-0.22	-0.09	-0.02	-0.02	-0.03	0.19	0.294
	[-4.05]	[-1.62]	[-0.38]	[-0.49]	[-0.74]	[2.46]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for different excess cash (EC) quintiles as well as for the difference between quintiles of high and low excess cash. Excess cash of fund i as of the end of month t is calculated as the residual from cross-sectional regression

$$\text{CASH}_{it} = \gamma_{0t} + \gamma_{1t}\text{RU12}_{it} + \gamma_{2t}\text{FF1}_{it} + \gamma_{3t}\beta^{\text{Mkt}}_{\text{Fund},it} + \varepsilon_{it},$$

where CASH_{it} is the percentage of fund total net assets held in cash as of the end of month t; RU12_{it} is the 12-month fund return runup ending at the end of month t; FF1_{it} is fund flow during month t; and $\beta^{\text{Mkt}}_{\text{Fund},it}$ is market beta of the fund, calculated from market model regressions using realized fund returns from months $t-11$ to t. At the beginning of month $t+4$, an investment is made in the funds that were assigned to a particular excess cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^{M}), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). R^2 is the adjusted R^2 from regressions using as dependent variable the difference in returns between high and low excess cash funds. Returns are weighted by total net assets. Sample period is 1992-2008.

Table A2. Excess Cash Groups Transition Probabilities

	$\text{Low}_{\tau+1}$	$\text{EC2}_{\tau+1}$	$\text{EC3}_{\tau+1}$	$\text{EC4}_{\tau+1}$	$\text{High}_{\tau+1}$
Low_{τ}	0.31	0.27	0.18	0.14	0.11
EC2_{τ}	0.23	0.25	0.24	0.18	0.10
EC3_{τ}	0.18	0.22	0.23	0.23	0.14
EC4_{τ}	0.14	0.15	0.24	0.25	0.22
High_{τ}	0.09	0.10	0.12	0.23	0.46

Notes: This table reports transition probabilities of the five excess cash groups. Excess cash as of the end of calendar year τ is estimated from the cross-sectional regression (1) on page 14. Sample period is 1992-2008.

Table A3. Fund Excess Cash Holdings and Future Performance: Permanent vs. Transitory High and Low Excess Cash

	Low Excess Cash (L)		High Excess Cash (H)		Differences in Returns					
	Perm (P)	Trans (T)	Perm (P)	Trans (T)	HT–LT	HP–LP	LT–LP	HT–HP	HT–LP	HP–LT
Raw	0.09	0.39	0.56	0.73	0.35	0.47	0.29	0.17	0.64	0.18
	[0.22]	[1.03]	[1.50]	[1.94]	[2.42]	[2.68]	[2.16]	[1.21]	[3.65]	[1.30]
α^{M}	-0.56	-0.21	-0.03	0.14	0.35	0.53	0.35	0.17	0.70	0.18
	[-4.78]	[-2.11]	[-0.25]	[1.21]	[2.39]	[3.07]	[2.68]	[1.18]	[4.04]	[1.29]
α^{FF}	-0.56	-0.25	0.01	0.11	0.36	0.57	0.31	0.10	0.66	0.26
	[-4.54]	[-2.44]	[0.09]	[0.91]	[2.34]	[3.25]	[2.27]	[0.67]	[3.73]	[1.84]
α^{CAR}	-0.45	-0.28	-0.08	0.09	0.36	0.37	0.17	0.17	0.54	0.19
	[-3.79]	[-2.64]	[-0.75]	[0.71]	[2.31]	[2.28]	[1.35]	[1.13]	[3.05]	[1.36]
α^{PS}	-0.44	-0.27	-0.08	0.05	0.32	0.36	0.17	0.13	0.49	0.19
	[-3.62]	[-2.51]	[-0.69]	[0.44]	[2.04]	[2.19]	[1.30]	[0.87]	[2.78]	[1.31]
α^{SD}	-0.46	-0.29	-0.09	0.10	0.39	0.38	0.17	0.18	0.56	0.20
	[-3.88]	[-2.76]	[-0.78]	[0.80]	[2.49]	[2.30]	[1.32]	[1.23]	[3.22]	[1.42]
α^{FS}	-0.43	-0.27	-0.03	0.11	0.38	0.40	0.16	0.15	0.54	0.24
	[-3.57]	[-2.50]	[-0.31]	[0.92]	[2.38]	[2.45]	[1.23]	[0.98]	[3.07]	[1.67]

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for four excess cash groups: permanent (P) and transitory (T) low (L) and high (H) excess cash portfolios as well as for the difference in returns between these groups. A fund that falls into a high excess cash group at time t is assigned into a permanent group if it also belonged to either high or next-to-high excess cash quintile in at least two thirds of the observations over the previous three years, and is assigned to a transitory group otherwise. Low excess cash funds are similarly separated into permanent and transitory groups. Excess cash as of month t is calculated as the residual from the cross-sectional regression (1) on page 14. At the beginning of month $t + 4$, an investment is made in the funds that were assigned to a particular excess cash group as of the end of month t, and the position is held without rebalancing for the following 12 months. Row labeled 'Raw' shows average unadjusted returns. Risk-adjusted returns are from market model (α^{M}), Fama-French 3-factor model (α^{FF}), Carhart 4-factor model (α^{CAR}), 4-factor model with added Pastor-Stambaugh liquidity factor (α^{PS}), 4-factor model with added Sadka liquidity factor (α^{SD}), and the conditional Ferson-Schadt model (α^{FS}). Returns are weighted by total net assets. Sample period is 1992-2008.