Cash Holdings and Mutual Fund Performance

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1. Introduction

Studies of the value of active management have focused extensively on examining differences in the stock positions of equity mutual funds. Numerous studies have concluded that the characteristics of a fund's shareholdings can be used to infer managerial skills (e.g., Chen, Jegadeesh, and Wermers, 2000; Kacperczyk, Sialm, and Zheng, 2005, 2008; Alexander, Cici, and Gibson, 2007; Cremers and Petajisto, 2009). Yet, stock positions comprise only one component of a fund's overall portfolio. This paper shows that detailed analysis of the cash holdings of actively managed equity funds can be very useful in predicting fund performance, identifying skilled managers, assessing the impact of fire sales, and can shed light on the importance and value of a fund's access to liquid resources such as cash.

Cash holdings of mutual funds can differ dramatically even among seemingly comparable funds. For example, at the end of 2010, one-tenth of actively managed U.S. mutual funds with a growth objective held over 10% of their total net assets in cash. For another tenth of the funds, this number was below 0.1%. Why do some managers choose to hold seemingly excessive amounts of cash, and how do excess cash holdings impact fund performance? On the one hand, carrying excess cash is costly: Low expected returns on cash can hinder fund performance (Wermers, 2000). Holding excess cash in an attempt to time a market downturn can also have detrimental effects: Poor managerial timing skills documented in prior literature suggest that such attempts are likely to be futile and costly (e.g., Henriksson, 1984; Daniel, Grinblatt, Titman, and Wermers, 1997). On the other hand, carrying unusually large amounts of cash affords the fund valuable flexibility, allowing the manager to make quick investments in attractive stocks and to satisfy outflows without costly fire sales (e.g., Edelen, 1999; Christoffersen, Keim, and Musto, 2006; Coval and Stafford, 2007; Brunnermeier and Pedersen, 2009). I show that managers carrying excess cash benefit from the flexibility it provides despite the costs of holding cash.

I define excess cash as the residual from cross-sectional regressions of the ratio of cash to total net assets on fund characteristics. 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. Using a sample of actively managed U.S. equity funds, I show that funds with high excess cash holdings outperform those with low excess cash by 2% per year. After standard risk adjustment (e.g., controlling for the four factors of Carhart, 1997), the difference in returns reaches nearly 3% annually. The results of Fama-MacBeth (1973) regressions confirm that excess cash has significant predictive power for fund performance.

To understand the driving forces behind the positive relation between excess cash and future fund performance, it is important to recognize the key factors impacting cash holdings. Cash positions are affected by observable fund characteristics, such as expenses; by exogenous flows, which include withdrawals, deposits and dividends; and by discretionary managerial decisions about purchases and sales. I control for differences in recent fund flows and fund characteristics in defining excess cash, and therefore the positive relation between excess cash and fund performance does not appear to be due to observable fund attributes or past flows. Instead, I conjecture that it is attributable to managerial decisions to adjust a fund's cash holdings. Adjustments to cash positions and thus the level of excess cash can reflect (i) a manager's stock-picking abilities and investment opportunities, (ii) a manager's aptitude at controlling fund costs, particularly those associated with satisfying fund outflows and conducting equity transactions, and (iii) the market-timing skills of a manager. I develop these hypotheses in detail and present empirical evidence for each conjecture.

I first explore whether high excess cash proxies for a manager's stock-selection abilities. Cash tends to earn a lower return than equities do, and therefore unskilled managers may prefer to remain fully invested in stocks in an attempt to match benchmark returns. By contrast, skilled managers who do not find the available investment opportunities attractive or who are gradually building their positions in attractive stocks (for example, to avoid price pressure) may carry high excess cash and in the future make lucrative investment decisions. Consistent with this argument, I show that high excess cash funds make better stock selection decisions than their low excess cash peers do: Stocks purchased by high excess cash funds generate returns that exceed those bought by the low excess cash group by 2% per year.

Several other pieces of evidence indicate that the relation between excess cash and future fund performance is consistent with high excess cash fund managers exhibiting superior stock selection skills. In particular, the high excess cash funds' relative outperformance is more pronounced during periods of high dispersion in stock valuation, when stock-picking abilities may be particularly beneficial. I also find that in a sample of index funds – whose stated goal is to track rather than outperform a broad portfolio – the excess cash-performance link is weak.

The positive relation between excess cash and future fund performance can also relate to managerial proficiency at controlling fund costs. Holding excess cash can enable a manager to economically satisfy fund outflows and cheaply conduct stock transactions, benefiting fund performance. By contrast, a manager who fails to anticipate fund outflows and lacks sufficient cash to satisfy such outflows can be forced to liquidate some of the shareholdings at a disadvantageous time and price. Consistent with this conjecture, I find that the difference in performance of the high and

low excess cash funds is particularly pronounced when fund flows are low and when measures of market-wide illiquidity are high. Further supporting this hypothesis, I show that in a sample of closed-end funds – which are not affected by the flow concerns to nearly the same extent as their open-end counterparts are – no significant relation emerges between excess cash and future performance. The results suggest that low excess cash funds lack sufficient flexibility to cover outflows and are forced to fire-sell their shareholdings, whereas the high excess cash group is well positioned to meet fund outflows and generates better returns. In line with the idea that high excess cash funds are better positioned to trade cheaply, I also find that such funds incur significantly lower transaction costs in the future than their low excess cash peers do.

The empirical evidence I present suggests that managers carrying excess cash benefit from the flexibility it provides despite the costs of holding cash. These managers are able to economically satisfy redemption requests and purchase attractive stocks quickly and cheaply. By contrast, low excess cash managers may be forced to fire-sell their assets to satisfy outflows and may also be less nimble in taking advantage of purchasing desirable stocks. The results suggest that they overestimate the costs of carrying cash and can benefit from better cash management policies.

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. This lack of research is particularly puzzling given that cash positions represent a substantial component of most mutual fund portfolios,[1] and ample anecdotal evidence suggests that fund managers actively adjust their cash holdings in response to changes in market conditions and investment opportunities.[2] The two notable exceptions are Chordia (1996) and Yan (2006), who study the link between cash holdings and a number of fund characteristics. Yan also documents the absence of a relation between raw cash and future fund performance. I complement the literature by focusing on excess cash holdings, documenting a positive relation between excess cash and fund performance, and exploring the sources of this relation. I also identify important new determinants of fund cash holdings that jointly explain three times as much cross-sectional variation in cash positions as variables studied in the prior literature do.

The rest of the paper proceeds as follows. Section 2 describes the data and summary statistics. Section 3 explores the determinants of fund cash holdings. Section 4 provides details of excess cash estimation and documents the positive relation between excess cash and future fund performance.

[1] The 2011 edition of the Investment Company Fact Book notes that at the end of 2010, investment in actively managed U.S. equity funds totaled $5.667 trillion. CRSP data suggest that in 2010 approximately 3%, or $170 billion, of this amount was held in cash.

[2] For examples, see "Fund's extra cash holds opportunities", *Wall Street Journal*, April 8, 2009; "More stocks funds declare cash king", *Wall Street Journal*, April 9, 2009; "Cash regains its asset status", *Barron's*, August 17, 2009.

Section 5 analyzes the sources of this relation. Section 6 concludes.

2. Data and Summary Statistics

I obtain fund cash holdings, returns, investment objectives, fees, total net assets, and other fund characteristics from the Center for Research in Security Prices (CRSP) Survivor-Bias-Free Mutual Fund Database. I use the Wharton Research Data Services mflink file to merge this database with the Thomson Financial Mutual Fund Holdings dataset, which contains information on stock positions of funds (see Wermers, 2000). To determine the characteristics of the equity portfolios of the funds, I use stock-level data from the CRSP and Compustat files.

I restrict my analysis to diversified domestic equity mutual funds with aggressive growth, long-term growth, or growth-and-income objectives. The CRSP database provides annual details on fund asset compositions including cash balances 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 contain monthly total net assets prior to 1992, complicating calculations of the level and volatility of fund flows. Also, certain variables (e.g., 12b-1 fees) are not reported prior to 1992. For these reasons, I focus my analysis on the 1992-2009 period.[3] Appendix A provides complete details of the sample selection.

Table 1 presents summary statistics for selected fund characteristics. The average fund holds 4% of assets in cash, and cross-sectional differences in cash holdings are considerable: The average 10th percentile of holdings reaches just 0.18%, while funds in the 90th percentile hold over 9% in cash. Figure 1 shows that assets held in cash have been declining over the sample period: Average cash holdings dropped from nearly 7% in the early 1990s to just 3% by the late 2000s.

To explore the characteristics of the funds' equity portfolios, I compute the loadings on the market, value, size, momentum, and liquidity factors for each stock-month observation, and use each fund's most recently reported holdings to determine its average loadings. Market, value, size, and momentum loadings are Dimson (1979) sum betas from the four-factor model regressions on daily data. To account for non-synchronous trading, I include the first lag and the average of lags 2 through 4 of each factor in the regressions. Liquidity loadings are from the two-factor model regressions on monthly data with market and Pastor and Stambaugh (2003) liquidity factors.[4] All

[3] Empirical results in Table 3 of Dellva and Olson (1998), who study the 1987-1992 sample, hint at a positive relation between cash holdings and fund performance in the earlier period.

[4] Regressions use one year of data and require at least 200 (10) valid daily (monthly) return observations. Data on the market, value, size, and momentum factors and the risk-free rate are from Ken French's website, http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. Data on the liquidity factor are from Lubos Pastor's website, http://faculty.chicagobooth.edu/lubos.pastor/research/liq_data_1962_2010.txt. Earlier ver-

betas exhibit high cross-sectional variation.

Table 1 also shows that cash holdings correlate strongly with a number of fund characteristics, including fund flows, fees, and the attributes of the equity portfolio. These correlations are suggestive of the determinants of cash holdings, which I now turn to exploring in greater detail.

3. Determinants of Fund Cash Holdings

Cash holdings of mutual funds represent the largest non-equity asset class and can differ dramatically even among seemingly comparable funds (see Table 1). Striking differences in cash positions of competing funds that are pursuing similar objectives are puzzling, yet only limited attention in the literature has been devoted to analyzing the sources of these differences.[5] 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 important new determinants of fund cash holdings.

Table 2 presents the results of cross-sectional regressions of fund cash holdings on a number of characteristics.[6] Regression (1) shows the impact of fund fee structure, fund size, and turnover ratio on the cash position. Expenses are paid with cash on hand, and therefore funds with higher expenses tend to hold more cash. Barber, Odean, and Zheng (2004) observe that fund flows are lower for funds with higher front-load fees. Such funds can thus hold more cash to cushion against a potential cash shortfall. Deferred loads, by comparison, discourage fund outflows, and it is natural to expect a negative relation between deferred loads and cash holdings. The results of regression (1) are in line with both of these observations.

Consistent with the findings of Yan (2006), fund size relates positively to the fraction of assets held in cash when controlling for fund fee structure. This observation contradicts the notion of the economies of scale but is in line with the idea that larger funds are less nimble and may find it costlier to raise cash from selling their shareholdings (for example, due to price pressure). As a result, they choose to hold more cash than smaller funds do.

sions of this paper also used the Sadka (2006) liquidity factor, which produced similar empirical results, but is not available after 2005. The results are also robust to using a liquidity factor based on the Amihud (2002) measure.

[5]The scarcity of research on the importance of mutual fund cash holdings stands in stark contrast to the abundance of studies on corporate cash, which have proliferated in recent years. See, for example, Opler, Pinkowitz, Stulz, and Williamson (1999), Mikkelson and Partch (2003), Faulkender and Wang (2006), Dittmar and Mahrt-Smith (2007), Foley, Hartzell, Titman, and Twite (2007), Bates, Kahle, and Stulz (2009), and Simutin (2010).

[6]Regressions are run in every cross-section when cash holdings data are available: annually until 1998 and quarterly thereafter. Restricting the sample to post-1998 data has little effect on the average coefficients reported in Table 2 or their significance. Note that for ease of exposition, terms such as 'cash holdings', 'cash positions', and 'cash balances' are used to mean the fraction of assets invested in cash rather than the dollar level of cash holdings.

Specification (2) next explores the relation between cash holdings and a fund's lagged 1-, 6-, and 12-month flows and returns. Whereas each of these variables is statistically significant in univariate regressions, the multivariate specification shows that fund performance over the previous year and lagged 6-month flow have a particularly strong effect on cash balances. The positive link between cash and past fund returns is driven in part by the fact that fund flows follow past performance (e.g., Sirri and Tufano, 1998). The positive relation between past flows and cash holdings suggests that managers carry higher cash balances until they have had sufficient time to fully invest recent inflows.

Regression (3) combines the variables that prior researchers found to relate to mutual fund cash holdings. Most of the regressors are statistically significant, but jointly they explain only 5% of the cross-sectional variation in cash holdings. Interestingly, the volatility of fund flows relates insignificantly to cash holdings in this multivariate specification.

The next two regressions show that the risk loadings and other characteristics of a fund's equity positions are important determinants of fund cash holdings. Funds investing in stocks with high market, value, and size betas carry a greater fraction of assets in cash. This result is consistent with funds using cash to manage the overall risk of their portfolios. For example, managers holding high market beta stocks tend to carry more cash to decrease the risk of the fund's overall portfolio. Additionally, high beta and smaller stocks are generally more volatile, and hence funds investing in such stocks on average maintain a larger cash cushion to satisfy potential fund outflows.

Regression (5) shows further that funds whose equity portfolio earns a high 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 (6) shows that a number of fund attributes other than those studied in the prior literature have a strong impact on cash holdings. First, funds with concentrated portfolios hold more cash. A fund investing in a small number of stocks can exhibit volatile performance, suggesting that fund flows are also likely to be volatile, and leading the manager to allocate more of the fund's assets to cash. Second, the regression highlights a positive link between cash holdings and fund age, consistent with the idea that older funds with established track records reduce their overall risk exposure by carrying more cash (cf. Chevalier and Ellison, 1999). Specification (6) shows further that funds that belong to a family of funds invest less in cash than do stand-alone funds. Conversations with fund managers indicate that it is uncommon for one fund to borrow from another fund within

the same family, suggesting that this relation plausibly reflects better cash management practices of larger families rather than diversification of flow shocks. Regression (6) also shows that fund style impacts the cash position of a fund. In particular, funds with an aggressive growth objective, which are more likely to hold smaller, less liquid, and more volatile stocks, carry more cash.

Regression (7) uses the full set of explanatory variables and illustrates the importance of the determinants of cash holdings that I consider. Relative to the characteristics examined in the prior literature and used in regression (3), the variables I study explain three times as much cross-sectional variation in cash holdings.

4. Excess Cash Holdings and Future Fund Performance

In this Section, I describe the methodology used to estimate excess cash, 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.

4.1. Excess Cash: Definition, Motivation, and Robustness

I use regression (7) of Table 2, which combines all of the considered fund characteristics and achieves the highest adjusted R^2, to define excess cash holdings of mutual funds. At every point when the data on fund cash holdings are available (annually prior to 1998 and quarterly thereafter), I calculate excess cash for a given fund as the residual from this cross-sectional regression and assign funds into quintiles on the basis of this value. Excess cash is thus the difference between actual and expected allocation to cash, and can be interpreted as the amount of cash above what an average fund with similar characteristics holds. All explanatory variables are measured contemporaneously with or prior to the time when cash holdings are observed, and consequently the calculation introduces no look-ahead bias.[7] Untabulated results show that there is no monotonic relation between *excess* cash and any of the variables used in the regression, irrespective of whether averages or medians are considered. While some characteristics (e.g., expense ratio) exhibit a U-shaped relation with excess cash, the average values of the top and bottom quintiles are comparable for all attributes.[8]

[7]The methodology used to define mutual fund excess cash is similar in spirit to calculating excess corporate cash (Opler, Pinkowitz, Stulz, and Williamson, 1999), excess CEO compensation (Brick, Palmon, and Wald, 2006), and excess leverage (Lemmon, Roberts, and Zender, 2008). The results of this paper are robust to measuring excess cash from a panel regression. However, given the later focus on the predictability of fund performance, it is more appealing to use a method that calculates excess cash at a given time using only data available up to that point.

[8]The similarity in characteristics of funds in high and low excess cash groups suggests that the differences in their future performance documented in this section are not due to observable fund attributes. For example, these differences are not driven by low excess cash funds being closet indexers.

Defining excess cash as a residual from the cross-sectional regression with all explanatory variables is very appealing, as it accounts for many factors that can intuitively be expected to affect mutual fund cash holdings. Yet, the definition is admittedly subjective, and one could estimate excess cash using another set of regressors. To address any concerns about the sensitivity of the results to this particular way of estimating excess cash, Appendix B shows that the empirical conclusions drawn in this paper are robust to alternative measures of excess cash. I focus on excess cash because, as a discretionary amount, it can capture information about otherwise unobservable fund characteristics that affect fund performance. Raw cash, by contrast, is affected by observable exogenous shocks (e.g., fund flows) and endogenous fund characteristics (e.g., riskiness of shareholdings). Appendix B considers several alternative definitions of excess cash that control for flow shocks and fund characteristics, and additional robustness tests are summarized on the author's website. All definitions generate results that are similar to those discussed later in the paper.[9]

4.2. Performance Measures

To explore the relation between a fund's excess cash holdings and future performance, I examine raw returns of funds in the excess cash groups and study their risk-adjusted returns after controlling for the factor loadings using the capital asset pricing model, the Fama and French (1993) three-factor model, and the Carhart (1997) four-factor model. I also use a five-factor specification that augments the Carhart model with the Pastor and Stambaugh (2003) liquidity factor. Finally, I consider the Ferson and Schadt (1996) conditional performance measure to account for the fact that commonly used unconditional performance metrics may be unreliable if risk premiums or betas are time-varying. The Ferson-Schadt model uses a pre-determined set of conditioning variables:

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

where R_{it} is the excess return in month t of a portfolio of funds that belong to excess cash quintile i; R_{Mt}, HML_t, SMB_t, and MOM_t are market, value, size, and momentum factors, respectively; and $Z_{F,t-1}$ is the demeaned value of macroeconomic variable F in month $t-1$. Following previous studies, I include the following macroeconomic variables: dividend yield of the S&P 500 index, term spread (the difference between the rates on a 10-year Treasury note and a three-month Treasury

[9] An earlier version of this paper showed robustness of the results to additional alternative definitions of excess cash. To ensure that the residual does not mechanically relate to future fund performance, I also consider using as a regressand either randomly generated noise or variables other than cash. The residuals from those specifications are unrelated to future fund performance. Analysis based on data from Morningstar confirms that excess cash relates positively to future fund performance. The results of the robustness tests are available upon request.

bill), default spread (the difference between the rates on AAA and BAA bonds), and the three-month Treasury bill rate.[10] The intercept α_i^{FS} from this regression is the Ferson-Schadt conditional performance measure.

I examine performance both before and after deducting fund expenses. Investors are primarily concerned with fund performance net of expenses, but examining performance before deducting expenses makes it possible to better assess differences in managerial abilities if skilled managers extract rents by charging higher expenses (Berk and Green, 2004). The results obtained using net and gross returns are qualitatively similar, and below I will focus the discussion on performance after expenses.

4.3. Future Fund Performance

To study the relation 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 total net assets-weighted portfolios for 12 months beginning in month $t+4$. I skip three months between excess cash estimation and the beginning of the holding period to ensure that all data required for excess cash calculation (e.g., fund holdings) are publicly available. The choice of the 12-month holding period is motivated by the fact that prior to 1999 cash holdings are observed only annually.[11] The first estimation of excess cash 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. Starting in 1999, during any given month in quarter τ, the quintile i 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 relation between raw cash and future returns. To do this, I assign funds into quintiles on the basis of raw rather than excess cash. Table 3 shows future returns of the five resulting groups. Consistent with the observations of Yan (2006), there is no link between cash holdings and future returns regardless of the performance measurement approach. Funds in both high and low cash groups earn an average excess return of 0.32% per month. The differences in their alphas do not exceed 0.05% monthly and are in no case statistically significant.

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

[11] The results of this paper are robust to starting the holding period in month $t + 1$, immediately after excess cash calculation, and to considering shorter holding periods in post-1998 data, when cash holdings are available quarterly. Figures 2 and 3 provide additional evidence of robustness.

B. Excess Cash and Future Performance

Table 4 shows a strong positive relation between a fund's excess cash holdings and future returns. The difference in returns of high and low excess cash groups reaches 0.18% monthly (0.39% vs. 0.22%). This difference is particularly remarkable given the drag cash imposes on fund performance (Wermers, 2000). Adjusting for the differences in loadings on risk factors produces very similar differences in performance: Depending on the model used, the alphas of high excess cash funds exceed the alphas of the low excess cash group by between 0.21% and 0.22% monthly. For each performance measure considered, the differences in returns between high and low excess cash funds are both statistically significant and economically important. It is also interesting to point out that, although the alphas of each excess cash group are negative, they are statistically indistinguishable from zero for the top two quintiles. Even more intriguing, funds in these quintiles earn positive gross alphas, giving an early indication that managers of these funds may possess superior skills. The poor risk-adjusted performance of the mutual fund industry as a whole is thus driven mainly by the weak returns of the funds with low excess cash.

To verify that the difference in performance between high and low excess cash funds is not limited to a particular time period, Figure 2 plots the steadily increasing cumulative difference in risk-adjusted returns of the high and low excess cash funds. The performance differential is remarkably stable over the sample period and persists in both bull and bear markets.

Figure 3 plots cumulative risk-adjusted returns of each excess cash quintile in event time for five years following portfolio assignment. Several observations related to this figure are particularly noteworthy. First, the differences in performance persist over the entire five-year period: The gap between the cumulative risk-adjusted returns of high and low excess cash groups actually widens during most of the five years following portfolio assignment. Second, low excess cash funds perform strikingly, and consistently, poorly. Their risk-adjusted returns average an abysmal -0.17% per month over the course of the five years. Finally, the top two excess cash quintiles perform comparably well, with the top group edging slightly ahead.[12]

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

Table 5 confirms the robustness of the positive relation between excess cash and future fund performance by presenting the results of Fama-MacBeth (1973) regressions. Carhart four-factor fund alphas computed using data from months $t+4$ to $t+15$ are regressed on excess cash and other fund characteristics measured at the end of month t. Regression (1) confirms that excess cash relates

[12]Given the results described here, it is natural to ask whether low excess cash funds are more likely to dissolve, merge with other funds, or be acquired. I find no relation between excess cash and the likelihood of such events happening, which is in line with investors' failing to flee the worst performing funds (e.g., Sirri and Tufano, 1998).

positively to future fund performance, whereas specifications (2) and (3) shows that raw cash is unrelated to future returns. Hence what predicts fund performance is not raw cash by itself, nor is it the linear function of the determinants of cash holdings; rather it is the difference between them, or excess cash.

The next three regressions demonstrate that fund size, return gap, and characteristics of the fund's stock portfolio correlate with future performance.[13] Including them alongside excess cash in regressions (4)-(6) does not affect the significance of the excess cash measure. The magnitude of the coefficient on excess cash is stable across regressions and economically meaningful: An increase in excess cash by one standard deviation (5%) results in an approximately $0.02 \times 5 = 0.10\%$ increase in the monthly risk-adjusted return, or over 1% annually.

In the next section, I discuss why a positive excess cash allocation could be beneficial to fund performance. At the same time, it makes intuitive sense that a disproportionately large cash position could be detrimental to fund performance and could suggest agency problems. To explore whether holding too much excess cash is disadvantageous, I include in regression (7) a dummy variable equal to one if the fund falls into the top five percent in terms of excess cash allocation, and to zero otherwise. In accordance with the argument that extreme cash positions can be detrimental to fund performance, the coefficient on this variable is significantly negative. Mutual fund managers can indeed hold too much excess cash. By contrast, a sensible amount of excess cash proves beneficial to fund performance, and I now turn to exploring the reasons for this relation.

5. Sources of the Relation Between Excess Cash and Fund Performance

In this Section, I explore the sources of the positive relation between excess cash and future fund returns. I show that managers carrying excess cash benefit from the flexibility it provides despite the costs of holding cash. They make superior stock-picking decisions, and excel at controlling fund expenses by economically satisfying fund flows and cheaply transacting in equities.[14]

[13] None of the other variables robustly related to future fund performance, and I do not include them in Table 5.

[14] It is interesting to consider whether the positive link between excess cash and fund performance relates to a fund's short-selling activities or to the usage of futures and other derivatives. Koski and Pontiff (1999) find that funds that use derivatives generate returns comparable to those that do not. Almazan, Brown, Carlson, and Chapman (2004) show that few funds engage in short-selling or use derivatives and confirm that the performance of the funds restricted from such investments is similar to that of unconstrained funds. An analysis based on the Almazan, Brown, Carlson, and Chapman (2004) data shows that the relation between excess cash and fund performance is not due to the use of derivatives. I thank Murray Carlson for providing the data.

5.1. 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.[15] Thus, unskilled managers may prefer to remain fully invested in stocks in an attempt to match benchmark returns. By contrast, skilled managers who do not find the available investment opportunities attractive or who are gradually building their positions in attractive stocks (for example, to avoid price pressure) may carry high excess cash and in the future make lucrative investment decisions that compensate for the lower return cash tends to earn relative to equity benchmarks.[16] I now present evidence that excess cash proxies for stock-selection skills.

A. Excess Cash and Profitability of Stock Trades

I begin by studying the performance of stock transactions made by excess cash groups. I compare fund holdings at the time excess cash is estimated with holdings six months later. For each fund, I determine which stocks were bought or sold and in which the number of shares were left unchanged in the fund portfolio during this period. Aggregating across excess cash groups results in three portfolios: 'Purchases', 'Sales', and 'Unchanged', respectively. The time of purchases and sales is not directly observable, and I assume that all transactions take place in the middle of the examined six-month period. I calculate value-weighted average returns earned by each portfolio and by the 'Purchases – Sales' portfolio in each cross-section and then compute a time series mean of raw and style-adjusted (as in Daniel, Grinblatt, Titman, and Wermers, 1997, DGTW) returns.[17]

The 'Purchases' column of Table 6 shows that managers of high excess cash funds identify good investment opportunities. The stocks they buy earn 0.27% per month more than the shares purchased by the low excess cash funds. The difference in style-adjusted returns is a lower but

[15]It is worth clarifying that investing a large fraction of a portfolio in cash simply lowers its beta but does not affect its risk-adjusted performance. In the context of mutual funds, however, raw (or unsophisticatedly adjusted for risk) performance is frequently the measure that guides investor flows. For example, Del Guercio and Tkac (2002) show that retail investors principally rely on raw performance measures in evaluating managers. Additionally, performance of mutual funds is often simply compared to that of a benchmark index and funds with similar style, and allocating large fraction of assets to cash can make it hard to beat the index or competing funds. The drag large investments in cash impose on fund performance thus presents an important concern for mutual fund managers.

[16]Low excess cash group can certainly include managers with good stock-picking skills who are fully invested and do not anticipate better buying opportunities in the near future. I explore this issue in the section 5.1.B. One can also conjecture that skilled managers will allocate excess cash into stocks or exchange-traded funds while awaiting better investment opportunities. However, buying opportunities are arguably more abundant following market dips, and thus not only will this allocation fall in value due to the dip, but it may also suffer as the manager tries to convert it back into cash.

[17]The assumption regarding the timing of purchases and sales has no significant impact on the reported results. The average return on the 'Purchases' portfolio exceeds that of the 'Unchanged' portfolio which, in turn, exceeds that of the 'Sales' group (e.g., 0.81%, 0.32%, and 0.13%, respectively, for the low excess cash quintile). This is because purchases tend to be past winners, sells tend to be past losers (e.g., Grinblatt, Titman, and Wermers, 1995), and not all transactions take place in the middle of the examined six-month period.

statistically significant 0.17% monthly. The 'Unchanged' portfolio of high excess cash funds also performs well: It earns 0.20% per month more than the corresponding portfolio of the low excess cash funds does, although statistically this difference is only marginally significant.

Lack of a relation between excess cash and performance of the 'Sales' portfolio may suggest that low excess cash funds make good sale decisions. More plausibly, the poor average performance of stocks sold by the low excess cash funds reflects not their superior selling decisions but the fact that this group simply holds stocks inferior to those held by the high excess cash funds. Alternatively, the apparently good selling decisions of the low group may reflect price pressure (Edelen, 1999; Coval and Stafford, 2007). If these funds are forced to fire-sell some of their positions (for example, to raise cash to satisfy fund outflows), the returns on the stocks they sell may suffer, creating the appearance that the managers made smart sale decisions.

To further explore whether high excess cash funds possess better stock selection abilities, I also study the characteristic selectivity measure of DGTW. The last column of Table 6 shows that the measure of the top quintile funds exceeds that of the bottom group by a statistically significant 0.20% quarterly (0.09% vs. −0.11%), providing corroborating evidence that high excess cash fund managers make better stock selection decisions.

B. Volatility of Excess Cash

It is important to recognize that a skilled stock picker will not always carry high excess cash. When attractive investment opportunities are abundant, a skilled manager may be more fully invested in equities. When such opportunities are sparse, he may carry high excess cash to be able to take quick advantage of lucrative investments as they become available. As a result, excess cash in the hands of skilled managers is likely to fluctuate. By contrast, excess cash holdings of unskilled managers may be more stable as these managers have little to gain by shifting their portfolios between cash and equities. Thus, it is natural to expect that funds with volatile excess cash holdings perform particularly well and that high excess cash is an especially valuable proxy for future performance of such funds.

I test this hypothesis by examining the differences in future performance of funds in the high and low excess cash groups conditional on their past excess cash holdings being either volatile or persistent. I assign a fund that falls into a high excess cash group at a particular time into a persistent group if it also belonged to either the high or next-to-high excess cash quintile in at least two-thirds of the observations in the previous three years, and otherwise assign it to a volatile group. I similarly separate low excess cash funds into persistent and volatile groups.[18] This

[18]For this analysis, I require funds to have at least three valid excess cash observations in at least two of the

procedure results in an approximately equal number of funds in both volatile and persistent (V and P) categories of high and low (H and L) excess cash quintiles.

Table 7 reports the average returns of each of the resulting four groups (LP, LV, HP, HV) as well as the differences in returns between them. Funds in both volatile and persistent high excess cash groups outperform funds with low excess cash. Consistent with the argument above, funds in the volatile groups perform better than those in the persistent groups do. HV funds achieve the highest average return of any group: The managers of these funds actively adjust their excess cash positions to take advantage of changing investment opportunities. Of the four groups, the one carrying persistently low excess cash (LP) generates the worst performance. The return differential between HV and LP funds reaches nearly 4% per year.

C. The Value of Excess Cash in a Stock-Picker's Market

If excess cash proxies for stock selection abilities, then the differences in performance between high and low excess cash funds should be particularly striking when stock-picking skills are especially beneficial: For example, during periods of high dispersion in stock valuation and periods of market undervaluation. To explore this conjecture empirically, I propose two measures of dispersion in stock valuation and rely on a number of variables commonly used to proxy for market undervaluation.

The first measure I propose to capture a stock-picker's market is the cross-sectional variation in book-to-market ratios of the firms. High variation can coincide with periods during which a skilled manager may find undervalued securities more easily. The second proxy I use is the median cross-sectional correlation of stock and market returns.[19] A high value of such a median correlation can suggest that all stocks are moving together with the market and that identifying stand-out stocks may be difficult, whereas low values may proxy for a better market for skilled stock-pickers.[20]

Table 8 reports the results of regressing the difference in risk-adjusted returns of the high and low excess cash portfolios, computed from the Carhart model using data from months $t+1$ to $t+12$, on the two measures of dispersion in stock valuation and several proxies for market undervaluation calculated as of month t. Regressions (1) and (2) show that both measures of a stock-picker's market predict the difference in performance of the high and low excess cash groups. Median correlation is a particularly valuable measure, explaining 27% of variation in outperformance of high excess cash funds. Regression (3) points out that past market return relates positively to the performance

previous three years.

[19]To compute the median correlation as of month t, I calculate correlation of each stock's returns with market returns using daily data from $t-11$ to t. I then calculate the median of these values in the cross-section.

[20]Picking up on this concept in an October 6, 2010 article titled "The rise and rise of correlation", *Financial Times* cited a U.S. fund manager: "Stock-picking is dead... We spend all this time picking stocks and then everything rises and falls at the same time. It is a nightmare." I thank Thomas Ruf for bringing this quote to my attention.

differential, although its statistical significance is subsumed by the median correlation in regression (4). Consistent with the idea that stock selection skills are particularly valuable during times of market undervaluation, specifications (5) through (7) show that the differences in performance between high and low excess cash groups are positively linked to such measures of market valuation as dividend yield and T-bill rate.[21]

D. Evidence from Index Funds

To further explore whether high excess cash holdings signify superior stock selection abilities, it is interesting to compare the performance of actively managed equity funds with that of passive index funds. The objective of equity index funds is to track rather than outperform an equity benchmark such as the S&P 500 index, and thus stock selection skills have little relevance for such funds. The absence of a relation between the excess cash of index funds and their future performance can be viewed as indirect evidence supporting the hypothesis that excess cash of actively managed funds proxies for stock-selection skills.

I follow the same procedure used for actively managed funds to calculate the excess cash of index funds and obtain the time series of raw and risk-adjusted returns of each excess cash group. Table A2 of the Appendix shows that returns generated by index funds are similar across excess cash quintiles. The difference in returns between high and low excess cash index funds is not statistically significant and, depending on the performance measure, ranges between 0% and 0.05% monthly.

E. Market Timing

The results presented thus far in this section suggest that managers of high excess cash funds exhibit good stock-selection abilities. It is also interesting to ask whether these managers also possess better timing skills.[22] A mutual fund manager with market-timing ability will optimally carry a high cash position prior to a market downturn. At the same time, he will hold little cash prior to a bull market. Therefore, it is unlikely that the positive relation 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 concentrated in the ability to predict market downturns, market timing may help explain the stronger performance of high excess cash funds.

To test this hypothesis, I study the market-timing skills of the funds in different excess cash

[21] Campbell (1987), Campbell and Shiller (1988), Fama and French (1988, 1989), Fama and Schwert (1977), Keim and Stambaugh (1986), Rozeff (1984), and others discuss market valuation and the predictability of market returns.

[22] The market-timing ability of mutual fund managers has been extensively discussed by, among others, Treynor and Mazuy (1966), Henriksson and Merton (1981), Chang and Lewellen (1984), Henriksson (1984), Cumby and Glen (1990), Graham and Harvey (1996), Daniel, Grinblatt, Titman, and Wermers (1997), Becker, Ferson, Myers, and Schill (1999), Wermers (2000), Bollen and Busse (2001), Jiang, Yao, and Yu (2007), Mamaysky, Spiegel, and Zhang (2008), and Kacperczyk, Van Nieuwerburgh, and Veldkamp (2011).

groups. I first consider the classical regressions of Treynor and Mazuy (1966) and Henriksson and Merton (1981). These return-based tests, however, can be subject to an "artificial timing" bias (Jagannathan and Korajczyk, 1986), and I therefore also use the style-timing measure of DGTW and follow a holdings-based approach of Jiang, Yao, and Yu (2007). To implement to latter method, I estimate the average change in the market beta of shareholdings of each excess cash quintile i during the 12-month period ($t+1$ to $t+12$) following excess cash calculation, $\Delta\beta_{i,t+1:t+12}$, and then regress the subsequent 12-month ($t+13$ to $t+24$) market return on this change in beta:

$$R_{M,t+13:t+24} = \gamma_{0i} + \gamma_{1i}\Delta\beta_{i,t+1:t+12} + \varepsilon_{it}.$$

If managers of the funds in quintile i have market-timing ability, then the coefficient γ_{1i} should be positive: These managers increase their exposure to the market prior to market runup and decrease it prior to a downturn.

Table 9 summarizes the results of the market-timing tests. On the whole, the relation between excess cash and future fund performance can be attributed only marginally to differences in the market-timing skills of high and low excess cash fund managers. Depending on the approach used to detect timing skills, differences in the abilities of high and low excess cash funds are either significantly or insignificantly positive. Yet, all of the approaches suggest that funds in the low excess cash group possess the worst timing skills, while high excess cash funds exhibit positive market-timing abilities. For example, the difference in the DGTW timing measures of the top and bottom excess cash groups reaches 0.18% per quarter (0.07% vs. −0.11%), suggesting that better timing skills of high excess cash funds contribute to their superior performance.

Taken together, several pieces of evidence presented here are consistent with the idea that managers of high excess cash funds are skilled stock-pickers. First, they make superior stock-purchasing decisions. Second, funds with high and volatile excess cash perform particularly well: The managers of these funds actively adjust their excess cash positions to take advantage of changing investment opportunities. Third, high excess cash funds perform especially well when stock selection skills are likely to be particularly beneficial: when the market is undervalued and when the cross-sectional dispersion in stock valuation is high. Fourth, no relation between excess cash and fund performance exists in a sample of index funds. Finally, performance of high excess cash funds benefits form better timing ability possessed by their managers.

5.2. Controlling Fund Expenses: Costly Flows and Transaction Costs

Edelen (1999) and Coval and Stafford (2007) show that fund flows adversely affect fund performance. If a manager lacks sufficient cash to meet fund outflows, he can be forced to liquidate some of the shareholdings at a potentially disadvantageous time and price, damaging fund performance.[23] By contrast, a manager carrying high excess cash can satisfy outflows more economically, keeping trading costs low and avoiding costly fire sales. Lower costs, in turn, contribute to better fund performance (e.g., Gruber, 1996; Carhart, 1997). Hence, the difference in future performance of high and low excess cash funds can be attributable in part to the fact that high excess cash fund managers are better positioned to control fund expenses by economically satisfying fund outflows and cheaply conducting stock transactions. I now confirm this conjecture by exploring the relation between excess cash and future performance conditional on either future realized fund flows or aggregate market liquidity and by studying trading costs.

A. Impact of Fund Flow Shocks and Aggregate Liquidity on Fund Performance

I assign funds within high and low excess cash quintiles into two groups on the basis of future realized fund flows. Panel A of Table 10 shows that excess cash proves particularly valuable for funds that experience low fund flows. For example, the difference between the Ferson-Schadt alphas of high and low excess cash funds is 0.23% monthly when future fund flows are low and just 0.15% when future fund flows are high. This result corroborates the hypothesis that managers of high excess cash fund proficiently satisfy fund outflows. By contrast, low excess cash funds do not carry sufficient cash and lack the flexibility needed to cover outflows and can therefore be forced to fire-sell some of their shareholdings, damaging fund performance, and potentially trapping the fund in a loss spiral (Shleifer and Vishny, 1992; Brunnermeier and Pedersen, 2009; see also Figure 3).[24]

Fund outflows can be especially costly when aggregate liquidity is low. During such times, fire-selling shares to satisfy outflow shocks can be particularly detrimental to the performance of low excess cash funds. Panel B of Table 10 shows that this is indeed the case. I assign months into two groups depending on whether aggregate market liquidity, proxied for by the Pastor and Stambaugh (2003) measure, is above or below its median. In months when aggregate liquidity is low, poor

[23] See also Yan (2008) and Chen, Goldstein, and Jiang (2010). Funds can certainly use services such as those offered by ReFlow, a company that lends to mutual funds on a short-term basis to help them to cover outflow shocks. However, as Roger Edelen mentioned during our conversation, the subscription rate to ReFlow was very low, and the number of subscribers actually using the services was lower still. I thank him for this information. The low subscription rate can reflect managerial overconfidence and underestimation of the likelihood of flow shocks.

[24] In Appendix C, I provide further corroborating evidence by showing that in a sample of closed-end funds – which are not affected by the flow concerns to the same extent as their open-end counterparts are – no significant relation emerges between excess cash and future performance.

performance of low excess cash funds is particularly pronounced. During such periods, low excess cash funds generate a Ferson-Schadt alpha that is 0.27% per month less than that earned by high excess cash funds. The differential is only 0.14% during times of high liquidity.[25]

Low aggregate liquidity generally occurs during times of poor market performance. However, it is important to highlight that the superior performance of high excess cash funds in times of market illiquidity is not mechanically due to cash outperforming the market during such times. Only raw returns, but not alphas, are affected by cash earning a higher return than the market. The superior risk-adjusted performance of high excess cash funds during times of low aggregate liquidity is thus not due simply to low market returns during those periods but rather to the fact that the performance of low excess cash funds suffers as they have to satisfy flow shocks by selling some of their stocks in an illiquid market.

A skilled manager who can anticipate flow shocks will not carry high excess cash at all times but will rather adjust the excess cash position as his expectations about future fund flows change. The superior performance of funds with volatile past excess cash presented in Table 7 and discussed in the previous section is consistent with this idea: Managers of high excess cash funds with volatile excess cash holdings are particularly skilled at anticipating and satisfying outflows, and their performance exceeds that of any other group.

B. Ability to Control Fund Expenses

If high excess cash funds are better positioned to satisfy outflows without costly fire sales, as the results above imply, then it is natural to expect that such funds on average incur lower transaction costs. Theoretical framework presented in Appendix D also suggests a negative relation between excess cash and managerial ability to control fund expenses. The model shows that cost-minimizing managers carry excess cash to allow for slower portfolio adjustments and thus reduce the price pressure from their trading. I now explore how excess cash holdings relate to future fund expenses.

Transaction costs incurred by a fund are not directly observable, and I use as proxies two variables that are likely to correlate with them. Table 11 shows a monotonic negative relation between excess cash calculated in month t and a fund's turnover ratio and an estimate of execution costs, all corresponding to the year ending in month $t + 12$.[26] During the twelve months *following*

[25] Results of a Monte Carlo simulation comparing performance of two hypothetical passive funds, one investing 95% and the other allocating 99% of assets in a value-weighted portfolio of 90 randomly picked stocks with the remainder of assets invested in cash at the T-Bill rate, suggest that excess cash is a cheap form of insurance against outflow shocks and that low excess cash funds can benefit from increasing their cash allocation. The 99th percentile of the return differential of the two funds amounts to just 0.37% per year.

[26] Note that all the variables are calculated during the year *after* excess cash estimation and the relations between these variables and cash are thus distinct from those in Table 2. I calculate transaction costs following Keim and Madhavan (1997), Wermers (2000), and Kacperczyk, Sialm, and Zheng (2008). Appendix E provides the details.

excess cash calculation, the high excess cash funds spend on average 0.11% of total net assets less on execution costs, and have a turnover ratio that is 10% lower than do the low excess cash funds. The results are in line with the findings of Section 5.2.A: Lack of excess cash may force low excess cash funds to transact inefficiently when selling their equities to satisfy outflows. Consequently, such funds incur higher costs in the future than do funds carrying high excess cash.

On the whole, the empirical evidence suggests that high excess cash funds are well-positioned to control fund expenses by economically satisfying fund outflows and cheaply conducting stock transactions. Their relative outperformance is particularly prominent when future fund flows are low and when market illiquidity is high. High excess cash funds also benefit their performance by incurring lower transaction costs.

6. Conclusion

This study documents a positive relation between the 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 – outperform their low excess cash peers by over 2% per year. This difference in returns cannot be explained by the commonly used factor models or differences in observable fund attributes. Rather, I show that it is driven by unobservable characteristics, including managerial stock-selection skills and the ability to satisfy fund outflows and control fund expenses.

Managers carrying high excess cash benefit from the flexibility it provides despite the low expected return cash offers relative to other forms of investment. These managers are able to purchase attractive stocks quickly and to economically satisfy redemption requests and control transaction costs. By contrast, low excess cash managers are less nimble in taking advantage of purchasing desirable stocks and can be forced to fire-sell their assets to satisfy outflows. I find that stocks bought by high excess cash funds outperform equities purchased by the low excess cash group by 2% annually. The relative outperformance of high excess cash funds is prominent during periods of market undervaluation and periods of high dispersion in stock valuation, when stock-picking skills are likely to be particularly beneficial. It is also pronounced when future fund flows are low and when market illiquidity is high, suggesting that low excess cash funds carry insufficient cash to cover the outflows and are forced to sell some of their holdings at a disadvantageous time and price, damaging fund performance.

The findings of this paper raise interesting questions about managerial abilities to determine

optimal levels of cash holdings. Why do managers of low excess cash funds hold very little cash? This decision may reflect managerial overconfidence: Expectations of good future fund performance, low fund outflows, and the ability to adjust quickly should a cash shortfall occur. The empirical evidence indicates that this overconfidence is misplaced: Managers of low excess cash funds generate abysmal returns for as long as five years following excess cash calculation, make poor stock purchasing decisions, do not exhibit market-timing abilities, and incur high expenses in the future. The performance of funds run by such managers suffers particularly during periods of low fund flows and low market liquidity, suggesting that these funds may benefit from maintaining a larger cash cushion and, more broadly, from a more thoughtful cash management policy.

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Figures and Tables

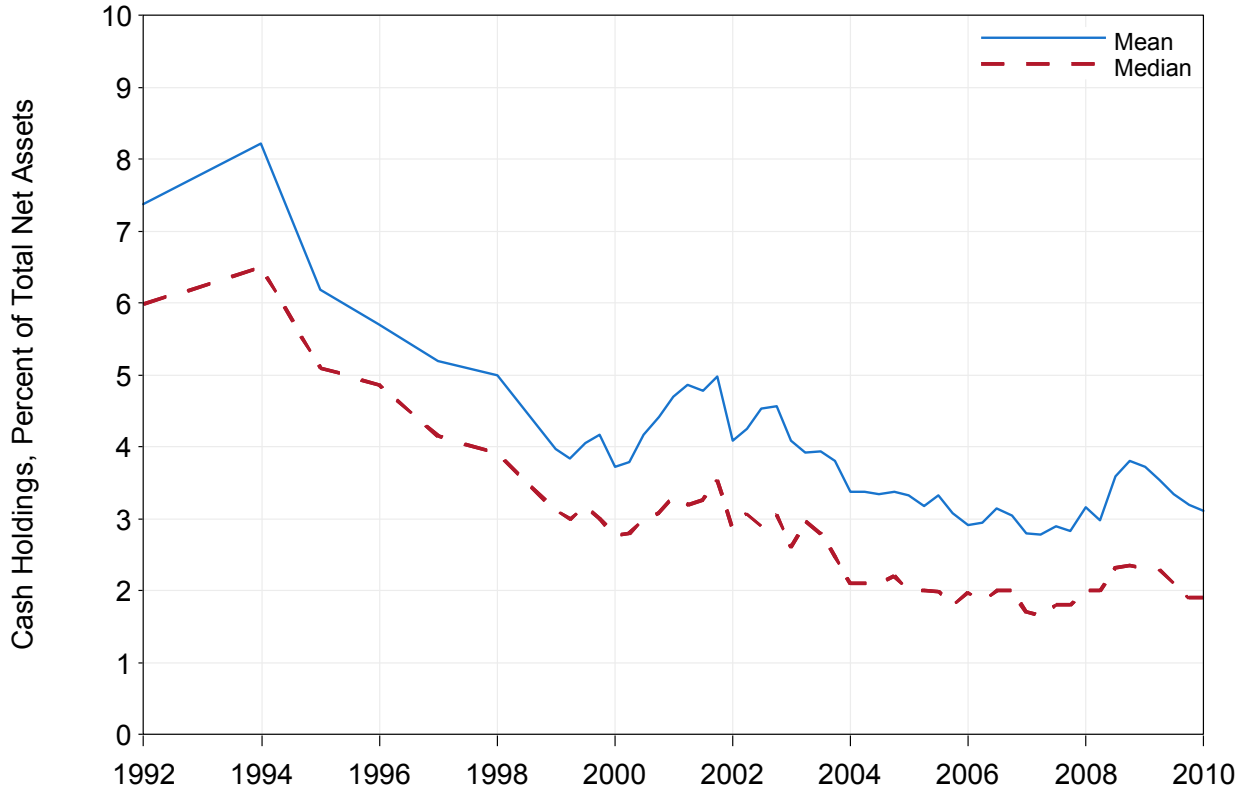

Figure 1. Fund cash holdings. This figure plots average and median fund cash holdings as a percentage of total net assets. The sample contains actively managed U.S. equity mutual funds with a growth objective.

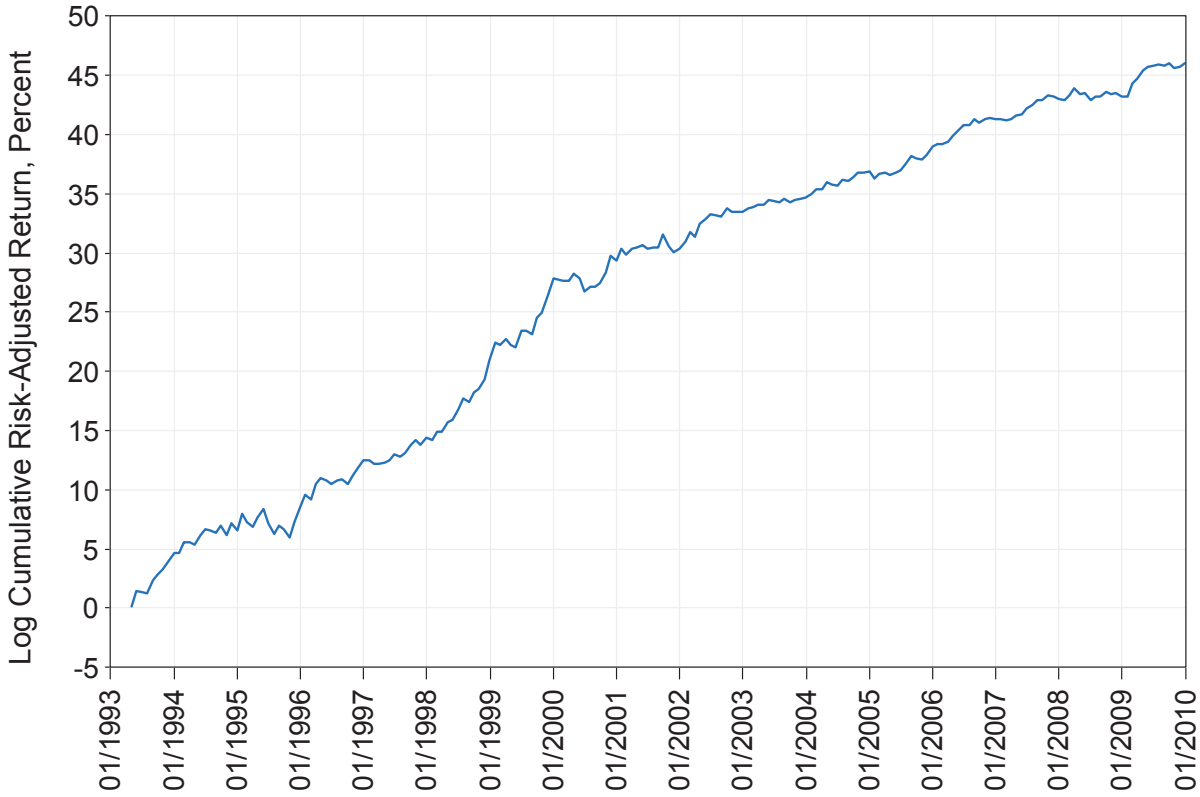

Figure 2. Performance of High–Low excess cash portfolio. This figure plots the log cumulative difference in risk-adjusted returns of the high and low excess cash funds. Risk-adjusted returns are estimated from the conditional Ferson-Schadt (1996) performance regression

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

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

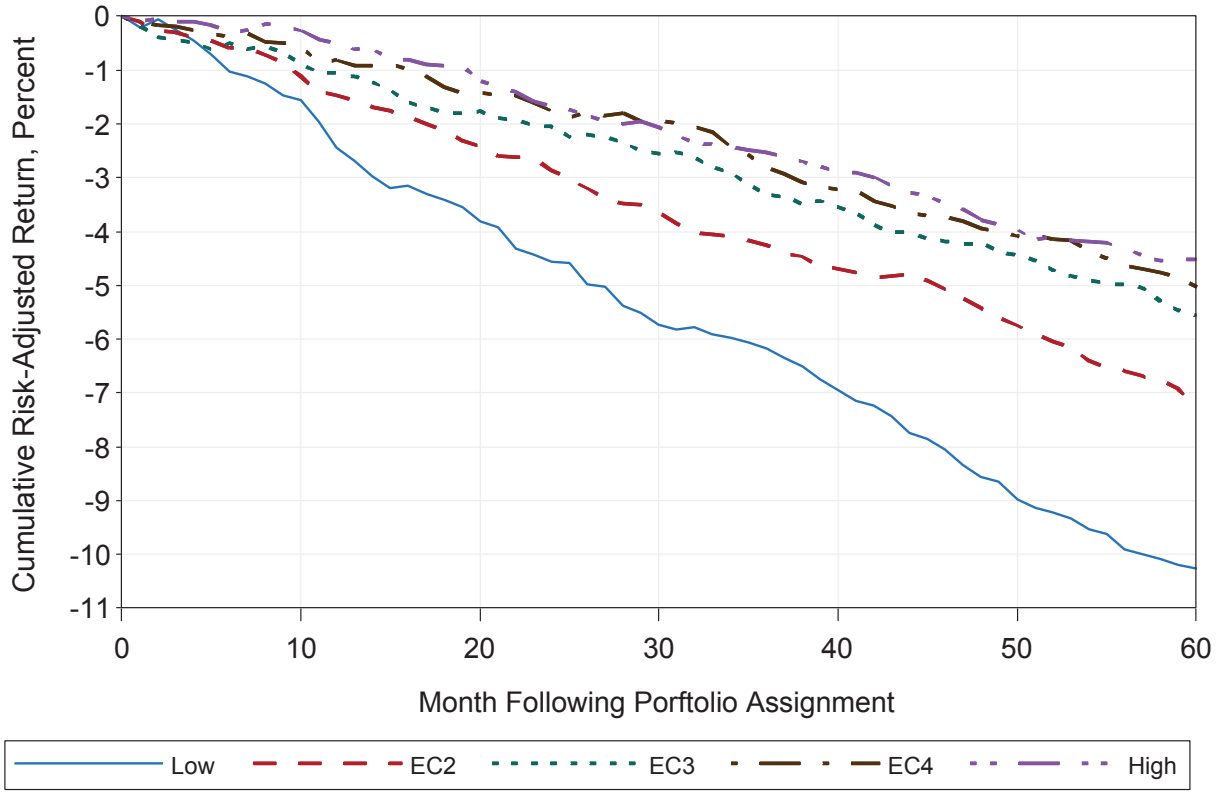

Figure 3. Cumulative risk-adjusted returns of excess cash groups. This figure plots cumulative risk-adjusted returns of each excess cash quintile for five years following portfolio assignment. Risk-adjusted returns are estimated from the conditional Ferson-Schadt (1996) performance regression

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

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

Table 1. Summary Statistics

Variable	Mean	Median	Stdev	10th Pctl	90th Pctl	Corr w Cash
Cash, percent of total net assets	3.97	2.76	5.17	0.18	9.09	1.000
Expense ratio, percent	1.32	1.29	0.44	0.84	1.87	0.095
12b-1 fee, percent	0.40	0.36	0.24	0.18	0.74	-0.029
Front load, percent	1.55	1.92	1.48	0.00	3.21	-0.007
Deferred load, percent	0.68	0.46	0.73	0.00	1.74	0.005
Total net assets, $ million	1,523	251	5,325	33.2	3,109	0.051
Turnover ratio	0.86	0.65	0.78	0.17	1.79	0.044
1-month fund return runup, percent	0.49	0.42	2.32	-2.11	3.17	0.022
6-month fund return runup, percent	3.23	2.74	6.36	-4.09	11.3	0.055
12-month fund return runup, percent	5.43	4.35	10.84	-6.25	18.4	0.087
Fund flow, last 1 month, percent	0.94	-0.46	20.38	-3.38	3.98	0.046
Fund flow, last 6 month, percent	5.56	-1.95	32.3	-14.3	28.3	0.102
Fund flow, last 12 months, percent	22.9	-2.6	106	-24.7	70.9	0.080
Fund flow volatility, percent	12.2	2.85	50.6	0.89	13.8	0.002
Market beta	1.06	1.04	0.17	0.89	1.26	0.007
Value (HML) beta	-0.02	-0.02	0.36	-0.47	0.42	0.058
Size (SMB) beta	0.06	-0.02	0.32	-0.25	0.49	0.094
Momentum (UMD) beta	0.00	0.00	0.18	-0.20	0.20	0.000
Liquidity beta	0.00	0.00	0.26	-0.28	0.29	0.017
Stock market capitalization, percentile	93.5	95.8	5.5	87.0	97.8	-0.136
Stock book-to-market ratio, percentile	31.6	30.5	9.6	19.9	44.4	0.107
Stock return runup, percentile	59.1	58.6	8.5	49.0	70.3	-0.007
Dividend yield, percent	1.54	1.46	0.87	0.54	2.59	-0.008
Number of stocks	97	71	92	33	177	-0.065
Fund age, years	14.6	9.32	14.7	3.08	35.1	0.016
Family dummy	0.74	0.80	0.22	0.71	0.80	-0.055
Aggressive growth dummy	0.08	0.00	0.27	0.00	0.02	0.067
Growth and income dummy	0.31	0.00	0.46	0.00	1.00	-0.022
Return gap, percent annual	-0.08	-0.13	3.88	-4.02	3.95	-0.007
Volatility of cash, percent	3.09	2.27	2.84	0.72	6.29	0.289

Notes: This table reports the summary statistics for fund characteristics. Statistics are calculated in each cross-section and then averaged. Fund flow volatility is calculated using 36 months of flow data. The market, value, size, and momentum betas are Dimson (1979) sum betas from the four-factor model regressions on daily data. To account for non-synchronous trading, the first lag and the average of lags 2 through 4 of each factor are included as regressors. Liquidity loading is from a two-factor model regression on monthly data with market and Pastor and Stambaugh (2003) liquidity factors. The family dummy is set to one if the fund is a member of a fund family, and to zero otherwise. The volatility of cash holdings is calculated using three years of data. The sample period is 1992-2009.

Table 2. Determinants of Mutual Fund Cash Holdings

Determinant	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expense ratio, percent	1.95 [8.85]		2.00 [8.56]				0.93 [4.86]
12b-1 fee, percent	-0.23[-1.09]		-0.30[-1.57]				-0.24[-1.28]
Front load, percent	0.08 [2.02]		0.10 [2.45]				0.14 [3.45]
Deferred load, percent	-0.36[-3.53]		-0.27[-3.16]				-0.16[-1.72]
Log TNA (in $ thousand)	0.22 [7.76]		0.21 [7.77]				0.10 [2.57]
Turnover ratio	0.26 [2.58]		0.32 [3.25]				0.00 [0.03]
1-month fund return runup		1.73 [0.46]					0.92 [0.17]
6-month fund return runup		-0.08[-0.04]					-3.18[-1.67]
12-month fund return runup		4.07 [3.07]	4.37 [3.31]				4.49 [3.80]
Last 1-month fund flow		0.35 [0.69]					2.56 [2.14]
Last 6-month fund flow		1.87 [5.69]					2.42 [3.74]
Last 12-month fund flow		0.24 [1.40]	1.38 [10.3]				0.32 [1.91]
Fund flow volatility			-0.41[-1.58]				0.25 [0.39]
Market beta				2.33 [3.09]			1.20 [1.92]
Value (HML) beta				1.17 [2.44]			-0.08[-0.23]
Size (SMB) beta				2.24 [9.00]			0.74 [1.56]
Momentum (UMD) beta				-0.59[-0.66]			0.14 [0.34]
Liquidity beta				0.24 [0.91]			0.70 [1.47]
Stock market capitalization, pctl					-10.1[-7.53]		-3.76[-1.81]
Stock book-to-market ratio, pctl					6.00 [5.85]		5.83 [5.70]
Stock return runup, pctl					-0.18[-0.15]		-2.22[-1.32]
Dividend yield, percent					-0.31[-3.34]		-0.41[-4.16]
Number of stocks, scaled by 100						-0.29[-3.98]	-0.23[-3.67]
Fund age, decades						0.03 [2.04]	0.08 [3.90]
Family dummy						-0.65[-2.76]	-0.38[-0.99]
Aggressive growth dummy						0.56 [3.06]	0.47 [1.94]
Growth and income dummy						0.01 [0.09]	-0.02[-0.19]
Return gap, percent annual						-0.40[-1.30]	-0.45[-1.39]
Volatility of cash						0.18 [6.27]	0.15 [6.14]
Adjusted R^2, percent	3.09	3.22	5.45	2.94	3.41	8.65	15.4

Notes: This table reports the results of cross-sectional regressions of fund cash holdings as a percentage of total net assets on fund characteristics. Regressions are run in every cross-section when cash holdings data are available (annually up to 1998 and quarterly thereafter). Reported are average slope coefficients, corresponding Newey-West (1987) t-statistics (in square brackets), and average adjusted R^2 values. Expense ratios exclude 12b-1 fees. Fund flow volatility is calculated using 36 months of flow data. The market, value, size, and momentum betas are Dimson (1979) sum betas from the four-factor model regressions on daily data. To account for non-synchronous trading, the first lag and the average of lags 2 through 4 of each factor are included as regressors. Liquidity loading is from a two-factor model regression on monthly data with market and Pastor and Stambaugh (2003) liquidity factors. The family dummy is set to one if the fund is a member of a fund family, and to zero otherwise. The volatility of cash holdings is calculated using three years of data. The return runup, market capitalization, and book-to-market percentiles are scaled by 100. All independent variables are winsorized at 1% and 99% in each cross-section. The sample period is 1992-2009.

Table 3. Raw Cash Holdings and Future Fund Performance

Performance measure	Low	Quint 2	Quint 3	Quint 4	High	High-Low	R^2
A. Based on Net Returns							
Excess	0.32	0.29	0.33	0.38	0.32	0.01	
return	[0.95]	[0.89]	[1.02]	[1.23]	[1.06]	[0.11]	
Market model	-0.15	-0.16	-0.12	-0.05	-0.10	0.05	37.0
alpha	[-3.45]	[-4.62]	[-3.47]	[-1.40]	[-2.25]	[1.20]	
Fama-French	-0.13	-0.15	-0.10	-0.05	-0.09	0.04	37.5
3-factor alpha	[-3.07]	[-4.18]	[-2.97]	[-1.43]	[-2.03]	[1.00]	
Carhart	-0.15	-0.15	-0.11	-0.06	-0.11	0.04	37.2
4-factor alpha	[-3.59]	[-4.31]	[-3.46]	[-1.75]	[-2.55]	[0.96]	
Carhart + liquidity	-0.16	-0.15	-0.10	-0.06	-0.12	0.04	37.0
5-factor alpha	[-3.86]	[-4.03]	[-2.99]	[-1.67]	[-2.72]	[1.03]	
Ferson-Schadt	-0.16	-0.15	-0.09	-0.05	-0.11	0.05	38.1
conditional alpha	[-3.76]	[-4.01]	[-2.82]	[-1.44]	[-2.47]	[1.16]	
B. Based on Gross Returns							
Excess	0.41	0.38	0.41	0.46	0.40	-0.00	
return	[1.21]	[1.16]	[1.27]	[1.50]	[1.33]	[-0.00]	
Market model	-0.06	-0.07	-0.04	0.03	-0.02	0.04	37.1
alpha	[-1.37]	[-2.09]	[-1.08]	[1.01]	[-0.35]	[1.07]	
Fama-French	-0.04	-0.06	-0.02	0.03	-0.00	0.03	37.7
3-factor alpha	[-0.92]	[-1.61]	[-0.47]	[0.97]	[-0.07]	[0.86]	
Carhart	-0.06	-0.06	-0.03	0.02	-0.02	0.03	37.4
4-factor alpha	[-1.41]	[-1.78]	[-0.95]	[0.65]	[-0.57]	[0.82]	
Carhart + liquidity	-0.07	-0.06	-0.02	0.02	-0.03	0.04	37.1
5-factor alpha	[-1.71]	[-1.54]	[-0.49]	[0.68]	[-0.78]	[0.89]	
Ferson-Schadt	-0.07	-0.06	-0.01	0.03	-0.03	0.04	38.2
conditional alpha	[-1.65]	[-1.58]	[-0.38]	[0.92]	[-0.58]	[1.02]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for each of the raw cash quintiles as well as for the difference between quintiles of high and low cash. At the beginning of month $t+4$, a total net assets-weighted 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 for the following 12 months. The 5-factor model uses Pastor-Stambaugh liquidity factor. R^2 is the adjusted R^2, in percent, from regressions using the difference in returns between high and low cash funds as a dependent variable. The sample period is 1992-2009.

Table 4. Excess Cash Holdings and Future Fund Performance

Performance measure	Low	Quint 2	Quint 3	Quint 4	High	High-Low	R^2
A. Based on Net Returns							
Excess	0.22	0.31	0.37	0.38	0.39	0.18	
return	[0.64]	[0.93]	[1.15]	[1.23]	[1.23]	[3.05]	
Market model	-0.25	-0.15	-0.07	-0.05	-0.03	0.22	42.2
alpha	[-5.26]	[-4.08]	[-2.18]	[-1.46]	[-1.15]	[5.18]	
Fama-French	-0.23	-0.12	-0.06	-0.05	-0.01	0.22	41.9
3-factor alpha	[-5.01]	[-3.57]	[-1.87]	[-1.45]	[-0.82]	[4.96]	
Carhart	-0.24	-0.13	-0.08	-0.07	-0.03	0.21	42.0
4-factor alpha	[-5.18]	[-3.78]	[-2.35]	[-2.11]	[-1.25]	[4.73]	
Carhart + liquidity	-0.25	-0.13	-0.08	-0.05	-0.04	0.22	42.2
5-factor alpha	[-5.44]	[-3.64]	[-2.30]	[-1.59]	[-1.36]	[4.90]	
Ferson-Schadt	-0.24	-0.12	-0.07	-0.06	-0.03	0.21	45.2
conditional alpha	[-5.01]	[-3.41]	[-2.07]	[-1.74]	[-1.19]	[4.73]	
B. Based on Gross Returns							
Excess	0.31	0.40	0.45	0.47	0.47	0.16	
return	[0.86]	[1.22]	[1.39]	[1.49]	[1.52]	[3.06]	
Market model	-0.16	-0.06	0.01	0.03	0.06	0.24	39.1
alpha	[-3.72]	[-1.66]	[0.07]	[0.96]	[1.01]	[5.02]	
Fama-French	-0.14	-0.04	0.03	0.03	0.07	0.23	39.6
3-factor alpha	[-3.35]	[-1.10]	[0.51]	[0.93]	[1.40]	[4.80]	
Carhart	-0.14	-0.04	0.00	0.01	0.05	0.21	41.9
4-factor alpha	[-3.32]	[-1.24]	[-0.12]	[0.38]	[0.90]	[4.38]	
Carhart + liquidity	-0.16	-0.04	0.00	0.03	0.05	0.22	42.3
5-factor alpha	[-3.64]	[-1.13]	[-0.11]	[0.79]	[0.79]	[4.61]	
Ferson-Schadt	-0.13	-0.04	0.02	0.02	0.05	0.20	46.9
conditional alpha	[-3.07]	[-1.03]	[0.20]	[0.61]	[0.92]	[4.29]	

Notes: This table reports average raw and risk-adjusted returns, in percent per month, and the corresponding t-statistics for each of the excess cash quintiles as well as for the difference between quintiles of high and low excess cash. Excess cash is calculated as the residual from cross-sectional regression (7) in Table 2. At the beginning of month $t + 4$, a total net assets-weighted 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 for the following 12 months. The 5-factor model uses Pastor-Stambaugh liquidity factor. R^2 is the adjusted R^2, in percent, from regressions using the difference in returns between high and low excess cash funds as a dependent variable. The sample period is 1992-2009.

Table 5. Excess Cash Holdings and Future Fund Performance: Evidence from Fama-MacBeth Regressions

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Excess cash, percent of TNA	0.02			0.02	0.02	0.02	0.05
	[1.98]			[2.04]	[2.33]	[2.28]	[4.15]
Raw cash, percent of TNA		0.18					
		[1.01]					
Expected cash, percent of TNA			-0.03				
			[-0.86]				
Log of total net assets				-0.13		-0.03	-0.03
				[-2.05]		[-0.65]	[-0.68]
Expense ratio, percent				-0.36		-0.79	-0.76
				[-0.51]		[-2.77]	[-2.64]
Fund flow, last 1 month				-1.29		-0.67	-0.58
				[-0.89]		[-0.78]	[-0.68]
12-month fund return runup				0.23		3.19	3.19
				[0.06]		[1.24]	[1.23]
Market beta					-2.73	-1.57	-1.58
					[-1.74]	[-1.16]	[-1.16]
Value (HML) beta					2.55	1.12	1.11
					[1.61]	[0.77]	[0.76]
Size (SMB) beta					3.73	4.03	4.05
					[2.68]	[2.89]	[2.90]
Momentum (UMD) beta					-0.73	0.25	0.21
					[-0.39]	[0.14]	[0.12]
Return gap, percent						0.88	0.85
						[2.66]	[2.58]
Excess cash in top 5 pctl dummy							-1.17
							[-3.57]

Notes: This table reports the results of Fama-MacBeth regressions. Carhart 4-factor alphas (in percent) calculated using data from month $t+4$ to $t+15$ are regressed on the variables measured at the end of month t. Average betas of shareholdings are Dimson (1979) sum betas from the 4-factor model regressions on daily data from $t-11$ to t. To account for non-synchronous trading, the first lag and the average of lags 2 through 4 of each factor are included as regressors. Excess cash is calculated as the residual from cross-sectional regression (7) in Table 2. The regressions are run for each period when cash holdings data are observed (annually prior to 1999 and quarterly thereafter). Reported are average coefficients and the corresponding Newey-West (1987) t-statistics. The sample period is 1992-2009.

Table 6. Excess Cash and Stock Selection Abilities

	Purchases		Sales		Purchases - Sales		Unchanged		Characteristic
Excess Cash Rank	Raw	DGTW	Raw	DGTW	Raw	DGTW	Raw	DGTW	Selectivity
Low	0.81	0.30	0.13	-0.18	0.68	0.47	0.32	-0.06	-0.11
Quintile 2	0.84	0.41	0.12	-0.18	0.72	0.60	0.47	0.05	0.02
Quintile 3	0.97	0.39	0.20	-0.18	0.77	0.56	0.52	0.05	0.08
Quintile 4	0.99	0.46	0.26	-0.11	0.74	0.56	0.47	0.05	0.06
High	1.08	0.47	0.16	-0.23	0.92	0.70	0.58	0.14	0.09
High-Low	0.27	0.17	0.03	-0.05	0.24	0.22	0.26	0.20	0.20
	[2.09]	[2.02]	[0.68]	[-0.95]	[2.38]	[2.70]	[1.42]	[1.68]	[2.16]

Notes: This table reports average returns on stocks bought (Purchases), sold (Sales), and held without changes (Unchanged) between months $t+1$ and $t+6$ (inclusive) by funds assigned to each excess cash quintile at the end of month t. Also shown are the differences between purchases and sales (Purchases-Sales). Purchase and sale transactions are assumed to take place at prices prevalent at the end of month t+3. The last column summarizes characteristic selectivity measures, calculated following Daniel, Grinblatt, Titman, and Wermers (1997) as $CS_\tau = \sum_j w^j_{\tau-1}(R^j_\tau - BR^{j,\tau-1}_\tau)$, where $w^j_{\tau-1}$ is the weight of stock j in the fund equity portfolio at the end of period $\tau-1$, R^j_τ is the return of stock j in period τ, and $BR^{j,\tau-1}_\tau$ is the return in period τ of the benchmark portfolio to which stock j was assigned during period $\tau-1$ on the basis of its size, value, and momentum characteristics. Returns are in percent per month except for characteristic selectivity, which is in percent per quarter. Reported are raw returns and style-adjusted returns (DGTW, calculated following Daniel, Grinblatt, Titman, and Wermers, 1997), CS measures, as well as t-statistics for the differences in returns of high and low excess cash groups (in square brackets). The sample period is 1992-2009.

Table 7. Volatility of Excess Cash and Future Fund Performance: Persistent vs. Volatile High and Low Excess Cash

Performance	Low Excess Cash (L)		High Excess Cash (H)		Differences in Returns					
measure	Pers (P)	Volat (V)	Pers (P)	Volat (V)	HV-LV	HP-LP	LV-LP	HV-HP	HP-LV	HV-LP
Excess	0.00	0.15	0.22	0.32	0.17	0.22	0.15	0.10	0.07	0.32
return	[0.00]	[0.38]	[0.62]	[0.83]	[2.26]	[2.80]	[2.61]	[1.76]	[1.07]	[3.76]
Market model	-0.38	-0.22	-0.11	-0.04	0.18	0.27	0.16	0.07	0.11	0.34
alpha	[-6.53]	[-3.80]	[-2.39]	[-0.60]	[2.47]	[4.49]	[2.88]	[1.49]	[1.99]	[4.24]
Fama-French	-0.36	-0.20	-0.09	0.00	0.21	0.27	0.15	0.09	0.12	0.36
3-factor alpha	[-6.18]	[-3.67]	[-1.91]	[0.00]	[2.77]	[4.44]	[2.75]	[1.76]	[2.17]	[4.38]
Carhart	-0.35	-0.22	-0.10	-0.03	0.19	0.25	0.13	0.07	0.12	0.32
4-factor alpha	[-5.96]	[-3.95]	[-2.21]	[-0.49]	[2.57]	[4.11]	[2.36]	[1.44]	[2.18]	[4.01]
Carhart + liquidity	-0.35	-0.24	-0.11	-0.02	0.23	0.24	0.10	0.09	0.14	0.33
5-factor alpha	[-5.85]	[-4.34]	[-2.27]	[-0.26]	[3.06]	[3.95]	[1.92]	[1.80]	[2.49]	[4.11]
Ferson-Schadt	-0.31	-0.19	-0.09	0.01	0.21	0.22	0.12	0.10	0.10	0.33
conditional alpha	[-5.21]	[-3.25]	[-1.83]	[0.24]	[2.71]	[3.65]	[2.14]	[2.08]	[1.77]	[4.16]

Notes: This table reports average raw and risk-adjusted net-of-fees returns, in percent per month, and the corresponding t-statistics for four excess cash groups: persistent (P) and volatile (V), low (L) and high (H) excess cash portfolios as well as for the differences in returns among these groups. A fund that falls into a high excess cash group at time t is assigned into a persistent group if it also belonged to either a high or a next-to-high excess cash quintile in at least two-thirds of the observations over the previous three years, and is otherwise assigned into a volatile group. Low excess cash funds are similarly separated into persistent and volatile groups. Excess cash as of month t is calculated as the residual from cross-sectional regression (7) in Table 2. At the beginning of month $t + 4$, a total net assets-weighted 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 for the following 12 months. The 5-factor model uses Pastor-Stambaugh liquidity factor. The sample period is 1992-2009.

Table 8. Predicting Performance of High-Low Excess Cash Portfolio: The Value of Excess Cash in a Stock-Picker's Market

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cross-sectional BM variance	0.05							0.03
	[3.99]							[3.39]
Median correlation		-9.78		-8.77				-10.2
		[-6.64]		[-4.32]				[-4.17]
Market return, percent			0.04	0.01				0.03
			[3.90]	[0.94]				[1.92]
Dividend yield, percent					0.98			1.49
					[2.14]			[2.97]
T-Bill rate, percent						3.45		-2.49
						[1.70]		[-1.24]
Term spread, percent							0.40	-0.23
							[1.45]	[-1.11]
Adjusted R^2	5.1	26.9	11.8	27.3	5.2	4.7	5.7	40.4

Notes: This table reports coefficients, corresponding Newey-West (1987) t-statistics, and adjusted R^2 values from regressing Carhart 4-factor alphas (computed using data from months $t+1$ to $t+12$) of the portfolio that is long high excess cash funds and short low excess cash funds on variables measured as of the end of month t. BM variance is the cross-sectional variance of the book-to-market ratios of common stocks listed on NYSE, Amex, or Nasdaq. The median correlation is the cross-sectional median correlation of returns on common stocks listed on NYSE, Amex, or Nasdaq with market return, computed using daily data from $t-11$ to t. Market return is computed for the 12 months between $t-11$ and t. The sample period is 1992-2009.

Table 9. Excess Cash and Market Timing Abilities

Excess	Treynor-Mazuy			Henriksson-Merton			Holdings-Based	Style
cash rank	δ_{i0}	δ_{i1}	δ_{i2}	ϕ_{i0}	ϕ_{i1}	ϕ_{i2}	γ_{1i}	Timing
Low	-0.244	1.035	-0.025	-0.219	1.043	-0.017	-0.644	-0.11
	[-4.32]	[92]	[-0.19]	[-2.77]	[58]	[-0.49]	[-1.34]	[-1.22]
Quintile 2	-0.150	1.017	-0.005	-0.149	1.018	-0.001	-0.265	-0.06
	[-3.41]	[117]	[-0.04]	[-2.42]	[72]	[-0.04]	[-1.35]	[-0.64]
Quintile 3	-0.101	0.985	0.117	-0.139	0.966	0.035	-0.129	0.05
	[-2.49]	[123]	[1.20]	[-2.46]	[75]	[1.43]	[-0.30]	[0.56]
Quintile 4	-0.047	0.964	-0.014	-0.027	0.970	-0.013	0.013	0.02
	[-1.15]	[118]	[-0.14]	[-0.47]	[74]	[-0.51]	[0.03]	[0.20]
High	-0.029	0.933	0.007	-0.040	0.930	0.006	0.073	0.07
	[-0.59]	[95]	[0.06]	[-0.57]	[59]	[0.21]	[0.20]	[0.69]
High-Low	0.215	-0.102	0.032	0.179	-0.113	0.023	0.965	0.18
	[4.63]	[-11.1]	[0.29]	[2.77]	[-7.65]	[0.83]	[1.55]	[2.20]

Notes: This table reports the coefficients and the corresponding t-statistics of the market timing regressions and in the last column reports the style timing measures of Daniel, Grinblatt, Titman, and Wermers (1997). 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 in month t of excess cash quintile portfolios or the difference in returns of high and low excess cash quintiles, and R_{Mt} is the market excess return. The intercepts are in percent. The holdings-based specification is

$$R_{M,t+13:t+24} = \gamma_{0i} + \gamma_{1i} \Delta\beta_{i,t+1:t+12} + \varepsilon_{i,t},$$

where $R_{M,t+13:t+24}$ is the market excess return during the 12-month period ending in month $t+24$ and $\Delta\beta_{i,t+1:t+12}$ is the change in the average market model betas of the holdings of the funds in excess cash portfolio i during the 12-month period following excess cash calculation. t-statistics shown in the Holdings-based column are calculated following Newey and West (1987). Style timing is calculated following Daniel, Grinblatt, Titman, and Wermers (1997) as $\sum_j (w^j_{\tau-1} BR^{j,\tau-1}_\tau - w^j_{\tau-5} BR^{j,\tau-5}_\tau)$, where $w^j_{\tau-k}$ is the weight of stock j in the fund equity portfolio at the end of period $\tau - k$ and $BR^{j,\tau-k}_\tau$ is the return in period τ of the benchmark portfolio to which stock j was assigned during period $\tau - k$ on the basis of its size, value, and momentum characteristics. Excess cash is calculated as the residual from cross-sectional regression (7) in Table 2. The sample period is 1992-2009.

Table 10. Fund Excess Cash Holdings and Future Performance: Impact of Future Fund Flows and Market Liquidity

Performance measure	High EC	Low EC	High-Low	High EC	Low EC	High-Low
A. Future fund performance conditional on future fund flows						
	Low Fund Flow			High Fund Flow		
Excess	0.19	0.00	0.19	0.50	0.37	0.13
return	[0.52]	[-0.01]	[2.53]	[1.59]	[1.08]	[2.06]
Ferson-Schadt	-0.24	-0.46	0.23	0.07	-0.08	0.15
conditional alpha	[-5.11]	[-6.92]	[3.62]	[1.00]	[-1.33]	[2.62]
B. Future fund performance conditional on market liquidity						
	Low Aggregate Liquidity			High Aggregate Liquidity		
Excess	-0.53	-0.85	0.33	1.28	1.28	0.00
return	[-1.05]	[-1.49]	[3.93]	[4.36]	[3.93]	[0.07]
Ferson-Schadt	-0.01	-0.28	0.27	-0.08	-0.22	0.14
conditional alpha	[-0.51]	[-4.05]	[4.40]	[-1.32]	[-3.10]	[2.24]

Notes: This table reports average raw and risk-adjusted net-of-fees returns, in percent per month, and the corresponding t-statistics for high and low excess cash (EC) quintile portfolios and for their differences, conditional on future fund flows (in Panel A) and aggregate liquidity (Panel B). Excess cash as of month t is calculated as the residual from cross-sectional regression (7) in Table 2. At the beginning of each month $t+4$, a total net assets-weighted investment is made in the funds that were assigned to a particular excess cash/fund flow/aggregate liquidity group, and the position is held for the following 12 months. In Panel A, fund flow is for the 12-month period from $t+4$ to $t+15$. Within each excess cash quintile, funds are split into Low or High fund flow groups. In Panel B, performance measures are calculated conditional on whether market liquidity, proxied for by Pastor and Stambaugh (2003) aggregate liquidity, is above or below its median value. The sample period is 1992-2009.

Table 11. Excess Cash and Future Expenses

Excess cash rank	Turnover ratio	Execution costs
Low	72.2	0.712
Quintile 2	65.5	0.590
Quintile 3	62.4	0.625
Quintile 4	62.5	0.618
High	62.3	0.598
High-Low	-9.90	-0.114
	[-2.64]	[-3.58]

Notes: This table reports average future portfolio turnover (in percent per year) and execution costs in each of the five excess cash groups. Excess cash as of month t is calculated as the residual from cross-sectional regression (7) in Table 2, and all other variables correspond to the year between $t + 1$ and $t + 12$. Execution costs are defined in Appendix E. The bottom two rows show the differences between values for high and low quintiles, and the corresponding Newey-West (1987) t-statistics. The sample period is 1992-2009.

Appendix

A. Sample Selection

The 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 various institutions and cover a range of time periods and funds: Strategic Insight objective codes are available between 1992 and 1999, Lipper classifications are present from the end of 1999 through 2008, Wiescat codes begin in early 2008, and Wiesenberger codes run through 1993. To obtain the sample studied in this paper, I include funds with AGG, GRI, GMC, GRO, and ING Strategic Insight codes, EIEI, G, LCCE, LCGE, LCVE, MCCE, MCGE, MCVE, MLCE, MLGE, and MLVE Lipper codes, AGG, GCI, and GRD Wiescat codes, and AGG, MCG, G, G-S, GS, GRO, LTG, GCI, G-I, G-I-S, G-S-I, I-G, I-G-S, I-S-G, S-G-I, S-I-G, and GRI Wiesenberger codes.

I exclude international, balanced, sector, bond, money market, and index funds. I identify as international funds all funds containing any of the words International, Global, Emerging Market, Non-US, and similar variants in their names. To identify index funds, I search for words such as 'index, 'idx', 's&p', 'dfa', 'program', 'ultra', 'nasdaq', 'spdr', and similar in fund name. I also exclude target date funds by searching for the keyword 'target' or a target year such as '2020' in the fund name. To identify sector funds, I screen out funds whose names contain words or fragments such as: 'utilit', 'sector', 'technol', 'health', 'real est', 'consum', 'service', 'natural re', 'industri', 'material', 'commodit', 'silver', 'pharmac', 'gold', 'semicond', 'telecom', 'biotech', 'software', and 'internet'.

Reported fund objectives do not always accurately characterize a fund, and following Kacperczyk, Sialm, and Zheng (2008) and Glode (2011), I exclude funds that hold *on average* less than 80% of their net assets in equity. I also exclude funds with total net assets (TNA) of 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 the paper.

Many 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 the TNA of each fund as the sum of the TNA 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 share classes. My final sample contains 18,223 fund-year observations representing 2,263 distinct funds.

B. Robustness to Alternative Definitions of Excess Cash

Defining excess cash as a residual from the cross-sectional regression with all explanatory variables as done in this paper is very appealing, as it accounts for a wide range of factors that impact mutual fund cash holdings. The variables I consider are intuitive and from an economic viewpoint can all be expected to relate to mutual fund cash holdings. The regression used to define excess cash is also attractive because the regressors explain the largest fraction of the cross-sectional variation in fund cash positions. Yet, some of the explanatory variables in that regression are not significant, which could result in a noisy excess cash estimate. Moreover, one may use an alternative set of regressors to define excess cash. I now address any concerns about the sensitivity of the results to the definition of excess cash by showing that the empirical conclusions of this paper are robust to alternative measures of excess cash.

This paper focuses on excess cash because, as a discretionary amount, it can capture information about otherwise unobservable fund characteristics that affect fund performance. This information may reflect, among other things, stock-picking skills, market-timing abilities, and the investment opportunity set of a manager, as well as managerial expectations about the liquidity needs of a fund. Raw cash is a problematic proxy for such information because it is affected by observable exogenous shocks (e.g., fund flows) and endogenous fund characteristics (e.g., the riskiness of shareholdings).

I consider four alternative definitions of excess cash. The first and most elementary approach defines excess cash (EC1) as the residual from a regression using the past month's fund flow and the market beta of the fund's stockholdings as explanatory variables. I choose these two regressors because the former is an intuitive proxy for exogenous flow shocks and the latter proxies for the characteristics of a fund's shareholdings. The two variables positively and significantly relate to fund cash holdings and the resulting definition of excess cash is simple to understand and interpret: It captures cash holdings that are unattributable to recent exogenous flows and the riskiness of the equity portfolio. Alternatively, it is the amount above what an average fund with similar recent flows and with similar riskiness of the stockholdings carries.

For the second alternative definition of excess cash (EC2), I include the fund expense ratio as an additional regressor. Prior research (Yan, 2006) and Table 2 show that this variable is an important determinant of fund cash positions. Expenses are paid with cash on hand, and adding this regressor captures another important observable fund characteristic and ensures that excess cash does not include the amount held to pay a fund's expenses.

The third alternative definition (EC3) comes from a regression that also adds the fund flows over the past six months, the fund dividend yield, the average book-to-market percentile of the fund's stockholdings, the number of stocks in the portfolio, fund age, and the volatility of a fund's cash holdings. I choose these additional variables because they prove to be particularly useful in explaining the cross-section of mutual fund cash holdings (see regression (7) of Table 2).

Finally, to alleviate concerns that including statistically insignificant regressors when defining excess cash can lead to unnecessarily noisy excess cash estimates, I use only those regressors that are significant at a more than 5% level in regression (7) of Table 2 (EC4). This regression achieves an adjusted R^2 value of over 11%, and makes intuitive sense because it uses the set of explanatory variables that the analysis of the determinants of mutual fund cash holdings revealed to be most important (in addition to variables used for EC3 definition, this regression uses the log of TNA, the 12-month return runup, the front-load fee, and an aggressive growth dummy).

Table A1 summarizes key empirical results of the paper using each of the alternative excess cash definitions (EC1 through EC4). Regardless of the definition considered, the findings of the paper prove to be robust, strongly suggesting that they are not sensitive to the particular regression specification used to define excess cash. Panel A shows that high excess cash funds significantly outperform their low excess cash peers. The difference in the Ferson-Schadt alphas of the two groups reaches between 1.56% and 2.04% per year. This difference in performance is partly attributable to the superior stock selection (Panel B) and market-timing abilities (Panel C) of high excess cash funds. For example, the difference in characteristic selectivity measures of high and low excess cash funds ranges between 0.17% and 0.22% quarterly depending on which alternative definition of excess cash is used. Panel D confirms the results shown in Table 11: High excess cash fund managers control their future costs well. Finally, Panel E summarizes the results of Fama-MacBeth regressions of future fund performance on lagged excess cash and other variables. Both in univariate and multivariate regressions and for each of the alternative definitions considered, excess cash relates significantly and positively to future fund performance.

The analysis in this section reveals that the key empirical results of the paper are not sensitive to the particular regression specification used. In defining excess cash, it is important to account for

exogenous flows and endogenous fund characteristics. Even a simple specification that controls for differences in recent fund flows and the riskiness of a fund's shareholdings is sufficient to obtain a meaningful measure of excess cash that proxies for managerial discretionary decisions and captures managerial abilities and other factors that relate to future fund performance. Each of the alternative excess cash measures I consider generates results similar to those presented in the paper.

C. Excess Cash Holdings of Closed-End Funds

To determine whether the positive link between excess cash and mutual fund performance is related to differences in the managerial ability to meet outflow shocks, I 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 or costs of fund flows.

A. Data

To study the relation between the excess cash holdings of closed-end funds and future fund performance, I obtain from CRSP the list of 608 closed-end funds that were in operation at some point between 1994 and 2008 (those with share code 14).[27] 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 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 such report 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 an equity investment objective, while most others invest mainly in municipal or corporate bonds. After restricting the sample to diversified domestic equity funds, I arrive at the final sample of 54 funds or 833 fund-quarter observations.[28]

B. Summary Statistics

Table A3 reports summary statistics for the sample. Data are more restrictive for closed-end than for open-end funds, and information on only a limited set of fund characteristics is available. Closed-end funds hold on average considerably lower net assets in cash (1.79%) than do their open-end peers (3.78% during 1994-2008), suggesting that fund flow concerns play an important role in determining cash holdings of open-end funds. Closed-end funds have on average lower assets under management ($557 million) and a lower fund market beta than do open-end funds.[29] A median closed-end fund has been in operation for 15 years and its shares trade at a 17.5% discount to the per share net asset value.

C. Determinants of Closed-End Fund Cash Holdings

To calculate the excess cash holdings of closed-end funds, I begin by exploring the determinants of their cash positions. Following the methodology used in analyzing open-end funds, in each cross-section I regress the cash-to-net asset values of closed-end funds on a number of fund characteristics. Regression (1) of Table A4 shows that larger funds hold considerably less cash and that fund size

[27] Data prior to 1994 are not widely available in the Edgar, which leads me to focus on the 1994-2008 period.

[28] 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.

[29] Holdings data are not readily available for closed-end funds, and I measure the fund beta rather than the average beta of fund shareholdings as was done for the open-end funds. Beta is the loading from the market model regressions using one year of monthly data.

plays the single most important role in explaining fund cash holdings: The average R^2 of this regression exceeds 24% whereas the comparable number for open-end funds is just 0.2%. After controlling for size, cash holdings of closed-end funds relate positively to expenses and fund age (regressions 3 and 4), which is consistent with what Table 2 shows to be the case for open-end funds. Somewhat surprisingly, regression (5) shows a negative relation between cash holdings and fund discount. I define excess cash of closed-end funds as the residual from the cross-sectional regression (6) that uses all available fund characteristics as explanatory variables and explains the largest fraction of cross-sectional variation in cash positions. The average number of observations in each cross-section is just 22, and it is prudent to interpret the lack of a relation between excess cash and future performance of closed-end funds (see Table A5) with care.

D. Excess Cash Holdings and Closed-End Fund Performance

Table A5 of the Appendix shows that there is no statistically significant difference in performance between high and low excess cash closed-end funds, consistent with the hypothesis 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.[30]

D. Model of Costly Stock Trading

I 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 or who transacts more frequently than is optimal, a cost-minimizing manager will tend to carry a higher cash balance. The framework can therefore justify the positive link between excess cash and performance: Managers may carry more excess cash as a result of their efforts to minimize transaction costs and consequently they outperform their low excess cash peers.

A manager buying or selling n_i shares of stock i at price p_i per share incurs a total cost of

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

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

Suppose that the manager can transact only at discrete points in time, and for simplicity assume that the price is not directly affected by the manager's decisions (V_i may capture price pressure). The manager's objective is to minimize the total cost associated with transacting in 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 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 the rth transaction.[31]

Given that the manager will make N_i transactions in stock i and that the total variable cost increases with the dollar value of shares bought or sold in a given transaction, the number of shares

[30] It is prudent to note that the sample of closed-end funds is small, covering just 54 funds, and any conclusions drawn from it should be interpreted with caution. The lack of a relation between closed-end funds' excess cash and future performance may also be viewed as contradicting the idea that excess cash proxies for stock-selection abilities because stock-picking skills are arguably equally important for both closed- and open-end funds. The small sample size again suggests that this conclusion should be interpreted with care.

[31] This set-up implies that the manager does not face any costs of delaying his transactions, but I assume that the manager prefers to conduct his transactions as soon as possible. A manager may prefer to do so, for example, when he receives a signal about future performance of a stock.

n_i^r that minimizes the total cost is n_i/N_i.[32] Therefore, 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

$$N_i^* = \begin{cases} \sqrt{V_i/F_i}\left(n_i p_i\right) & \text{if } \sqrt{V_i/F_i}\left(n_i p_i\right) \text{ is an integer,} \\ \underset{N_i \in \left\{\left\lfloor \sqrt{V_i/F_i}(n_i p_i)\right\rfloor, \left\lfloor \sqrt{V_i/F_i}(n_i p_i)\right\rfloor + 1\right\}}{\arg\min} Cost_i\left(N_i\right) & \text{otherwise,} \end{cases}$$

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 a manager who would like to sell all of his shares of stock S and invest the proceeds in stock B. 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 is, then $N_S^* < N_B^*$. In other words, the manager will take a longer time to purchase the desired amount of the illiquid stock B than to sell his holdings in the liquid stock S. As a result, the cumulative change in cash unrelated to transaction costs will be non-negative at any point. By contrast, a non-optimizing manager who either invests all sales proceeds immediately or who transacts in the illiquid stock more frequently than is optimal will cause a change in cash that is smaller than the change in cash of a fund run by a cost-minimizing manager.

Additionally, if the manager can use fund cash reserves only to cover fixed and variable costs but not to finance stock purchases directly, then he will use the proceeds from the sale of stock S to cover the purchase of stock B. Consequently, a cost-minimizing manager will carry a higher or similar cash balance than a manager who invests the sales proceeds more quickly will, even when $\sqrt{V_S/F_S} \geq \sqrt{V_B/F_B}$.

Figure A1 shows cumulative changes in cash holdings under two scenarios: when the manager buys a stock that is less liquid than the one that he sells (Panel A), and when he finances the purchase of stock B by proceeds from the sale of stock S (Panel B). In either case, at any point in time the cumulative change in cash unrelated to transaction costs is non-negative. In comparison, a corresponding change in cash of a fund run by a manager who invests all sales proceeds immediately will be non-positive.

The framework outlined above implies that managers who are better able to control their transaction costs may carry higher excess cash balances. It additionally suggests that managers who are transitioning to a less liquid portfolio may also carry more excess cash. In untabulated results, I confirm that the average future liquidity of fund shareholdings declines (loading on both Pastor and Stambaugh (2003) and Amihud (2002) illiquidity factors rise) with excess cash, suggesting that high excess cash funds are transitioning to a less liquid equity portfolio. The negative relation between excess cash and future fund costs summarized in Table 11 provides further empirical support of the model's implications.

In light of this evidence, the positive relation between excess cash and fund performance can be attributed in part to funds carrying high excess cash as a result of minimizing the total costs of transacting in stocks. Cost-minimizing managers carry more excess cash and generate better results than do managers who make sub-optimal decisions by reinvesting the proceeds from share sales immediately or by otherwise transacting inefficiently.

[32] 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 $2V_i n_i^j p_i = \lambda$, where λ is the Lagrange multiplier. This suggests that for every j and k, $n_i^j/n_i^k = 1$, or $n_i^j = n_i^k = n_i/N_i$.

E. Trading Costs

I follow Keim and Madhavan (1997), Wermers (2000), and Kacperczyk, Sialm, and Zheng (2008) in estimating the execution costs of mutual funds. The costs of buying and selling stock i during quarter t, in percentage of trade value, are estimated separately as

$$\begin{aligned} B_{i,t} &= 1.098 + 0.336 \cdot Nasdaq_{i,t} + 0.092 \cdot TradeSize_{i,t} - 0.084 \cdot LogME + 13.807/P_{i,t}, \text{ and} \\ S_{i,t} &= 0.979 + 0.058 \cdot Nasdaq_{i,t} + 0.214 \cdot TradeSize_{i,t} - 0.059 \cdot LogME + 6.537/P_{i,t}, \end{aligned}$$

respectively, where $Nasdaq$ is a dummy variable equal to 1 if the stock trades on Nasdaq, $TradeSize$ is the dollar value of the trade scaled by market capitalization of the stock, $LogME$ is the log of market capitalization of the stock, measured in thousands of dollars, and P is the price per share of the stock. As in Kacperczyk, Sialm, and Zheng (2008), I compute monthly execution costs by dividing quarterly costs by three.

Appendix Figures and Tables

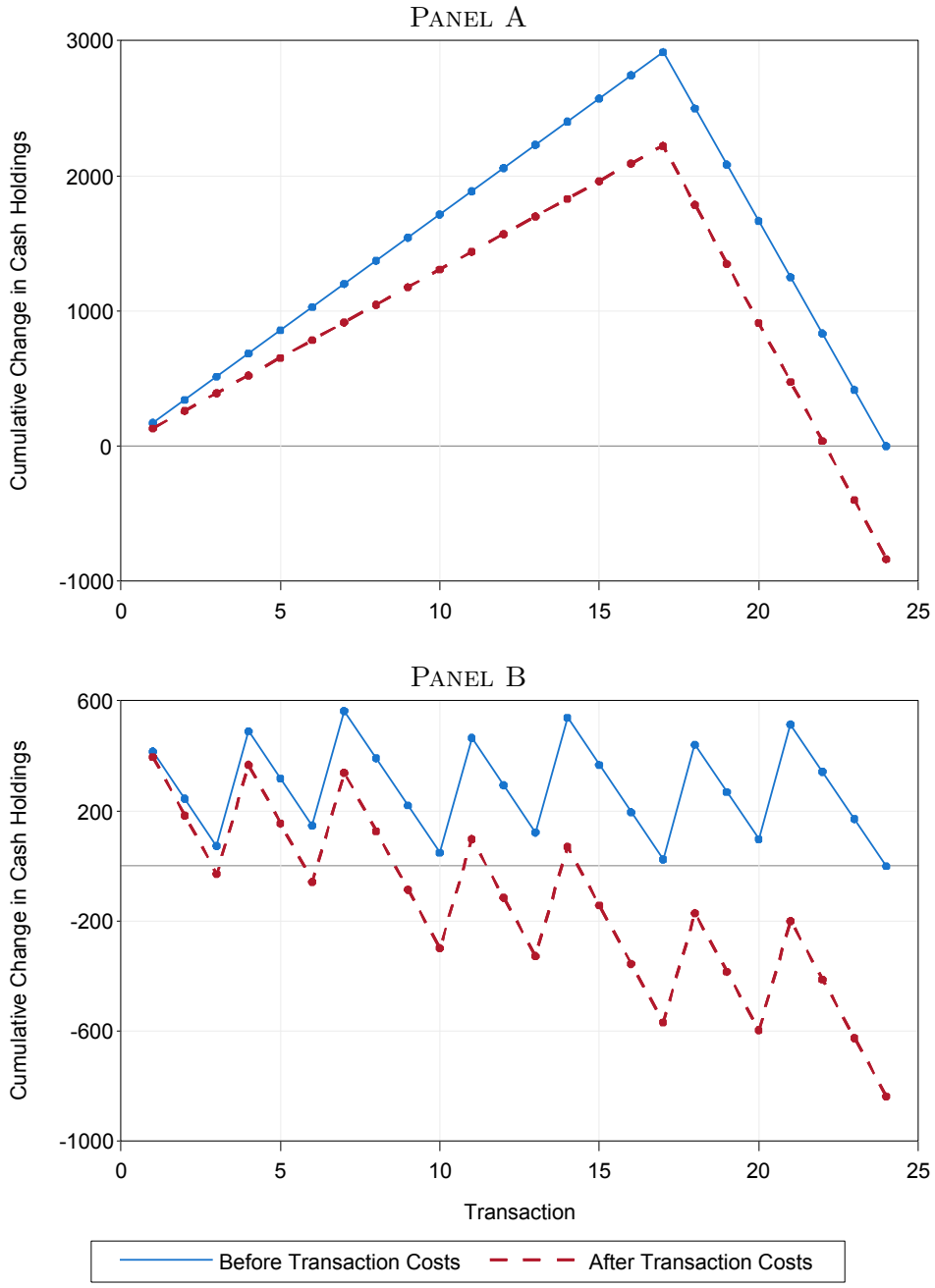

Figure A1. Effects of costly stock trading on cumulative change in cash. This figure plots cumulative changes in cash implied by the model developed in Appendix D. The figure in Panel A is plotted assuming that $n_S = 100$ shares of stock S are being sold at price $p_S = 100$ with variable cost $V_S = 0.00006$ 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 $V_B = 0.00003$ 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 be financed only by the proceeds from the sale of stock S, so that cash reserves can be used only to cover transaction costs.

Table A1. Robustness to Alternative Definitions of Excess Cash

A. Future Fund Performance

	Market Alphas				Ferson-Schadt Alphas			
	(EC1)	(EC2)	(EC3)	(EC4)	(EC1)	(EC2)	(EC3)	(EC4)
Low	-0.21	-0.21	-0.22	-0.19	-0.16	-0.17	-0.22	-0.19
Quintile 2	-0.15	-0.18	-0.15	-0.15	-0.12	-0.14	-0.11	-0.11
Quintile 3	-0.07	-0.10	-0.07	-0.04	-0.05	-0.10	-0.06	-0.06
Quintile 4	-0.06	-0.03	-0.05	-0.05	-0.07	-0.03	-0.05	-0.07
High	-0.01	-0.04	-0.03	-0.04	-0.03	-0.05	-0.05	-0.03
High-Low	0.20	0.17	0.19	0.15	0.13	0.13	0.17	0.16
	[3.90]	[3.38]	[3.90]	[3.72]	[2.64]	[2.33]	[3.28]	[2.68]

B. Stock-Selection Abilities

	CS Measure of DGTW				Style-Adjusted Returns on Purchases			
Low	-0.09	-0.16	-0.11	-0.11	-0.03	-0.07	-0.02	-0.01
Quintile 2	0.03	0.00	0.05	0.07	0.03	0.04	0.01	0.11
Quintile 3	0.07	0.07	0.05	0.06	0.07	0.20	0.28	0.18
Quintile 4	0.09	0.05	0.04	0.05	0.09	0.09	0.08	0.07
High	0.08	0.07	0.06	0.07	0.55	0.31	0.28	0.25
High-Low	0.17	0.22	0.17	0.18	0.58	0.38	0.30	0.27
	[1.65]	[2.54]	[2.01]	[2.11]	[3.76]	[2.26]	[1.83]	[1.81]

C. Market-Timing Abilities

	CT Measure of DGTW				Holdings-Based Coefficients			
Low	-0.08	-0.03	-0.04	-0.07	-0.72	-0.85	-0.69	-0.43
Quintile 2	0.01	-0.06	-0.07	-0.02	-0.01	-0.22	-0.42	-0.36
Quintile 3	-0.03	-0.04	0.00	-0.02	0.05	-0.23	-0.02	-0.44
Quintile 4	0.03	0.05	0.01	0.00	-0.10	0.01	0.26	0.33
High	0.02	0.05	0.06	0.07	-0.05	0.14	0.00	0.11
High-Low	0.10	0.08	0.11	0.14	0.96	1.20	1.04	0.51
	[1.39]	[1.14]	[1.61]	[2.22]	[2.06]	[2.32]	[1.86]	[1.61]

D. Future Expenses and Turnover

	Execution Costs				Turnover ratio			
Low	0.69	0.69	0.73	0.70	69.4	73.4	68.8	67.4
Quintile 2	0.65	0.64	0.60	0.60	68.6	67.7	66.8	65.9
Quintile 3	0.71	0.65	0.64	0.64	64.0	66.8	64.1	65.8
Quintile 4	0.62	0.59	0.58	0.60	61.5	61.1	64.0	61.6
High	0.61	0.59	0.60	0.60	59.3	59.0	58.9	60.7
High-Low	-0.08	-0.10	-0.13	-0.10	-10.1	-14.4	-9.88	-6.71
	[-3.63]	[-3.83]	[-5.50]	[-2.84]	[-3.28]	[-4.36]	[-2.88]	[-1.93]

Notes: Table continues on the next page.

Table A1. Robustness to Alternative Definitions of Excess Cash, Continued

E. Evidence from Fama-MacBeth Regressions

	(EC1)		(EC2)		(EC3)		(EC4)	
Variable	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Excess cash, percent of TNA	0.06	0.03	0.06	0.03	0.03	0.03	0.03	0.03
	[3.75]	[2.11]	[3.73]	[2.15]	[2.79]	[2.31]	[2.70]	[2.23]
Return gap, percent		0.94		0.94		0.98		0.98
		[2.94]		[2.94]		[2.95]		[2.95]
Log of total net assets		-0.02		-0.02		-0.03		-0.02
		[-0.53]		[-0.53]		[-0.67]		[-0.58]
Expense ratio, percent		-0.84		-0.81		-0.76		-0.75
		[-3.18]		[-3.05]		[-2.80]		[-2.77]
Fund flow, last 1 month		-1.20		-1.25		-1.01		-1.02
		[-1.60]		[-1.66]		[-1.20]		[-1.22]
12-month fund return runup		2.93		2.93		2.91		2.92
		[1.18]		[1.18]		[1.16]		[1.16]
Market beta		-1.29		-1.30		-1.46		-1.47
		[-0.92]		[-0.92]		[-1.04]		[-1.05]
Value (HML) beta		1.00		1.00		1.10		1.11
		[0.69]		[0.69]		[0.75]		[0.76]
Size (SMB) beta		4.02		4.02		4.05		4.06
		[2.85]		[2.85]		[2.89]		[2.90]
Momentum (UMD) beta		0.05		0.05		0.15		0.15
		[0.03]		[0.03]		[0.08]		[0.09]

Notes: This table reports the results of robustness tests from using four alternative definitions of excess cash (EC1 through EC4). EC1 is the residual from the cross-sectional regression of cash-to-total net assets ratio on the past month's fund flow and the market beta of a fund's stockholdings. To calculate EC2, fund expense ratio is included as an additional regressor. EC3 additionally includes most significant regressors from specification (7) of Table 2: fund flows over the past six months, fund dividend yield, average book-to-market percentile of the fund's stockholdings, number of stocks in the portfolio, fund age, and volatility of a fund's cash holdings. Finally, EC4 adds other regressors that are significant at the 5% level in specification (7) of Table 2: log of total net assets, 12-month return runup, front load fee, and aggressive growth dummy. Future fund performance in Panel A is calculated as in Table 4, Panel A. The stock selection abilities summarized in Panel B are computed as in Table 6. Market-timing abilities in Panel C are calculated as in Table 9. Panel D shows future expenses and portfolio turnover (in percent per year), computed as in Table 11. Finally, Panel E summarizes the results of Fama-MacBeth regressions estimated following the same methodology as in Table 5. The sample period is 1992-2009.

Table A2. Excess Cash and Future Performance of Index Funds

Performance measure	Low	Quint 2	Quint 3	Quint 4	High	High-Low	R^2
Excess	0.46	0.58	0.47	0.46	0.46	-0.00	
return	[1.40]	[1.66]	[1.48]	[1.47]	[1.45]	[-0.08]	
Market model	0.01	0.13	0.03	0.03	0.03	0.01	3.9
alpha	[0.17]	[0.95]	[0.54]	[0.57]	[0.43]	[0.22]	
Fama-French	-0.03	0.09	-0.01	0.01	0.01	0.04	8.2
3-factor alpha	[-0.44]	[0.61]	[-0.14]	[0.17]	[0.27]	[0.70]	
Carhart	-0.01	0.10	0.01	0.03	0.03	0.04	7.7
4-factor alpha	[-0.13]	[0.72]	[0.15]	[0.62]	[0.72]	[0.70]	
Carhart + liquidity	-0.02	0.12	0.01	0.02	0.03	0.05	7.5
5-factor alpha	[-0.34]	[0.85]	[0.22]	[0.50]	[0.57]	[0.81]	
Ferson-Schadt	-0.00	0.06	-0.06	0.02	-0.00	-0.00	10.3
conditional alpha	[-0.02]	[0.44]	[-0.90]	[0.34]	[-0.05]	[-0.02]	

Notes: This table reports average raw and risk-adjusted net-of-fees returns, in percent per month, and the corresponding t-statistics for each of the excess cash quintiles of index funds as well as for the differences between quintiles of high and low excess cash. Funds are classified as index following the procedure outlined in Appendix A. Excess cash is calculated as the residual from regressing cash-to-total net assets ratio of index funds on the same explanatory variables that are used in cross-sectional regression (7) in Table 2. At the beginning of month $t + 4$, a total net assets-weighted 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 for the following 12 months. The 5-factor model uses Pastor-Stambaugh liquidity factor. R^2 is the adjusted R^2 from regressions using as a dependent variable the difference in returns between high and low excess cash funds. Imposing the same restrictions that are used for the actively managed funds limits the sample to 266 index funds. The sample period is 1992-2009.

Table A3. Summary Statistics: Closed-End Funds

Variable	Mean	Median	Stdev	10th Pctl	90th Pctl	Corr w Cash
Cash, percent of total net assets	1.79	0.06	4.86	0.00	5.24	1.00
Total net assets, $ million	557	358	602	64.5	1,354	-0.25
Market beta of fund	0.79	0.79	0.48	0.19	1.38	-0.10
12-month fund return runup, percent	9.54	9.12	14.52	-7.76	26.90	-0.03
Expense ratio, percent	1.65	1.02	2.09	0.41	3.34	0.23
Fund age, years	23.90	15.12	23.46	4.16	68.87	-0.07
Fund discount, percent	20.96	17.50	22.31	-1.86	49.64	-0.01

Notes: This table reports summary statistics for closed-end fund characteristics. The market beta is calculated from the market model regression using realized fund returns over the past 12 months. The discount is computed by comparing net asset value per share with market share price. Statistics are calculated semiannually in June and December cross-sections and then averaged. The sample period is 1994-2008.

Table A4. Determinants of Closed-End Fund Cash Holdings

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Total net assets, $ million	-0.023	-0.023	-0.025	-0.024	-0.027	-0.025
	[-3.74]	[-3.82]	[-3.62]	[-3.45]	[-4.09]	[-3.17]
Market beta of fund		-0.010		-0.006		-0.004
		[-1.13]		[-0.59]		[-0.41]
12-month fund return runup, percent		0.028		0.035		0.028
		[0.49]		[0.70]		[0.56]
Expense ratio, percent			0.816	0.888		0.707
			[2.12]	[2.23]		[1.56]
Fund age, decades			0.006	0.005		0.004
			[4.15]	[3.54]		[2.70]
Fund discount, percent					-0.036	-0.027
					[-3.60]	[-1.86]
Adjusted R^2, percent	24.2	25.9	30.7	28.7	28.5	31.5

Notes: This table reports the results of the cross-sectional regressions of closed-end fund cash holdings as a percentage of total net assets on fund characteristics. The market beta is calculated from the market model regression using realized fund returns over the past 12 months. The 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. Reported are average slope coefficients, corresponding Newey-West (1987) t-statistics (in square brackets), and adjusted R^2 values. The sample period is 1994-2008.

Table A5. Excess Cash and Future Performance of Closed-End Funds

Performance measure	Low	Quint 2	Quint 3	Quint 4	High	High-Low	R^2
Excess	0.29	0.27	0.36	0.32	0.23	-0.06	
return	[0.19]	[0.36]	[1.10]	[1.31]	[0.41]	[0.36]	
Market model	0.02	-0.01	0.08	0.04	-0.07	-0.09	0.021
alpha	[-0.68]	[-0.49]	[0.66]	[1.22]	[-0.79]	[0.22]	
Fama-French	-0.29	-0.20	-0.09	-0.10	-0.27	0.02	0.065
3-factor alpha	[-1.67]	[-1.80]	[-0.16]	[0.36]	[-1.95]	[0.59]	
Carhart	-0.13	-0.11	-0.07	-0.04	-0.12	0.01	0.059
4-factor alpha	[-1.02]	[-1.15]	[0.19]	[0.66]	[-1.25]	[0.32]	
Carhart + liquidity	-0.12	-0.09	-0.02	-0.06	-0.15	-0.04	0.066
5-factor alpha	[-1.07]	[-1.12]	[0.14]	[0.84]	[-1.21]	[0.40]	
Ferson-Schadt	0.08	0.00	-0.03	0.02	0.10	0.02	0.074
conditional alpha	[0.02]	[-0.58]	[-0.01]	[1.22]	[0.05]	[0.01]	

Notes: This table reports average raw and risk-adjusted net-of-fees returns, in percent per month, and the corresponding t-statistics for each of the excess cash quintiles 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 a fund's size, lagged market beta, past 12-month return, expense ratio, age, and discount (regression (6) in Table A4). At the beginning of month $t + 4$, a total net assets-weighted 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 for the following 12 months. The 5-factor model uses Pastor-Stambaugh liquidity factor. R^2 is the adjusted R^2 from regressions using the difference in returns between high and low excess cash funds as a dependent variable. The sample period is 1994-2008.