

Excess Cash and Stock Returns

Mikhail Simutin
The University of British Columbia*

October 27, 2009

Abstract

I document a positive relationship between corporate excess cash holdings and future stock returns. The difference in returns of portfolios of high and low excess cash firms amounts to 5% annually, or 6% after standard 3-factor risk adjustment. Firms with more excess cash have higher market betas and earn lower returns during market downturns. High excess cash companies invest considerably more in the future than do their low-cash peers, but do not experience stronger future profitability. On the whole, this evidence is consistent with the notion that excess cash holdings proxy for risky growth options.

Keywords: Cash holdings, stock returns, investment, growth options

JEL Classifications: G12

*Sauder School of Business, University of British Columbia, 2053 Main Mall, Vancouver, BC, V6T 1Z2. Email: mikhail.simutin@sauder.ubc.ca, phone: 1-604-839-2540. I thank for helpful comments William Christie (editor), two anonymous referees, Murray Carlson, Adlai Fisher, Wendy Rotenberg, and seminar participants at the University of British Columbia and the 2009 Northern Finance Association meeting.

Excess Cash and Stock Returns

Abstract

I document a positive relationship between corporate excess cash holdings and future stock returns. The difference in returns of portfolios of high and low excess cash firms amounts to 5% annually, or 6% after standard 3-factor risk adjustment. Firms with more excess cash have higher market betas and earn lower returns during market downturns. High excess cash companies invest considerably more in the future than do their low-cash peers, but do not experience stronger future profitability. On the whole, this evidence is consistent with the notion that excess cash holdings proxy for risky growth options.

I. Introduction

Corporate cash holdings can differ dramatically even for seemingly comparable companies. For example, Blackberry manufacturer Research in Motion ended fiscal 2008 with over \$1 billion in cash and equivalents, which accounted for 21% of the firm’s total assets. By contrast, Nokia’s cash-to-assets ratio in the same year reached only 4%. In recent research, authors have attempted to explain the determinants of cash holdings, showing that size, book-to-market ratio, past cash flows, and other firm characteristics affect cash balances carried by companies.¹

In this paper, I study how cash holdings in excess of the level predicted by firm characteristics (“excess cash”) impact stock returns. I emphasize *excess* cash because it has the potential to capture information about firm prospects that is not reflected in the usual proxies such as book-to-market ratio. Information captured by excess cash may relate to a firm’s future raw and abnormal stock returns, risk, investment, and profitability in two distinct ways. First, unusually high excess cash levels may indicate managerial concerns about future operating cash flows and investment opportunities, hinting at a negative link between excess cash holdings and returns, investment, and profitability. On the other hand, firms facing costly external financing may build up cash reserves in anticipation of future investment opportunities, implying that excess cash can relate positively to risk, future investment, and expected returns.² The empirical evidence I present is, on the whole, supportive of the latter argument.

I document a positive relationship between corporate excess cash holdings and future stock returns. I define excess cash following Opler, Pinkowitz, Stulz, and Williamson

¹Opler, Pinkowitz, Stulz, and Williamson (1999) were the first to study the determinants of cash holdings. Kim, Mauer, and Sherman (1998), Almeida, Campello, and Weisbach (2004), and Riddick and Whited (2009) explore the trade-off between the low and taxable returns that high cash balances produce and the reduced dependence on costly external financing they provide. Foley, Hartzell, Titman, and Twite (2007) propose a tax-based explanation for differences in cash holdings. Bates, Kahle, and Stulz (2009) document an increase in corporate cash holdings since 1980 and explore reasons for this increase.

²Examples of recent literature examining the relationship between risk and investment include Berk, Green, and Naik (1999), Gomes, Kogan, and Zhang (2003), Carlson, Fisher, and Giammarino (2004, 2006) and Zhang (2005).

(1999) as the residual from cross-sectional regressions of cash-to-assets ratios on variables previously shown to explain cash holdings. This measure of excess cash retains its stock return forecasting ability even after controlling for a variety of firm characteristics known to relate to future returns, including book-to-market ratio, asset growth, accruals, and others. Consistent with excess cash serving as a proxy for growth opportunities, high excess cash firms have higher market betas and report significantly higher investment expenditures in the future. The difference in investment-to-assets ratios of the top and bottom excess cash groups reaches nearly 5% in just the first year following portfolio assignment. Interestingly, while this difference slowly attenuates, high excess cash firms invest more than their low-cash peers in each of the following ten years. However, over the same ten-year period, firms with high measures of excess cash report profitability figures that are no larger than those of low-cash companies.

If high excess cash does in fact proxy for growth options, as larger betas and greater investment expenditures of such firms suggest, higher returns earned by the firms with larger cash resources may be viewed as compensation for additional risk. However, I find that controlling for loadings on common risk factors does not eliminate the relationship between excess cash and stock returns. For example, the Fama and French (1993) 3-factor alpha of the strategy that is long high excess cash decile and short the group with low values is 0.52% per month. Including factors that control for differences in momentum, asset growth, accruals, and leverage does not eliminate the statistical and economic significance of profits from this strategy.

I explore whether firms with higher excess cash earn greater returns in all market states. It is natural to expect that in times of economic downturns, companies with greater excess cash might exhibit better stock performance than those with limited cash holdings. During such times, acquiring external capital may be more costly, meeting financial obligations may be more difficult, and having an extra cash cushion may prove particularly valuable. Curiously, I find that this is not the case: while the average spread between value-weighted returns of firms in high and low excess cash deciles amounts to

0.40% per month, in times of market slowdowns high excess cash stocks *underperform* their peers with low excess cash by 0.31%. During expansions, on the other hand, the difference in returns of the two groups is positive, exceeding 1% monthly. This finding, while surprising, is consistent with the idea that excess cash holdings correlate with growth opportunities. During market downturns, the value of such investment opportunities falls and the performance of high excess cash firms suffers, while the opposite is true during expansions.

This study most closely relates to the recent literature that examines the value of cash holdings. Faulkender and Wang (2006) include lagged cash as a control for explaining changes in firm value, but focus on the contemporaneous relationship between stock returns and changes in firm characteristics. Harford, Mikkelsen, and Partch (2003) find that during and immediately following an industry sales decline, firms with larger cash reserves invest more. Pinkowitz and Williamson (2004) study the marginal value of cash, but their focus is on the cross-sectional variation related to the investment opportunity set of the firm.³

In independent contemporaneous work, Palazzo (2009) finds no unconditional relationship between raw cash levels and future stock returns but observes a positive link when conditioning on size and book-to-market. His primary empirical results are consistent the findings that I document. He additionally focuses on the ability of a cash factor to serve as a risk proxy and proposes a model with costly equity financing in which firms whose cash flows are correlated with an aggregate shock hedge a cash shortfall by increasing their savings.⁴ By contrast, I focus on excess cash holdings, carefully control for other predictors of stock returns, condition on the market state, and explore levels of risk, investment, and profitability.

Prior literature documents a negative relationship between investment and future

³Other related papers include Mikkelsen and Partch (2003), Pinkowitz, Stulz, and Williamson (2006), and Dittmar and Mahrt-Smith (2007).

⁴Nikolov (2008) also develops a model in which firms face financial constraints and use cash as a means to cover unexpected operating losses and avoid inefficient asset sales. Consistent with the model, he finds that cash holdings are related to the intensity of product market competition.

stock returns (e.g., Titman, Wei, and Xie, 2004).⁵ It may thus seem somewhat puzzling why this paper finds that excess cash firms have both higher future returns and higher future investment. However, I find no relationship between excess cash and lagged or contemporaneous investment but document that high excess cash firms invest more only in the future. Indeed, the reason why the positive relationship between excess cash and future stock returns has not been discussed in the prior literature may in part relate to the commonly used approach of skipping up to 18 months between fiscal year end and inclusion of a stock into a portfolio. This method confounds two effects: higher returns prior to exercising of growth options and lower returns following their exercise. This paper focuses on the former effect and shows that firms with excess cash are temporarily riskier and earn higher returns as they prepare to exercise their growth options. In the future, these options are gradually exercised, as is evidenced by significantly higher investment-to-assets ratios of the high excess cash firms.

The rest of the paper proceeds as follows. Section II describes the data and discusses characteristics of firms with different levels of excess cash. Empirical relationship between excess cash and future returns is examined in Section III. Section IV studies the relationship between excess cash holdings and future investment and profitability. Section V provides concluding remarks. Data definitions and robustness checks, including the results from alternative definitions of excess cash, are discussed in the Appendix.

II. Excess Cash Holdings: Estimation and Firm Characteristics

Cross-sectional cash holdings can vary substantially depending on the nature of a firm's business and recent activities of the firm. To account for such differences, I focus on a measure of *excess* cash, that is, holdings above what one would expect for companies in a similar line of business and with similar characteristics. In this Section, I discuss data and methodology used in constructing excess cash measures (ECM) and study the characteristics of firms with different levels of ECM.

⁵Anderson and Garcia-Feijóo (2006) document a negative relationship between investment *growth* and subsequent stock returns.

A. Estimation of Excess Cash Measure

Opler, Pinkowitz, Stulz, and Williamson (1999, “OPSW”) thoroughly explore the determinants of cash holdings, and I use their findings as a guide for determining excess cash. More specifically, to obtain an excess cash measure for stock i in month t , I use all stocks that have fiscal year ends between $t - 11$ and t . In each month t , I run a cross-sectional regression

$$C_{i\tau} = \gamma_{0t} + \gamma_{1t}MB_{i\tau} + \gamma_{2t}Size_{i\tau} + \gamma_{3t}CPX_{i\tau} + \gamma_{4t}WC_{i\tau} + \gamma_{5t}LTD_{i\tau} + \gamma_{6t}RD_{i\tau} + \gamma_{7t}CF_{i\tau} + \gamma_{8t}\sigma_{i\tau}^{IND} + \epsilon_{it},$$

where variable definitions follow those in OPSW: C is the log of ratio of cash to total assets less cash; market-to-book ratio MB is measured as the book value of assets, less the book value of equity, plus market value of equity, divided by assets; $Size$ is the log of real (adjusted by CPI) assets; CPX is the ratio of capital expenditures to assets; WC is the ratio of net working capital calculated without cash to assets; LTD is the ratio of long-term debt to assets; RD is the ratio of research and development expense (R&D) to sales; CF is the ratio of cash flow to total assets; and σ^{IND} , industry sigma, is the mean of standard deviations of CF over 10 years for firms in the same 2-digit SIC industry. I also include industry dummies based on Kenneth French’s 17 industry definitions and a dividend dummy.⁶ τ refers to the fiscal year that ended between $t - 11$ and t , and all variables with the τ subscript thus use the most recent data available for firm i . ECM as of the end of month t is defined as the residual ϵ_{it} from this regression. This study focuses on the U.S. corporations in the 1960-2006 period with valid CRSP and Compustat data and excludes all financial firms (SICs = 6XXX) and utilities (SICs = 49XX).⁷

⁶Bates, Kahle, and Stulz (2009) use a similar regression specification to explain corporate cash holdings. The findings of this paper are robust to alternative reasonable definitions of excess cash, which I explore in Appendix B.

⁷None of the results are affected by retaining these firms; however, they could be misleading because financials (utilities) tend to hold a large (small) fraction of their assets in cash and equivalents.

Table 1 presents the results of regressions used to estimate excess cash measures. Similarly to OPSW who focus on the 1971-1994 period and to Bates, Kahle, and Stulz (2009, “BKS”) who study the 1980-2006 sample, I find that cash holdings increase with ratios of market equity to book equity, R&D to sales, cash flow to assets, as well as industry sigma, and decline with size, ratio of working capital to assets, and leverage. While OPSW and BKS observe that the effect of the ratio of capital expenditures to assets on cash holdings is sensitive to regression specifications, I document that it relates strongly negatively to cash holdings. Unlike OPSW and BKS, I find that in my extended sample dividend-paying firms maintain cash-to-assets ratios that are no different from those of non-dividend-paying companies.

B. Excess Cash and Firm Characteristics

To study the relationship between characteristics of firms and their excess cash levels, at the end of each calendar year τ , I assign companies into excess cash deciles and obtain the most recent values of the characteristics of interest for each firm. All accounting measures such as cash, book equity or debt of a given firm thus refer to the most recent year τ observation for that company.

Table 2 presents averages of the selected characteristics of each ECM decile.⁸ As one would expect, firms with higher ECM hold a significantly higher fraction of assets in cash: while companies in the highest ECM decile hold on average 42% of assets in cash, the comparable figure for firms in the lowest group is just 1.7%.

Cash is one of the safest assets, and it is commonly considered to be less risky than assets in place. It is thus natural to expect firms with higher ECM to have lower risk. Surprisingly, I find the opposite: Table 2 shows that firms’ risk, as proxied for by market beta, *increases* with excess cash.⁹ The relationship is surprisingly monotonic: firms in the lowest ECM quintile have an average beta of just 0.86 while those in the top group

⁸Median characteristics are qualitatively similar to averages and are reported in Table A1 in the Appendix.

⁹I calculate market beta as the sum of slope coefficients (Dimson, 1979) from regressions of daily excess stock returns in year τ on market excess return, its lead and its lag.

have risk measures that are nearly 20% higher, at 1.02.¹⁰ The difference between average loadings of high and low excess cash groups, at 0.16, is highly significant (t -statistic of 5.37). This positive relationship between excess cash and betas can be justified if excess cash proxies for the presence of risky growth options. In the following Section, I will provide further evidence supporting this explanation.

The next four columns of Table 2 examine the relationship between excess cash and book-to-market ratio, firm size, profitability, and cash flow. While each of these characteristics is lower for the decile of high ECM firms, there is no monotonic relationship between excess cash and either of the variables.¹¹ On average, firms in both high and low ECM deciles are smaller, have lower book-to-market ratio, and generate lower return on assets and lower cash flows relative to firms in the middle groups.

The last three columns of Table 2 illustrate the generally monotonic relationship between ECM and measures of debt, accruals, and asset growth. Leverage reaches 0.22 for low excess cash firms and gradually declines to 0.15 for companies with high excess cash. This negative relationship between excess cash and leverage is consistent with the idea that firms with limited access to debt financing may accumulate higher levels of cash to ensure they have enough resources to meet financial obligations. Table 2 further documents that firms that have experienced low accruals or high asset growth in the past tend to have higher ECMs. The monotonic relationships of excess cash with leverage, accruals, and asset growth are interesting, and I will take particular care in ensuring that the findings of this paper are not driven by either of these three characteristics.

¹⁰The fact that average betas are lower than unity is attributable to the fact that they are calculated as equal-weighted averages over all stocks with valid ECMs. This restricts the sample to firms with valid Compustat data and thus eliminates smaller stocks that tend to have higher betas.

¹¹Table 1 follows OPSW definition of market-to-book ratio (MB) in estimating excess cash, while Table 2 and all subsequent tables use the more conventional book-to-market ratio (BM), whose calculation is detailed in the Appendix. Excess cash is orthogonal to MB by definition and relates only weakly to BM, as Table 2 shows.

III. Excess Cash Holdings and Stock Returns

What relationship should exist between excess cash holdings and the performance of a company's stock? On the one hand, high excess cash levels may be indicative of managerial concerns about future operating cash flows and investment opportunities, hinting at a negative link between cash holdings and returns. On the other hand, in the presence of costly external financing firms may accumulate cash in anticipation of future investment opportunities, implying that cash can relate positively to risk and expected returns. The positive link between excess cash and market beta documented in the previous Section is in line with the latter argument. In this Section, I present additional evidence supporting this explanation by documenting a positive relationship between excess cash and future stock returns.

A. Future Raw Returns

I begin the empirical investigation by examining the performance of ten portfolios formed on the basis of excess cash level. In particular, at the end of every month t , I use all common stocks with fiscal years ending between $t - 15$ and $t - 4$ to assign stocks into quintiles based on their market betas calculated using daily data from $t - 15$ to $t - 4$. This sorting is done to filter out differences in betas documented in Table 2. Within each beta group, I then assign stocks into deciles d on the basis of their excess cash measures computed as of month $t - 4$.¹² Grouping all firms that fall into a given decile d results in ten ECM portfolios with approximately equal market exposure. The position taken in each company at the beginning of month $t + 1$ is equal to either \$1 (when computing equal-weighted returns) or to market capitalization of the firm as

¹²A commonly used approach in the literature is to assign stocks into groups based on data from fiscal year $\tau - 1$ and hold the resulting portfolios from July of year τ to June of $\tau + 1$. This lag of up to 18 months is excessive to capture a short-lived effect like that documented in this paper for ECM and future returns. For this reason, I assume that accounting data is publicly available four months after the fiscal year end. This approach is not uncommon: indeed, Haugen and Baker (1996) assume just a three-month lag. In unreported results, I use all post-1993 data available from the SEC via EDGAR to determine that just 1% of the companies in my sample file their 10-K reports later than 4 months following fiscal year end. Excluding those firms does not affect the results in the 1993-2006 subperiod.

of the end of month t (when computing value-weighted returns). I hold the position without rebalancing for 12 months starting in month $t + 1$.

Table 3 reports average returns and the corresponding t -statistics for each of the ECM deciles and for the difference between high and low ECM portfolios. The same message emerges both from full sample (1960-2006) and subsample (1960-1982 and 1983-2006) results: stocks with higher ECMs earn greater returns in the future. In the full sample, the spread in returns of high and low ECM deciles amounts to 0.40% per month, which is both statistically (t -statistic of 4.19) and economically significant. These results are similar in subperiods, with average return difference reaching 0.33% during 1960-1982 and 0.47% during 1983-2006.

Figure 1 plots the time series of monthly and cumulative log returns of the high minus low ECM portfolio. Monthly returns fluctuate in the range of $\pm 5\%$ between 1960 and late 1990s, but the portfolio experiences increased volatility and a substantial runup followed by a decline around the time of the dot-com bubble. The two most extreme returns occur in two consecutive months around the peak of the bubble (25.66% in February 2000 and -12.58% in March 2000).¹³

B. Fama-MacBeth Regressions

The positive relationship between excess cash holdings and future stock performance is intriguing, but as Table 2 shows, cash holdings are correlated with a number of firm characteristics known to relate to future returns. To ensure that excess cash measures do not simply proxy for such characteristics, I use Fama-MacBeth (1973) regressions to control for a number of variables previously linked to future stock returns. Table 4 presents average slope coefficients and the corresponding t -statistics from these monthly cross-sectional regressions of monthly returns on lagged ECM and other firm characteristics.

Regression (1) confirms the results of Table 3 by showing that excess cash holdings is

¹³In untabulated results, I find that excluding the dot-com bubble period from the sample does not alter the results of the paper.

a significant predictor of future stock returns. Regression (2) shows that controlling for market risk, size, and book-to-market does not diminish the ability of ECM to forecast stock returns. As in Fama and French (1992), beta is unrelated to, while firm size and book-to-market ratio are strongly related to future stock returns.

Table 2 documents a generally monotonic relationship between excess cash and both asset growth and accruals, but specifications (3) and (4) show that ECM remains a statistically significant predictor of returns after accounting for these variables.¹⁴ Similarly, specifications (5) through (9) show that controlling for investment, cash flow, leverage, momentum, and stock issuance does not eliminate the statistical significance of ECM. While investment, past returns, and share issuance are significant predictors of stock returns, ECM retains its forecasting power in their presence.¹⁵

Specification (10) shows that combining multiple predictor variables does not affect the ability of excess cash holdings to forecast returns. The average slope coefficient on ECM, at 0.074, is only slightly lower than that of regression (1) with no additional controls, and is statistically significant (t -statistic of 3.69).¹⁶ Excess cash measure is thus not simply proxying for other variables previously documented to relate to future stock returns but is rather a predictor different from those discussed earlier in the literature.

C. Risk-Adjusted Returns

I now examine whether higher returns earned by the firms with larger excess cash resources may be viewed as compensation for additional risk. I consider a strategy that each month buys the stocks in the top ECM decile, shorts those in the low ECM group, and holds the resulting position for 12 months. I conduct a series of unconditional regressions to find that neither market, nor 3- and 4-factor models, nor models that

¹⁴The negative relationship between asset growth and future returns is consistent with the findings of Cooper, Gulen, and Schill (2008). Sloan (1996) studies the link between accruals and future returns.

¹⁵Titman, Wei, and Xie (2004), Jegadeesh and Titman (1993), and Daniel and Titman (2006), among other, investigate the relationship between future returns and investment, momentum, and share issuance, respectively.

¹⁶In untabulated results, I find that raw cash does relate positively to future stock returns, although this result is weak in several Fama-MacBeth regression specifications.

include asset growth, accruals, and leverage factors can explain profitability of this portfolio.

1. Time Series Characteristics

Table 5 details the first four moments and other time series characteristics of returns of the high minus low ECM portfolio and several factors. I obtain the commonly used four factors (market, value, size, and momentum) from Kenneth French’s data library, and construct asset growth, accruals, and debt factors following the same procedure used to obtain ECM returns.¹⁷ Confirming the results of Table 3, the difference in returns between the portfolios of high and low excess cash firms amounts to 0.40% per month, a magnitude comparable to average return of the value factor. However, due to lower volatility of ECM portfolio returns, the strategy’s Sharpe ratio (0.18) is slightly above that of the value factor. ECM returns are considerably right skewed, with skewness (2.39) exceeding that of any other time series considered. Excess cash portfolio returns are also leptokurtic, with kurtosis comparable to that of size, momentum and asset growth factors.

For completeness, Table 5 presents the correlation matrix of returns of the ECM strategy and the factors. Excess cash portfolio exhibits positive correlation with market (correlation coefficient of 0.23), size (0.34), and momentum (0.14) returns, and is negatively correlated with value (−0.47), asset growth (−0.24), accruals (−0.17), and debt (−0.54) factors. Given these high correlations, it is particularly important to consider risk adjustment that controls for these factors, which is what I explore next.

¹⁷More precisely, I assign stocks into deciles on the basis of lagged asset growth, accruals, or debt. Each month I take a long position in the top decile while shorting the bottom group and hold the resulting portfolio for 12 months. The returns from such high minus low portfolios define the three factors.

2. Unconditional Risk Adjustment

Table 6 presents the results of the unconditional regressions of high minus low ECM portfolio returns on a number of factors. Specification (1) confirms that the high ECM decile outperforms the low ECM group by 0.40% per month (t -statistic of 4.19). Market model regression (2) shows that market excess return alone is insufficient to explain the profits of the investment strategy (alpha of 0.34%). Both the Fama-French (1993) 3-factor and the Carhart (1997) 4-factor models (regressions (3) and (4), respectively) only augment the returns of the strategy when compared to the case of no risk adjustment in specification (1). In particular, the 3-factor alpha amounts to 0.52% monthly (t -statistic of 6.10), while the 4-factor alpha stands at 0.47% (t -statistic of 5.36). The loading on the value factor is strongly negative, while the size and momentum betas are significantly positive.

Regressions (5) through (8) of Table 6 consider risk adjustment with asset growth, accruals, and debt factors. Specifications (5) and (6) show that the loadings on asset growth and, to a lesser degree, accruals factors are strongly negative. The R^2 values, however, are low, and the profitability of the ECM portfolio remains both statistically and economically meaningful. Interestingly, inclusion of the leverage factor alone in regression (7) produces a higher adjusted R^2 (29.21%) than does the 4-factor model. Yet, despite the high R^2 and a large loading on the debt factor, the returns of the high minus low ECM portfolio retain their significance (alpha of 0.46% with t -statistic of 5.74). Combining the three factors in specification (8) renders the accruals factor insignificant, but the high minus low ECM portfolio remains profitable (alpha of 0.33%).

Specification (9) considers both the commonly used four factors and the three factors I constructed to attempt to explain the returns of the ECM strategy. Each factor except momentum is statistically significant, and the adjusted R^2 of this specification is higher than that of any other regression considered, but the alpha remains both statistically and economically significant. Thus, neither the commonly used four factors, nor the asset growth, accruals and leverage factors can explain the profits from the investment

strategy that buys the stocks in the top ECM decile and shorts those in the bottom group.

It is tempting to infer a causal relationship between excess cash and future returns, but the profitability of the high minus low ECM portfolio should be interpreted with caution. I consider a number of commonly used models to explain the returns of the high minus low ECM portfolio, and while none of them are able to explain the profitability of the strategy, it may be more prudent to conclude that higher excess cash holdings correlate with, rather than cause, higher future returns.

D. Excess Cash Holdings and Market State

It seems reasonable to expect that cash is particularly valuable during times of economic slowdown, and to check this conjecture I study the relationship between excess cash and future returns conditional on the state of the market. I use market return as a proxy for whether general economic conditions are strong or poor, and assign each month from January 1960 to December 2006 into five groups based on the magnitude of market return in that month.

Table 7 explores the relationship between excess cash holdings and stock returns conditional on the market state. During the times with the lowest market returns, it is the stocks of firms with the highest excess cash that perform the worst (-6.27% per month for high excess cash stocks vs. -5.96% for the low-cash group). This is somewhat surprising as it may be intuitive to expect cash to be particularly beneficial during economic downturns. During such times, access to credit may be tight, cash flows may be low, and holding excess cash may prove especially valuable. However, this finding is consistent with the idea that firms build up cash reserves in anticipation of investment opportunities: in down markets, the value of such growth options is likely to fall, resulting in lower stock returns for firms with high excess cash.

In other states of the market, the picture reverses: during such times, high excess cash firms outperform their low-cash peers. In the best state of the market ('High'),

the spread in returns of high and low ECM portfolios amounts to 1.08% per month. This is consistent with more abundant investment opportunities present during the times of economic expansion. High ECM firms have readily available resources to take advantage of such opportunities, while those with low excess cash either cannot afford to make similar investments, or may be forced to obtain funds through costly external financing.

IV. Excess Cash, Investment, and Profitability

If high excess cash holdings do in fact proxy for growth opportunities, as the empirical results presented thus far suggest, it is natural to ask whether high excess cash firms invest more in the future than do their peers with lower holdings. In this Section, I show that investment increases with the level of excess cash for up to ten years following portfolio assignment. However, I find no relationship between excess cash and future profitability, hinting at a possibility of overinvestment by high excess cash firms.

For each of the five excess cash quintiles, Figure 2 presents average ratios of investment to total assets measured in the year of portfolio assignment and in each of the following ten years.¹⁸ The five groups report comparable levels of investment in the year of the sort, but the differences in investment among them become striking beginning the following year. The conclusions are similar whether I use all firms (Panel A) or consider just those that survive for the entire ten years (Panel B): future investment increases dramatically with the level of excess cash. One year after portfolio assignment, high excess cash companies invest on average an amount equal to 13.8% of their assets, while the comparable numbers for the middle and low groups are 10.7% and 9%, respectively. What is even more intriguing is that this shock to investment decays very slowly: indeed, in each of the following ten years average investment of the top group exceeds that of the low-cash firms. Five years following the sort, high excess cash companies invest

¹⁸For ease of exposition, the figures use ECM quintiles rather than deciles. The results are qualitatively similar when deciles are used.

on average 11.9% of assets while the firms in the bottom group invest just 9.6%. Only ten years after portfolio assignment do the differences in investment activity between the two groups revert to year 0 level.

In related research, Riddick and Whited (2009) use theory and simulation to show that in the presence of positively correlated income shocks, firms that generate high cash flow find it more valuable to invest this cash flow rather than keep it as savings.¹⁹ Empirically, Riddick and Whited focus on cash *flows*, rather than cash levels, and confirm that firms with high cash flows tend to save less. By contrast, I focus on companies with different excess cash *levels* and observe that even controlling for differences in past cash flows, firms with unusually high levels of cash tend to invest more in the future than do firms with lower excess cash.

The research questions addressed in Riddick and Whited’s work and in this paper are different, but the findings of the two papers are nonetheless related. This can be seen by recognizing that while high cash flow firms tend to save a smaller fraction of their cash flow, they also tend to hold a higher fraction of assets as cash.²⁰ Evidence of a positive relationship between cash flow and cash level is provided in Table 1 of this paper and in Table 4 of Opler, Pinkowitz, Stulz, and Williamson (1999). Thus a positive relationship exists among cash flow, cash level and future investment, and the observations of Riddick and Whited are consistent with the findings of this paper: high cash flow firms tend to hold more cash and invest more in the future.²¹

How profitable are the investments that high ECM firms undertake? Figure 3 depicts average return on assets of each excess cash quintile. Regardless of whether I use all firms (Panel A) or study just those that are present in the sample for the entire ten years

¹⁹Gamba and Triantis (2008) relax several assumptions of Riddick and Whited and find that cash flow is frequently used to increase a firm’s cash holdings (i.e., positive propensity to save).

²⁰Company A that saves a lower fraction of its cash flow may hold a greater fraction of assets in cash than company B that saves a greater part of its cash flow if, for example, A starts the prior period with greater fraction of assets in cash than does B.

²¹The findings of this Section also relate to the work of Gopalan, Kadan, and Pevzner (2009) who document a positive relationship between firm asset liquidity and stock liquidity. Among other things, they show that this relationship is weaker when deployment uncertainty is high, which happens when a manager is expected to transform liquid assets such as cash into illiquid assets such as investments.

(Panel B), the conclusion is similar: there is no monotonic relationship between excess cash holdings and future profitability. In fact, firms in the high excess cash group are on average the least profitable in each of the ten years following portfolio assignment.²²

These findings can be interpreted as indicative of overinvestment by high excess cash companies and can be viewed as evidence of suboptimal cash holdings: long-term profitability of high excess cash firms suffers due to costs of holding cash and overinvestment; earnings of companies in the bottom group are low due to cash shortfalls; but profitability of firms in the middle group is the strongest as these companies choose a cash level that is neither too low nor excessive. Indeed, firms in the third quintile report on average the highest return on assets during the ten years following portfolio assignment.

Table 8 summarizes average profitability, investment activity, and cash holdings of high and low excess cash groups during the ten years before and after the year of portfolio inclusion. The differences in profitability and investment of the two groups are stable during the ten years leading up to year 0 and become more pronounced beginning in year 1. Cash holdings, on the other hand, exhibit very interesting dynamics both before and after portfolio inclusion. Average cash-to-assets ratio of the high ECM firms increases monotonically each year τ , from 0.19 in $\tau = -10$ to 0.34 in $\tau = 0$, and then monotonically declines to 0.17 in $\tau = 10$. The dynamics of cash holdings of the low ECM group are exactly opposite: their cash-to-assets ratio falls from 0.09 in $\tau = -10$ to 0.02 in $\tau = 0$ and then rises to 0.07 in $\tau = 10$. These patterns in cash holdings, coupled with the investment dynamics, are consistent with the idea that low excess cash firms either lack investment opportunities or lack liquid resources to take advantage of such opportunities, while high excess cash firms gradually build up their cash reserves and then use their savings for investment purposes.

²²The positive link between excess cash and future 12-month returns is particularly interesting given the lack of relationship between excess cash and profitability over the following decade. However, in unreported results I find that starting two years following portfolio assignment, stocks of high excess cash firms do not perform significantly differently from those of low excess cash firms.

V. Conclusion

This paper documents a positive relationship between corporate excess cash holdings and future stock returns. Firms with high excess cash outperform their low-cash peers by 0.40% per month. Neither market, nor 3- and 4-factor asset pricing models can explain this difference in returns. Contrary to the intuition that cash is particularly valuable in market downturns, I find that in such times stocks of firms with high excess cash perform worse than those of companies with lower levels. Although cash is less risky than assets in place, I show that high excess cash firms have larger market betas. Finally, I find that future investment activity is strongly and positively related to excess cash, with differences in investment persisting for up to ten years, but observe no significant relationship between excess cash and future profitability.

The empirical evidence thus suggests that firms build cash reserves in anticipation of future investment. These firms have or are acquiring growth options, as is reflected by their higher market betas; they are therefore riskier than their low excess cash peers and earn higher returns. During market downturns, growth options of high excess cash firms become less valuable, as is reflected in their lower returns during such times, while during expansions, these companies have readily available resources to take advantage of investment opportunities. In the future, high excess cash firms exercise their growth options as is evidenced by their dramatically higher investment spending over the following years.

Some findings of this paper are puzzling and warrant further research. In particular, it is interesting that high excess cash firms exhibit poor accounting performance over the course of a decade following portfolio assignment. If overinvestment is the reason for poor profitability of such companies, the results of this paper raise questions about proper use of resources by the firms with large excess cash balances and, more generally, about the ability of managers to pick optimal levels of cash holdings.

Appendix

A. Data Definitions

Book equity used to calculate book-to-market ratio BM is defined following Davis, Fama, and French (2000) as stockholders' book equity, plus balance sheet deferred taxes, plus investment tax credit, less the redemption value of preferred stock. If redemption value of preferred stock is not available, I use its liquidation value. If stockholders' equity value is not on Compustat, I compute it as sum of book value of common equity and the value of preferred stock. Finally, if these items are not available, stockholders' equity is measured as the difference between total assets and total liabilities.

Size is calculated as the log of real (CPI-adjusted) total assets.

Cash flow, CF , is operating income before depreciation less interest less dividends less taxes divided by total assets.

Profitability is proxied for by the return on assets, ROA , calculated following Cooper, Gulen, and Schill (2008) as operating income before depreciation over total assets.

Debt is computed similar to Titman, Wei, and Xie (2004) as the ratio of long-term debt to long-term debt plus market value of equity.

Investment, I , is defined as capital expenditures plus acquisitions less sale of property, plant and equipment, divided by total assets.

Accruals, $Accr$, is estimated following Cooper, Gulen, and Schill (2008) as [(change in current assets - change in cash) - (change in current liabilities - change in short-term debt - change in taxes payable) - depreciation expense] / average total assets.

Asset growth, Ag , is the ratio of total assets to lagged total assets minus one.

Issue is measured following Daniel and Titman (2006), as $Ln[ME_{t-1}/ME_{t-36}] - RU36$, where ME_t is market capitalization as of the end of month t , and $RU36$ is the 3-year buy-and-hold return ending in month $t - 1$.

B. Alternative Definitions of Excess Cash

Definition of excess cash as a residual from cross-sectional regression follows from the prior literature and is very appealing, as it accounts for a wide number of variables that affect corporate cash holdings. To address any concerns about the sensitivity of the results to this particular way of estimating excess cash, I now show that the empirical conclusions of this paper are robust to alternative measures of excess cash. In particular, I first propose a modified regression specification to estimate ECM and then discuss an approach that does not require running a regression to obtain excess cash. In untabulated results, I also confirm that the findings presented in this paper are robust to omitting variables that have been found to relate to future returns (e.g., market-to-book ratio) from the cross-sectional regressions used to define excess cash.

1. Modified Regression Specification

A potential concern with the regression used in Section II is that it scales or transforms the explanatory variables in a number of different ways. For example, some regressors are logs of levels (Size), some are scaled by assets (e.g., CF), while others are scaled by sales (RD). To ensure that the results of this paper are not driven by this particular specification, I now explore an alternative approach that uses log transformations of all variables. More specifically, to obtain an excess cash measure for stock i in month t , I again use all stocks that have fiscal year ends between $t - 11$ and t , but run a different cross-sectional regression each month t :

$$\ln C_{it} = \gamma_{0t} + \gamma_{1t} \ln ME_{it} + \gamma_{2t} \ln A_{it} + \gamma_{3t} \ln CPX_{it} + \gamma_{4t} \ln WC_{it} + \gamma_{5t} \ln LTD_{it} + \gamma_{6t} \ln CF_{it} + \gamma_{7t} \ln(\sigma_{it}^{\text{IND}}) + \epsilon_{it},$$

where $\ln C$ is log of cash level, $\ln ME$ is log of market equity, $\ln A$ is log of real assets, $\ln CPX$ is log of capital expenditures level, $\ln WC$ is log of level of net working capital calculated without cash, $\ln LTD$ is log of level of long-term debt, $\ln CF$ is log of cash flow level, and $\ln(\sigma_{it}^{\text{IND}})$ is log of industry sigma. As before, I include dividend and industry dummies.²³

Table A2 presents the results of this modified regression specification. As one would expect, bigger firms tend to hold higher levels of cash. Consistent with the results of Table 1, firms with larger capital expenditures, working capital, and long-term debt tend to hold less cash, while those with higher cash flows and greater industry sigma hold higher levels of cash. As in Table 1, cash holdings of dividend-paying companies are not statistically different from those of non-dividend-paying firms.

Table A3 reports average value- and equal-weighted returns of the ten ECM portfolios, formed in the same manner as described in Section III but using the alternative excess cash definition. The results are remarkably consistent with those presented in Table 3: firms with high excess cash outperform those with low values by 0.37% per month (0.38% when equal-weighted returns are used). This amount is both statistically (t -statistics of 4.84 and 5.12 for value- and equal-weighted results) and economically significant. As before, this result is robust in subperiods, with the difference in returns of high and low excess cash groups amounting to 0.44% during 1960-1982 and reaching 0.30% during 1983-2006 subperiod (0.43% and 0.33%, respectively, when returns are equal-weighted).

To ensure that excess cash does not simply proxy for other variables known to relate to future returns, I perform Fama-MacBeth regressions controlling for a number of firm

²³I do not include research and development expenditures as an additional explanatory variable because many companies report a zero R&D level. Including this variable in a log form as is done with other regressors will dramatically (by more than 50%) decrease the sample size. In unreported results that include log R&D level as a regressor, I find that the conclusions of this paper still hold.

characteristics that have been previously found to predict stock returns. The results of these regressions, presented in Table A4, are in line with those presented in Table 4: excess cash retains its stock return forecasting ability even after controlling for size, book-to-market ratio, asset growth, and other firm characteristics.

In unreported results, I use the alternative excess cash measure introduced in this Section to confirm the findings presented in other tables, but omit them for brevity. In particular, I find that high excess cash firms are riskier than their low-cash peers, where risk is proxied for by market beta (as in Table 2); that neither market, nor 3- and 4-factor asset pricing models, nor models that include asset growth, accruals, and leverage factors can explain the difference in returns between high and low excess cash groups (as in Table 6); that high excess cash firms perform worse than their low-cash peers in down markets (as in Table 7); and that future investment activity increases with, while future profitability is unrelated to excess cash (as in Table 8 and Figures 2 and 3).

2. Simplified Excess Cash Definition

Estimation of excess cash as a residual from cross-sectional regressions is attractive because it controls for a number of variables that affect corporate cash holdings. However, one may be concerned that the empirical conclusions of this paper are sensitive to this estimation method. I now propose a simplified approach of computing ECM that does not rely on conducting regressions.

I estimate this alternative excess cash measure for a given firm as the difference between log of ratio of cash to total assets of this firm and log of median ratio of cash to total assets of all firms in the same size decile and in the same 2-digit SIC industry. Stocks are then assigned into ten portfolios in a manner similar to that outlined in Section III. This method is very straightforward, although, unlike the approach employed throughout the paper, it clearly does not account for a number of other important determinants of cash holdings. The purpose of this simpler method is to demonstrate the robustness of the empirical results by showing that even a less elaborate measure of excess cash retains the ability to forecast stock returns.

Table A5 presents average returns and the corresponding t -statistics for each ECM decile and for the difference between high and low ECM groups. Consistent with the results of Table 3, firms with higher ECM earn greater stock returns in the future. Over the entire 1960-2006 period, the difference in value-weighted (equal-weighted) returns of high and low excess cash deciles amounts to 0.34% (0.44%) per month with corresponding t -statistic of 4.13 (4.72). The difference in returns retains its statistical and economic significance in both subperiods considered, with value-weighted (equal-weighted) returns averaging 0.34% and 0.34% (0.36% and 0.50%) in the 1960-1982 and 1983-2006 subperiods, respectively.

To test the robustness of the positive link between the measure of excess cash discussed in this Section and future stock performance, I perform Fama-MacBeth regressions to control for a number of variables related to future stock returns. Table A6 delivers a message similar to that of Table 4: excess cash holdings is a robust predictor of future stock returns even after controlling for market beta, book-to-market ratio, size, asset growth, accruals, investment, cash flow, leverage, momentum, and share issuance. Excess cash measure retains its significance in each of the specifications considered.

As with the modified regression specification, in unreported results I confirm the robustness of other empirical findings presented in the paper but omit them for brevity.

C. Additional Robustness Tests

1. Results Obtained Using Equal-Weighted Returns

The empirical findings of this paper are similar regardless of whether I use value- or equal-weighted returns. To keep the presentation focused, in the main body of the paper, I study value-weighted returns. I now summarize the results obtained using equal-weighted returns.

Table A7 presents average returns of each ECM decile and of the portfolio long high excess cash firms and short the low ECM group. High excess cash firms robustly outperform their low-cash peers: in the full sample, the difference in returns between top and bottom ECM deciles is 0.45% per month (t -statistic of 4.56). The difference in returns is also statistically and economically significant in the subsamples, amounting to 0.32% during 1960-1982 and reaching 0.58% during 1983-2006.

The results of unconditional regressions of returns from the high minus low ECM portfolio on the commonly used four factors (market, value, size, and momentum) and the three factors I constructed (asset growth, accruals, and leverage) are presented in Table A8. The results are similar to those presented in Table 6: profitability of the high minus low ECM strategy remains significant in each regression specification.

Finally, Table A9 confirms that high excess cash firms underperform their low-cash counterparts in the worst states of the market. The difference in equal-weighted returns of high and low ECM deciles is -0.17% during such times. During market upturns, on the other hand, high excess cash firms outperform the low-cash group. During the best state of the market ('High'), the difference in returns amounts to over 1% monthly.

2. ECM Returns Conditional on Book-to-Market, Size, and Debt

In this Section of the Appendix, I confirm the robustness of the empirical relationship between excess cash and future returns by showing that returns of high excess cash firms exceed those of their low-cash peers regardless of which book-to-market, size, and

leverage group the firms belong to. Book-to-market ratio is commonly interpreted as a proxy for growth options, and the empirical results of this paper are consistent with the notion that excess cash also proxies for growth opportunities. It is thus interesting to explore whether high excess cash stocks outperform their low excess cash peers in different book-to-market groups. It is also pertinent to explore the relationship between excess cash and future returns conditional on firm size: smaller firms arguably have more restricted access to capital markets than do larger ones, and it is natural to conjecture that excess cash is particularly valuable for smaller companies. Finally, in valuation settings, cash is often viewed as negative debt, and it is interesting to ask whether the link between excess cash and future returns depends of firm leverage.

To explore whether high excess cash firms outperform the low-cash group regardless of book-to-market, size, or leverage, I assign stocks into ECM deciles and independently sort them into tertiles based on either book-to-market ratio, size, or debt. The results are similar regardless of whether value-weighted (Table A10) or equal-weighted returns (Table A11) are used, and I will focus the discussion on the value-weighted case.

Panel A of Table A10 assigns stocks into groups conditional on both book-to-market ratio and ECM. Regardless of which book-to-market group the firms belong to, high excess cash companies generate higher returns than do their peers with lower excess cash. The difference in high minus low ECM returns amounts to 0.45% per month for the low book-to-market firms and to 0.29% for the high book-to-market group. This confirms that the relationship between excess cash and future returns is not driven by differences in book-to-market ratios.

Panel B illustrates that while the relationship between excess cash and future stock returns is particularly pronounced for smaller firms, it is also present for the larger ones. In particular, the difference in returns of high and low ECM groups amounts to 0.81% per month for the smallest stocks, and to a lower but sizeable 0.18% per month for their larger counterparts. This observation is consistent with the intuition that smaller stocks are considerably more sensitive to shocks to cash holdings and lack easy access to external financing: in times of economic downturns smaller stocks with low cash may run into trouble due to slowing business and lack of access to credit, while in times of economic expansion these firms may not have enough resources to take on profitable investment opportunities. Their high excess cash peers, on the other hand, are better suited to withstand economic hardships and to take advantage of the booming times when investment opportunities abound.

Under the simplifying assumption of absence of transaction costs or other frictions associated with debt financing, cash can be viewed simply as negative debt. Panel C of Table A10, however, points out that this characterization is not empirically accurate: future returns increase with the level of excess cash in each leverage group considered, with the difference in returns of high and low ECM deciles amounting to 0.27% for the least levered companies and to 0.46% for the firms with high debt ratios.

References

- [1] Almeida, Heitor, Murillo Campello, and Michael S. Weisbach, 2004, The cash flow sensitivity of cash, *Journal of Finance* 59, 1777-1804.
- [2] Anderson, Christopher W., and Luis Garcia-Feijóo, 2006, Empirical evidence on capital investment, growth options, and security returns, *Journal of Finance* 61, 171-194.
- [3] Bates, Thomas W., Kathleen M. Kahle, and René Stulz, 2009, Why do U.S. firms hold so much more cash than they used to? *Journal of Finance* 65, 1985-2021.
- [4] Berk, Jonathan, Richard C. Green, and Vasant Naik, 1999, Optimal investment, growth options, and security returns, *Journal of Finance* 54, 1553-1607.
- [5] Carhart, Mark M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57-82.
- [6] Carlson, Murray, Adlai Fisher, and Ron Giammarino, 2004, Corporate investment and asset price dynamics: Implications for the cross-section of returns, *Journal of Finance* 59, 2577-2603.
- [7] Carlson, Murray, Adlai Fisher, and Ron Giammarino, 2006, Corporate investment and asset price dynamics: Implications for SEO event studies and long-run performance, *Journal of Finance* 61, 1009-1034.
- [8] Cooper, Michael J., Huseyin Gulen, and Michael J. Schill, 2008, Asset growth and the cross-section of stock returns, *Journal of Finance* 63, 1609-1651.
- [9] Daniel, Kent, and Sheridan Titman, 2006, Market reactions to tangible and intangible information, *Journal of Finance* 61, 1605-1643.
- [10] Davis, James L., Eugene F. Fama, and Kenneth R. French, 2000, Characteristics, covariances, and average returns: 1929 to 1997, *Journal of Finance* 55: 389-406.
- [11] Dimson, Elroy, 1979, Risk measurement when shares are subject to infrequent trading, *Journal of Financial Economics* 7, 197-226.
- [12] Dittmar, Amy, and Jan Mahrt-Smith, 2007, Corporate governance and the value of cash holdings, *Journal of Financial Economics* 83, 599-634.
- [13] Fama, Eugene F., and Kenneth R. French, 1992, The cross-section of expected stock returns, *Journal of Finance* 47, 427-465.

- [14] Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.
- [15] Fama, Eugene F., and James D. MacBeth, 1973, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 81, 607-636.
- [16] Faulkender, Michael, and Rong Wang, 2006, Corporate financial policy and the value of cash, *Journal of Finance* 61, 1957-1990.
- [17] Foley, C. Fritz, Jay C. Hartzell, Sheridan Titman, and Garry Twite, 2007, Why do firms hold so much cash? A tax-based explanation, *Journal of Financial Economics* 86, 579-607.
- [18] Gamba, Andrea, and Alexander Triantis, 2008, The value of financial flexibility, *Journal of Finance* 63, 2263-2296.
- [19] Gomes, João, Leonid Kogan, and Lu Zhang, 2003, Equilibrium cross-section of returns, *Journal of Political Economy* 111, 693-732.
- [20] Gopalan, Radhakrishnan, Ohad Kadan, and Mikhail Pevzner, 2009, Managerial decisions, asset liquidity, and stock liquidity, Working Paper, Washington University, St. Louis.
- [21] Harford, Jarrad, Wayne Mikkelsen, and M. Megan Partch, 2003, The effect of cash reserves on corporate investment and performance in industry downturns, Working Paper, University of Washington.
- [22] Haugen, Robert A., and Nardin L. Baker, 1996, Commonality in the determinants of expected stock returns, *Journal of Financial Economics* 41, 401-439.
- [23] Jegadeesh, Narasimhan, and Sheridan Titman, 1993, Returns to buying winners and selling losers: Implications for stock-market efficiency, *Journal of Finance* 48, 65-91.
- [24] Kim, Chang-Soo, David C. Mauer, and Ann E. Sherman, 1998, The determinants of corporate liquidity: Theory and evidence, *Journal of Financial and Quantitative Analysis* 33, 335-359.
- [25] Mikkelsen, Wayne H., and M. Megan Partch, 2003, Do persistent large cash reserves hinder performance? *Journal of Financial and Quantitative Analysis* 38: 275-294.
- [26] Nikolov, Boris, 2008, Cash holdings and competition, Working Paper, Ecole Polytechnique Fédérale de Lausanne.

- [27] Opler, Tim, Lee Pinkowitz, René Stulz, and Rohan Williamson, 1999, The determinants and implications of cash holdings, *Journal of Financial Economics* 52, 3-46.
- [28] Palazzo, Dino, 2009, Firm's cash holdings and the cross-section of equity returns, Working Paper, New York University.
- [29] Pinkowitz, Lee, René Stulz, and Rohan Williamson, 2006, Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis, *Journal of Finance* 61, 2725-2751.
- [30] Pinkowitz, Lee and Rohan Williamson, 2004, What is a dollar worth? The market value of cash holdings, Working Paper, Georgetown University.
- [31] Riddick, Leigh A., and Toni M. Whited, 2009, The corporate propensity to save, *Journal of Finance*, Forthcoming.
- [32] Sloan, Richard G., 1996, Do stock prices fully reflect information in accruals and cash flows about future earnings? *Accounting Review* 71, 289-315.
- [33] Titman, Sheridan, K. C. John Wei, and Feixue Xie, 2004, Capital investments and stock returns, *Journal of Financial and Quantitative Analysis* 39, 677-700.
- [34] Zhang, Lu, 2005, The value premium, *Journal of Finance* 60, 67-103.

TABLE 1. – DETERMINANTS OF CASH HOLDINGS

	Slope	<i>t</i> -stat
Intercept	-2.370	-51.243
MB	0.122	17.754
Size	-0.074	-14.249
CPX	-1.984	-11.201
WC	-1.345	-13.456
LTD	-1.881	-18.572
RD	0.519	2.653
CF	0.726	4.691
σ^{IND}	4.873	11.184
Div	0.006	0.155
R^2	23.413	

Notes: This table reports the results of the cross-sectional regressions used to estimate excess cash measures. Excess cash for firm i as of the end of month t is estimated as the residual ϵ_{it} from the cross-sectional regression

$$C_{i\tau} = \gamma_{0t} + \gamma_{1t}MB_{i\tau} + \gamma_{2t}Size_{i\tau} + \gamma_{3t}CPX_{i\tau} + \gamma_{4t}WC_{i\tau} + \gamma_{5t}LTD_{i\tau} + \gamma_{6t}RD_{i\tau} + \gamma_{7t}CF_{i\tau} + \gamma_{8t}\sigma_{i\tau}^{\text{IND}} + \epsilon_{it},$$

where C is the log of ratio of cash to total assets less cash; market-to-book ratio MB is measured as the book value of assets, less the book value of equity, plus the market value of equity, divided by assets; $Size$ is the log of real (adjusted by CPI) assets; CPX is the ratio of capital expenditures to assets; WC is the ratio of net working capital calculated without cash to assets; LTD is the ratio of long-term debt to assets; RD is the ratio of research and development expenses to sales; CF is defined as operating income before depreciation less interest less dividends less taxes divided by total assets; and σ^{IND} is the mean of standard deviations of CF over 10 years for firms in the same 2-digit SIC industry. Regressions also include a dividend dummy, Div , and industry dummies based on Kenneth French's 17 industry definitions. Each cross-sectional regression uses all firms that have fiscal year ends between $t - 11$ and t . τ refers to the fiscal year ending between $t - 11$ and t . All variables with the τ subscript thus use the most recent data for firm i . Reported are average coefficients of December cross-sectional regressions, corresponding t -statistics, and average adjusted R^2 values. Sample period is 1960-2006.

TABLE 2. – CHARACTERISTICS OF ECM DECILES

ECM	Cash	β	BM	Size	ROA	CF	Debt	Accr	Ag
Low	0.017	0.861	-0.444	-0.336	0.057	-0.014	0.217	-0.027	0.140
2	0.031	0.900	-0.364	0.099	0.099	0.029	0.229	-0.019	0.147
3	0.045	0.928	-0.367	0.245	0.106	0.035	0.233	-0.017	0.151
4	0.064	0.942	-0.375	0.272	0.107	0.035	0.236	-0.024	0.157
5	0.087	0.954	-0.376	0.263	0.106	0.033	0.227	-0.025	0.187
6	0.113	0.971	-0.397	0.300	0.112	0.037	0.215	-0.028	0.142
7	0.147	0.993	-0.394	0.306	0.113	0.036	0.205	-0.029	0.160
8	0.193	1.005	-0.413	0.232	0.109	0.032	0.189	-0.032	0.153
9	0.258	1.037	-0.449	0.093	0.097	0.019	0.178	-0.034	0.173
High	0.420	1.024	-0.551	-0.469	0.042	-0.036	0.154	-0.040	0.232
High-Low	0.403	0.162	-0.107	-0.133	-0.015	-0.021	-0.063	-0.013	0.093
	[19.08]	[5.37]	[4.44]	[5.28]	[2.58]	[5.18]	[12.26]	[3.80]	[4.56]

Notes: This table reports selected average characteristics of each excess cash measure (ECM) decile, to which firms are assigned as of the end of each calendar year τ . Cash is the most recently available ratio of cash to total assets; β is beta obtained from market model regressions using daily data from year τ with one lead and lag of market excess return; BM is the log of book-to-market ratio, measured as in Davis, Fama, and French (2000); Size is the log of real (adjusted by CPI) assets; ROA is operating income before depreciation over assets; CF is operating income before depreciation less interest less dividends less taxes over total assets; Debt is measured as the ratio of long-term debt to long-term debt plus market value of equity; Accr, Accruals, is calculated as [(change in current assets - change in cash) - (change in current liabilities - change in short-term debt - change in taxes payable) - depreciation expense] / average total assets; and Ag is asset growth defined as the ratio of total assets to lagged total assets minus one. t -statistics for the difference between High and Low values are reported in square brackets. Sample period is 1960-2006.

TABLE 3. – ECM DECILE PORTFOLIO RETURNS

Period	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
1960-2006	0.852 [3.66]	0.939 [4.03]	1.060 [4.53]	1.105 [4.72]	1.107 [4.64]	1.185 [4.89]	1.176 [4.88]	1.249 [5.13]	1.255 [4.99]	1.253 [4.68]	0.401 [4.19]
1960-1982	0.913 [2.60]	0.949 [2.69]	1.085 [3.10]	1.123 [3.20]	1.060 [2.96]	1.113 [3.19]	1.127 [3.34]	1.200 [3.58]	1.255 [3.67]	1.242 [3.54]	0.330 [3.51]
1983-2006	0.794 [2.57]	0.929 [3.02]	1.036 [3.31]	1.088 [3.48]	1.152 [3.63]	1.254 [3.72]	1.223 [3.55]	1.296 [3.67]	1.255 [3.41]	1.262 [3.14]	0.469 [2.85]

Notes: This table reports average raw value-weighted returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles as well as for the difference between deciles of high and low ECM for different time periods. Stocks are first sorted into quintiles based on market betas, and then into ECM deciles within each beta quintile. At the beginning of each month t , an investment is made in the stocks that were assigned to a particular ECM decile as of the end of month $t - 5$, and the position is held without rebalancing for the following 12 months.

TABLE 4. – FAMA-MACBETH REGRESSION RESULTS

	ECM	β	BM	ME	Ag	Accr	I	CF	Debt	RU12	Issue
(1)	0.084 [3.78]										
(2)	0.105 [5.34]	-0.117 [1.14]	0.177 [3.46]	-0.151 [3.24]							
(3)	0.093 [4.24]				-0.668 [6.06]						
(4)	0.067 [2.95]					-2.254 [7.42]					
(5)	0.067 [2.93]						-1.411 [3.83]				
(6)	0.084 [3.93]							0.171 [0.29]			
(7)	0.088 [4.25]								0.350 [1.70]		
(8)	0.079 [3.81]									0.310 [1.97]	
(9)	0.079 [3.57]										-0.600 [4.59]
(10)	0.074 [3.69]	-0.061 [0.68]	0.085 [1.94]	-0.182 [4.46]	-0.410 [4.08]	-1.784 [6.17]	-0.097 [0.32]	1.157 [2.71]	-0.119 [0.71]	0.149 [1.10]	-0.328 [3.42]

Notes: This table reports the results of Fama-MacBeth regressions. Every month stock returns in month t , in percent, are regressed on ECM, excess cash measure; β is beta obtained from market model regressions using daily data from $t - 16$ to $t - 5$ with one lead and lag of market excess return; BM, log of book-to-market ratio, measured as in Davis, Fama, and French (2000); ME, log of market capitalization measured as of the end of $t - 1$; Ag, asset growth, defined as the ratio of total assets to lagged total assets minus one; Accr, Accruals, calculated as [(change in current assets - change in cash) - (change in current liabilities - change in short-term debt - change in taxes payable) - depreciation expense] / average total assets; I, Investment, defined as capital expenditures plus acquisitions less sale of property, plant and equipment, divided by total assets; CF, cash flow, computed as operating income before depreciation less interest less dividends less taxes over total assets; Debt, estimated as the ratio of long-term debt to long-term debt plus market value of equity; RU12, 12-month ($t - 12$ to $t - 1$) compounded return; and Issue, measured as $\ln[ME_{t-1}/ME_{t-36}] - RU36$, where ME_t is market capitalization as of the end of month t , and $RU36$ is the 3-year buy-and-hold return ending in month $t - 1$. Reported are average coefficients and t -statistics. Accounting data is taken from annual report for the fiscal year ending between $t - 16$ and $t - 5$. ECM is computed as of the end of month $t - 5$. Sample period is 1960-2006.

TABLE 5. – TIME SERIES CHARACTERISTICS

	ECM	MKT	HML	SMB	UMD	AGF	ACCRF	DEBTF
MEAN	0.40	0.93	0.47	0.22	0.83	-0.83	-0.69	0.18
STD	2.27	4.35	2.85	3.16	3.91	3.82	2.57	3.62
SHARPE	0.18	0.21	0.16	0.07	0.21	-0.22	-0.27	0.05
SKEW	2.39	-0.47	0.02	0.54	-0.65	-1.35	-0.28	-1.19
KURT	5.19	2.02	2.61	5.77	5.70	6.41	2.17	12.57
MIN	-12.58	-22.54	-12.40	-16.79	-25.06	-28.41	-11.34	-31.72
MAX	25.66	16.56	13.85	21.96	18.39	10.85	9.57	14.29
Correlation Coefficients								
ECM	1.00	0.23	-0.47	0.34	0.14	-0.24	-0.17	-0.54
MKT	0.23	1.00	-0.41	0.30	-0.07	0.14	0.13	-0.12
HML	-0.47	-0.41	1.00	-0.28	-0.12	-0.23	-0.19	0.67
SMB	0.34	0.30	-0.28	1.00	0.01	-0.30	0.01	-0.13
UMD	0.14	-0.07	-0.12	0.01	1.00	0.01	-0.09	-0.21
AGF	-0.24	0.14	-0.23	-0.30	0.01	1.00	0.57	0.01
ACCRF	-0.17	0.13	-0.19	0.01	-0.09	0.57	1.00	0.01
DEBTF	-0.54	-0.12	0.67	-0.13	-0.21	0.01	0.01	1.00

Notes: This table reports selected time series characteristics of the monthly returns (in percent) of portfolio of high minus low excess cash measure deciles (ECM), value-weighted market index (MKT), as well as value (HML), size (SMB), momentum (UMD), asset growth (AGF), accruals (ACCRF), and Debt (DEBTF) factors. Returns of AGF, ACCRF, and DEBTF factors are calculated by taking a value-weighted long position in the decile of stocks with the highest Ag, Accr, and Debt measures, respectively, and an offsetting short position in the decile of stocks with the lowest values. Reported are averages, standard deviations, Sharpe ratios, skewness, kurtosis, as well as lowest and highest monthly returns. The bottom eight rows report correlation coefficients. Sample period is 1960-2006.

TABLE 6. – UNCONDITIONAL RISK ADJUSTMENT

	Intercept	Mktrf	HML	SMB	UMD	AGF	ACCRF	DEBTF	R ²
(1)	0.401 [4.19]								
(2)	0.344 [3.67]	0.119 [5.57]							5.06
(3)	0.518 [6.10]	-0.003 [0.15]	-0.325 [10.13]	0.162 [5.84]					26.16
(4)	0.468 [5.36]	0.003 [0.16]	-0.313 [9.66]	0.162 [5.84]	0.049 [2.32]				26.73
(5)	0.281 [2.96]					-0.144 [5.90]			5.66
(6)	0.298 [3.05]						-0.150 [4.08]		2.70
(7)	0.462 [5.74]							-0.340 [15.27]	29.21
(8)	0.330 [4.10]					-0.124 [5.03]	-0.042 [1.13]	-0.338 [15.82]	34.67
(9)	0.291 [3.67]	0.053 [2.76]	-0.160 [3.84]	0.104 [3.76]	0.020 [1.05]	-0.115 [4.30]	-0.096 [2.68]	-0.229 [7.87]	42.59

Notes: This table reports the results of unconditional regressions of returns (in percent per month) from High minus Low excess cash measure (ECM) portfolio (value-weighted returns are used) on market excess return (Mktrf), value (HML), size (SMB), momentum (UMD), asset growth (AGF), accruals (ACCRF), and leverage (DEBTF) factors. Mktrf, HML, SMB, and UMD are from Kenneth French's data library. Returns of AGF, ACCRF, and DEBTF factors are calculated by taking a value-weighted long position in the decile of stocks with the highest Ag, Accr, and Debt measures, respectively, and an offsetting short position in the decile of stocks with the lowest values. Reported are regression coefficients, t -statistics, and adjusted R² values. Sample period is 1960-2006.

TABLE 7. – ECM DECILE PORTFOLIO RETURNS CONDITIONAL ON MARKET STATE

Mkt	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
Low	-5.961 [13.30]	-6.135 [13.74]	-6.076 [13.64]	-6.096 [13.88]	-6.181 [14.23]	-6.101 [13.69]	-6.146 [14.09]	-6.024 [13.50]	-6.165 [13.66]	-6.274 [12.81]	-0.313 [1.78]
2	-1.689 [7.68]	-1.501 [7.27]	-1.496 [7.75]	-1.521 [7.54]	-1.475 [7.32]	-1.581 [7.47]	-1.424 [7.04]	-1.316 [6.23]	-1.423 [6.23]	-1.546 [6.62]	0.143 [1.03]
3	1.276 [5.52]	1.408 [6.84]	1.522 [7.22]	1.687 [8.25]	1.667 [7.87]	1.685 [7.50]	1.572 [7.72]	1.545 [8.33]	1.618 [6.93]	1.588 [6.43]	0.312 [2.26]
4	3.888 [14.84]	3.745 [15.87]	4.129 [17.80]	4.124 [17.78]	4.154 [16.58]	4.387 [15.19]	4.406 [14.39]	4.443 [13.05]	4.672 [12.60]	4.660 [10.60]	0.772 [2.67]
High	6.686 [18.26]	7.115 [20.65]	7.159 [20.76]	7.269 [22.30]	7.305 [19.79]	7.470 [21.98]	7.409 [21.62]	7.535 [21.19]	7.507 [20.51]	7.768 [17.63]	1.082 [4.20]

Notes: This table reports average value-weighted returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles as well as for the difference between deciles of high and low ECM for each market return group. To determine market return quintiles, months from January 1960 to December 2006 are assigned into 5 groups based on market return in that month. Sample period is 1960-2006.

TABLE 8. – ANNUAL PROFITABILITY, INVESTMENT ACTIVITY, AND
CASH HOLDINGS AROUND INCLUSION INTO HIGH OR LOW ECM GROUPS

Rel Yr	High ECM			Low ECM		
	ROA	Inv	Cash	ROA	Inv	Cash
-10	0.151	0.100	0.188	0.142	0.097	0.087
-9	0.147	0.103	0.194	0.137	0.097	0.086
-8	0.140	0.107	0.199	0.134	0.097	0.084
-7	0.137	0.108	0.206	0.131	0.101	0.081
-6	0.130	0.110	0.213	0.128	0.103	0.079
-5	0.123	0.113	0.221	0.124	0.106	0.074
-4	0.112	0.115	0.231	0.119	0.108	0.068
-3	0.104	0.115	0.246	0.114	0.107	0.063
-2	0.095	0.116	0.266	0.106	0.108	0.057
-1	0.085	0.116	0.293	0.098	0.109	0.046
0	0.070	0.119	0.339	0.078	0.107	0.024
1	0.061	0.138	0.278	0.097	0.090	0.043
2	0.069	0.128	0.250	0.106	0.091	0.051
3	0.079	0.123	0.231	0.110	0.092	0.056
4	0.079	0.121	0.218	0.115	0.093	0.060
5	0.083	0.119	0.206	0.117	0.096	0.063
6	0.094	0.115	0.196	0.120	0.096	0.065
7	0.099	0.113	0.188	0.120	0.096	0.067
8	0.096	0.110	0.182	0.122	0.096	0.069
9	0.098	0.110	0.174	0.123	0.096	0.070
10	0.106	0.106	0.169	0.126	0.097	0.073

Notes: This table reports average return on assets (ROA), investment-to-assets ratios (Inv), and cash-to-assets ratios (Cash) of high and low excess cash measure (ECM) quintiles in each of the 10 years preceding and following inclusion in the corresponding ECM portfolio. Sample period is 1960-2006.

TABLE A1. – MEDIAN CHARACTERISTICS OF ECM DECILES

ECM	Cash	β	BM	Size	ROA	CF	Debt	Accr	Ag
Low	0.011	0.821	-0.344	-0.553	0.114	0.055	0.167	-0.026	0.062
2	0.023	0.866	-0.297	-0.048	0.127	0.062	0.189	-0.023	0.069
3	0.033	0.888	-0.321	0.122	0.130	0.064	0.194	-0.022	0.073
4	0.048	0.912	-0.330	0.139	0.131	0.064	0.192	-0.027	0.075
5	0.068	0.912	-0.341	0.174	0.133	0.066	0.177	-0.028	0.075
6	0.095	0.922	-0.381	0.171	0.136	0.067	0.156	-0.031	0.076
7	0.128	0.937	-0.402	0.163	0.137	0.067	0.140	-0.032	0.081
8	0.173	0.941	-0.435	0.053	0.137	0.065	0.120	-0.034	0.082
9	0.243	0.981	-0.504	-0.085	0.132	0.061	0.096	-0.035	0.090
High	0.420	0.959	-0.553	-0.611	0.088	0.023	0.052	-0.033	0.077
High-Low	0.409	0.138	-0.210	-0.058	-0.026	-0.032	-0.115	-0.007	0.016
	[15.88]	[4.48]	[7.40]	[1.95]	[3.68]	[6.01]	[19.57]	[2.63]	[2.39]

Notes: This table reports selected median characteristics of each excess cash measure (ECM) decile, to which firms are assigned as of the end of each calendar year τ . Cash is the most recently available ratio of cash to total assets; β is beta obtained from market model regressions using daily data from year τ with one lead and lag of market excess return; BM is the log of book-to-market ratio, measured as in Davis, Fama, and French (2000); Size is the log of real (adjusted by CPI) assets; ROA is operating income before depreciation over assets; CF is operating income before depreciation less interest less dividends less taxes over total assets; Debt is measured as the ratio of long-term debt to long-term debt plus market value of equity; Accr, Accruals, is calculated as [(change in current assets - change in cash) - (change in current liabilities - change in short-term debt - change in taxes payable) - depreciation expense] / average total assets; and Ag is asset growth defined as the ratio of total assets to lagged total assets minus one. t -statistics for the difference between High and Low values are reported in square brackets. Sample period is 1960-2006.

TABLE A2. – DETERMINANTS OF CASH HOLDINGS:
MODIFIED REGRESSION SPECIFICATION

	Slope	<i>t</i> -stat
Intercept	1.253	6.410
lnME	0.177	16.355
lnA	1.292	62.501
lnCPX	-0.114	-7.988
lnWC	-0.197	-24.769
lnLTD	-0.210	-13.130
lnCF	0.051	5.034
ln(σ^{IND})	0.230	9.041
Div	0.023	1.222
R ²	73.187	

Notes: This table reports the results of the modified cross-sectional regressions used to estimate excess cash measures. Excess cash for firm i as of the end of month t is estimated as the residual ϵ_{it} from the cross-sectional regression

$$\ln C_{i\tau} = \gamma_{0t} + \gamma_{1t} \ln \text{ME}_{i\tau} + \gamma_{2t} \ln \text{A}_{i\tau} + \gamma_{3t} \ln \text{CPX}_{i\tau} + \gamma_{4t} \ln \text{WC}_{i\tau} + \gamma_{5t} \ln \text{LTD}_{i\tau} + \gamma_{6t} \ln \text{CF}_{i\tau} + \gamma_{7t} \ln(\sigma_{i\tau}^{\text{IND}}) + \epsilon_{it},$$

where $\ln C$ is log of cash level, $\ln \text{ME}$ is log of market equity, $\ln \text{A}$ is log of real assets, $\ln \text{CPX}$ is log of capital expenditures level, $\ln \text{WC}$ is log of level of net working capital calculated without cash, $\ln \text{LTD}$ is log of level of long-term debt, $\ln \text{CF}$ is log of cash flow level, and $\ln(\sigma_{i\tau}^{\text{IND}})$ is the log of industry sigma. Regressions also include a dividend dummy, Div, and industry dummies based on Kenneth French's 17 industry definitions. Each cross-sectional regression uses all firms that have fiscal year ends between $t - 11$ and t . τ refers to the fiscal year ending between $t - 11$ and t . All variables with the τ subscript thus use the most recent data for firm i . Reported are average coefficients of December cross-sectional regressions, corresponding t -statistics, and average adjusted R² values. Sample period is 1960-2006.

TABLE A3. – ECM DECILE PORTFOLIO RETURNS:
MODIFIED REGRESSION SPECIFICATION

Period	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
A. Value-Weighted											
1960-2006	0.979 [4.40]	1.080 [4.68]	1.030 [4.55]	1.083 [4.71]	1.126 [4.95]	1.247 [5.44]	1.219 [5.27]	1.257 [5.45]	1.300 [5.57]	1.348 [5.68]	0.369 [4.84]
1960-1982	0.911 [2.63]	1.032 [2.90]	0.957 [2.76]	1.029 [2.93]	1.105 [3.17]	1.142 [3.29]	1.060 [3.10]	1.075 [3.15]	1.190 [3.57]	1.349 [3.86]	0.438 [5.40]
1983-2006	1.043 [3.69]	1.125 [3.80]	1.100 [3.75]	1.134 [3.79]	1.145 [3.88]	1.348 [4.47]	1.372 [4.38]	1.432 [4.59]	1.405 [4.30]	1.347 [4.18]	0.304 [2.38]
B. Equal-Weighted											
1960-2006	1.045 [4.50]	1.166 [4.89]	1.131 [4.80]	1.133 [4.80]	1.228 [5.16]	1.360 [5.69]	1.316 [5.42]	1.353 [5.65]	1.405 [5.79]	1.427 [5.93]	0.382 [5.12]
1960-1982	0.995 [2.70]	1.187 [3.18]	1.033 [2.84]	1.115 [3.04]	1.246 [3.35]	1.279 [3.47]	1.161 [3.16]	1.196 [3.30]	1.318 [3.67]	1.429 [3.91]	0.434 [4.94]
1983-2006	1.094 [3.80]	1.145 [3.81]	1.225 [4.04]	1.151 [3.83]	1.211 [4.03]	1.437 [4.67]	1.465 [4.57]	1.503 [4.78]	1.488 [4.53]	1.426 [4.52]	0.332 [2.78]

Notes: This table reports average value-weighted (in Panel A) and equal-weighted (in Panel B) returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles as well as for the difference between deciles of high and low ECM for different time periods. Excess cash for firm i is defined as the residual from a modified regression specification described in Appendix B.1. Stocks are first sorted into quintiles based on market betas, and then into ECM deciles within each beta quintile. At the beginning of each month t , an investment is made in the stocks that were assigned to a particular ECM decile as of the end of month $t - 5$, and the position is held without rebalancing for the following 12 months.

TABLE A4. – FAMA-MACBETH REGRESSION RESULTS:
MODIFIED REGRESSION SPECIFICATION

	ECM	β	BM	ME	Ag	Accr	I	CF	Debt	RU12	Issue
(1)	0.109 [5.51]										
(2)	0.111 [5.87]	-0.175 [1.70]	0.136 [3.79]	-0.102 [2.59]							
(3)	0.115 [5.84]				-0.945 [7.96]						
(4)	0.076 [3.75]					-3.552 [10.21]					
(5)	0.092 [4.51]						-1.845 [4.73]				
(6)	0.115 [6.31]							0.339 [0.47]			
(7)	0.114 [6.51]								0.532 [2.47]		
(8)	0.100 [5.78]									0.546 [3.51]	
(9)	0.110 [5.95]										-0.698 [5.84]
(10)	0.064 [3.18]	-0.062 [0.67]	0.075 [2.25]	-0.142 [3.74]	-0.472 [3.92]	-2.654 [7.96]	-0.372 [1.06]	1.316 [2.19]	0.057 [0.33]	0.377 [2.80]	-0.376 [4.17]

Notes: This table reports the results of Fama-MacBeth regressions. Every month stock returns in month t , in percent, are regressed on ECM, excess cash measure defined as the residual from a modified regression specification described in Appendix B.1; β is beta obtained from market model regressions using daily data from $t-16$ to $t-5$ with one lead and lag of market excess return; BM, log of book-to-market ratio, measured as in Davis, Fama, and French (2000); ME, log of market capitalization measured as of the end of $t-1$; Ag, asset growth, defined as the ratio of total assets to lagged total assets minus one; Accr, Accruals, calculated as [(change in current assets - change in cash) - (change in current liabilities - change in short-term debt - change in taxes payable) - depreciation expense] / average total assets; I, Investment, defined as capital expenditures plus acquisitions less sale of property, plant and equipment, divided by total assets; CF, cash flow, computed as operating income before depreciation less interest less dividends less taxes over total assets; Debt, estimated as the ratio of long-term debt to long-term debt plus market value of equity; RU12, 12-month ($t-12$ to $t-1$) compounded return; and Issue, measured as $\ln[ME_{t-1}/ME_{t-36}] - RU36$, where ME_t is market capitalization as of the end of month t , and $RU36$ is the 3-year buy-and-hold return ending in month $t-1$. Reported are average coefficients and t -statistics. Accounting data is taken from annual report for the fiscal year ending between $t-16$ and $t-5$. ECM is computed as of the end of month $t-5$. Sample period is 1960-2006.

TABLE A5. – ECM DECILE PORTFOLIO RETURNS:
SIMPLIFIED EXCESS CASH DEFINITION

Period	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
A. Value-Weighted											
1960-2006	0.880 [3.80]	1.005 [4.24]	1.087 [4.55]	1.082 [4.60]	1.193 [4.83]	1.170 [4.86]	1.192 [4.68]	1.232 [4.85]	1.211 [4.83]	1.221 [4.85]	0.341 [4.13]
1960-1982	0.916 [2.60]	1.003 [2.81]	1.043 [2.90]	1.000 [2.90]	1.138 [3.15]	1.207 [3.41]	1.220 [3.50]	1.205 [3.51]	1.204 [3.59]	1.261 [3.59]	0.344 [4.15]
1983-2006	0.845 [2.78]	1.008 [3.20]	1.129 [3.56]	1.160 [3.61]	1.247 [3.67]	1.136 [3.45]	1.164 [3.13]	1.257 [3.36]	1.218 [3.27]	1.183 [3.28]	0.338 [2.40]
B. Equal-Weighted											
1960-2006	0.980 [3.99]	1.058 [4.26]	1.200 [4.76]	1.204 [4.86]	1.303 [5.03]	1.276 [5.01]	1.277 [4.75]	1.360 [5.13]	1.314 [4.96]	1.414 [5.33]	0.435 [4.72]
1960-1982	1.064 [2.81]	1.091 [2.90]	1.184 [3.11]	1.152 [3.12]	1.246 [3.30]	1.345 [3.55]	1.331 [3.55]	1.373 [3.73]	1.317 [3.67]	1.427 [3.83]	0.363 [3.87]
1983-2006	0.899 [2.83]	1.025 [3.15]	1.215 [3.64]	1.255 [3.76]	1.358 [3.81]	1.211 [3.53]	1.225 [3.18]	1.347 [3.52]	1.312 [3.37]	1.403 [3.71]	0.503 [3.22]

Notes: This table reports average value-weighted (in Panel A) and equal-weighted (in Panel B) returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles as well as for the difference between deciles of high and low ECM for different time periods. Excess cash for firm i is defined as the difference between log cash-to-assets ratio of that firm and log of median cash-to-assets ratio of all firms in the same size decile of the industry in which firm i belongs. Stocks are first sorted into quintiles based on market betas, and then into ECM deciles within each beta quintile. At the beginning of each month t , an investment is made in the stocks that were assigned to a particular ECM decile as of the end of month $t - 5$, and the position is held without rebalancing for the following 12 months.

TABLE A6. – FAMA-MACBETH REGRESSION RESULTS:
SIMPLIFIED EXCESS CASH DEFINITION

	ECM	β	BM	ME	Ag	Accr	I	CF	Debt	RU12	Issue
(1)	0.105 [4.55]										
(2)	0.113 [5.53]	-0.140 [1.36]	0.139 [3.81]	-0.156 [3.30]							
(3)	0.109 [4.80]				-0.740 [7.36]						
(4)	0.088 [3.81]					-2.348 [8.08]					
(5)	0.099 [4.12]						-1.119 [3.31]				
(6)	0.118 [5.92]							0.221 [0.39]			
(7)	0.137 [7.05]								0.393 [1.94]		
(8)	0.104 [5.26]									0.320 [2.03]	
(9)	0.109 [5.02]										-0.616 [4.90]
(10)	0.090 [4.56]	-0.072 [0.79]	0.057 [2.06]	-0.181 [4.56]	-0.394 [4.38]	-1.872 [6.76]	-0.022 [0.08]	1.116 [2.91]	0.021 [0.13]	0.173 [1.30]	-0.411 [4.73]

Notes: This table reports the results of Fama-MacBeth regressions. Excess cash for firm i is defined as the difference between log cash-to-assets ratio of that firm and log of median cash-to-assets ratio of all firms in the same size decile of the industry in which firm i belongs. Every month stock returns in month t , in percent, are regressed on ECM, excess cash measure; β is beta obtained from market model regressions using daily data from $t-16$ to $t-5$ with one lead and lag of market excess return; BM, log of book-to-market ratio, measured as in Davis, Fama, and French (2000); ME, log of market capitalization measured as of the end of $t-1$; Ag, asset growth, defined as the ratio of total assets to lagged total assets minus one; Accr, Accruals, calculated as [(change in current assets - change in cash) - (change in current liabilities - change in short-term debt - change in taxes payable) - depreciation expense] / average total assets; I, Investment, defined as capital expenditures plus acquisitions less sale of property, plant and equipment, divided by total assets; CF, cash flow, computed as operating income before depreciation less interest less dividends less taxes over total assets; Debt, estimated as the ratio of long-term debt to long-term debt plus market value of equity; RU12, 12-month ($t-12$ to $t-1$) compounded return; and Issue, measured as $\ln[ME_{t-1}/ME_{t-36}] - RU36$, where ME_t is market capitalization as of the end of month t , and $RU36$ is the 3-year buy-and-hold return ending in month $t-1$. Reported are average coefficients and t -statistics. Accounting data is taken from annual report for the fiscal year ending between $t-16$ and $t-5$. ECM is computed as of the end of month $t-5$. Sample period is 1960-2006.

TABLE A7. – ECM DECILE PORTFOLIO EQUAL-WEIGHTED RETURNS

Period	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
1960-2006	0.958 [3.76]	0.998 [4.06]	1.176 [4.76]	1.207 [4.88]	1.243 [4.93]	1.272 [5.01]	1.268 [5.03]	1.378 [5.39]	1.348 [5.18]	1.409 [5.08]	0.451 [4.56]
1960-1982	1.063 [2.82]	1.015 [2.74]	1.208 [3.25]	1.251 [3.38]	1.219 [3.21]	1.263 [3.41]	1.211 [3.36]	1.332 [3.70]	1.387 [3.82]	1.378 [3.70]	0.315 [3.04]
1983-2006	0.858 [2.50]	0.981 [3.01]	1.145 [3.50]	1.165 [3.52]	1.266 [3.78]	1.280 [3.68]	1.323 [3.74]	1.423 [3.91]	1.311 [3.52]	1.439 [3.50]	0.581 [3.50]

Notes: This table reports average equal-weighted returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles as well as for the difference between deciles of high and low ECM for different time periods. Stocks are first sorted into quintiles based on market betas, and then into ECM deciles within each beta quintile. At the beginning of each month t , an investment is made in the stocks that were assigned to a particular ECM decile as of the end of month $t - 5$, and the position is held without rebalancing for the following 12 months.

TABLE A8. – UNCONDITIONAL RISK ADJUSTMENT:
EQUAL-WEIGHTED RETURNS

	Intercept	Mktrf	HML	SMB	UMD	AGF	ACCRF	DEBTF	R ²
(1)	0.451 [4.56]								
(2)	0.399 [4.09]	0.108 [4.87]							3.87
(3)	0.571 [6.12]	0.012 [0.51]	-0.303 [8.61]	0.073 [2.39]					16.87
(4)	0.521 [5.43]	0.018 [0.79]	-0.291 [8.18]	0.072 [2.37]	0.050 [2.13]				17.39
(5)	0.390 [3.85]					-0.060 [2.47]			0.90
(6)	0.418 [4.09]						-0.045 [1.26]		0.10
(7)	0.507 [5.81]							-0.309 [12.77]	22.35
(8)	0.469 [5.17]					-0.049 [1.78]	0.017 [0.41]	-0.306 [12.63]	22.61
(9)	0.436 [4.69]	0.055 [2.47]	-0.127 [2.97]	0.038 [1.21]	0.026 [1.17]	-0.063 [2.12]	0.005 [0.14]	-0.228 [7.47]	26.71

Notes: This table reports the results of unconditional regressions of returns (in percent per month) from High minus Low excess cash measure (ECM) portfolio (equal-weighted returns are used) on market excess return (Mktrf), value (HML), size (SMB), momentum (UMD), asset growth (AGF), accruals (ACCRF), and leverage (DEBTF) factors. Mktrf, HML, SMB, and UMD are from Kenneth French's data library. AGF, ACCRF, and DEBTF factors are calculated by taking an equal-weighted long position in the decile of stocks with the highest Ag, Accr, and Debt measures, respectively, and an offsetting short position in the decile of stocks with the lowest values. Reported are regression coefficients, *t*-statistics, and adjusted R² values. Sample period is 1960-2006.

TABLE A9. – ECM DECILE PORTFOLIO EQUAL-WEIGHTED RETURNS
CONDITIONAL ON MARKET STATE

Mkt	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
Low	-5.941 [11.95]	-6.083 [12.70]	-6.010 [12.56]	-5.998 [12.30]	-6.028 [12.66]	-6.100 [12.57]	-6.078 [12.97]	-5.939 [12.32]	-6.053 [12.64]	-6.112 [11.85]	-0.170 [1.07]
2	-1.620 [5.22]	-1.348 [5.14]	-1.284 [5.28]	-1.485 [6.13]	-1.358 [5.55]	-1.442 [5.82]	-1.279 [5.34]	-1.196 [4.63]	-1.207 [4.75]	-1.308 [4.85]	0.313 [1.75]
3	1.520 [4.80]	1.430 [5.47]	1.668 [6.33]	1.867 [7.04]	1.848 [6.69]	1.844 [6.56]	1.698 [6.65]	1.800 [7.51]	1.712 [6.09]	1.762 [5.91]	0.242 [1.45]
4	4.194 [11.25]	3.984 [12.86]	4.327 [14.21]	4.400 [14.41]	4.461 [13.40]	4.645 [13.90]	4.623 [12.54]	4.665 [11.78]	4.876 [11.38]	4.926 [9.93]	0.732 [2.49]
High	6.579 [15.15]	6.942 [16.87]	7.112 [17.53]	7.189 [18.98]	7.227 [17.07]	7.347 [18.88]	7.311 [18.50]	7.496 [18.45]	7.348 [17.92]	7.711 [16.03]	1.132 [4.42]

Notes: This table reports average equal-weighted returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles as well as for the difference between deciles of high and low ECM for each market return group. To determine market return quintiles, months from January 1960 to December 2006 are assigned into 5 groups based on market return in that month. Sample period is 1960-2006.

TABLE A10. – ECM DECILE PORTFOLIO RETURNS
CONDITIONAL ON BM, SIZE, AND DEBT: VALUE-WEIGHTED RETURNS

	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
A. Returns Conditional on Book-to-Market											
Low	0.382 [1.40]	0.587 [2.21]	0.734 [2.74]	0.840 [3.16]	0.833 [3.13]	0.776 [2.86]	0.910 [3.38]	0.973 [3.58]	0.986 [3.34]	0.835 [2.75]	0.453 [3.43]
Medium	0.931 [4.18]	0.989 [4.29]	1.049 [4.50]	1.140 [4.87]	1.018 [4.29]	1.303 [5.43]	1.246 [5.14]	1.292 [5.26]	1.343 [5.54]	1.495 [5.51]	0.564 [4.10]
High	1.344 [5.76]	1.257 [5.49]	1.434 [6.27]	1.363 [5.87]	1.559 [6.50]	1.565 [6.43]	1.501 [6.33]	1.659 [7.05]	1.541 [6.69]	1.636 [6.75]	0.292 [2.52]
B. Returns Conditional on Size											
Low	0.482 [1.45]	0.810 [2.60]	0.990 [3.28]	1.256 [4.01]	1.084 [3.49]	1.136 [3.60]	1.154 [3.77]	1.320 [4.16]	1.324 [3.94]	1.293 [3.82]	0.811 [4.97]
Medium	0.832 [3.14]	0.874 [3.39]	1.098 [4.17]	1.041 [3.99]	1.212 [4.62]	1.260 [4.79]	1.171 [4.31]	1.227 [4.50]	1.357 [4.95]	1.361 [4.54]	0.529 [3.52]
High	0.957 [4.59]	1.000 [4.66]	1.029 [4.83]	1.059 [4.93]	1.040 [4.75]	1.143 [5.25]	1.194 [5.58]	1.233 [5.79]	1.166 [5.28]	1.135 [4.89]	0.178 [1.79]
C. Returns Conditional on Debt											
Low	0.914 [3.57]	0.952 [3.84]	1.059 [4.27]	1.238 [5.03]	1.094 [4.40]	1.084 [4.33]	1.122 [4.43]	1.053 [3.94]	1.135 [4.16]	1.182 [4.08]	0.268 [2.00]
Medium	0.914 [3.99]	0.987 [4.34]	1.115 [4.91]	1.155 [4.97]	1.164 [4.97]	1.315 [5.51]	1.195 [5.11]	1.353 [5.78]	1.428 [5.67]	1.436 [5.18]	0.522 [3.09]
High	0.653 [2.59]	0.778 [3.06]	0.963 [3.79]	0.888 [3.48]	1.035 [3.91]	1.132 [4.25]	1.171 [4.49]	1.238 [4.67]	1.229 [4.64]	1.115 [3.80]	0.462 [2.98]

Notes: This table reports average value-weighted returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles conditional on book-to-market, size, and debt. Stocks are assigned into ECM deciles and are independently sorted into tertiles based on either the ratio of book-to-market, measured as in Davis, Fama, and French (2000), or on size, measured as CPI-adjusted total assets, or on debt, measured as the ratio of long-term debt to long-term debt plus market value of equity. Sample period is 1960-2006.

TABLE A11. – ECM DECILE PORTFOLIO RETURNS
CONDITIONAL ON BM, SIZE, AND DEBT: EQUAL-WEIGHTED RETURNS

	Low	ECM2	ECM3	ECM4	ECM5	ECM6	ECM7	ECM8	ECM9	High	High-Low
A. Returns Conditional on Book-to-Market											
Low	0.431 [1.43]	0.533 [1.87]	0.812 [2.78]	0.833 [2.92]	0.860 [3.04]	0.715 [2.50]	0.913 [3.21]	1.002 [3.50]	1.033 [3.38]	0.873 [2.77]	0.442 [3.16]
Medium	0.972 [3.90]	1.012 [4.17]	1.110 [4.52]	1.226 [4.92]	1.071 [4.27]	1.334 [5.25]	1.290 [5.06]	1.336 [5.15]	1.383 [5.43]	1.635 [5.60]	0.663 [4.28]
High	1.474 [5.93]	1.377 [5.67]	1.578 [6.62]	1.494 [6.16]	1.734 [6.83]	1.723 [6.74]	1.638 [6.55]	1.818 [7.30]	1.647 [6.84]	1.830 [7.19]	0.356 [2.69]
B. Returns Conditional on Size											
Low	0.944 [2.78]	1.065 [3.45]	1.326 [4.36]	1.482 [4.74]	1.354 [4.32]	1.323 [4.26]	1.343 [4.38]	1.518 [4.80]	1.447 [4.39]	1.570 [4.67]	0.626 [3.66]
Medium	0.901 [3.39]	0.892 [3.48]	1.122 [4.25]	1.065 [4.09]	1.278 [4.86]	1.300 [4.97]	1.197 [4.46]	1.336 [4.90]	1.396 [5.18]	1.448 [4.84]	0.547 [3.52]
High	0.992 [4.60]	1.014 [4.59]	1.040 [4.80]	1.060 [4.83]	1.071 [4.79]	1.167 [5.22]	1.247 [5.68]	1.249 [5.77]	1.191 [5.34]	1.168 [5.03]	0.176 [1.78]
C. Returns Conditional on Debt											
Low	1.004 [3.63]	1.085 [4.14]	1.210 [4.65]	1.356 [5.26]	1.255 [4.73]	1.177 [4.52]	1.219 [4.56]	1.128 [4.08]	1.282 [4.60]	1.346 [4.43]	0.342 [2.34]
Medium	1.049 [4.19]	1.012 [4.18]	1.209 [5.03]	1.261 [5.03]	1.307 [5.26]	1.393 [5.42]	1.286 [5.20]	1.444 [5.82]	1.468 [5.55]	1.585 [5.42]	0.536 [2.94]
High	0.816 [2.89]	0.884 [3.28]	1.044 [3.91]	1.003 [3.70]	1.155 [4.17]	1.199 [4.36]	1.276 [4.72]	1.347 [4.90]	1.356 [4.92]	1.249 [4.13]	0.433 [2.63]

Notes: This table reports average equal-weighted returns, in percent per month, and the corresponding t -statistics for different excess cash measure (ECM) deciles conditional on book-to-market, size, and debt. Stocks are assigned into ECM deciles and are independently sorted into tertiles based on either the ratio of book-to-market, measured as in Davis, Fama, and French (2000), or on size, measured as CPI-adjusted total assets, or on debt, measured as the ratio of long-term debt to long-term debt plus market value of equity. Sample period is 1960-2006.

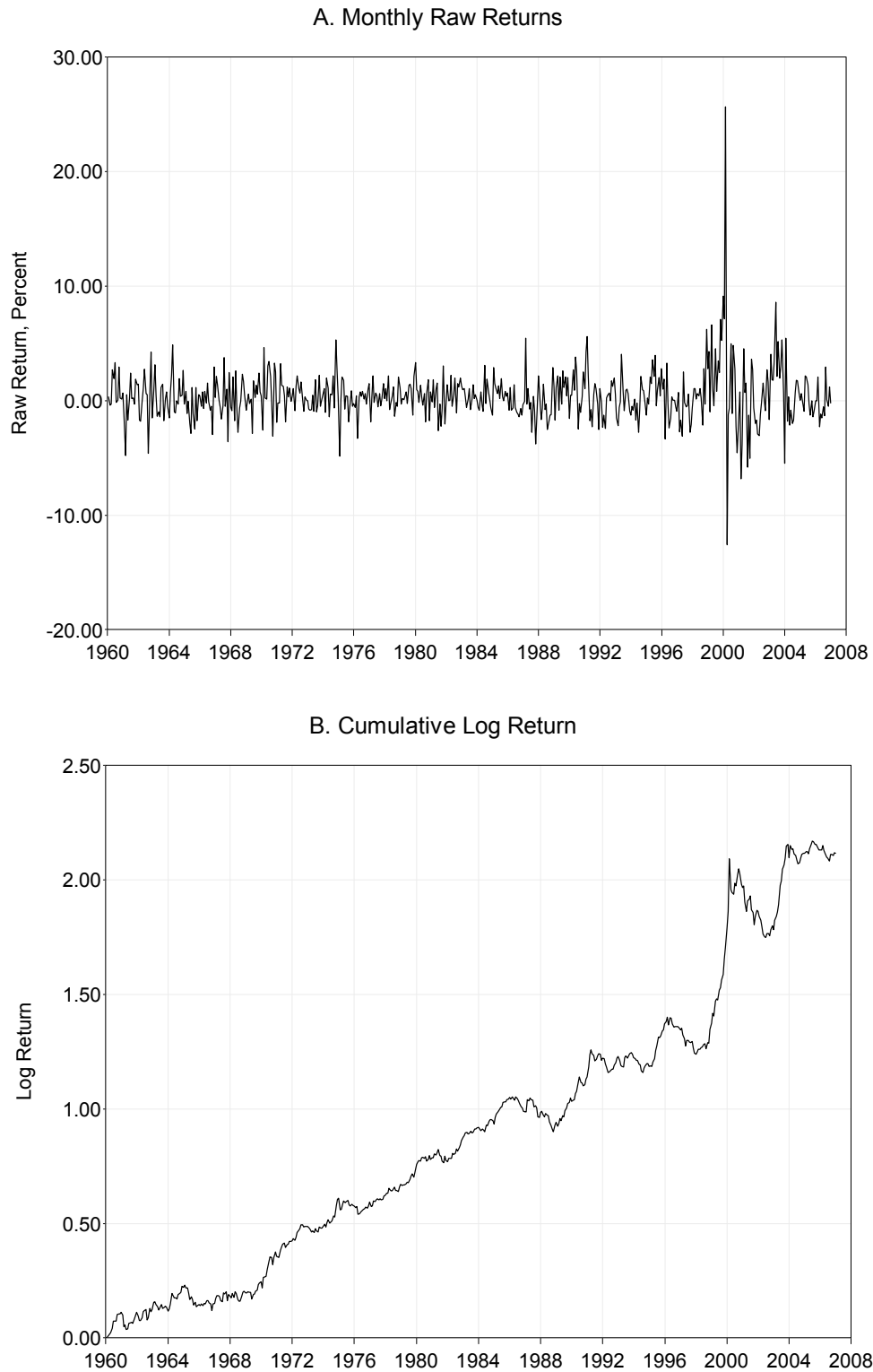


Figure 1. – Time Series of High Minus Low ECM Portfolio Returns. This figure plots in Panel A average raw monthly returns (in percent) of the portfolio that is long the decile of high excess cash firms and short the decile of low excess cash firms. Panel B shows log of cumulative monthly return of this portfolio. Sample period is 1960-2006.

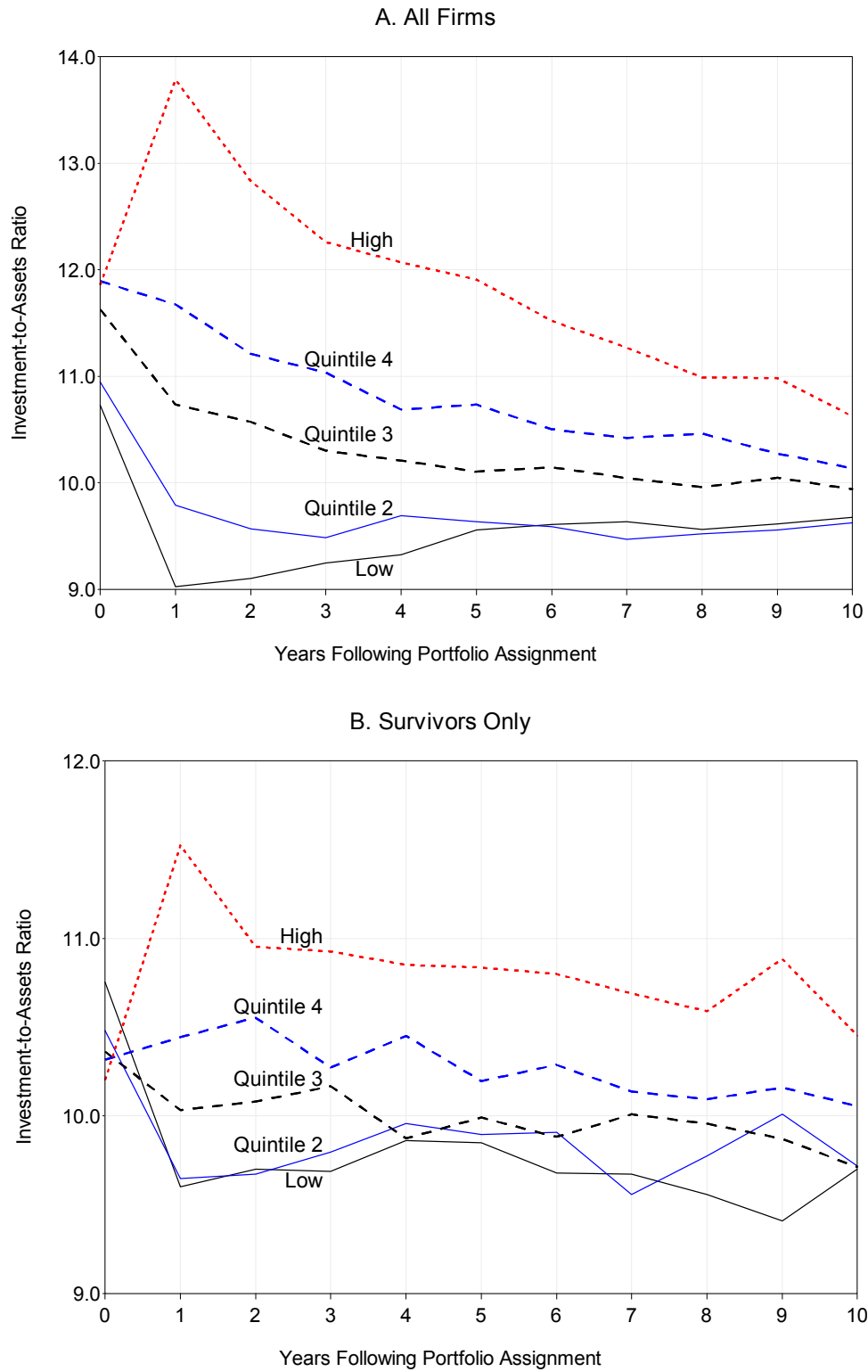


Figure 2. – Excess Cash and Investment. This figure plots average investment-to-assets ratios (in percent) for each excess cash quintile during the year of portfolio assignment and the subsequent ten years. Investment is defined as capital expenditures plus acquisitions less sale of property, plant and equipment, divided by total assets. Panel A uses all firms, while Panel B uses just those that survived for the entire ten years. Sample period is 1960-2006.

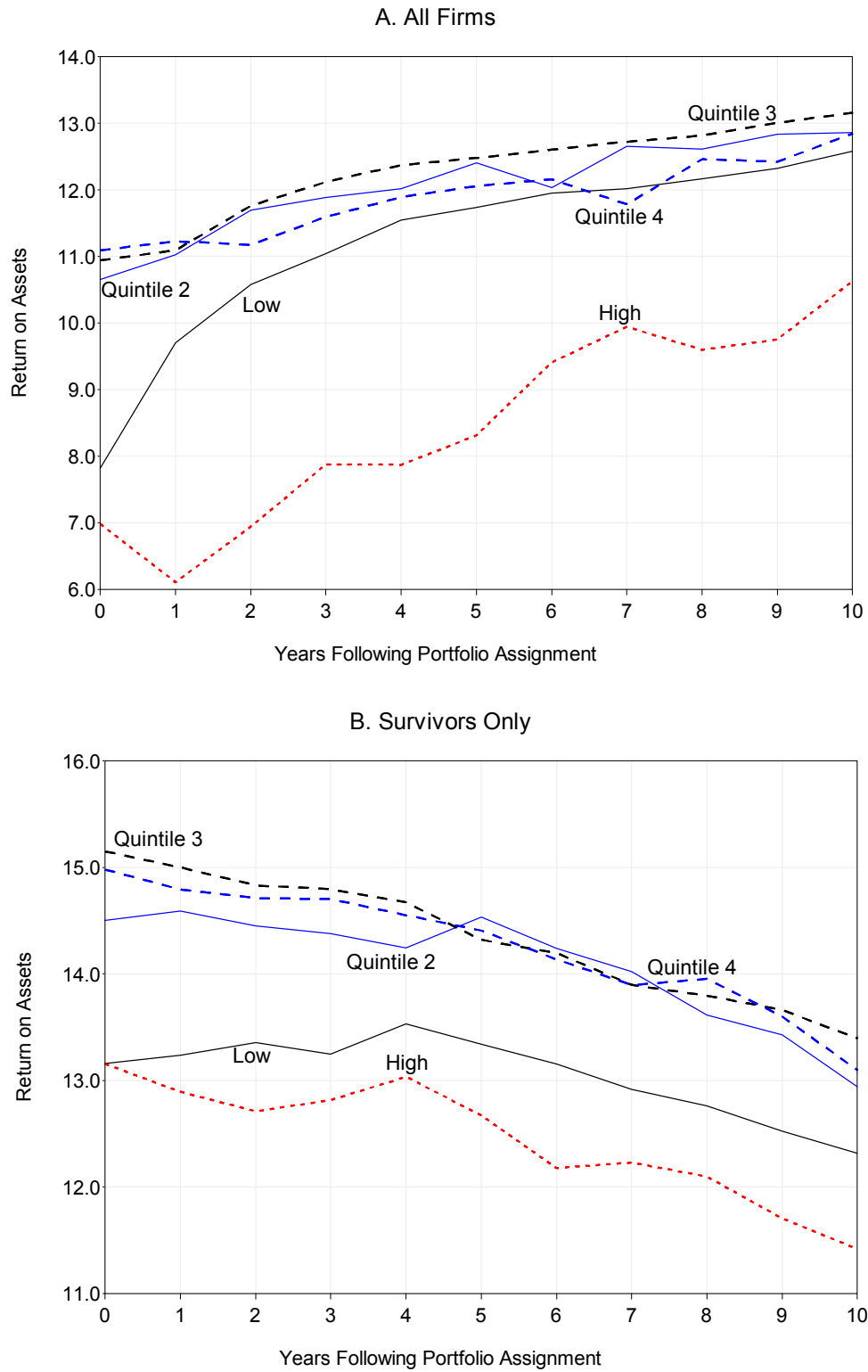


Figure 3. – Excess Cash and Profitability. This figure plots average return on assets (in percent) for each excess cash quintile during the year of portfolio assignment and the subsequent ten years. Profitability is defined as operating income before depreciation divided by total assets. Panel A uses all firms, while Panel B uses just those that survived for the entire ten years. Sample period is 1960-2006.