The Cash Effect and Market Reaction Over Three Decades

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We find that a trading strategy based on buying High Cash firms and selling Low Cash firms would have generated excess returns. These abnormal returns are "period specific," with the strongest results occurring during the 1980s and the first six years of the 2000s. Finally, we show that the significance of the results disappears when we use alternative intuitive scaling factors for cash such as Sales and EBITDA. Our analysis suggests that the "cash effect" has been unstable through time, seems to have disappeared in the most recent time period, and is a function of the chosen scaling factor.

INTRODUCTION

The large increase in corporate cash holdings over the last three decades, and in particular over the last few years, has drawn a significant amount of attention. Policymakers and the general public have called on firms to put these so-called "war chests" of cash to use. Businesses have defended their position by referring to the need to have cash buffers on hand, which was shown to be critical to survival during the recent financial crisis and ensuing credit crunch when financing dried up.

In addition to building up cash, corporations have also been reducing their financial leverage. The combination of these two trends has been a general building up of financial "slack," which has value, as demonstrated by Myers and Majluf (1984), and which has been verified in numerous empirical studies. We also know that firms' investment and financing decisions are jointly determined. Aside from allowing firms to survive extreme financing rationing, slack helps firms overcome future financial constraints that may prevent them from undertaking future valuable projects. Hence, examining the benefits and costs of carrying financial slack is an important issue.

We show that the median Cash-to-Total Assets (Cash/TA) ratio has increased dramatically since the early 1980s, reaching its record high of 14 percent in 2012 (up from about 4 percent in the early 1980s). Similarly, the median Cash-to-Current Assets ratio increased from 6 percent to 40 percent. Over the same period leverage ratios decreased dramatically, with the median Book Leverage Ratio falling from 0.28 to 0.18 and the median Market Leverage Ratio decreasing from 0.40 to 0.10. Interestingly, over the same period, profitability decreased slightly, yet capital expenditures and R&D spending increased up until the recent financial crisis, while growth opportunities have increased (as measured by the Market-to-Book (M/B) ratio).

While there has been an abundance of studies examining the factors contributing to this cash hoarding behavior (e.g., Bates et al., 2009; Faulkender et al., 2006; Opler et al., 1999; Zhou, 2012), there has been

less research into market reactions. A notable exception is the recent paper from Simutin (2010), who finds that high cash firms display annual excess returns in the 5 to 6 percent range over the 1960 to 2006 period.[1] This is an important result since it implies that markets reward firms for holding more cash, all else being equal. This may seem counter-intuitive to many, given the low (zero) returns that firms earn on cash holdings, versus the returns generated by other assets. For example, Faulkender and Wang (2006) estimate that the marginal value of $1 of cash holdings is $0.94, while Pinkowitz, Stulz and Williamson (2006) estimate a marginal value of $0.91 for firms in countries with above-median investor protection and only $0.33 for other countries. With evidence like this, one must ask why holding more cash leads to greater excess returns? Of course, the main counter-argument is that financial slack has value, as discussed above. Hence, the value of cash remains a subject of both theoretical and empirical debate.

We revisit the cash effect issue and confirm Simutin's main findings with extended data. In particular, we find that excess market returns for high Cash/TA firms have exceeded those for low cash firms over the 1980 to 2012 period by an average over 8 percent annually after controlling for size, value, and momentum. Given the important implications of this result as discussed above, we consider four plausible factors that could affect their generality. First, we examine the possibility that industry factors could be playing a major role. We find that industry factors do influence the results only slightly, and not to as great an extent as one might suppose a priori. Second, we control for firm-specific characteristics that cash holdings may be "picking up." This does not seem to be the case, as we find that our main results hold after controlling for IVol, ROE and growth opportunities; although we do find weak evidence that the reward for holding cash is greater for firms with high growth opportunities - this is consistent with the financial slack argument and with previous empirical evidence.[2]

Third, we examine whether or not this pattern has persisted throughout various sub-periods. This is a logical question since we know that average levels of cash holdings have changed significantly since the 1980s. Our analysis suggests that these abnormal returns are "period specific," with the strongest results occurring during the 1980s and the first six years of the 2000s. In fact, during the 2007 to 2012 period, high cash firms actually produced lower returns than low cash firms. This finding is consistent with Faulkender and Wang (2006)'s argument that the rewards for maintaining cash this would decline significantly beyond some upper bound, and since cash levels have been increasing steadily in recent years, it could be possible that we may have reached or exceeded this threshold.

Finally, we examine the impact of using different scaling factors for cash. Simutin (2010) uses net total assets (i.e., total assets minus cash), while most papers in the cash literature use either total assets or net total assets. These measures are intuitive since they measure the importance of cash in the firm's asset mix at a particular point in time. However, it is also reasonable to scale cash by other variables such as sales and EBITDA with which they have a logical connection. For example, Harford et al (2008) scale cash by sales, arguing that as sales increase firms will need more cash for working capital purposes to support this growth. When we use these two alternative scaling factors (i.e., Sales and EBITDA), the main results become weak and insignificant.

Hence, we contribute to the cash literature by showing that the "cash effect" does not appear to be a persistent or exploitable pattern since it has been unstable through time, seems to have disappeared in the most recent time period, and is a function of the chosen scaling factor.

The remainder of the paper is outlined as follows: Section II provides motivation for the study including a brief review of the literature; Section III discusses our sample characteristics; Section IV discusses the market reaction to cash holdings, the results of trading strategies based on cash holdings and other firm characteristics, and industry impact; Section V conducts sub-period analyses, and examines the impact of alternative scaling factors; and, Section VI concludes.

THEORETICAL AND EMPIRICAL MOTIVATION

Many of the studies on cash holdings have focused on the motives for holding cash. The first motive takes the form of the transaction cost argument: converting non-cash financial assets into cash is costly via the transaction costs associated with conversion (e.g., Baumol, 1952; Miller and Orr, 1966, etc.), and

large firms benefit from economies of scale; therefore, they tend to hold less cash (e.g., Mulligan, 1997). Opler et al. (1999) suggest that the transaction argument implies that firms with higher cash flow volatility will hold more cash, and Bates et al. (2009) verifies this relationship empirically. Opler et al. (1999) also argue that cash holdings will be decreasing in the level of interest rates, and with the firm's ability to sell assets easily. Bates et al. (2009) find support for the negative relationship with interest rates. So there is reasonable empirical support for the transactions argument.

Second, for precautionary reasons firms increase their cash holdings. Adverse shocks to firms' cash flows are an important part of the manager's cash holding decision especially when access to the capital market is costly. For example, Opler et al. (1999) show that firms with riskier cash flows and poor access to the capital markets hold more cash. Moreover, their study supports the idea that the firms which value future financial flexibility due to high levels of growth opportunities will hold more cash. Along similar lines, Faulkender et al. (2006) find that cash holdings are more valuable to constrained firms with higher growth opportunities, as do Pinkowitz and Williamson (2004), and Denis and Sibilkov (2009). Brown and Petersen (2010) also support this assertion, finding that young firms use cash to smooth out their R&D expenses. Relatedly, we find that high cash firms tend to be smaller, with higher M/B ratios, and display higher R&D expenses than low cash firms. Finally, Bates et al. (2009) find that the recent increase in cash holdings is related to increases in cash flow volatility. Obviously, this motive has a great deal of merit during recent years in response to recent financial crises.

The tax motive for holding cash suggests that firms with higher marginal tax rates have a tendency to carry more cash on their balance sheet (Foley, 2007). Finally, agency related issues have been shown to impact firm cash holdings behavior. Managers of firms with poor investment opportunities retain cash instead of paying out to the shareholders. For example, Dittmar et al. (2003) show that firms in countries with greater agency problems hold more cash. In addition, Dittmar et al. (2007) and Pinkowitz et al. (2006) calculate the value of cash and show that it is worth less due to agency problems. However, Bates et al. (2009) did not find empirical support for this argument. They show that the value of cash hasn't decreased over time so agency problems should not be the sole reason for increased cash holdings over the last 20 years.

Several additional arguments have been advanced to explain the dramatic increase in cash levels. For example, Zhou (2012) points out the "listing effect" as documented by Fama and French (2004) and, Hall and Lerner (2010), which has led to an increasing weight in young firms in available databases. Aside from the "size" effect, there has also been an "industry" effect, since an increasing proportion of these new listings are high tech firms in the information technology or pharmaceutical industries. Zhou (2012) essentially argues that both effects have led to higher cash holdings, consistent with the positive relationship between R&D and cash, and the negative relationship between size and cash, which were noted above.

While it is interesting to examine the motives and causes of this increase in cash holdings, the more interesting and relevant question is whether this is a good or a bad thing. In other words, are firms being overly conservative and bypassing good investments, leading to stagnating sales and profitability growth, at both the firm and aggregate level? Or is this conservative behavior well-justified, especially in light of recent financial crises, and the associated "drying up" of general credit and long-term capital?

Indeed, despite the large recent literature dealing with why firms have increased their cash holdings over the last 20 years, research related to the implications of this increase in cash holdings has not attracted as much attention. Of course, understanding the motives of cash holdings helps us to examine the consequences. For example, one might expect to see different consequences of precautionary cash savings and agency related cash savings. The subject does not only have an academic importance but also it is very relevant to practitioners and policymakers.

In this study, we examine this issue by seeing how the market has reacted to firms maintaining high cash holdings. Faulkender and Wang (2006) used excess market returns to indirectly measure the average marginal value of a dollar of cash and found that the market "rewards" firms for maintaining cash. They also found the rewards to be "diminishing" in the amount of cash held, and suggest "there may be an upper bound on the amount of cash for which the firm is rewarded for holding." Simutin (2010) takes a

different approach, looking at the excess returns associated with portfolios based on their relative level of excess cash holdings to total assets. He finds that the market rewards high cash firms. We examine and extend Simutin's analysis and provide important new insights by showing that we cannot generalize the fact that high cash firms generate excess returns.

SAMPLE CHARACTERISTICS

We use a panel data set of quarterly financial statement data for U.S. firms over the 1980 (Q1) to 2012 (Q4) period, obtained from the *North American Compustat* data set. The Fama-French three factor time series data as well as the size (SMB), book-to-market (HML), and momentum (UMD) factors are downloaded from Kenneth French's web page.[3] Industry portfolios are formed using the 12 Fama-French industry classifications; although we eliminate utility and financial firms and so are left with 10 relevant industry classifications. Monthly stock return and stock market (market=VWRETD) data are obtained from *CRSP*. In order to construct quarterly data from monthly data, we use the CRSP date according to the Compustat definitions. For example, February-April is Quarter 1, May-July is Quarter 2, etc. Then we keep only the last month of each quarter to create end of Quarter values of Cash/TA ratios as well as other variables of interest. We exclude financial and utility firms. Our full sample consists of 16,017 firms. We delete data with unusual observations such as total assets or sales ≤ 0. We minimize the impact of extreme values by winsorizing all variables at their 1 and 99 percentile levels. The Appendix shows how the variables used in this study are constructed.

Figure 1 (Panels A through D) shows the patterns in four variables of interest. Panel A of Figure 1 shows that the median Cash/TA ratio has increased dramatically since the early 1980s, reaching almost 14 percent in 2012 (up from about 4 percent in the early 1980s). This steady increase started after the 1990s and continued until the recent financial crisis. Similarly, Panel B shows that the median Cash-to-Current Assets ratio has increased from 6 percent as of the early 1980s to over 30 percent.

In line with this increase in cash holdings, we observe a dramatic decrease in leverage ratios, both in terms of book and market values. Panel C shows that the median Book Leverage Ratio dropped from 0.28 to 0.18 during our sample period, while Panel D shows a similar decline in the median Market Leverage Ratio, which decreased from 0.40 to 0.10. The combination of these two trends is a significant increase in financial slack over the period as we observe more high-cash, low-leverage firms.

Table 1 shows that the patterns noted above for cash and leverage have generally led to significant differences in these variables from the 1980s to the 1990s, and again into the 2000s. The remaining statistics in this table confirm previous results but also lead us to examine some interesting previously uncovered observations. For example, we find that while cash holdings are increasing, profitability has decreased slightly, yet capital expenditures and R&D spending have increased up until the recent financial crisis.[4] In addition, while both book and market leverage have decreased, growth opportunities have increased.

MARKET REACTIONS TO CASH HOLDINGS

Basic Results

In this section, we examine how markets react to company cash positions. We do so by breaking the firms into quintiles every quarter based on their Cash/TA ratios. Scaling cash by assets is intuitive, since knowing the proportion of assets comprised by cash is of obvious interest - it is also the measure of relative cash used by Simutin (2010) and numerous other studies. Table 2 shows the medians for several variables of interest for these cash quintiles.[5] Some very strong patterns emerge, most of which are expected given our previous discussion and the results presented in Table 1. In particular, we see that the high cash quintiles (#5) have higher M/B ratios, lower profitability, lower leverage, higher R&D/Sales, higher Z-scores, and slightly higher figures for IVol and Capex/Sales. All of these variables show monotonic trends as we move across the quintiles. Surprisingly, Size is larger for the highest cash quintile than for the smallest cash quintile; however, it is smaller than for the other three quintiles.

Table 3 reports the monthly excess returns (or alphas) generated by the Cash/TA quintile portfolios according to the Carhart 4-Factor model.[6] The results show a monotonic increase in raw and abnormal returns as we move from the Low Cash quintile (#1) to the High Cash quintile (#5).[7] Focusing on the two extreme quintiles in cash holdings, the last two rows show that a trading strategy that buys High Cash/TA stocks and sells Low Cash/TA stocks earns excess returns of 2.154% per quarter with a t-stat of 2.84. In other words, this strategy earns abnormal returns of over 8 percent per year, which is economically and statistically significant.

Examination of the factor coefficients indicates that market betas hover around one for all five quintiles, as one would expect, with quintile #5 having the highest market beta (of 1.24). Low Cash/TA stocks have a small and insignificant coefficient on size, while quintile 3 has a negative and significant coefficient on size, indicating that they are bigger stocks. The high Cash/TA quintile (#5) has a positive and significant coefficient indicating it contains smaller stocks, as expected. Moreover, Low Cash/TA stocks (quintiles 1 and 2) have positive but insignificant coefficients on the B/M factor, while higher Cash/TA stocks (quintiles 3-5) tend to be growth stocks as they have negative and significant coefficients on the value factor. This observation is also consistent with the higher M/B ratios for High Cash/TA stocks documented in Table 2. Finally, the Momentum factor is negative and significant for quintiles 1 and 2, and is insignificant across the remaining three Cash quintiles.

The results reported in Table 3 represent those for the "next" quarter. Given the lag in availability of some financial information, one could argue that the available information might not be available to implement such a trading strategy. We account for this in Table 4, where we repeat the process in Table 3, except that we form portfolios based on Cash/TA figures from the "previous" quarter, but we compute excess returns in quarter t+1. The results remain relatively unchanged; suggesting that a lag in the availability of information does not drive the results. Having confirmed that excess returns are higher for High cash/TA firms, we now proceed to examine the first two issues identified earlier.

Industry Analysis

We begin our analysis of industry effects by examining the industry breakdown of our cash quintiles, and Panel A of Table 5 shows some expected results. In particular, we see that firms in the following industries tend to maintain lower levels of cash holdings: Non-Durables; Durables; Manufacturing; Energy; Chemicals; Telecom; and, Retail & Wholesalers. We also see that Healthcare firms hold higher cash levels, as predicted by Zhou (2012). As expected, firms in the Equipment category (which includes high technology firms) have the highest percentage of high cash holding firms.

Panel B of Table 5 presents the regression results of applying our Cash/TA quintile trading strategy as applied to the 10 Fama-French industry groups we consider. While the High-Low Cash alphas are positive for 8 of the 10 portfolios, the only significant results are for the Equipment, Manufacturing, Retail and Wholesale, and Other industry groups. Recalling that Equipment firms have the highest percentage of High Cash/TA firms (as reported in Panel A) followed by Healthcare firms, suggests these two industry groups could be driving the overall results. We address this issue in Panel C, where we run the regressions for the entire sample excluding Equipment and Healthcare firms, and leaving firms in their quintile as originally determined within the entire sample. Interestingly, despite the apparent industry influences, our main results are actually *stronger* when these firms are removed. The quarterly excess alpha for the High-Low Cash/TA strategy is now 2.457 percent (or approximately 10% annually).[8] Thus, while there is no doubt that industry factors affect the level of cash holdings, it does not appear that industry effects account for the overall pattern in excess returns.

Controls for Firm-Specific Factors

We now examine whether the observed pattern in stock returns is driven by some of the other characteristics associated with firms. We do so by creating "double-sorted" portfolios. This is accomplished by allocating firms to quintiles according to their Cash/TA ratios, and simultaneously doing likewise with respect to several other variables including: IVol, return on equity (ROE), and M/B. We chose these since they represent proxies for firm-specific risk, profitability, and growth opportunities

respectively.[9] While not reported here, the breakdown of these portfolios provides some useful insights. In particular, High Cash firms have slightly higher percentages of firms with low ROEs and higher M/B ratios, consistent with expectations. There is no strong pattern with respect to IVol; although there are lower numbers of High Cash firms among the low IVol firms.

Table 6 reports the abnormal returns generated by the 25 "double-sorted" portfolios. We begin by looking at the Cash-IVol double-sorted portfolios in Panel A. Our sorting procedure controls for the level of the Cash/TA ratio to analyze the conditional relation between idiosyncratic volatility and future stock returns. Since IVol is not included in the Carhart model, it is possible that High Cash /TA firms earning higher returns could be a form of compensation for idiosyncratic risk. Past research has documented that there is a negative relation between idiosyncratic volatility and future stock returns, and we confirm this pattern in our sample. Across all five Cash/TA quintiles, there is a negative relation between idiosyncratic volatility and future stock returns, which can be seen in the last column in Panel A of Table 6, with the results being significant only for cash quintiles 2 and 3. More importantly for the purposes of the present study, the positive relation between cash holdings and future stock returns holds strongly and significantly for IVol quintiles 3 and 4, significantly at the 10% level for quintile 1, and is insignificant for quintiles 2 and 5. Hence, the overall sample results hold quite well after controlling for IVol.

Panel B reports the results for the Cash-ROE sorted portfolios. We control for ROE since it is a measure of investment quality. If past investment quality is high, then investors may reward cash hoarding behavior if they believe that the cash is going to be used for high return investments. Hence cash holding may be good for high ROE firms. On the other hand, investors will be unhappy with Low ROE firms' hoarding cash if they believe that cash is going to be used for other purposes. The last column in Panel B shows that, as expected, High ROE firms perform better than Low ROE firms across all Cash/TA quintiles; with the positive alpha being significant for Cash/TA quintile 1, 4 and 5, and being significant at the 10% level for quintiles 2 and 3. More importantly for our purposes, the last row in the table shows that the positive relation between cash holdings and future stock returns exists for all five ROE quintiles, which is significant for quintiles 1, 2 and 5, and is significant at the 10% level for quintile 3. So this evidence also supports our main results after controlling for ROE.

Panel C uses M/B as a proxy for growth opportunities in order to double sort the portfolios. We observe positive alphas for the High-Low M/B quintiles 1, 2, 4 and 5 and a negative alpha for quintile 3; although all of the alphas are insignificant. More importantly, we observe positive excess alphas for the High-Low Cash portfolios for four of the M/B quintiles; although the alphas are only significant for quintiles 3 and 5. Notice that the High-Low Cash result is strongest for Q5, which suggests holding additional cash is more valuable to high-growth firms, which is consistent with expectations and with previous empirical evidence noted previously. However, overall, the evidence is generally supportive of the robustness of our main results.

SUB-PERIOD ANALYSIS AND THE IMPACT OF SCALING FACTORS

Sub-Period Analysis

So far, the main result of excess returns for high cash firms has remained robust despite considering some very plausible explanations. In this sub-section, we proceed to examine the possibility that these results are "time-specific," and/or, have changed through time. Panel A of Table 7 shows that the results reported in Table 3 for the entire 1980 to 2012 period do not hold across all sub-periods. In particular, while the High-Low Cash/TA alpha is significant and similar to the entire period alpha at 1.965% per quarter during the 1980s, the positive alphas are much smaller and are insignificant during both the 1990s and 2000s sub-periods.

Simutin (2010)'s sample ends in 2006, and he finds positive and significant alphas during the periods of 1960-2006, and during the sub-periods of 1960-82 and 1982-2006. In addition, Panel A of Figure 1 showed that cash levels have continued to increase during the latter part of the 2000s. Therefore, we split the 2000-2012 period in two in order to see if any differences have emerged in recent years. Interestingly, we can see that the positive but insignificant result observed over the entire 12-year period is driven by

some very different results when this period is split in half. In particular, we observe a very large positive and significant alpha of 3.643% during the 2000-2006 period, and a negative and insignificant alpha (-0.315%) during the 2007-2012 period.

The results reported in Panel B confirms that the sub-period pattern documented for the entire sample remain intact when we eliminate the Equipment and Healthcare firms.[10] Hence, we can conclude that the excess positive alphas observed over the entire sample period are driven by strong results during the 1980s and the 2000-2006 period, while they disappear and actually become negative alphas during the most recent 2007-2012 period, where cash levels have hit all-time highs. Either investors have recognized this pattern in returns and started trading on it, or the excess returns for holding cash have disappeared as cash levels have exceeded some maximum level, where the marginal costs outweigh the marginal benefits. This lends support for the argument of Faulkender and Wang (2006) that markets will only reward firms for maintaining cash up to some maximum level. However, before we can make any definitive conclusions in this regard, we examine one last factor that could be driving our overall results in the sub-section below.

The Influence of Scaling Factors

The sub-period analysis above suggests that the relationship between cash holdings and stock returns has changed through time, when cash is scaled by total assets. While most papers in the cash literature use either total assets or net total assets to scale cash, some have used alternative scaling factors. For example, Harford et al (2008) scale cash by sales, arguing that as sales increase firms will need more cash for working capital purposes to support this growth. Hence, it is also reasonable to scale cash by variables such as sales and EBITDA with which they have a logical connection. Clearly, cash holdings have increased dramatically through our entire sample period when scaled by total assets as shown in Panel A of Figure 1, and also relative to current assets as shown in Panel B of Figure 1. These measures are of obvious interest, since they measure cash as a percentage at a particular point in time - i.e., they are static measures. However, it is quite possible that we may observe a different pattern in the growth of cash holdings relative to other factors. For example, it is reasonable to assume that cash holdings will increase as company sales grow, if for no other reason than additional cash may be required to sustain this growth. A similar argument can be made for cash relative to changes in profits. Both of these measures scale cash by a flow variable.

Figure 2 provides graphs of the following two variables throughout our sample period – Cash/Sales and Cash/EBITDA. Panel A shows that Cash/Sales has increased steadily through the sample period, from a median of around 0.1 to almost 0.5. Similarly, Panel B shows that Cash/EBITDA increased from a median of just under 1 to around 3. Thus, we can see that cash holdings grew over the period according to all three of our scaling factors, but to varying degrees.

We now proceed to examine how the impact of these scaling factors influences our conclusions regarding market reactions to firm cash holdings. Table 8 repeats the analyses of market reactions to cash holdings by sorting into quintiles based on these two scaling factors – for the entire period (as in Table 3), and during the sub-periods (as in Table 7). Panel A shows that when we scale cash by sales, we still find that high cash firms outperform low cash firms in terms of both raw returns and Carhart alphas by approximately 1% per quarter; however, the results are much weaker and are no longer significant. This is true for the entire sample period, and in all sub-periods; although the sub-period patterns remain the same as when the quintiles are formed based on Cash/TA (i.e., the strongest results occur during the 1980s and during 2000-2006). Panel B reports the results when Cash is scaled by EBITDA, with very similar results to those in provided in Panel A – i.e., once again we find that High Cash/EBITDA firms outperform Low Cash/EBITDA firms, but the pattern is much weaker and all the differences are now insignificant.[11] In addition, the sub-period patterns also remain but are weaker. Overall, the results in this sub-section suggest that while the market does not seem to punish firms for holding cash, the excess returns previously attributed to high cash firms is very sensitive to the chosen scaling factor.

CONCLUSIONS

Firms have been building up cash and reducing debt steadily over the last three decades. While there has been an abundance of studies examining the factors contributing to this cash hoarding behavior, there has been less research devoted to market reactions. This is surprising, given the abundance of pressure exerted by policy makers and the general public on corporations to "put this money to use." Using data over the 1980 to 2012 period, we find evidence to support Simutin (2010)'s important result that a trading strategy based on holding High Cash/TA firms would have generated excess returns. In particular, we find that such a strategy would have earned excess returns of over 8 percent per year, after controlling for size, value, and momentum.

We extend Simutin (2010)'s analysis by considering four plausible factors that could affect the generality of this result. In particular, we examine industry factors and find that they influence the results only slightly, and not to as great an extent as one might suppose a priori. Secondly, we find that firm-specific characteristics (i.e., IVol, ROE and growth opportunities) do not drive the results; although we do find evidence that the reward for holding cash is greater for firms with high growth opportunities.

We then examine this pattern across several sub-periods and find that these abnormal returns are "period specific," with the strongest results occurring during the 1980s and the first six years of the 2000s. In fact, during the 2007 to 2012 period, high cash firms actually produced lower returns than low cash firms. This finding is consistent with Faulkender and Wang (2006)'s argument that the rewards for maintaining cash this would decline significantly beyond some upper bound, and since cash levels have been increasing steadily in recent years, it could be possible that we may have reached or exceeded this threshold. Finally, we examine the impact of using alternative intuitive scaling factors for cash. We find that using these two alternative scaling factors (Sales and EBITDA), the main results become weak and insignificant.

Hence, overall, our analysis suggests that the "cash effect" does not appear to be a persistent or exploitable pattern since it has been unstable through time, seems to have disappeared in the most recent time period, and is a function of the chosen scaling factor.

This topic leads to several other interesting questions that we have not addressed in this study. For example, how does this affect corporate governance related issues for firms given the relatively high stocks of cash available to management? Is this the "new normal" for companies (i.e., lower leverage and higher cash), or will this trend reverse itself? How has this impacted dividends, share repurchases and M&A activity? On the flip side, will the "lack" of slack among financial institutions and governments lead to greater and more prolonged crises going forward?

ENDNOTES

1. More specifically, Simutin (2010) uses excess cash to net total assets to classify firms.
2. For example, see Faulkender et al (2006), Pinkowitz et al (2004), Williamson (2004), and Denis et al (2009).
3. The authors thank Kenneth French for providing the data at: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html.
4. It is interesting to note that firm capital expenditures have been higher for firms maintaining higher cash ratios. This suggests that cash hoarding has not necessarily hurt investment as many have suggested. It also supports the argument above that if financial slack has value, firms with higher growth opportunities will maintain additional slack.
5. We report the medians instead of the means, since several means are skewed by extreme observations.
6. All of the results reported in this paper are virtually identical using the Fama-French 3-Factor model.
7. The fact that the alphas for all five quintiles are positive is not uncommon. Many papers have such a result including Simutin (2010) and Frazzini and Pedersen (2014) for example.
8. In results not reported here, we repeated this process, except we formed new or "resorted" Cash/TA quintiles after first excluding Equipment and Healthcare firms. Once again, the main results remain unchanged, and in fact are virtually identical to those reported in Table 3.

9. We also examined several other variables such as size and leverage (not reported here), which did not impact the main results.
10. This is also true if we "resort" the quintiles after first excluding these firms; although we have not reported the results here.
11. We eliminate negative EBITDA observations in order to form the cash quintiles, since the use of negative EBITDAs could lead to high cash firms being classified as low cash due to the influence of the negative EBITDA values.

REFERENCES

Bates, T. W., K. M. Kahle, and R. M. Stulz (2009), "Why Do U.S. Firms Hold So Much More Cash Than They Used To?" *The Journal of Finance* 64, 1985-2021.

Baumol, W. J. (1952), "The Transactions Demand for Cash: An Inventory Theoretic Approach," *Quarterly Journal of Economics* 66, 545–556.

Brown, J. R., and B. C. Petersen (2011), "Cash Holdings and R&D Smoothing," *Journal of Corporate Finance* 17, 694-709.

Denis, D. J., and V. Sibilkov (2010), "Financial Constraints, Investment, and the Value of Cash Holdings," *The Review of Financial Studies* 23, 247-269.

Dittmar, A., and J. Mahrt-Smith (2007), "Corporate Governance and The Value Of Cash Holdings," *Journal of Financial Economics* 83, 599–634.

Dittmar, A., and J. Mahrt-Smith, and H. Servaes (2003), "International Corporate Governance and Corporate Cash Holdings," *Journal of Financial and Quantitative Analysis* 38, 111–133.

Fama, E. F., and K. R. French (2004), "New Lists: Fundamentals and Survival Rates," *Journal of Financial Economics* 73, 229-69.

Faulkender, M. W., and R. Wang (2006), "Corporate Financial Policy and The Value of Cash," *Journal of Finance* 61, 1957–1990.

Foley, C. F., J. Hartzell, S. Titman, and G. J. Twite (2007), "Why Do Firms Hold So Much Cash? A Tax-Based Explanation," *Journal of Financial Economics* 86, 579–607.

Frazzini, A., and L.H. Pedersen (2014), "Betting Against Beta," *Journal of Financial Economics* 111, 1-25.

Hall, B. H., and J. Lerner (2010), "The Financing of R&D and Innovation." In *Handbook of the Economics of Innovation*. Vol. 1, edited by B. H. Hall and N. Rosenberg.

Miller, M. H., and D. Orr (1966), "A Model of The Demand For Money By Firms," *Quarterly Journal of Economics* 80, 413–435.

Mulligan, C. B. (1997), "Scale Economies, the Value of Time, and the Demand for Money: Longitudinal Evidence from Firms." *Journal of Political Economy*, 105, 1061-79.

Myers, S., and N.S. Majluf (1984), "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics* 13, 187-221.

Opler, T., L. Pinkowitz, R. M. Stulz, and R. Williamson (1999), "The Determinants and Implications of Corporate Cash Holdings," *Journal of Financial Economics* 52, 3–46.

Pinkowitz, L., R. Stulz, and R. 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.

Pinkowitz, L. and Williamson, R. (2004), "What is a Dollar Worth? The Market Value of Cash Holdings," working paper.

Simutin, M. (2010), "Excess Cash and Stock Returns," *Financial Management*, 1197-1222.

Zhou, J. (2012), "Increase in Cash Holdings: Pervasive or Sector-Specific?" Working Paper.

APPENDIX

VARIABLE DESCRIPTIONS

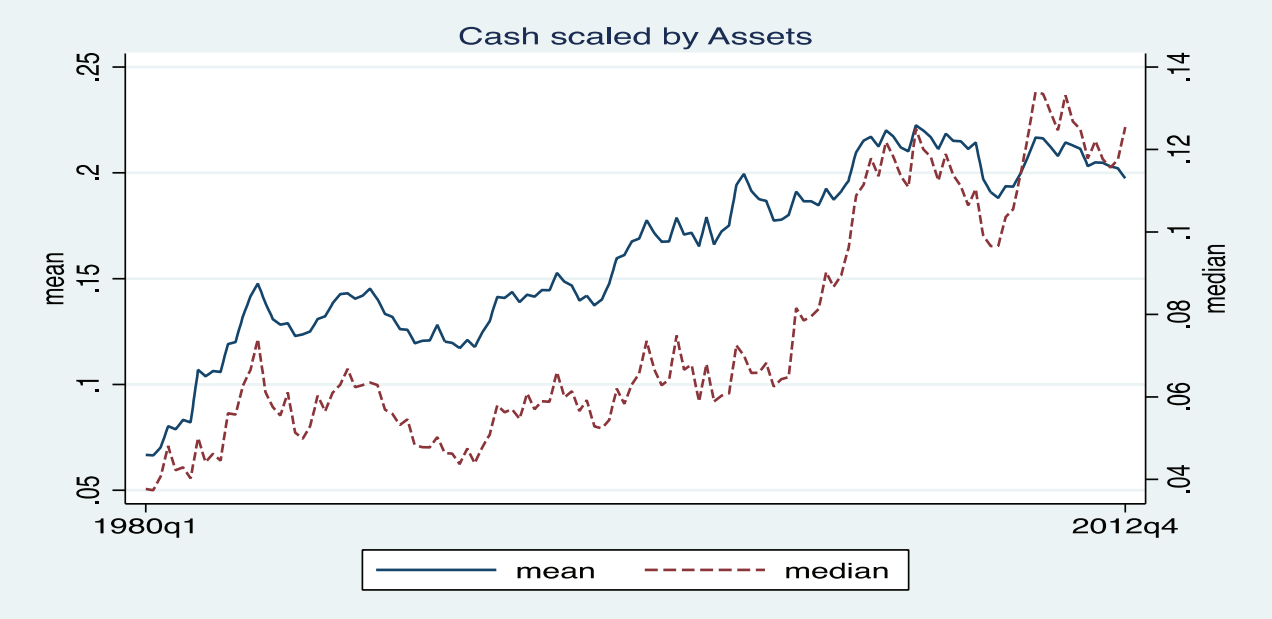
Variable	Description	Compustat Item
Cash-to-Total Assets	Ratio of cash holdings to total book value of assets	CHEQ/ATQ
Cash-to-Current Assets	Ratio of cash holdings to current assets	CHEQ/ACTQ
Total Debt	Current liabilities + Long-term liabilities adjusted to 2000 dollars	DLCPQ+DLLTQ
Book Leverage Ratio	Book leverage	(DLCPQ+DLLTQ)/ATQ
Market Leverage Ratio	Market leverage	(DLCPQ+DLLTQ)/(DLCPQ+DLLTQ+CSHOQ*PRCCQ)
Market Cap	Market Capitalization	PRCCQ*CSHOQ
Market-to-Book Ratio	Ratio of market assets to book assets (Tobin's Q)	(LTQ-TXDITCQ+CSHOQ*PRCCQ)/ATQ
Z Score	Altman's Z Score	3.3*(OIADPQ/ATQ)+0.99*(SALEQ/ATQ)+0.6*(CSHOQ*PRCCQ/LTQ)+1.2*(Working Capital/ATQ)+1.4*(REQ/ATQ)
IVOL	Idiosyncratic volatility is computed as the standard deviation of the residuals from the Fama-French three-factor (excess of the risk-free rate) (FF 3-Factor) model of daily returns within the year.	The residuals are estimated from the following regression of daily returns for each firm, each month: $r_t^i - r_f = \alpha^i + \beta_{MKT}^i MKT + \beta_{SMB}^i SMB + \beta_{HML}^i HML$ Idiosyncratic volatility is defined as $\sqrt{Var(\epsilon_t^i)}$.
EBITDA/Sales	Ratio of earnings before interest, taxes, and depreciation to sales	OIBDPQ/SALEQ
Capex/Sales	Ratio of capital expenditure to sales	Define quarterly investment by using year-to-date capxy as follows: CAPXQ= CAPXY-CAPXY[_n-1] Then CAPXQ/SALEQ
R&D/Sales	Ratio of research and development Expense to sales	XRDQ/SALEQ
Cash/Sales	Ratio of cash holdings to sales	CHEQ/SALEQ
Cash/EBITDA	Ratio of cash holdings to EBITDA	CHEQ/ OIBDPQ

Source: Compustat

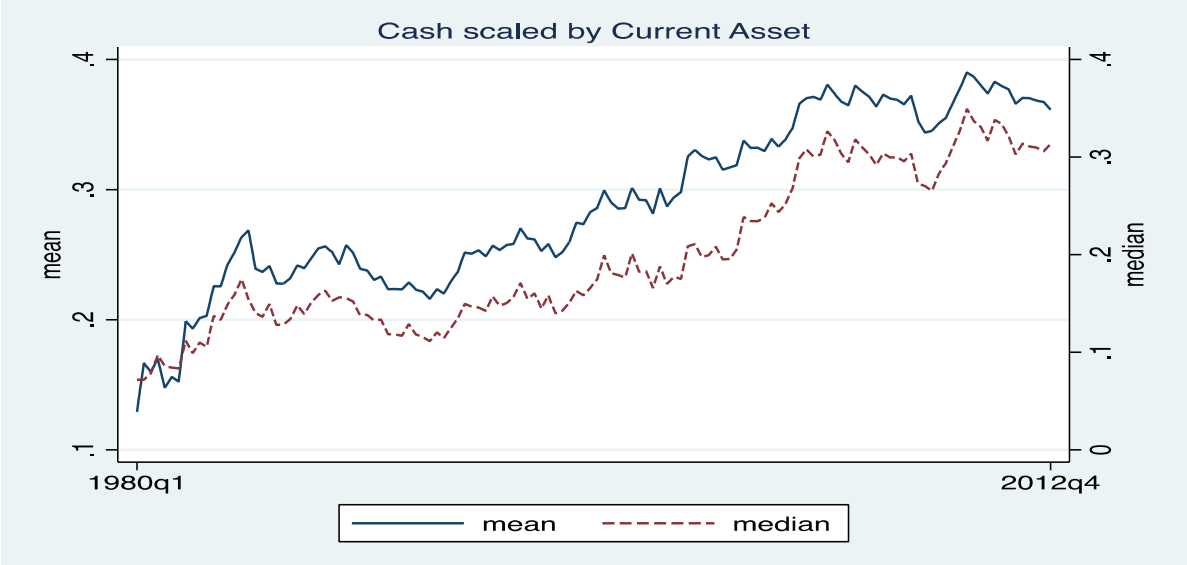
FIGURE 1

The figure shows time series behaviour of the following variables: Cash-to-Total Asset, Cash-to-Current Asset, Book Leverage and Market Leverage. All variables are defined in Appendix. Our sample period is 1980-2012. Mean and median values are computed for every quarter.

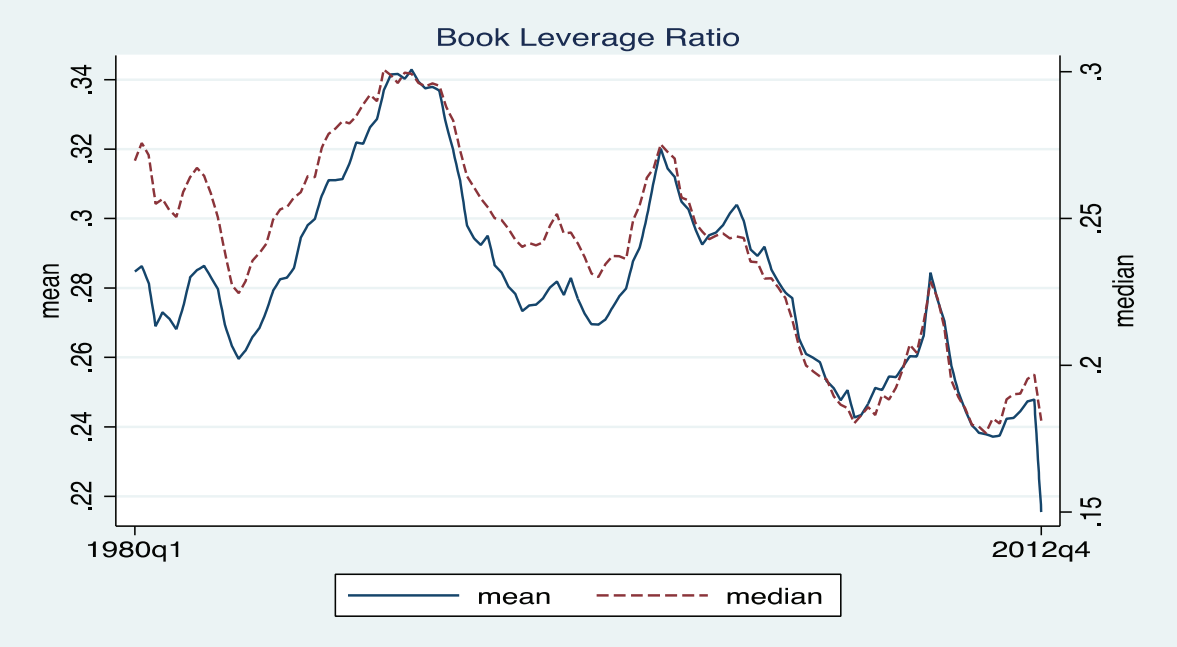
PANEL A: Cash-to-Total Assets



PANEL B: Cash-to-Current Assets



PANEL C: Book Leverage Ratios



PANEL D: Market Leverage Ratios

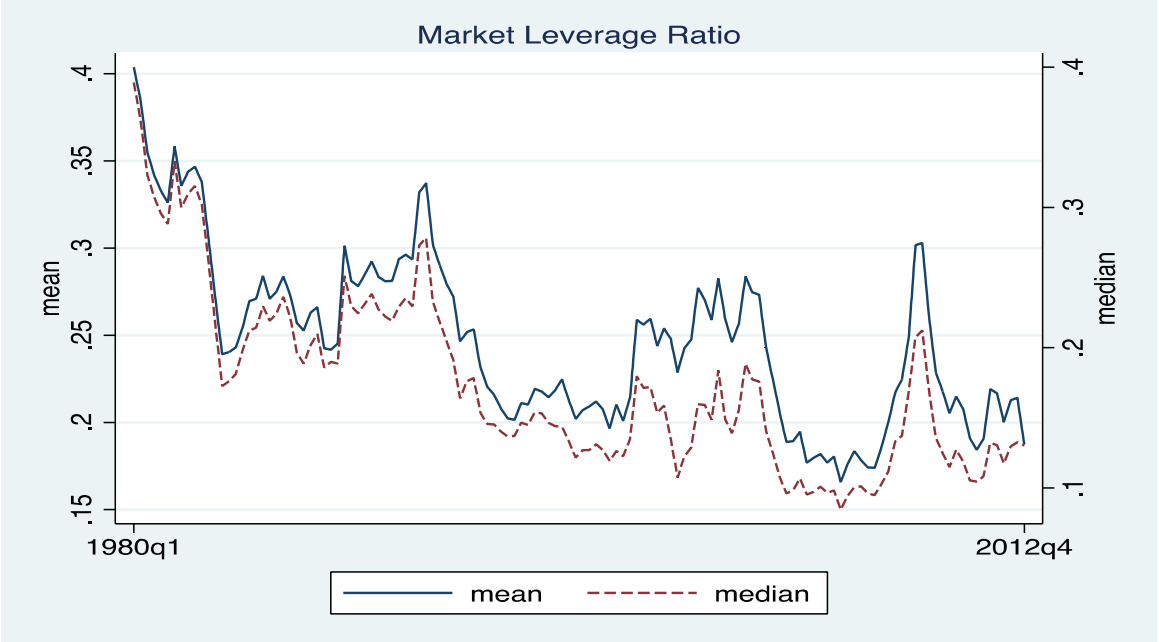
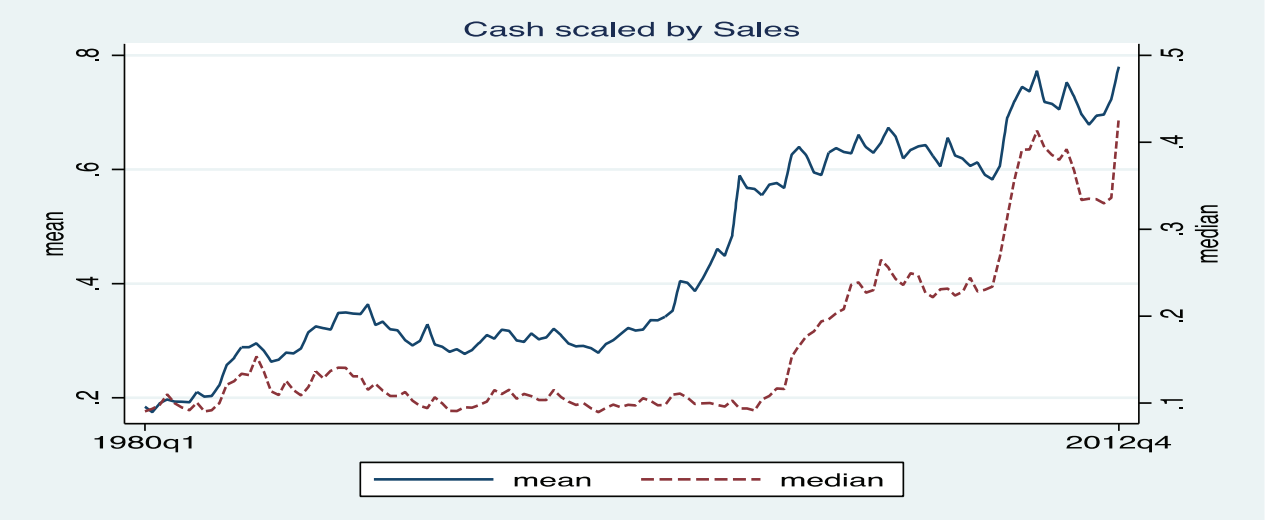


FIGURE 2
DIFFERENT SCALING MEASURES OF CASH HOLDINGS

The figure shows time series behaviour of the following variables: Cash-to-Sales, Cash-to-EBITDA, Cash-to-Market Cap. All variables are defined in Appendix. Our sample period is 1980-2012. Mean and median values are computed for every quarter.

PANEL A: Cash-to-Sales



PANEL B: Cash-to-EBITDA

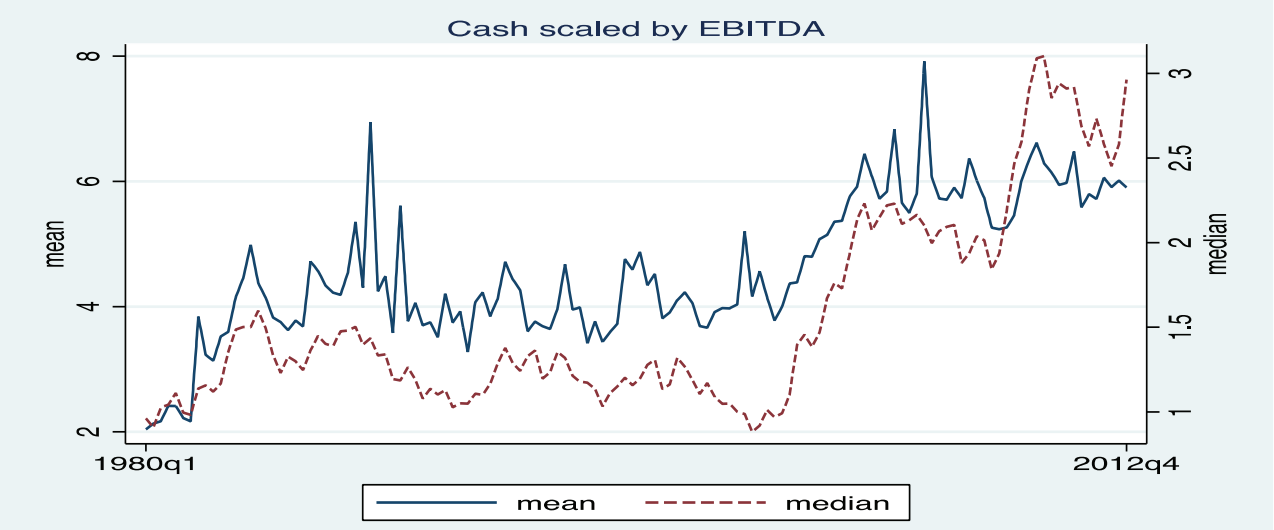


TABLE 1
SUMMARY STATISTICS FOR SUB-PERIODS

The table shows *mean* and *median* values of the following variables: Cash-to-Total Assets, Cash-to-Current Assets, Book Leverage and Market Leverage. All variables are defined in the Appendix. Our sample period is 1980-2012. Table also reports mean and median differences as well as *t*-stats/p-values.

	Cash-to-Asset		Cash-to-CA		Book Leverage		Market Leverage	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
(1) 1980-1990	0.126	0.06	0.300	0.25	0.300	0.25	0.287	0.23
(2) 1991-2000	0.162	0.06	0.288	0.21	0.288	0.21	0.231	0.15
(3) 2001-2012	0.205	0.12	0.530	0.17	0.530	0.17	0.204	0.12
(1)-(2)	-0.036	-0.01	0.013	0.04	0.013	0.04	0.056	0.09
t-stat / p-value	-60.16	0.00	9.77	0.00	9.77	0.00	67.41	0.00
(2)-(3)	-0.04	-0.06	-0.24	0.04	-0.24	0.04	0.03	0.03
t-stat / p-value	-31.22	0.00	-11.40	0.00	-11.40	0.00	16.48	0.00

TABLE 2
SUMMARY STATISTICS FOR CASH-TO-TOTAL ASSET QUINTILES

The table shows *median* values of the following variables: Cash-to-Total Assets (Cash/Asset), Market Cap (Size), Dividend-to-Total Assets (Div/TA), Market-to-Book (M/B), EBITDA-to-Sales, Book Leverage, Market Leverage, Capex-to-Sales, R&D-to-Sales, idiosyncratic volatility (IVol), and Z-Score. All variables are defined in the Appendix. In every quarter, we sort firms based on their Cash-to-Asset values in the current quarter and form five Cash-to-Asset quintiles. Our sample period is 1980-2012.*

Variable	Cash/Asset Quintile				
	Low	2	3	4	High
Cash/TA	0.01	0.03	0.07	0.19	0.49
Size (Mkt Cap)	54.88	82.46	82.33	79.14	73.56
M/B	1.21	1.25	1.36	1.57	2.21
EBITDA/Sales	0.09	0.09	0.09	0.09	0.02
Book Leverage	0.35	0.31	0.24	0.11	0.01
Market Leverage	0.35	0.29	0.2	0.07	0.00
Capex/Sales	0.03	0.03	0.03	0.03	0.04
R&D/Sales	0.01	0.02	0.04	0.09	0.22
IVol	0.03	0.03	0.03	0.03	0.04
Z-Score	1.10	1.26	1.51	2.25	4.45

* The p-values for the differences in all of the variables between the High and Low cash categories are all 0.

TABLE 3
RELATION BETWEEN CASH HOLDINGS AND STOCK RETURNS

The sample period is 1980-2012. In every *quarter t*, we sort firms based on their Cash-to-Total Assets (Cash/Asset) ratios in *quarter t-1* and we form five Cash/Asset quintiles. Quintile 1 contains stocks with the lowest Cash/Asset ratios and Quintile 5 consists of the highest Cash/Asset ratio stocks. The row "High-Low" refers to the difference in quarterly returns between Quintile 5 and Quintile 1 in *quarter t.* VWRET refers to value-weighted portfolio of simple unadjusted quarterly percentage returns in *quarter t*. The Carhart Alpha column shows excess returns with respect to the Carhart 4-Factor Model. Robust Newey-West (1987) *t*-statistics are reported in brackets.

Cash/TA Quintile	VWRET	Market	SIZE	B/M	MOM	Carhart Alpha (%)
Low	1.705	0.966	0.104	0.132	-0.154	0.145
		[20.996]	[1.515]	[1.678]	[-3.26]	[0.485]
2	1.957	0.978	0.050	0.091	-0.146	0.422
		[22.253]	[1.065]	[1.558]	[-3.20]	[1.845]
3	2.255	0.939	-0.143	-0.181	-0.041	0.922
		[24.254]	[-2.56]	[-3.54]	[-0.97]	[4.664]
4	3.417	1.123	0.189	-0.700	-0.056	2.113
		[11.528]	[0.863]	[-3.29]	[-0.44]	[3.604]
High	3.815	1.235	0.592	-1.032	0.012	2.300
		[10.196]	[2.548]	[-4.36]	[0.079]	[3.303]
High-Low	2.110					2.154
	[1.356]					[2.842]

TABLE 4
RELATION BETWEEN CASH HOLDINGS AND STOCK RETURNS:
"LAGGED" BY ONE QUARTER

The sample period is 1980-2012. In every *quarter t*, we sort firms based on their Cash-to-Total Asset (Cash/Asset) ratios in *quarter t-1* and we form five Cash/Asset quintiles. Quintile 1 contains stocks with the lowest Cash-to-Total Asset ratios and Quintile 5 consists of the highest Cash/Asset ratio stocks. The row "High-Low" refers to the difference in quarterly returns between Quintile 5 and Quintile 1 in *quarter t+1*. Robust Newey-West (1987) *t*-statistics are reported in brackets. VWRET refers to value-weighted portfolio of simple unadjusted quarterly percentage returns in *quarter t+1*. The Carhart Alpha column shows excess returns with respect to the Carhart 4-Factor Model in *quarter t+1*.

Cash/TA Quintile	VWRET	Market	SIZE	B/M	MOM	Carhart Alpha (%)
Low	1.680	0.988	0.160	0.213	-0.197	0.071
		[20.205]	[2.248]	[2.538]	[-4.23]	[0.230]
2	1.943	0.952	0.094	0.124	-0.144	0.408
		[24.939]	[1.831]	[2.096]	[-2.78]	[1.705]
3	2.310	0.942	-0.125	-0.193	-0.001	0.919
		[23.168]	[-1.60]	[-3.17]	[-0.02]	[4.323]
4	3.088	1.114	0.284	-0.573	-0.080	1.737
		[14.219]	[1.626]	[-3.38]	[-0.81]	[3.599]
5	3.396	1.237	0.650	-1.079	-0.010	2.018
		[9.810]	[2.955]	[-4.54]	[-0.07]	[3.023]
High-Low	1.715					1.946
	[1.093]					[2.643]

TABLE 5
INDUSTRY RESULTS

The sample period is 1980-2012. In every *quarter t*, we sort firms based on their Cash-to-Total Asset (Cash/Asset) ratios in *quarter t-1* and we form five Cash-to-Total Asset quintiles. Quintile 1 contains stocks with the lowest Cash-to-Total Asset ratios and Quintile 5 consists of the highest Cash-to-Total Asset ratio stocks. Industry portfolios are formed using the 12 Fama-French industry classification. We exclude finance and utility industries hence we have 10 industry groups. In Panel A, the number of stocks is shown in each Cash/TA and Industry double-sorted portfolio. In Panel B, High minus Low Cash/TA Carhart 4-Factor Model Alphas are shown for all 10 industry groups. Robust Newey-West (1987) *t*-statistics are reported in brackets. In Panel C, the replication of Table 3 can be seen for a sample that excludes Equipment and Healthcare Industries by using original quintile sorting.

PANEL A: Cash/TA Quintiles – Industry Breakdown

Industry	Cash/Asset Quintile				
	Low	2	3	4	High
Non-durables	108	81	64	53	36
Durables	43	39	35	26	16
Manufacturing	178	168	145	123	66
Energy, Oil, Gas, Coal	74	66	61	44	31
Chemicals	34	37	32	25	20
Equipment	101	115	156	242	315
Telecom	41	38	38	32	23
Shops, Wholesale, Retail	166	172	144	110	58
Healthcare, medical	58	69	83	109	225
Others	170	188	215	210	183

PANEL B: High- Low Cash/TA the Carhart Model Alphas (%)

Business Equipment	2.940	Healthcare	1.764
	[2.423]		[1.299]
Nondurables	1.423	Durables	1.919
	[1.370]		[1.651]
Energy, oil, gas, coal	0.985	Chemicals	-0.782
	[0.564]		[-0.623]
Manufacturing	2.241	Others	3.022
	[2.014]		[3.003]
Telecom	-0.654	Shops, Wholesale, Retail	3.131
	[-0.471]		[3.003]

PANEL C: The Carhart Regression Results Excluding Equipment and Healthcare Industries (using original quintiles)

Cash/TA Quintiles	Market	SIZE	B/M	MOM	Carhart Alpha (%)
Low	0.973	0.078	0.141	-0.157	0.171
	[20.799]	[1.073]	[1.749]	[-3.38]	[0.567]
2	0.981	0.054	0.130	-0.155	0.444
	[22.459]	[1.133]	[2.192]	[-3.54]	[1.979]
3	0.956	-0.121	-0.031	-0.046	0.805
	[29.373]	[-2.60]	[-0.63]	[-1.25]	[4.751]
4	1.245	0.048	-0.553	-0.126	2.006
	[11.784]	[0.324]	[-2.80]	[-1.04]	[3.461]
High	1.203	0.537	-0.799	-0.095	2.628
	[11.552]	[2.623]	[-3.70]	[-0.72]	[4.151]
High-Low					2.457
					[3.503]

TABLE 6
CASH HOLDINGS AND STOCK RETURNS CONDITIONAL ON STOCK'S CHARACTERISTICS

The sample period is 1980-2012. In every *quarter t*, we sort firms based on their Cash-to-Total Asset (Cash/Asset) ratios in *quarter t-1* and we form five Cash/Asset quintiles. We also sort firms based on their firm characteristics in *quarter t-1* with respect to idiosyncratic volatility (IVol), Return on Equity (ROE), and Market-to-Book (M/B), and form five quintiles. Then the double-sorted portfolios are formed as the intersection of each of these variable quintiles and Cash/Asset quintiles. Quintile 1 contains stocks with the lowest Cash/Asset ratios and Quintile 5 consists of the highest Cash/Asset ratios. Excess returns are calculated with respect to the Carhart 4-Factor Model. Robust Newey-West (1987) *t*-statistics are reported in brackets. Panel A reports the results for IVol and Cash/TA double-sorted portfolios; Panel B, for ROE and Cash/TA double-sorted portfolios; and, Panel C, for M/B and Cash/TA double-sorted portfolios.

PANEL A: Cash/TA and IVOL Portfolios

	Low Ivol	2	3	4	High Ivol	High-Low Ivol (%)
Low Cash/TA	0.469	0.265	-1.876	-0.732	-2.032	-2.501
	[1.028]	[0.719]	[-3.029]	[-0.99]	[-1.307]	[-1.54]
2	0.916	0.549	-0.299	-0.926	-2.285	-3.200
	[2.856]	[1.394]	[-0.425]	[-1.491]	[-2.105]	[-2.83]
3	0.918	0.98	0.565	-0.491	-1.291	-2.209
	[3.296]	[2.258]	[1.01]	[-0.508]	[-1.238]	[-2.05]
4	1.412	1.344	2.434	1.997	-0.341	-1.754
	[1.512]	[2.357]	[2.811]	[1.766]	[-0.264]	[-1.10]
High Cash/TA	2.212	1.058	2.387	2.675	1.504	-0.708
	[2.958]	[1.159]	[3.466]	[2.328]	[0.741]	[-0.33]
High -Low Cash/TA(%)	1.743	0.792	4.263	3.407	3.536	
	[1.99]	[0.80]	[4.60]	[2.49]	[1.38]	

PANEL B: Cash/TA and ROE Portfolios

	Low ROE	2	3	4	High ROE	High-Low ROE (%)
Low Cash/TA	-2.939	-1.461	0.034	0.845	1.09	4.029
	[-3.99]	[-3.25]	[0.085]	[2.374]	[2.440]	[4.67]
2	-0.165	-1.123	0.297	0.317	1.549	1.714
	[-0.19]	[-2.11]	[0.714]	[1.041]	[3.240]	[1.70]
3	-0.241	0.496	-0.08	1.33	1.596	1.836
	[-0.26]	[0.606]	[-0.21]	[3.797]	[4.513]	[1.87]
4	-0.684	-0.249	0.848	2.276	2.783	3.467
	[-0.67]	[-0.23]	[1.612]	[3.952]	[4.136]	[2.85]
High	0.971	0.572	2.256	1.506	4.212	3.241
	[0.861]	[0.648]	[2.026]	[2.591]	[6.116]	[2.45]
High –Low Cash/TA(%)	3.910	2.033	2.222	0.661	3.122	
	[2.90]	[2.05]	[1.88]	[0.97]	[3.80]	

PANEL C: Cash/TA and M/B Portfolios

	Low M/B	2	3	4	High M/B	High-Low M/B (%)
Low Cash/TA	-0.479	-0.162	-0.206	0.469	0.405	0.884
	[-0.85]	[-0.34]	[-0.47]	[1.290]	[0.628]	[1.03]
2	0.131	0.282	0.39	0.53	0.888	0.757
	[0.222]	[0.682]	[1.118]	[1.546]	[1.635]	[0.95]
3	1.169	0.656	0.613	1.549	0.694	-0.474
	[2.122]	[1.507]	[1.744]	[3.689]	[2.800]	[-0.79]
4	0.769	1.023	1.137	1.466	2.618	1.849
	[1.044]	[2.075]	[2.482]	[2.492]	[3.801]	[1.83]
High	0.962	-0.358	1.373	1.176	2.669	1.707
	[1.130]	[-0.59]	[2.317]	[2.231]	[3.396]	[1.47]
High –Low Cash/TA(%)	1.44	-0.196	1.580	0.707	2.264	
	[1.41]	[-0.25]	[2.14]	[1.10]	[2.23]	

TABLE 7
RELATION BETWEEN CASH/TA RATIOS AND STOCK RETURNS: SUB-PERIOD ANALYSIS

The sample period is 1980-2012. In every *quarter t*, we sort firms based on their Cash-to-Total Asset (Cash/Asset) ratios in *quarter t-1* and we form five Cash/Asset quintiles. Quintile 1 contains stocks with the lowest Cash/Asset ratios and Quintile 5 consists of the highest Cash/Asset ratios. The column "High-Low Cash Alphas" refers to the difference in quarterly returns between Quintile 5 and Quintile 1. Robust Newey-West (1987) *t*-statistics are reported in brackets. In Panel A, High minus Low Cash/TA alphas for the respective sub-periods are reported for the total sample. In Panel B, High minus Low Cash/TA alphas for the respective sub-periods are reported for the total sample excluding Equipment and Healthcare by using the "original" quintiles.

PANEL A: Total Sample Results

Sub-periods	High-Low Cash Alphas(%)
1980-1989	1.965
	[2.106]
1990-1999	0.571
	[0.386]
2000-2012	0.492
	[0.532]
2000-2006	3.643
	[2.134]
2007-2012	-0.315
	[-0.385]

PANEL B: Total Sample excluding Equipment and Healthcare (using "original" quintiles)

Sub-periods	High-Low Cash Alphas(%)
1980-1989	1.597
	[1.729]
1990-1999	-0.032
	[-0.025]
2000-2012	1.436
	[1.356]
2000-2006	4.352
	[2.401]
2007-2012	0.197
	[0.168]

TABLE 8
RELATION BETWEEN CASH HOLDINGS AND STOCK RETURNS: ALTERNATIVE SCALING FACTORS

The sample period is 1980-2012. In every *quarter t*, we sort firms based on their Cash-to-Sales and Cash-to-EBITDA ratios in *quarter t-1* and we form five Cash-to-*Variable* quintiles based upon these variables. Quintile 1 contains stocks with the lowest Cash-to-*Variable* ratios and Quintile 5 consists of the highest Cash-to-*Variable* ratios. The row "High-Low" refers to the difference in quarterly returns between Quintile 5 and Quintile 1 in *quarter t.* VWRET refers to value-weighted portfolio of simple unadjusted quarterly percentage returns in *quarter t*. The Carhart Alpha column shows the excess returns with respect to the Carhart 4-Factor Model. Robust Newey-West (1987) *t*-statistics are reported in brackets.

PANEL A: Using Cash/Sales to Form Quintiles

Cash/Sales Quintile	VWRET	Market	SIZE	B/M	MOM	Carhart Alpha (%)
Low	1.98	0.901	0.108	0.057	-0.134	0.560
		[16.978]	[1.519]	[0.790]	[-2.158]	[1.609]
2	2.03	0.931	0.014	0.092	-0.124	0.552
		[21.166]	[0.294]	[1.391]	[-2.886]	[2.326]
3	2.25	0.983	-0.128	0.021	-0.044	0.652
		[34.514]	[-3.167]	[0.625]	[-1.271]	[3.804]
4	2.67	1.007	0.009	-0.594	-0.058	1.564
		[14.273]	[0.062]	[-4.114]	[-0.733]	[3.800]
High	3.00	1.181	0.279	-0.950	0.059	1.553
		[9.895]	[1.247]	[-3.978]	[0.411]	[2.428]
High-Low	1.02					0.993
	[0.72]					[1.360]

Sub-Periods	Carhart Alpha(%)	t-stat.
1980-1989	1.02	1.26
1990-1999	-0.05	-0.04
2000-2012	-0.40	-0.41
2000-2006	1.63	0.96
2007-2012	-0.34	-0.36

PANEL B: Using Cash/EBITDA to Form Quintiles

Cash/EBITDA Quintile	VWRET	Market	SIZE	B/M	MOM	Carhart Alpha (%)
Low	1.81	0.882	0.102	0.229	-0.270	0.539
		[10.246]	[0.826]	[0.977]	[-1.384]	[0.572]
2	2.93	0.962	-0.512	-0.067	-0.328	2.183
		[7.642]	[-1.188]	[-0.399]	[-1.014]	[1.001]
3	3.29	0.841	-0.008	-0.234	-0.705	3.417
		[9.534]	[-0.045]	[-1.190]	[-1.729]	[2.176]
4	2.71	1.023	-0.006	-0.390	-0.061	1.398
		[10.825]	[-0.031]	[-1.748]	[-0.411]	[1.743]
High	3.19	1.308	0.133	-0.748	-0.135	1.787
		[8.406]	[0.482]	[-2.301]	[-0.875]	[1.932]
High-Low	1.38					1.247
	[0.77]					[0.94]

Sub-Period	Carhart Alpha(%)	t-stat.
1980-1989	1.93	0.85
1990-1999	0.66	0.24
2000-2012	0.04	0.02
2000-2006	6.89	1.45
2007-2012	-2.37	-1.29