

# **A Re-Examination of Increasing Cash Holdings**

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*We reexamine the widely accepted phenomenon that U.S. corporations are holding increasing amount of cash in the last few decades. We document that increase in cash holdings (scaled by the market value of assets) is a smaller and narrower phenomenon. We find that the average amount of cash holdings went up from 9.6% during the period 1980-84 to 11.1% during 2010-14. We also find that most of the increase in cash holdings can be attributed to smaller firms and firms in only two sectors, namely, healthcare, and hi-tech sectors. Finally, we also document that this phenomenon of an increase in cash holding for the healthcare and hi-tech sectors is not random but spans the entire period in our sample.*

*Keywords: cash policy, cash holding, market value of a firm, market value of assets, firm liquidity*

## **INTRODUCTION**

In a seminal paper, Bates, Kahle, and Stulz (2009) (henceforth BKS) document a trend of increasing cash holdings by US firms between 1980 and 2006. They attribute this increase in cash holdings to the increase in the cash flow volatility and to the precautionary motive rather than to the widely documented determinant of corporate liquidity, namely, agency problems.

The objective of this paper is to re-examine the trend of increasing cash holdings by US firms. We propose an alternate measure of cash holdings and identify a sub-sample of firms that count for most of the increase in cash holdings. While earlier studies have used cash holdings scaled by the book value of total assets as a measure of cash holdings, we propose that cash scaled by the market value of assets is a better measure. As Fama and French (2000) observe “a firm's market value measures not only the value of future investments, but also the value of assets in place.” We discuss this choice in detail in the paper and argue that the market value of equity is a more relevant measure of equity when measuring cash holdings, just as it is when measuring leverage (Bradley, Jarrell, and Han (1984); Bowman, (1980)). When using the market value of equity to measure the cash holdings, we show a much-muted increase in cash holdings as compared to earlier studies. Our results indicate that increased cash holdings in the recent years is specific to only a part of the economy, contrary to the belief that it is a more general phenomenon. More specifically, smaller firms and firms from technology and healthcare sectors contribute most to the increase in cash holdings.

The remainder of the paper proceeds as follows. Section 2 introduces the alternate measure of cash holdings. Section 3 examines whether the increased cash holding is a general or a narrow phenomenon.

Section 4 provides the econometric evidence to the stability of cash holding. Section 5 discusses the findings and concludes.

## **ALTERNATE MEASURE OF CASH HOLDINGS**

While existing research uses cash scaled by total assets as a measure of cash holdings, we argue that it is better to scale the cash variable by the market value of equity rather than the book value of equity. Similar arguments have been made in measuring leverage ratios. Titman and Wessels (1988) observe, “Firms with high market values relative to their book values have higher borrowing capacities and hence have higher debt levels relative to their book values.” Titman and Wessels (1988) posit that managers determine their level of “long-term debt” based on the market values rather than on the book values of assets. Bowman (1980) finds that the book value of debt to the market value of equity is a more powerful debt ratio measure than the book value of debt to the book value of equity.

Another argument for using the market value of assets comes from studies that examine firm liquidity vis-à-vis firm debt. Opler, Pinkowitz, Stulz, Williamson (1999), for instance, claim that cash is negative debt. They assert that an unconstrained firm uses its cash to pay debt and firms that have higher growth opportunities (as proxied by market value of equity) retain a higher level of cash. Acharya, Almeida, and Campello (2007) also argue that cash is negative debt for firms that have uncertain future cash flows. However, firms that have uncertain future cash flow face costly external capital. In such case, cash does not equal negative debt because holding cash may be better than reducing debt. Accordingly, a firm’s liquidity and capital structure policy are largely dependent on the expected cash flow from investments. Given that cash flows from investments correlate more with the market value of a firm, we contend that a firm’s cash policy should be examined vis-à-vis its market value of assets rather than the book value of assets.

Furthermore, theory suggests four motivations of holding cash: the transaction motive, the precautionary motive, the opportunistic motive, and the tax motive. Transaction motive states that the level of cash a firm holds depends upon the transaction costs it incurs in investing and in converting those assets into cash (Baumol, 1952). The implication of transaction motive is that large firms hold less cash due to the economy of scale which lowers their transaction costs (Bates et al. (2009)). The precautionary motive states that a firm holds cash in order to protect itself in times when external financing is costly (Almeida, Campello, and Weisbach (2004)). Precautionary motive also proposes that a firm holds cash to take advantage of a future investment opportunity (Opler, Pinkowitz, Stulz, and Williamson (1999)). The opportunistic motive suggests that, in order to increase their resources under control, entrenched managers keep cash instead of paying dividends when they have “low-return projects” (Jensen, 1986). Tax motives suggest that multinational firms that face a large amount of tax on repatriation hold a large amount of cash.

In these suggested motives of holding cash, it is the market value of equity that is relevant. For example, if cash is held to acquire another company, then the price paid is a function of the market value of equity of the target and the acquirer. Also, if the CEO is holding cash to repurchase company stocks during a downturn then the amount of cash to be held should be determined as a percentage of the market value of equity.

Similarly, while measuring the cost of capital it is customary to use the market value of debt and equity. Brealey, Myers, and Allen (2011) use market-based measures to calculate the weighted average cost of capital. The authors also posit that the cost of capital thus calculated can be used to evaluate potential projects of average risk. They suggest that the cost of capital represents the minimum rate of return that a firm must earn from its projects in order to satisfy the suppliers of funds. Thus, the use of cash-to-the book value of total assets, an accounting measure, would not represent the true value generated by the managers with the funds provided by the investors. They also suggest that firms should use the cost of capital thus generated to examine the economic value added (EVA) of firms in evaluating the managerial performances and deciding about managerial compensation.

Consistent with these studies, in this paper we measure cash ratio as the amount of cash divided by the market value of assets.

## Empirical Evidence and Hypothesis- Book Value Versus Market Value Measure

In this section, we present univariate analysis on market value-based cash holding measures. For our analysis, we use the variables and ratios used in the extant literature, especially those used by Bates et al. (2009) and Opler et al. (1999). All ratios are computed from Compustat. Cash ratio is defined as cash and cash equivalents divided by the market value of assets. The market value of assets is calculated as the market value of equity (fiscal year close price times common shares outstanding plus the book value of assets minus the book value of equity). Following Bates et al., (2009) we exclude financial firms (SIC code 6000-6999) and utilities (SIC codes 4900-4999) from the sample.

Table 1 and Figure 1 present the average (median) cash ratios from 1980 to 2014. For brevity, we average the annual average measures over 5-year intervals. The average (median) cash ratio fell from 9.6% (5.3%) in the first half of the 1980s to 8.7% (3.8%) in the second half of the 1990s. The measure reached its peak of 14.4% (9.4%) in 2005-2009 period before decreasing to 11.1% (7.2%) in 2010-2014. These findings do not support a linear increase in cash holdings over the sample period.

**TABLE 1**  
**CASH RATIO FROM 1980 TO 2014**

Period	N	Average Cash Ratio	Median Cash Ratio
1980-1984	18906	0.096	0.053
1985-1989	21654	0.094	0.042
1990-1994	22460	0.091	0.044
1995-1999	27401	0.087	0.038
2000-2004	21150	0.112	0.072
2005-2009	17264	0.144	0.094
2010-2014	14715	0.111	0.072

The following table shows cash ratio for the period 1980 through 2014 for Compustat firms. The sample does not include utility and financial service industries. Cash ratio is defined as cash and cash equivalents (che) divided by the market value of assets. The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Aggregate cash ratio is the sum of all cash holdings divided by the sum of all market value of assets for all firms in a year. Average (median) cash ratio is the average (median) of Cash ratio for all firms in the sample for a particular year. The sample period is divided into 5-year periods as indicated. The 5-year values are computed by taking the average of the annual averages of the respective ratios.

**FIGURE 1**  
**AVERAGE CASH RATIO FROM 1980 TO 2014**

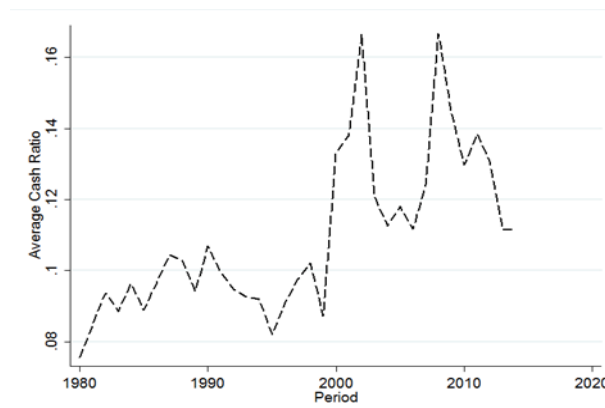


Figure 1 (a) Average Cash ratio ratio

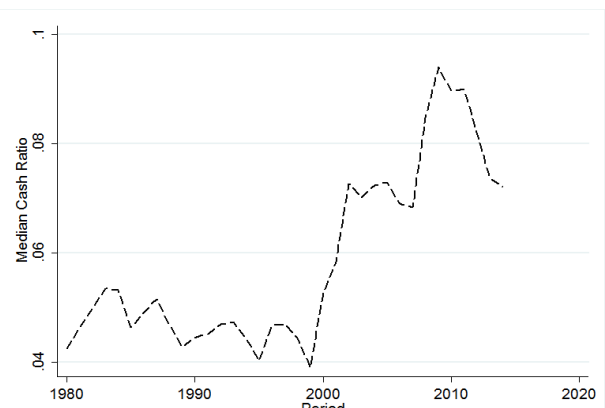


Figure 1 (b) Median Cash ratio ratio

The figure summarizes the aggregate, average, and median cash ratio for the period 1980 and 2014 for Compustat firms. The sample does not include utility and financial service industries. Cash ratio is defined as cash and cash equivalents (che) divided by the market value of assets. The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Aggregate cash ratio is the sum of all cash holdings divided by the sum of all market value of assets for all firms in a year. Average (median) cash ratio is the average (median) of Cash ratio for all firms in the sample for a particular year. The sample period is divided into 5-year periods as indicated. The 5-year values are computed by taking the average of the annual averages of the respective ratios.

### INCREASED CASH HOLDINGS: GENERAL OR NARROW PHENOMENON

Our second objective is to investigate if cash holdings have increased across the economy or are a much narrower phenomenon. To this end, we divide our sample into size quartiles based on the market value of equity and ten sectors. The reason behind dividing the sample into size quartiles comes from prior literature that correlate cash holding to firm size. For instance, Almeida, Campello and Weisbach (2004), and Han and Qiu (2007) find that smaller firms, which are generally cash constrained, have more cash holdings due to precautionary motives. Our rationale for examining cash holdings by industry is motivated by the finding of Chudson (1945), Bates et al. (2009), and Booth and Zhou (2013) that cash holdings vary by industry.

#### Empirical Evidences and Hypothesis- Size-Sorted Analysis

Table 2 and Figure 2 report results for the sample after dividing into size quartiles (based on . We compare cash-to-market values during the 1980-1984 period to values in the 2010-2014 period. The average (median) cash-to-market value increases from 12.9% (5.2%) to 18.5% (12.5%) for the first quartile, from 9.3% (5.5%) to 12.1% (9.4%) for the second quartile. The average (median) goes from 9.1% (5.7%) to 8.0% (6.1%) for the third quartile and decreases from 7.1% (5.0%) to 5.9% (4.7%) for the fourth quartile.

While Bates et al. (2009) document that cash-to-asset ratios are the same across firm sizes, our results, which uses cash-to-market value of assets, indicate that most of the increase in cash holding comes from smaller firms. Our results are consistent with Mulligan (1997) and Han and Qiu (2007), which suggest that smaller firms have stronger transaction and precautionary motives than their larger counterparts.

**TABLE 2**  
**CASH RATIO FROM 1980 TO 2014 FOR EACH SIZE QUARTER**

Panel A- Quartile 1				
Period	N	Average Cash	Median Cash	
1980-1984	4729	0.129	0.052	
1985-1989	5415	0.131	0.044	
1990-1994	5617	0.123	0.052	
1995-1999	6852	0.129	0.050	
2000-2004	5291	0.137	0.080	
2005-2009	4318	0.200	0.115	
2010-2014	3681	0.185	0.125	

Panel B- Quartile 2			
1980-1984	4726	0.093	0.055
1985-1989	5413	0.096	0.044
1990-1994	5614	0.105	0.054
1995-1999	6850	0.099	0.047
2000-2004	5286	0.134	0.094
2005-2009	4315	0.170	0.127
2010-2014	3678	0.121	0.094
Panel C- Quartile 3			
1980-1984	4727	0.091	0.057
1985-1989	5415	0.088	0.048
1990-1994	5616	0.084	0.048
1995-1999	6851	0.074	0.041
2000-2004	5287	0.108	0.080
2005-2009	4317	0.121	0.091
2010-2014	3680	0.080	0.061
Panel D- Quartile 4			
1980-1984	4724	0.071	0.050
1985-1989	5411	0.059	0.034
1990-1994	5613	0.054	0.030
1995-1999	6848	0.046	0.027
2000-2004	5286	0.069	0.047
2005-2009	4314	0.086	0.070
2010-2014	3676	0.059	0.047

This table shows the size sorted Cash ratio for the period 1980 through 2014 for Compustat firms. The yearly sample is divided into four size quartiles based on the market value of equity. The sample does not include utility and financial service industries. Cash ratio is defined as cash and cash equivalents (che) divided by the market value of assets. The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Aggregate cash ratio is the sum of all cash holdings divided by the sum of all market value of assets for all firms in a year. Average (median) cash ratio is the average (median) of Cash ratio for all firms in the sample for a particular year. The sample period is divided into 5-year periods as indicated. The 5-year values are computed by taking the average of the annual averages of the respective ratios.

**FIGURE 2**  
**TREND ON CASH RATIO FROM 1980 TO 2014 FOR DIFFERENT SIZE QUARTILES**

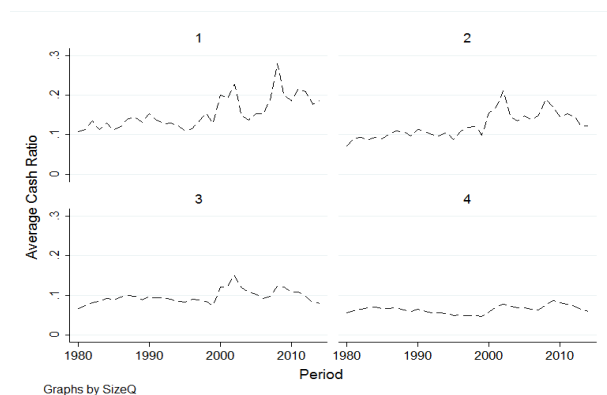


Figure 2 (a) Average cash ratio

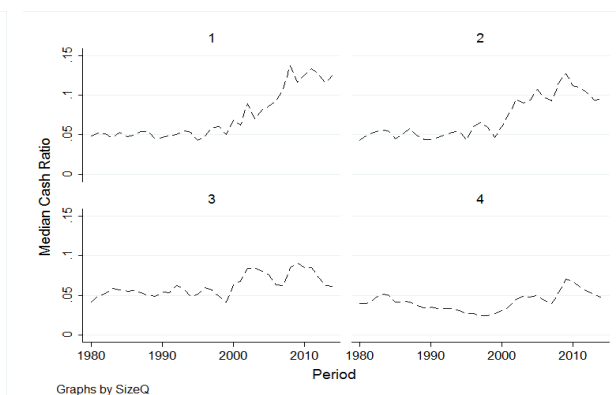


Figure 2 (b) Median cash ratio

The figure shows the size sorted trend of Cash ratio for the period 1980 through 2014 for Compustat firms. The yearly sample is divided into four size quartiles based on the market value of equity. The sample does not include utility and financial service industries. Cash ratio is defined as cash and cash equivalents (che) divided by the market value of assets. The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Aggregate cash ratio is the sum of all cash holdings divided by the sum of all market value of assets for all firms in a year. Average (median) cash ratio is the average (median) of Cash ratio for all firms in the sample for a particular year. The sample period is divided into 5-year periods as indicated. The 5-year values are computed by taking the average of the annual averages of the respective ratios.

### Empirical Evidences and Hypothesis- Sector Sorted Analysis

In order to examine whether the increase in cash holdings is a trend specific to certain sectors in the economy or is a more universal phenomenon, we divide firms into 10 Fama-French industries and examine the cash ratios for the nine sectors of interest (utilities excluded). We find that the increase in cash ratios is contributed mainly by the healthcare, and the hi-tech, sectors and to some extent by the telecom and the durables sectors. In Table 4 we report cash ratios for each sector over the 5-year period from 1980-1984 to 2010-2014.

As reported in Table 3 and Figure 3, the average (median) cash ratio increases from 8.5% (4.9%) to 9.7% (7.1%) for durables, decreases from 9.9% (4.4%) to 4.8% (2.5%) for energy, increases from 12.9% (7.9%) to 18.3% (13.2%) for health cares, increases from 10.5% (6.8%) to 14.8% (11.7%) for hi-tech, increases from 8.3% (4.5%) to 8.5% (5.2%) for manufacturing, decreases from 8.6% (4.2%) to 6.7% (3.1%) for non-durable, decreases from 8.8% (5.0%) to 6.1% (3.2%) for shops, increases from 6.0% (2.6%) to 7.7% (3.3%) for telecom and decreases from 10.6% to 8.2% for others. These results are consistent with the idea that cash holding vary by industry [Chudson (1945); Bates et al. (2009); Booth and Zhou (2013)].

**TABLE 3**  
**CASH RATIO FROM 1980 TO 2014 BY SECTORS**

Panel A- Durables				
Period	N	Average Cash Ev	Aggregate Cash Ev	Median Cash Ev
1980-1984	783	0.085	0.123	0.049
1985-1989	786	0.059	0.037	0.026
1990-1994	785	0.051	0.054	0.021
1995-1999	890	0.047	0.050	0.019
2000-2004	600	0.061	0.083	0.040
2005-2009	498	0.105	0.125	0.082
2010-2014	464	0.097	0.100	0.071
Panel B- Energy				
1980-1984	1787	0.099	0.051	0.044
1985-1989	1344	0.112	0.036	0.053
1990-1994	1193	0.069	0.027	0.029
1995-1999	1149	0.057	0.014	0.021
2000-2004	830	0.061	0.048	0.031
2005-2009	967	0.063	0.030	0.031
2010-2014	972	0.048	0.035	0.025

Panel C- Health Care				
1980-1984	1106	0.129	0.078	0.079
1985-1989	1922	0.119	0.049	0.056
1990-1994	2770	0.149	0.047	0.085
1995-1999	3431	0.123	0.032	0.068
2000-2004	2991	0.153	0.073	0.112
2005-2009	2802	0.190	0.092	0.136
2010-2014	2408	0.183	0.079	0.132
Panel D- Hi Tech				
1980-1984	3165	0.105	0.059	0.068
1985-1989	4422	0.123	0.072	0.065
1990-1994	4512	0.125	0.080	0.086
1995-1999	6546	0.116	0.041	0.066
2000-2004	5867	0.166	0.110	0.138
2005-2009	4246	0.218	0.124	0.163
2010-2014	3418	0.148	0.109	0.117
Panel E- Manufacturing				
Period	N	Average Cash Ev	Aggregate Cash Ev	Median Cash Ev
1980-1984	4281	0.083	0.053	0.045
1985-1989	4140	0.076	0.038	0.035
1990-1994	4039	0.067	0.033	0.030
1995-1999	4320	0.062	0.022	0.019
2000-2004	3065	0.072	0.042	0.042
2005-2009	2491	0.105	0.063	0.077
2010-2014	2231	0.085	0.049	0.052
Panel F- Non durable				
1980-1984	1753	0.086	0.056	0.042
1985-1989	1700	0.077	0.034	0.028
1990-1994	1766	0.066	0.023	0.025
1995-1999	1974	0.069	0.022	0.022
2000-2004	1313	0.069	0.034	0.031
2005-2009	1035	0.099	0.045	0.055
2010-2014	871	0.067	0.047	0.031
Panel G- Shops				
1980-1984	2723	0.088	0.046	0.050
1985-1989	3109	0.075	0.034	0.034
1990-1994	3180	0.064	0.025	0.027
1995-1999	3741	0.058	0.022	0.026
2000-2004	2642	0.066	0.048	0.039
2005-2009	2075	0.088	0.049	0.053
2010-2014	1771	0.061	0.039	0.032

Panel H- Telecom				
1980-1984	414	0.060	0.033	0.026
1985-1989	651	0.049	0.019	0.012
1990-1994	794	0.077	0.022	0.025
1995-1999	1034	0.067	0.027	0.034
2000-2004	827	0.084	0.032	0.041
2005-2009	667	0.101	0.040	0.049
2010-2014	539	0.077	0.030	0.033
Panel I- Other				
1980-1984	2894	0.106	0.076	0.059
1985-1989	3580	0.096	0.056	0.042
1990-1994	3421	0.089	0.035	0.044
1995-1999	4316	0.083	0.031	0.038
2000-2004	3015	0.100	0.069	0.058
2005-2009	2483	0.132	0.096	0.084
2010-2014	2041	0.082	0.079	0.056

This table shows Sector-wise Cash ratio based on Fama-French 10 industries (results shown for 9 industries after excluding the utilities sector) for the period 1980 through 2014 for Compustat firms. The sample does not include utility and financial service industries. Cash ratio is defined as cash and cash equivalents (che) divided by the market value of assets. The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Aggregate cash ratio is the sum of all cash holdings divided by the sum of all market value of assets for all firms in a year. Average (median) cash ratio is the average (median) of Cash ratio for all firms in the sample for a particular year. The sample period is divided into 5-year periods as indicated. The 5-year values are computed by taking the average of the annual averages of the respective ratios.

**FIGURE 3**  
**TREND ON CASH RATIO FROM 1980 TO 2014 FOR DIFFERENT INDUSTRIES**

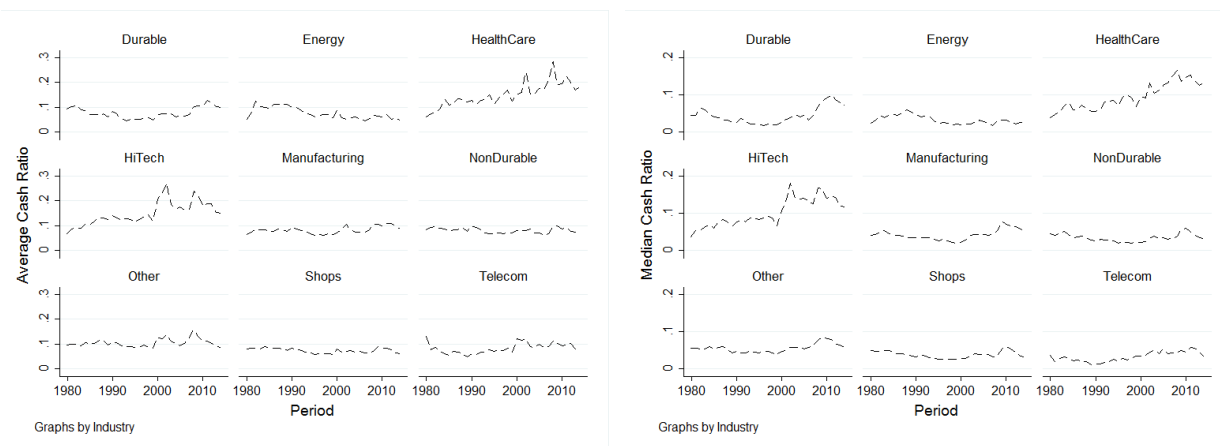


Figure 3 (a): Average Cash ratio ratio

Figure 3 (b): Median Cash ratio ratio

The figure shows the aggregate, average, and median Cash ratio ratio for each of Fama-French 10 industries (results shown for 9 industries after excluding the utilities sector) covering the period from 1980 to 2014 for Compustat firms. The sample does not include utility and financial service industries. Cash ratio is defined as cash and cash equivalents (che) divided by the market value of assets. The market value of



assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Aggregate cash ratio is the sum of all cash holdings divided by the sum of all market value of assets for all firms in a year. Average (median) cash ratio is the average (median) of Cash ratio for all firms in the sample for a particular year. The sample period is divided into 5-year periods as indicated. The 5-year values are computed by taking the average of the annual averages of the respective ratios.

These results from table 4 indicate that the change in cash holdings is not homogenous across sectors but is quite concentrated in two sectors- healthcare and hi-tech. Other sectors experience little or even negative change. These findings caution against generalizing the trend of increasing cash holdings.

### Regression Tests

In this section we estimate a regression predicting cash holdings to assess whether the difference in cash holdings across the industries is statistically significant. Extant literature [see for instance, Bates et al. (2009), Opler et al. (1999), Almeida et al. (2004)] provides several variables that explain a firm's cash holdings. We use cash and marketable securities as a measure of firm cash holding. We use the market to book ratio to measure firm growth opportunity, defined as the market value of total assets divided by the book value of total assets. Size is measured as the logarithm of the market value of total assets deflated to 2014 dollars. Cash flow is measured as the earnings before depreciation but after interest, dividends, and taxes. Our measure of net working capital is net of cash. The riskiness of cash flow is measured using the averages of the mean standard deviation of cash for firms in 2-digit sic code. The standard deviation is based on cash flow in the prior 10 years with the requirement that cash flow is available for at least 3 years. Leverage is measured as the book value of total debt divided by the market value of assets. R&D is the research and development costs. We also have an indicator variable for firms that pay dividends in a given year. Unlike the extant literature that uses book value of total assets, we use the market value of assets to scale the variables, unless otherwise mentioned. The market value of assets is calculated as the market value of equity, measured as the fiscal year close price multiplied by common shares outstanding, plus the book value of assets minus the book value of equity. Besides the variables mentioned above we also have eight discrete variables indicating each of the eight industries, manufacturing being the base model. Accordingly, we use the following empirical model for our regression analysis.

$$\text{Cash Holding}_i = \beta_0 + \beta_1 \text{Industry\_sigma}_i + \beta_2 \text{Market-to-book}_i + \beta_3 \text{Size}_i + \beta_4 \text{Cash\_flow}_i + \beta_5 \text{NWC}_i + \beta_6 \text{Capex}_i + \beta_7 \text{Leverage}_i + \beta_8 \text{R\&D}_i + \beta_9 \text{Dividend payer}_i + \beta_{10} \text{Acquisitions}_i + \beta_j (8 \text{ Industry\_dummies})_i + \varepsilon_i \quad (1)$$

Table 4 presents the summary statistics on the variables used in regression analysis. As seen in the table, some variables are quite different for the two industries of interest. More specifically, industry sigma is much higher for hi tech and healthcare. It is 5.6% for hi tech and 5.9% for healthcare industries. This is consistent with the finding of Almeida, Campello and Weisbach (2004) that firms with risky cash flow are likely to save more cash. Similarly, at 22% and 108% of sales, hi tech and healthcare spend significantly more in research and development in comparison to the rest of the industries. High amount of expected future R&D expenditure is likely to be the reason why these firms are saving more cash (Hand and Qiu, 2007). Also, firms in these two industries are less likely to pay dividends. Only 15.6% and 13.6% of firms in hi-tech and healthcare respectively pay dividends. This is consistent with the tradeoff theory (Myers (1984); Fama and French (2002)) which predicts that firms in the industries that have higher need to invest in research and development save cash to fund investments rather than for paying dividends.

**TABLE 4**  
**SUMMARY STATISTICS OF VARIABLES**

Industry	Panel A: Mean									
	Manufacturing	Durable	NonDurable	Shops	Other	Telecom	Energy	Hi-Tech	HealthCare	
N	24567	4806	10412	19241	21750	4926	8242	32176	17430	
Market to book	1.622	1.646	1.675	1.661	1.816	1.968	1.665	2.411	3.157	
Size	6.094	5.997	6.059	5.933	5.905	7.474	6.393	5.551	5.551	
Cash flow	0.035	0.031	0.033	0.031	0.016	0.019	0.027	-0.010	-0.049	
NWC	0.296	0.339	0.293	0.318	0.156	0.060	0.080	0.216	0.120	
Capex	0.044	0.042	0.041	0.051	0.063	0.057	0.125	0.032	0.022	
Industry sigma	0.044	0.044	0.036	0.035	0.049	0.042	0.062	0.056	0.059	
Leverage	0.195	0.194	0.201	0.203	0.200	0.256	0.213	0.094	0.097	
R&D/sales	0.052	0.043	0.016	0.007	0.025	0.039	0.012	0.222	1.081	
Div Payer	0.519	0.459	0.512	0.364	0.325	0.370	0.375	0.156	0.136	
Acquisitions	0.016	0.015	0.016	0.013	0.015	0.021	0.015	0.013	0.013	

Panel B: Median

Industry	Manufacturing	Durable	NonDurable	Shops	Other	Telecom	Energy	HiTech	HealthCare
N	24567	4806	10412	19241	21750	4926	8242	32176	17430
Industry sigma	0.041	0.043	0.033	0.033	0.044	0.036	0.061	0.053	0.054
Market-book	1.284	1.278	1.322	1.274	1.335	1.548	1.327	1.706	2.323
Size	6.021	5.771	5.866	5.842	5.880	7.399	6.360	5.345	5.311
Cash flow	0.050	0.051	0.047	0.047	0.038	0.039	0.049	0.030	0.000
NWC	0.260	0.301	0.238	0.267	0.099	0.049	0.064	0.161	0.071
Capex	0.032	0.031	0.029	0.035	0.034	0.043	0.095	0.019	0.012
Leverage	0.165	0.161	0.161	0.166	0.142	0.225	0.178	0.032	0.034
R&D/sales	0.009	0.008	0.000	0.000	0.000	0.000	0.000	0.088	0.103
Div Payer	1	0	1	0	0	0	0	0	0
Acquisitions	0	0	0	0	0	0	0	0	0

This table provides the summary statistics on key variables for the sample covering the period from 1980 to 2014 for Compustat firms. Panel A reports the mean and Panel B reports the median of the variables. The sample does not include utility and financial service industries. All of the variables are scaled by the market value of assets unless otherwise specified. The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Market to book is the market value of total assets (Mv) divided by the book value of total assets (at). Size is the market value of total assets deflated to 2014 dollars. Cash flow is the earnings before depreciation (oibdp) but after interest (xint), dividends (dvc), and taxes (txt). NWC is net working capital (nwc) minus cash (che). CAPEX is the capital expenditure (capex). Industry sigma is the averages of the mean standard deviation of cash flow for firms in 2-digit sic code. Leverage is measured as the book value of total debt (dlc + dltd) divided by the market value of assets. R&D is the research and development costs (xrd). Dividend payer is the indicator variable equal to 1 if a firm paid a dividend. Acquisitions is the acquisition expenditure (aqe). The standard deviation is based on cash flow in the prior 10 years with the requirement that cash flow is available for at least 3 years.

The regression results predicting cash holdings are reported in table 5. The table shows that all of the variables are significant determinants of corporate cash holdings, except for capital expenditure. Firms with higher level of cash holding have riskier cash flow (higher industry sigma), are smaller, have lower level of debt, make higher research and development expenditures, are less likely to make dividend payments, spend less in acquisitions, and invest less in net working capital (net of cash). The coefficients on industry indicators show that, while most of the industries differ from manufacturing industry, hi-tech and healthcare show significantly more amount of cash holding not explained by the determinants. This is consistent with our earlier findings that healthcare and hi-tech sectors contribute most to the increase in cash holdings.

**TABLE 5**  
**REGRESSION RESULTS ESTIMATING THE DETERMINANTS OF CASH HOLDINGS**

Item	Coefficient	T-stat
Industry sigma	0.497	20.53***
Market to book	-0.035	-92.35***
Size (market)	-0.008	-30.58***
Cash flow	-0.233	-20.17***
NWC	-0.094	-29.1***
Capex	-0.026	-1.26
Leverage (market)	-0.286	-98.4***
R&D/sales	0.018	23.89***
Dividend payer	-0.017	-21.81***
Acquisition	-0.108	-15.78***
Durable	-0.005	-3.01***
Energy	-0.028	-12.52***
Non-Durable	0.009	5.78***
Other	0.008	6.51***
Shops	-0.001	-0.91
Healthcare	0.024	16.19***
Hi-tech	0.042	33.52***
Telecom	0.019	8.2***
Intercept	0.268	82.82***
R <sup>2</sup>	0.299	

$$\text{Cash Holding}_i = \beta_0 + \beta_1 \text{Industry\_sigma}_i + \beta_2 \text{Market-to-book}_i + \beta_3 \text{Size}_i + \beta_4 \text{Cash\_flow}_i + \beta_5 \text{NWC}_i + \beta_6 \text{Capex}_i + \beta_7 \text{Leverage}_i + \beta_8 \text{R\&D}_i + \beta_9 \text{Dividend payer}_i + \beta_{10} \text{Acquisitions}_i + \beta_j (8 \text{ Industry\_dummies})_i + \varepsilon_i$$

This table provides the regression results estimating the determinants of cash holdings. The sample covers the period from 1980 to 2014 for Compustat firms. The sample does not include utility and financial service industries. The results are based on 125,333 observations with 14,857 unique firms. All of the variables are scaled by the market value of assets unless otherwise specified. The dependent variable is the cash holdings (che). The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Market to book is the market value of total assets (Mv) divided by the book value of total assets (at). Size is the market value of total assets deflated to 2014 dollars. Cash flow is the earnings before depreciation (oibdp) but after interest (xint), dividends (dvc), and taxes (txt). NWC is net working capital (nwc) minus cash (che). Capex is the capital expenditure (capex). Industry sigma is the averages of the mean standard deviation of cash flow for firms in 2-digit sic code. The standard deviation is based on cash flow in the prior 10 years with the requirement that cash flow is available for at least 3 years. Leverage is measured as the book value of total debt (dlc + dltd) divided by the market value of assets. R&D is the research and development costs (xrd). Dividend payer is the indicator variable equal to 1 if a firm paid a dividend in a given year. Acquisition is the acquisition expenditure (aqc). The model allows for separate industry dummy for Energy, Non-Durable, Other, Shops,

Healthcare, Hi-tech, Telecom sectors, Manufacturing being the base industry. \*\*\*, \*\*, \* indicate significance at 1, 5 and 10% levels respectively.

Given the findings that hi-tech and healthcare stand apart from the other industries, for robustness test, we run the above regression for each year individually over our sampling period. Running the regression individually also allow us to investigate whether the trend is specific to a certain period or is more widespread. Table 6 reports the coefficients in the industry indicator when we estimate the above equation (model 1) individually for each sample year rather than for the entire period. The results confirm our results reported above. As seen in the table, the coefficients for hi-tech and healthcare industries are positive and statistically significant at 1% for most of the years after 1983. The only other sector that has consistently significant coefficient is the energy sector which has negative coefficient between 2000 and 2014. Our results suggest that, both healthcare and hi-tech have been keeping more cash than manufacturing industry (our base industry), while other industries do not show any such trend in cash holdings during this period.

**TABLE 6**  
**ESTIMATED COEFFICIENTS ON INDUSTRY INDICATOR VARIABLES IN CROSS SECTION REGRESSIONS ESTIMATED ANNUALLY**

Year	N	Durable	Energy	NonDurable	Other	Shops	Healthcare	HiTech	Telecom	R <sup>2</sup>
1980	2672	0.035***	0.009	0.024***	0.026***	0.020***	0.006	-0.001	0.123	0.169
1981	2844	0.019*	0.000	0.022***	0.019***	0.013**	-0.017**	-0.002	0.004	0.223
1982	2927	0.017	0.005	0.018**	0.010	0.002	-0.013	0.001	0.003	0.209
1983	3061	-0.006	0.005	0.011	0.003	0.004	0.011	0.002	-0.006	0.201
1984	3307	-0.003	-0.024**	0.013*	0.004	0.003	0.028***	0.005	-0.014	0.255
1985	3251	0.001	-0.002	0.012*	0.014**	0.010*	0.021***	0.012**	-0.017*	0.209
1986	3303	0.009	-0.008	0.016**	0.011*	0.004	0.032***	0.017***	0.000	0.229
1987	3515	0.001	0.004	0.011	0.025***	-0.001	0.042***	0.024***	-0.001	0.271
1988	3420	0.003	0.003	0.013	0.017**	-0.001	0.032***	0.022***	-0.000	0.238
1989	3320	-0.009	-0.005	0.008	0.010	-0.007	0.017*	0.019***	0.005	0.238
1990	3289	-0.004	-0.022*	0.008	-0.008	-0.016	0.009	0.014	0.002	0.194
1991	3331	-0.010	0.000	0.010	-0.000	-0.008	0.013	0.018**	-0.007	0.177
1992	3503	-0.013*	-0.037	0.006	-0.005	-0.009	0.027***	0.031***	0.002	0.245
1993	3852	-0.013*	0.001	0.001	0.006	-0.002	0.023***	0.043***	0.015	0.258
1994	4153	-0.008	-0.019**	0.002	0.009	0.005	0.023***	0.044***	0.011	0.294
1995	4311	0.002	-0.019**	0.007	0.014**	0.004	0.018***	0.035***	0.015	0.261
1996	4719	-0.008	-0.031**	0.010	0.012**	0.005	0.027***	0.037***	0.023**	0.306
1997	4882	-0.004	-0.001	0.004	0.015***	0.006	0.034***	0.045***	0.025***	0.341
1998	4701	-0.017**	-0.017	0.002	0.011*	-0.005	0.039***	0.044***	0.027***	0.333
1999	4506	-0.017**	-0.010	0.003	0.012**	-0.007	0.020***	0.036***	0.018**	0.280
2000	4447	-0.013	-0.035**	0.009	0.015*	-0.010	0.022**	0.053***	0.023*	0.452
2001	4085	-0.013	-0.049***	0.014	0.003	0.001	0.014	0.050***	0.040***	0.419
2002	3893	0.002	-0.045***	0.004	0.017*	-0.012	0.025**	0.076***	0.033**	0.443
2003	3654	0.002	-0.028***	0.004	0.012*	0.001	0.019***	0.053***	0.011	0.378
2004	3672	-0.002	-0.023***	-0.006	0.009*	-0.001	0.023***	0.052***	0.008	0.368
2005	3623	0.005	-0.024***	-0.001	0.004	0.001	0.033***	0.058***	0.015	0.417
2006	3564	-0.003	-0.019***	-0.008	0.005	-0.008*	0.025***	0.046***	0.001	0.407
2007	3504	-0.007	-0.043***	-0.006	0.000	-0.011**	0.031***	0.039***	0.003	0.433
2008	3354	-0.020*	-0.038***	-0.004	0.014	-0.018**	0.047***	0.067***	0.025*	0.408
2009	3202	-0.005	-0.053***	-0.001	0.012	0.003	0.027***	0.067***	0.028***	0.357
2010	3164	-0.007	-0.044***	-0.008	0.001	-0.005	0.039***	0.051***	0.013	0.362
2011	3075	-0.002	-0.047***	-0.003	0.001	-0.010	0.042***	0.060***	0.016	0.341
2012	3017	-0.013	-0.056***	0.006	0.008	-0.009	0.028**	0.055***	0.027**	0.282
2013	3055	0.004	-0.047***	0.003	-0.003	-0.010	0.023**	0.050***	0.013	0.294
2014	3157	-0.002	-0.031**	0.005	-0.004	-0.013*	0.026**	0.043***	0.019*	0.293

This table provides the estimated coefficients on industry indicator variables in cross section regressions (equation 1) estimated annually. The sample covers the period from 1980 to 2014 for Compustat firms. The sample does not include utility and financial service industries. The results are based on 125,333 observations with 14,857 unique firms. All of the variables are scaled by the market value of assets unless otherwise specified. The dependent variable is the cash

holdings (che). The market value of assets is calculated as the market value of equity (fiscal year close price (prcc\_f) times common shares outstanding (csho)) plus the book value of assets (at) minus the book value of equity (ceq). Market to book is the market value of total assets (Mv) divided by the book value of total assets (at). Size is the market value of total assets deflated to 2014 dollars. Cash flow is the earnings before depreciation (oibdp) but after interest (xint), dividends (dvc), and taxes (txt). NWC is net working capital (nwc) minus cash (che). Capex is the capital expenditure (capex). Industry sigma is the averages of the mean standard deviation of cash flow for firms in 2-digit sic code. The standard deviation is based on cash flow in the prior 10 years with the requirement that cash flow is available for at least 3 years. Leverage is measured as the book value of total debt (dlc + dltd) divided by the market value of assets. R&D is the research and development costs (xrd). Dividend payer is the indicator variable equal to 1 if a firm paid a dividend in a given year. Acquisition is the acquisition expenditure (aqc). The model allows for separate industry dummy for Energy, Non-Durable, Other, Shops, Healthcare, Hi-tech, Telecom sectors, Manufacturing being the base industry. \*\*\*, \*\*, \* indicate significance at 1, 5 and 10% levels respectively.

## CONCLUSION

The objective of this study is to reexamine the widely accepted idea that cash holdings are increasing for US firms. Using an alternate measure of cash holdings, we find that cash holdings are not increasing by as much as widely believed and that most of the increase in cash holdings can be attributed to smaller firms and firms in just two sectors, namely, healthcare, and hi-tech.

Bates, Kahle, and Stulz (2009) find that US firms are increasing their cash holdings in the recent decades due to precautionary motives. It is customary in the literature to examine cash holding vis-à-vis a firm's book value of assets. We argue that the motives of holding cash, however, relate more with the market value of the assets of a firm than the book value of the assets. Accordingly, our study examines whether the increase in corporate cash holding (scaled by the market value of assets of a firm) is as universal phenomenon as suggested by the extant literature. More specifically, we examine whether the level of cash holding is conditional on firm size and firm's sector, and whether the trend, if any, is specific to a certain period or is more widespread.

When the level of cash holding, scaled by market value of assets, is examined for different size quartiles, we document that increase in cash holdings comes mainly from the lowest quartile firms and two sectors in the economy, i.e., healthcare and hi-tech. We document that, from the period 1980-1984 to 2010-2014, the lowest size quartile firms show an increment in the average (median) cash holdings of 43% (140%), while the largest size quartile firms show a decrease of 17% (6%).

Similarly, when we divide firms into ten sectors, two sectors show most of the increase. Healthcare shows an average (median) increase of 42% (67%), while hi-tech shows an average (median) of 41% (72%) increase in the cash ratio. Durables, manufacturing, and telecom show a modest increase, while energy, non-durables, shops, and other show a decrease over the period from 1980-1984 to 2010-2014. We also document that this increase in cash holding for healthcare and hi-tech spans most of the years in our sample period.

An important implication of our finding is that managers likely determine their level of cash holding based on the market value of the assets in place rather than the book value of assets.

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