# The impact of cash holdings and financial leverage on stock performance in boom and crisis periods

Shaobo Shen

A Thesis

In

The John Molson School of Business

Present in Partial Fulfillment of the requirements

for the Degree of Master of Science in Administration (Finance) at Concordia University

Montreal, Quebec, Canada

January 2020

**CONCORDIA UNIVERSITY**

**School of Graduate Studies**

This is to certify that the thesis prepared

By: Shaobo Shen

Entitled: **The impact of cash holdings and financial leverage on stock performance in boom and crisis periods**

and submitted in partial fulfillment of the requirements for the degree of

**Master of Science in Administration (Finance Option)**

complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by the final examining committee:

_____ Chair
Denis Schweizer

_____ Examiner
Denis Schweizer

_____ Examiner
Thomas Walker

_____ Supervisor
Juliane Proelss

Approved by: _____
Dr. Nilanjan Basu, Graduate Program Director

---

Dr. Anne-Marie Croteau, Dean, John Molson School of Business

Date: January 15th 2020

# ABSTRACT

The impact of cash holdings and financial leverage on stock performance in boom and crisis periods

Shaobo Shen

This paper explores the effects of cash holdings and financial leverage on firms' stock performance in contrasting economic periods: booms and crises. We use US listed firms with S&P investment grade ratings as our sample and select four different periods to represent economic expansion and distress. Using an expanded Fama-French model, we conclude that cash holdings and financial leverage exhibit opposite influences during different periods. Rich cash holdings can significantly protect firm stock performance during recession periods, but conversely can damage stock performance during economic growth periods. Moreover, aggressive financial leverage strategies are positively associated with stock performance during expansion periods and negatively associated with stock performance during economic recessions.

# ACKNOWLEDGEMENT

I would like to express my very sincere gratitude to my supervisor Dr. Juliane Proelss, for her continuous guidance and supports on this study. I am extremely grateful for everything she has done to me. Her guidance and feedback supported me in conducting this thesis and I could not finish it that well without her council. I would also like to thank my thesis committee Dr. Denis Schweizer and Dr. Thomas Walker for their insightful feedback and advice.

I would like to thank Dr. David Newton, Dr. Nilanjan Basu, and my colleague Ashrafee Takdir Hossain and everyone else who helped in this thesis conducting. It is my honor to have you all in my life and I shall never forget that.

Last but not least, I would like to thank my parents for the financial supports.

# Table of Contents

# List of Tables

## 1. Introduction

On September 15, 2008, the stock price of Lehman Brothers fell to $0.21 and on the following day, the fourth largest investment bank in the United States filed bankruptcy. After operating for over 150 years and described as too big to fail, Lehman Brothers became history. However, when it filed bankruptcy, it had $639 billion in assets and $619 billion in debt[1]. Mawutor (2014) explains that the reason for Lehman Brothers' failure was not that its assets could not cover its liabilities, but that the firm lacked sufficient liquidity. In the first quarter of 2007, housing prices in the United States began to fall and a large number of defaults began to occur. As a result, as one of the largest mortgage-holding investment banks, Lehman Brothers could not collect the usual amount of cash flow from its mortgage business. Therefore, Lehman Brothers had to use another approach to find enough liquidity to cover its interest expense. However, because of its extremely high leverage ratio (Assets/Equity) of 24[2], Lehman Brothers was not able obtain much current financing from commercial banks. Even worse, the continuous decline in housing prices caused the value of its mortgage assets to depreciate, making it hard to find buyers. Eventually, by September 12, 2008, Lehman had only $1.1 billion in cash[3]. Due to its lack of solvency, the company's investors started to panic and Lehman's stock price fell sharply. Finally, the firm became bankrupt.

As the famous economist Ben Shalom Bernanke said, confidence is something fragile and when a crisis occurs, only enough liquidity can appease investors and avoid a run. The most direct reason for Lehman Brothers' bankruptcy is obviously its lack of liquidity. Moreover, it is not

[1] Koppenheffer, M. (2019). 7 Mind-Blowing Numbers from the Lehman Brothers Disaster | the Motley Fool.
[2] Same as above
[3] Same as above

difficult to see that in Lehman Brothers' case, high leverage was another important reason for its failure; this aggravated the initial lack of liquidity and prevented the investment bank from attracting new investors and later recovering.

In fact, the results of this situation are not a coincidence. On the contrary, as early as the 1930s, the prominent economist Irving Fisher had already proposed the well-known theory of debt deflation. Fisher (1933) indicated that during economic booms, the credit system would rapidly expand because of overinvestment and eventually lead to a situation of overindebtedness. At that point, if the economic system was hit by an unexpected shock, the value of entire market's mortgage function would be greatly reduced due to asset depreciation. In this case, debtors might have difficulty repaying debt, because they would be unable to find other financing to acquire the necessary liquidity. Meanwhile, if there was no external intervention, debtors would end up with a compulsory debt settlement. As noted by Ivashina and Scharfestein (2009), in the 2008 financial crisis, new loans fell by 79% compared to the boom period.

Therefore, lack of liquidity and overindebtedness are considered two central reasons for the decline in firm performance during a crisis. However, by contrast, during an expansion period, poor liquidity and high leverage can greatly benefit a firm. According to Sraders (2019)[4], Lehman Brothers earned a huge amount of profits before the crisis due to its extremely high leverage and poor liquidity strategy. Between 2004 and 2006, Lehman Brothers recorded the fastest growth rate among investment banks and other asset management institutions. At the end of 2006, Lehman Brothers held an $85 billion portfolio of mortgage-backed securities[5], which was four times the amount of its shareholders' equity, and held only a few cash assets in its current account. As a

[4] Sraders, A. (2019). The Lehman Brothers Collapse and How It's Changed the Economy Today.
[5] Crossley-Holland, D. (2019). Lehman Brothers, the bank that bust the boom.

result, in 2006, the firm earned net income of $4.2 billion with only $19.3 billion in equity[6]. Clearly, these two strategies result in different patterns in different periods. Therefore, this study explores the effects of cash holdings and financial leverage on firm performance during periods of booms and crises. Since cash and cash equivalents are the most liquid assets, in this study, we use cash holdings to represent liquidity.

The reminder of this paper proceeds as follows. Section 2 summarizes prior studies and proposes the hypotheses. Section 3 illustrates the methodology. Section 4 describes the variables and data, and Section 5 explains the empirical results. Section 6 concludes with the study's findings and limitations.

## 2. Literature Review and Hypotheses Development

### *2.1 Cash holdings*

The effects of cash holdings on firm performance have been debated for decades. On the one hand, firm performance can be negatively affected by large cash holdings because of managers' tendency to overinvest. Myers and Rajan (1998) claim that when firms have too much cash, managers may invest in poor quality projects, such as those with negative NPV, and damage firm performance. In addition, Ferreira and Vilela (2004) argue that large cash holdings can also lead to entrenched managers stealing. Large cash holdings can reduce the pressure on managers to perform well and lead them to choose projects that best meet their own objectives, but may not be in shareholders' best interests. On the other hand, large cash holdings can also positively influence firm performance. Myers and Majluf (1984) suggest that large cash holdings can reduce the chance of underinvestment, a situation where managers do not undertake good projects (those with

[6] Sraders, A. (2019). The Lehman Brothers Collapse and How It's Changed the Economy Today.

positive NPV) because of inadequate cash. Acharya, Davydenko, and Strebulaev (2012) mention that large cash holdings can reduce a firm's short-tern default risk, while Ozkan and Ozkan (2004) note that cash can lower firms' cost of capital.

Several studies find that larger cash holdings can negatively influence firm performance. Ferreira and Vilela (2004) examine the cash balances data for EMU countries from 1987 to 2000, where they find a negative relationship between cash holdings and firm performance. In addition, Kalcheva and Lins (2007) collect cross-sectional data of 5,102 firms from 31 different countries in 1996; they find that when external country-level shareholder protection is weak, cash holdings are negatively related to firm performance. Moreover, Jose, Lancaster, and Stevens (1996) study 2,718 full-recorded US listed firms from 1974 to 1993 and conclude that aggressive working capital policies, which refers to low cash holdings, can benefit firm performance.

To summarize, we observe that in the papers mentioned above, the samples all cover an economic expansion period. The only exception is Jose, Lancaster, and Stevens (1996), whose sample includes several recession periods; however, since these periods only account for about 20% of their total sample, we believe the effects may be effectively diluted, and the results should be considered as relating to an economic expansion period.

In contrast, there are also numerous studies that find a positive relationship between cash holdings and firm performance. Mikkelson and Partch (2003) study the performance of 89 US listed firms that hold over 25% of their assets in cash or cash equivalents between 1986 and 1991 and between 1992 and 1996, and they observe a positive relationship between cash holdings and firm performance. Garcia-Appendini and Montoriol-Garrigacd (2013) analyze the effects of cash holdings on firm performance during the 2008 financial crisis. They collect data for 2,250 US listed non-financial firms from July 2007 to June 2008 and conclude that large cash holdings can

benefit firm performance during a financial crisis. Using four-digit industry codes, Fresard (2010) analyzes 105 industries from 1973 to 2006 and find a positive relationship between cash holdings and firm performance.

After reviewing the papers mentioned above, we find their conclusions of a positive relationship between cash holdings and firm performance are largely induced by their biased sample selection. Mikkelson and Partch (2003) and Fresard (2010) use limited samples of firms that meet certain conditions, while Garcia-Appendini and Montoriol-Garrigacd (2013) study the relationship only during a crisis period.

Connecting the above studies, we believe period selection is the exclusive reason for their different conclusions about the relationship between cash holdings and firm performance, where large cash holdings have a negative relationship with firm performance during economic expansion periods and a positive relationship during economic recessions. Therefore, we propose the following hypotheses:

*Hypothesis 1: Cash holdings are positively associated with stock performance during a crisis.*

*Hypothesis 2: Cash holdings are negatively associated with stock performance during a boom.*

*2.2 Financial leverage*

The effects of financial leverage on firm performance have also been a concern for decades. First, high financial leverage is known to be positively associated with firm performance because of better external supervision. As Ilyukhin (2015) describes, commercial banks establish a series of financial conditions for firms that borrow from them, and to meet these conditions, managers must work hard and improve firm performance. In addition, Jensen and Meckling (1976) propose that high financial leverage leads to low agency costs for all capital sources, and further, increase

firm performance. Finally, but importantly, Jensen (1987) indicates that higher financial leverage means higher interest expense and lower free cash flow, which potentially reduces the agency costs of free cash flow and increases firm performance. However, in contrast, high financial leverage may also negatively influence firm performance as a result of default risk, as Kraus and Litzenberger (1973) illustrate. They claim that financial leverage leads to firm insolvency and triggers bankruptcy costs, which potentially reduce firm performance. Moreover, Bradley and Kim (1984) suggest that higher financial leverage results in heavier "leverage-related" costs, including bankruptcy penalties and the agency costs of liabilities, and waste non-debt tax shields, which damages corporate profits. As we can observe from prior studies, they are more focus on the accounting performance and propose the mechanical possibility of the different effects of financial leverage. Although we are not look into mechanical effects, since the stock performance perceive the account performance, we believe the effects are also existing for stock performance.

To prove their theories on the influence of financial leverage on firm performance, many scholars propose their own studies. On the one hand, a group of economists support the conclusion that financial leverage can be positively associated with firm performance. Margaritis and Psillaki (2010) explore French firms in the chemical, computer, and textile industries from 2002 to 2005 and use the debt-to-assets ratio to define financial leverage. Eventually, they conclude that high financial leverage has a positive influence on firm performance. Berger and Di Patti (2006) study US commercial banks from 1984 to 1995 and use the equity-to-assets ratio to represent financial leverage. Their results show that high financial leverage can effectively decrease agency costs and improve firm performance. Margaritis and Psillaki (2007) analyze the relationship between financial leverage and firm performance using a sample of 12,240 New Zealand firms from 2003 to 2004, and measure financial leverage using the long-term debt ratio. They conclude that high

levels of financial leverage can positively influence firm performance. Regarding the papers above, we observe that they either use periods of economic expansion (Margaritis and Psillaki, 2010; Margaritis and Psillaki, 2007), or apply a long period (Berger and Di Patti (2006)), where the effects of extreme periods are fully diluted.

On the other hand, a number of scholars insist there is a negative relationship between financial leverage and firm performance. González (2013) examines the relationship between financial leverage and firm performance using a sample of 10,375 firms from 39 countries during industrial downturns and measure financial leverage with total debt (short-term and long-term) divided by total assets. Consequently, they find that financial leverage is negatively associated with firm performance during periods of distress. Opler and Titman (1994) use 46,799 firm-year observations for US listed firms from 1972 to 1991 and include in their model an interaction dummy variable for financial leverage and distress industry to analyze the effects of financial leverage on firm performance during industrial distress periods. They measure financial leverage using the book value of debt divided by the book value of total assets and conclude that high financial leverage reduces firm performance during distress periods. Tsuruta (2016) conducts research on small Japanese firms from 2003 to 2009, an economic recession period[7]. He measures financial leverage by the ratio of the total book value of debt to the book value of total assets, and finds financial leverage has a negative effect on firm performance.

Summarizing the papers above, we can see that the findings of a negative relationship between financial leverage and firm performance all result from testing during a distress period. Therefore, we believe the effect of financial leverage on firm performance has different patterns

[7] Leika Kihara (August 17, 2012). "Japan eyes end to decades long deflation". Reuters. Retrieved September 7, 2012.

during different periods. More precisely, we believe high financial leverage can improve firm performance during boom periods and worsen firm performance during crisis periods. Furthermore, to clarify our arguments, we establish the following hypotheses.

*Hypothesis 3: Financial leverage is negatively associated with stock performance during crises.*

*Hypothesis 4: Financial leverage is positively associated with stock performance during booms.*

## 3. Methodology

To test our hypotheses, we employ an extension of the Fama and French (1993) three-factor (FF3) model to explain the connection between stock performance and fundamental information. During the past decades, many scholars have refined the FF3 model with the goal of obtaining better explanatory power. Jegadeesh and Titman (1993) indicate that a recent performance, momentum, or WML (winners minus losers) variable can be added to the FF3 model to obtain better explanatory power. Carhart (1997) adds an extra momentum factor to the FF3 model and obtains better results. Titman, Wei, and Xie (2004) imply that the FF3 model incompletely explains the variation, and suggest improving it by adding profitability and investment variables. Petkova (2006) illustrates that a model including investment variables performs better than the FF3 model. Charghori, Chanm, and Faff (2007) test the FF3 model using a sample that covers January 1995 to December 2004 and conclude that the model cannot proxy for default risk. Berk, DeMarzo, and Harford (2009) employ a fourth WML factor and find it better explains excess returns than the FF3 model. Gregory and Tharyan (2013) test a four-factor model with an extra factor that is decomposed and value-weighted, and show that it works better than the FF3 model when there is no exposure to extreme momentum. Even Fama and French (2015) add profitability and investment variables to their original three-factor model and illustrate its better

ability to explain excess returns. To summarize, the extended FF3 model has been applied to measure the influence of momentum factors on firm stock performance. Moreover, as Fama French (2015) describe, Fama French model shall be more effective for the normal period and the effectiveness during the extreme period needs to be study further. Therefore, this study extends the FF3 model with two more factors to enhance the power of Fama French model during the extreme period and uses the extended model to test our hypotheses.

*3.1 Portfolio building*

Following Fama and French (1993), we first form 25 portfolios by size and cash holdings and calculate the monthly excess returns for each portfolio to test the effect of cash holdings on firm performance. Then, we repeat the procedure and form portfolios by size and financial leverage to observe the effects of financial leverage.

Since circumstances during a financial crisis change quickly, to avoid missing useful information, we rebalance our portfolios both annually[8] and quarterly[9]. In line with Fama and French's (1993) original methodology, we sort the stocks in the annually rebalanced portfolios once a year at the end of June. We first calculate the quintile breakpoints for size and cash holdings (financial leverage), respectively, by equally sorting at the end of June of year t, and then we calculate intersecting breakpoints for the corresponding variables. Finally, we allocate valid stocks from the NYSE, Amex, and NASDAQ stock markets into the portfolio framework. The procedure used to form quarterly rebalanced portfolios is primarily the same; the main difference is that we

[8] The annually rebalanced methodology means we calculate the variables (market value of equity, book value of equity, cash asset ratio, and financial leverage) once per year to allocate the companies, and then calculate the value-weighted returns for the portfolios.

[9] The quarterly rebalanced methodology means we calculate the variables (market value of equity, book value of equity, cash asset ratio and financial leverage) once per quarter to allocate the companies, and then calculate the value weighted returns for the portfolios.

calculate size, cash holdings, and financial leverage and allocate stocks by quarter. We conduct the processes above for each sample period we select (both recession and boom), to compare the effects of cash holdings and financial leverage in different periods.

The other detailed procedures and proxies are identical to those of Fama and French (1993). In the annually rebalanced portfolios, we measure firm size using the market value of equity, the book to market value ratio, cash holdings, and financial leverage at the end of December of year t-1. We exclude firms until they have been included in Compustat for two years. We use the NASDAQ breakpoints for ME, BE/ME[10], CH, and LEV to allocate the NYSE, Amex, and NASDAQ stocks. In the quarterly rebalanced portfolios, we re-measure all variables and re-allocate stocks every quarter.

Finally, to improve the rigor of our analysis, we also conduct a univariate test for excess monthly returns. However, since it is hard to test the value-weighted geometric mean directly, we transform the returns into natural logarithms and test the difference in the value-weighted arithmetic average return for the transformed data to test the null hypothesis.

*3.2 Regression test*

To test the effects of the two proposed variables in a multivariate setting, we estimate a regression analysis. First, we test the proposed effects separately. In terms of cash holdings and financial leverage, the first tested model is shown in equation (1):

[10] The book value of equity is equal to the recorded amount of total stockholders' equity plus deferred taxes and investment tax credits minus preferred stock; the market value of equity is equal to shares outstanding times the closing price of the corresponding stock. Preferred stock is estimated by redemption, liquidation, or par value (in that order) in the annually rebalanced portfolios, and by redemption in the quarterly rebalanced portfolios.

$$Rit - RFt = \alpha i + bi(Rmt - RFt) + siSMBt + hiHMLt + riRMPt + eit \quad (1)$$

In equation (1), consistent with Fama and French's (1993) description, $R_{it}$ is the return on security or portfolio i for sample period t. $RF_t$ stands for the risk free return for the same period t, and $RM_t$ is the return on the value-weighted market portfolio. $SMB_t$ represents the difference between the returns on a diversified portfolio of small stocks and the returns on a diversified portfolio of large stocks. $HML_t$ indicates the difference between the returns on diversified portfolios with high B/M values during period t minus the return on diversified portfolios with low B/M values. All three variables above are from Fama French three-factor model and after that, $RMP_t$ is a brand new variable we create and it refers to the excess returns of stocks with rich cash holdings minus the excess returns of stocks with poor cash holdings. Finally, $e_{it}$ is a zero-mean residual[11]. In addition, regarding the parameters in equation (1) as true figures instead of estimates, if the factor exposures $b_i$, $s_i$, hi, and $r_i$ explain all the variation in expected returns, the intercept $a_i$ should be zero for all securities and portfolios i.

After that, we check financial leverage, our second variable; the model is shown in equation (2):

$$Rit - RFt = \alpha i + bi(Rmt - RFt) + siSMBt + hiHMLt + ciCMAt + eit \quad (2)$$

where CMAt indicates the excess returns of firms with conservative financial leverage minus the excess returns of firms with aggressive financial leverage during time period t.

In equation (3), we test the effects of cash holdings and financial leverage jointly, as follows:

[11] We apply 2*2*2*2 strategy when calculating SMB, HML, RMP, CMA factors.

$$Rit - RFt = \alpha i + bi(Rmt - RFt) + siSMBt + hiHMLt + riRMPt + ciCMAt + eit \quad (3)$$

However, compared to Fama and French (1993, 2015), which use monthly data over more than 40 years to perform the regression, our separate sample financial crisis periods are much shorter. Therefore, to increase our model's empirical power, we use daily data under a quarterly rebalancing principal. In addition, we conduct a VIF (variance inflation factor) test for all regression results to check for multicollinearity problems.

In our final model, considering the special dimension of separating the sample periods, we add two extra interaction dummy variables to our model, shown in equation (4) below:

$$Rit - RFt = \alpha i + bi(Rmt - RFt) + siSMBt + hiHMLt + riRMPt + piRMPCt + ciCMAt + miCMACt + eit \quad (4)$$

where RMPC and CMAC are two interact dummy variables. We build a variable "CrisisD" as a dummy variable that refers to a crisis period, and equals 1 for observations during a financial crisis, and 0 for observations during a boom. RMPC is equal to RMP*CrisisD, which is an interaction dummy variable that equals RMP for crisis periods and 0 for boom periods. CMAC is equal to CMA*CrisisD, which is an interaction dummy variable that equals CMA for crisis periods and 0 for boom periods.

## 4. Variable and Data Descriptions

### *4.1 Variable measurement*

#### *4.1.1 Measurement of cash holdings*

The measurements used in the literature for cash holdings vary. Gregory (2005); Han and Qiu (2007); Bates, Kahle, and Stulz (2009); Álvarez, Sagner, and Valdivia (2012); Harford, Klasa,

and Maxwell (2013); Deb, David, and O'Brien (2015); and Rocca and Cambrea (2018) use the cash to assets ratio, which equals cash and marketable securities divided by the book value of assets, to represent cash holdings in their studies. Opler, Pinkowitz, Stulz, and Williamson (1999) and Dittmar, Mahrt-Smith, and Servaes (2003) apply cash and short term investments divided by the book value of total assets excluding cash and short-term investments to denote cash holdings. Dittmar and Mahrt-Smith (2007) employ cash and cash equivalents divided by the market value of equity to measure cash holdings. Harford, Mansi, and Maxwell (2008) measure cash holdings using the ratio of cash to sales.

Following Gregory (2005), Han and Qiu (2007), and others, we measure cash holdings using cash and short-term investments (Compustat item #1) divided by the book value of total assets (Compustat item #6), as shown in equation (5) below:

$$Cash\ holding = \frac{Cash\ and\ Short\ Term\ Investements\ (CHE)}{Total\ Assets\ (AT)} \tag{5}$$

Considering the cash holdings mentioned in our case are mainly used to cover interest expense, in this paper, we apply an interest coverage ratio[12] (cash and short-term investments "CHE" over interest expense "XINTQ") to represent the cash ratio as a robustness check to make our study more representative.[13]

[12] Other well-accepted liquidity measurements include: the cash ratio (1st grade liquidity) = liquid funds over short-term liabilities, the quick ratio (2nd grade liquidity) = (liquid funds + short-term receivables + securities) over short-term liabilities, and the current ratio (3rd grade liquidity) = (liquid funds + short-term receivables + securities +inventories) over short-term and mid-term liabilities. These measurements are closely related to the measure we use in our robustness check. We do not expect the results to differ significantly because that group of measures also accounts for the firm's ability to pay their liabilities out of funds that can be liquidated on short notice.

[13] We add this measure not only to use the most popular liquidity measure but also to use one that accounts for the firm's ability to pay its interest expense.

*4.1.2 Measurement of financial leverage*

Measurements of financial leverage are also well discussed in the extant literature. Ghosh and Jain (2000); González (2013); Tsuruta (2016); Bae, Kim, and Oh (2017); and Davies, Hillier, and McColgan (2005) measure financial leverage as the ratio of total debt over the book value of total assets. Maury and Pajuste (2005) denote financial leverage with long-term debt over total assets. Aivazian, Ge, and Qiu (2005) use both total debt over total assets and long-term debt over total assets to represent financial leverage.

To be consistent with prior studies, we use long-term debt (Compustat item #9) plus debt included in current liabilities (Compustat item #34) over the book value of total assets (Compustat item #6) to measure financial leverage, following González (2013), Bae, Kim, and Oh (2017), and others. Equation (7) presents the calculation:

$$Financial\ leverage = \frac{Long\ Term\ Debt\ (DLTT) + Debt\ in\ Current\ Liabilities(DLC)}{Total\ Assets\ (AT)} \quad (7)$$

As above, we perform a robustness check using long-term debt (DLTT) over total assets (AT). We believe the long-term debt ratio is an excellent measurement of financial leverage due to its stable nature over time, and the fact that it is not easily diluted by short-term borrowings.[14]

*4.2 Data and sample definition*

Market efficiency is a considerable factor in market selection, because stock performance can reflect firms' operating information better in a more efficient market. Therefore, we use the US market as our sample. Our sample consists of US listed firms included in Compustat's annual

[14] Note that we do not apply market values here, because market values can be easily misestimated during crisis periods.

and quarterly data with available balance sheet and income statement data.[15] We exclude firms without positive cash holdings or positive financial leverage. According to Altman (1989), firms with higher credit ratings are less likely to default than others. Thus, when analyzing financial leverage, we use firms with S&P investment grade ratings (BBB- and higher) as our sample to offset the potential problem of our sample being biased by possible firm defaults.[16]

The sample period includes both crisis (recession) periods and booms. According to NBER's Business Cycle Dating Committee, we select July 1990 to March 1991 (9 months and 188 working days) and from December 2007 to June 2009 (19 months and 397 working days) to represent financial crises[17]. We do not include the recession of 2001 because that crisis was mainly focused on the IT industry[18]. Correspondingly, we select October 2006 to June 2007 (9 months and 187 working days) and September 2014 to March 2016 (19 months and 398 working days) to denote economic expansion periods.

To summarize, our baseline sample consists of US listed firms with an S&P Domestic Long Term Issuer Credit Rating of BBB- or higher for the four separate periods identified above, including 560 (July 1990-March 1991), 700 (December 2007-June 2009), 690 (October 2006-June 2007), and 688 (September 2014-March 2016) firms. We obtain the accounting data, including book value of equity, cash and short-term investments, long-term debt, debt in current liabilities,

---

[15] Note that we do not exclude banks and the other financial firms as other corporate finance papers would do. There are two main reasons: the first one is that our paper largely follows Fama French (1993) and Fama French (2015) and since they do not exclude them, we do not do that as well; a second reason is that we have tried the eliminated sample and the results are remain unchanged.

[16] Note that we do not apply the S&P rating selection for the cash holdings analysis procedure because there is no clear evidence showing a critical relationship between cash holdings and survival bias, and we believe the full sample will result in better explanatory power. Moreover, we also check the effects of cash holdings by selected samples and the results remain unchanged.

[17] Retrieved 4 December 2019, from https://www.nber.org/cycles/cyclesmain.html. (2019).

[18] Amadeo, K. (2019). How 9/11 Worsened the 2001 Recession. Retrieved 4 December 2019.

and total assets from Compustat North America annually and quarterly. We collect the S&P Domestic Long Term Issuer Credit Rating from Compustat Ratings. In addition, we acquire the monthly and daily stock returns, shares outstanding, and closing stock prices (to calculate the market value of equity), from CRSP monthly and daily data. Finally, we get the monthly and daily risk-free rate from WRDS Fama French & Liquidity Factors monthly and daily.

## 5. Empirical Results

### *5.1. Portfolios sorted by size and cash holdings*

We begin our presentation of results with the full sample. Tables 1a and 1b exhibit value-weighted average monthly excess returns for 25 size-cash holdings portfolios. We denote firms within least 20% cash holdings as "poor," and firms within the top 20% of cash holdings as "rich."

**********Insert table 1a here**********

**********Insert table 1b here**********

Panel R1, our first economic recession period, in Tables 1a and 1b shows that excess monthly returns typically increase from cash poor stocks to rich stocks, independent of firm size. Portfolios for firms with high market value and poor cash are an exception. After checking firms in this portfolio, we find that firms with the largest influence (market value of equity) are mainly energy firms and telecommunications companies. Therefore, we regard the industrial nature of firms as a possible explanation (Gardner, 1994).[19] The effect of cash holdings in R2 of Tables 1a and 1b, which refers to our second economic recession period, is not clear[20]. Generally, smaller

[19] The immediate cause of the 1990 crisis was the oil price shock and "the bulk of these losses were in construction and manufacturing" as Gardner (1994) describes.

[20] In a robustness check, we only include investment grade firms. However, the results remain largely similar to those shown in Tables 1a and 1b for Panel R2.

firms show lower excess returns compared to larger firms, independent of cash holdings. Possible explanations include the uniqueness of the 2008 credit crisis, during which external financing options were largely constrained, and when there is a loss of confidence, firms tend to cancel or postpone operations and investments. As Campello and Harvey (2010) note, this dilutes the effects of cash holdings.

In line with our expectations, in Panels E1 and E2 of Tables 1a and 1b, which refer to the economic expansion periods, the monthly excess returns for the first four rows roughly fall from stocks with poor cash holdings to stocks with rich cash holdings. Similar to R1, we find that portfolios with high market value in Panel E2 of Tables 1a and 1b have a different pattern, where the negative effect is largely reversed.

To obtain more indirect information, we conduct a univariate test for excess returns of portfolios with rich cash holdings and those with poor cash holdings; these results are presented in Table 2.

**********Insert table 2 here**********

Table 2 shows the univariate analysis results. Rows (3) and (6) of column R1 (recession period) show that the average monthly excess returns of stocks with poor cash holdings are significantly smaller than those with rich cash holdings in most cases, which supports hypothesis 1 that stocks with rich cash holdings perform better during crisis periods. However, the excess returns difference for our second recession period (R2) is not significant in row (3) and is significantly positive in row (6), which is inconsistent with our expectations.

On the contrary, for the economic expansion periods (Columns E1 and E2), we observe significantly positive results in row (3) of E1, which means firms with poor cash holdings

experience better stock performance during economic expansion periods, thus supporting hypothesis 2. Contrary to hypothesis 2, the figures in row (6) of E2 are negative and significant at the 5% level, while the other results are not statistically significant at the usual levels. It is possible these abnormal results are biased by the value-weighted calculation, because value-weighted excess returns are more affected by firms with high market value, which makes the results less representative. Additionally, because of the univariate nature of our analysis, our results may be diluted by other effects such the B/M ratio, which may affect the excess returns observed. Thus, we test our results in a multivariate setting to account for those effects.

*5.2 Portfolios by size and financial leverage*

For the following analysis, we only include investment grade firms because non-investment grade firms exhibit high default risk, especially in times of recession, which would bias the analysis. The results for the complete sample are available upon request. Tables 3a and 3b show the value-weighted average monthly excess returns for 25 size-financial leverage portfolios. We denote firms in the lowest 20% of financial leverage as "conservative," and identify firms in the highest 20% of financial leverage as "aggressive." In addition, we collect the median S&P long-term domestic debt rating for each portfolio; the results are included in Appendices E1 and E2.

**********Insert table 3a here**********

**********Insert table 3b here**********

From Panels R1 and R2 of Tables 3a and 3b, we observe that for the largest size quintile, extremely high leverage is associated with lower average excess returns than extremely low

leverage, which is consistent with hypothesis 3[21]. However, the trend in the other size quintiles is not clear. One possible reason is the different ratings; while we require investment grade, due to sample size, we do not limit our results to firms with a specific rating.

For smaller to mid-size firms in Panels R1 and R2 with annual balancing, in line with our expectations we find the 4th quintile (2nd most aggressive leverage) exhibits lower average excess returns compared to firms with less aggressive leverage, despite better ratings (see Appendix E1 and Appendix E2). When quarterly rebalancing is applied, this effect vanishes and, contrary to our expectations, firms with high (more aggressive) leverage on average have higher average returns compared to firms with more conservative leverage, despite similar or better ratings. Similar to our univariate findings for cash, our results may be diluted by other effects such the B/M ratio, which may affect the excess returns observed.

A relatively clear upward trend exists in the economic expansion periods. For all size quintiles in Panel E2 of Table 3a, portfolios with aggressive financial leverage experience higher excess returns than portfolios with conservative financial leverage, despite equal or lower ratings. There are some exceptions in Panel E1 of Tables 3a and 3b as well as Panel E2 of Table 3b, which can largely be explained by rating differences (see Appendix E1 and Appendix E2). We generally observe that the average return rises as leverage increases, which supports hypothesis 4: high financial leverage is positively associated with stock performance during economic expansion periods.

[21] Note the average rating for aggressive leverage firms is A (A-) and AA (A) for conservative leverage firms.

We also conduct a univariate test for excess returns of portfolios with aggressive leverage and with conservative leverage; these results are shown in Table 4.

**********Insert table 4 here**********

Table 4 presents the univariate evidence. Although some of the differences are not significant, we observe that for the recession periods (R1 and R2), firms with conservative financial leverage have better stock prices than firms that apply an aggressive financial leverage strategy, which supports hypothesis 3. Moreover, in the second expansion period, we observe better stock performance for firms with high financial leverage, which is consistent with hypothesis 4. However, the difference for the first economic expansion period (E1) is negative. One possible explanation could be differences in the ratings of firms in the different portfolios, causing deviations in the cost of capital or changes in credibility over time; we note that portfolios with a conservative leverage strategy share an overall higher rating than portfolios with an aggressive leverage policy, as discussed above.

*5.3 Regression test*

This section presents our multivariate evidence using an extension of the FF3 model.

**********Insert table 5 here**********

Table 5 shows the results from the four-factor model that includes the cash holdings variable, and the results are clear. In line with hypotheses 1 and 2, the PMR factor is significantly positive during the two recession periods and significantly negative during the expansion periods, illustrating that rich cash holdings can positively influence stock returns during economic recession periods and are negatively associated with firm performance during economic expansion periods. In addition, all the variance inflation factor (VIF) results are less than 3, which indicates

multicollinearity is not a significant problem in this study. A robustness check was conducted using the interest coverage ratio to represent the cash ratio; the results are the same, and are included in Appendix A.

**********Insert table 6 here**********

Table 6 presents the results for the four-factor model that includes financial leverage. We observe a significantly positive coefficient for the CMA factor in the first recession period, which supports hypothesis 3 that a low level of financial leverage can benefit stock returns during a recession. However, the result for the second recession period is insignificant, although it is still positive. With respect to Fosberg (2013), we think the unique nature of a short-term debt increase may drive the results, and we later perform a robustness check using the long-term debt/asset ratio. On the contrary, in line with hypothesis 4, the coefficients for the two economic expansion periods are both significantly negative, which means a high level of financial leverage can positively influence stock performance during boom periods. The largest variance inflation factor (VIF) in table 7 is only 2.89, which implies there is no issue with multicollinearity.

We also conduct a robustness check using the long-term debt ratio to represent financial leverage; the results are included in Appendix B, where the CMA coefficients support hypotheses 3 and 4. Considering the results in table 6 and Appendix B, we suggest a possible explanation for the insignificant coefficient of the CMA factor in R2 in Table 6 lies in the exclusive nature of the intense increase in short-term debt in the 2008 financial crisis. Therefore, the total debt/assets ratio would be somewhat less representative.

**********Insert table 7 here**********

We combine the cash holdings and financial leverage factors in a single model, and the results of this five-factor model are shown in Table 7. The main results are largely unchanged. The coefficients for the RMP and CMA factors are all positive during the economic recession periods, although the CMA coefficient for period R2 is not statistically significant. This may be due to the unique nature of the 2008 crisis, as discussed above. Most of the coefficients are negative during the economic expansion periods, which is consistent with our hypotheses. However, the results of our sample period E2 are an exception, where more cash (we expected less) and more leverage result in better performance. However, the negative CMA coefficient is stronger than in the other expansion period, which could suggest very high leverage and thus very high interest expense. Thus, a possible explanation may be that firms should maintain higher cash levels to maintain a buffer as security and keep loan costs low. Again, with 3.32 as the largest VIF, there is no serious multicollinearity problem here either. As above, we conduct a robustness check and the results are included in Appendix C, where the RMP factors are all statistically significant at the usual levels and consistent with our hypothesis; however, CMA is not significant. Possible explanations include the rating migration issue and the uncommon nature of the 2008 crisis.

*5.4 Combined regression test interaction dummy variables*

In this section, we add two interaction dummy variables to our regression; the results are shown in Table 8.

**********Insert table 8 about here**********

Considering the results in Table 8, the coefficient of RMP represents the effect of cash holdings on firm performance during the economic expansion periods. It is significantly negative, which means rich cash holdings have a negative influence on firms' stock performance during

boom periods, which supports hypothesis 2. Further, combining the coefficients for RMP and RMPC, we obtain a positive result, which indicates rich cash holdings can positively influence firm performance during a financial crisis, consistent with hypothesis 1. As we summarize above, holding more cash has two contradictory effects. It can either lead to an overinvestment problem and an entrenched manager stealing, which would negatively influence firm performance, or offset the underinvestment issue and decrease the default risk, which would potentially increase firm wealth. Our findings suggest that more (less) cash is better in a recession (boom), which implies more cash could lead to overinvestment and entrenched manager stealing problems during economic expansions and would largely offset the underinvestment problem and reduce default risk during recessions.

Similarly, a negative coefficient of CMA in Table 8 indicates that a high level of financial leverage is negatively associated with firm performance during economic expansion periods. This supports hypothesis 4, but the combined figure for CMA and CMAC is close to zero. As a result, we cannot easily identify the overall effects; they may be due to a rating migration problem, which we will explore in the future. As we note in the literature review, a high level of financial leverage can both increase firm performance because of better external supervision and lower agency costs, and reduce firm profit, as a result of higher bankruptcy costs and higher agency costs. Our finding implies that during economic expansion periods, higher financial leverage can enhance external supervision and lead to overall lower agency costs, which benefits the firm, while during recession periods, a higher level of financial leverage means higher bankruptcy costs and even higher agency costs, which can be harmful to firm performance.

The robustness check results are included in Appendix D, The coefficients of RMP, measured as cash over interest expense, thus adjusting cash/liquidity for the firm's ability to pay

their interest obligations, are all significant, The measure of CMA using long term debt over total assets, which thus focuses on long term and on average more stable financing, are also significant at the usual levels and support our hypotheses.

## 6. Conclusion

In this study, we research the effects of cash holdings and financial leverage in different periods (boom and crisis). Based on prior literature and observing the effects in actual stock markets, we believe they have different patterns in terms of their effect on firm performance during these two types of periods. Considering the analysis above, we confirm the following conclusions. Both cash holdings and financial leverage have opposite effects on firm performance during economic expansion periods and recession periods. Rich cash holdings are positively associated with firms' stock performance during crisis periods, which is in line with hypothesis 1, but, in contrast, damages stock performance during boom periods, which supports hypothesis 2. Examining the results more closely, a high level of financial leverage can positively influence stock performance during economic expansion periods, consistent with hypothesis 3, but will decrease firms' stock performance during economic recession periods, which supports hypothesis 4. However, to offset the survival bias problem in the crisis period, we form our sample using firms with investment grade S&P Long-term Domestic Debt ratings. This creates potential problems, including rating migration and the special nature of certain crises, which may bias our results to some extent. Future study is needed to focus on these problems.

## References

Fama, E.F., French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33(1),* 3-56.

Jegadeesh, N, Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance, 48(1),* 65-91.

Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance, 52(1),* 57-82.

Petkova, R. (2006). Do the Fama–French Factors Proxy for Innovations in Predictive Variables? *The Journal of Finance, 61(2),* 581-612.

Gaunt, C. (2004). Size and book to market effects and the Fama French three factor asset pricing model: evidence from the Australian stock-market. *Accounting and Finance, 44(1),* 27-44.

Berk, J., DeMarzo, P., Harford, J. (2009). *Fundamentals of Corporate Finance.*

Gregory, A., Tharyan, R., Christidis, A. (2013). Constructing and Testing Alternative Versions of the Fama–French and Carhart Models in the UK. *Journal of Business Finance & Accounting, 40(1-2),* 172-214.

Fama, E.F., French, K.R. (2015). A five-factor asset pricing model. *Journal of Financial Economics, 116(1),* 1-22.

Wang, Y.J. (2002). Liquidity management, operating performance, and corporate value: evidence from Japan and Taiwan. *Journal of Multinational Financial Management, 12(2),* 159-169.

Raheman, A., Nasr. M. (2007). Working Capital Management and Profitability – Case of Pakistani Firms. *International Review of Business Research Papers, 3,* 279-300.

Garcia-Teruel, P.J., Martinez-Solano, P. (2007). Effects of working capital management on SME profitability. *International Journal of Managerial Finance, 3(2),* 164-177.

Titman, S., Wei, K.C.J., Xie, F. (2004). Capital Investments and Stock Returns. *Journal of Financial and Quantitative Analysis, 39(4),* 677-700.

Jermias, J. (2008). The relative influence of competitive intensity and business strategy on the relationship between financial leverage and performance. *The British Accounting Review, 40(1),* 71-86.

Vithessonthi, C., Tongurai, J. (2014). The effect of firm size on the leverage–performance relationship during the financial crisis of 2007–2009. *Journal of Multinational Financial Management, 29,* 1-29.

Opler, T.C., Titman, S. (1994). Financial Distress and Corporate Performance. *The Journal of Finance, 49(3),* 1015-1040.

Saleem, Q., Rehman, R.U. (2011). Impacts of liquidity ratios on profitability. *Interdisciplinary Journal of Research in Business, 1(7),* 95-98.

Olagunju, A., David, A.O., Samuel, O.O. (2011). Liquidity Management and Commercial Banks' Profitability in Nigeria. *Research Journal of Finance and Accounting, 2(7-8),* 24-38.

Niresh, J.A. (2012). Trade-off between liquidity & profitability: A study of selected manufacturing firms in Sri Lanka. *Journal of Arts, Science & Commerce, 4(2),* 34-40.

Lartey, V.C., Antwi, S., and Boadi, E.K. (2013). The relationship between liquidity and profitability of listed banks in Ghana. *International Journal of Business and Social Science, 4(3),* 48-56.

Bauman, Z. (2013). *Liquid modernity.*

Abdulazzez, Y.H., Saif-Alyousfi, Asish, S., Rohani, M. (2017). Profitability of Saudi Commercial Banks: A Comparative Evaluation between Domestic and Foreign Banks using Capital Adequacy, Asset Quality, Management Quality, Earning Ability and Liquidity Parameters. International *Journal of Economics and Financial Issues, 7(2),* 477-484.

Alshatti, A.S. (2015). The effect of credit risk management on financial performance of the Jordanian commercial banks. *Investment Management and Financial Innovations, 12(1),* 338-345.

Jang, C.H.H., Tang, S.C.S. (2009). The tourism–economy causality in the United States: A sub-industry level examination. *Tourism Management, 30(4),* 553-558.

Malik, H. (2011). Determinants of insurance companies' profitability: An analysis of insurance sector of Pakistan. *Academic Research International, 1(3),* 315-321.

Kartikasari, D., Merianti, M. (2016). The effect of leverage and firm size to profitability of public manufacturing companies in Indonesia. *International Journal of Economics and Financial Issues, 6(2),* 409-413.

Abraham, R., Harris, J., Auerbach, J. (2017). Earnings yield as a predictor of return on assets, return on equity, economic value added and the equity multiplier. *Modern Economy, 8,* 10-24.

Charghori, P., Chan, H., Faff, R. (2007). Are the Fama-French Factors Proxying Default Risk? *Australian Journal of Management, 32(2),* 223-250.

Ahmad, N., Salman, A., Shamsi, A.F. (2015). Impact of Financial Leverage on Firms' Profitability: An Investigation from Cement Sector of Pakistan. *Research Journal of Finance and Accounting, 6(7),* 75-80.

Deb, P., David, P., O'Brien, J. (2015). When is cash good or bad for firm performance? *Strategy Management Journal, 38(2),* 436-454.

Gregory A. (2005). The Long Run Abnormal Performance of UK Acquirers and the Free Cash Flow Hypothesis. *Journal of Business Finance & Accounting, 32(5-6),* 777-814.

Rocca, M.L., Cambrea, D.R. (2018). The effect of cash holdings on firm performance in large Italian companies. *Journal of International Financial Management & Accounting, 30(1),* 30-59.

Harford, J., Klasa, S., Maxwell, W.F. (2013). Refinancing Risk and Cash Holdings. *The Journal of Finance, 69(3),* 975-1012.

Bates, T.W., Kahle, K.M., Stulz, R.M. (2009). Why Do U.S. Firms Hold So Much More Cash than They Used To? *The Journal of Finance, 64(5),* 1985-2021.

Faukender, M., Wang, R. (2006). Corporate Financial Policy and the Value of Cash. *The Journal of Finance, 61(4),* 1957-1990.

Franzoni, F., Nowak, E., Phalippou, L. (2012). Private Equity Performance and Liquidity Risk. *The Journal of Finance, 67(6),* 2341-2373.

Álvarez, R., Sagner, A., Valdivia, C. (2012). Liquidity Crises and Corporate Cash Holdings in Chile. *The Developing Economies, 50(4),* 378-392.

Tsuruta, D. (2016). Variance of Firm Performance and Leverage of Small Businesses. *Journal of Small Business Management, 55(3),* 404-429.

Bae, J., Kim, S., Oh, H. (2017). Taming polysemous signals: The role of marketing intensity on the relationship between financial leverage and firm performance. *Review of Financial Economics, 33(1),* 29-40.

Angell, R.J., Brewer, B.L. (2003). Improving the coverage of the dupont approach of financial analysis in finance courses through the use of the net leverage multiplier. *Journal of economics and finance education, 2(2),* 1-5.

González, V.M. (2013). Leverage and corporate performance: International evidence. *International Review of Economics & Finance, 25(1),* 169-184.

Enekwe, C.I., Agu, C.I., Ezideo, K.N. (2014). The effect of financial leverage on financial performance: Evidence of quoted pharmaceutical companies in Nigeria. *Journal of Economics and Finance, 5(3),* 17-25.

Mikkelson, W.H., and Partch, M.M. (2003). Do Persistent Large Cash Reserves Hinder Performance? *The Journal of Financial and Quantitative Analysis, 38(2),* 275–294.

Ferreira, M.A., Vilela, A.S. (2004). Why Do Firms Hold Cash*?* Evidence from EMU Countries*. European Financial Management, 10(2),* 295-319.

Garcia-Appendini, E., Montoriol-Garriga, J. (2013). Firms as liquidity providers: Evidence from the 2007–2008 financial crisis. *Journal of Financial Economics, 109(1),* 272-291.

Faleye, O. (2005). Cash and Corporate Control. *The Journal of Finance, 59(5),* 2041-2060.

Anderson, R.W., Hamadi, M. (2016). Cash holding and control-oriented finance. *Journal of Corporate Finance, 41(1),* 410-425.

Aivazian, V. A., Ge, Y., & Qiu, J. (2005). The impact of leverage on firm investment: Canadian evidence. *Journal of corporate finance, 11(1-2),* 277-291.

Kalcheva, I., Lins, K.V. (2007). International Evidence on Cash Holdings and Expected Managerial Agency Problems. *The Review of Financial Studies, 20(4),* 1087-1112.

Margaritis, D., Psillaki, M. (2010). Capital structure, equity ownership and firm performance. *Journal of Banking & Finance, 34(3),* 621-632.

Campello, M. (2005). Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics, 82(1),* 135-172.

Gomes, J.F., Schmid, L. (2010). Levered Returns. *The Journal of Finance, 65(2)*, 467-494.

Marie, A., Rao, A. (2008). Cost efficiency and value driver analysis of insurers in an emerging economy.

Maury, B., Pajuste, A. (2005). Multiple large shareholders and firm value. *Journal of Banking & Finance, 29(7)*, 1813-1834.

Davies, J.R., Hillier, D., McColgan, P. (2005). Ownership structure, managerial behavior and corporate value. *Journal of Corporate Finance, 11(4),* 645-660.

Ivashina, V., & Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. Journal of Financial economics, 97(3), 319-338.

Simutin, M. (2013). Cash holdings and mutual fund performance. *Review of Finance, 18(4),* 1425-1464.

Ghosh, A., & Jain, P. C. (2000). Financial leverage changes associated with corporate mergers. *Journal of Corporate Finance, 6(4),* 377-402.

Myers, S. C., & Rajan, R. G. (1998). The paradox of liquidity. *The Quarterly Journal of Economics, 113(3),* 733-771.

Acharya, V., Davydenko, S. A., & Strebulaev, I. A. (2012). Cash holdings and credit risk. *The Review of Financial Studies, 25(12),* 3572-3609.

Jose, M. L., Lancaster, C., & Stevens, J. L. (1996). Corporate returns and cash conversion cycles. *Journal of Economics and finance, 20(1),* 33.

Ozkan, A., & Ozkan, N. (2004). Corporate cash holdings: An empirical investigation of UK companies. *Journal of banking & finance, 28(9),* 2103-2134.

Fresard, L. (2010). Financial strength and product market behavior: The real effects of corporate cash holdings. *The Journal of finance, 65(3),* 1097-1122.

Baxter, N. D. (1967). Leverage, risk of ruin and the cost of capital. *The Journal of Finance, 22(3),* 395-403.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of financial Economics, 97(3)*, 470-487.

Kim, E. H., Lewellen, W. G., & McConnell, J. J. (1979). Financial leverage clienteles: Theory and evidence. *Journal of Financial Economics, 7(1),* 83-109.

Ilyukhin, E. (2015). The impact of financial leverage on firm performance: Evidence from Russia. *Корпоративные финансы, (2 (34))*.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics, 3(4)*, 305-360.

Fosberg, R. (2013). Short-Term Debt Financing During the Financial Crisis. International *Journal of Business and Social Science, 4(8),* 1-5.

Jensen, M. C. (1987). The free cash flow theory of takeovers: A financial perspective on mergers and acquisitions and the economy. *In Proceedings of a conference sponsored by Federal Reserve Bank of Boston (102-143).*

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of finance, 28(4)*, 911-922.

Bradley, M., Jarrell, G. A., & Kim, E. H. (1984). On the existence of an optimal capital structure: Theory and evidence. *The Journal of Finance, 39(3)*, 857-878.

Han, S., & Qiu, J. (2007). Corporate precautionary cash holdings. *Journal of Corporate Finance, 13(1)*, 43-57.

Berger, A. N., & Di Patti, E. B. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking & Finance, 30(4)*, 1065-1102.

Harford, J., Mansi, S. A., & Maxwell, W. F. (2008). Corporate governance and firm cash holdings in the US. *Journal of financial economics, 87(3),* 535-555.

Altman, E. I. (1989). Measuring corporate bond mortality and performance. *The Journal of Finance, 44(4)*, 909-922.

Gardner, J.M. (1994). The 1990-1991 Recession: How Bad was the Labor Market. *Monthly Labor Review. Bureau of Labor Statistics. 117 (6),* 3–11

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of financial economics, 52(1),* 3-46.

Dittmar, A., & Mahrt-Smith, J. (2007). Corporate governance and the value of cash holdings. *Journal of financial economics, 83(3),* 599-634.

Dittmar, A., Mahrt-Smith, J., & Servaes, H. (2003). International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative analysis, 38(1),* 111-133.

Margaritis, D., & Psillaki, M. (2007). *Capital structure and firm efficiency. Journal of Business Finance & Accounting, 34(9-10)*, 1447-1469.

Table 1a

Average monthly excess returns for annually rebalanced portfolios formed on Size and Cash holdings. Panel R1 and R2 refer to economic recession periods. Panel E1 and E2 refer to economic expansion periods.

| Panel R1: 07/1990-03/1991 | | | | | |
|---|---|---|---|---|---|
| | Poor | 2 | 3 | 4 | Rich |
| Small | -6.2% | -4.8% | -4.6% | -3.0% | -4.6% |
| 2 | -4.1% | -4.1% | -4.3% | -2.5% | -3.8% |
| 3 | -4.2% | -3.3% | -3.7% | -2.2% | -2.6% |
| 4 | -2.5% | -2.2% | -2.8% | -2.5% | -0.4% |
| Big | 0.0% | -0.6% | -0.1% | 0.0% | 1.2% |
| Panel R2: 12/2007-06/2009 | | | | | |
| | Poor | 2 | 3 | 4 | Rich |
| Small | -5.9% | -6.0% | -5.4% | -6.3% | -6.6% |
| 2 | -5.4% | -4.6% | -4.4% | -5.9% | -5.8% |
| 3 | -4.0% | -4.3% | -4.1% | -4.7% | -4.6% |
| 4 | -4.6% | -4.3% | -4.4% | -3.9% | -3.5% |
| Big | -3.2% | -3.3% | -3.2% | -3.2% | -3.3% |
| Panel E1: 10/2006-06/2007 | | | | | |
| | Poor | 2 | 3 | 4 | Rich |
| Small | 0.4% | 0.3% | 0.4% | 1.1% | -0.3% |
| 2 | 0.8% | -0.2% | 0.6% | 0.0% | -0.7% |
| 3 | 0.9% | 0.5% | 0.8% | 1.1% | -0.1% |
| 4 | 0.4% | 0.8% | 1.1% | 1.1% | 0.2% |
| Big | 1.3% | 1.0% | 0.9% | 0.5% | 1.2% |
| Panel E2: 09/2014-03/2016 | | | | | |
| | Poor | 2 | 3 | 4 | Rich |
| Small | -1.8% | -1.3% | -3.1% | -2.7% | -4.9% |
| 2 | -1.0% | -0.7% | -1.3% | -1.8% | -3.7% |
| 3 | -1.2% | -1.2% | -1.0% | -1.4% | -2.3% |
| 4 | -1.3% | -1.0% | -0.8% | -0.4% | -1.2% |
| Big | -0.4% | -0.1% | -0.1% | 0.2% | 0.0% |

Table 1b

Average monthly excess returns for quarterly rebalanced portfolios formed on Size and Cash holdings. Panel R1 and R2 refer to economic recession periods. Panel E1 and E2 refer to economic expansion periods.

| Panel R1: 07/1990-03/1991 | | | | | |
|---|---|---|---|---|---|
| | Poor | 2 | 3 | 4 | Rich |
| Small | -2.9% | -2.0% | -2.9% | -0.2% | -1.2% |
| 2 | -3.7% | -3.3% | -4.0% | -2.9% | -2.5% |
| 3 | -3.5% | -2.9% | -2.1% | -1.3% | -0.2% |
| 4 | -2.4% | -2.2% | -1.9% | -2.6% | 0.1% |
| Big | 0.1% | -0.5% | -0.1% | 0.0% | 1.0% |
| Panel R2: 12/2007-06/2009 | | | | | |
| | Poor | 2 | 3 | 4 | Rich |
| Small | -4.2% | -4.0% | -5.6% | -3.9% | -6.2% |
| 2 | -4.6% | -4.9% | -4.8% | -5.8% | -5.7% |
| 3 | -4.4% | -4.2% | -4.5% | -4.7% | -4.4% |
| 4 | -4.2% | -3.9% | -4.5% | -3.8% | -4.3% |
| Big | -2.9% | -3.4% | -3.7% | -3.3% | -3.8% |
| Panel E1: 10/2006-06/2007 | | | | | |
| | Poor | 2 | 3 | 4 | Rich |
| Small | -0.2% | -0.1% | 0.3% | 0.9% | 1.6% |
| 2 | 0.6% | 0.3% | 0.3% | -0.7% | 0.1% |
| 3 | 0.6% | 0.1% | 0.9% | 1.6% | 0.2% |
| 4 | 0.8% | 0.1% | 1.1% | 1.1% | 0.0% |
| Big | 1.2% | 0.7% | 1.0% | 0.7% | 1.5% |
| Panel E2: 09/2014-03/2016 | | | | | |
| | Poor | 2 | 3 | 4 | Rich |
| Small | -1.7% | -1.9% | -2.7% | -3.1% | -4.8% |
| 2 | -1.7% | -2.6% | -1.4% | -2.9% | -2.7% |
| 3 | -1.6% | -1.5% | -1.7% | -2.2% | -2.9% |
| 4 | -1.7% | -1.1% | -1.7% | -0.9% | -2.2% |
| Big | -0.7% | -0.5% | -0.5% | 0.0% | -0.2% |

Table 2

Value weighted average monthly return comparison for stocks with poor and rich cash holdings.
N refers to the number of observation. Mean indicates the value weighted average continuous return. R1 and R2 represent economic recession periods. E1 and E2 represent economic expansion periods.
T-values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All the null hypothesis test results, including significance level and t value, are made for value weighted arithmetic average of logarithm risk free return.

| | | R1:07/1990-03/1991 | | R2: 12/2007-06/2009 | | E1: 10/2006-06/2007 | | E2: 09/2014-03/2016 | |
|---|---|---|---|---|---|---|---|---|---|
| | | N | Mean | N | Mean | N | Mean | N | Mean |
| Average monthly return for stocks with poor cash holding (annually rebalanced) | (1) | 9327 | 0.0% (-0.32) | 17651 | -3.3%*** (-33.45) | 8781 | 1.2%*** (21.81) | 14552 | -0.4%*** (-6.56) |
| Average monthly return for stocks with rich cash holding (annually rebalanced) | (2) | 5800 | 0.9%*** (4.82) | 10848 | -3.4%*** (-21.77) | 5174 | 1.0%*** (8.91) | 8979 | 0.2%* (1.67) |
| Difference in average monthly return poor cash – rich cash (1) - (2) | (3) | | -1.0%*** (-3.66) | | 0.2% (0.68) | | 0.2%* (1.72) | | -0.2% (-1.61) |
| | | N | Mean | N | Mean | N | Mean | N | Mean |
| Average monthly return for stocks with poor cash holding (quarterly rebalanced) | (4) | 8271 | 0.0% (0.40) | 15730 | -3.0%*** (-29.84) | 8690 | 1.1%*** (19.54) | 14009 | -0.7%*** (-11.60) |
| Average monthly return for stocks with rich cash holding (quarterly rebalanced) | (5) | 5496 | 0.9%*** (4.54) | 9690 | -3.9%*** (-23.74) | 4950 | 1.3%*** (9.23) | 8492 | -0.4%*** (-3.66) |
| Difference in average monthly return poor cash – rich cash (4) - (5) | (6) | | -0.8%*** (-3.60) | | 0.9%*** (4.41) | | -0.1% (-0.99) | | -0.3%** (-2.11) |

Table 3a

Average monthly excess returns for annually rebalanced portfolios formed on Size and Financial Leverage. Panel R1 and R2 refer to economic recession periods. Panel E1 and E2 refer to economic expansion periods.

| Panel R1: 07/1990-03/1991 | | | | | |
|---|---|---|---|---|---|
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | -2.1% | -2.3% | -0.6% | -4.6% | 0.2% |
| 2 | -2.1% | -0.8% | -0.9% | -2.3% | 0.1% |
| 3 | -0.2% | -5.3% | -4.3% | -2.5% | -0.6% |
| 4 | -1.0% | -0.4% | 0.0% | 0.0% | -0.3% |
| Big | 0.2% | 0.1% | 0.1% | 0.5% | -0.6% |
| Panel R2: 12/2007-06/2009 | | | | | |
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | -5.0% | -5.0% | -12.9% | -7.4% | -3.5% |
| 2 | -2.4% | -3.9% | -4.1% | -5.0% | -2.2% |
| 3 | -2.8% | -3.5% | -5.0% | -3.4% | -2.9% |
| 4 | -6.2% | -2.7% | -4.2% | -3.6% | -4.1% |
| Big | -2.8% | -2.5% | -3.4% | -2.4% | -4.0% |
| Panel E1: 10/2006-06/2007 | | | | | |
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | 0.0% | 0.0% | 3.1% | -2.0% | 0.4% |
| 2 | 1.6% | 1.4% | 0.9% | -0.7% | 0.0% |
| 3 | 1.2% | 1.1% | 1.3% | 1.8% | 1.4% |
| 4 | 1.7% | 1.2% | 1.6% | 2.6% | 0.4% |
| Big | 1.8% | 0.8% | 0.5% | 1.2% | 0.8% |
| Panel E2: 09/2014-03/2016 | | | | | |
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | 0.5% | -0.7% | -0.9% | 1.8% | 1.4% |
| 2 | -0.3% | 0.0% | -0.5% | 0.0% | 0.3% |
| 3 | -0.4% | -0.1% | -0.7% | 0.3% | 0.6% |
| 4 | 0.2% | -0.2% | -0.2% | -0.6% | 0.3% |
| Big | -0.1% | 0.5% | 0.1% | -0.2% | 0.1% |

Table 3b

Average monthly excess returns for quarterly rebalanced portfolios formed on Size and Financial Leverage. Panel R1 and R2 refer to economic recession periods. Panel E1 and E2 refer to economic expansion periods.

| Panel R1: 07/1990-03/1991 | | | | | |
|---|---|---|---|---|---|
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | 1.0% | 2.5% | -6.0% | -1.4% | -0.3% |
| 2 | -2.6% | -2.6% | -0.1% | -0.9% | 0.4% |
| 3 | -7.9% | -2.2% | -4.8% | -2.1% | -2.0% |
| 4 | -2.8% | 2.0% | 1.7% | 0.7% | 0.5% |
| Big | -0.1% | 1.8% | 0.6% | 0.2% | -0.7% |
| Panel R2: 12/2007-06/2009 | | | | | |
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | -3.1% | -1.1% | -2.1% | -2.4% | -2.6% |
| 2 | -3.7% | -1.8% | -6.5% | -3.0% | -1.4% |
| 3 | -1.1% | -4.4% | -3.8% | -3.3% | -2.4% |
| 4 | -2.9% | -2.4% | -3.0% | -3.1% | -3.7% |
| Big | -2.8% | -3.5% | -3.8% | -2.6% | -3.4% |
| Panel E1: 10/2006-06/2007 | | | | | |
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | 0.8% | 1.8% | 1.2% | 1.1% | 1.6% |
| 2 | 0.9% | 0.6% | 0.8% | 0.4% | 1.8% |
| 3 | 1.6% | 0.2% | 1.6% | 0.9% | 0.9% |
| 4 | 0.6% | 1.0% | 2.3% | 1.9% | 0.6% |
| Big | 1.6% | 0.5% | 1.1% | 1.2% | 0.5% |
| Panel E2: 09/2014-03/2016 | | | | | |
| | Conservative | 2 | 3 | 4 | Aggressive |
| Small | 0.3% | 1.0% | 1.1% | -0.1% | -0.2% |
| 2 | -0.1% | -0.7% | 0.0% | 0.3% | 0.2% |
| 3 | 0.3% | 0.1% | 0.1% | 0.5% | 0.2% |
| 4 | 0.6% | -0.3% | 0.0% | -0.3% | -0.1% |
| Big | -1.0% | 0.0% | 0.0% | 0.3% | 0.2% |

Table 4

Value weighted average monthly return comparison for stocks with aggressive and conservative financial leverage.
N refers to the number of observation. Mean indicates the value weighted average continuous return. R1 and R2 represent economic recession periods. E1 and E2 represent economic expansion periods.
T-values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All the null hypothesis test results, including significance level and t value, are made for value weighted arithmetic average of logarithm risk free return.

| | | R1:07/1990-03/1991 | | R2: 12/2007-06/2009 | | E1: 10/2006-06/2007 | | E2: 09/2014-03/2016 | |
|---|---|---|---|---|---|---|---|---|---|
| | | N | Mean | N | Mean | N | Mean | N | Mean |
| Average monthly return for stocks with aggressive financial leverage (annual rebalance) | (1) | 2225 | -0.6%*** (-3.09) | 3396 | -3.9%*** (-14.44) | 1818 | 0.8%*** (7.17) | 2956 | 0.2%* (1.87) |
| Average monthly return for stocks with conservative financial leverage (annual rebalance) | (2) | 427 | 0.1% (0.22) | 1018 | -3.0%*** (-8.33) | 449 | 1.7%*** (7.97) | 1074 | -0.1% (-0.36) |
| Difference in average monthly return aggressive leverage – conservative leverage (1) - (2) | (3) | | -0.7% (-1.47) | | -1.0%** (-2.11) | | -0.9%*** (-3.63) | | 0.3% (1.18) |
| | | N | Mean | N | Mean | N | Mean | N | Mean |
| Average monthly return for stocks with aggressive financial leverage (quarterly rebalanced) | (4) | 1989 | -0.6%*** (-3.27) | 2909 | -3.3%*** (-13.71) | 1809 | 0.6%*** (4.94) | 2667 | 0.1% (1.09) |
| Average monthly return for stocks with conservative financial leverage (quarterly rebalanced) | (5) | 540 | -0.3% (-0.71) | 1241 | -2.8%*** (-8.58) | 382 | 1.4%*** (5.92) | 918 | 0.0% (-0.08) |
| Difference in average monthly return aggressive leverage – conservative leverage (4) - (5) | (6) | | -0.3% (-0.71) | | -0.5% (-1.36) | | -0.9%*** (-3.63) | | 0.1% (0.50) |

Table 5

Using four factors in regressions to explain the effect of Cash Holdings to Stock Return. R1 and R2 refer to the economic recession periods. E1 and E2 refer to the economic expansion periods. VIF values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | | $R_M$-$R_f$ | SMB | HML | RMP |
|---|---|---|---|---|---|
| R1 (07/1990-03/1991) | | 0.89*** | 0.10*** | 0.16*** | 0.04*** |
| ($R^2$ = 0.17) | VIF | (2.27) | (1.83) | (1.45) | (1.86) |
| R2 (12/2007-06/2009) | | 1.04*** | 0.17*** | 0.02*** | 0.08*** |
| ($R^2$ = 0.40) | VIF | (1.77) | (2.37) | (3.30) | (1.82) |
| E1 (10/2006-06/2007) | | 1.00*** | 0.17*** | -0.05*** | -0.08*** |
| ($R^2$ = 0.21) | VIF | (1.07) | (1.13) | (1.08) | (1.02) |
| E2 (09/2014-03/2016) | | 1.00*** | 0.19*** | 0.20*** | -0.01** |
| ($R^2$ = 0.28) | VIF | (1.34) | (1.45) | (1.61) | (1.37) |

Table 6

Using four factors in regressions to explain the effect of Financial Leverage to Stock Return. R1 and R2 refer to the economic recession periods. E1 and E2 refer to the economic expansion periods. VIF values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | $R_M$-$R_f$ | SMB | HML | CMA |
|---|---|---|---|---|
| R1 (07/1990-03/1991) | 0.88*** | 0.10*** | 0.15*** | 0.06*** |
| ($R^2$ = 0.17) VIF | (2.44) | (1.82) | (1.37) | (1.96) |
| R2 (12/2007-06/2009) | 1.05*** | 0.16*** | 0.04*** | 0.01 |
| ($R^2$ = 0.40) VIF | (1.58) | (2.28) | (2.89) | (1.24) |
| E1 (10/2006-06/2007) | 1.00*** | 0.18*** | -0.04*** | -0.10*** |
| ($R^2$ = 0.21) VIF | (1.06) | (1.14) | (1.08) | (1.03) |
| E2 (09/2014-03/2016) | 1.00*** | 0.20*** | 0.22*** | -0.13*** |
| ($R^2$ = 0.28) VIF | (1.12) | (1.46) | (1.49) | (1.11) |

Table 7

Using five factors in regressions to explain the effect of Cash Holdings and Financial Leverage to Stock Return. R1 and R2 refer to the economic recession periods. E1 and E2 refer to the economic expansion periods. VIF values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | $R_M$-$R_f$ | SMB | HML | RMP | CMA |
|---|---|---|---|---|---|
| R1 (07/1990-03/1991) | 0.87*** | 0.10*** | 0.14*** | 0.03** | 0.06*** |
| ($R^2$ = 0.17) VIF | (2.75) | (1.83) | (1.66) | (1.92) | (2.02) |
| R2 (12/2007-06/2009) | 1.03*** | 0.17*** | 0.03*** | 0.08*** | 0.00 |
| ($R^2$ = 0.40) VIF | (1.81) | (2.37) | (3.32) | (1.87) | (1.28) |
| E1 (10/2006-06/2007) | 1.00*** | 0.18*** | -0.04** | -0.06*** | -0.08*** |
| ($R^2$ = 0.21) VIF | (1.09) | (1.15) | (1.08) | (1.08) | (1.09) |
| E2 (09/2014-03/2016) | 1.00*** | 0.20*** | 0.23*** | 0.03*** | -0.14*** |
| ($R^2$ = 0.28) VIF | (1.35) | (1.46) | (1.68) | (1.50) | (1.21) |

Table 8

Regression for summarized periods: 07/1990-03/1991, 12/2007-06/2009, 10/2006-06/2007 and 09/2014-03/2016, 56 months.
RMPC and CMAC are two interact dummy variables, which equal to RMP and CMA respectively for the economic recession periods and equal to 0 for the economic expansion periods.

| | |
|---|---|
| Intercept | 0.00*** |
| | (13.29) |
| Rm-Rf | 1.01*** |
| | (449.42) |
| SMB | 0.16*** |
| | (51.54) |
| HML | 0.06*** |
| | (19.36) |
| RMP | -0.06*** |
| | (-6.60) |
| CMA | -0.07*** |
| | (-8.25) |
| RMPC | 0.12*** |
| | (11.40) |
| CMAC | 0.06*** |
| | (6.48) |

T-values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix A

Using four factors in regressions to explain the effect of Cash Holdings to Stock Return. R1 and R2 refer to the economic recession periods. E1 and E2 refer to the economic expansion periods. Cash factor is measured by Cash and Short-Term Investments (CHE) over Total Interest and Related Expense (XINT).
VIF values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | $R_M$-$R_f$ | SMB | HML | RMP |
|---|---|---|---|---|
| R1 (07/1990-03/1991) | 0.90*** | 0.13*** | 0.12*** | 0.10*** |
| ($R^2$ = 0.17) VIF | (2.34) | (2.07) | (1.52) | (1.33) |
| R2 (12/2007-06/2009) | 1.10*** | 0.23*** | 0.03*** | 0.11*** |
| ($R^2$ = 0.40) VIF | (1.39) | (2.66) | (3.06) | (1.24) |
| E1 (10/2006-06/2007) | 1.00*** | 0.19*** | -0.04*** | -0.07*** |
| ($R^2$ = 0.22) VIF | (1.05) | (1.22) | (1.17) | (1.01) |
| E2 (09/2014-03/2016) | 1.00*** | 0.20*** | 0.22*** | -0.08*** |
| ($R^2$ = 0.27) VIF | (1.26) | (1.35) | (1.38) | (1.25) |

Appendix B

Using four factors in regressions to explain the effect of Financial Leverage to Stock Return. R1 and R2 refer to the economic recession periods. E1 and E2 refer to the economic expansion periods. Financial leverage is measured by Long-Term Debt Total (DLTT) over Total Assets (AT).
VIF values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | $R_M$-$R_f$ | SMB | HML | CMA |
|---|---|---|---|---|
| R1 (07/1990-03/1991) | 0.91*** | 0.14*** | 0.10*** | 0.06*** |
| ($R^2$ = 0.17) VIF | (2.49) | (2.08) | (1.61) | (1.44) |
| R2 (12/2007-06/2009) | 1.10*** | 0.22*** | 0.05*** | 0.06*** |
| ($R^2$ = 0.40) VIF | (1.52) | (2.68) | (2.98) | (1.31) |
| E1 (10/2006-06/2007) | 1.00*** | 0.19*** | -0.03*** | -0.04*** |
| ($R^2$ = 0.22) VIF | (1.08) | (1.24) | (1.18) | (1.10) |
| E2 (09/2014-03/2016) | 1.00*** | 0.21*** | 0.24*** | -0.18*** |
| ($R^2$ = 0.27) VIF | (1.15) | (1.34) | (1.32) | (1.15) |

Appendix C

Using five factors in regressions to explain the effect of Cash Holdings and Financial Leverage to Stock Return. R1 and R2 refer to the economic recession periods. E1 and E2 refer to the economic expansion periods. Cash factor is measured by Cash and Short-Term Investments (CHE) over Total Interest and Related Expense (XINT). Financial leverage is measured by Long-Term Debt Total (DLTT) over Total Assets (AT).

VIF values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | $R_M$-$R_f$ | SMB | HML | RMP | CMA |
|---|---|---|---|---|---|
| R1 (07/1990-03/1991) | 0.90*** | 0.13*** | 0.12*** | 0.10*** | 0.01 |
| ($R^2$ = 0.17) VIF | (2.57) | (2.09) | (1.64) | (1.66) | (1.80) |
| R2 (12/2007-06/2009) | 1.10*** | 0.23*** | 0.03*** | 0.10*** | 0.01 |
| ($R^2$ = 0.40) VIF | (1.53) | (2.68) | (3.07) | (1.56) | (1.64) |
| E1 (10/2006-06/2007) | 1.00*** | 0.18*** | -0.04** | -0.07*** | 0.01 |
| ($R^2$ = 0.22) VIF | (1.08) | (1.30) | (1.18) | (1.44) | (1.57) |
| E2 (09/2014-03/2016) | 1.00*** | 0.20*** | 0.23*** | -0.03*** | -0.16*** |
| ($R^2$ = 0.27) VIF | (1.26) | (1.35) | (1.40) | (1.73) | (1.49) |

| Appendix D | |
|---|---|
| Regression for summarized periods: 07/1990-03/1991, 12/2007-06/2009, 10/2006-06/2007 and 09/2014-03/2016, 56 months.<br>Cash factor is measured by Cash and Short-Term Investments (CHE) over Total Interest and Related Expense (XINT). Financial leverage is measured by Long-Term Debt Total (DLTT) over Total Assets (AT).<br>RMPC and CMAC are two interact dummy variables, which equal to RMP and CMA respectively for the economic recession periods and equal to 0 for the economic expansion periods. | |
| Intercept | 0.00***<br>(14.33) |
| Rm-Rf | 1.06***<br>(478.61) |
| SMB | 0.21***<br>(62.68) |
| HML | 0.09***<br>(22.82) |
| RMP | -0.10***<br>(-9.90) |
| CMA | -0.11***<br>(-7.74) |
| RMPC | 0.18***<br>(16.68) |
| CMAC | 0.13***<br>(8.47) |
| T-values are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. | |

Appendix E1

Median S&P domestic long-term debt rating for annually rebalanced portfolios formed on Size and Financial Leverage. Panel R1 and R2 refer to economic recession periods. Panel E1 and E2 refer to economic expansion periods.

Panel R1: 07/1990-03/1991

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | A-/BBB+ | BBB | AA-/BBB+ | A | A- |
| 2 | A- | AA-/A | A-/BBB+ | A- | BBB+ |
| 3 | AA+/AA- | BBB+ | A | A- | BBB+ |
| 4 | A | A/A- | A-/BBB+ | A- | BBB+ |
| Big | AA | A+ | A+ | A+ | A |

Panel R2: 12/2007-06/2009

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | BBB+ | BBB+ | BBB+ | BBB+ | BBB+ |
| 2 | BBB | BBB | BBB | BBB | BBB |
| 3 | A- | BBB+ | BBB | BBB | BBB |
| 4 | BBB+ | A- | A- | A- | BBB |
| Big | A | A | A- | A- | A- |

Panel E1: 10/2006-06/2007

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | BBB | BBB | BBB+ | BBB+/BBB | BBB+ |
| 2 | BBB | BBB | BBB | BBB+/BBB | BBB |
| 3 | BBB+ | A- | BBB+ | BBB | BBB |
| 4 | BBB+ | A-/BBB+ | A- | A- | BBB |
| Big | A | A | A | A- | A- |

Panel E2: 09/2014-03/2016

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | BBB+ | BBB | BBB | BBB+ | BBB |
| 2 | BBB+ | BBB | BBB | BBB | BBB |
| 3 | BBB+ | BBB+ | BBB | BBB | BBB |
| 4 | A | A | A- | A- | BBB+ |
| Big | A | A+ | A | A | A- |

Appendix E2

Median S&P domestic long-term debt rating for quarterly rebalanced portfolios formed on Size and Financial Leverage. Panel R1 and R2 refer to economic recession periods. Panel E1 and E2 refer to economic expansion periods.

Panel R1: 07/1990-03/1991

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | BBB | BBB+ | BBB | A-/BBB+ | BBB+ |
| 2 | A- | A- | A- | BBB | A- |
| 3 | BBB | A-/BBB+ | A- | BBB+ | BBB+ |
| 4 | A | A- | A-/BBB+ | A- | BBB+ |
| Big | AA- | A+ | A+ | A+ | A |

Panel R2: 12/2007-06/2009

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | BBB+ | BBB | BBB | BBB+/BBB | BBB+ |
| 2 | BBB | BBB | BBB | BBB | BBB |
| 3 | BBB+ | BBB+ | BBB+ | BBB+ | BBB |
| 4 | A- | BBB+ | A-/BBB+ | A- | BBB+ |
| Big | A | A- | A- | A- | A- |

Panel E1: 10/2006-06/2007

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | A | BBB | BBB | BBB+ | BBB+ |
| 2 | BBB | BBB | BBB | BBB+ | BBB |
| 3 | A-/BBB+ | BBB+ | BBB | BBB+ | BBB |
| 4 | A | BBB+ | BBB+ | A- | BBB+ |
| Big | A | A | A- | A- | A |

Panel E2: 09/2014-03/2016

| | Conservative | 2 | 3 | 4 | Aggressive |
|---|---|---|---|---|---|
| Small | A | BBB | BBB | BBB+ | BBB+ |
| 2 | BBB | BBB | BBB | BBB+ | BBB |
| 3 | A-/BBB+ | BBB+ | BBB | BBB+ | BBB |
| 4 | A | BBB+ | BBB+ | A- | BBB+ |
| Big | A | A | A- | A- | A |