Is Cash King: A Shareholder's Perspective

'a study of excess cash implications on stock returns in periods of boom and bust'

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Abstract

Title:	Is Cash King: A Shareholder's Perspective 'a study of excess cash implications on stock returns in periods of boom and bust'
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Five key words:	Excess cash, stock returns, shareholder, GFC, cash ratio
Purpose:	The purpose of this study is to identify if a relationship exists between excess cash and stock returns analysed across periods of boom and bust.
Methodology:	Quantitative approach using multiple regression analysis as well as portfolio construction and comparison.
Theoretical Perspectives:	Excess cash holdings, opportunity costs, constraint and financial flexibility, motives of cash holdings, agency theory, determinants and implications of cash holdings.
Empirical foundation:	A sample containing 2278 listed U.S. firms analysed during 2005 – 2010.
Conclusions:	Our findings document an overall positive relationship between excess cash holdings and stock returns. In regards to the specific period this paper documents a negative relationship in boom times and a positive relationship in times of downturn. From the shareholder perspective, over the long term, more value is obtained from investing in high cash firms.

Contents

1.0 Introduction

This chapter presents the background and problem discussion providing the basis from which the purpose of the study is built and the research questions defined. Delimitations and a short thesis outline are also presented.

1.1 Background

The recent global financial crisis was an economic shock that surprised companies and countries alike with its swiftness and pervasiveness across all economies and sectors. The prediction of such events is certainly not an exact science and is perhaps summed by a simple statement expressed by Paul Samuelson, 'Wall Street indices predicted nine out of the last five recessions!' The meteoric growth rates experienced in the late 2000s suddenly, quickly and broadly came to a crashing halt and the global economy plunged into a rapid decline. The longest recession since WW2, the global financial crisis (GFC) presents a somewhat purist setting to analyse the impact of an extreme trough in that its source was from the financial sector and impacted across all major industries. This event presented companies with high financial constraint and high cash flow volatility. This is a scenario which, according to theory and research, lends to an importance of internal financing capacity or namely cash. The reduction in access to external money markets ensured cash as a hot topic of debate, just how important would it be to be able to internally finance projects, that is, how important a financial position of large excess cash holdings impact upon the value creating ability of a firm. The media was rife with where investors should look for gains and certainly firms that were cashed up were singled out as worthy entities. Deloitte 2011, made the following statement:

> 'The global financial crisis has simultaneously increased the cost of credit and constrained its availability. This tightening makes cash management — and preservation — much more critical... reducing risk, controlling costs and preserving cash are critical in this new environment... For instance, if disbursements aren't necessary or protective, they shouldn't be paid out. Cash remains king. Companies that maximize their cash positions and minimize debt are better protected than more highly leveraged firms.'

Cash is a topic that by its nature falls into many financial categories of discussion. It is the hope of the authors that this paper will not only provide a sound discursive and empirical analysis but open the door for further research within the field. This paper will explore the importance of cash, namely excess cash holdings, from the shareholder's perspective and aim to provide a comprehensive overview of the topic and a solid base from which further research can be built from.

1.2 Problem Discussion

Keynes first postulated in 1936 that one would hold onto cash as long the marginal benefits outweighed the marginal costs. Keynes (1936) stated that, 'there is no necessity to hold idle cash to bridge over intervals if it can be obtained without difficulty at the moment when it is actually required.' In a Miller and Modigliani (M&M) world, according to *irrelevance theory*, firm capital structure is irrelevant given the assumptions: (1) Neutral taxes; (2) No capital market restrictions; (3) Symmetric access the capital markets; and (4) Firm's financial policy reveals no information. In the real world, however, market frictions exist that can both be exploited and also place factors on a firm that demand appropriate planning and strategy. Keynes statement has two important elements, "*obtained without difficulty*" and "*at the moment when it is actually required.*" The former is perceived by the authors to relate to if a company is either *constrained* or *unconstrained* and the latter statement to *timing*. The inability to predict a crisis is exemplified by the suddenness and pervasiveness of the GFC. Knowing therefore the timing of when a period of general constraint and volatility will occur is therefore considered by the authors to be a largely unpredictable part of the business cycle for the purposes of this study. With this assumption standing the ability to obtain financing for projects *without difficulty* becomes highly pertinent. The discussion of cash holdings and its value creating or destroying potential creates an intriguing and interesting study with many avenues of assessment.

The majority of papers delve into the pros and cons of cash holdings looking at a plethora of topics and niche discussion areas, however, stop short of discussing whether their results translate into positive or negative stock returns for investors. It is therefore the intention of this paper to fill this gap in the research by assessing cash holdings through a shareholder lens, ascertaining if cash holdings share a linear relationship with stock returns. Are corporate excess cash holdings a source of value creation for shareholders? This paper is the result of thorough research into the topic of cash, utilising an extensive amount of studies. These studies are of both core theoretical ideas and frameworks and the empirical assessment of these frameworks. Furthermore, studies researched cover over 74 years of research and samples that cover 60 years of analysis.

The shareholder perspective leads us to also delve into the motives behind why companies seek to create excess stores of cash. By having a greater understanding of these motives the investor is better equipped to assess the nature of the cash holdings and therefore construct a pertinent investment portfolio. For example, are the cash holdings of a firm *idle* (the company is lacking positive investment opportunities) or are they held for a particular value creating purpose? Perhaps the firm perceives opportunity cost in the present to be less than gains from investment in the future.

Motives of firms to hold cash were first documented by Keynes (1936). His initial studies into this subject matter presented the *transaction*, *precautionary* and *speculative* motives. Further studies by Jensen & Meckling (1976) postulated the *agency* motive and finally Foley, Hartzell, Titman, and Twite (2007) added the *tax* motive. This paper discusses these motives and provides a comprehensive list of articles analysing them in section 2.0. These motives help to explain *why* companies hold cash.

Further research has been conducted as to if holding cash adds value to the firm and indeed what scenarios cash has the greatest advantage. These scenarios are primarily those that look into the impact of cash against different levels of constraint placed on a firm (from both internal and external factors). The papers on cash holdings delve into a range of different aspects. These studies largely present evidence on specific scenarios distant from peer's parallel research. Taking into account those studies that we have researched, there is no conclusive evidence that cash is either absolutely value creating or absolutely value destroying. Its benefits and drawbacks are rather situation and policy dependant and its use is hence subject to the diligence of those that employ it as part of firm strategy. Thus understanding the value of cash through the assessment of its relationship to stock price across periods of constraint and non-constraint will further the research into its value potential to the firm and shareholder.

Our study primarily aims to investigate the relationship of excess cash on firm stock returns. To assess this we conduct a thorough empirical investigation first running a multivariate regression to isolate excess cash from regular cash holdings. These excess cash results are the residual of the regression and is performed on a sample of 2278 companies. Based on the resultant excess cash level findings we construct a multitude of portfolios (1800) to assess the impact of excess cash reserves on stock price. Therefore we endeavour to shed some light on the topic from a shareholder perspective.

The bulk of previous studies do not analyse the topic of cash holdings utilising a timeframe focused on the immediate years surrounding a crisis. Many of the studies either focus entirely on the boom times, entirely on the bust times or over an extended long-term period. We aim to delve into the immediate years pre point of crisis and the immediate years post point of crisis. The empirical study will concentrate on specific yearly time periods as well as the whole period. By analysing this time frame the study therefore assesses periods of financial constraint and financial freedom.

The study is therefore multidimensional in that it explores excess cash holdings and their impact on stock returns, whilst also measuring these returns across unique but connected periods of differing economic environments.

1.3 Purpose

This study will focus on what cash holdings mean to the firm and if cash holdings create direct tangible value for the investor. Through the empirical study, it will investigate to what extent firms being cash rich impacts upon stock returns and hence if a linear relationship exists that can be referenced when creating a portfolio.

After extensive review of literature and papers relevant to the concept of cash holdings within firms it is apparent that there is a certain disconnect or independence at times between different studies and hence this study will also look to create a comprehensive overview of the cash implications on firms utilising the plethora of research that is currently published. A secondary aim of this study will be the mapping of key characteristics for investors and future researchers to be aware of when assessing the viability of a cash rich firm to be part of their investment portfolio, or in the latter conducting analysis. Furthermore on this stream of analysis, which very few studies have assessed, is how firms' cash levels impact upon stock returns, that is, if there is a certain relationship between excess cash holdings and stock performance. Therefore the empirical analysis of this paper will be to examine a number of constructed portfolios to assess the value of cash within a company from the investor perspective. Analysis will be conducted in boom times as well as bust times and will therefore provide evidence as to its value to stockholders across both peaks and troughs within the economy.

The key purpose of this paper is:

1) Identify and map those characteristics, based on previous studies, that are pertinent for shareholders to be aware of when investing in cash rich firms. This will also provide a comprehensive base for our own empirical study and from which future researchers can draw from.

2) Investigate whether there is a link between excess cash and stock returns analysed during a period of boom, crisis and across the whole period. This will allow a determination of implications of holding excess cash in different market states.

3) Provide shareholders with the knowledge and means to decipher the meaning of cash holdings within companies and enable shareholders to increase their ability to select sound investment portfolios.

1.4 Delimitations

Information for the empirical analysis was obtained from DataStream. The reliance on DataStream to construct our sample puts a limit on the size of the sample, as we are limited to the selection of companies that have information for all data items across all analysis time points within the defined reference period.

One of the problems with DataStream was the inability to identify if a company had ceased operations or if their information simply didn't exist on DataStream. We considered individual firm assessment to establish if firms were alive or ceased (an arduous task considering this would be performed on a company by company basis). However, through research within our studies we found that Harford, Mikkelson and Partch (2003) established that higher levels of cash to assets do not seem to lead to higher rates of survival during industry downturns. As default probability is independent to cash levels our findings won't be biased through the exclusion of these particular firms. Furthermore, Simutin (2010) found that whether his entire sample or survivor only firms were used to evaluate the topic, his findings and conclusion were of a similar nature. Therefore we conclude that the exclusion of these observations will not negatively impact upon the accuracy of our results.

1.5 Thesis Outline

Chapter two presents the literature review, discussing the theoretical and empirical frameworks that this thesis draws from. The motives behind cash holdings are discussed, empirical studies analysed, a literature map provided and finally commentary on previous studies provided. Chapter three looks into the methodological framework and delves into the research approach, data collection, regression and portfolio formation. Finally assess the validity of the methods ensuring the quality of the study. Chapter four presents the findings of the study through descriptive statistics, the regression results and the portfolio results. Chapter five provides an analysis across the pertinent time frames conducting an in depth look into the empirical results to ascertain sound inferences and analysis. Chapter 6 summarises the findings and presents the conclusions of the study.

2.0 Literature Review

The literature review chapter first provides an overview of the major motives behind holding cash delving into each motive in detail. Secondly a review of empirical studies shows the major findings regarding determinants and implications of cash holdings. A small section on corporate governance and cash holdings is included purely for its contribution to the shareholder perspective. A literature map is provided showing the extensive research that has been conducted within the research area and for the development of this paper and finally commentary on previous studies provided.

2.1 Motives for Holding Cash

Five key motives have been identified as to why firms hold cash reserves. This section will explain these motives in detail first providing an overview through the following summary chart.

(1) Transaction: stockpiling cash to create internal financing capacity to minimise the cost of raising capital for investments. Including both direct and indirect costs, this cost minimisation is due to the excess costs involved in raising capital externally, whether through debt or equity.

(2) Precautionary: defensive strategy where firms hold cash reserves as a call option against volatility in the marketplace to create a cushion against threats to liquidity.

(5) Agency: Managers hoard cash or utilise large cash reserves to serve their own interests. This can lead to the acceptance of negative value projects, empire building and general mismatch between managers and other stakeholders.
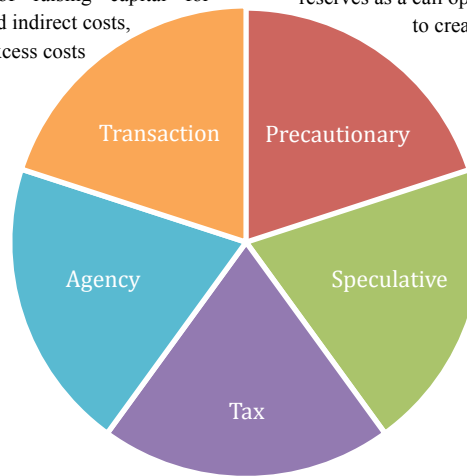
(3) Speculative: An offensive strategy where firms build cash stores to take advantage of unforeseen or unexpected opportunities in a timely manner.

(4) Tax: 'Firms have a disincentive to repatriate foreign earnings if the level of taxation in their home country is substantially higher than that of the other countries within which they operate. This can result in multinational firms accumulating foreign stores of cash.' (Foley, Hartzell, Titman, and Twite 2007).

NOTE: (1) to (4) can be considered as positive cash holding scenarios, positive dependant on the situation. (5) can be considered as a negative

2.1.1 Transaction Motive

The Modigliani-Miller theorem on capital structure assumes no transaction costs, therefore in a frictionless environment there is no distinction between utilising internal or external capital markets. Firms will have no motivation to hold cash, as access to external financing is unrestricted and does not incur any costs. In the presence of transaction costs

however, a value-maximizing firm will determine its optimum level of cash by evaluating its marginal costs against its marginal benefits (Keynes, 1936). The assessment of the optimum level takes into consideration factors such as the cost disparity between external and internal financing.

Transaction costs can be direct: underwriting costs, legal fees, borrowing fees, third party fees, consulting fees, cash required to meet routine expenses or requirements; and indirect: for example stakeholder conflicts identified by Jensen and Meckling (1976) and Myers (1984) and information asymmetries with outside investors (Myers & Majluf, 1984). As capital market frictions increase the cost of outside capital relative to internally generated funds increases. These transaction costs can be avoided to some extent by utilising internal financing, that is, using cash reserves to fund value-increasing investments and therefore serve stockholders´ interests.

On the downside, holding cash and other liquid assets does not deliver pure benefits. The opportunity cost associated with liquid assets is usually referred to as a liquidity premium, as cash and liquid assets that are easily turned into cash will normally generate lower pecuniary returns.

Evidence presented by studies on transaction costs points towards the idea that firms engaging in external fundraising experience higher costs, both direct and indirect, than firms that rely on internally generated funds (Smith, 1977; Mikkelson & Partch, 1986). Further evidence reveals economies of scale under the transaction motive allowing for cost effective raising of external funds. Therefore large firms tend to hold less cash whereas smaller firms hold more cash to avoid the premium of attaining the funds externally (Lee, Lochhead, Ritter, & Zhao, 1996; Mulligan, 1997; Kim, Mauer, & Sherman, 1998) also find that firms are becoming more and more R&D intensive and thus hold higher levels of intangible assets making external financing more costly.

2.1.2 Precautionary Motive
Firms hold cash reserves as a call option against volatility in the marketplace to create a cushion against threats to liquidity and access to external capital markets. Han & Qui (2007, p. 44) define the precautionary motive as when 'a firm reserves cash to hedge for the risk of future cash shortfalls.' Bates Kahle & Stulz (2009, p. 2) define the precautionary motive as firms holding 'cash as a buffer to protect against adverse cash flow shocks. This insinuates that firms with poor access to external capital markets and riskier cash flows will hold more cash to ensure the ability (availability of funds) to execute value enhancing investment opportunities as they become available. This was investigated by and is consistent with the findings of Opler et al. (1999). Furthermore, this type of company has per se higher costs of financial distress and therefore management act in a way that is reflective of a firm with high levels of debt.

As identified by Han & Qui (2007), financially constrained firms suffer higher sensitivity to cash flow volatility. A trade-off presents itself between current and future investments. 'When future cash flow risk cannot be fully diversifiable, the trade-off gives constrained firms the incentives of precautionary savings: they increase their cash holdings in response to increases in cash flow volatility,' (Han & Qui, 2007, p. 1). Conceivably a cash build up will also occur if the company perceives future investments to hold greater value than current investment, or investments in downturns will give greater returns than investments in boom times. It is also plausible that an unconstrained firm that perceives a forward position of constraint and volatility may follow a similar precautionary strategy of cash stockpiling (Opler, Pinkowitz, Stulz, & Williamson, 1999; Keynes, 1936).

2.1.3 Speculative Motive
Building cash stores to take advantage of unexpected opportunities. For example, taking advantage of favourable price fluctuations, interest rate fluctuations, and raw material fluctuations. The ability to make timely (snap on-time) acquisitions (Keynes, 1936).

The speculative motive differs from the precautionary motive in that it is an offensive rather than defensive.

2.1.4 Tax Motive
Firms have a disincentive to repatriate foreign earnings if the level of taxation in their home country is substantially higher than that of the other countries within which they operate. This can result in multinational firms accumulating foreign stores of cash (Foley, Hartzell, Titman, & Twite, 2007).

2.1.5 Agency Motive
When facing abundant cash and the decision on what to do with it, managers will have four options. They can disperse the cash back to the firm's shareholders, spend it on internal or external investments, or simply continue to hold on to it. The interest and incentives of managers on what to do with the firm's cash is not however always aligned with those of the stockholders. Jensen (1986) finds that by financing projects internally managers can avoid monitoring by the capital markets otherwise incurred when raising funds externally. Paying the cash out to stockholders, or pledging it to the repayment of debt, the resources under the control of managers will be reduced. This reduces the managers' power to exploit the firms' cash for their own benefits (Jensen, 1986; Easterbrook, 1984; Rozeff, 1982).

There are numerous ways and reasons for managers to exploit the firm's resources. With compensation being one of them it has been shown that managers tend to make the firm grow beyond its optimal size to increase the resources under their control. Compensation is often related to the growth in sales (Murphy, 1985) and growth also increases the

supply of new positions that allow for the promotion of middle managers through promotion-based compensation schemes (Baker, 1986). The conflicts between managers and stockholders are further enhanced, as managers of cash rich firms tend to drive growth through value decreasing investments (Harford, 1999).

As competition increases within an industry prices tend to slope downwards, forcing managers to increase efficiency. Another problem identified with investments where abundant cash is at hand is that managers tend to show weaker disciplinary actions and thus waste stockholders money on inefficiencies(Jensen, 1986).

The agency theory relation to cash is therefore how to align managers and stockholders interest by motivating managers not to spend the firm's cash on value-decreasing investments and operating inefficiencies.

2.2 Empirical Evidence on Cash Holdings

2.2.1 Determinants and Implications of Cash Holdings
Opler, Pinkowitz, Stulz and Williamson (1999) explored the determinants and implications of corporate cash holdings. By looking at 530 publicly traded U.S firms across the years 1971-1994 they performed tests to see whether firms act as if they have a target level of cash holdings. By using an autoregressive model they established that there are systematic factors that causes firms not to let cash balances fall too low or rise too high. Their results were therefore positive to their hypothesis and that raised the question of how these target levels are set. By utilising a cross-sectional regression they determined several influencing factors relating to the determinants of cash balances including corporate growth prospects, short-term working capital imbalances, leverage, industry volatility, and firm size. From these regressions they found that many firms held excess liquid asset positions. They defined excess cash as the amount of cash held in excess of that predicted by their model. Further questions emerged; why do firms hold excess cash, does it allow them to make expenditure decisions that they would not otherwise make and what is the main reason that firms experience large changes in excess cash. Their results indicate that firms with higher growth opportunities tend to hold more cash. They also find evidence that firms with greater access to capital markets, that is large firms and those with credit ratings, hold less cash than smaller firms that have both higher costs and more limited access to external financing. These results are both consistent with precautionary as well as transactional motives for holding cash.

In his paper on corporate cash reserves and acquisitions, Harford (1999) aimed towards providing an answer to Jensen's (1986) free cash flow theory, that firms with high cash flows and cash balances would be more prone to spend the cash on value decreasing investments. The research period of his study was 1972-1994. By utilising a similar regression model introduced by Opler et al. (1997) he estimates the levels of cash and determines that cash rich firms are those with cash holdings of one standard deviation above the one predicted by the model. He detects the same correlation between cash balances and future growth options as Opler et al. (1999) found in their studies. To determine whether cash rich firms tend to make bad investment decisions he focuses on announcement effects of acquisitions as well as operating performance prior to and after the acquisition. His results show a negative relationship between acquisitions made by cash rich bidders and the subsequent market reactions. This is supported by the idea that cash rich acquirers bid for firms that are unattractive and/or diversifying. Unattractive acquisitions are logically value destroying, and as reported by Morck, Schleifer and Vishny (1990), acquisitions of a diversifying nature have a lower likelihood to create value for the bidder. When looking at the operating performance of those firms that completed the announced acquisitions his results were firmly confirmed and firms realised the expected negative performance proposed by the announcement effect in the post acquisition period. In addition to these two main questions he looks into whether firms experience any movements in stock prices when building up the cash reserves. He finds his results support the free cash flow hypothesis and the markets react negatively to firms that stockpile cash and positively to firms that maintain their cash payout ratio.

Mikkelson and Partch (2003) believed that it was essential to the discussion of cash holdings to consider whether high levels of cash where persistent and part of firms policy. They considered a sample of 89 U.S. publicly traded firms that held consistently high levels of cash, 25% or more of the total book value of assets, over the period 1986-1991 and compared their performance to firms matched by size and industry for the subsequent five years, 1992-1996. Their research revealed that cash rich firms experienced greater operating performance than firms matched by size, industry and propensity to hoard cash. They took this analysis further, utilising a multivariate regression to assess if this relationship was also apparent when looking at excess cash. Interestingly excess cash did not share this relationship and was not related to operating performance. Consistent with Opler et al. (1997) and Harford (1999) they also found that cash rich firms grew faster, invested more and had higher market-to-book ratios. They found that 'high cash firms do not have characteristics consistent with weak incentives or oversight of managers, in addition there is no unusual performance with firms with lower insider stock ownership, higher inside board composition or control by a founder.' Hence they surmise that governance cannot act as a proxy to explain variation in performance among firms with

large cash holdings. Their findings are supportive of precautionary and speculative motives for holding cash.

Harford, Mikkelson and Partch (2003) studied the effects of cash reserves on corporate investment and performance during and after industry downturns and how cash reserves affect operating performance through their effect on spending following the downturn. They define downturn as when the substantial majority of firms within an industry experience large decline in sales following a period of growth in sales. To be more precise two conditions had to be met. Firstly, 75% of all the firms within an industry had to experience decline in sales and secondly the median of the sales decline for the firms had to be at least one standard deviation of median annual change in sales growth for the industry during the period 1980-1998. Their final sample consisted of 642 firms throughout eight industries. Their findings conclude that firms with higher cash levels are able to invest more during downturns compared to their peers and that those investments improve operating performance. Furthermore these effects are weaker and even absent outside of downturns. These findings are consistent both with precautionary and transactional motives for holding cash.

The relationship between excess cash and stock returns was the focus of Simutin (2010). To get a measure of excess cash he utilises the findings of Opler et al. (1999) as a base for his regression model. The research period of his study covered a much longer period than previous studies had used before, 1960-2006. Simutin's results show a strong relationship between future stock returns and excess cash holdings. Contrary to the intuition that cash would be more valuable during downturns he finds the opposite to be true. Firms with higher excess cash levels perform worse than their low excess cash peers. Furthermore he finds that future investments are strongly and positively correlated to excess cash. He finds a relationship between market beta and cash levels, market to book ratio and cash levels, and size and cash levels. By controlling for each of these variables his results are not affected and excess cash is still a good predictor of future stock returns. To further prove the robustness of his findings he utilises a Fama-McBeth regression controlling for a number of variables that are known to explain stock returns. The results from those regressions did not eliminate the explanatory power of excess cash as a predictor of future stock returns.

2.2.2 Corporate Governance and Cash Holdings
One of the central analysis in papers surrounding corporate governance and cash holdings is the sufficient provision of internal capital for managers to efficiently fund all good projects, while not providing excess internal capital as to allow managers to fund projects and acquisitions that are value destroying and at the expense of shareholders (avoiding agency costs) (Harford, Mansi, & Maxwell, 2008).

15

The difference between a poorly governed firm compared to a well governed firm is quite compelling. Dittmar & Mahrt-Smith (2007) test corporate governance quality on US firms through two fundamental variables, that of the degree of managerial entrenchment and secondly shareholder monitoring. These variables are analysed using four proxies: (1) Gompers et al. (2003) corporate governance index; (2) Bebchuck et al. (2005) index; (3) an institutional block ownership measure; and (4) a pension fund ownership measure.

Dittmar & Mahrt-Smith (2007) show through regressions performed on all four measures that the value of a dollar of cash is less than a dollar in poorly governed firms and greater than a dollar in well governed firms.

> 'Using block ownership to measure governance, the value of a dollar of cash is $0.87 in a poorly governed firm but $1.23 in a well governed firm. Using management entrenchment due to anti-takeover provisions as a governance proxy, the value of a dollar is only $0.38 in a poorly governed firm but $1.54 in a well governed firm.'

These results show the importance for investors to be mindful of the state of corporate governance within firms they are considering an investment within. Due to potential agency problems and empire-building this is especially important so as not to destroy the value that holding cash can provide. Dijk, Schauten & Waal (2008) run an analysis on European firms and produce similar results showing that €1 invested by a poorly governed firm is worth €0.89 and €1.45 for a well-governed firm. They utilise Deminor ratings for their analysis which include: (1) rights and duties of shareholders; (2) range of takeover defences; (3) disclosure on financial matters and corporate governance; and (4) Board structure and functioning.

The bulk of studies conclude that poorly governed firms leave management with the propensity to spend cash reserves quickly and in value decreasing external projects Harford (1999) & Harford, Mansi and Maxwell (2008).

2.3 Literature Mapping

This section provides a comprehensive literature map of empirical studies detailing their relationship to the key motives behind cash holdings. The information is presented in the following table entitled Summary of Previous Findings.

2.3.1 Summary of Previous Findings

Study	Authors	Year	Time Period	Sample size	Region of Study	Methodology	Relation to Theory				
							Transactional Motive	Precautionary motive	Agency Motive	Speculative motive	Tax Motive
Growth, Beta, And Agency costs as determinants of dividend payout ratios	Rozeff	1982	1974-1980	1000	USA	Multivariate regression	+		+		
Valuation effects of security offerings and the issuance process	Mikkelson and Partch	1985	1972-1982	360	USA	Multivariate regression	+				
Investment banking and the capital acquisition process	Smith	1986	1974-1983	-	USA	Review of previous studies	+				
The costs of raising capital	Lee, Lochhead and Ritter	1996	1990-1994	1767	USA	Documentation	+				
The Determinants and Implications of Corporate Cash Holdings	Opler, Pinkowitz, Stulz and Williamson	1997	1971-1994	-	USA	Multivariate regression	+	+			
Corporate Cash Reserves and Acquisitions	Harford	1998	1950-1994		USA	Multivariate regression			+		
Do Persistent Large Cash Reserves Hinder Performance?	Mikkelson and Partch	2003	1986-1991	89	USA	Multivariate regression	+	+	-	+	
The effect of cash reserves on corporate investment and performance in industry downturns	Harford, Mikkelson and Partch	2003	1980-1998	642	USA	Multivariate regression		+			
Corporate Cash Holdings: Evidence from Switzerland	Drobetz and Gruninger	2006	1995-2004	156	Switzerland	Multivariate regression	+	+	+		
Corporate financial policie and the value of cash	Faulkender and Wang	2006	1971-2001	-	USA	Multivariate regression		+			
Corporate Governance and Firm Cash Holdings	Harford, Mansi and Maxwell	2006	1990-2004	1872	USA	Multivariate regression			+		
Corporate Governance and the value of cash holdings	Dittmar and Mahrt-Smith	2006	1990-2002	1958	USA	Multivariate regression			+		
Corporate precautionary cash holdings	Han and Qui	2007	1997-2002	-	USA	Multivariate regression		+			
Costly external financing, investment timing, and investment-cash flow sensitivity	Lyandres	2007	1951-2005	-	USA	Multivariate regression	+/-				
Financial constraints, investment, and the value of cash holdings	Denis and Sibilikov	2007	1995-2002	-	USA	Multivariate regression	+	+			
The Value of Financial Flexibility	Gamba and Triantis	2007	Unspecified	10000	USA	Simulation	+				
Why do firms hold so much more cash? A tax-based explanation	Foley, Hartzell, Titman and Twite	2007	1982-2004	-	USA	Multivariate regression					+
Cash Holdings and Credit Risk	Aharya, Davydenko and Strebulaev	2008	1996-2003	480	USA	Multivariate regression		+			
Corporate Governance and the Value of Excess Cash Holdings of Large European Firms	Schauten and van Dijk	2008	2000-2004	300	Europe	Multivariate regression			+		
Why do U.S. firms hold so much more cash than they used to?	Bates, Kahle and Stulz	2009	1980-2006	2735	USA	Multivariate regression	+	+	+		
Costly external finance, Corporate investment and the subprime Mortage credit crisis	Duchin, Ozba and Sensoy	2009	2006-2009	3668	USA	Multivariate regression		+			
Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings	Fresard	2009	1972-2001	-	USA	Multivariate regression		+		+	
The real effects of financial constraints: Evidence from a financial crisis	Campello, Graham and Harvey	2009	2008	1050	USA	Questionary		+			
Excess Cash and Stock Returns	Simutin	2010	1960-2006	-	USA	Multivariate regression		+			
Cash holdings and R&D smoothing	Brown and Petersen	2011	1970-2006	-	USA	Multivariate regression		+			
Costly external finance, Liquidity risk and Default risk	Yang	2011	2007-2008	470	USA	Multivariate regression		+			
Financial Flexibility: Do Firms Prepare for Recession?	Ang and Smedema	2011	1980-2008	-	USA	Multivariate regression		+			
Firm diversification and the value of corporate cash holdings	Tong	2011	1998-2005	6867	USA	Multivariate regression			+		
Firms Structure and corporate cash holdings	Subramaniam, Tang, Yue and Zhou	2011	1988-2006	>5000	USA	Multivariate regression			+		
The determinants of corporate cash management policies: evidence from around the world	Kusnadi and Wei	2011	1995-2004	15912	World	Multivariate regression		+			

17

2.4 Comments on Previous Studies

Studies are largely focused on specific aspects of the firm and how that relates back to one or many of the motives of holding and utilising cash above other methods of financing the day-to-day firm expenses and investment in large projects and investment opportunities. The findings are often of a high calibre in their own right and help to add and complete the picture of a certain motive or core theorem however can fall short of putting their study in the context of the studies completed by their peers. Furthermore, the majority of studies don't take their findings a step further to address impact (be it negative or positive) on the listed equity holdings of the firm.

In terms of comparability, different studies utilise different time periods when examining the topic of cash holdings. Simutin (2010) explores a time period of 46 years and Harford (1999) 44 years while Denis and Sibilikov (2007) only use 5 years of observations. When looking at a long period such as Harford and Simutin do we need to acknowledge the fact that the economy and its characteristics change over time. Longer periods will also cover multiple business cycles while the studies with shorter time frame could only delve into a part of a single business cycle.

Also of importance when comparing results of previous studies is the sample size. Smaller samples such as the 89 companies Mikkelson and Partch (2003) use for their study might not be a good representative of the population. The 2735 companies Bates, Kahle and Stulz (2009) look at would presumably be much more reflective of the population and hence give more reliable results.

Studies on cash richness prior to Opler et al. (1999) do not adequately take into consideration the varying levels of base cash amounts that different companies use dependant on their individual and unique operating characteristics and circumstances. For example, Lang, Stulz & Walkling (1991) utilise a basic cash to asset ratio to identify cash richness.

Further studies still subscribe to cash rich measures based on a percentage value of total cash to total book value of assets which is a questionable measure based again upon variances in firm individual characteristics and circumstances. They manually try to control for firm size and industry specifics however many parameters are still not incorporated. An example is Mikkelson and Partch (2003) where their main analysis on cash holdings effecting performance is measured in this questionable method.

Opler et al. (1999) made an important contribution that allowed for a measure of cash richness that can be applied across industries and scenarios with reduction in the use of manual controls thereby facilitating a more efficient analysis. Their regression method establishes an excess cash level beyond those cash holdings utilised for day-to-day

activities thus a true measure of cash richness is identified. It is often the amount of cash in excess of base operations which is the important variable to analyse.

The majority of modern studies draw from Opler et al. (1999). It can be witnessed that the analysis' vary slightly on the definition of different input variables. This causes potential issues for the comparison of different studies. For example, Harford (1999) Dittmar & Mahrt-Smith (2007), and Simutin (2010) all use slightly differing input definitions.

3.0 Method

This chapter provides a thorough explanation of the methodology used to assess the research questions of this paper and delves into the research approach, data collection, regression and portfolio formation. Finally this section will also assess the validity of the methods ensuring the quality of the study.

3.1 Research Approach

Cash holdings as a research topic delves into a multitude of various elements as to why firms hold certain levels of cash and what cash holdings mean to the firm. Harford, Mikkelson and Partch (2003) document a positive relationship between cash reserves and investments during downturns and that these investments are beneficial and result in higher operating performance and sales growth. They document that operating performance increases the more that a company spends. Outside of downturns this relationship is does not hold as strongly. Simutin (2010) however finds the opposite to be true. Firms with high excess cash levels perform worse during downturns compared to their peers but outperform their low cash peers during periods of growth. Further research, due to inconsistent findings in previous papers, is therefore needed to establish more reliable results that will give better understanding as to whether excess cash translates into positive returns for the firms' stockholders.

The process of this study is based on a broad and thorough literature review, taking into consideration both theoretical as well as empirical works. Based on the theoretical framework a logical hypothesis is constructed. Relevant observations are then collected and the hypothesis is tested based on those observations. This research approach is described as a deductive research approach.

The study aims to conclusively answer if excess cash has a direct impact on stock price in pre crisis boom years and the post crisis trough and recovery period. These questions are in line with previous research on the topic area and will be pitted against previous studies. We hypothesis that during the boom years excess cash will have a negative relationship to cash holdings or no relationship. Within the downturn and recovery period we hypothesis cash to hold a positive and strong relationship to stock price. Finally we assess the period as a whole to ascertain the value of cash across the entire period to determine whether holding a cash rich portfolio is ultimately value destroying or increasing.

20

3.2 Data

The data required to examine the relationship between cash holdings of firms and their stock returns is based on secondary sources, such as databases (e.g. COMPUSTAT and DataStream) and annual reports. For this study DataStream[1] is used as the provider of all relevant observations needed to attain the results in order to answer the research questions. This method of obtaining data is consistent with methods used in previous studies.[2] Using an immense database such as DataStream facilitates the construction of a large sample of firms allowing the reduction of systematic errors and skewness in the sample. All of the variables used in this study follow the definition provided by DataStream unless specified otherwise.

3.2.1 Sample

We construct a sample of U.S. based firms for our empirical tests using annual data for the 2005-2010 period. The sample data pertains to actively traded stocks on U.S. based stock exchanges (Nasdaq, NYSE, NYSE Amex and NYSE ARCA) of which DataStream has information on within the defined time period. Firms in the sample range from small cap to large cap and across all industries. Our original sample was subject to exclusions of observations due to reasons discussed within the exclusions section. We are not aware of any changes in accounting regulations within the study period that would impact our results. The final sample consists of 2278 listed and actively traded U.S. firms.

The timeframe for our analysis is based on the global financial crisis. We perceive this timeframe to be a fairly pure period of boom and bust across all industries due to the nature of the failure of the financial sector triggering common high volatility and constraint across the economy. To this end we utilise the determinations of the National Bureau of Economic Research (NBER).

> 'The National Bureau of Economic Research is a private, non-profit, nonpartisan research organization dedicated to promoting a greater understanding of how the economy works. The NBER is committed to undertaking and disseminating unbiased economic research among public policymakers, business professionals, and the academic community... they are the leading non-profit economic research organisation in the U.S... Eighteen of the 33 American Nobel Prize winners in Economics and six of the past Chairmen of the President's Council of Economic Advisers have been researchers at the NBER. The more than 1,000 professors of economics and business now teaching at colleges and universities in North America who are NBER researchers are the leading scholars in their fields. These Bureau associates concentrate on four types of empirical research: developing new statistical measurements,

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[1] DataStream is a database by Thomson Reuters and provids, amongst others, company specific data.

[2] See for example Harford, Mikkelson and Partch (2003) and Simutin (2010)

estimating quantitative models of economic behaviour, assessing the economic effects of public policies, and projecting the effects of alternative policy proposals'

Their determination is that the crisis began in December 2007 and lasted until June 2009. A period of 18 months (the longest of any recession since WW2). They base their determination on the behaviour of various indicators of the economy. These indicators include:

- Macroeconomic Advisers' monthly GDP
- The Stock-Watson index of monthly GDP
- Their index of monthly GDI
- An average of their two indexes of monthly GDP and GDI
- Real manufacturing and trade sales
- Index of Industrial Production
- Real personal income less transfers
- Aggregate hours of work in the total economy
- Payroll survey employment
- Household survey employment

NBER (2010)

Our timeframe therefore begins two years prior (data is from three years prior to account for lag) to the beginning of the crisis and ends three years post the beginning of the crisis. This enables a focused analysis of boom and bust years surrounding a period of crisis. The following graph depicts the shape of the period in question with markers showing the start and close of the GFC.

NBER (2010)

22
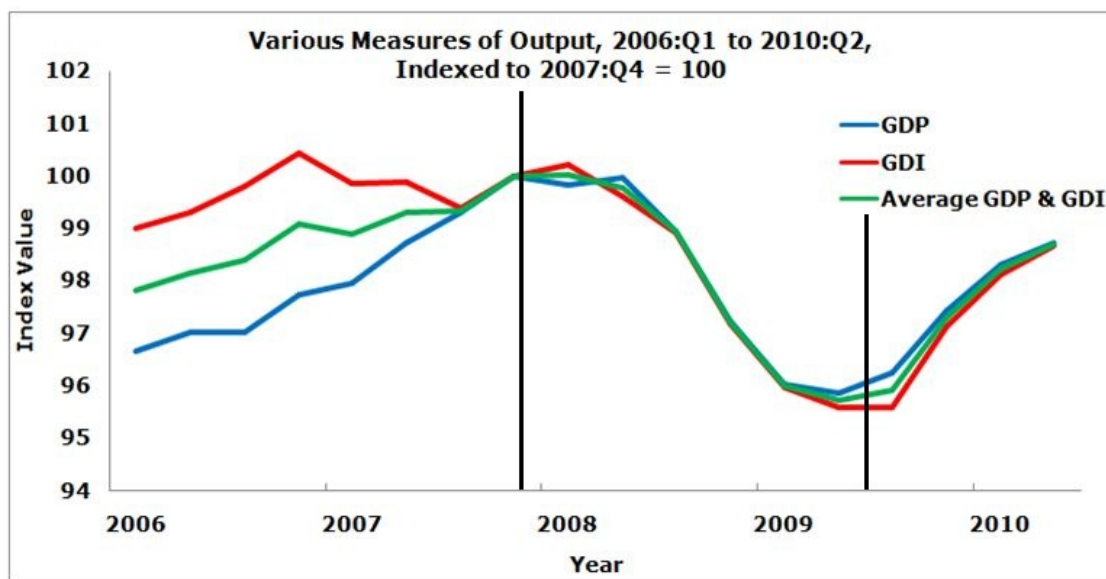
3.2.2 Exclusions

A number of observations had to be excluded from the original sample in order to minimise statistical errors caused by missing data items or further reasons discussed within this section. First we have excluded all financial and utilities firms as these firms may be subject to regulatory supervision and may carry cash to meet capital requirements. The reasons for cash holdings of these firms are therefore not in line with the economic reasons discussed and studied in this paper. Second, all firms traded on OTC markets and so called Pink Sheet firms are also excluded as they are not required to disclose any data by regulatory agencies such as the SEC. Furthermore price fluctuations can be very severe or none at all over an extended period of time as the stocks for these firms are not frequently traded. Data obtained for OTC traded and Pink Sheet firms are therefore not fully reliable and are excluded as mentioned before. Third, all firms with missing data items for any of the given years were excluded as the reasons for the missing data is not known. After investigation on randomly selected firms with missing data we concluded that there was no systematic reason for why the data was missing. Including these firms could therefore give rise to misleading results. Furthermore, according to the studies of Harford, Mikkelson and Partch (2003) and Simutin (2010) findings will not be impacted upon by the exclusion of non-survivors.

3.3 Regression

This section provides an overview of the regression that has been conducted within this research paper. The regression model is utilised to establish the excess levels of cash that firms carry and is based upon the research of Opler et al. (1999) and Simutin (2010).

Cash holdings can vary substantially amongst firms based on numerous factors such as industry, recent activities and nature of the firms business[3]. In order to appropriately establish the cash richness of a firm it is important to account for firm specific differences. We begin by focusing on the measure of excess cash; that is, cash that is in surplus of cash required for fixed non-flexible predetermined use in the firm's operations. Opler et al. (1999) explored the determinants of corporate cash holdings and their model for determining firms' liquid assets has been widely used and recognised in subsequent and present studies. This model provides the base for the excess cash measure used in this study.

3.3.1 The Regression Model

The following is the regression model used to assess the excess cash measure:

$$C_{it} = \alpha_{0t} + \beta_{1t}MB_{it} + \beta_{2t}Size_{it} + \beta_{3t}CPX_{it} + \beta_{4t}WC_{it} + \beta_{5t}L_{it} + \beta_{6t}RD_{it} + \beta_{7t}CF_{it} + \beta_{8t}\sigma_{it}^{IND} + \beta_{9t}Div_{it} + \varepsilon_{it}$$

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[3] See for example Opler et al. (1999), Drobetz and Gruninger (2007) and Bates, Kahle and Stulz (2009)

Since liquidity can't be negative the dependent variable in the regression model is the natural logarithm of liquid asset holdings. Alfa represents the intercept; beta the coefficients and the variable names represent different input variables. The excess cash measure is characterized by the equations residual, ε.

3.3.2 Variables[4]

3.3.2.1 Dependant variable

Liquid asset holdings (C). The dependent variable in the regression model is the natural logarithm of liquid asset holdings. Liquid asset holdings are measured as the ratio of cash and short-term investments divided by total assets less cash and short-term investments.

$$C = LN\left(\frac{Cash\ and\ Cash\ Equivalents}{Total\ Book\ Value\ of\ Assets - Cash\ and\ Cash\ Equivalents}\right)$$

3.3.2.2 Independent variables[5]

Market-to-book (MB). The book value of assets does not include future growth opportunities. Market value of assets on the other hand should reflect the value of all future growth options. Firms with higher market value compared to the book value should therefore reflect firms' with greater future growth opportunities. To measure whether a firm will have positive NPV investment opportunities in the future we use the market-to-book ratio as defined in Opler et al (1999). The market-to-book ratio is defined as the book value of assets, less the book value of equity, plus market value of equity, divided by assets.

$$MB = \frac{Book\ Value\ of\ Assets - Book\ Value\ of\ Equity + Market\ Value\ of\ Equity}{Assets}$$

Firm size (Size). To measure firm size we use the natural logarithm of the book value of real assets. Real assets are total assets at the end of the year measured in 2010 dollars.

$$Size = LN(Total\ Book\ Value\ of\ Assets)$$

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[4] Definitions of all variables are based on the research of Opler et al. (1999)

[5] For all independent variables that are deflated by assets, assets are defined as total assets less cash and short-term investments. $Assets = Total\ Book\ Value\ of\ Assets - Cash\ and\ Cash\ Equivalents$

Capital expenditures (CPX). CPX is measured as the ratio of capital expenditures to assets.

$$CPX = \frac{Capital\ Expenditures}{Assets}$$

Working Capital (WC). WC is measured as the ratio of working capital, less cash and short-term investments, divided by assets to account for liquid asset substitutes.

$$WC = \frac{Working\ Capital - Cash\ and\ Cash\ Equivalents}{Assets}$$

Financial Leverage (L). Leverage is measured as total debt (STD+LTD) divided the book value of assets.

$$L = \frac{Short\ Term\ Debt + Long\ Term\ Debt}{Total\ Book\ Value\ of\ Assets}$$

Financial distress cost (RD). To proxy for the potential of financial distress costs we use the ratio of R&D expenses divided by sales.

$$RD = \frac{Research\ and\ Development\ Expenses}{Revenues}$$

Cash flow (CF). Cash flow is measured as EBIT less interest, taxes and dividends paid but before depreciation divided by assets.

$$CF = \frac{EBIT + Depreciation - Interest - Taxes - Common\ Dividends}{Total\ Book\ Value\ of\ Assets}$$

Cash flow riskiness (σ_{IND}). To measure cash flow riskiness we use the standard deviation of industry cash flow divided by assets for the previous 10 years. Industry cash flow is computed as follows. For each firm the standard deviation of cash flow is computed and then the average of these standard deviations is taken across the firms industry.

$$\sigma_{IND} = Average(\sigma_{Firms\ within\ industry})$$

Dividend payment dummy (Div.). A dummy is defined and set equal to one in the years the firm paid dividend, otherwise it is set to zero.

3.3.3 Reliability of the Regression Model

A number of key diagnostics were performed to ensure the quality of the findings. The following aspects were analysed: normality, error variance of continuity (heteroscedasticity), independence of error variables (autocorrelation) and multicollinearity.

Normality – To test for normality we utilise a set of normality tests (see results in appendices 1). The residuals show evidence against normality. However this should not impose a problem due to the large sample size. ANOVA and t-tests should be fairly robust to violations of this standard.

Error Variance of Continuity – we utilised the Breusch-Pagan test and found that the error of variance variable was constant and therefore did not suffer from heteroscedasticity. In other words the requirement was satisfied and of a homoscedastic nature.

Independence of error variables – checking for the autocorrelation of the error variables we utilised the Durbin-Watson statistic and found no evidence of non-independence.

Multicollinearity – there is no significant relationship between the independent variables hence there is no multicollinearity. This was tested through correlation matrix (see appendices 2). This indicates a viable regression model.

In conclusion the regression meets the required conditions that: the mean of the error distribution is zero, the standard deviation of ε is σ_ε (constant), the errors are independent and the errors are independent of the independent variables. ANOVA and t-tests should be robust to violations in normality due to the large sample size.

3.4 Portfolio Construction

The construction of the portfolios and their analysis is a complex process. The following steps explain the method in which the portfolio analysis was completed:

1. Based on the findings of the regression, companies are sorted into 10 deciles utilising their level of excess cash.
2. Portfolios are revolved on a yearly basis. This involves reassessing the excess cash levels of all firms and re-allocating firms to the appropriate portfolio for their level of excess cash. This use of a revolving system ensures that the yearly analysis of excess cash deciles to returns remains true and a proper relationship can be assessed. The number of portfolios over the reference period totals to 1800.

26

3. Total Shareholder Return (TSR) is calculated for each of the 2278 firms. To calculate the portfolios' individual returns we utilise the value weighted average return of the firms within a particular portfolio. We acknowledge the assumption of this approach: that stock prices are efficient in their reflection of firm fundamentals and prospects, representing the fair equity value of the firm.
4. We construct tables for each year consisting of the excess cash portfolios and their returns. We also include the average values of relevant variables that have been postulated in theory to explain stock returns. These variables are beta, market-book and size.
5. Finally we analyse the results and test the strength of the relationship between excess cash and returns. We test for correlation and also run controlled portfolios on the afore mentioned variables and assess if the relationship still holds. In other words, we fix other potential influencing variables testing if excess cash maintains its relationship to stock returns.

3.5 Validity and Reliability

We base the methodological framework for our study on previous papers. The models used to determine measures of excess cash and the comparability of those measures to stock returns have all been recognised and used in previous studies. Previous studies have performed numerous robustness tests that have positively confirmed the method to be sound. The method chosen in our research is therefore considered to be valid and applicable.

To ensure the reliability of the study we utilise known methods of attaining data through recognised and valid databases as well as applying known methods of analysis. All data used for this study is obtained through DataStream and therefore considered reliable. Exclusions of observations are solely based on theoretical foundation and missing data, consistent with methods used in previous studies. To ensure correct calculations all regressions where performed with Statplus®.

4.0 Empirical Findings

Empirical findings provides descriptive statistics on the sample and detailed reviews of the regression and portfolio findings.

4.1 Descriptive Statistics

The total sample consists of 2278 unique firms and is observed across a period of six years with a one-year lag. Analysis is performed on the period 2005 - 2010. This amounts to 13668 firm year observations. The following summary table provides an overview of data items pertinent to the analysis.

Summary

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(1.946)	(1.833)	1.785	(11.957)	4.463
MB	4.175	1.955	13.087	0.123	749.052
Size	13.205	13.213	2.021	5.207	20.539
CPX	0.066	0.041	0.081	0	1.342
WC	0.028	0.068	0.511	(14.939)	0.853
LTD	0.198	0.134	0.256	0	5.151
R&D	0.665	0.003	13.094	0	820.400
CF	0.003	0.056	0.304	(12.034)	2.416
IND. Sigma	0.250	0.179	0.311	0.031	2.690
Dividend dummy	0.335	0	0.472	0	1.000

Important for the analysis is that there is no obtuse skewness within the dependant variable (cash ratio). The only concerns surrounding skewness are within MB and R&D. It should be noted that the size of the firm is CPI adjusted to 2010 outputs. The various range results (difference between maximum and minimum) indicates a good spread and therefore good firm representation. This, coupled with the quality of the spread across industries and the number of unique firms, results in a sound sample from which one can conduct analysis and draw informed conclusions.

In terms of shifts across individual years (see appendices 3) the cash ratio becomes much lower during bust years and increases again at the latter stages of recovery. This indicates an increased usage of cash during times of constraint. Across the same period, as expected, market-book drops dramatically in the crisis years and improves into the recovery.

CAPEX and working capital fall in the crisis period and are yet to revert back to pre-crisis levels at the close of the analysis. Cash flows fall negative for two consecutive years are become positive again at the close of 2009.

These statistics present a clear picture of the period under analysis. Firms are moving from a period of boom (non constraint) to a period of bust (constraint) and finally we witness the early signs of recovery.

The descriptive statistics present a story of a sound sample from which one can gain quality inferences and also an insight into the period of study, thus assuring that in this regard the requirements of the study have been met.

4.2 Regression Results

The results are largely consistent with previous studies, namely, Opler et al. (1999) and Simutin (2010). The following Linear Regression table reports the results of the cross sectional regressions used to estimate excess cash measures. Reported are average coefficients of year-end cross sectional regressions, corresponding t-statistics and p-values and the average R^2. Individual year regressions can be found in appendices 4.

Linear Regression			
Regression Statistics			
R	0.526		
R Square	0.277		
Adjusted R Square	0.274		
Standard Error	1.516		
Total Number Of Cases	2,278.		
	Coefficients	*t Stat*	*p-level*
Intercept	-0.132	-0.549	0.31
MB	0.038	8.92	0.007
Size	-0.103	-5.554	0.
CPX	-0.547	-1.277	0.146
WC	-0.538	-6.369	0.001
L	-1.948	-14.577	0.
R&D	0.005	1.92	0.261
CF	-0.284	-2.409	0.091
IND. Sigma	0.093	0.88	0.41
Dividend dummy	-0.556	-7.462	0.
T (2%)	2.328		

The following explanations discuss the meaning of the coefficient sign that each variable has received:

Market-Book (+) – a positive sign for market-book is consistent with the notion that firms with higher growth opportunities hold higher levels of cash.

Size (-) – consistent with the notion that larger firms have lower cash ratios due to their ability to utilise economies of scale in attaining external financing.

CAPEX (-) – firms with high CAPEX hold less cash.

Working Capital (-) – this is consistent with the notion that working capital is a substitute for cash.

Leverage (-) – firms with high Leverage hold less cash.

R&D (+) – firms with higher R&D are more likely to face financing problems due to asymmetric information in times of economic distress and hence hold more cash (Opler et al., 1999).

Cash Flows (-) – firms with high cash flows hold less cash. This is consistent with the notion that firms with stronger cash flows require less cash on hand and have better access to debt.

Industry Sigma (+) – consistent with the notion that firms suffering higher volatility in cash flows hold cash as a buffer.

Dividend Dummy (-) – firms that pay out more dividends retain less cash.

The coefficients for CAPEX, R&D and industry sigma are not statistically significant at the 2% level.

4.3 Portfolio Results

The portfolio results are analysed across all years from 2006 – 2010. We also assess the inherent periods within the time frame looking at the boom years precluding the GFC (2006-2007), the crash and recovery period (2008-2010) and finally the period as a whole (2006-2010). See appendices 5 and 6 for an overview of results to be utilised in conjunction with the text of this section.

On a whole throughout all tested time periods we report a positive relationship between excess cash levels and stock returns. This relationship is not monotonic. This relationship does experience differing explanatory power across the various periods. The R^2 values for the boom period, crash and recovery period and finally across the whole time frame are 1.7%, 11.6% and 6.5% respectively.

We explore this relationship further by testing for correlation between excess cash and relevant variables (beta, market-book and size) and then test the impact of these variables on findings. We test them through controlling them (effectively holding the variable stationary) and applying the ten deciles of excess cash to ascertain if the relationship to stock returns still holds.

The findings of the controlled assessment give slightly different results. The slope is still positive when controlling for market-to-book for all time periods and the explanatory power stays relatively the same. When controlling for size, the correlation between excess cash and stock returns remains positive when assessing the whole period. However, we observe a negative slope when looking at the 2006-2007 period indicating that firms get punished for holding excess cash in times of low constraint. When looking at the time period 2008-2010 we see good positive relationship between excess cash and stock returns. This is consistent with the notion that cash becomes more valuable during times of financial constraint. In the third test where the excess cash portfolios are all exposed to the same risk (beta held constant) the explanatory power drops dramatically as does the effect excess cash has on stock returns. The relationship is however consistent when controlling for size; the coefficient is positive for the 2006-2010 period, negative for times of low constraints and positive during times of crisis. The changes in the relationship of excess cash and stock returns when controlling for size and beta suggest that these two variables impact upon stock returns.

In the times of constraint we consistently witness a dramatic increase in the explanatory power as well and the effect excess cash holdings have on stock returns. The relationship is however not as monotonic when looking at the boom times.

5.0 Analysis & Discussion

This section discusses the findings of the portfolio results from chapter four. The findings are assessed per specific time periods of boom (non-constraint), downturn and recovery (constraint) and the periods combined as a whole. Each period will be defined by its market characteristics, how these relate to theory, a hypothesis formed based on this theory and the results of the study discussed forming context and pertinence for the analysis.

5.1 Analysis of Time Periods

5.1.1 [2006 – 2007] Boom Period

This period is one marked by low constraint and general financial freedom. Companies in this financial setting, on a whole, should have an ease of access to lines of credit and hence the value of excess cash holdings is theoretically diminished across the broad spectrum of the market. Cash should therefore be less valuable in this time period.

We hypothesis a negative relationship and/or minimal explanatory power of excess cash upon stock returns. This should reflect a perceived opportunity cost of holding cash.

Our uncontrolled results suggest a slightly positive connection between excess cash and stock returns. However, as expected, the explanatory power of this observation is very low with a R^2 of only 1.7%. When controlling for different variables the most apparent finding is when controlling for size. Here we see quite a negative slope with an R^2 of 52%. This result suggests that excess cash, as postulated and in-line with theory and past studies, is not beneficial in times of financial freedom.

The consensus of our findings within this period is that holding excess cash is not perceived to be beneficial to the firm and generally does not explain the movements in stock price. A strategy of long high ECM portfolio and short low ECM would yield an average yearly return of -3.72% in the uncontrolled portfolios and -4.62% in the portfolio where firm size no longer has an impact. This would reflect previous findings such as by Harford (1999) where excess cash leads to poor investment choices.

5.1.2 [2008 – 2010] Downturn & Recovery Period

Following from the boom period we shift into a period of high constraint and high volatility. Within this period access to credit lines should be diminished across the broad spectrum of the market. The value of excess cash holding should therefore increase. As excess cash is now of a greater pertinence to a firm's ability to enact investment opportunities, we hypothesis that excess cash should attain a positive slope to returns and

achieve higher explanatory power. This should reflect a perceived value enhancer through the retention of financial flexibility. This relates to the precautionary motive, that is, holding cash as a call option.

Our uncontrolled results show a positive slope that increases in steepness compared with the boom period. We also witness a marked increase in R^2 to 11.6% which suggests that excess cash within a period of downturn accounts for a much greater element of the movements in the stock price. This is in-line with our hypothesis regarding the benefits of flexibility. In regards to the explanatory power, internal sources of financing have become more important to the financing of projects and hence this is reflected in greater explanatory of excess cash on stock returns.

Our controlled analysis again supports the findings of the uncontrolled. Again we witness an interesting story coming out of the size variable. The positive slope is much steeper and has an R^2 $value\ of$ 68%.

A further story of interest within this period is that during 2008, when the down swing of the market initially occurred, firms with higher levels of excess cash underperformed those companies with lower excess cash. Simutin (2010) came to the same conclusions that firms with higher levels of excess cash underperformed the firms with lower excess cash during periods of constraint. We would try to explain this relationship by the fact that smaller firms tend to hold more cash than larger firms. This observation is further strengthened when we look at the portfolios that have been controlled for size. In this circumstance excess cash has a positive relationship to stock returns giving proof to our explanation.

As noted before, the level of cash firms hold drops substantially during the period of crisis. This would suggest that firms utilise their cash holding in market downturn and experience greater future stock returns. This is consistent with the findings of Harford, Mikkelson and Partch (2003) where the ability to continue investments during downturn resulted in improved post downturn operating performance.

The consensus of our findings for this period is that holding excess cash is perceived to be beneficial to the firm in times of downturn and recovery.

5.1.3 [2006 – 2010] Whole Period
The whole period analysis allows for the story of if excess cash holdings give a positive or negative return across market peaks and troughs over an extended period of time.

Uncontrolled findings give a slightly positive slope with an R^2 value of 6.5%. When controlling for market-book and size we also find a positive slope with R^2 values of 22% and 35% respectively.

The consensus of these results suggests a slightly positive relationship across the whole period. From the shareholder's perspective the findings indicate that there is indeed value in a share portfolio that holds a high level of excess cash.

5.2 Discussion of Results

We document a link between excess cash and different market states. In times of boom we document a slightly positive relationship with a low explanatory value. The high minus low evaluation indicates that high excess cash firms generate less returns on their stocks that low excess cash firms.

In times of constraint we document a positive relationship between high excess cash and returns. This relationship holds across all controlled tests showing that in times of constraint excess cash becomes a value enhancer for the investor.

Overall we document a positive relationship between excess cash holdings and stock returns. To this end our findings also confirm the precautionary and speculative motives for holdings cash as a way of creating value for the company and investors.

5.3 Further Discussion (R^2)

A further interesting relationship within the findings is a consistent shift in the R^2 values from low explanatory power within boom times and at times incredibly high explanatory power within the periods of bust and recovery on consistent positive slopes. This perhaps is explained or indeed helps to explain the differences that constraint places upon cash usage.

Studies such as Harford, Mikkelson and Partch (2003) provide evidence that cash is most useful for firms suffering constraint where access to external money markets is restricted and hence that value of internal financing capacity much higher.

The empirical study utilising the GFC gave the opportunity to analyse a large sample of companies that should be feeling fairly uniform non-constraint in the boom years and again fairly uniform constraint in the downturn.

The increased explanatory power of excess cash in the downturn and recovery period suggests that in these periods cash did become a much more important element of enacting investment opportunities and thus supports the idea that excess cash is beneficial in negative financial climates. To this extent it's not the absolute R^2 value that is important but rather the positive shift in R^2 value showing the increased worth of cash in a downturn.

In combining the absolute value of R^2 a further inference can be made. The generally low R^2 is perhaps indicative of the fact that by merely having excess cash it doesn't mean that a firm has the investment opportunities to be enacted by that excess cash. A further

inference is perhaps that as the explanatory power grows the cash portion within general firm investments is increasing. Hence the value of excess cash is not as a producer of investment opportunity but an enabler of investment opportunity. As constraint rises and more cash is used to fuel investments we see the explanatory value rise. What does this mean to the investor? This confirms the past findings that the value of cash is situation and policy dependant. At the very least an investor knows that a firm with high excess cash is enabled to take advantage of an investment opportunity. As the findings show a positive slope it also means that if an investment opportunity should arise in times of constraint the company with higher excess cash will be in a better position than a low cash firm to continue to be able to take advantage of investment opportunities and generate higher returns for investors.

6.0 Conclusion

In this chapter we present our conclusions to our study.

This study has two main purposes. The primary purpose is to identify if a link exists between excess cash holdings and stock returns applied across boom and bust scenarios in a concentrated manner. The secondary purpose is to provide a mapping of relevant papers and studies providing a thorough analysis of the topic of cash holdings. This both provides a strong base for the analysis and a more informed investor on the topic of cash rich firms.

The latter is achieved through rigorous and comprehensive analysis of a plethora of documentation on the topic area. Findings provided insight into the five key motives: Transactional, Precautionary, Speculative, Tax and Agency. The empirical papers provided assessment on these motives and these were mapped to gain a picture of the research area. This research provides an informative base for investors and provided a sound base from which to build the empirical analysis.

The regression analysis provided a quality measure of excess cash. Through the results of the regression applied across our sample of 2287 companies we were able to construct a multitude of portfolios to address the primary purpose of the paper.

The empirical analysis of this paper documents an overall positive relationship between excess cash holdings and stock returns. In regards to the specific period this paper documents a negative relationship in boom times and a positive relationship in times of downturn. These findings support the use of a precautionary and/or speculative motive for excess cash holdings. From the shareholder perspective, over the long term, more value is obtained from investing in high cash firms.

6.1 Further Research

Due to the positive relationship of excess cash holdings to returns a further investigation could be conducted on if it would be possible to optimise the investment portfolios utilising a corporate governance input. Due to value enhancing benefits of sound corporate governance to cash rich firms (discussed in section 2.2.2) it is conceivable that through the addition of a corporate governance input portfolio quality and therefore returns may be able to be enhanced.

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8.0 Appendices

8.1 Appendices 1: Results of Normality Tests

Normality Tests 2005

Variable #1 (Var1)

Sample size	2278	Mean	-2.44946E-15
Standard Deviation	1.54599	Median	0.2373
Skewness	-0.96116	Kurtosis	5.56033
Alternative Skewness (Fisher's)	-0.96179	Alternative Kurtosis (Fisher's)	2.56859

	Test Statistics	p-level	Conclusion: (5%)
Kolmogorov-Smirnov/Lilliefor Test	0.06444	1.30368E-24	Strong evidence against normality
Shapiro-Wilk W	0.9639	1.99254E-23	Reject Normality
D'Agostino Skewness	16.00057	0.E+0	Reject Normality
D'Agostino Kurtosis	11.89769	0.E+0	Reject Normality
D'Agostino Omnibus	397.57313	0.E+0	Reject Normality

Histogram for Var1

Normality Tests 2006

Variable #1 (Var1)

Sample size	2278	Mean	-1.25604E-15
Standard Deviation	1.57298	Median	0.24679
Skewness	-1.00603	Kurtosis	5.34868
Alternative Skewness (Fisher's)	-1.00669	Alternative Kurtosis (Fisher's)	2.35648

	Test Statistics	p-level	Conclusion: (5%)
Kolmogorov-Smirnov/Lilliefor Test	0.06833	7.76627E-28	Strong evidence against normality
Shapiro-Wilk W	0.95715	2.27505E-25	Reject Normality
D'Agostino Skewness	16.56248	0.E+0	Reject Normality
D'Agostino Kurtosis	11.37786	0.E+0	Reject Normality
D'Agostino Omnibus	403.77143	0.E+0	Reject Normality

Histogram for Var1

Normality Tests 2007

Variable #1 (Var1)

Sample size	2278	Mean	1.6026E-15
Standard Deviation	1.56666	Median	0.20373
Skewness	-0.89157	Kurtosis	5.61719
Alternative Skewness (Fisher's)	-0.89216	Alternative Kurtosis (Fisher's)	2.62558

	Test Statistics	p-level	Conclusion: (5%)
Kolmogorov-Smirnov/Lilliefor Test	0.0589	2.23507E-20	Strong evidence against normality
Shapiro-Wilk W	0.95622	1.27932E-25	Reject Normality
D'Agostino Skewness	15.09847	0.E+0	Reject Normality
D'Agostino Kurtosis	12.03099	0.E+0	Reject Normality
D'Agostino Omnibus	372.70864	0.E+0	Reject Normality

Histogram for Var1

Normality Tests 2008

Variable #1 (Var1)

Sample size	2278	Mean	2.01957E-16
Standard Deviation	1.45742	Median	0.2059
Skewness	-0.96606	Kurtosis	5.50975
Alternative Skewness (Fisher's)	-0.96669	Alternative Kurtosis (Fisher's)	2.5179

	Test Statistics	p-level	Conclusion: (5%)
Kolmogorov-Smirnov/Lilliefor Test	0.07108	3.07427E-30	Strong evidence against normality
Shapiro-Wilk W	0.95815	4.26568E-25	Reject Normality
D'Agostino Skewness	16.06264	0.E+0	Reject Normality
D'Agostino Kurtosis	11.77693	0.E+0	Reject Normality
D'Agostino Omnibus	396.70448	0.E+0	Reject Normality

Histogram for Var1

Normality Tests 2009

Variable #1 (Var1)

Sample size	2278	Mean	1.10126E-16
Standard Deviation	1.44864	Median	0.18615
Skewness	-0.98126	Kurtosis	6.47542
Alternative Skewness (Fisher's)	-0.98191	Alternative Kurtosis (Fisher's)	3.4857

	Test Statistics	p-level	Conclusion: (5%)
Kolmogorov-Smirnov/Lilliefor Test	0.07419	4.55646E-33	Strong evidence against normality
Shapiro-Wilk W	0.94775	1.00978E-27	Reject Normality
D'Agostino Skewness	16.25424	0.E+0	Reject Normality
D'Agostino Kurtosis	13.77715	0.E+0	Reject Normality
D'Agostino Omnibus	454.00999	0.E+0	Reject Normality

Histogram for Var1

Normality Tests 2010

Variable #1 (Var1)

Sample size	2278	Mean	3.77584E-15
Standard Deviation	1.48667	Median	0.20317
Skewness	-1.1797	Kurtosis	7.35687
Alternative Skewness (Fisher's)	-1.18047	Alternative Kurtosis (Fisher's)	4.36909

	Test Statistics	p-level	Conclusion: (5%)
Kolmogorov-Smirnov/Lilliefor Test	0.08673	7.93339E-46	Strong evidence against normality
Shapiro-Wilk W	0.93962	1.65423E-29	Reject Normality
D'Agostino Skewness	18.60213	0.E+0	Reject Normality
D'Agostino Kurtosis	15.18486	0.E+0	Reject Normality
D'Agostino Omnibus	576.61932	0.E+0	Reject Normality

Histogram for Var1
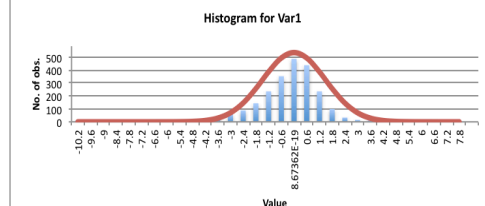
8.2 Appendices 2: Correlation Coefficients Matrix for Multicollinearity Check

Correlation Coefficients Matrix									
Sample size	2278	*Critical value (5%)*	1.961						
	MB	*Size*	*CPX*	*WC*	*LTD*	*R&D*	*CF*	*IND. Sigma*	*Dividend dummy*
MB	*1.*								
Size	*-0.219*	*1.*							
CPX	*0.093*	*-0.024*	*1.*						
WC	*-0.511*	*0.052*	*-0.161*	*1.*					
LTD	*-0.092*	*0.186*	*-0.016*	*-0.057*	*1.*				
R&D	*0.07*	*-0.061*	*0.029*	*-0.067*	*0.179*	*1.*			
CF	*-0.278*	*0.294*	*-0.046*	*0.321*	*-0.142*	*-0.202*	*1.*		
IND. Sigma	*0.047*	*-0.033*	*0.141*	*-0.114*	*0.012*	*0.02*	*-0.068*	*1.*	
Dividend dummy	*-0.126*	*0.426*	*-0.064*	*0.085*	*0.051*	*-0.037*	*0.154*	*-0.082*	*1.*

8.3 Appendices 3: Descriptive Statistics for the Sample

Summary

	Mean	*Median*	*Standard Deviation*	*Minimum*	*Maximum*
Cash ratio	(1.946)	(1.833)	1.785	(11.957)	4.463
MB	4.175	1.955	13.087	0.123	749.052
Size	13.205	13.213	2.021	5.207	20.539
CPX	0.066	0.041	0.081	0	1.342
WC	0.028	0.068	0.511	(14.939)	0.853
LTD	0.198	0.134	0.256	0	5.151
R&D	0.665	0.003	13.094	0	820.400
CF	0.003	0.056	0.304	(12.034)	2.416
IND. Sigma	0.250	0.179	0.311	0.031	2.690
Dividend dummy	0.335	0	0.472	0	1.000

2005

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(1.900)	(1.787)	1.843	(11.012)	4.214
MB	5.129	2.294	12.852	0.497	342.650
Size	13.041	13.025	2.039	6.574	20.435
CPX	0.073	0.045	0.092	0	1.342
WC	0.024	0.067	0.600	(13.161)	0.823
LTD	0.184	0.123	0.249	0	4.990
R&D	0.600	0.002	8.408	0	317.367
CF	0.015	0.062	0.276	(4.875)	2.416
IND. Sigma	0.254	0.200	0.310	0.034	2.682
Dividend dummy	0.331	0	0.471	0	1.000

2006

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(1.975)	(1.872)	1.876	(11.957)	3.920
MB	4.931	2.310	12.996	0.590	317.769
Size	13.167	13.170	2.005	6.561	20.445
CPX	0.073	0.046	0.089	0	1.311
WC	0.035	0.074	0.468	(8.368)	0.834
LTD	0.178	0.114	0.225	0	2.335
R&D	0.897	0.003	16.840	0	704.450
CF	0.017	0.063	0.269	(5.377)	1.974
IND. Sigma	0.256	0.204	0.310	0.032	2.685
Dividend dummy	0.339	0	0.474	0	1.000

2007

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(2.021)	(1.964)	1.853	(10.090)	4.386
MB	4.539	2.128	13.289	0.530	387.799
Size	13.254	13.266	1.997	5.207	20.537
CPX	0.073	0.045	0.087	0	1.110
WC	0.030	0.069	0.473	(8.036)	0.849
LTD	0.181	0.122	0.245	0	5.151
R&D	0.694	0.004	13.724	0	535.252
CF	0.011	0.061	0.305	(8.189)	0.790
IND. Sigma	0.256	0.201	0.311	0.032	2.690
Dividend dummy	0.350	0	0.477	0	1.000

2008

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(2.104)	(2.026)	1.733	(8.820)	4.041
MB	2.581	1.411	5.125	0.123	101.226
Size	13.255	13.281	2.012	6.984	20.539
CPX	0.072	0.045	0.088	0	1.096
WC	0.044	0.068	0.401	(6.196)	0.838
LTD	0.209	0.145	0.261	0	4.088
R&D	0.710	0.003	17.467	0	820.400
CF	(0.031)	0.049	0.330	(5.876)	0.968
IND. Sigma	0.249	0.192	0.312	0.033	2.689
Dividend dummy	0.343	0	0.475	0	1.000

2009

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(1.845)	(1.743)	1.686	(10.796)	3.526
MB	3.562	1.797	10.949	0.390	368.065
Size	13.229	13.243	2.026	7.060	20.492
CPX	0.051	0.033	0.060	0	0.756
WC	0.022	0.067	0.508	(11.332)	0.853
LTD	0.233	0.166	0.278	0	3.947
R&D	0.501	0.004	8.620	0	377.238
CF	(0.016)	0.043	0.307	(7.716)	0.934
IND. Sigma	0.245	0.190	0.310	0.031	2.686
Dividend dummy	0.317	0	0.465	0	1.000

2010

	Mean	Median	Standard Deviation	Minimum	Maximum
Cash ratio	(1.831)	(1.681)	1.692	(11.276)	4.463
MB	4.307	1.945	19.149	0.442	749.052
Size	13.285	13.266	2.040	7.860	20.437
CPX	0.052	0.034	0.060	0	0.917
WC	0.028	0.064	0.534	(14.939)	0.840
LTD	0.205	0.140	0.269	0	4.697
R&D	0.586	0.005	10.339	0	437.394
CF	0.019	0.058	0.330	(12.034)	1.294
IND. Sigma	0.239	0.175	0.310	0.033	2.686
Dividend dummy	0.332	0	0.471	0	1.000

8.4 Appendices 4: Yearly Regression Results

2005

Linear Regression

Regression Statistics

R	0.544
R Square	0.296
Adjusted R Square	0.293
Standard Error	1.549
Total Number Of Cases	2278

ANOVA

	d.f.	SS	MS	F	p-level
Regression	9.	2,288.361	254.262	105.962	0.00
Residual	2,268.	5,442.225	2.4		
Total	2,277.	7,730.586			

	Coefficients	Standard Error	LCL	UCL	t Stat	p-level	H0 (2%) rejected?
Intercept	-0.598	0.243	-1.164	-0.031	-2.457	0.014	Yes
MB	0.04	0.003	0.033	0.048	11.971	0.	Yes
Size	-0.079	0.019	-0.123	-0.035	-4.176	0.	Yes
CPX	0.544	0.361	-0.297	1.385	1.505	0.132	No
WC	-0.205	0.075	-0.379	-0.031	-2.737	0.006	Yes
L	-1.989	0.141	-2.316	-1.661	-14.147	0.	Yes
R&D	0.003	0.004	-0.006	0.012	0.751	0.453	No
CF	-0.55	0.133	-0.86	-0.241	-4.139	0.	Yes
IND. Sigma	0.219	0.107	-0.03	0.468	2.047	0.041	No
Dividend dummy	-0.599	0.077	-0.778	-0.421	-7.823	0.	Yes
T (2%)	2.328						

LCL - Lower value of a reliable interval (LCL)
UCL - Upper value of a reliable interval (UCL)

2006

Linear Regression

Regression Statistics

R	0.545
R Square	0.297
Adjusted R Square	0.295
Standard Error	1.576
Total Number Of Cases	2278

ANOVA

	d.f.	SS	MS	F	p-level
Regression	9.	2,383.699	264.855	106.62	0.00
Residual	2,268.	5,633.936	2.484		
Total	2,277.	8,017.635			

	Coefficients	Standard Error	LCL	UCL	t Stat	p-level	H0 (2%) rejected?
Intercept	-0.24	0.253	-0.828	0.348	-0.949	0.343	No
MB	0.031	0.003	0.024	0.038	10.063	0.	Yes
Size	-0.092	0.02	-0.137	-0.046	-4.676	0.	Yes
CPX	-0.722	0.38	-1.607	0.162	-1.9	0.058	No
WC	-0.674	0.086	-0.874	-0.474	-7.831	0.	Yes
L	-2.299	0.156	-2.663	-1.935	-14.705	0.	Yes
R&D	0.008	0.002	0.004	0.013	4.054	0.	Yes
CF	-0.311	0.141	-0.638	0.017	-2.209	0.027	No
IND. Sigma	0.087	0.108	-0.165	0.34	0.807	0.42	No
Dividend dummy	-0.644	0.078	-0.824	-0.463	-8.298	0.	Yes
T (2%)	2.328						

LCL - Lower value of a reliable interval (LCL)
UCL - Upper value of a reliable interval (UCL)

2007

Linear Regression

Regression Statistics

R	0.541
R Square	0.292
Adjusted R Square	0.29
Standard Error	1.46
Total Number Of Cases	2278

ANOVA

	d.f.	SS	MS	F	p-level
Regression	9.	1,998.948	222.105	104.153	0.00
Residual	2,268.	4,836.486	2.132		
Total	2,277.	6,835.434			

	Coefficients	Standard Error	LCL	UCL	t Stat	p-level	H0 (2%) rejected?
Intercept	-0.544	0.234	-1.09	0.001	-2.324	0.02	No
MB	0.105	0.007	0.089	0.122	15.108	0.	Yes
Size	-0.095	0.018	-0.137	-0.052	-5.225	0.	Yes
CPX	-0.705	0.354	-1.529	0.12	-1.99	0.047	No
WC	-0.271	0.076	-0.447	-0.095	-3.576	0.	Yes
L	-1.639	0.123	-1.925	-1.353	-13.334	0.	Yes
R&D	-0.001	0.002	-0.005	0.003	-0.53	0.597	No
CF	-0.241	0.103	-0.48	-0.001	-2.341	0.019	Yes
IND. Sigma	0.076	0.1	-0.157	0.309	0.757	0.449	No
Dividend dummy	-0.591	0.071	-0.757	-0.425	-8.28	0.	Yes
T (2%)	2.328						

LCL - Lower value of a reliable interval (LCL)
UCL - Upper value of a reliable interval (UCL)

2008

Linear Regression

Regression Statistics

R	0.534
R Square	0.285
Adjusted R Square	0.282
Standard Error	1.57
Total Number Of Cases	2278

ANOVA

	d.f.	SS	MS	F	p-level
Regression	9.	2,227.137	247.46	100.423	0.00
Residual	2,268.	5,588.735	2.464		
Total	2,277.	7,815.873			

	Coefficients	Standard Error	LCL	UCL	t Stat	p-level	H0 (2%) rejected?
Intercept	0.41	0.251	-0.174	0.993	1.634	0.102	No
MB	0.028	0.003	0.021	0.035	9.545	0.	Yes
Size	-0.146	0.019	-0.191	-0.101	-7.548	0.	Yes
CPX	-1.032	0.393	-1.947	-0.116	-2.624	0.009	Yes
WC	-0.721	0.088	-0.926	-0.516	-8.174	0.	Yes
L	-1.826	0.14	-2.151	-1.501	-13.085	0.	Yes
R&D	0.008	0.002	0.002	0.014	3.197	0.001	Yes
CF	0.144	0.126	-0.15	0.438	1.142	0.253	No
IND. Sigma	0.074	0.109	-0.179	0.328	0.684	0.494	No
Dividend dummy	-0.633	0.076	-0.81	-0.456	-8.309	0.	Yes
T (2%)	2.328						

LCL - Lower value of a reliable interval (LCL)
UCL - Upper value of a reliable interval (UCL)

2009

Linear Regression

Regression Statistics

R	0.512
R Square	0.262
Adjusted R Square	0.259
Standard Error	1.452
Total Number Of Cases	2278

ANOVA

	d.f.	SS	MS	F	p-level
Regression	9.	1,695.751	188.417	89.43	0.00
Residual	2,268.	4,778.388	2.107		
Total	2,277.	6,474.139			

	Coefficients	Standard Error	LCL	UCL	t Stat	p-level	H0 (2%) rejected?
Intercept	0.066	0.223	-0.454	0.585	0.295	0.768	*No*
MB	0.018	0.004	0.009	0.027	4.816	0.	*Yes*
Size	-0.099	0.017	-0.14	-0.059	-5.725	0.	*Yes*
CPX	-1.089	0.514	-2.285	0.107	-2.121	0.034	*No*
WC	-0.71	0.074	-0.883	-0.538	-9.58	0.	*Yes*
L	-1.931	0.116	-2.2	-1.662	-16.717	0.	*Yes*
R&D	0.012	0.004	0.004	0.021	3.4	0.001	*Yes*
CF	-0.138	0.12	-0.417	0.14	-1.157	0.248	*No*
IND. Sigma	-0.022	0.1	-0.255	0.211	-0.221	0.825	*No*
Dividend dummy	-0.45	0.071	-0.616	-0.284	-6.296	0.	*Yes*

T (2%) 2.328
LCL - Lower value of a reliable interval (LCL)
UCL - Upper value of a reliable interval (UCL)

2010

Linear Regression

Regression Statistics

R	0.478
R Square	0.228
Adjusted R Square	0.225
Standard Error	1.49
Total Number Of Cases	2278

ANOVA

	d.f.	SS	MS	F	p-level
Regression	9.	1,487.773	165.308	74.498	0.00
Residual	2,268.	5,032.604	2.219		
Total	2,277.	6,520.377			

	Coefficients	Standard Error	LCL	UCL	t Stat	p-level	H0 (2%) rejected?
Intercept	0.116	0.229	-0.418	0.65	0.507	0.612	*No*
MB	0.005	0.003	-0.001	0.012	2.017	0.044	*No*
Size	-0.106	0.018	-0.147	-0.065	-5.974	0.	*Yes*
CPX	-0.281	0.527	-1.508	0.946	-0.533	0.594	*No*
WC	-0.65	0.103	-0.889	-0.41	-6.318	0.	*Yes*
L	-2.007	0.13	-2.309	-1.705	-15.471	0.	*Yes*
R&D	0.002	0.003	-0.006	0.01	0.648	0.517	*No*
CF	-0.606	0.105	-0.852	-0.361	-5.752	0.	*Yes*
IND. Sigma	0.124	0.103	-0.115	0.363	1.206	0.228	*No*
Dividend dummy	-0.418	0.073	-0.587	-0.25	-5.768	0.	*Yes*

T (2%) 2.328
LCL - Lower value of a reliable interval (LCL)
UCL - Upper value of a reliable interval (UCL)

8.5 Appendices 5: Portfolio Results Tables

2006-2010

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.033	1.068	5.796	12.817	11.34%
2	0.040	0.975	2.491	13.251	6.30%
3	0.062	1.009	2.296	13.421	7.16%
4	0.103	1.011	2.809	13.410	7.81%
5	0.140	0.906	2.888	13.396	5.95%
6	0.190	0.991	3.238	13.330	7.58%
7	0.260	1.007	4.120	13.226	10.09%
8	0.327	1.002	4.800	13.194	10.80%
9	0.423	0.979	5.604	12.995	7.78%
High	0.576	1.106	7.619	12.819	10.21%

2006-2007

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.037	1.046	7.006	12.821	18.18%
2	0.037	1.059	2.747	13.187	9.76%
3	0.062	1.097	2.981	13.337	12.25%
4	0.100	1.010	3.136	13.334	12.75%
5	0.153	0.920	3.696	13.122	7.82%
6	0.194	1.130	3.753	13.224	13.54%
7	0.273	1.033	4.986	13.204	14.63%
8	0.343	1.207	6.064	13.039	20.72%
9	0.441	1.104	6.795	12.876	10.72%
High	0.599	1.282	9.361	12.872	14.46%

2008-2010

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.031	1.083	4.990	12.814	6.78%
2	0.041	0.919	2.319	13.294	4.00%
3	0.061	0.950	1.840	13.478	3.76%
4	0.104	1.012	2.591	13.461	4.51%
5	0.131	0.897	2.349	13.578	4.71%
6	0.188	0.899	2.895	13.400	3.60%
7	0.252	0.990	3.543	13.240	7.06%
8	0.316	0.865	3.957	13.298	4.19%
9	0.411	0.895	4.811	13.074	5.82%
High	0.560	0.988	6.458	12.784	7.38%

2006

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.035	1.084	6.761	12.849	20.16%
2	0.040	1.131	3.032	13.081	16.47%
3	0.065	1.153	2.918	13.315	20.58%
4	0.099	1.034	2.831	13.233	12.73%
5	0.158	1.030	4.042	12.940	8.00%
6	0.198	1.203	3.920	13.083	20.60%
7	0.265	1.015	4.883	13.219	10.78%
8	0.348	1.181	5.915	12.916	25.36%
9	0.448	0.949	7.195	12.861	9.24%
High	0.618	1.132	10.051	12.893	11.82%

2007

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.040	1.008	7.251	12.793	16.20%
2	0.034	0.987	2.463	13.293	3.04%
3	0.060	1.041	3.044	13.359	3.93%
4	0.101	0.986	3.440	13.435	12.78%
5	0.149	0.810	3.350	13.304	7.64%
6	0.189	1.056	3.585	13.365	6.48%
7	0.281	1.051	5.090	13.188	18.48%
8	0.338	1.232	6.212	13.162	16.08%
9	0.434	1.260	6.395	12.891	12.20%
High	0.580	1.431	8.672	12.850	17.10%

2008

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.028	1.010	6.482	12.923	-39.70%
2	0.033	0.866	2.536	13.287	-31.99%
3	0.056	0.982	2.190	13.404	-33.34%
4	0.100	1.066	3.618	13.454	-42.91%
5	0.125	0.897	2.969	13.659	-26.29%
6	0.181	0.886	3.315	13.403	-34.13%
7	0.267	1.022	4.472	13.195	-32.55%
8	0.325	0.986	5.551	13.343	-29.78%
9	0.433	0.901	6.242	13.033	-42.30%
High	0.583	0.954	8.203	12.800	-41.40%

2009

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.034	1.102	3.511	12.683	33.01%
2	0.036	1.015	1.808	13.335	24.78%
3	0.057	0.897	1.712	13.539	26.21%
4	0.095	1.052	2.120	13.463	39.13%
5	0.121	0.838	1.854	13.550	22.73%
6	0.173	0.940	2.356	13.479	30.42%
7	0.227	0.934	2.611	13.246	39.96%
8	0.296	0.757	2.754	13.283	20.60%
9	0.377	0.918	3.079	13.093	38.43%
High	0.534	0.956	4.074	12.833	54.14%

2010

ECM	Cash ratio	Beta	MB	Size	Return
Low	0.030	1.138	4.975	12.837	27.02%
2	0.054	0.876	2.613	13.260	19.20%
3	0.071	0.970	1.618	13.490	18.40%
4	0.118	0.917	2.035	13.465	17.31%
5	0.146	0.956	2.226	13.524	17.69%
6	0.211	0.871	3.013	13.320	14.51%
7	0.262	1.015	3.545	13.279	13.78%
8	0.328	0.852	3.567	13.268	21.76%
9	0.424	0.867	5.111	13.095	21.34%
High	0.563	1.055	7.097	12.719	9.38%

ECM Decile Portfolio Returns

	ECM LOW	ECM 2	ECM 3	ECM 4	ECM 5	ECM 6	ECM 7	ECM 8	ECM 9	ECM High	High - Low
2006-2010	11.34%	6.30%	7.16%	7.81%	5.95%	7.58%	10.09%	10.80%	7.78%	10.21%	-1.13%
2006-2007	18.18%	9.76%	12.25%	12.75%	7.82%	13.54%	14.63%	20.72%	10.72%	14.46%	-3.72%
2008-2010	6.78%	4.00%	3.76%	4.51%	4.71%	3.60%	7.06%	4.19%	5.82%	7.38%	0.60%
2006	20.16%	16.47%	20.58%	12.73%	8.00%	20.60%	10.78%	25.36%	9.24%	11.82%	-8.34%
2007	16.20%	3.04%	3.93%	12.78%	7.64%	6.48%	18.48%	16.08%	12.20%	17.10%	0.90%
2008	-39.70%	-31.99%	-33.34%	-42.91%	-26.29%	-34.13%	-32.55%	-29.78%	-42.30%	-41.40%	-1.69%
2009	33.01%	24.78%	26.21%	39.13%	22.73%	30.42%	39.96%	20.60%	38.43%	54.14%	21.13%
2010	27.02%	19.20%	18.40%	17.31%	17.69%	14.51%	13.78%	21.76%	21.34%	9.38%	-17.64%

Returns Conditional on Market-to-Book

	ECM LOW	ECM 2	ECM 3	ECM 4	ECM 5	ECM 6	ECM 7	ECM 8	ECM 9	ECM High	High - Low
2006-2010	9.36%	10.20%	10.72%	11.84%	15.26%	9.90%	13.00%	14.84%	13.71%	10.60%	1.24%
2006-2007	7.10%	11.62%	15.64%	13.73%	8.49%	13.50%	21.92%	14.16%	11.17%	7.72%	0.62%
2008-2010	10.87%	9.26%	7.44%	10.58%	19.77%	7.50%	7.05%	15.29%	15.41%	12.52%	1.65%
2006	8.64%	12.96%	17.99%	14.01%	11.17%	17.84%	23.27%	20.42%	17.44%	11.01%	2.38%
2007	5.56%	10.28%	13.29%	13.44%	5.80%	9.16%	20.56%	7.89%	4.90%	4.42%	-1.13%
2008	-31.06%	-33.70%	-33.43%	-38.30%	-40.22%	-44.20%	-41.52%	-49.73%	-45.17%	-44.44%	-13.38%
2009	41.97%	37.44%	34.54%	49.26%	78.17%	42.01%	48.06%	76.90%	70.57%	53.50%	11.53%
2010	21.71%	24.04%	21.22%	20.78%	21.35%	24.69%	14.62%	18.71%	20.83%	28.51%	6.80%

Returns Conditional on Size

	ECM LOW	ECM 2	ECM 3	ECM 4	ECM 5	ECM 6	ECM 7	ECM 8	ECM 9	ECM High	High - Low
2006-2010	7.80%	10.25%	12.47%	7.11%	9.00%	10.35%	12.19%	10.68%	11.00%	13.95%	6.14%
2006-2007	15.20%	16.46%	13.80%	10.46%	11.04%	15.41%	12.73%	9.78%	7.62%	10.58%	-4.62%
2008-2010	2.87%	6.11%	11.58%	4.87%	7.65%	6.99%	11.83%	11.27%	13.26%	16.19%	13.32%
2006	19.39%	15.67%	16.45%	15.01%	16.53%	16.57%	13.75%	15.20%	10.33%	15.48%	-3.90%
2007	11.01%	17.25%	11.16%	5.91%	5.55%	14.25%	11.71%	4.37%	4.91%	5.68%	-5.33%
2008	-38.95%	-43.03%	-42.40%	-42.46%	-38.35%	-43.94%	-38.21%	-39.31%	-40.09%	-34.72%	4.23%
2009	18.51%	35.57%	50.26%	27.84%	38.75%	40.48%	44.53%	47.03%	54.16%	58.16%	39.65%
2010	29.06%	25.78%	26.88%	29.23%	22.54%	24.42%	29.16%	26.09%	25.71%	25.14%	-3.92%

Returns Conditional on Beta

	ECM LOW	ECM 2	ECM 3	ECM 4	ECM 5	ECM 6	ECM 7	ECM 8	ECM 9	ECM High	High - Low
2006-2010	12.35%	10.37%	13.05%	10.37%	9.75%	10.08%	16.05%	11.59%	11.24%	11.07%	-1.27%
2006-2007	11.58%	12.60%	14.77%	13.99%	11.25%	11.20%	19.68%	12.97%	15.83%	6.17%	-5.42%
2008-2010	12.85%	8.88%	11.90%	7.95%	8.76%	9.33%	13.63%	10.67%	8.19%	14.35%	1.49%
2006	16.26%	17.37%	15.96%	15.24%	18.03%	15.62%	19.32%	15.15%	15.52%	9.57%	-6.69%
2007	6.91%	7.83%	13.57%	12.74%	4.47%	6.77%	20.05%	10.79%	16.14%	2.77%	-4.14%
2008	-38.09%	-35.79%	-35.56%	-41.04%	-40.16%	-38.64%	-33.55%	-42.77%	-40.21%	-38.73%	-0.64%
2009	46.25%	40.35%	44.25%	38.37%	48.14%	52.49%	48.10%	54.00%	44.78%	63.99%	17.74%
2010	30.40%	22.06%	27.02%	26.51%	18.28%	14.13%	26.35%	20.77%	20.00%	17.77%	-12.63%

8.6 Appendices 6: Portfolio Results Graphs

2006-2010	**2006-2007**	**2008-2010**

ECM Decile Portfolio Returns

$y = 0.0016x + 0.076$
$R^2 = 0.06493$

$y = 0.0016x + 0.1258$
$R^2 = 0.01663$

$y = 0.0016x + 0.0428$
$R^2 = 0.11587$

Returns Conditional on Market-to-Book

$y = 0.0033x + 0.1013$
$R^2 = 0.21995$

$y = 0.0015x + 0.1168$
$R^2 = 0.01051$

$y = 0.0045x + 0.0909$
$R^2 = 0.10612$

Returns Conditional on Size

$y = 0.0041x + 0.0821$
$R^2 = 0.35216$

$y = -0.0068x + 0.1605$
$R^2 = 0.51691$

$y = 0.0114x + 0.0298$
$R^2 = 0.68281$

Returns Conditional on Beta

$y = 0.0003x + 0.1143$
$R^2 = 0.00218$

$y = -0.0011x + 0.1361$
$R^2 = 0.00893$

$y = 0.0012x + 0.0998$
$R^2 = 0.024$

* y-axis shows stock returns
x-axis shows the ECM portolios, ranging from low(0) to high (10).