HERIOT-WATT UNIVERSITY

Cash Holdings: Motivation, Perception and Valuation

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Abstract

The thesis empirically investigates the motivation, perception and value of cash holdings in the UK setting over the period 1980 to 2017. The study is motivated by the marked increase in cash holdings among UK firms, the trend in cash holdings has been subject to media and academic coverage. The research provides an empirical explanation for the upward trend in cash holdings by UK listed companies. In addition, I evaluate how the cash holdings of firms are perceived by the market during corporate investment announcements. The study addresses how cash is valued and in particular, if cash-rich firms outperform cash-poor firms in the stock market and if this effect heightens during periods of high economic uncertainty. The empirical analyses in this study are conducted using a combination of difference in differences (DiD) regression, Two-stage least squares (2SLS) regression, Fama-Macbeth regression and ordinary least squares (OLS) as the estimation techniques. The results indicate that firms increase cash holdings in response to increased competition, the increase in cash holdings is more pronounced among firms exposed to high predatory threat and financing frictions. Furthermore, cash-rich firms make gains in the product market at the expense of their rivals. The gains in market share as a result of increased cash holdings is amplified among firms with low exposure to predatory threat and financing frictions. Also, since cash may convey important price sensitive information about the future strategic direction of a firm, I use a sample of 3,251 corporate investment announcements by firms listed on the London Stock Exchange over the period 2005-2016 and demonstrate that higher cash holdings at announcement results in increased market valuation of corporate investments. The relationship between cash holdings and market valuation of corporate investment becomes negative at higher levels of cash holdings. The results also reveal that the positive impact of cash holdings is more noticeable for organic investment announcements, particularly R&D. Lastly, I examine the market performance of a portfolio of abnormally high cash holding firms compared to a portfolio of abnormally low cash holding firms. The results suggest that the portfolio of abnormally high cash holdings outperforms their counterpart. The outperformance increases during periods of increased economic uncertainty. The results of this thesis have important implications for the cash holdings literature, market participants and policymakers. Firstly, the increase in cash holdings indicates limitations in the ease of accessing finance in the capital market. This points to the need to reform the existing opaque capital market to accommodate the needs of disadvantaged companies. Similarly, the increase in cash holdings during periods of increased competition intensity further reinforces the argument of an opaque capital market. It appears that the problem of financial constraint is amplified during periods of increased competition. To mitigate this anomaly, regulators could enact laws that lessen the financing deficit during such periods. Since high cash holdings have an important bearing on a firm's market performance, shareholders and other stakeholders can pursue activist policies that actively monitor firm cash holdings policies which maximises firm value.

Dedication

This thesis is dedicated to my lovely wife Tutu, my beautiful daughter Jasmine, the Adamolekun family, and the Adejugbe family for their unwavering love, encouragement, inspiration and support during this academic journey.

Acknowledgement

"Learning never exhausts the mind."

Leonardo da Vinci

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Research Thesis Submission

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Introduction and Overview

1.0 Motivation and Background

In spite of advances in the range of liquidity management tools available in the financial market, most companies still favour the traditional approach of building cash reserves. Recent evidence suggests cash held by companies is increasing. In 2016, cash reserves for nonfinancial firms in the S&P 500 attained $1.9trillion. Just five years earlier, the value was $510billion (S&P Global, 2016). In the UK, Bloomberg reported that British firms are building up cash reserves. Deposits held by non-financial firms have grown by 3.5% and there has been a contraction in borrowing (Bloomberg, 25th January 2019). Another report on the cash reserves of UK firms suggests that cash held by non-financials within the FTSE 100 has exceeded the $80billion reported during the financial crisis. As of 2013, cash held by UK companies amounted to $181billion (Deloitte, 2014).

In the academic literature, the implication and interpretation of the cash holdings trend has been subject of much debate. One of the earliest views on liquidity was postulated by Keynes (1936) in his seminal work: "*The general theory of Employment, Interest, and Money*". He argues that cash is held for (i) transactions-motive i.e. cash held to meet private and corporate exchanges; (ii) precautionary-motive i.e. holding cash with desire to prevent future shortages; and (iii) speculative-motive i.e. cash held with the objective of taking advantage of market anomalies. In the corporate finance literature, there are two popular competing theories regarding the implication of firm cash holdings. The first argument was proposed by Myers (1984) and Myers and Majluf (1984) in what is considered the *"pecking order theory"*.[1] The theory is anchored on the precept of information asymmetry between managers and the market. The existence of information asymmetry between managers and the market results in adverse selection during capital raising such that the market assumes equity is overvalued during new equity issues.

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[1] The theory is also attributed to the work of Donaldson (1961).

Therefore, the market reacts by attaching a low value to new equity issues. In response to the bias from the market, managers accumulate financial slack to avoid issuing under-priced securities. The theory posits that the hierarchical preference of financing is internal finance, then debt and finally equity (Myers, 1984; Myers and Majluf, 1984). The second competing theory: *the agency theory,* proposed by Jensen (1986) in his seminal article *"Agency cost of free cash flow, corporate finance and takeover"* contends that because managers and shareholders are utility maximisers, objectives may conflict in their individual pursuit of maximum utility. As a result of the conflict of interest between managers and shareholders, managers may spend free cash flow on investments that promote their self-interest at the expense of shareholders. The theory underlines the role of debt in reducing the agency cost of free cash flow.[2] Theoretically, cash reserves could connote positive and negative implications.

The empirical studies on cash holdings have provided mixed opinions regarding the motivation, perception, and implication of cash holdings. Companies with high growth opportunities, volatile cash flow, difficulty with accessing the capital market, high managerial ownership, and standalone operations build up cash reserves (Opler *et al.*, 1999; Opler *et al.*, 2001; Ozkan and Ozkan, 2004; Duchin, 2010). Targets of proxy fights retain more financial slack than comparable firms. In addition, there is a direct relationship between high cash and the return from proxy fight announcements (Faleye, 2004). Cash rich firms undertake acquisitions that are perceived as value destroying (Harford, 1999). The competitive merits of cash differ from the strategic benefit of debt. A firm's cash holding policy is capable of dictating product market outcomes. Deep pocketed companies can systematically grow their market share at the expense of sector

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[2] Free cash flow is the cash flow that exceed what is required to fund all positive NPV projects after discounting at the company cost of capital (Jensen 1986).

competitors (Fresard, 2010). The strategic advantage afforded to high cash holding firms exists because cash holdings may be associated with the expected level of competition intensity among rivals. The volume of cash held by a firm may be dictated by the cash holding choices of their industry rivals (Lyandres and Palazzo, 2016). The existing literature fails to sufficiently address the interaction between firm cash holdings and changes in the product market. Furthermore, evidence on market perception of cash holdings is relatively unexplored. In addition, the link between firm cash holdings and market performance particularly under different states of the world remains to be examined. Lastly, most of the existing literature on cash holdings focus on data from the USA, which limits the extent to which results obtained can be generalised, as sovereign nations differ in terms of economy, regulations, culture, and institutional structures. Corporate finance practices differ with country factors like legal system, culture, stage of development, and structure of institution (La Porta *et al.*, 1997; La Porta *et al.*, 2000; Gaud, Hoesli and Bender, 2007).

This thesis joins the debate on cash holdings by empirically evaluating the motivation, perception, and valuation of cash reserves in the UK. The study answers the following questions: (I) Can product market competition affect firm cash holdings level? (II) How does firm cash holdings adjustment in response to increased competition differ with firms' inherent characteristics? (III) How does the market perceive firm cash holdings? (IV) How does the market perception of cash holdings vary with firms' inherent characteristics and motives for cash holdings? (V) Do cash holdings affect firm market performance? (VI) Does the effect of firm cash holdings on market performance vary with the degree of economic uncertainty? (VII) Do firm cash holdings affect firm performance and value? This study fills the gap in the literature by evaluating how companies change their cash holdings in response to increased competition. The study

represents a significant addition to the existing strand of literature on cash holdings that investigate the determinants of cash holdings (See for instance, Opler *et al.*, 1999; Opler *et al.*, 2001; Ozkan and Ozkan, 2004). Next, relying on the bounds of the theoretical cash holdings arguments, this study extends the literature by documenting the market perception of cash holdings. Lastly, the study provides novel evidence regarding the value and performance of high cash holding firms. Particularly, the thesis identifies the role and value of high cash holdings during periods of high economic uncertainty.

The following section details a summary of the contribution of the thesis and a brief overview of the structure of the thesis.

1.1 Main Contributions

The thesis contributes to the literature on cash holdings in three empirical chapters. Examining the interplay of firm cash holdings and increased product market competition, as well as the market perception of cash holdings and the value of high cash holdings provides new insights of the unexplained implications of the rising cash holdings in the UK and beyond. In light of rising cash reserves globally, it is important to understand the consequences and general market perception of this trend.

The first contribution of this study to the literature is that I document a relationship between firm cash holdings and increased product market competition. To the best of my knowledge, I am the first study to explore the link between changes in product market competition and firm cash holdings. Prior studies on the relationship between firm cash holdings and product market competition are few and in cases where examined, the studies focus on the role of cash in the product market.[3] Furthermore, the study compares how changes in cash holdings due to increases in product market competition vary with the level of product differentiation and exposure to financing frictions. In addition, the

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[3] See for instance (Fresard, 2010; Alimov 2014; Lyandres and Palazzo, 2016).

study investigates the influence of increased cash holdings in the product market as well as how the effect of cash holdings in the product market differ with the degree of product differentiation and exposure to financing frictions. Overall, the results indicate that firms increase cash holdings in response to increased competition. The degree of increase in cash holdings vary directly with the level of exposure to predatory threat (product differentiation) and ease with which firms access funds in the financial market. The results align with the precautionary motive of cash holdings and the pecking order theory.[4] The thesis also reports that high cash holding firms make gains in the product market at the expense of rivals. The impact of this relationship varies indirectly with the level of exposure to predatory threat and financing frictions. Put together, this implies cash is an important strategic tool in the product market. These findings provide some explanations for the increasing level of cash holdings as well as the implication of the trend.

Next, the study contributes to the literature by evaluating how firms' cash holding regimes are perceived by the market. To test this, I investigate the relationship between firm cash holdings and company investment announcements. I proffer three significant additions to the literature on cash holdings. Firstly, I document the first attempt, to the best of my knowledge, at understanding the relationship between firm cash holdings level and abnormal returns around company investment announcements. Secondly, I provide insights on how the relationship between cash holdings and company investment vary with investment classification. Lastly, I report how the market perception of cash holdings varies with the hypothesised motive for cash holdings. The results demonstrate that firm cash holdings is positively priced during corporate investment announcements.

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[4] Cash may be held to cater for uncertainty in the future, hence the precautionary motive of cash holdings, in addition, increased cash holdings is important during period of information asymmetry between managers and the market (Keynes 1936; Myers and Majluf 1984).

Furthermore, the positive impact of firm cash holdings is more pronounced among organic investment and particularly research and development (R&D). Lastly, I find that cash is held mainly for survival and expansion motives and the positive perception of cash is stronger for the survival motive of cash holding.

On a final note, the thesis contributes to the cash holdings literature by evaluating the performance of abnormally high cash holding firms. The study assesses how the performance of abnormally high cash holding firms differs with increased level of economic uncertainty. The premise for examining this relationship is built on the arguments of the literature on cash holdings that identify the merits of cash holdings (See Myers and Majluf, 1984; Opler *et al.*, 1999; Opler *et al.*, 2001; Fresard, 2010; Lyandres and Palazzo, 2016). I document that a portfolio of abnormally high cash holding firms outperforms a portfolio of abnormally low cash holding firms. The difference in the outperformance between the portfolios accelerates during periods of increased economic uncertainty. Lastly, the thesis documents a direct relationship between firm cash holdings, firm performance and firm value.

Generally, my study provides an empirical explanation to the increasing cash holdings in three regards, the motivation, perception and valuation of cash holdings. Firstly, I empirically test the motivation for the increase in the cash holdings level. Next, I examine how high cash reserves is perceived. Lastly, I document the value of cash holdings.

1.2 Policy Implications

Media and empirical studies suggest cash holdings levels are on the rise in the UK. The results documented in this thesis indicate that cash is an important strategic tool in the product market. In addition, it implies that embedded in a firm's cash holding regime is important information regarding firm value. Thus, the level of cash held by a firm is an

important source of information for valuing company investment announcements. Further, investing in a portfolio of high cash holding companies offers significant excess returns. These findings have important implications for policy makers for firms and regulators.

Firstly, the increasing level of cash holdings generally indicates a limitation on the ease of accessing finance in the capital market. For managers and policy makers, the tendency for firms to increase the volume of their cash reserves suggests that firms in the UK face considerable challenges in raising capital from the financial market. This points at the need to reform the existing opaque capital market to accommodate the needs of disadvantaged companies. Although existing regulations aimed at ameliorating the ease of access of capital by small and start-up companies already exist, there is a need to re-evaluate how efficiently these reforms have tackled the issue. Overall, the increasing cash holdings level inter-alia indicates the failings of capital market.

The thesis also underlines the importance of company investment classification in the valuation of investment announcements. Particularly, information as to whether an investment announcement signifies an internal or external investment decision is price sensitive. In addition, the level of cash held could shape market reaction to an investment announcement. In this regard, it pertinent that policies to ensure all price sensitive information regarding an investment decision be made available to the market. This will enhance the price discovery process. To this effect, I suggest that appropriate classification of an investment decision be made available to market participants. At the firm level, since embedded in a firm's cash holding is important information about investment valuation, in the face of market imperfection, it is vital that managers consider this factor when making investment announcements.

The increase in cash holdings during periods of increased competition intensity further reinforces the argument of an opaque capital market. It appears that the problem of financial constraint is amplified during periods of increased competition. To mitigate this effect, regulators could enact rules that attenuate the financing deficit during such periods. Hence, during certain threshold levels of increased competition, financing policies that lessen the opaqueness of capital markets may be installed. Such regulations should favour disadvantaged firms. The policy will ensure the survival of underprivileged companies. Markedly, the thesis reveals that cash is a key strategic tool in the product market, hence managers should pay close attention to their financial flexibility. At large this can enhance economic growth.

Abnormally high cash holdings levels have an important bearing on a firm's performance and value. This further reiterates how vital cash is to the survival of a firm. Shareholders and other stakeholders can pursue activist policies that actively monitor firm cash holdings policies that maximise firm value. Finally, by investing in a portfolio of abnormally high cash holding companies, an investor can generate significantly positive abnormal stock returns. These returns are amplified during periods of economic uncertainty. For investors, in the face of economic uncertainty like BREXIT, investing in abnormally high cash holding companies can help buffer the negative effect of the uncertainty. For managers, cash is an important strategic tool, it is linked to firm value, and this link is amplified during periods of high economic uncertainty.

1.3 Data and Research Methodology

For the first and third empirical chapter (Chapter IV and VI), the thesis used a sample of 8,587 firms (79,962 firm-year observations). To be included in the sample, a firm must be listed on the London Stock Exchange (LSE). The period examined is between 1980

to 2017. The data on all firm specific data was collected from Thomson Reuters DataStream. Included in the sample were surviving and non-surviving companies. Data on economic policy uncertainty was collected from www.policyuncertainty.com (Baker, Bloom and Davis, 2016). For the monthly and daily Fama, French and Carhart factors, they were collected from the repository of the Xfi centre of finance and investment, Exeter University as developed by Gregory, Tharyan and Christidis, (2013). Industries considered in the study include industrials, consumer services, technology, basic material, consumer goods, utilities, oil & gas, telecommunications and health care.

Notably, the study excludes firms in the financial services industry, given their nature and structure, their cash holdings levels provide counterintuitive explanations to my study. More, this is the popular practice in the literature (See for instance Ozkan and Ozkan, 2004).I focus on the sample period due to the available data from Thomson Reuters DataStream. Moreover, the 37 years of the sample allows for an evaluation of the impact of the changes in company composition on firm decisions. Focussing on a short term may indicate an oversight of vital dynamics of the impact of variations in corporate composition on firm liquidity management. The selection of the UK setting is predicated on a number of factors. Firstly, the recent media coverage on the rising cash holdings level in the UK begs the question why and what are the implications of this trend. Secondly, the focus of most studies on the US market limits the extent to which results can be generalised and interpreted at a wider context. Differences in macroeconomic factors, culture, legal structure and institutional structures shapes corporate decisions and practices (La Porta *et al.*, 1997; La Porta *et al.*, 2000; Gaud, Hoesli and Bender, 2007; Öztekin, 2015).

In the second chapter of the thesis I collect firm level data from Thomson Reuters DataStream. Data on announcement of corporate investment was collected from Morningstar (2017), the official national storage mechanism appointed by the UK Financial Conduct Authority (FCA). The period covered is 2005 to 2016. Again, I exclude firms in the financial services industry. To be included in the sample a firm needs to be listed on the London Stock Exchange.

For the first and third empirical chapter, I rely on panel data models to investigate the relationship between cash holdings, product market competition, firm performance and firm value. Panel data reduces the possibility of obtaining biased results, this is because the data structure allows for adequate variation, high degrees of freedom and less collinearity (Baltagi, 2008). Due to the nature and structure of corporate investment announcements, the second empirical chapter is a pooled data set.

The models specified in this thesis are estimated using difference in differences regression, instrumental variable regression, and ordinary least squares regression. The methods adopted in each chapter align with prior approaches documented in the literature for estimating the relationship between cash holdings, corporate practices and the product market environment see for instance (Harford, 1999; Opler *et al.*, 1999; Ozkan and Ozkan, 2004; Fresard, 2010; Frésard and Valta, 2016).

1.4 Structure of the Thesis

The thesis is divided into seven chapters. Chapter 2 details a review of the relevant literature on cash holdings. It identifies the cash holding theories and discusses the main strands in the cash holding literature hence identifying the gaps to be filled therein.

The third chapter details the description of the data as well as the data cleaning procedure and the definition of the variables. It also presents a brief summary of the characteristics of the data used in the three empirical chapter.

In chapter 4, the study discusses the first empirical analysis. It examines the relationship between cash holdings and increased product market competition. Furthermore, it evaluates how the changes in firm cash holdings in response to increased competition vary with the degree of exposure to predatory threat and financing friction. Lastly, this section investigates the effect of increasing cash holdings in the product market.

Chapter 5 presents the second empirical chapter. The section examines the perception of firm cash holdings during corporate investment announcements. In addition, it investigates how the perception of cash holdings varies with different categories of investment announcements. Lastly, the chapter evaluates how the impact of cash holdings on corporate investment valuation varies with the motive for cash holding.

Chapter 6 contains the third empirical chapter. The chapter examines the value of abnormally high cash holding firms. It tests if a portfolio of abnormally high cash holding companies outperforms a portfolio of abnormally low cash holding companies. Furthermore, it evaluates how this outperformance varies during period of economic uncertainty. Lastly, it investigates the relationship between cash holdings, firm performance and firm value.

Chapter 7 summarises and concludes the study. The chapter also identifies areas for future research as well as the limitations of the study.

Chapter 2
Literature Review

2.0 Introduction

This chapter reviews the literature on cash holdings. Although the trend of rising cash holdings in the UK has stirred media attention.[5] Studies to explain the implication, perception, and motivation of the trend in the UK are very few. More so, the question of the perception and implication of firm cash holdings remain largely unanswered.[6] This section discusses the literature review that motivates the research in this thesis. The remainder of the chapter is structured as follows. Section 2.2 discusses cash holding theories. Section 2.3 reviews the empirical literature on cash holdings. Section 2.4 reviews other strands in the cash holdings literature.

2.2 Cash Holding Theories

2.2.1 Pecking Order Theory

The seminal work of Myers and Majluf (1984) **"***Corporate financing and investment decisions when firms have information that investors do not have"* provides the foundation for the pecking order theory and argues that in the hierarchy of firm financing preferences, internal finance ranks higher than debt and equity.[7] Hence, the theory argues in favour of increasing cash holding levels, so much so it became the cornerstone for arguments underlining the benefits of cash holding.[8] The theory posits that management has a better estimation of their firm's value than potential investors. Consequent to the asymmetry of information between managers and providers of external finance regarding firm value, funding of investment opportunities by means of external finance would be expensive during period of firm undervaluation by external financiers. Survey evidence of members of the Fortune 500 companies suggest that managers rank financial flexibility

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[5]Bloomberg, Deloitte, and Moody all report on the increasing cash levels by UK firms.
[6] Very few studies have evaluated the market perception of firm cash holdings. The question of how firm cash holding is perceived by the market is largely unanswered.
[7] The idea is also credited to Donaldson (1961).
[8] See for instance Opler *et al.* 1999; 2001.

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and survivability highly during capital raising (Pinegar and Wilbricht, 1989). This confirms the notion that most managers follow a hierarchical approach where internal cashflow is preferred to external sources of finance when seeking funds. Thus, when in need of finance, firms may decline to issue stocks or borrow if they consider the valuation of the external financier below the fair value of the company. Accordingly, they may be forced to reject investment opportunity if they have no financial slack (Myers, 1984; Myers and Majluf, 1984).

Among the benefits of financial slack is that firms that do not want to issue stocks on short notice can rely on their cash for financing immediate investment opportunities. In addition, financial slack limits the exposure to the costs of financial distress. As a counter argument to the agency problem proposed by Jensen (1986), the Myers and Majluf model suggests, "*Firms with excessive financial slack should seek out acquisition targets with good investment opportunities and limited slack and about which investors have limited information*". Smith and Kim (1994) document the benefit of a cash-rich firm acquiring firms with severe cash shortages. Thus, reinforcing Myers and Majluf's counter argument. Similarly, subsequent studies point out that asymmetry of information can reduce firm investment.

For example, Ascioglu, Hegde and McDermott (2008) show that information asymmetry decreases a firm's investment, thus confirming the position of the Myers-Majluf model. This implies that firms with significant levels of asymmetry of information between themselves and the market may be limited as regards the number of investment opportunities they can exercise. Correspondingly, Easley and O'Hara (2004) further validate the argument of Myers-Majluf's model; their study highlights the impact of information asymmetry. They contend that high levels of information asymmetry results

in an excessive cost of equity. The significance of this is that such companies may be forced to finance growth internally since the market systematically undervalues companies by overpricing funds. Hence, such firms can only grow to the extent of their internal finance allows. By implication, they are faced with serious problems of underinvestment as suggested by Myers and Majluf. Subsequent studies argue that large cash holdings are only validated when firms have huge investment opportunities (Chen, 2008). This assertion links to the argument by Jensen, indicating that firms without sufficient growth opportunities will overinvest and consequently expropriate value from investors.

2.2.2 Agency Theory

Agency theory stems from the notion of information asymmetry. It posits that managers take advantage of private information and make decisions to serve their self-interest at the expense of shareholders (Jensen, 1986; Narayanan, 1988). Given this possibility, debt is an important tool for regulating the practices of managers since it provides a means of monitoring companies, more so, it keeps bad firms out of the market (Narayanan, 1988). When managers have access to free cash flow, they can evade the monitoring of the market and perpetrate self-serving projects or investment (Jensen, 1986). Free cash flow is a situation in which the cash held by a firm exceeds what is required to fund all its investment projects with positive Net Present Value (NPV) when discounted at the appropriate cost of capital (Jensen, 1986).

Jensen identifies the role of debt in monitoring the activities of managers. He opines that debt lessens the agency problem associated with managers by reducing the volume of cash at their disposal. Furthermore, the paper alludes that the control function of debt is more important in corporations with limited growth opportunities but generates huge cash

flow. The position of the theory is that managers with excessive cash positions are likely to invest in projects that may be suboptimal to overall shareholder objectives. Such expansion may be motivated by personal desires of the manager rather than in alignment with corporate values or benefit. Lang *et al.,* (1991) evaluate the free cash flow hypothesis in the context of takeovers, results of their study reveal that takeover announcements by firms with high cash flow and low Q are followed by destruction of shareholders wealth, they hypothesise that this is largely because the announcement indicates negative information about a bidder's management or investment opportunities. Results of Lang *et al*., (1991) affirm the position of the free cash flow hypothesis, implying excess financial slack results in rent-seeking and overinvestment. Furthermore, studies by Harford (1999); Titman *et al*., (2004); and Harford *et al.,* (2008) provide evidence that firms with cash holding values larger than usual often result to investing in acquisitions that destroyed firm value.

2.2.3 Trade-off Theory

The trade-off theory posits that the optimal value of a firms is achieved by matching the marginal cost of cash holdings against the marginal benefit, in essence, to maximise shareholder's wealth, firms must identify the threshold of cash holdings that maximises returns (Miller and Orr, 1966; Kim, Mauer and Sherman, 1998; Ferreira and Vilela, 2004; Al-Najjar, 2013). Thus, there is an optimal level of cash holdings for firms and a cost attached to building cash reserves. In effect, a firm forgoes an alternative by choosing to save rather than invest (Dittmar, Mahrt-Smith and Servaes, 2003). The trade-off theory is a hybrid of the free cash flow/agency cost theory and the pecking order theory. The underlining message of this theory is that firms have a target level for cash holdings level (Opler *et al.*, 1999).

Therefore, to answer the question of whether a firm is holding too much cash or too little cash, empirical studies build their research based on the trade-off theory (Opler *et al.*, 1999). Empirical evidence suggest that the trade-off theory is important in explaining firm cash holdings policy (Opler *et al.*, 1999; D'Mello, Krishnaswami and Larkin, 2008). The trade-off theory posits that firms with good credit rating hold less cash. Similarly, the theory suggests that small firms hold less cash (Opler *et al.*, 1999). The theory argues that a firm's choice of leverage, cash holdings and investment are made jointly (Opler *et al.*, 1999). D'Mello, Krishnaswami and Larkin (2008) document that firms deviate from their targeted cash holdings due to the pecking order effect/adverse selection problem of the capital market.

2.3 Review of Empirical Literature

2.3.1. Determinants of Cash Holding Levels

One of the popular strands of the literature on cash holdings focuses on understanding what influences the level of cash held by firms. This section reviews these factors.

2.3.1.1 Firm Size

As a result of imperfections in the capital market, it is challenging for relatively small firms to access funds with the same speed and ease as firms with large assets. Therefore, disadvantaged firms will be forced to hold higher cash reserves than usual to meet financing shortfalls (Opler *et al.*, 1999; Opler *et al.*, 2001; D'Mello, Krishnaswami and Larkin, 2008; Bigelli and Sánchez-Vidal, 2012; Al-Najjar, 2013). The level of cash holdings for smaller firms in the European Union is largely tied to variability in cash flow (Martínez-Carrascal, 2010; Martínez-Sola, García-Teruel and Martínez-Solano, 2013). Thus, firms that have been able to guarantee some level of market confidence over time, coupled with substantial level of assets, tend to hold lower level of cash, since navigating the capital market is easier for such firms as compared to their counterparts (Kim, Mauer

and Sherman, 1998). In addition, raising finance by disposing of unimportant assets during periods of financial distress will be easier for well-diversified companies, since such companies are typically large (Lang, Poulsen and Stulz, 1995; Rajan and Zingales, 1995). Theoretically, the pecking order and trade off theory suggest that small firms should hold more cash while the free cash flow theory indicates big firms have been successful in the past and as such should have large cash reserves (Miller and Orr, 1966; Myers and Majluf, 1984; Jensen, 1986; Ferreira and Vilela, 2004).

2.3.1.2 Shareholder Protection

Comparative evidence from well-developed markets (US and UK) and developing markets (Brazil, Russia, India and China) indicate that firms located in markets with poor shareholder protection are likely to hold substantial volumes of cash and/or equivalents in their balances (Al-Najjar, 2013). The high cash holdings levels in developing market may be an indication of the strength of governance in these countries. Pinkowitz, Stulz and Williamson (2006) suggest that the value of cash is lower in countries with poor shareholder protection because shareholders are exposed to expropriation of resources. In countries with better shareholder protection, shareholders will approve larger cash reserves if they are confident that the corporate governance structure can protect them from self-interested managers (Chen and Chuang, 2009).

2.3.1.3 Growth Opportunities

Firms with high growth potential may seek to hedge their position by holding such amount of cash that ensures they can fund on going or new investments without problems during period of financing pitfalls (Opler *et al.*, 1999; Opler *et al.*, 2001; Ozkan and Ozkan, 2004; Martínez-Carrascal, 2010). The alternative can be inferred for firms with poor growth opportunities. The expectation is that such an excess position of cash is paid out in dividend or share repurchases (Jensen, 1986). Empirical evidence supports the

notion that firms with high growth opportunities hold more cash (Opler *et al.*, 1999; Ozkan and Ozkan, 2004; Han and Qiu, 2007). The literature on the option valuation posits that returns on an investment diminish when there is delay in exercising the option to invest (McDonald and Siegel, 1986). Therefore, cash is more valuable to firms with high growth opportunities, particularly if they are exposed to the adverse selection problem of the capital market (Denis and Sibilkov, 2009). Theoretically, the pecking order theory and the trade-off theory suggest a positive relationship between cash holdings and growth opportunities while the free cash flow theory predicts a negative relationship between cash holdings and growth opportunities (Miller and Orr, 1966; Myers and Majluf, 1984; Jensen, 1986).

2.3.1.4 Risky Operations/ Cash Flow
The rate at which the cash flow of a firm fluctuates could also affect the continuity of operations and ongoing investment, or even intended projects. To mitigate such a position, firms exposed to such risk may hold reasonably high volumes of cash in their balances, such that during period of turmoil their operations and investment are unaffected. Therefore, savings will compensate for the shortfall in cash flow and operations will not be excessively impacted by deficits in cash flow (Kim, Mauer and Sherman, 1998; Opler *et al.*, 1999; Ozkan and Ozkan, 2004; Uyar and Kuzey, 2014). In support of this proposition, Alti (2003), demonstrate that firm cash flow can be sensitive to its investment opportunities, thus indicating financial constraints. As a result of this, a firm's investment spending may vary with the availability of internal funds and not the number of viable investment projects available to pursue (Fazzari *et al.* 1988; and Hovakimian and Hovakimian 2003). This suggest cash holdings may improve survival chances of firms that are deeply affected. In essence, firms exposed to the adverse effects of uncertainty typically hold more cash than others (Han and Qiu, 2007). Empirical

evidence indicates that firms with risky operations hold more cash than less risky firms (Han and Qiu, 2007; Bigelli and Sánchez-Vidal, 2012).

2.3.1.5 Managerial Ownership

Ozkan and Ozkan (2004) find that there is a non-monotonic relationship between cash holdings and managerial ownership . The relationship between managerial ownership and cash holdings is such that cash holdings decrease with ownership up to a point and then increase (Ozkan and Ozkan, 2004). The implication of the finding is that at first there is an incentive alignment explained by the negative relationship, this later deteriorates to the managerial entrenchment problem as evidenced by the positive relationship. In essence, initially, managers are unable to circumvent control and are as result forced to limit their cash holdings, however, when managers are able to evade control structures, they build up cash. Furthermore, Anderson and Hamadi (2016) indicate that there is a strong positive relationship between the concentration of ownership and the cash holding regime of a firm. This further reinforces the findings of Ozkan and Ozkan (2004) implying firms with concentrated ownership tend to favour holding high level of cash since the financial slack can be effectively utilised to promote organisational growth.

2.3.1.6 Credit Rating

A good credit rating simply mirrors the markets confidence as to the credit worthiness of a firm. Therefore, firms that are highly rated may access the capital market with more ease as compared to poorly rated companies. In addition, the cost of external finance will be relatively be cheaper for highly rated companies, when compared to firms poorly rated or without a rating (Opler *et al.*, 1999; Khieu and Pyles, 2012). This implies that as a result of the advantage provided by their rating, such companies are not compelled to hold huge cash balances in order to meet cash shortfalls, whereas, firms poorly rated are forced to hold huge cash balances to trade off the effect of the expensive finance. Khieu and

Pyles (2012) suggest that firms that have their credit rating downgraded tend to hold higher levels of cash when compared to a matched sample without degradation.

2.3.1.7 Diversification

Firms with diversified operations hold lesser cash than firms that have specific activities, this is attributed to the complementary growth opportunities of diversified firms and the availability of internal capital market (Duchin, 2010; Subramaniam *et al.*, 2011). The advantage afforded to diversified firms is that they command a high level of liquidity, this implies that as result of their operation they are able to draw on liquidity during periods of shortages (Duchin, 2010; Subramaniam *et al.*, 2011). Among the benefit afforded to a well-diversified company is that because of their wide-ranging operations, they are co-insured and as such their exposure to both systemic and non-systemic risk is reduced. This self-insurance allows them hold lower cash compared to counterparts with standalone operations (Duchin, 2010).

2.3.1.8 Cost of Carry

In the long run, changes in the cost of carry may influence the ratio of cash held by firms. Cost of carry therein refers to the difference between the risk free interest rate and the return on the corporate liquid assets portfolio (Azar, Kagy and Schmalz, 2016). The implication of this assertion is that firms will favour investing in the risk free interest rate over holding cash if the returns from the risk free asset exceed the cost of holding cash(Azar, Kagy and Schmalz, 2016). This lends more credence to the trade-off theory. Managers need to balance the cost of carrying cash against the potential benefit of investing cash (Miller and Orr, 1966).

2.3.1.9 Refinancing Risk

Corporations that believe they are exposed to refinancing risk often mitigate their position by holding high levels of cash. This could be achieved by saving a reasonable portion of their cash flow. The refinancing risk often arises as a result of shorter maturity debt. The implication of the exposure to refinancing risk is that the problem of underinvestment becomes more pronounced (Almeida, Campello and Weisbach, 2004; Harford, Klasa and Maxwell, 2014). Cheung (2016) argues that firms less exposed to systematic risk are more likely to take on debts with short maturity. Such debts have higher refinancing risk. To reduce the adverse effect of the potential interest rate changes, such firms build up cash.

2.3.1.10 Financing Constraints

Denis and Sibilkov (2009) evaluate why the value of cash holding is greater for constrained firms, results of their analysis indicate that financially constrained firms hold more cash to increase value in the face of expensive external finance. Similarly, Almeida, Campello and Weisbach (2004) document that firms that have trouble in raising external finance hoard a larger portion of their cash flow compared to firms less exposed to such friction from generating funds in the capital market. Han and Qiu (2007) posit that the cash reserves of financially constrained firms is sensitive to cash flow variations. This is because their financing inadequacy creates an intertemporal trade-off between future and current investment choices. Therefore, firms exposed to the adverse selection bias of the capital market build up more reserves than their unconstrained counterparts (Han and Qiu, 2007; Denis and Sibilkov, 2009).

2.3.1.11 Dividend Policy

Evidence on cash holdings indicates mixed findings regarding company dividends. A few studies document that firms that have high dividend pay-out ratios hold less cash (Opler *et al* 1999; Harford *et al* 2008). Other studies revealed that high dividend pay-out ratios

are followed by high cash holding levels as evidenced in private companies (Bigelli and Sanchez-Vidal 2011). In another study that focuses on European firms, Ferreira and Vilela (2004) find that there is no relationship between firm cash holdings and firm dividend payments. According to the trade-off theory, the relationship between firm cash holdings and dividend payments is negative since a high dividend paying firms can raise finance simply by cutting dividends (Miller and Orr, 1966; Ferreira and Vilela, 2004). There are no theoretical propositions on the relationship between cash holdings and firm dividend policy based on the pecking order theory and the free cash flow hypothesis (Myers and Majluf, 1984; Jensen, 1986; Ferreira and Vilela, 2004).

2.3.1.12 Taxation
Firms with lower effective tax rates hold higher ratio of cash compared to rivals (Bigelli and Sánchez-Vidal, 2012). Whereas, firms with high tax rates might try to take advantage of the tax shield benefit and in turn reduce the level of cash held (Opler *et al* 1999). In addition, firms may prefer to keep cash windfalls overseas to circumvent the consequences of repatriating the profit (Foley *et al.*, 2007; De Simone, Piotroski and Tomy, 2017). Corroborating this argument, Foley *et al.* (2007) find that firms exposed to high repatriation tax cost build up cash reserves overseas. In support of this position, Dhaliwal *et al.* (2011) propose that tax avoidance impacts the value of cash negatively. A possible explanation for this relationship is that tax avoidance exacerbates the problem of rent seeking. Therefore, firms' corporate governance structures can limit the adverse effects the exposure to tax avoidance (Dhaliwal *et al.*, 2011). Contrarily, Faulkender (2002) argues that there is no relationship between firm cash holdings and tax rates. Another potential avenue through which tax may influence a firm's cash holdings is uncertainty of tax value. To this effect, Hanlon, Maydew and Saavedra (2017) argue that firms exposed to high tax uncertainty hold more cash reserves than their counterparts with less exposure.

2.3.1.13 Leverage

A few studies implicitly find that cash is negative debt.[9] This position holds where there is an absence of market frictions or in firms that are deeply constrained (Acharya, Almeida and Campello, 2007). However, many studies have been argued against this notion. Within the cash holding literature, most studies suggest that a negative relationship exists between cash holding and leverage (Ozkan and Ozkan, 2004; D'Mello, Krishnaswami and Larkin, 2008). Acharya, Almeida and Campello (2007) provide a theoretical explanation for this relationship, they conjecture that cash serves as a hedging tool, since current level of debt can be reduced by holding more cash. The free cash flow theory posits that the relationship between firm cash holdings and leverage is negative. This is because firms with high leverage are likely to be subjected to high capital market monitoring, thus limiting the extent to which managers can alter cash holdings level (Jensen, 1986; Ferreira and Vilela, 2004). The pecking order theory argues that low cash holdings and high leverage can occur concurrently when corporate investment exceeds retained earnings (Myers and Majluf, 1984; Ferreira and Vilela, 2004). The trade-off theory makes no clear prediction on the potential relationship between cash holdings and leverage (Miller and Orr, 1966; Ferreira and Vilela, 2004).

2.3.2 Discussion

The literature on the determinants of cash holdings identifies key drivers of cash holdings. Size, managerial ownership, growth opportunities, credit rating, risk, leverage, taxation, dividend and financial constraints all play important roles in shaping a firm's cash holding (Opler *et al.*, 1999; Ferreira and Vilela, 2004; Ozkan and Ozkan, 2004; Foley *et al.*, 2007; Denis and Sibilkov, 2009; Harford, Klasa and Maxwell, 2014). The existing literature on

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[9] See for instance Kim *et al.* (1998), Opler *et al.* (1999), Dittmar *et al.* (2003), Almeida *et al.* (2004), and Faulkender and Wang (2006).

the determinants of firm cash holdings do not address whether changes in product market competition can drive the level of cash held by a firm. This thesis adds to the literature on the determinants of cash holdings by evaluating whether firms alter their cash holdings when the intensity of competition changes in the product market. The basis for hypothesising a link between product market competition and firm cash holdings is that during periods of increased competition, the cost of debt increases (Valta, 2012). To mitigate the adverse effect of the increase in the cost of debt firms will increase cash holdings.

2.4 Studies in the Cash Holdings Literature

2.4.1 Cash Holdings and Product Market Competition

Firms' cash holdings may be linked to the level of expected competition intensity and rivalry within its industry, this link is more pronounced among firms who are financially constrained (Fresard, 2010; Lyandres and Palazzo, 2016). Firm cash holding choices are negatively associated to those of their competitors (Lyandres and Palazzo, 2016). Complementing this position, Morellec, Nikolov and Zucchi (2014), reveal that product market competition influences the cash holding policy to be adopted by a constrained firm. The general intuition in these intense industries is that an increase in cash holding is often followed by an increase in investment in innovation.

When product market competition increases, the value of cash held increases. The impact of the increase in the value of cash holdings is more pronounced among firms exposed to higher risk of losing their investment opportunities to rivals (Alimov, 2014). In effect, high cash holding companies are able to make gains in the product market at the expense of their rivals (Fresard, 2010). This entails that cash is a key strategic tool in the product market. Although the role of financial flexibility in the product market is well documented

in the literature.[10] Most studies focus on the relationship between debt and product market competition, for instance (Chevalier, 1995; Petersen and Rajan, 1995; Phillips, 1995; Becker and Milbourn, 2011; Valta, 2012). They detail the relationship between debt and the product market. Most studies assume the inference from debt-based studies in the product market can be directly interchanged with cash since cash is often regarded as a substitute for debt. They assume cash is simply negative debt. However, cash differs substantially from negative debt (Chung *et al.*, 2015). Cash confers a different advantage to a firm in the competitive market. Cutting back on indebtedness today does not guarantee access to more debt in the future (Acharya, Almeida and Campello, 2007).

Given these differences between cash and debt, it is important that studies evaluate how firm cash holdings dictate firms' product market interaction. To this effect, this thesis adds to this emerging strand of the product market literature by evaluating how firms' cash holdings are influenced by product market competition. Also, since the cost of debt increases during periods of increased competition (Valta, 2012), I can expect that as a precaution firms may alter their cash holdings to cope with the rising cost of debt (Keynes, 1936). This thesis extends the literature on product market competition by testing if firms increase cash held during periods of increased product market competition. Further discussion on my findings on the link between cash holdings and product market competition is presented in the chapter 4 (the first empirical chapter).

2.4.2 Market Perception of Cash Holdings
Deep-pocketed companies have a higher likelihood of engaging in acquisitions. Investment in acquisitions by deep-pocketed companies are perceived as value decreasing and firms involved in such acquisitions are likely to experience a decline in their operating

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[10] For instance, Fresard (2010); Valta (2012); Lyandres and Palazzo (2016) discuss the relationship between product market competition and financial flexibility.

performance in years following the investment in acquisition (Harford, 1999). This agency problem is more prominent among cash rich firms, since they are able to evade capital market monitoring due to their cash reserves (Harford, 1999). There is a clear gap in the literature on the market perception of firm cash holdings. This thesis fills this gap in the literature by evaluating the market perception of cash holdings during corporate investment announcement/decisions. In addition, existing studies focus on the effect of cash holdings during acquisition announcements. Particularly, how cash funded acquisitions are valued (see for example Wansley, Lane and Yang, 1983; Bruner, 1988; Bruner and Perella, 2004). A unique strand of the literature demonstrate that the market interprets firm corporate finance choices which in turn mirrors on a firm share price (Soter, Brigham and Evanson, 1996). For instance, on the 9th of May 1994, FPL reduced dividends by 32% and consequently FPL's stock price plummeted by about 20% since this was initially perceived as a bad signal for the future. Subsequently, the stock price rebounded and recovered when the market realised the action was not an indication of financial distress (Soter, Brigham and Evanson, 1996).

In Chapter 5, this thesis provides new evidence on the effect of cash holdings on various categories of investments including acquisition of assets, product launches, acquisition of company equity and R&D announcements.

2.4.3 Cash Holdings and Firm Value

A few papers opine that an optimal target of cash holding level exists, implying that the cash holding regime of a firm is contingent on a partial adjustment model (Pinkowitz, Stulz and Williamson, 2006). This strand of the cash holding literature explores trading off the benefits of cash holding with the cost; the optimal point is the point at which the marginal cost of cash offsets the marginal benefit (Martínez-Carrascal, 2010; Martínez-Sola, García-Teruel and Martínez-Solano, 2013). They demonstrate that the optimal level

of cash holding is around 14% and reveal that deviation from this rate reduces the value of a firm. Accordingly, Faulkender and Wang (2006) evaluate the marginal value of cash as a result of differences in financial policy of firms. The results of their analysis indicate that the marginal value of cash deteriorates with higher cash holdings, higher leverage, better access to the capital markets coupled with firms choosing superior cash distribution via dividends instead of share repurchases.

The level of information asymmetry decreases the marginal value of cash to firms; this indicates that firms with low levels of information asymmetry tend to experience higher valuation of increases in cash holding levels (Drobetz, Grüninger and Hirschvogl, 2010). Smith (2014) examines the value of financial flexibility, proxied by cash holding and debt capacity during periods of market uncertainty, results of the study indicate that high levels of cash holding are often attributed to higher market valuation after periods of market volatility. However, debt capacity plays an insignificant role in market valuation. This underpins that debt capacity is not a direct substitute for cash. Further, Chung *et al.* (2015), posit that high cash holding are often accompanied by low information asymmetry, implying the monitoring cost hypothesis of cash holdings supersedes the investment opportunity hypothesis. The monitoring cost hypothesis of cash holdings implies that the level of cash holdings is indirectly related to the level of information asymmetry between managers and stockholders. Whereas the investment opportunity hypothesis affirms that the level of information asymmetry is directly related to cash holding level. Huang, Liao and Chang (2015), reveal that cash is valued less in firms with issues of overinvestment when compared with firms with underinvestment. The study reveals that investment activities plays a role in explaining the value shareholders place on cash held.

Taken together these arguments imply that cash may offer some competitive advantage. More so, all things being equal, if the governance structure of a firm is strong, high cash holdings can offer strategic advantage at the expense of firms' competitors. This effect should be more pronounced during periods when the debt market is not organised and/or the capital market is uncertain. In the third empirical Chapter (Chapter 6), this thesis examines the value of high cash holdings firms during periods of economic uncertainty.

2.4.4 Motivations for Cash Holding

The liquidity preference theory posits that cash may be held simply for exchanging values between businesses and individuals (for transaction purposes). Businesses may also accumulate reserves to prevent the adverse effect of future uncertainty (for precautionary purposes). Cash may also be held with the objective of taking advantage of future opportunities (for speculation) (Keynes, 1936). When the debt market is inefficient or less organised, cash savings, for the precautionary motive, will increase. Along this line of thought, firms may increase their cash reserve when the cost of raising finance is high. The high cost of finance is mostly linked to market imperfections asymmetry information (Myers and Majluf, 1984; Dittmar, Mahrt-Smith and Servaes, 2003). In support of the precautionary motive for cash holdings, Opler *et al.* (1999); Ferreira and Vilela (2004); Ozkan and Ozkan (2004) argue that firms that face difficulty in accessing the capital market hold more cash than their counterparts. Example of such companies include, small firms, firms with low credit rating, and firms with risky cash flow (Opler *et al.*, 1999; Ferreira and Vilela, 2004; Ozkan and Ozkan, 2004). Alternatively, when the debt market is efficient/organised, savings motivated by the speculative motive increase (Keynes, 1936). Firms may build up cash reserves which ensure they are able to exercise their growth opportunities (Opler *et al.*, 1999; Ozkan and Ozkan, 2004).

Although the theoretical literature identifies the transaction motive, precaution motive and speculative motive for cash holdings, the theory is mute on whether firms are motivated to hold cash to meet the self-interest of managers. Since the financial policy of a firm is a subjective choice of the management of a firm (Ozkan and Ozkan, 2004; Anderson and Hamadi, 2016; Florackis and Sainani, 2018), it follows that cash may be held to simply meet the self-interest of the manager. In this thesis, I describe this reason for cash holdings as the *managerial motive for cash holdings.* Prior literature on the relationship between cash holdings and managerial behaviour posit that the attitude of manager is capable of shaping their cash holdings policy (Huang-Meier, Lambertides and Steeley, 2016). Complementing this line of thought, this thesis adds to the literature by testing if cash is held for this reason and how it is perceived by the market during periods of corporate investment valuation. In line with the precautionary motive for cash holdings, this thesis also corroborates this line of thought by exploring if firms are motivated to alter cash holdings as a result of change in the product market. Lastly, the research examines if building up cash during cautious periods results good market performance and significant gains in the product market.

2.4.5 Cash Holdings and Corporate Governance Structure

In China, female CEOs hold higher cash reserves than their male counterparts. This can be attributed to the precautionary motive for cash holding (Zeng and Wang, 2015). The study also reveal that the agency problem of free cash flow is moderated with the presence of female CEOs. Similarly, older CEOs tend to hold higher cash reserves than younger CEOs (Bertrand and Schoar, 2003). A possible explanation for this tendency is that, older managers may be more risk averse when compared to younger CEOs (Bertrand and Schoar, 2003). Another argument on the relationship between firm cash holdings and corporate governance is that the relationship depends on the investment opportunity set

available to the firm. Shareholders of firms with high growth opportunities will approve high levels of cash holdings if the corporate governance structure can limit managerial misbehaviour (Kuan, Li and Chu, 2011). Firms where CEOs are owners tend to hold low cash, and, for newly listed firms, the level of board independence positively impacts firm cash holdings (Chen, 2008). The implication of this is that the corporate governance structure of a firm can mitigate the agency cost of excess cash holdings (Chen, 2008).

Results on the link between firm cash holdings and corporate governance are mixed. Some literature in this strand argue that poorly governed companies hold larger cash balances when compared to well governed firms (Dittmar, Mahrt-Smith and Servaes, 2003; Dittmar and Mahrt-Smith, 2007). Firms with weak corporate governance spend their cash quickly. This is a possible explanation for why they are unable to grow their cash reserves (Harford, Mansi and Maxwell, 2008). This reaffirms the entrenchment argument made by Jensen (1986). To this effect, Pinkowitz and Williamson (2001) demonstrate that banks could restrict the cash balances of firms through monopoly. I extend the literature on the relationship between cash holdings and corporate governance by evaluating the value and perception of cash holdings in a new setting, the UK.[11] The UK market has a good investor protection structure (DeFond, Hung and Trezevant, 2007).

2.5 Summary

The chapter identifies the key literature relating to the empirical work conducted in this thesis and identifies some gaps in the literature on cash holdings. Following these gaps, several hypotheses have been constructed. Firstly, the thesis addresses how firms change cash holdings in response to increased competitive pressure, and how these changes vary with the degree of exposure to capital market imperfections and product market

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[11] Previous studies in this strand of the literature focus on the USA. For instance, Faulkender and Wang (2006), and Dittmar and Mahrt-Smith (2007).

competition. Next, the thesis investigates how cash is perceived by the market during corporate investment announcements. Lastly, it tests the performance of companies which maintain abnormally high cash holdings. In the next chapter, the methodology used to test these hypotheses is explained.

Chapter 3
Data and Methodology

3.0 Introduction

This chapter discusses the data and methodology used in the three empirical chapters (Chapter IV, V, and VI). Section 3.2 details how the sample was screened. Thereafter, section 3.2.1 presents the composition of the sample. The variable definitions are presented in section 3.3. Section 3.4 discusses an overview of methodologies used in the empirical chapters.

3.1 Sample Screening Procedure

This section discusses the procedure employed in screening the data for the respective empirical chapters. For chapter IV and VI, the section details the screening filters applied before reaching the final sample. The section also states the system used in cleaning and categorising the investment announcements in chapter IV.

3.1.1 Screening Procedure for Chapter IV and VI

All firm level data were collected from Thomson Reuters DataStream. Following the standard literature on cash holdings for instance, (Harford, 1999; Ozkan and Ozkan, 2004), I exclude firms in the financial sector as their activity and policies may bias analysis. Using this initial filter, I collect data on all other sectors for the period 1980-2017.[12] For the first and third empirical chapter, I were initially left with 9,011 firms (90,456 firm years). Next, I exclude companies without data on cash and total asset. This is a popular approach in the literature, for instance Akbar, ur Rehman and Ormrod (2013) follow a similar approach in their study. In total, 11,213 firm years were excluded on the basis of this screening filter. Next, to control for outliers that may be driven by errors in the data reported by Thomson Reuters Datastream (2017) or extraordinary activities, I winsorize at 0.05% along both tails of the data. This procedure ensures the compounding

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[12] I was limited to this period due to the available data on Thomson Reuters DataStream.

effect of outliers are limited. The firms included in the sample comprises both dead and surviving companies. This ensures the sample is not subject to survivorship bias. After applying all the following filter, a total of 79,343 firm years were left for the analysis. Details of the distribution of the data among years are reported in table 3.1. Reported in Appendix 3C is the histogram distribution of the dependent and independent variables.

3.1.2 Screening Procedure for Chapter V

For the second empirical chapter, I collect data on corporate investment announcements from Morningstar.co.uk (Morningstar, 2017) . I follow a similar approach as the chapters 4 and 6 by excluding company announcements for firms that belong to the financial sector. Before excluding firms from the financial services industry, the sample consisted of 9,860 announcements for the period 2005-2016.[13] After excluding firms in the financial sector, unclassified announcements, and dirty announcements. The sample consist of 3,620 clean announcements. Next, I exclude companies without data on cash and total asset. Upon including this filter, the sample consisted of 3,251 announcements by 371 unique firms. Firms included in the sample comprised of both dead and surviving companies, thus mitigating any concerns of survivorship bias in the sample. Details of the histogram distribution of the independent and dependent variables are reported in the chapter Appendix 3C.

3.1.3 Classifying Investment Announcements

Based on the growth strategy implied in the announcement, announcements were classified as either organic or inorganic. Organic investment refers to corporate growth fuelled by expansion or improvement of existing processes within an organisation (Irvin, Pedro and Gennaro, 2003). Inorganic investments are corporate development fuelled by expansion gained by acquiring existing business processes outside an organisation (Irvin,

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[13]The analysis was limited to this period because this was the data available on Morningstar.co.uk

Pedro and Gennaro, 2003). Included among organic investments were purchase of asset announcements, product launch announcements, and research and development announcements (R&D). Inorganic announcements on the other hand were corporate acquisitions. Inorganic investments on the other hand comprise of acquisitive growth/inorganic growth activity, and as such they are outward looking.

To ensure the classification procedure was systematic and objective, an experiment was conducted, where samples of each category of the announcement was handed to students of the MSc Finance class at Edinburgh Business School. Results of the experiment indicate an average of 90% accuracy in classifying investment into the relevant categories. Details of the test are reported in Appendix 3A.

i:Table 3.1: Sample Distribution by Year

Panel A: Sample Distribution by Year (Chapter IV and VI)

Year	Freq.	Percent	Cum.		Year	Frequency	Percent	Cum.
1980	786	0.99	0.99					
1981	812	1.02	2.01					
1982	831	1.05	3.06					
1983	864	1.09	4.15					
1984	984	1.24	5.39					
1985	1,093	1.38	6.77		*Panel B: Announcement distribution by year (Chapter V)*			
1986	1,143	1.44	8.21		Year	Frequency	Percent	Cum.
1987	1,542	1.94	10.15		2005	129	3.97	3.97
1988	1,815	2.29	12.44		2006	308	9.47	13.44
1989	1,903	2.4	14.84		2007	347	10.67	24.12
1990	1,998	2.52	17.36		2008	308	9.47	33.59
1991	2,041	2.57	19.93		2009	209	6.43	40.02
1992	2,042	2.57	22.5		2010	303	9.32	49.34
1993	2,083	2.63	25.13		2011	370	11.38	60.72
1994	2,178	2.75	27.87		2012	313	9.63	70.35
1995	2,224	2.8	30.68		2013	208	6.4	76.75
1996	2,555	3.22	33.9		2014	243	7.47	84.22
1997	2,666	3.36	37.26		2015	255	7.84	92.06
1998	2,596	3.27	40.53		2016	258	7.94	100
1999	2,519	3.17	43.7		**Total**	3,251	100	
2000	2,564	3.23	46.93					
2001	2,618	3.3	50.23					

2002	2,677	3.37	53.61
2003	2,737	3.45	57.06
2004	2,840	3.58	60.64
2005	2,886	3.64	64.27
2006	2,893	3.65	67.92
2007	2,779	3.5	71.42
2008	2,606	3.28	74.71
2009	2,455	3.09	77.8
2010	2,392	3.01	80.82
2011	2,367	2.98	83.8
2012	2,316	2.92	86.72
2013	2,274	2.87	89.58
2014	2,222	2.8	92.38
2015	2,130	2.68	95.07
2016	2,045	2.58	97.65
2017	1,867	2.35	100
Total	**79,343**	**100**	

The table presents a distribution of the final sample used in this thesis by year. Panel A reports the distribution of the final sample for the IV and VI chapter. Panel B presents the frequency distribution of the sample of announcements used in chapter v.

A company investment announcement can signal the future direction of a company. Embedded in these announcements are price sensitive information that can shape opinions on a firm's future cash flow (McConnell and Muscarella, 1985). Using information contained in an investment announcements, market participants can identify good investment decisions from poor ones and discount the value of the investment into the share price of companies (Chan, Gau and Wang, 1995). Market perception and valuation of investment announcements differ. Grouping company announcements based on distinct features may help inform understanding on market perception of announcements. Particularly, this can elucidate what market participants perceive as good investment decisions and poor investment decisions. Therefore, there is a need for more studies to expound on the role of investment features on market reactions to corporate investment (Woolridge and Snow, 1990). This thesis extends the literature on corporate investment classification by categorising investment on the basis of the growth strategy embedded in the investment announcement.

Prior studies classify company investments based on several features of the investment. For instance, Dean (1951) classifies investments based on the potential variation in their profit projection. Investments can be categorised as either replacement (cost savings), expansion (increased revenue), product line (new products/ improved products), or strategic products (non-profit) (Dean, 1951). Like Dean's classification, Merrett and Sykes (1973) categorise investments based on their risk return relationship or non-profit generation. In this respect, investment groups include, risk related, obligatory, welfare amenity, risk free, normal projects, and speculative projects (Merrett and Sykes, 1973). Van Horne (1983) posits that an important factor in classifying investment is the source of the investment proposal within the company. The source of investment proposal identified includes marketing projects (new products/expansion of existing products), production projects (replacement of building/equipment), and R &D / welfare expenditures.

Following the Woolridge and Snow (1990)'s argument, I provide new evidence on how the growth strategy of the investment influences announcement valuation. It is important to note that this does not refer to the classification suggested by Burton *et al.* (1999) where capital expenditures were grouped on the basis of immediate propensity to generate cash. The investment classification focuses on the growth strategy pursued by a firm. I categorize company investment announcements as either organic or inorganic. Organic investment refers to growth fuelled by expansion or improvement of existing processes within an organisation (Irvin, Pedro and Gennaro, 2003). They refer to investments in existing business processes to enhance existing cash flow or to generate new cash flow. Inorganic investment on the other hand refers to acquired growth. They encompass the purchase of existing external business processes. Hence, these investments involve purchasing external businesses with an existing cash generation process as such laying

claim to the potential future cash flow of the business. Therefore, inorganic investments can be defined as short-term strategies, which offers quicker rewards (Trautwein, 1990). Inorganic investment is often regarded as the "buy and build strategy" (Hammer *et al.*, 2017). Thomsen and Pedersen (2000) argue that organic growth strategies are less risky as compared to acquisition strategies. The level of uncertainty attached to acquisitive growth/ inorganic investments is mitigated in organic investments, since firms hold first-hand information of the capability and potential of the investment project. Hence, the problem of information asymmetry between acquiring and acquired firms can be mitigated in the case of organic investments.

3.1.4 Identifying Organic Investment Announcements

To identify organic investment, I note company announcements that suggests organic growth strategy. Organic growth refers to corporate growth fuelled by expansion or improvement of existing processes within an organisation (Irvin, Pedro and Gennaro, 2003). Hence, any implicit or explicit commitment of resources for the improvement of existing processes such that it results in the increase of current and future cash flow or for the generation of new future cash flow from the existing process can be identified as organic investment. Within this category, I identify all investment announcements that do not involve the purchase of an existing cash generating business as members of this class of investment. Following this approach and based on the available data on Morningstar (2017), I categorise the following announcements as organic; R&D, product launch, and purchase/acquisition of assets.

3.1.4.1 Research and Development

These are investment projects that involve the commitment of resources, implicitly or explicitly to activities directed at the innovation, introduction, and enhancement of products, services and processes (Jones, 1998). R&D projects generally have a huge level

of uncertainty embedded in them since where, when and how returns will be generated is often unclear (Jones, Danbolt and Hirst, 2004). Hence, a significant portion of the value of an R&D is its option value. Most of the announcements in this group were made by companies in the pharmaceutical industry. In selecting constituents of the group, it was not necessary for the amount invested to be stated. The company only needed to indicate implicitly or explicitly that resources have been committed to the development of a product, service or process. Company announcement within this group were drawn from the Morningstar.co.uk (Morningstar, 2017) classification "*Research Update*".

Announcement Extracted from Morningstar.co.uk

"ASTRAZENECA ANNOUNCES POSITIVE RESULTS FROM BENRALIZUMAB PHASE III"
"PROGRAMME IN SEVERE ASTHMA"

"Benralizumab first AstraZeneca respiratory biologic to complete Phase III 17 May 2016"

"AstraZeneca today announced that benralizumab, a potential new medicine and anti-eosinophil monoclonal antibody, was well tolerated and achieved the primary endpoint in two pivotal Phase III registrational trials (SIROCCO and CALIMA), demonstrating significant reductions in the annual asthma exacerbation rate compared to placebo".

"Sean Bohen, Executive Vice President, Global Medicines Development and Chief Medical Officer, said: "Severe asthma affects the health and quality of life of millions of people around the world, and exacerbations can be life threatening for these patients. I are pleased with the top-line results from these pivotal trials as they demonstrate the potential for benralizumab to improve outcomes for patients with severe asthma. Benralizumab is AstraZeneca's first respiratory biologic and its development underscores our commitment to transform the treatment of asthma and chronic respiratory disease with our next generation of respiratory medicines."

"The trials evaluated the efficacy and safety of two dose regimens of benralizumab as an add-on therapy for severe uncontrolled asthma with eosinophilic inflammation in adults and adolescents 12 years of age and older".

"In SIROCCO and CALIMA, the primary analysis population included patients on high-dose inhaled corticosteroids (ICS) plus long-acting β2-agonist (LABA) with a baseline blood eosinophil count ≥ 300 cells/microliter. Patients were randomised to receive benralizumab 30mg every 4 weeks; 30mg every 4 weeks for the first three doses followed by 30mg every 8 weeks; or placebo. The safety and tolerability findings for benralizumab were generally consistent with those reported in previous trials".

"Mark FitzGerald, MD, director of the Centre for Heart and Lung Health at the Vancouver Coastal Health Research Institute and Principal Investigator in the CALIMA trial, said: "I are learning more about different sub-types of asthma, and these trials investigate a potential new treatment to address the underlying driver for some patients. Within the appropriate patient population, the anti-eosinophil effect of benralizumab has the potential to deliver uniquely-targeted treatment for patients whose asthma is driven by eosinophilic inflammation."

"Eosinophils are the biological effector cells that drive inflammation and airways hyper-responsiveness in approximately 50% of asthma patients, leading to frequent exacerbations, impaired lung function and reduced quality of life. Benralizumab is an anti-eosinophil monoclonal antibody that depletes eosinophils via antibody-dependent cell-mediated cytotoxicity (ADCC), the process by which natural killer cells are activated to target eosinophils. Benralizumab induces direct, rapid, and near complete depletion of eosinophils in the bone marrow, blood and target tissue. Benralizumab was developed by MedImmune, AstraZeneca's global biologics research and development arm".

"Results from the SIROCCO and CALIMA trials will be presented at a future medical meeting. Regulatory submissions in the US and EU are anticipated in the second half of 2016."
Announcement Extracted from Morningstar.co.uk

In the case of the Astrazeneca announcement, there is an implicit commitment of resources to the development of a new product. In addition, the investment was developed by a unit within the firm. All these put together indicates that the investment announcement matches all the required features of both an organic and R&D investment announcement

3.1.4.2 Product Launches

This refers to the debut of a product into the market, it is the process of introducing a new product or service into the market. To be considered as a member of this group the initial sum invested need not be stated. Announcements within this group were drawn from the Morningstar.co.uk (Morningstar, 2017) announcement classification "product launch".

Announcement Extracted from Morningstar.co.uk

29 June 2016

(Gfinity plc"Gfinity" or the "Company")

Launch of the Gfinity Elite Series
Gfinity launches global professional eSports series

"Gfinity Plc (AIM: GFIN), a leading eSports promoter, announces the launch of the Gfinity Elite Series (the "Series"), a dynamic new eSports league format, featuring some of the world's most popular gaming titles".

"Launching first in the UK, with a view to expanding across international markets in the near future, the Series will provide the eSports community with exciting new opportunities to watch or play in a fiercely competitive environment on www.gfinityelite.com".

"Competition will start in January 2017, when gamers of any ability from anywhere around the world will be able to compete in the Gfinity Challenger Series to win Gfinity Elite Series ranking points. The competitors with the most points will qualify for the Gfinity Elite Draft, where professional teams will offer the best players a place in their Gfinity Elite Series franchises".

"The Gfinity Elite Series itself will launch in April 2017 and will see Gfinity Elite Series Franchises compete for the title of Gfinity Elite Series Champion. The Gfinity Elite Series will be streamed live to a global audience from the home of UK eSports, the Gfinity Arena in London".

"The Gfinity Elite Series is expected to attract an active audience of eSport enthusiasts to generate sponsorship and broadcasting rights for Gfinity and create a unique set of sponsorship, media and franchise opportunities for potential partners seeking access to the rapidly growing and valuable UK eSports population of 6.5 million, most of which fall into the male under 35 demographic".

"Neville Upton, Chief Executive Officer, Gfinity Plc, said: "As the gamers' champion, Gfinity is excited to be launching the Gfinity Elite Series. The UK has some of the best talent in eSports and Gfinity Elite Series gives them the opportunity to hone their skills and take on some of the best from around the world. This is what the UK eSports community has been waiting for and I can't wait to take this truly global."

Announcement Extracted from Morningstar.co.uk

In the example of Gfinity product launch announcement, all the criteria stated in the definition were met. The product/service is new and there was an implicit commitment of resources to the investment.

3.1.4.3 Acquisition/Purchase of Asset

This refers to the commitment of resources for the acquisition of land, building, and machinery. They include expenditure on plants, equipment, and machinery for the development and maintenance of existing processes (Jones, 1998). Constituents within this group were hand collected from the general classification of announcements in "acquisitions" on Morningstar.co.uk (Morningstar, 2017).

Announcement Extracted from Morningstar.co.uk

"Edita Food Industries Acquires New Land to Produce a Premix Formula"

"Cairo, 3 August 2016"

"Edita Food Industries signed a contract to purchase a new plot of land to implement a new project that aims to enhance the efficiency and quality of the production process. The company

signed the contract to acquire around 12,878 square meters of land in Sixth of October City's Polaris Al-Zamil Industrial Park valued at approx. EGP 19.0 million (including utilities), to be paid on three installments over the 6 months period commencing on 3rd August 2016. The project aims to protect the recipe and knowhow confidentiality of the company's products where a premix formula will be produced and supplied to all of Edita's factories. Additionally, the project will enhance efficiency and quality through standardization of input blends".

Announcement Extracted from Morningstar.co.uk

In this example, there is a clear commitment of resources for the purchase of land, the price, payment period and strategic advantage of the investment is clearly stated.

3.1.5 Identifying Inorganic investment

This refers to acquisitive growth/ inorganic growth. It involves the commitment of resources for the growth of firms by acquiring already existing business processes. The emphasis in determining if an investment falls into this category is in answering the question, does the investment constitute a commitment of resources to the purchase of an existing cash flow generating business? In this group, announcements of the acquisition of companies were identified within the Morningstar.co.uk (Morningstar, 2017) classification "acquisition". Acquisition announcement made by financial services companies were excluded.

Announcement Extracted from Morningstar.co.uk

"Carr's Group plc
"Carr's" or the "Group"

"Acquisition of STABER GmbH" 25 October 2016"

"Carr's, the Agriculture and Engineering Group, announces the acquisition and completion of STABER GmbH ("STABER" or the "Company"), for a total cash consideration of €7.85 million (£6.98 million), and after adjusting for estimated net cash within the Company at completion, a net consideration of €6.75 million (£6.00 million) (the "Acquisition")".

"STABER, formally called Städele GmbH, is a family owned engineering business located near the Group's existing German operations in Markdorf ".

"STABER and Wälischmiller Engineering GmbH, a subsidiary of Carr's Engineering Ltd, have been working together closely for over 50 years and STABER has most recently been a key

supplier of parts for the remote handling business. During 2014 and 2015 STABER was intrinsic in assisting Wälischmiller in the development of the Demo 2000 Telbot®, a robotic system for vessel inspection and cleaning in the oil and gas market, and the first in the world to be certified for use in the most highly explosive of environments. STABER has designed and developed specialised intellectual property ("IP") which will be strategically beneficial to Wälischmiller in both the near and long term. This IP will accelerate the ongoing strategic development work on the Telbot® and the Demo 2000 Telbot® by Wälischmiller ".

"STABER will be fully integrated into Wälischmiller over the next 18 months, enhancing efficiencies and providing technological growth opportunities across the remote handling business of the Group". "To ensure the successful integration and transfer of the IP, €2.0 million of the total consideration will be deferred, until at the latest 31 June 2018".

"Highlights and strategic rationale of the Acquisition"

> *"STABER is a long term strategic partner of Wälischmiller, having jointly developed multiple products over the past fifty years".*
> *"The Acquisition will provide the Group with specialised IP relating to high quality, niche robotics and design technology".*
> *"STABER's IP will advance Wälischmiller's ongoing product development in the global nuclear, oil & gas and defence industries".*
> *"Combining STABER and Wälischmiller is expected to generate certain cost and operational synergies".*
> *"STABER will provide the Group with access to new technologies and engineering design expertise".*
> *"The Acquisition is in line with Carr's strategy of being at the forefront of innovation and technology".*

"For the year ended 31 December 2015, STABER recorded adjusted EBITDA of €0.67 million and the adjusted gross assets of STABER as at 31 December 2015 were €1.76 million. The Acquisition is expected to be earnings neutral in the first year and enhancing thereafter ".

"The total consideration is being satisfied by the Group's existing resources following the Group's disposal of the Food division, announced on 5 September 2016. The Group expects this acquisition to enhance the capability of Wälischmiller and its long term operational performance".

Tim Davies, Chief Executive, commented:

"We are delighted to announce the acquisition of STABER. This family run business has been a key partner of Wälischmiller for over half a century and this acquisition is a seamless extension of this long standing relationship".

"Carr's will benefit from the introduction of new technologies into the Group as well as the operational synergies that will come from this acquisition. This purchase is fully aligned with the Engineering division's growth strategy of capitalising on the global resurgence of nuclear decommissioning as well as the use of robotic technologies in highly explosive environments."

"I welcome the STABER team to Carr's and look forward to working with them in the months and years ahead."

Announcement Extracted from Morningstar.co.uk

In the above announcement, the features indicate it is an outward investment. It involves the purchase of an already existing external business unit with cash generation capability. The consideration of the investment is clearly stated and the strategic advantage of the investment is implicitly stated.

3.2 Variable Description

In this section, the variables used in the thesis are defined. A brief definition/formula of the variables used in this thesis is presented on table 3.2. To ensure model estimates are not subject to adverse scaling effect, most variables were deflated by total asset or a similar distinct firm size indicator. The approach adopted by this study aligns with existing studies on cash holding (Opler *et al.*, 1999; Opler *et al.*, 2001; Ozkan and Ozkan, 2004).

3.2.1 Dependent Variables

This subsection details how the dependent variables in the thesis was calculated and the literature supporting the choice of the variable.

3.2.1.1 Cash Holdings

The cash holdings variable captures the degree of liquidity of a firm. To measure this, the thesis follows a similar approach as the seminal work of Opler *et al.* (1999). The study deflates cash and cash equivalent by the difference between total assets and cash and cash equivalent for market-based study in the second and third empirical chapter. However, for the first empirical chapter the thesis adopts the same approach as Fresard (2010), deflating cash and cash equivalent by the total assets of the firm. This approach is popular among product market studies.[14]

Chapter IV

$$Cash\ Holdings_{it}\ =\ \frac{Cash\ and\ Cash\ Equivalent_{it}}{Total\ Assets_{it}}$$

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[14] For instance, Haushalter, Klasa and Maxwell (2007), Fresard (2010), and Alimov (2014) use a similar approach.

$$Cash\ Holdings_{it}\ =\ \frac{Cash\ and\ Cash\ Equivalent_{it}}{Total\ Assets_{it} -\ Cash\ and\ Cash\ Equivalent_{it}}$$

3.2.1.2 Sales growth/ Market share

To measure firm competitiveness in the first empirical chapter, I follow a similar approach as Haushalter, Klasa and Maxwell (2007) and Fresard (2010). I estimate the growth in sales and adjust the value by the industry sales growth for the year. The estimated value indicates a firm's sales growth comparative to competitors (Fresard, 2010). The motivation for adjusting firm sales growth by general industry sales growth is that the resultant value is indicative of new share of the market captured by a firm (Fresard, 2010), using the unadjusted value is not informative as general industry sales growth may be higher than a firm's sales growth.

$$Sales\ growth/Market\ Share = (\frac{Sales_t - Sales_{t-1}}{Sales_{t-1}}) - (\frac{Industry\ Sales_t - Industry\ Sales_{t-1}}{Industry\ Sales_{t-1}})$$

3.2.1.3 Excess Returns

Using a similar approach as Fama and French (1993) Faulkender and Wang (2006), Dittmar and Mahrt-Smith (2007) and Simutin (2010), I characterise portfolio excess stock return in relation to the Fama-French 25 portfolio sort which is based on size and book to market ratio.

$$Excess\ returns_{it}\ =\ r_{i,t} - rb_t$$

Where $r_{i,t}$ refers to annual stock returns of firm i at time t and rb_t is the return from the benchmark portfolio of a stock.

3.2.1.4 Return on Asset (ROA)/Operation performance

To measure operating performance, I calculate the industry adjusted ROA of each firm. Similar to Haushalter, Klasa and Maxwell (2007), Dittmar and Mahrt-Smith (2007),

Fresard (2010), and Simutin (2010) I deflate earnings before interest, tax, depreciation and amortisation by total asset. The industry mean value is subtracted from the resultant value. The value obtained indicates a firms operating performance relative to its industry.

$$ROA_{it} = \left(\frac{EBITDA_t}{Total\ Asset_t}\right) - \left(\frac{Mean\ Industry\ EBITDA_t}{Mean\ Industry\ Total\ Asset_t}\right)$$

3.2.1.5 Return on Capital Employed (ROCE)

Return on capital employed is a measure of firm performance that evaluates the general profitability and efficiency of a firm (Afrifa and Padachi, 2016). It is estimated by dividing firm operating performance by the capital employed (Al-Najjar and Hussainey, 2011). To ensure values calculated are intuitive, this study adjusts the ROCE value by the industry mean value.

$$ROCE_{it} = \left(\frac{EBIT_t}{Capital\ Employed_t}\right) - \left(\frac{Mean\ Industry\ EBIT_t}{Mean\ Industry\ Capital\ Employed_t}\right)$$

3.2.1.6 Return on Equity (ROE)

Firms' ability to generate profit based on shareholders' equity can be assessed by computing a firms ROE. The value obtained from deflating a firms net income by shareholders' equity indicates how efficient a company is in turning over profit in relation to each unit of equity (Beaver and Ryan, 2000; Wang *et al.*, 2015). These values are adjusted relative to the industry mean value.

$$ROE_{it} = \left(\frac{Net\ Income_t}{Shareholders'\ Equity_t}\right) - \left(\frac{Mean\ Industry\ Net\ Income_t}{Mean\ Industry\ Shareholders'\ Equity_t}\right)$$

ii:Table 3.2: Variable Definition

Variable	Formula / Definition
Cash holdings (Chapter I)	*Cash and Cash Equivalent/Total Asset*
Cash holdings (Chapter II and III)	*Cash and Cash Equivalent/(Total Asset – Cash and Cash Equivalent)*
Cash holdings squared	*(Cash and Cash Equivalent/(Total Asset – Cash and Cash Equivalent))^2*
Cash holdings cubed	*(Cash and Cash Equivalent/(Total Asset – Cash and Cash Equivalent))^3*
Zcash	*((Cash holding - Average Industry Cash holding)/Year Industry standard deviation of cash holding)*
Net Working Capital	*Net working capital divided by total asset*
Research and Development	*R&D is dummy variable that takes the value 1 if a firm disclose R&D expenses and 0 otherwise*
Excess Return (Equal Weighted Portfolio)	*Firm stock returns minus the return from the equally weighted portfolio of the market*
Excess Return (Market Capital Weighted Portfolio)	*Firm stock returns minus the return from the market capitalisation weighted portfolio of the market*
Annualised Return	*Firm monthly stock returns expressed in annual terms*
Beta	*Correlation between stock returns and the market returns*
Organic Investment	*A dummy variable which is = 1 when investment is an organic investment and 0 otherwise*
Size	*Log of Total asset*
Market share	*Growth in sales - Industry growth in sales*
ROA	*(EBITDA/Total Asset) - (Average Industry ROA)*
Leverage	*Debt/ Total Asset*
Market capitalisation	*Annual share price multiplied by total shares in issue*
Market to Book	*Market value of assets divided by book value of total assets*
Dividend	*A binary variable that takes the form of 1 if a firm pays dividend and zero otherwise*
CAPEX	*Growth in Property Plant and Equipment*

Table 3.2: Variable Definition Continued

Variable	Formula / Definition
No of firms in industry	*Total number of firms in industry*
Entropy	*Sum of the log of 1 divided by sales by total industry sales*
Gini	*Square root of the Sum of the absolute difference between firm sales and industry sales*
Capital to Labour Ratio	*Property, plant, and equipment divided by total employees*
Asset Tangibility	*0.715∗Receivables plus 0.547∗Inventories plus 0.535∗ Fixed capital (Berger et al. 1996).*
ROCE	*It is the industry adjusted value of returns on capital employed. It is derived by dividing operating profit by capital employed.*
ROE	*It is the industry adjusted value of the returns on equity, it is calculated by dividing operating profit by shareholders equity.*
Bid-Ask	*Annual difference between Ask price minus Bid price*
Relative Size	*Total Investment / Market Capitalisation*

3.2.2 Independent Variables

3.2.2.1 Increase in competition

To measure increase in competition, I calculate changes in three measures of competition (Industry concentration index, HHI, Theil's Entropy Index and Gini index).[15] Periods that indicate increase in the measure of competition are assigned the value of 1 and other periods are assigned the value 0.

3.2.2.2 Measures of competition

Measures the changes in the number of firms in an industry, an increase indicates an increase in competition (Jiang *et al.*, 2015). Since the population of an industry can significantly affect the ability of a firm to influence prices (Huang and Lee, 2013). An increase in the number of firms within an industry indicates an increase in competition while a decrease in number of firms suggests a decrease in competition. I identify periods of increased competition as periods where:

$$\Delta i_t >= 1$$

Where i is number of firms in an industry and t indexes the year.

3.2.2.3 Gini Coefficient

In general, the Gini coefficient measures the degree of dispersion of wealth/income (Gini, 1921). The Gini equation can be written in relation to firm sales within an industry, such that an increase in dispersion indicates an increase in competition in the industry (Nissan and Caveny, 1993).

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[15] These measures are popular in the product market literature. For instance, Fresard (2010), Valta (2012), and Huang and Lee (2013) follow a similar approach in measuring competition.

$$Gini = 1/2n \sum_{i=1}^{j} \sum_{j=2}^{n} |S_i - S_j|$$

Where $S_1 \geq S_2 \geq \ldots \ldots \geq S_n$, $\sum_{t=1}^{n} S_t = 1$. S_t therein refers to the share of sales accounted by the ith ranked firm and n denotes the number of firms in an industry at time t.

3.2.2.4 Theil's Entropy Index

This measures the degree of disorderliness in as system. In the context of competition, the higher the level of disorderliness the higher the level of competition (Nissan and Caveny, 1993).

$$E = \sum_{i=1}^{n} S_i \, \log(1/S_i)$$

Where S_i is the share of sales and n refers to the number of firms in an industry at time t. The index captures the degree of size differences between firms in an industry. When all firms have equal share then $E = \log n$, implying entropy is maximised and concentration minimised. The reverse is true when a firm controls all the sales in an industry, $E = 0$.

3.2.2.5 Herfindahl Hirschman Index (HHI)

The Herfindahl Hirschman Index (HHI) captures the distribution of the sales of firms in an industry. The HHI is calculated by summing the square of firms' proportion of sales within an industry. As in Fresard (2010) and Valta (2012), I compute the value as follow:

$$HHI = \sum_{i=1}^{n} S_i^2, \frac{1}{n} \leq H \leq 1$$

Where S refers to the market share of the ith firm in an industry and n is the number of firms

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3.2.2.6 Size

The cash holdings literature documents a strong relationship between firm size and cash holdings. For instance, Opler *et al.* (1999), Ozkan and Ozkan (2004), and Al-Najjar (2013) document the effect of firm size on cash holdings. However, there is no consensus position in the literature on the direction of the relationship between cash holdings and firm size.[16] This thesis further addresses the debate on the direction of the relationship between cash holdings and size. To measure firm size, this thesis follows the same approach as Opler *et al.* (1999) and Ozkan and Ozkan (2004) and estimates the natural logarithm of total assets.

$$Size_{it} \ = \ \ln(\text{ Total Assets}_{it})$$

3.2.2.7 Leverage

Firms with high levels of debt relative to total assets may be unable to build up high cash reserves because of commitment to interest payments. Accordingly, Opler *et al.* (1999) and Ozkan and Ozkan (2004) posit that there is a negative relationship between firm cash holdings and leverage. As an explanation to this, Ferreira and Vilela (2004) argue that firms with high levels of indebtedness are unable to build large cash reserves because they are subjected to more capital market monitoring. As in Opler *et al.* (1999), I measure leverage as the ratio of total debt to total assets.

$$Leverage_{it} \ = \ \frac{Total\ Debt_{it}}{Total\ Assets_{it}}$$

3.2.2.8 Organic investment

Organic investment is a binary variable that identifies if a firm adopts an internal (organic growth) or external investment strategy (inorganic growth). The variable is assigned the value 1 if an investment announcement is an organic investment. Alternatively, inorganic investment is assigned the value 0.

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[16] Opler et al (1999), Ozkan and Ozkan (2004) and Al-Najjar (2013) all document different directional relationship between cash holdings and firm size.

3.2.2.9 Market to Book

In the cash holdings literature, market to book is a proxy that characterises a firms investment opportunity set.[17] Firms with high investment opportunity are likely to build up their cash reserves to ensure they can exercise all growth opportunities when they fall due (Opler *et al.*, 1999; Opler *et al.*, 2001; Ferreira and Vilela, 2004). To measure market to book ratio, the thesis follows the same approach as Ferreira and Vilela (2004) and Ozkan and Ozkan (2004) by deflating the market value of assets by the book value of assets.

$$Market\ to\ Book_{it}\ =\ \frac{Market\ Value\ of\ Assets_{it}}{Book\ Value\ of\ Assets_{it}}$$

3.2.2.10 Dividend

The dividend policy of a firm can shape their cash holding policy (Ozkan and Ozkan, 2004; Al-Najjar, 2013). Firms with high dividend policy may increase cash holdings to ensure they maintain their dividend obligations (Bigelli and Sánchez-Vidal, 2012). Therefore, a positive relationship is reasonable. Similarly firms facing financing shocks can react by cutting dividend payments (Ozkan and Ozkan, 2004; Al-Najjar, 2013). Hence a negative relationship is also plausible between cash holdings and firm dividend policy. To measure a firm's dividend policy, I follow two approaches. Firstly, like Ferreira and Vilela (2004) I assign firms that pay dividend in a given year the value 1 and if otherwise they are assigned the value zero. For the second measure, like Ozkan and Ozkan (2004) I divide dividend payments by total assets.

$$Dividend_{it}\ =\ \frac{Dividend\ Payment_{it}}{Total\ Assets_{it}}$$

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[17] Ferreira and Vilela (2004) and Ozkan and Ozkan (2004) use a similar approach to measure the level of growth available to a firm.

3.2.2.11 Capital Expenditure (CAPEX)

The investment decisions of firms have important implications on firms' cash holdings. For instance, Brown and Petersen (2011) posit that firms use their cash reserves to smooth their research and development (R&D) expenses. They argue that this tendency is more likely among young firms. However, Opler *et al.* (1999) do not find a significant relationship between cash holdings and capital expenditure. Therefore, there is no unanimity in the literature regarding the relationship between cash holdings and capital expenditure. To measure capital expenditure, the study adopts the approach of Opler *et al.* (1999) and deflate capital expenditure by total assets.

$$CAPEX_{it} \ = \ \frac{Capital \ Expenditure_{it}}{Total \ Assets_{it}}$$

3.2.2.12 Net working capital

The net working capital of a firm is an indication of its available substitute for cash holdings. This provides a buffer against losses besides cash reserves and debt capacity and available credit lines (Opler *et al.*, 1999; Opler *et al.*, 2001). Empirical evidence indicate that there is a negative relationship between cash holdings and net working capital (Opler *et al.*, 1999; Ferreira and Vilela, 2004). A potential explanation for this is because net working capital is a substitute of liquid asset (Opler *et al.* 1999). To measure the ratio of net working capital, the study follows Opler *et al.* (1999) and deflate net working capital by total assets.

$$Net \ working \ capial_{it} \ = \ \frac{Net \ working \ capital_{it}}{Total \ Assets_{it}}$$

3.2.2.13 Asset Tangibility

Another potential substitute for liquid asset is asset tangibility. It correlates to a firm's cash reserves. Asset tangibility is expressed as a function of receivables, inventory and fixed capital (Berger, Ofek and Swary, 1996; Fresard, 2010). Fresard (2010) report a

negative relationship between cash holdings and asset tangibility. To measure asset tangibility, I follow Berger, Ofek and Swary (1996) and Fresard (2010) by estimating the equation below. It is important to note that cash holdings differ substantively with asset tangibility because it is a construct that mimics the liquidity of a firm.

$$Asset\ Tangibility_{it} = \ 0.75(\ Receivables_{it}\ ) + \ 0.547(\ Inventories_{it}\ ) +$$
$$0.535(\ Fixed\ Capital_{it}\ )$$

3.2.2.14 Relative size

The literature on acquisitive growth argue that the size of an investment is an important indicator of how an investment will be valued by the market. For instance, Moeller, Schlingemann and Stulz (2004), and Masulis, Wang and Xie (2007) posit document a positive relationship between the size of an investment and abnormal returns. Similarly, Burton *et al.* (1999) suggest that the relationship between investment size and abnormal return is positive for immediate cash generating investments. To measure the size of an investment, I adopt a similar strategy as Masulis, Wang and Xie (2007) and deflate investment by market value of equity.

$$Relative\ size_{it}\ \ = \ \frac{Size\ of\ investment_{it}}{Market\ value\ of\ equity_{it}}$$

3.2.2.15 Beta

The beta coefficient demonstrates how correlated a firm's stock return is to the market return (Sharpe, 1963; Sharpe, 1964). Firm beta coefficients were obtained from the market model regressions using the yearly daily firm stock and market returns with leads and lags respectively.[18] The beta coefficient of a firm is computed from the regression equation below.

$$ER_{i_t} - Rft = \alpha_{it} + \beta_{i_t}(Rmt - Rft) + \varepsilon_{it}$$

Where $ER_{i_t} - Rft$ is the excess stock returns. $R_{mt} - R_{ft}$ is the excess return of the market portfolio at time t. It is computed by subtracting the one-month T-bill return ($R_{ft,}$ risk free rate) from the return on the value-weighted portfolio of the FTSE ALL SHARE.

3.2.2.16 Zcash

Zcash characterises cash in relation to competitors, such that the embedded advantage or disadvantage of a deviational cash holding policy from the industry is indicated in the beta coefficient (Fresard, 2010). Following Campello (2003) and Fresard (2010), the study computes firm Zcash by deducting the mean industry cash holdings from firm cash holdings and thereafter dividing the value by the industry year standard deviation.

$$Zcash_{it} = \frac{Cash\ holding_{it} - Mean\ Industry\ Cash\ holding_{it}}{Industry\ Cash\ holding\ Standard\ Deviation_{it}}$$

3.3 Descriptive Statistics

Table 3.3 reports the summary statistics of the variables used in the thesis. Reported in the table is the mean, standard deviation, 25tth percentile and 75th percentile of the annualised returns, beta coefficient, bid-ask spread, capital expenditure, CAR_1TO1 (i.e.

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[18] This is a popular approach in the asset pricing literature. For instance, Simutin (2010) compute firm beta by estimating the market model based using daily yearly return of firms and the market.

cumulative abnormal returns), cash holdings, dividend, entropy, excess returns, GINI coefficient, HHI score, interest rate, leverage, market capitalisation, market share, market to book, net working capital, number of firms in an industry, organic investment, Q ratio, Relative size, R&D, ROA, size, and total assets. A Shapiro-Francia normality test demonstrating the normality of the variables is reported on Appendix 3D.

iii:Table 3.3: Summary Statistics

Variable	Mean	St. Dev	P25	P75	Skewness	Kurtosis
Annualised Return	0.10	0.44	-0.11	0.24	2.29	16.21
Beta	0.70	0.71	0.08	1.12	0.65	3.25
Bid-Ask	0.01	0.08	0.00	0.00	10.95	12.43
Capital Expenditure	0.02	0.09	-0.01	0.04	0.06	10.64
CAR_1TO1	0.01	0.08	-0.02	0.03	2.73	12.15
Cash Holdings	0.16	0.18	0.04	0.20	2.05	7.29
Entropy	0.06	0.05	0.02	0.08	0.21	1.04
Excess Return (Equal Weighted Portfolio)	0.00	0.40	-0.21	0.13	1.01	6.48
Excess Return (Market Capital Weighted Portfolio)	0.00	0.41	-0.21	0.13	1.07	6.58
Gini	0.03	0.03	0.01	0.03	2.85	15.49
HHI Score	0.41	0.28	0.18	0.58	0.78	2.41
Interest Rate	1.56	2.02	0.26	1.18	1.17	2.47
Leverage	0.13	0.14	0.00	0.20	1.40	4.89
Market Capitalisation	£46M	£229M	£222K	£3M	26.90	1348.11
Market share	0.14	0.69	-0.08	0.16	4.64	30.44
Market to Book	1.35	1.67	0.47	1.51	3.49	17.80
Net Working Capital	0.00	0.18	-0.09	0.10	-0.51	5.55
No of firms in industry	48	39	21	59	1.44	4.62
Organic	0.12	0.33	0.01	0.85	2.37	6.60
Q	1.19	0.94	0.62	1.49	4.47	7.29
Relative Size	0.05	0.20	0.00	0.03	10.76	157.34
ROA	0.03	1.92	0.05	0.17	-0.56	3.76
Size	12.73	3.43	10.17	15.07	0.58	2.99
Total Asset	£88.8 M	£495M	£261K	£3.5M	156.23	34995.52

The table presents the descriptive statistics of the variables used in the three empirical chapters of the thesis. Values for the mean, standard deviation, 25th percentile and 75th percentile are reported in the 2nd, 3rd, 4th and 5th column respectively. The sample consists of non-financial firms listed on the London Stock Exchange. All variables are defined on table 3.2.

The value reported for cash holdings indicate firm cash holdings is on a rise. Compared to the mean value of 10% reported by Ozkan and Ozkan (2004), who study the impact ownership on firm cash holdings in the UK, the mean value of cash holdings reported in table 3.3, demonstrates that the mean value of cash holdings has risen by 6% between 2004 and 2017. This thesis adds to the literature on cash holdings, particularly the UK based studies by providing novel explanations for the trend in cash holdings as well as the implications of the trend for firms, industry and investors. However, the average value of cash holdings reported in this thesis is similar to recent UK studies on cash holdings (see for example, Florackis and Sainani, 2018). Similarly, size, leverage, capital expenditure and market to book ratio reported are comparable to the values reported by Ozkan and Ozkan (2004) and Florackis and Sainani (2018).

The standard deviation of cash holdings (18%) is higher than the standard deviation of leverage (14%). This may suggest cash holding policies are more volatile than leverage policy. Firm cash reserves may serve as a buffer against the adverse effect of bad economic cycle (Kim, Mauer and Sherman, 1998; Uyar and Kuzey, 2014). Therefore, because cash is the most accessible internal resource available to combat this anomaly, firm cash holding policy may be volatile and subjective to managerial choices. Compared to other UK studies like Ozkan and Ozkan (2004), Florackis and Sainani (2018) and Farinha, Mateus and Soares (2018), the mean values of ROA, dividend, capital expenditure, size and market to book ratio reported in this thesis aligns with previous estimates.

i:Figure 3.1: Trends in Cash Holdings, Sales Growth, Leverage, Investment and ROA
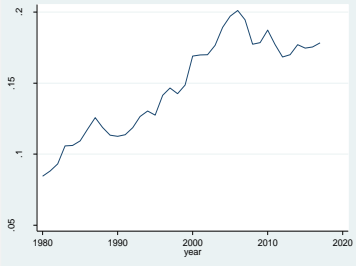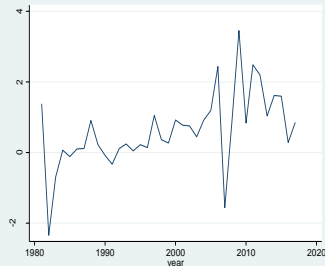
a)Cash Holding Trend   *b)Sales Growth Trend*   *c)Leverage Trend*   *d)Investment Trend*   *e)ROA Trend*
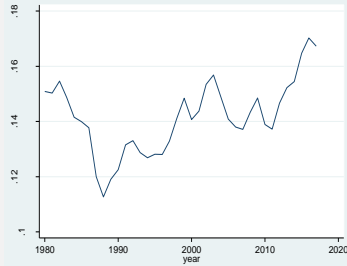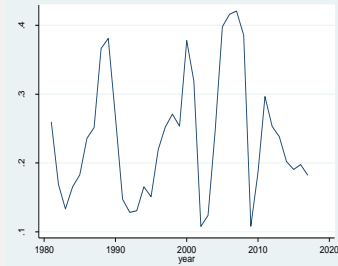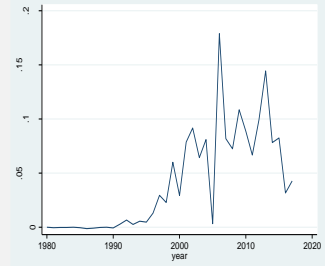
As depicted in figure 3.1a, cash holdings are on a constant rise. Although the upward long-run behaviour in cash held as proportion of total assets appears to have slowed down after the financial crisis. The long-run behaviour demonstrated in figure 3.1a aligns with recent reports by Deloitte and Bloomberg who posit that cash held by UK firms is on the rise. The reason for the change in this tendency in the UK remains largely unaddressed in the literature. This thesis attempts to provide some explanation for the reason and potential implication of this behaviour. When compared to cash holdings, leverage increased consistently since the financial crisis. The demonstrated long run behaviour aligns with the findings of Pattani, Vera and Wackett (2011), who posit that despite increases in volatility, debt and equity issuance has increased in the UK since the financial crisis.

Figure 3.2 demonstrates changes in cash holdings compared to investment, leverage and market share. The behaviour in figure 3.2a indicates that changes in cash holdings and investment are similar. Periods of increases in cash holding appear to coincide with periods of increases in investment. Although, previous studies on cash holdings and investment posit that cash rich firms are able to pursue optimal investment policies (see for instance, Opler *et al.* 1999 and Ferreira and Vilela, 2004). This evidence motivates further scrutiny of the reason for the apparent similarity in the long-run behaviour between changes in cash holdings and corporate investment. The thesis provides explanation for this behaviour by examining the relationship between cash holdings and corporate investment. I address this by evaluating the market perception of cash holdings during announcements of corporate investment decisions. Figure 3.2b reinforces the claim that cash and leverage are related (See for instance Opler *et al.*, 1999, Ozkan and Ozkan, 2004), and Harford, Klasa and Maxwell, 2014). The graph indicates that during periods of increased cash holdings there is a decrease in leverage. This further reaffirms

the position of Acharya, Almeida and Campello (2007), who contend that inferences on the relation between cash and leverage should be separated.

From figure 3.2c, it appears that slight changes in cash holdings coincide with much larger changes in market share. This points to a potentially strong relationship between firm cash holdings and firm competitiveness among UK firms. This thesis investigates this trend by evaluating the relationship as well as the potential implication of the relationship.

ii: Figure 3.2: Changes in Cash Holdings, Investment, Leverage, and Market Share

a) Changes in cash holdings and investment

b) Changes in cash holdings and leverage

c) Changes in cash holdings and market share
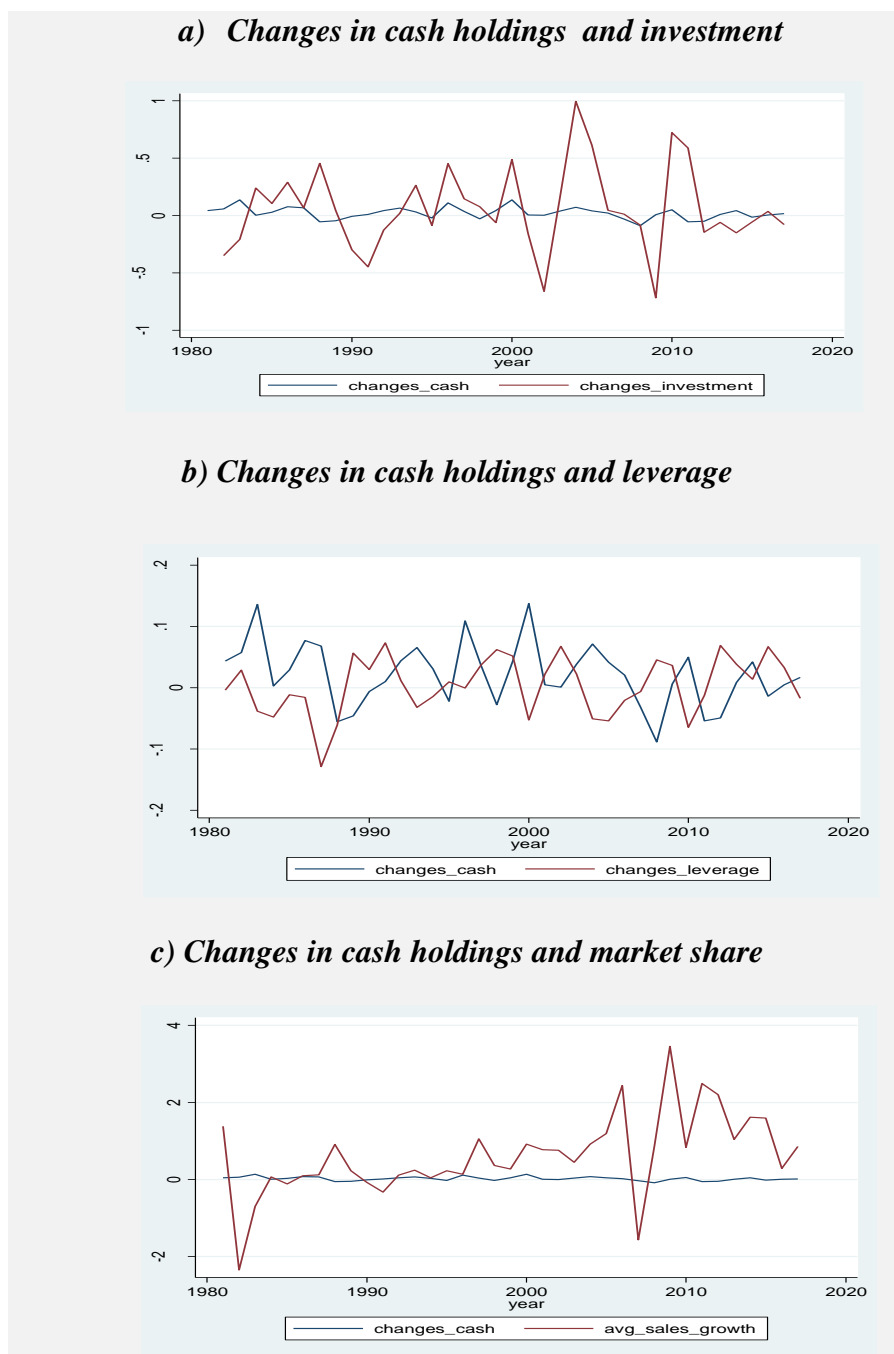
3.4 Methodology

In this section, the thesis provides a brief outline of the models and estimation procedures employed in the study. The thesis adopts various regression estimation procedures, such as Generalised Least Squares (GLS), Ordinary Least Squares (OLS), Two-Stage Least Square (2SLS), and Difference in Differences Regression (DiD). The thesis also uses the Event Study methodology. The choice of this methods is informed by the structure and nature of the data as well as the research question to be addressed. More comprehensive discussions on the procedures and models are provided in the three empirical chapters (Chapters IV, V, and VI).

3.4.1 Regression Analysis

In the empirical chapters, the study uses a mixture of ordinary least squares (OLS), difference in differences regression and instrumental variable regression (2SLS) to test the respective hypothesis. These estimation approaches are popular among studies in the cash holdings literature.[19]

Ordinary Least Squares

The estimates of the OLS are only credible if the orthogonal conditions of the independent variable and error terms are met, if these conditions are violated, then the model is inconsistent (Wooldridge, 2010). The Gauss-Markov theorem posits that the OLS has the least sampling variance among linear unbiased estimator if errors in the model; are uncorrelated, have equal variances and an expected value of zero (Theil, 1971). The first assumptions of the OLS is that it must be linear in parameters. The dependent variable y is related to the independent variable x and the disturbance term u, as,

$$Y = \alpha_0 + \beta_1 x + u \ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

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[19] For instance, Opler et al (1999), Ozkan and Ozkan (2004), Ferreira and Vilela (2004) and Fresard (2010) use similar approaches in their study.

The betas refer to the intercept and slope, respectively. The second assumption of the OLS regression is that the sample size from the population above is random. The third assumption is that the values of the explanatory variable in the sample varies. The fourth assumption is that the error term u has an expected value of zero for each regressor, in other words,

$$E = (U|X) = 0 ……………. (3.2)$$

Another important assumption is that the error u, has the same variance for each value of the regressor, this can be represented as,

$$Var(U|X) = \sigma^2 ……………….. (3.3)$$

In cases where I adopted the OLS methodology in this thesis as the preferred estimation technique, none of this assumption is violated.

Instrumental Variable Regression (IV)

To mitigate the problem of measurement error and omitted variable, instrumental variables can be applied (Wooldridge, 2010). In essence, IV can be deployed when there is the problem of endogeneity of explanatory variable or variables. Instrumental variable estimates use instruments that (a) Have a relationship with the endogenous explanatory variable (b) Have no relationship with the error term (c) Are not explanatory variable in the regression model (Murray, 2006). Therefore, I can still use equation 3.1, as long as I can find a suitable instrument, then I can express the assumptions in the following equation,

$$Cov\ (x, u) \neq 0 …………… (3.4)$$

Hence, I believe *x* and *u* are correlated. Given this condition, to ensure our beta estimates are consistent, our new variable must meet a new requirement. Suppose I have a variable *z* that satisfies the assumption that *z* is uncorrelated with u, that is,

$$Cov\ (z, u) = 0 ……………….. (3.5)$$

As well as the assumption that z is correlated with x,

$$Cov\ (z, x) \neq 0 \ldots\ldots\ldots\ldots \text{(3.6)}$$

In this case, I can call z an instrumental variable for x. I can simply summarise all the aforementioned conditions by saying z is exogeneous to equation 3.1.

For the first empirical chapter (chapter IV), the study employs a combination of difference-in-differences regression and instrumental variable regression. The motivation for using the difference-in-difference approach is because the structure of the formulated hypothesis requires a comparison of estimates from the untreated and treated group. A simple form of a difference in differences regression can be stylised to measure the outcomes for two groups over two periods. The first group is exposed to an effect/treatment in the first period but not the second period while the second group is not exposed to this effect in both periods (Woolridge 2010, Greene 2012). The difference in difference regression can be represented as:

$$y_i = x_i\beta + \delta D_i + \varepsilon_i \ \ldots\ldots\ldots\ldots.\text{(3.7)}$$

The parameter δ measures the effect of the treatment or changes in a policy (conditioned on x) on the sample. When comparing one group to another, the difference in differences regression can be represented as:

$$y_i = \beta_1 + \beta_2 D_i + \varepsilon_i \ \ldots\ldots\ldots\ldots\ldots.\text{(3.8)}$$

Where $\beta_1=(\bar{y}|D_i = 0)$, which is the average outcome of the members of the group who did not experience the effect of the changes. $\beta_2=(\bar{y}|D_i = 1)$ - $(\bar{y}|D_i = 0)$ represents the difference in the means of the two groups. As in Frésard and Valta (2016), the thesis matches the treated and untreated group using the Mahalonobis algorithm.

The Mahalonobis distance could be defined as

$$[X_I + \bar{X})\ ^{\text{t}}\ C^1\ (X_I - \bar{X})]\ ^{0.5} \ \ldots\ldots\ldots\ldots \text{(3.9)}$$

Where: $X_i =$ an object vector and $\bar{X} =$ arithmetic mean vector and C is the covariance coefficient of the matrix. (Varmuza and Filzmoser, 2016). In addition, because cash holdings may be related to market share (industry adjusted sales growth) indicating a potential selection problem. In essence, firms may be cash rich because they control most of the industry market share. To address this concern, the thesis adopts a two-stage estimation procedure. Since OLS estimations may be biased for reasons such as measurement errors, simultaneity effects, omitted variables, or Endogeneity, an Instrumental Variable regression addresses some of this concerns (Wooldridge 2010).First, it estimates the relationship between cash holdings and market share by predicting firm cash holdings using two instruments; the lagged value of cash holdings and asset tangibility. Thereafter, the predicted value of cash holdings is regressed against market share. This is approach is similar to the method used in Berger, Ofek and Swary (1996) and Fresard (2010). This ensures estimates are not subject to biases and mitigates the identification problem.

For estimating the pooled regression in the second empirical chapter (chapter V), the thesis uses an OLS estimation as none of the rules of the OLS appears to have been violated. Hence, estimates are not subject to bias. The thesis augments the estimation by generalising the maximum likelihood estimates of β where the noise/disturbances are of unequal variance (heteroscedastic). Further discussions on the estimation procedure are provided in the empirical chapter.

3.4.2 Event Study

The event study methodology is predicated on the concept of an efficient market. Following this theoretical construct, share prices adjust to new information (Konchitchki and O'Leary, 2011). To estimate market valuation of corporate investment valuation, this thesis utilises the event study methodology. Using the Fama, French and Carhart model,

the market model, and the index model, the study estimates the abnormal returns (ARs) during the investment announcement. Abnormal returns are calculated for the relevant event window on the relevant days.[20] The thesis follows a similar approach as MacKinlay (1997) and estimate the betas for computing the ARs using 265 trading days prior to the event date. This mitigates the problem of bias beta estimates. Following results from t-test, the thesis identifies the relevant event window. Furthermore, to limit the interference of confounding effects on the AR estimates, the thesis limits ARs to a period of -1 to +1.[21] Thereafter, abnormal returns are cumulated over relevant periods surrounding the investment announcement. Cumulative estimates over this period are referred to as cumulative abnormal returns (CARs). The CARs reflect to what extent the market integrates new information into the prices of companies. Market responses can be positive or negative depending on the manner of the information (Konchitchki and O'Leary, 2011).Further details of the methodology are detailed in the chapter as they differ with the testable hypotheses. The next section presents a summary of the chapter as well as the structure of the remainder of the thesis.

3.5 Summary

In this chapter, the thesis briefly discusses the sample screening procedure, variable description, and the research methodology. The data indicates that cash holdings is on a rise, this may indicate the inefficiency of the capital market. The summary statistics indicates firm cash holdings policy is more volatile than leverage, this may suggest firms' cash reserves is subjective to managerial choices.

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[20] The thesis computes abnormal returns using daily returns, Mackinlay (1997) argues that this approach is very effective for identifying abnormal share performance.

[21] Confounding effect occurs when there is another price relevant information during the time of the event of interest such that the changes in share prices can be equally attributed to the information from the event of no interest.

The graphical illustration of the time series plot for the relationship between cash holdings and investment indicates a direct relationship between changes cash holdings and changes in investment. The time series graphs also indicate that increase in cash holdings level coincide with decreases in leverage. Similarly, the trend analysis suggests that slight increases in cash holdings levels coincides with severe increases in market share. This may suggest a strong relationship between cash holdings and competition. All this put together indicate the need to examine the relationship between cash holdings, investment, and competition. The negative relationship between cash holdings and leverage indicated further echoes the debate on whether cash is simply a substitute of debt? This thesis addresses this question by evaluating the role cash plays during increased competition. Particularly, this thesis examines how firm alter cash holdings during period of increased competition comparative to existing studies on increased competition and leverage (See for instance Valta, 2012).

The remainder of this thesis is structured as follows. Chapter 4 discusses the results of relationship between cash holdings and firm competitiveness. In chapter 5, the thesis presents the findings on the relationship between firm cash holdings and market valuation of different classes of corporate investment announcement. Chapter 6 presents the results on the value and performance of abnormally high cash holding firms. In chapter 7, the thesis discusses the conclusion of the research, limitation and identify areas further research.

Appendices to Chapter 3

Appendix 3A: Student Experiment on Accuracy of Classification

Investment Classification	Student A	Student B	Student C	By Investment Class
Acquisition of Asset	85%	91%	92%	89%
Acquisition of Company	100%	78%	98%	92%
R and D	85%	82%	89%	85%
Product Launch	90%	92%	100%	94%
Accuracy	90%	86%	95%	90%

Appendix 3B: Industry distribution of Investment announcement

Panel A: Distribution of Announcements by Industry

Industry	Percent	Cum.	
Aerospace & Defense	139	4.28	4.28
Automobiles & Parts	23	0.71	4.98
Beverages	20	0.62	5.6
Chemicals	30	0.92	6.52
Construction & Materials	133	4.09	10.61
Electricity	25	0.77	11.38
Electronic & Electrical Equipment	63	1.94	13.32
Fixed Line Telecommunications	31	0.95	14.27
Food & Drug Retailers	34	1.05	15.32
Food Producers	41	1.26	16.58
Forestry & Paper	17	0.52	17.1
Gas, Water & Multiutilities	69	2.12	19.22
General Industrials	61	1.88	21.1
General Retailers	96	2.95	24.05
Health Care Equipment & Services	65	2	26.05
Household Goods & Home Construction	52	1.6	27.65
Industrial Engineering	110	3.38	31.04
Industrial Metals & Mining	4	0.12	31.16
Industrial Transportation	56	1.72	32.88
Leisure Goods	10	0.31	33.19
Media	432	13.29	46.48
Mining	139	4.28	50.75
Mobile Telecommunications	27	0.83	51.58

Appendix 3B: Industry distribution of Investment announcement continued

Mobile Equipment	1	0.03	51.61
Oil & Gas Producers	64	1.97	53.58
Oil Equipment & Services	99	3.05	56.63
Personal Goods	14	0.43	57.06
Pharmaceuticals & Biotechnology	271	8.34	65.4
Software & Computer Services	143	4.4	69.79
Support Services	671	20.64	90.43
Technology Hardware & Equipment	55	1.69	92.13
Tobacco	14	0.43	92.56
Travel & Leisure	242	7.44	100
Total	3,251	100	

Panel B: Distribution of Announcement by Year

Year	Freq.	Percent	Cum.
2005	129	3.97	3.97
2006	308	9.47	13.44
2007	347	10.67	24.12
2008	308	9.47	33.59
2009	209	6.43	40.02
2010	303	9.32	49.34
2011	370	11.38	60.72
2012	313	9.63	70.35
2013	208	6.4	76.75
2014	243	7.47	84.22
2015	255	7.84	92.06
2016	258	7.94	100
Total	3,251	100	

Appendix 3C: Histogram Distribution

a.) *Zcash*
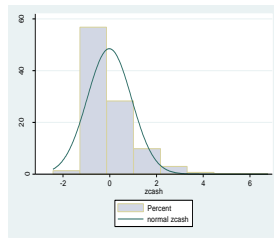
b.) *Leverage*
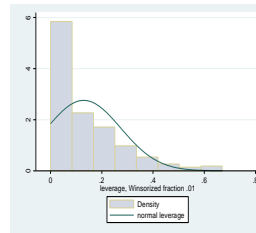
c.) *Cash holdings*
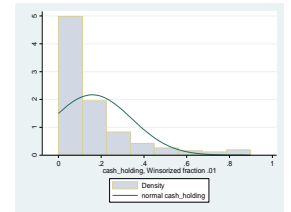
d.) *Beta*
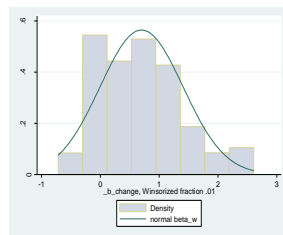
e) *Residuals of Cash holdings*
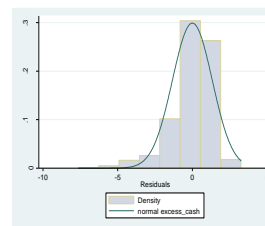
f.) *Annualised returns*
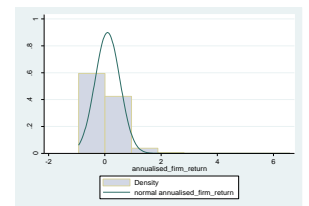
g.) *Investment*
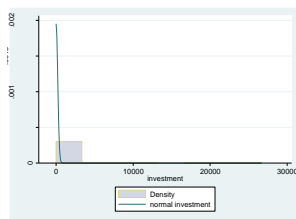
h.) *Market share*
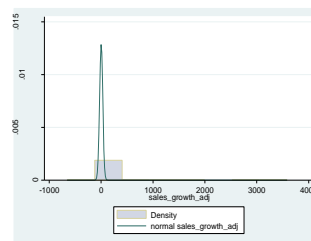
i.) *Excess returns (IW)*
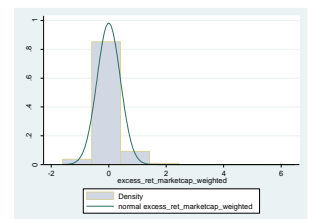
j.) *Market to book ratio*
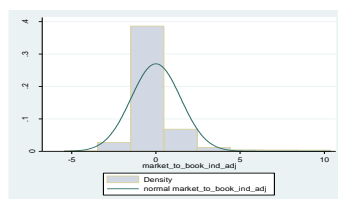
k.) *ROCE*
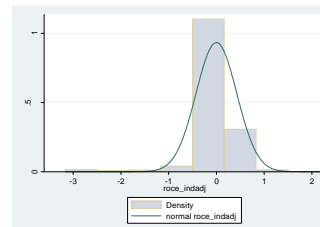
l.) *Net working capital*
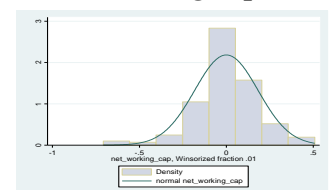
m.) *ROE*
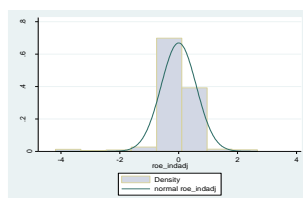
i) *ROA*
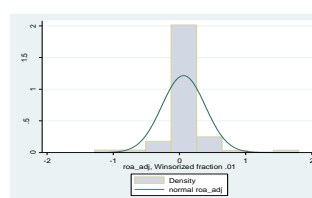
j.) *Excess return (EW)*
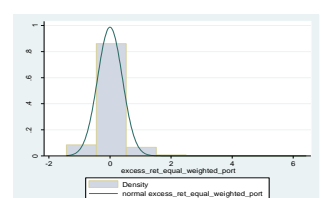
Appendix 3C: Histogram Distribution Continued

k.) Capex
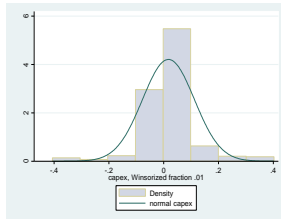
l.) Log of Cash holdings
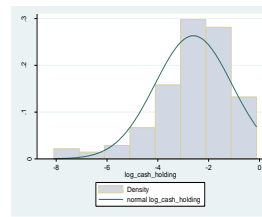
m.) Cashflow
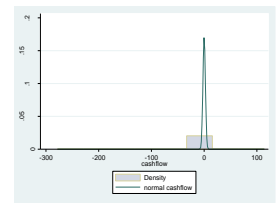
n.) Gini coefficient
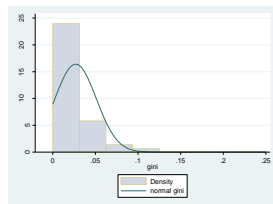
o.) Size
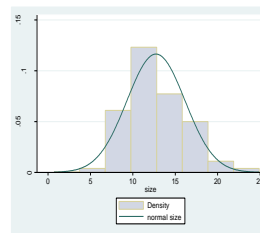
p.) Entropy index
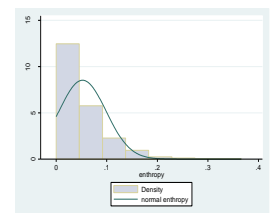
q.) Growth in firms
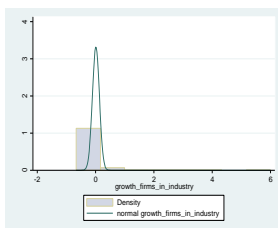
r.) Enterprise Value
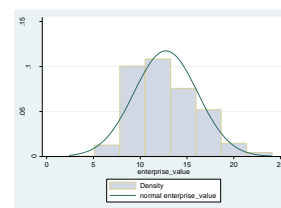
s.) HHI score
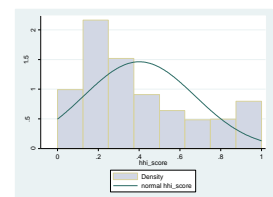
t.) Asset tangibility
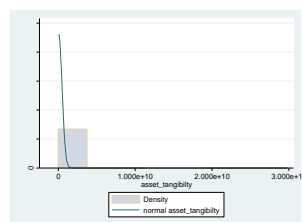
Appendix 3D: Shapiro-Francia Test for Normality

Variable	W	V	Z	Probability
Annualised Return	0.84921	121.41	0.004	0.49854
Beta	0.9346	52.655	0.004	0.49854
Bid-Ask	0.96442	28.647	0.004	0.49854
Capital Expenditure	0.43005	458.453	0.004	0.49836
CAR_1TO1	0.12015	1056.317	0.0015	0.49836
Cash Holding	0.4107	707.524	0.002	0.49836
Dividend	0.13977	692.419	0.004	0.49849
Entropy	0.86223	110.922	0.004	0.49854
Excess Return (Equal Weighted Portfolio)	0.91425	69.045	0.004	0.49854
Excess Return (Market Capital Weighted Portfolio)	0.85501	116.74	0.004	0.49854
Gini	0.86115	111.796	0.004	0.49854
HHI Score	0.85605	115.9	0.004	0.49854
Interest Rate	0.85605	26.216	0.00001	0.49854
Leverage	0.84964	83.058	0.006	0.49854
Market Capitalisation	0.71726	6.50E+02	0.004	0.49854
Market share	0.86223	110.922	0.004	0.49854
Market to Book	0.89603	83.628	0.004	0.49835
Net Working Capital	0.66921	38.044	0.004	0.49835
No of firms in industry	0.89682	83.058	0.004	0.4985
Organic	0.19289	649.843	0.004	0.49854
Q	0.01084	793.44	0.006	0.49746
Relative Size	0.01102	793.408	0.006	0.49754
Research and Development	0.61159	312.731	0.004	0.49854
ROA	0.72115	224.513	0.004	0.49854
Size	0.95272	38.044	0.004	0.49844
Total Asset	0.02247	811.093	0.133	0.4472

The table presents the Shapiro–Francia test (Shapiro and Francia 1972; Royston 1983; Royston 1993a). The test is an approximate test that is similar to the Shapiro –Wilk test for very large samples. With a threshold probability above 10%, we but we cannot reject the hypothesis that a variable is normally distributed.

Chapter 4
Cash Holdings and Firm Competitiveness

4.0. Summary

I examine whether product market competition is a key driver of firm cash holdings. The findings suggest that cash is an important strategic tool for managers to increase market share. Using various measures of competition intensity, I find that firms increase cash holdings during periods of increased competition. Next, I evaluate how firms' responses to increased competition vary with the ease with which their investment opportunities can be replicated (predatory threat) and the difficulties companies face in accessing capital markets (financing frictions). The results suggest that the degree of increase in cash holdings is magnified among firms exposed to high predatory threat and financing frictions. In addition, I examine if increasing cash holdings offers competitive advantage in the product market. The results indicate that firms with large cash reserves make gains in market share at the expense of their rivals, the gains in the product market are more pronounced among firms with low exposure to predatory risk and financing frictions.

Keywords: cash holdings, firm competitiveness, product market competition, predatory threat, financing frictions.

4.1 Introduction

In this chapter, I evaluate whether firms increase their cash reserves in response to increased competition. Following the literature on product market competition, particularly the work of Valta (2012), who contends that competitive pressure reduces a firm's pledgeable revenue by increasing cash flow risk, default risk and ultimately increasing bank lending rate. I argue that since increased competition results in increased cost of debt, firms will favour financing their activities with internal rather than external funds during periods of intense competition. Hence, as a response to increased competition intensity, firms would increase their cash reserves. Furthermore, I investigate how, under increased competitive pressure, changes in firm's cash holdings vary with the degree of product differentiation and financing frictions.[22]

Despite substantial developments in the financial market, corporations still favour holding large cash reserves in their coffers. For instance, Deloitte (2014a) report that the cash held by the top 1000 global non-financial firms had reached $3.53trillion in 2013. In the S&P500, cash held by non-financials reached $1.9trillion in 2016, five years earlier the total value of cash held was just $510billion (S&P Global, 2017). During the financial crisis, cash held by FTSE100 non-financials exceeded $131billion. As of 2013, UK companies held cash amounting to $181billion (Deloitte, 2014b).

The motivation for the high cash holdings trend has been subject of much discussion by industry practitioners and researchers alike. For instance, Harford (1999) demonstrates how firms that pursue a high cash holdings policy engage in investments which are perceived to be value-destroying. Other studies such as Opler *et al.* (1999), Opler *et al.* (2001), Bates, Kahle and Stulz (2009) and Bolton, Chen and Wang (2011) contend that

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[22] Financing frictions refers to financial constraint and all other challenges associated with the ease of access to the financial market.

as a result of high growth opportunities, financial constraints, volatile cash flow, and the high transaction costs associated with raising external finance, firms increase their cash holdings. In a press release on 22nd January 2014, <u>Deloitte</u> argue that there is a polarisation in the cash holdings of FTSE non-financial firms <u>(Deloitte, 2014c)</u>. They posit that most of the cash is held by a small number of firms. In another article in the Financial Times <u>(FT, 15th September 2013)</u>, they reveal that the growth in net cash (cash minus short term debt) is accelerating. Such trends beg the question, why are firms increasing their cash reserves? An emerging strand of the literature focuses on an alternative motivation for cash holdings. Recent evidence in the literature has brought to light the strategic advantages of holding cash. The cash-holding policy adopted by a firm is associated with the anticipated degree of competition among its rivals (Lyandres and Palazzo, 2016). To this effect, Fresard (2010) emphasises the strategic dimension of cash holdings and argues that due to large cash reserves corporations can make gains in competitive industries at the expense of industry rivals.

Cash can offer competitive advantage in several ways. For example, due to an increase in competition in a high growth environment, leaders of firms exposed to high predatory risk respond by increasing their corporate investment to deter entrants (Akdoğu and MacKay, 2008; Aguerrevere, 2009; Jiang *et al.*, 2015). When the speed of adjustment to the competitive environment is key, cash may offer a pre-emptive advantage and reinforce other corporate strategies. Cash-rich firms may resort to further enhancing their capability to discourage rivals (Álvarez and Hernando, 2007). Capabilities create competitive organizational assets in form of speed, efficiency, flexibility, incremental improvements and innovations (Baldwin and Clark, 1992; Stalk, Evans and Shulman, 1992; Watts, Kim and Hahn, 1995).

This study is conducted using UK data. The UK setting offers some advantages in evaluating the interplay between cash holdings and product market competition. Firstly, my study provides some empirical insight regarding the implications and motivations for increasing levels of cash holdings. Furthermore, as identified by La Porta *et al.* (1997), La Porta *et al.* (2000) and Gaud, Hoesli and Bender (2007) corporate finance practice is not uniform worldwide, country factors such as the legal system, culture, developmental status and institutional structure could shape corporate practices in specific jurisdictions. The legal competitive structure of the UK is uniquely appropriate for my study. Being a member state of the European Union (EU) during the period of the study, the UK is compelled to adhere to externally determined rules and regulations on competition. The EU competitive environment operates as a unified financial market and as such allows for *"near-perfect capital mobility"* (Mendoza and Tesar, 2005, p. 163). Using a sample of firms listed on the London Stock Exchange (LSE) offers the opportunity for testing the relationship between product competition and cash holdings in the most liquid non-US market (Galariotis and Giouvris, 2007). In addition, the LSE is one of the most attractive markets internationally (FT, 24th March 2006).

I contribute to the existing literature in several ways. Firstly, I extend the existing literature on the determinants of cash holdings (Opler *et al.*, 1999; Pinkowitz and Williamson, 2001; Ozkan and Ozkan, 2004; and Bates, Kahle and Stulz, 2009) and demonstrate how increased competition can affect firm cash holdings. To the best of my knowledge, I am the first study to document a direct link between cash holdings and increased product market competition. Secondly, I extend the growing strand of literature that identifies the strategic benefit of financial flexibility and specifically cash reserves in the product market. For instance, Fresard (2010) and Lyandres and Palazzo (2016) argue that cash offers significant advantages in competitive industries. I proffer novel evidence on the potency of cash in the product market. I find that the gains from increased cash

holdings vary with firm specific characteristics including the degree of product differentiation, hedging requirements and financing frictions. Lastly, I provide new evidence on how firms use cash holdings to gain competitive advantage in the product market using a distinct setting - the UK.

Our findings are as follows. Firstly, I find that firms increase cash holdings as the degree of intensity of competition increases. The results suggest that the degree of increase in cash holdings is intensified among firms with low degree of product/service differentiation (i.e. firms exposed to predatory threats). Further, the results suggest that firms exposed to higher financing friction increase their cash holdings to a higher degree than their counterparts. In addition, I find that firms with high cash reserves make gains in market share at the expense of their rivals in the product market. Accordingly, I demonstrate that gains in the product market as a result of increased cash holdings are amplified if a firm has low exposure to predatory threats (i.e. high degree of product differentiation) and low exposure to financing frictions.

The remainder of this chapter is structured as follows: section 2 presents the link between cash holdings and competitiveness. The data and methodology used in this study are outlined in section 3. Section 4 presents the findings of the study and the robustness checks and section 5 concludes the study.

4.2 Cash Holdings and Product Market Competition

The role of firm financial policy in the product market is well documented in the finance literature (see for example Fresard, 2010; Valta, 2012; Alimov, 2014). Although prior studies document a link between financial policy and firms' competitiveness in the product market, most studies focus on identifying the role of debt in the product market.

Such studies rely on the argument that cash and debt are substitutes. However, Acharya, Almeida and Campello (2007) and Fresard (2010) argue that cash and debt play distinct roles in satisfying a firm's financing needs.

There are several ways in which cash can be used as a strategic tool. Firstly, when the speed of adjustment to the competitive environment is key, cash may offer some pre-emptive advantages. Firms can deter entry into its competitive space or maintain competitiveness by means of corporate investment. During periods of increased competitive pressure, managers and firms exposed to high predatory risk respond by increasing their corporate investment (Akdoğu and MacKay, 2008; Aguerrevere, 2009; Jiang *et al.*, 2015). As a result of the first mover advantage and the exercise of existing growth options, cash-rich firms are able to shield themselves from the adverse effects of increased competition.

Similarly, Valta (2012) asserts that the cost of debt is higher for firms in competitive product markets. Increased competition can have adverse effects on a firm's default risk and asset liquidation value which in turn raises the bank lending rate. Further increases in competition will result in increases in the already expensive cost of debt, hence rendering debt less attractive to managers. In such industries, cash becomes an attractive means of responding to competitive threats. Therefore, cash-rich firms can strategically position themselves during periods of increased competition at the expense of other competitors. As documented in the literature, failure to respond to insurgence into competitive space quickly and adequately will result in losses in the product market (Froot, Scharfstein and Stein, 1993; Haushalter, Klasa and Maxwell, 2007; Jiang *et al.*, 2015). Accordingly, the lack of immediate sources of finance, may expose the firm to predatory risk. By implication, one firm's failure to react quickly results in another firm's gain.

In the strategic management framework of Akdoğu and MacKay (2012), cash can be used to exercise good investment opportunities. Cash-rich firms can respond faster than rivals during periods of increased competition or uncertainty. The presence of cash also indicates cash-rich firms are less likely to fall behind rivals since they can quickly exercise their investment options when competition becomes intense or their current share of the market is threatened. Firms can also use aggressive pricing as a means of deterring new entrants. By means of a strong financial position, firms may challenge a new entrant or rival by attacking their profitability. Methods adopted may include reducing prices such that entrance to the industry becomes less attractive (Bolton and Scharfstein, 1990).

Cash-rich firms may seek to further enhance their ability to discourage rivals and new entrants when their market share is threatened. By creating organizational assets in form of speed, efficiency, flexibility, incremental product or service improvements and innovations, combined with human skills, organisational procedures, physical assets as well as a collection of information systems that enhance performance (Baldwin and Clark, 1992), firms can develop defensive capabilities. These might include investment in form of relocation of stores, plants, upgrading distribution networks, funding advertisement campaigns targeted at rivals, or recruiting more efficient and productive personnel (Campello, 2006). Such actions require a rapid response to increased competition and may be delayed by financing frictions. Hence, they are better suited to cash financing.

Lastly, high cash holdings can be used as a tool for signaling aggressive behaviour to rivals, therefore distorting the activities of rivals in the product market. By building up superior cash position, deep pocketed firms indicate they can increase the business risk of rivals by distorting their cash flow and ultimately forcing them to exit an industry (Benoit, 1984; Bolton and Scharfstein, 1990; Campello, 2006).

4.2.1 Cash Holdings and Increased Competition Intensity

The role of cash as a strategic tool is well documented in the literature. For instance, Haushalter, Klasa and Maxwell (2007), Duchin (2010), Fresard (2010), Kim and Bettis (2014), and Lyandres and Palazzo (2016) discuss the role of cash as a strategic tool. However, few studies have provided empirical evidence on exactly how cash provides strategic advantage to firms. An emerging strand of the literature focuses on the relationship between cash holdings and product market competition. The evidence suggests that cash holdings policies are dictated by the firm's competitive environment (Fresard, 2010; Lyandres and Palazzo, 2016).

The existing literature on cash holdings and product market competition identifies the strategic role of cash in the product market. The question of whether firms increase their cash in response to increased competition remains unanswered. Why should firms increase their cash in response to increases in competition? Chief among the reasons why firms increase their cash reserves in response to increased competition is the rise in the cost of debt (Valta, 2012). As discussed above, financing both new and existing projects internally becomes a more attractive alternative for firms during periods of intense competition and when time is of the essence. Furthermore, cash is a primary tool for deterring entrance and expanding market share (Fresard, 2010; Akdoğu and MacKay, 2012; Lyandres and Palazzo, 2016). In this framework, firms will increase their cash reserves in order to maintain and enhance their competitive position. Hence, my first hypothesis is:

H1: Firms increase their cash holdings as competition increases.

4.2.2 Cash Holdings, Increased Competition Intensity, and Predatory Risk

The ability of a firm to effectively compete in the product market is a function of the level of internal liquidity the firm controls (Telser, 1966; Bolton and Scharfstein, 1990). The main merit of financial slack is that it affords a firm the ability to be flexible in the product market (Bolton and Scharfstein, 1990). As a result of this flexibility, firms can react promptly and aggressively to predatory actions of rivals in the product market. In addition, they can create barriers in their competitive space, hence restricting the entrance of new or potential rivals. Through cash, firms in such competitive space can fund various competitive strategies to deter entry or maintain competitive advantage. Competitive strategies can be in form of aggressive pricing, investment in capabilities, or simply increase cash to convey competitive signals (Bolton and Scharfstein, 1990; Campello, 2006).

The competitive merit of cash holdings is largely dependent on the nature of competitive interaction in a firm's product market. Froot, Scharfstein and Stein (1993) argue that increased cash holdings are more valuable in product markets where firms compete with closely related products/services. Accordingly, in such competitive space, there is a high degree of interdependence of growth opportunities. As discussed previously, Valta (2012) argues that the cost of debt increases as competition increases. Debt financing is thus rendered less attractive during periods of increased competition. By implication, the impact of increased competition will be amplified in industries where firms compete with strategic substitutes. If a firm wants to retain its competitive advantage in such an industry, it must internally fund growth opportunities. Failure to promptly fund investment opportunities will result in the loss of market share to rivals during periods of increased competition.

Taken together, these arguments imply that cash should be more valuable to firms in industries where there is high predatory risk. Therefore, such firms must seek to increase cash holdings as competition increases since the barriers to entry in such industries are typically low. For instance, barriers to entry would be expected to be higher in the Airline industry than in the restaurant and bar industry. Following the predatory threat-based theories, my second set of hypotheses is:

H2a: Increases in cash holdings during increased competition are positively associated with the degree of exposure to predatory threat.

Furthermore, since rivals cannot easily replicate investment opportunities if a firm's product/service significantly differs, I posit that:

H2b: Gains in market share associated with increased cash holdings are negatively associated with the degree of exposure to predatory risk.

4.2.3 Cash Holdings, Increased Competition and Financing Frictions

Cash differs substantively from negative debt. Cash confers a different advantage to a firm in the competitive market. Cutting back on indebtedness today does not guarantee access to more debt in the future. Therefore, future financing needs are not met merely by reducing debts today (Acharya, Almeida and Campello, 2007). Due to financing frictions, firms with excess cash reserves build up their reserve to combat exposure to financing shortfalls (Hennessy, Levy and Whited, 2007). Previous evidence by Kaplan and Zingales (1997) suggests that in the presence of financing frictions, the optimal level of investment is a function of the extent of exposure to financing frictions and the internal finances available to the firm.

Faulkender and Wang (2006), Pinkowitz, Stulz and Williamson (2006) and Denis and Sibilkov (2009) document that cash is of more value to financially constrained firms. Therefore, due to the presence of market imperfections and financing frictions, constrained firms often rely on internal finance to fund operating and investment needs. Cash, therefore, is of utmost importance for the survival of firms exposed to financing frictions. Accordingly, my third set of hypotheses is as follows:

H3a: During periods of increased competition, increases in cash holdings are positively associated with the degree of exposure to financing frictions.

H3b: Gains in market share (associated with increased cash holdings) are negatively associated with the degree of exposure to financing frictions.

4.3. Data and Methodology

4.3.1 Data

Firm-level data for all UK listed non-financial firms are collected from Thomson Reuters Datastream (2017) for the period 1980-2017. To ensure firms engaged in similar activities are categorised into appropriate groups, I employ a narrow classification of industries. I rely on the Thomson Reuters Industry level 5 classifications.[23] This ensures firms within the same economic markets are grouped together. Similar to Fresard (2010), this procedure results in the allocation of my data into 105 industry groups. Details of the industry groups are reported in Appendix 4C. After excluding financial industries, 92 industry groups remain. From 78,404 firm-year observations identified from the Thomson Reuters Industry level 5 classification, 76,128 firm-year observations are

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[23] In addition to this, I also use the Fama and French industry classification, Industry Classification Benchmark (ICB), Thomson Reuters Industry level 3 and 4 and find similar results.

included in the final sample. Details of the Thomson Reuters Industry level 5 classification is reported in Appendix 4C.

4.3.2 Measuring Competition

To measure competition, I use four popular measures of competition: Industry Concentration Index (change in the number of firms in an industry), Gini coefficient, Theil's Entropy Index (TEI) and Herfindahl Hirschman Index (HHI).

Industry Concentration Index

I follow a similar approach proposed by Huang and Lee (2013), Morellec, Nikolov and Zucchi (2014), and Jiang *et al.* (2015) to estimate the Industry Concentration Index (ICI). By counting the changes to the number of firms in an industry, the ICI measures the degree of competition in an industry. The population of an industry can significantly affect the ability of a firm to influence prices (Huang and Lee, 2013). An increase in the number of firms within an industry indicates an increase in competition while a decrease in number of firms suggests a decrease in competition.

Gini Coefficient

Generally, the Gini coefficient measures the degree of statistical dispersion of wealth or income of residents of a nation (Gini, 1921). In the context of an industry, it can be adjusted to capture the dispersion of market share among the firms in an industry. In this context, the Gini coefficient can be defined as:

$$G = 1 + \left(\frac{1}{n}\right) - \left(\frac{2}{n}\right) \left(\sum_{i=1}^{n} i\, S_t\right) \tag{4.1}$$

Where $S_1 \geq S_2 \geq \ldots \ldots \geq S_n$, $\sum_{t=1}^{n} S_t = 1$. S_t therein refers to the share of sales accounted by the ith ranked firm and n denotes the number of firms in an industry at time t. Nissan

and Caveny (1993) and Ghatak (2003) rewrite the equation such that it effectively takes account of differences between pairs of company within an industry. The equation can be rewritten as:

$$G = 1/2n \sum_{i=1}^{j} \sum_{j=2}^{n} |S_i - S_j| \qquad (4.2)$$

Theil's Entropy Index

Entropy captures the degree of disorderliness in a system (Coulter, 1989). Maximum entropy is achieved when each probability of all the discrete values is 1/n. n is number of the events.

$$E = -\sum s \ln s \qquad (4.3)$$

Where S denotes the probability of a discrete event. Therefore, the higher the entropy level, the higher the level of competition (Nissan and Caveny, 1993).The index can be further defined as:

$$E = \sum_{i=1}^{n} S_i \log(1/S_i) \qquad (4.4)$$

Where S_i is the share of sales and n refers to the number of firms in an industry at time t. The index captures the size differences between firms in an industry. When all firms have equal share then E = log n, implying entropy is maximised and concentration minimised. The reverse is true when a firm controls all the sales in an industry, E = 0.

Herfindahl Hirschman Index (HHI)

I follow Fresard (2010) and Valta (2012) and estimate the Herfindahl Hirschman Index. HHI is calculated by summing the square of firms' proportion of sales within an industry. It can be represented as follows:

$$HHI = \sum_{i=1}^{n} S_i^2, \frac{1}{n} \leq H \leq 1 \qquad (4.5)$$

Where S refers to the market share of the ith firm in an industry and n is the number of firms.

4.3.3 Empirical Method

I capture firm-years with increased competition intensity by identifying industry-years where there are changes in the adopted measures of competition that indicate increased competition. For instance, for industry-years where there is a new entrant into the industry, I define such industry-years as periods of increased competition. Similarly, for other measures of competition - Gini coefficient, Theil entropy index, and HHI - I identify years with changes in the industry value that indicate increased competition intensity. Hence, I define industry-years where changes in the Gini coefficient, Theil entropy index and HHI suggests increased competition intensity as "treated". Industry years without changes in competition are "untreated". From the "untreated" industry observations, I construct a matched sample. I use a similar matching approach to Frésard and Valta (2016) and match firms based on total debt, total assets, market capitalisation and net income. The matching was conducted through a matching algorithm that minimises the Mahalanobis distance.[24] Table 4.1 reports a comparison and summary of the results of the matching.

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[24] Mahalonobis distance could be defined as $[X_I + \bar{X})^t C^1 (X_I - \bar{X})]^{0.5}$, where: $X_{i=}$ an object vector and $\bar{X} =$ arithmetic mean vector C is the covariance coefficient of the matrix (Varmuza and Filzmoser, 2016).

iv:Table 4.1: Comparison of Differences between Treated and Matched Sample

	Concentration				HHI		
	Treated	Matched	Difference		Treated	Matched	Difference
Cash Holdings	0.1902	0.1841	0.0061***	**Cash Holdings**	0.1585	0.1527	0.0057***
EBITDA	2046971	2280372	-233401	**EBITDA**	13000000	13500000	-500000
Total Assets	9995654	10200000	-204346	**Total Assets**	139000000	140000000	-1000000
Market Capitalisation	20000000	26500000	-6500000	**Market Capitalisation**	74300000	75400000	-1100000
Market to Book	2.7154	1.5626	1.1528***	**Market to Book**	1.5488	1.4778	0.0710**
Net Sales	26800000	40800000	-14000000	**Net Sales**	108000000	113000000	-5000000
Size	10.70	11.46	-1.00	**Size**	12.83	13.15	-0.32
Total Debt	4683395	5595968	-912573	**Total Debt**	27400000	33700000	-6300000
Net Income	501894	449382	52512	**Net Income**	2722505	2819733	-97228
Leverage	0.1580	0.1262	0.0317***	**Leverage**	0.2418	0.1794	0.0623**
	Entropy				GINI		
	Treated	Matched	Difference		Treated	Matched	Difference
Cash Holdings	0.1569	0.1537	0.0032***	**Cash Holdings**	0.1557	0.1552	0.0005***
EBITDA	11900000	14900000	-3000000	**EBITDA**	13700000	12800000	900000
Total Assets	124000000	159000000	-35000000	**Total Assets**	137000000	142000000	-5000000
Market Capitalisation	69500000	81400000	-11900000	**Market Capitalisation**	74500000	75400000	-900000
Market to Book	1.5663	1.4439	0.1223	**Market to Book**	1.4888	1.5339	-0.045***
Net Sales	98700000	126000000	-27300000	**Net Sales**	113000000	108000000	5000000
Size	12.85	13.18	-0.33	**Size**	12.82	13.19	-0.37
Total Debt	29000000	33000000	-4000000	**Total Debt**	29900000	31600000	-1700000
Net Income	2686406	2883183	-196777	**Net Income**	3203135	2310240	892895
Leverage	0.2588	0.1473	0.1115***	**Leverage**	0.2660	0.1478	0.1182***

The table presents the mean comparison of the treated and matched sample based on four measures of competition (Increase in concentration, HHI, Entropy, and Gini coefficient). Using the Mahalonobis matching algorithm, the firms are matched on the basis of, Total Debt, Total Assets, Market Capitalisation and Net Income. Significance of the difference in mean are reported in asterisk.

Following the results of the Mahalanobis matching procedure, I estimate the following difference-in-differences model:

$$C_{i,j,t} = \alpha + \beta I_{i,j,t} + \theta X_{i,j,t} + \eta_i + \delta_i + \varepsilon_{i,j,t,}$$ (4.6)

C is cash and equivalent deflated by total assets α is the constant term, β refers to the treatment group specific effect (to account for average permanent differences between the treatment and control). I is a dummy variable that is 1 for treated firm and industry-years (i.e. that is if the industry in which a firm operates experienced an increase in competition) and zero for matched-firms. The vector X captures control variables known to determine firm cash holdings. I control for firm lagged cash holdings, market-to-book ratio, leverage, size, ROA and dividend. Similarly, I control for industry effect η_i to capture time invariant differences across industries. In addition, I control for year effect δ_i to control for difference in time periods. $_i$, $_j$ and $_t$ are firm, industry, and time respectively. ε is the random unobserved error term which contains all determinants of cash holdings which the model omits.

To examine the impact of cash holdings on firm competitiveness, I follow a similar model to Fresard (2010) and focus on the effect of cash on adjusted market share growth. If cash is a valuable strategic instrument in the product market, firms with large cash reserves should be able to increase their market share at the expense of their rivals (Fresard, 2010).

$$\Delta M_{i,t} = \alpha_i + \eta_t + \vartheta(Cash_{i,t-1}) + \lambda X_i + \varepsilon_{i,t,}$$ (4.7)

Where Δ **M** is the industry adjusted sales growth. Firm and year are denoted as i and t respectively. The parameter of interest is ϑ. Cash is the ratio of cash (and equivalents) to total assets. Since cash and market share can be endogenous, I proceed by estimating a two-stage least square (2SLS) model in which cash is instrumented by its own lagged

value and asset tangibility. The instruments, the lagged value of cash holdings and asset tangibility are uncorrelated with the error term. As in MacKay and Phillips (2005) and Fresard (2010), I also calculate the Z-score for cash to ensure I characterize a firm's cash position relative to its rivals. Zcash is computed by subtracting the industry-year mean from lagged cash holdings and dividing the difference by the industry-year standard deviation. The vector X_i captures control variables known to drive product market performance. This variable may be correlated with market share and firms' cash position, I proceed by instrumenting with their two-year lagged value. The variables have nonzero finite fourth moments; hence outliers are improbable. The control variables are firm size, debt, market-to-book ratio, past market share growth, and capital expenditure. Details of the variable description are presented in chapter 3. I account for the invariant firm and time trends by including the vector $\alpha_i \; and \; \eta_t$. The error term of the regression $\boldsymbol{\varepsilon}$ should be normally distributed. $\boldsymbol{\varepsilon}$ represents all the exogenous factors that affect market share when cash holdings is held constant.

Since the UK Competition Act 1998 and the Enterprise Act 2002 were introduced to enhance competitiveness among firms by introducing fairer trading conditions (Graham, 2004), I use the periods before the implementation of the act as less competitive periods and periods after more competitive in both instances (Competition Act 1998 and the Enterprise Act 2002). I identify periods prior to the implementation of the acts as less competitive compared to periods after the implementation of the act. Based on these legal regimes, I estimate the difference in difference model as follows:

$$C_{i,j,t} = \; \beta I_{j,t} \; + \; \mu X_{i,j,t} \; + \; \eta_i + \; \delta_i \; + \; \varepsilon_{i,j,t,} \hspace{3cm} \textbf{(4.8)}$$

Where $_i$, $_j$ and $_t$ represent firm, industry and time respectively. C is cash and cash equivalent deflated by total assets. I is a dummy variable that takes the value of 1 for firm-year observations after the introduction of a competition regime and 0 for matched-firm industry-year observations (i.e. before the introduction of a new competition act/law).[25] The vector X captures control variables known to determine firms' cash holdings. I control for firms' lagged cash holdings, market-to-book ratio, leverage, size, ROA, and dividends. Industry effects η_i are employed to capture time invariant differences across industries and for year effects δ_i. ε is the random unobserved error term which contains all determinants of cash holdings which the model omits.

To evaluate if increases in cash holdings are the result of such an effect, I examine whether profitability increases during the periods of increased competitive pressure. To do this, I estimate the following regression:

$$P_{i,j,t} = \beta I_{j,t} + \theta X_{i,j,t} + \eta_i + \delta_i + \varepsilon_{i,j,t,} \qquad \text{(4.9)}$$

where P represents firm profitability; measured as the natural log of EBITDA. $_i$, $_j$, and $_t$ represent firm, industry, and time respectively. I is a dummy variable that takes a value of 1 for treated firm industry-years (i.e. if the industry in which a firm operates experienced an increase in competition) and zero for matched-firms. The vector X captures control variables known to determine firm profitability. ε is the random unobserved error term which contains all determinants of profitability which the model omits.

[25] Using the Mahalonobis algorithm, I match treated observations with their nearest untreated observation based on total asset, total debt, market capitalisation, and net income.

Similarly, because increased cash holdings may be an expression of increased sales, I estimate the following model to evaluate if sales increase during the periods of increased competitive pressure.

$$S_{i,j,t} = \beta I_{j,t} + \theta X_{i,j,t} + \eta_i + \delta_i + \varepsilon_{i,j,t,} \hspace{3cm} (4.10)$$

where S refers to sales, measured as the natural log of sales. $_{i,j}$ and $_t$ are firm, industry, and time respectively. I is a dummy variable that takes a value of 1 for the treated firm industry-years (i.e. if the industry in which a firm operates experienced an increase in competition) and zero for matched-firms. The vector X captures control variables known to determine firm sales. ε is the random unobserved error term which contains all determinants of sales which the model omits.

4.4 Results

Cash holdings levels reported in this study differ from those of other UK studies (Ozkan and Ozkan, 2004; Florackis and Sainani, 2018). Figure 4.1 illustrates the upward trend in cash reserves by UK firms during the period of the study thus explaining the difference.

iii:Figure 4.1: Cash Holdings and Total Cash Reserve of UK Non-Financial Firms
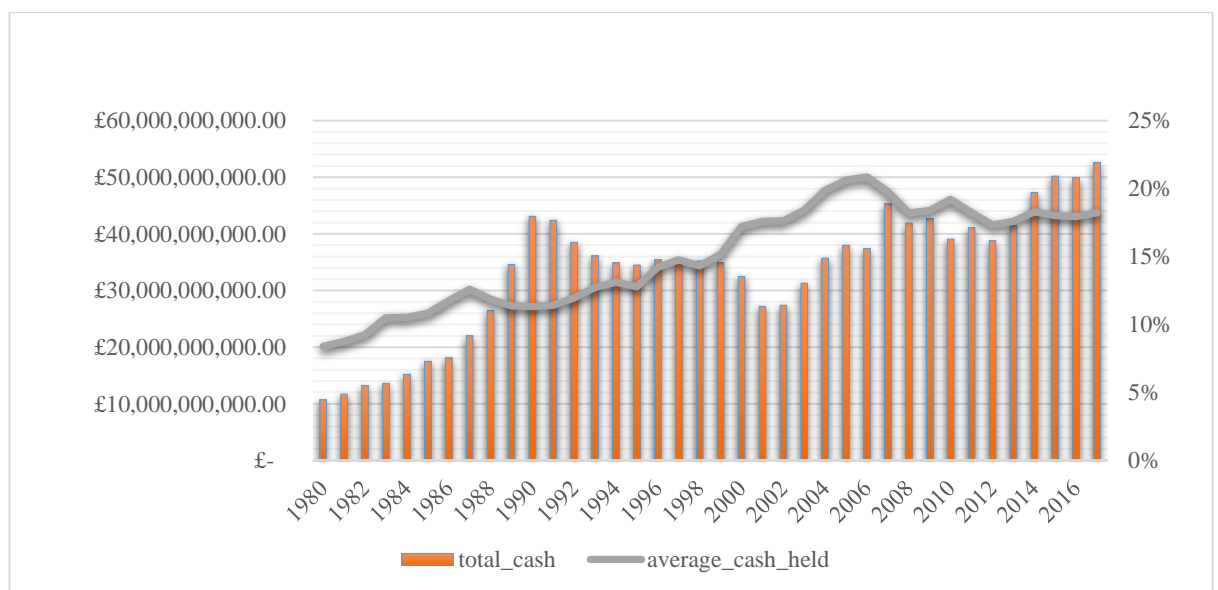
Table 4.2 presents summary statistics and the correlation matrix. Panel A details the summary statistics for dependent, explanatory and control variables. The correlation matrix is presented in Panel B. The coefficients reported for my measures of competition show that the adopted approaches to estimating the degree of competition are not closely correlated since the threshold of correlation coefficient suggested by Greene (2012) was not exceeded.

v: Table 4.2: Descriptive Statistics

Panel A: Summary Statistics										
	Obs	Mean	St. Dev	Min	P25	P50	P75	Max	Kurtosis	Skewness
Cash Holdings	76128	0.155	0.178	0	0.038	0.095	0.2	1.268	2.05	7.29
Size	76128	12.998	3.431	0.693	10.37	12.593	15.408	26.746	0.58	2.99
Market Share	76128	0.141	0.687	-1.016	-0.076	0.021	0.164	4.93	4.64	30.44
ROA	76128	0.049	0.323	-1.396	-0.032	0.025	0.116	1.711	-0.56	3.76
Leverage	76128	0.141	0.156	0	0.007	0.1	0.216	0.773	1.40	4.89
Market to Book	76128	1.31	1.628	0.065	0.447	0.8	1.466	10.682	3.49	17.80
CAPEX	76128	0.245	0.974	-0.758	-0.045	0.049	0.197	7.549	0.06	10.64
HHI Score	76128	0.407	0.275	0	0.181	0.329	0.584	0.885	0.78	2.41
No of firms in industry	76128	48	39	2	21	39	59	182	1.44	4.62
Gini	76128	0.029	0.027	0	0.013	0.021	0.033	0.25	2.85	15.49
Entropy	76128	0.055	0.05	0	0.019	0.04	0.075	0.366	0.21	1.04

Panel B: Correlation Table											
	Cash Holdings	Size	Market Share	ROA	Leverage	Market to Book	CAPEX	Enterprise Value	HHI Score	No of firms in industry	Gini
Size	-0.148***										
Market Share	0.104***	-0.121***									
ROA	0.0107**	0.0900***	0.00761								
Leverage	-0.227***	0.310***	-0.0321***	-0.0262***							
Market to Book	0.430***	-0.194***	0.138***	0.0311***	-0.184***						
CAPEX	0.0676***	-0.0968***	0.366***	0.0109**	-0.0390***	0.112***					
HHI Score	-0.00584	-0.0115**	0.0054	-0.0362***	0.0337***	0.00331	0.00162	-0.00780*			
No of firms in industry	0.139***	-0.250***	0.0794***	0.148***	-0.115***	0.112***	0.0363***	-0.225***	-0.105***		
Gini	-0.0787***	0.148***	-0.0357***	-0.0690***	0.0606***	-0.0628***	-0.0173***	0.132***	0.336***	-0.577***	
Entropy	-0.105***	0.176***	-0.0434***	-0.0544***	0.0572***	-0.0808***	-0.0116**	0.157***	-0.428***	-0.520***	0.379***

Panel A presents the summary statistics. Cash holdings refers to the ratio of cash to total assets. Market to book ratio is the ratio of the market value of equity to the book value of assets. Leverage is the ratio of debt to total assets. Sales growth is the industry adjusted value of sales growth. ROA is the industry-adjusted ratio of Return on Assets. Investment refers to changes in PPE. Size is the log of total assets. HHI Score is the sum of the square of market share by industry. Firms in industry refers to the number of firms in an industry. Gini refers to the Gini coefficient of an industry. Entropy is the Theil's entropy index for an industry year. Panel B presents the correlation matrix for variables in the study. *, **, *** represents significance at <0.10, <0.05, and <0.01 respectively.

For my baseline model, I focus on the Industry Concentration Index which captures the number of firms in an industry-year whilst my other measures are sensitive to industry-wide sales. One limitation of studies of industry concentration is that data on unlisted companies is rarely available. The data covers a period during which most of the largest companies are listed. However, the intuition behind the use of the ICI is that an increase in firms within an industry signifies a reduction in concentration. In the sample, I only identify 44 firm-years out of 79,433 firm-years which identify as monopolistic or oligopolistic structures. To cater for this issue, I exclude cases where the number of firms in an industry are less than three. Despite imposing this restriction there was no material impact on the results.[26]

4.4.1 Responses to Increased Competition

The results of the difference-in-difference models are presented in Table 4.3. Column 1 reports a coefficient of 0.043 for the variable of interest *Increased competition*. The coefficient is statistically significant at the 1% level. The implication of the estimate is that due to increased competition firms increase their cash reserves by 4.3%. The results confirm the position of hypothesis *H1*. Firms increase cash holdings and competition increases. To ensure my results are not been driven by the lagged value of cash holdings, I run another regression without including the lagged value of cash holdings. Despite these adjustments, the results remain consistent. The result of these adjustments is reported in Appendix 4A.

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[26] The models using this indicator implicitly assume that unlisted competition changes at the same rate as listed competition.

vi:Table 4.3: Increased Competition and Cash Holdings

	Concentration	Entropy	Gini	HHI
Increased Competition	0.0433***	0.0047***	0.0078***	0.0022***
	(3.31)	(6.22)	(9.36)	(2.78)
Cash Holdings *t-1*	0.7702***	0.7694***	0.7358***	0.7356***
	(328.26)	(327.92)	(300.41)	(300.16)
Leverage	-0.0335***	-0.0335***	-0.0350***	-0.0351***
	(-17.43)	(-17.45)	(-17.26)	(-17.28)
Size	-0.0007***	-0.0008***	-0.0005***	-0.0004***
	(-5.97)	(-6.10)	(-3.43)	(-3.16)
ROA	-0.0013***	-0.0013***	0.0000	0.0000
	(-3.36)	(-3.32)	(0.08)	(0.09)
Market to Book	0.0004***	0.0004***	0.0010***	0.0011***
	(6.23)	(6.23)	(14.81)	(15.03)
Investment	-0.0000***	-0.0000***	0.0000***	0.0000***
	(-9.27)	(-9.24)	(4.28)	(4.31)
Dividend	-0.0056***	-0.0054***	-0.0171***	-0.0171***
	(-5.58)	(-5.39)	(-15.99)	(-16.04)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Intercept	-0.6724***	-0.7715***	-0.7230***	-0.4917***
	(-7.89)	(-8.89)	(-7.49)	(-5.29)
Observation	67383	67440	63879	63892
Adj R squared	0.66	0.66	0.64	0.63

The table presents results of the difference in differences regression. Using four distinct measures of competition (Number of firms in industry, Theil Entropy index, Gini coefficient and HHI index) I demonstrate the relationship between cash holdings and increased competition. Following a treated and matched sample created by the Mahalonobis distance algorithm, observations found in the treatment group were matched by a corresponding observation within the same industry. The treatment group contains firms found in years where there was an increase in competition. Increase in competition in Model 1, 2, 3, and 4were derived by identifying periods in which there was an increase in competition in an industry using the above measures of competition. The dependent variable in the model is cash holdings levels. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0. Cash holdings refers to the lag of the ratio of cash to total assets. Leverage refers to the ratio of debt to total assets. Size refers to the log of total assets. ROA refers to industry adjusted value of the ratio of EBITDA to Total assets. Market to book ratio refers to the ratio of market value of equity to book value of total assets. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. t statistics are reported in parentheses. **, *** represents significance at <0.05, and <0.01 respectively.

Our findings complement the findings of Valta (2012). As a result of the increasing cost of debt during periods of increased competition, firms respond by increasing internal finance. Lyandres and Palazzo (2016) also conjecture that firms' cash holdings are dictated by the expected intensity of competition. My finding reaffirms this view. It is

widely documented that firms with large cash reserves make gains at the expense of their rivals in the product market; these gains will be amplified during periods of increased competition (Fresard, 2010). Hence, to strategically position themselves, firms increase their cash reserves. Analogously, Bolton and Scharfstein (1990) argue that firms with large cash reserves utilise their funds to finance competitive strategies. Such strategies include aggressive pricing, investment in capabilities or simply increasing cash holdings to convey a competitive signal. To remain competitive, firms increase cash as competition increases.

4.4.2 Increased Competition, Predation Threat, and Cash Holdings

To evaluate how firms' responses to increased competition vary with the degree of product differentiation, I follow a similar approach to that of Alimov (2014) and estimate the absolute value of the deviation of a firm's capital to labour ratio from the industry median. Large values for this deviation imply a firm utilises a production technology that is dissimilar to the rest of the industry and hence is exposed to a lower risk of losing investment opportunities to industry rivals.

vii:Table 4.4: Increased Competition, Cash Holdings and Predatory Risk

	High Predatory Risk	Low Predatory Risk	High Predatory Risk	Low Predatory Risk
Increased competition	0.0838***	0.0475***	0.0490***	0.1410
	(3.75)	(3.46)	(4.04)	(1.25)
Cash Holdings *t-1*	0.7569***	0.7788***	0.8016***	0.7273***
	(230.01)	(281.22)	(178.69)	(150.31)
Leverage	-0.0397***	-0.0323***	-0.0287***	-0.0555***
	(-14.78)	(-14.18)	(-7.87)	(-11.80)
Size	-0.0008***	-0.0009***	0.0011***	-0.0012***
	(-4.83)	(-4.88)	(5.54)	(-4.30)
ROA	-0.0011***	-0.0009	0.0010	-0.0015
	(-2.27)	(-1.56)	(0.30)	(-1.06)
Market to Book	0.0001	0.0022***	0.0012***	0.0031***
	(0.98)	(16.28)	(6.33)	(9.87)
Investment	-0.0000***	-0.0001***	-0.0000**	-0.0001***
	(-8.04)	(-12.19)	(-1.88)	(-9.81)
Dividend	-0.0034***	-0.0085***	-0.0041**	-0.0040**
	(-2.46)	(-7.15)	(-1.88)	(-1.94)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Intercept	-0.5965***	-0.7300***	0.5363**	0.2000
	(-4.85)	(-7.26)	(1.95)	(0.55)
Observation	35790	47502	16378	17390
Adj R squared	0.64	0.68	0.68	0.65
P value of (High-Low)		0.0***		-0.0***

The table presents results of the difference in differences regression of splitting the sample based on two measures of exposure to predatory risk. Following a treated and matched sample created by the Mahalonobis distance algorithm, observations found in the treatment group were matched by a corresponding observation within the same industry. The treatment group contains firms found in years where there was an increase in competition. The dependent variable is cash holdings. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0. Cash holdings refers to the lag of the ratio of cash to total assets. Leverage refers to the ratio of debt to total assets. Size refers to the log of total assets. ROA refers to industry-adjusted value of the ratio of EBITDA to Total assets. Market to book ratio refers to the ratio of market value of equity to book value of total assets. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. t statistics are reported in parentheses. **, *** represents significance at <0.05, and <0.01respectively. The p value of the difference between the coefficient of increased competition in high and low exposure to predatory risk is reported above.

If the values of deviations are small, firms can be interpreted as using production technology similar to the industry standard and as such are exposed to high degrees of predation. Competitors may be able to seize market share in such a situation (MacKay and Phillips, 2005). To ensure my insights are robust, I proceed by estimating an alternative measure of predatory threat. The second measure is the correlation of a firm's stock return with an equally weighted industry return index. As in Alimov (2014), stocks whose returns are more highly correlated with the industry return are exposed to higher predatory threat. Table 4.4 presents the result of splitting the data according to the degree of exposure to predatory threat. Across both measures of predation, the results indicate that in response to the risk associated with high predatory risk and exposure to loss of investment opportunities to rivals, firms with higher exposure increase their cash reserves at a faster rate than firms with lower exposure. The results corroborate the position of hypothesis H2a, increases in cash holdings during increased competition are positively associated with the degree of exposure to predatory threat.

4.4.3 Increased Competition, Financing Frictions, and Cash Holdings

Table 4.5 reports the models of cash holdings with increased competition as the explanatory variable in three scenarios of financial frictions. The first measure of financing frictions I examine is hedging need. I begin by evaluating how firms with high hedging requirements respond to increased competition. I follow Moyen (2004), Almeida, Campello and Weisbach (2004) and Carpenter and Guariglia (2008) and take the correlation between cash flow and investment opportunities as the firms hedging need

viii:Table 4.5: Increased Competition, Cash Holdings and Financing Frictions

	High Hedging Need	Low Hedging Need	Big Firms	Small Firms	Low debt capacity	High debt capacity
Increased Competition	0.0440***	0.0315	0.0548***	0.0489***	-0.0113	0.0927***
	(4.09)	(1.36)	(4.72)	(3.13)	(-0.41)	(2.51)
Cash Holdings *t-1*	0.7828***	0.7644***	0.8192***	0.7580***	0.7436***	0.7541***
	(226.15)	(286.48)	(286.37)	(269.11)	(162.07)	(145.58)
Leverage	-0.0363***	-0.0339***	-0.0285***	-0.0301***	0.0086***	-4.5590***
	(-12.15)	(-15.68)	(-12.78)	(-12.97)	(4.45)	(-5.85)
Size	0.0005***	-0.0014***	0.0006***	-0.0020***	0.0008***	-0.0019***
	(3.13)	(-9.22)	(4.00)	(-7.84)	(4.12)	(-3.64)
ROA	-0.0030	-0.0013***	-0.0004	-0.0012***	0.0052***	-0.0020***
	(-1.16)	(-3.09)	(-0.20)	(-2.66)	(7.66)	(-2.99)
Market to Book	0.0022***	0.0004***	0.0022***	0.0004***	0.0015***	0.0000
	(15.74)	(5.61)	(13.73)	(5.10)	(7.26)	(0.07)
Investment	-0.0000***	-0.0000***	-0.0000**	-0.0000***	-0.0001***	-0.0000***
	(-6.53)	(-8.25)	(-1.79)	(-8.65)	(-17.15)	(-2.94)
Dividend	-0.0053***	-0.0042***	-0.0082***	-0.0036***	-0.0055***	-0.0003
	(-3.33)	(-3.70)	(-7.88)	(-2.86)	(-3.86)	(-0.11)
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	-0.1184	-0.8351***	0.0775	-1.0235***	-0.1227	-0.9622***
	(-0.67)	(-6.20)	(1.13)	(-8.75)	(-1.04)	(-2.99)
Observation	31342	53035	35798	49033	17054	15694
Adj R squared	0.66	0.65	0.734	0.64	0.63	0.61
P value of the difference between high and low		0.0***		0.0***		0.0***

The table presents results of the difference in differences regression. Following a treated and matched sample created by the Mahalonobis distance algorithm, observations found in the treatment group were matched by a corresponding observation within the same industry. The treatment group contains firms found in years where there was an increase in competition. Firm-years are divided based on the degree of exposure to financing frictions. The dependent variable is cash holdings. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0. Cash holdings refers to the lag of the ratio of cash to total assets. Leverage refers to the ratio of debt to total assets. Size refers to the log of total assets. ROA refers to industry-adjusted value of the ratio of EBITDA to Total assets. Market to book ratio refers to the ratio of market value of equity to book value of total assets. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. t statistics are reported in parentheses. **, *** represents significance at <0.05, and <0.01 respectively. The p value of the difference between the coefficient of increased competition in high and low exposure to financing frictions is reported above.

The findings in Table 4.5 suggest that firms with high hedging need respond to increased competition by increasing their cash reserves whilst firms with lower hedging requirements do not increase their cash reserves. This lends support to the argument of Acharya *et al.* (2007*)*. Firms with high hedging requirements favour cash over other forms of finance. In addition, my results support their view that cash can be used as a hedging tool. Cash reserves can be used flexibly depending on future states of the world.

The next measure of financing frictions that I consider in Table 4.5 is firm size. I follow Almeida *et al.* (2004*)* and divide the sample on the basis of size. The results suggest that both unconstrained/larger firms and constrained/smaller firms respond to increased competition by increasing their cash holdings. The coefficient is marginally higher for the larger firms but is significant at the 1% level for both large and small firms.

For this final measure of financing frictions, I evaluate how the response to competition differs with a firm's debt capacity. The results indicate that firms with higher debt capacity increase cash at a greater rate than firms with low debt capacity. Firms with high debt capacity have lower exposure to interest payments. Therefore, because of this flexibility, they are able to build up their cash reserves quicker than firms with low debt capacity. To this effect Zou and Adams (2008) argue that debt capacity is related to cost of debt since firms with high debt capacity are less exposed to bankruptcy risk. In general, the results supports hypothesis H3a: During periods of increased competition, increases in cash holdings are positively associated with the degree of exposure to financing frictions.

4.4.4 Cash Holdings and Market Share

The approach to mitigate the potential endogenous effects between cash and market share within my models is similar to Berger, Ofek and Swary (1996) and Fresard (2010). The method involves two steps. First, I estimate the exogenous portion of cash holdings by regressing cash on asset tangibility and the lagged values of cash holding.[27] The estimated cash holdings from this procedure enters my equation as an instrument.

ix:Table 4.6: Cash Holdings and Market Share

Panel A: First Stage Regression	
Cash Holdings *(t-2)*	0.657***
	(221.25)
Asset Tangibility *(t-2)*	-0.000***
	(-2.22)
Intercept	0.0551***
	(59.56)
N	61663
Adjusted. R-squared	0.63

The table presents the first stage estimate used in predicting the lagged value of cash holdings. I follow Berger *et al.* (1996) and Fresard (2010) I predict cash using the lagged value of cash holdings and asset tangibility. **, ***denotes significance at <5%, and <1%, respectively. t statistics are reported in parentheses.

Panel B : Cash Holdings and Competitiveness	(1)	(2)
Cash Holdings	0.4005***	
	(17.65)	
Zcash		0.0557***
		(14.81)
Size	-0.0138***	-0.0155***
	(-15.60)	(-17.48)
Leverage	0.1385***	0.1154***
	(7.80)	(6.52)
Market Share	0.0474***	0.0491***
	(12.90)	(13.37)
Market to Book	0.0365***	0.0437***
	(20.10)	(25.61)
Investment	0.1251***	0.1252***
	(42.59)	(42.53)
Year	Yes	Yes
Industry	Yes	Yes
Intercept	-1.5597***	-3.3379***
	(-3.12)	(-6.68)
N	60617	60436
Adjusted R-squared	4.80%	4.85%
Jstatistics	0.48	0.33

The table presents the result of the 2SLS IV panel regressions examining the effect of cash holdings on market share. Market share refers to the industry-adjusted value of sales growth. Cash holdings refers to the predicted lag of the ratio of cash to total assets. Zcash refers to the predicted lag of the standardized value of cash. Zcash is the Z score of cash standardized by industry-adjusted value of cash standardized by industry year standard deviation. Leverage refers to the lag of the ratio of debt to total assets. Market to book is the lag ratio of market value of equity to book value of assets. Investment refers to the lag of the ratio of the growth in PPE. **, *** denotes significance at <5%, and <1%, respectively. t statistics are reported in parentheses.

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[27] Asset tangibility is expressed as a function of receivables, inventory and fixed capital (Berger, Ofek and Swary.1996; Fresard 2010).

To evaluate the relative impact of cash holdings on firm competitiveness, I follow Fresard (2010) and estimate the Z-score for cash. Since cash may be endogenous with market share, I proceed by Z-scoring cash and instrument cash by the estimated value of the Z-score of cash.

Presented in Table 4.6 are instrumental variable estimates of the impact of cash holdings on firms' competitiveness. Column 1 reports the result of the absolute value of cash holdings while column 2 reports the values after Z-scoring cash. Both coefficients are significantly positive. The results indicate that cash-rich firms make substantial gain in market share at the expense of rivals. The coefficient for Zcash in Panel B column 2 indicates that all things being equal, a one standard deviation increase in cash relative to rivals in year t-1 results in market share gains of 5.6% in year t. The magnitude reported in my study exceeds that reported in Fresard (2010). The results reported also corroborate my earlier findings. Bolton and Scharfstein (1990) argue that such increases in cash may be used to fund competitive strategies and investments which result in gains in market share. As previously discussed, documented methods for deploying cash in the product market include aggressive pricing, employment of more skilled employees, using cash to signal aggressive behaviour, using cash as a pre-emptive device, or using cash to develop capacity (Benoit, 1984; Bolton and Scharfstein, 1990; Campello, 2006).

4.4.5 Market Share, Cash Holdings, Predatory Threat and Financing Frictions

I proceed by examining if increases in cash holdings result in gains in market share and if gains differ with the degree of exposure to predatory risk and financing frictions. To test this, I split firms on the basis of their hypothesised level of exposure to predatory threat and financing frictions.

Table 4.7 shows the results of splitting the sample on the basis of predatory risk. The results indicate that firms exposed to a higher degree of predatory risk make lower gains in market share by increasing cash reserves compared to firms with low exposure. The findings are consistent with those in Table 4.4.

x:Table 4.7: Cash Holdings, Competitiveness and Predatory Threat

	High Predatory Risk	Low Predatory Risk	High Predatory Risk	Low Predatory Risk
Zcash	0.0496***	0.0627***	0.0426***	0.0871***
	(5.89)	(7.63)	(6.74)	(9.92)
Size	-0.0189***	-0.0212***	-0.0136***	-0.0176***
	(-10.38)	(-9.41)	(-8.36)	(-10.30)
Leverage	0.1337***	0.0673**	0.1787***	0.1356***
	(3.72)	(1.92)	(4.89)	(3.77)
Market Share	0.0038	0.0440***	0.0622***	0.0320***
	(0.55)	(6.17)	(8.30)	(4.54)
Market to Book	0.0438***	0.0531***	0.0490***	0.0411***
	(9.96)	(17.24)	(12.94)	(10.91)
Investment	0.1217***	0.1121***	0.1138***	0.1565***
	(22.31)	(20.37)	(20.20)	(26.60)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Intercept	-2.6139***	-2.1152***	-0.2305	-8.6311***
	(-2.32)	(-2.25)	(-0.13)	(-4.22)
Obs	17855	14063	14797	15236
Adj R-squared	0.07	0.11	0.10	0.10
P value of (Low – High)	0.0***		0.0**	
Jstatistics	0.33	0.47	0.52	0.44

The table presents the result of the 2SLS panel regressions examining the effect of cash holdings on market share based on the degree of exposure to predatory risk. Market share refers to the industry adjusted value of sales growth. Cash Holdings refers to the predicted lag of the ratio of cash to total assets. Zcash refers to the predicted lag of the standardized value of cash. Zcash is the Z score of cash standardized by industry adjusted value of cash standardized by industry year standard deviation. Leverage refers to the lag of the ratio of debt to total assets. Market to book is the lag ratio of market value of equity to book value of assets. Investment refers to the lag of the ratio of the growth in PPE. **, ***denotes significance at <5%, and <1%, respectively. t statistics are reported in parentheses. The p value of the difference between the coefficient of increased competition in low and high exposure to predatory risk is reported above.

To compensate for the risk of losing investment opportunities to rivals, firms with such exposure increase their cash reserves strongly. However, because investment opportunities are easily replicated in such industries, gains associated with increasing cash are less pronounced. The result support the argument of Haushalter, Klasa and Maxwell (2007), that predation risk is informative in understanding corporate finance policy choices and investment behaviour. The results confirm hypothesis H2b: Gains in market share associated with increased cash holdings are negatively associated with the degree of exposure to predatory risk.

In Table 4.8, I report the results of subsamples based on hedging requirements and financial constraints. The results indicate that increased cash reserves offer more return for firms with low hedging needs. The results are consistent with the view of Acharya, *et al.* (2007), that firms with high hedging needs prefer cash to debt. During periods of increased competition associated with financing frictions, cash offers opportunities for gains in market share. The benefits of holding cash are magnified among firms operating under constraints (Fresard, 2010; Lyandres and Palazzo, 2016). The results align with H3b: Gains in market share (associated with increased cash holdings) are negatively associated with the degree of exposure to financing frictions.

xi:Table 4.8: Cash Holdings, Competitiveness and Financing Frictions

	High Hedging Need	Low Hedging Need	Big Firms	Small Firms	Low debt capacity	High debt capacity
Zcash	0.0390***	0.0408***	0.0246***	0.0935***	0.0558***	0.0623***
	(7.02)	(5.24)	(6.49)	(8.40)	(6.39)	(6.77)
Size	-0.0090***	-0.0134***	-0.0125***	-0.0648***	-0.0213***	-0.0229***
	(-6.09)	(-8.89)	(-9.00)	(-7.20)	(-10.81)	(-7.87)
Leverage	0.1917***	0.0855***	0.0743***	0.1207***	-0.0384	-0.1896***
	(5.25)	(2.71)	(3.88)	(1.96)	(-1.32)	(-2.00)
Market Share	0.1155***	0.0266***	0.0259***	0.0220***	0.0126**	0.0322***
	(13.65)	(3.76)	(3.26)	(2.63)	(1.70)	(4.11)
Market to Book	0.0542***	0.0335***	0.0298***	0.0413***	0.0454***	0.0444***
	(11.73)	(8.85)	(12.95)	(8.96)	(11.35)	(12.79)
Investment	0.0752***	0.0973***	0.1722***	0.0939***	0.1477***	0.1196***
	(12.69)	(17.38)	(28.23)	(13.13)	(26.33)	(17.81)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	10.1135***	7.1586***	-0.7436	-3.5324**	-1.9241**	-8.3142***
	(4.54)	(2.06)	(-1.49)	(-1.73)	(-1.94)	(-4.90)
Obs	12329	15988	18011	10839	16029	12784
Adj R-squared	0.08	0.05	0.09	0.06	0.09	0.07
P value of (Low-High)		0.0***		0.0***		0.0***
Jstatistics	0.56	0.68	0.78	0.85	0.55	0.33

The table presents the result of the 2SLS IV panel regressions examining the effect of cash holdings on market share after dividing firms on the basis of their exposure to financing frictions. Market share refers to the industry-adjusted value of sales growth. Cash holdings refers to the predicted lag of the ratio of cash to total assets. Zcash refers to the predicted lag of the standardized value of cash. Zcash is the Z score of cash standardized by industry-adjusted value of cash standardized by industry year standard deviation. Leverage refers to the lag of the ratio of debt to total assets. Market to book is the lag ratio of market value of equity to book value of assets. Investment refers to the lag of the ratio of the growth in PPE. **, ***denotes significance at <5%, and <1%, respectively. t statistics are reported in parentheses.

4.4.6 Robustness

Cash Holdings and Competition Regimes

The UK Competition Act 1998 and the Enterprise Act 2002 were introduced to enhance competitiveness among firms by introducing fairer trading conditions (Graham, 2004). Since these acts were introduced to improve competition, I use this acts as exogeneous indicators of the degree of competition and evaluate how the acts independently impact firm cash holdings.

The result of this analysis is presented in Table 4.9. I find that firms increase their cash holdings to adjust to increased competitive pressure. The results in Table 4.9 confirm the result in Table 4.3 and are consistent with the findings of Valta (2012). Due to increased competition, the cost of debt financing increases and the market share of a company is threatened. To mitigate the effect of the increased competition, companies increase cash held.

xii:Table 4.9: Robustness Check: Cash Holdings and Increased Competition

	Competition Act 98	Enterprise Act 2002
Increased Competition	0.0057***	0.0036***
	(4.02)	(2.62)
Cash Holdings *t-1*	0.5930***	0.5932***
	(197.11)	(197.19)
Leverage	0.0010***	0.0010***
	(2.64)	(2.67)
Size	-0.0068***	-0.0067***
	(-24.46)	(-24.37)
ROA	-0.0008***	-0.0008***
	(-3.57)	(-3.48)
Market to Book	0.0004***	0.0004***
	(5.93)	(6.04)
Investment	-0.0000***	-0.0000***
	(-7.74)	(-7.73)
Dividend	0.0027***	0.0027***
	(2.16)	(2.17)
Industry	Yes	Yes
Year	Yes	Yes
Intercept	-0.4100***	-0.5682***
	(-2.65)	(-3.65)
Obs	67569	67569
Adj R squared	0.61	0.62

The table presents results of the difference in difference regression. Using two competition regimes the Competition Act of 1998 and the Enterprise Act of 2002 I demonstrate the relationship between cash holdings and increased competition. Increase in competition in the Models were derived by identifying periods before and after the implementation of the competition act. The dependent variable in model is cash holdings levels. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0.Periods before the act were denoted with the variable 1 and periods after the act were ascribed the value of 0. Cash holdings refers to the lag of the ratio of cash to total assets. Leverage refers to the ratio of debt to total assets. Size refers to the log of total assets. ROA refers to industry adjusted value of the ratio of EBITDA to Total assets. Market to book ratio refers to the ratio of market value of equity to book value of total assets. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. t statistics are reported in parentheses. **, *** represents significance at <0.05, and <0.01 respectively.

Endogeneity

Increased cash holdings may be a manifestation of increased profitability in the industry. Hence, new entrants may just be motivated to enter the industry because of increased profitability, and this manifests in cash holdings. To ensure my results are not driven by this possibility I estimate equation 4.9 and 4.10. The results of equations 4.9 and 4.10 are presented in Table 4.10.

xiii:Table 4.10: Robustness Check: Profitability, Sales and Increased Competition

	EBITDA	Sales
Increased Competition	0.1742	0.1005
	(1.40)	(1.06)
Cash Holdings	0.9951***	0.4564***
	(31.80)	(20.09)
Leverage	-0.8745***	-0.0732***
	(-30.12)	(-3.76)
Size	0.9466***	0.9884***
	(662.91)	(969.85)
Market Capitalisation	0.0740***	0.0562***
	(45.37)	(45.17)
Market to Book	-0.0000***	0.0000
	(-7.45)	(0.56)
Investment	-0.0006***	-0.0004***
	(-4.67)	(-6.30)
Dividend	0.3384***	0.3114***
	(28.16)	(38.08)
Market share	0.0002	-0.0000
	(0.84)	(-0.26)
Year	Yes	Yes
Industry	Yes	Yes
Intercept	-2.9721***	-2.2167***
	(-71.82)	(-73.56)
N	51766	56568
Adj. R-squared	0.92	0.96

Column one and two presents the result of the difference in differences regression of increase in competition on net income and EBITDA. Following a treated and matched sample created by the Mahalonobis distance algorithm, observations found in the treatment group were matched by a corresponding observation within the same industry. The treatment group contains firms found in years where there was an increase in competition. The dependent variable is Net Income and EBITDA respectively. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0. Cash holdings refers to the lag of the ratio of cash to total assets. Leverage refers to the ratio of debt to total assets. Size refers to the log of total assets. ROA refers to industry adjusted value of the ratio of EBITDA to Total assets. Market to book ratio refers to the ratio of market value of equity to book value of total assets. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. t statistics are reported in parentheses. **, *** represents significance at <0.05, and <0.01respectively.

I find that there is no significant difference in EBITDA and sales during periods of increased competition. Increases in cash are not motivated by increases in profitability or sales in an industry. In addition, as reported in the Appendix 4B, distinct from the Thomson Reuters level 5 industry classification, I also use the ICB industry classification, Fama and French Industry Classification, Thomson Reuters level 3 and 4 industry classification. The results indicate that firms increase cash in response to increased competition. Reported in Appendix 4C, 4D and 4E are details of the constituents of the respective industry classification.

4.5 Conclusion

Using a large data set covering the period 1980 to 2017, I provide empirical evidence on the relationship between competition and cash holdings. Firstly, I show that firms increase their cash reserves to mitigate increased competition intensity. In addition, I find that firms exposed to high predatory risk increase their cash reserves at a greater rate than firms exposed to lower predatory risk. Correspondingly, firms with high hedging requirements respond to increased competition by increasing cash at a higher rate than firms with lower hedging needs. I also document that unconstrained firms increase cash at a higher rate than constrained firms.

Next, I evaluate the impact of cash in the product market. My results suggest that cash holdings offer competitive advantages in the acquisition of market share as cash-rich firms can make gains at the expense of their counterparts. Further, I find that the gains increase if a firm is less exposed to predatory risk, constrained by financing frictions or has low hedging requirements.

This chapter signifies an important step in understanding the relationship between cash and product market competition. I provide a novel empirical explanation for the

increasing level of cash in the UK setting. And my results could reasonably be extended to other market-based economies such as the US. In addition, I reveal the impact of predatory risk and financing frictions on a firm's cash holdings policies in the presence of product market competition.

Appendices to Chapter 4

Appendix 4A: Robustness: Cash Holdings and Increased Competition

	Concentration	Entropy	Gini	HHI
Increased Competition	0.0089***	0.0166***	0.0030***	0.0115***
	(6.64)	(9.44)	(2.39)	(6.51)
Leverage	-0.1020***	-0.1272***	-0.1274***	-0.1309***
	(-34.61)	(-28.90)	(-41.31)	(-28.70)
Size	-0.0035***	-0.0113***	-0.0065***	-0.0115***
	(-16.53)	(-30.35)	(-28.83)	(-29.87)
ROA	-0.0027***	0.0060***	-0.0034***	0.0057***
	(-4.69)	(5.05)	(-5.57)	(4.75)
Market to Book	0.0022***	0.0105***	0.0028***	0.0103***
	(22.17)	(42.15)	(26.35)	(39.80)
Investment	-0.0000	-0.0000	-0.0000	-0.0000
	(-0.66)	(-0.95)	(-0.75)	(-1.00)
Dividend	-0.0348***	-0.0541***	-0.0578***	-0.0509***
	(-22.20)	(-25.19)	(-35.21)	(-23.01)
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Intercept	0.1528***	0.2916***	0.2623***	0.2911***
	(18.86)	(28.21)	(34.42)	(27.17)
Observation	67096	37972	65114	35684
Adjusted R-Squared	0.240	0.194	0.130	0.187

The table presents results of the difference in differences regression. Using four distinct measures of competition (Number of firms in industry, Theil Entropy index, Gini coefficient and HHI index) I demonstrate the relationship between cash holdings and increased competition. Following a treated and matched sample created by the Mahalonobis distance algorithm, observations found in the treatment group were matched by a corresponding observation within the same industry. The treatment group contains firms found in years where there was an increase in competition. Increase in competition in Model 1, 2, 3, and 4were derived by identifying periods in which there was an increase in competition in an industry using the above measures of competition. The dependent variable in the model is cash holdings levels. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0. Cash holdings refers to the ratio of cash to total assets. Leverage refers to the ratio of debt to total assets. Size refers to the log of total assets. ROA refers to industry adjusted value of the ratio of EBITDA to Total assets. Market to book ratio refers to the ratio of market value of equity to book value of total assets. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. t statistics are reported in parentheses. **, *** represents significance at <0.05, and <0.01 respectively.

Appendix 4B: Robustness: Cash Holdings and Increased Competition

	ICB Industry Class	Thomson Reuter Level 3 Industry Class	Thomson Reuter Level 4 industry Class	Fama and French Industry Class
Increase in Competition	0.0069***			
	(7.21)			
Increase in Competition		0.0029***		
		(3.66)		
Increase in Competition			0.0019***	
			(2.62)	
Increase in Competition				0.0026***
				(3.05)
Cash Holding (*t-1*)	0.7568***	0.7573***	0.7492***	0.7733***
	(457.87)	(470.83)	(442.46)	(486.12)
Leverage	-0.0359***	-0.0290***	-0.0345***	-0.0334***
	(-26.66)	(-22.35)	(-24.07)	(-26.72)
Size	-0.0008***	-0.0011***	-0.0012***	-0.0014***
	(-9.31)	(-12.37)	(-12.30)	(-14.69)
ROA	-0.0008***	-0.0004	0.0001	0.0049***
	(-2.33)	(-1.19)	(0.31)	(5.96)
Market to Book	0.0008***	0.0009***	0.0009***	0.0010***
	(13.21)	(15.45)	(15.73)	(17.87)
Investment	-0.0000***	-0.0000***	-0.0000***	-0.0000***
	(-7.90)	(-6.30)	(-7.94)	(-9.90)
Dividend	-0.0057***	-0.0049***	-0.0045***	-0.0049***
	(-8.54)	(-7.31)	(-6.33)	(-7.82)
Intercept	0.0340***	0.0609***	0.0439***	0.0485***
	(8.33)	(17.80)	(12.84)	(14.18)
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	142747	149709	139029	146967
Adjusted R Squared	0.67	0.68	0.69	0.67

The table presents additional analysis of the difference in differences regression using changes in the number of firms in an industry as the measure of competition. As an additional filter of robustness, I use four other industry classification (ICB Industry Classification, Thomson Reuters Level 3 Classification, Thomson Reuters Level 4 Classification, and the Fama and French Industry Classification).Following a treated and matched sample created by the Mahalonobis distance algorithm, observations found in the treatment group were matched by a corresponding observation within the same industry. The treatment group contains firms found in years where there was an increase in competition. Increase in competition in Model I, II, III, and IV were derived by identifying periods in which there was an increase in firms within an industry. Periods of intense competition were identified in Models by capturing years where there was an increase in the number of firms in the industry. The dependent variable in the models is cash holdings levels. Increase in competition is a dummy variable the captures period of increased competition as 1 and otherwise as 0. Cash holdings refers to the lag of the ratio of cash to total asset. Leverage refers to the ratio of debt to total asset. Size refers to the log of total asset. ROA refers to industry adjusted value of the ratio of EBITDA to Total asset. Market to book ratio refers to the ratio of market value of equity to book value of total asset. Investment refers to changes in PPE. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and 0 otherwise. Tstatistics are reported in parentheses. **, *** represents significance at <0.10, and <0.05 respectively.

Appendix 4C: Thomson Reuters Level 5 Industry Classification

Thomson Reuters level 5 sector name	Firm Year Per Industry	Percent
Aerospace	863	1.1%
Airlines	490	0.6%
Alt. Electricity	325	0.4%
Alternative Fuels	200	0.3%
Aluminium	178	0.2%
Apparel Retailers	840	1.1%
Auto Parts	538	0.7%
Automobiles	849	1.1%
Biotechnology	1,383	1.8%
Brewers	353	0.5%
Broadcast & Entertain	1,744	2.2%
Broadline Retailers	884	1.1%
Building Mat. & Fix.	1,649	2.1%
Bus. Train & Employment	892	1.1%
Business Support Svs.	4,056	5.2%
Clothing & Accessory	1,200	1.5%
Coal	328	0.4%
Comm. Vehicles, Trucks	690	0.9%
Commodity Chemicals	758	1.0%
Computer Hardware	711	0.9%
Computer Services	1,712	2.2%
Con. Electricity	1,270	1.6%
Consumer Electronics	523	0.7%
Containers & Package	476	0.6%
Defense	300	0.4%
Delivery Services	179	0.2%
Diamonds & Gemstones	248	0.3%
Distillers & Vintners	402	0.5%
Divers. Industrials	1,572	2.0%
Drug Retailers	64	0.1%
Dur. Household Prod.	589	0.8%
Elec. Office Equip.	205	0.3%
Electrical Equipment	1,608	2.1%
Electronic Equipment	1,161	1.5%
Exploration & Prod.	2,565	3.3%
Farm Fish Plantation	598	0.8%
Fixed Line Telecom.	1,534	2.0%
Food Products	2,052	2.6%
Food Retail, Wholesale	880	1.1%
Footwear	87	0.1%
Forestry	86	0.1%
Furnishings	470	0.6%
Gambling	508	0.6%
Gas Distribution	260	0.3%
General Mining	2,005	2.6%
Gold Mining	1,741	2.2%
Healthcare Providers	493	0.6%
Heavy Construction	1,140	1.5%
Home Construction	945	1.2%
Home Improvement Ret.	420	0.5%
Hotels	772	1.0%
Industrial Machinery	3,263	4.2%
Industrial Suppliers	1,197	1.5%
Integrated Oil & Gas	761	1.0%
Internet	456	0.6%
Iron & Steel	642	0.8%
Marine Transportation	507	0.6%
Media Agencies	1,232	1.6%
Medical Equipment	930	1.2%

Medical Supplies	376	0.5%
Mobile Telecom.	789	1.0%
Multiutilities	503	0.6%
Nondur.Household Prod	219	0.3%
Nonferrous Metals	511	0.7%
Oil Equip. & Services	743	0.9%
Paper	490	0.6%
Personal Products	408	0.5%
Pharmaceuticals	1,955	2.5%
Pipelines	18	0.0%
Plat. & Precious Metal	437	0.6%
Publishing	1,634	2.1%
Railroads	88	0.1%
Real Estate Hold, Dev	68	0.1%
Recreational Products	287	0.4%
Recreational Services	909	1.2%
Renewable Energy Eq.	159	0.2%
Restaurants & Bars	1,307	1.7%
Semiconductors	1,228	1.6%
Soft Drinks	191	0.2%
Software	3,194	4.1%
Spec.Consumer Service	237	0.3%
Specialty Chemicals	1,660	2.1%
Specialty Retailers	1,544	2.0%
Telecom. Equipment	1,337	1.7%
Tires	144	0.2%
Tobacco	331	0.4%
Toys	236	0.3%
Transport Services	827	1.1%
Travel & Tourism	504	0.6%
Trucking	245	0.3%
Waste, Disposal Svs.	205	0.3%
Water	836	1.1%
Total	78,404	100

Appendix 4D: Fama and French Industry Classification

Fama and French Industries	Freq.	Percent
Agriculture	5,763	12.74
Food Products	894	1.98
Candy & Soda	86	0.19
Beer & Liquor	34	0.08
Tobacco Products	1,080	2.39
Recreation	1,296	2.86
Printing and Publishing	927	2.05
Consumer Goods	913	2.02
Apparel	1,614	3.57
Medical Equipment	371	0.82
Pharmaceutical Products	29	0.06
Chemicals	800	1.77
Rubber and Plastic Products	375	0.83
Textiles	1,258	2.78
Construction Materials	3,142	6.94
Construction	3,612	7.98
Steel Works Etc.	943	2.08
Fabricated Products	255	0.56
Machinery	810	1.79
Electrical Equipment	222	0.49
Automobiles and Trucks	121	0.27
Aircraft	38	0.08
Shipbuilding, Railroad Equipment	41	0.09
Defense	212	0.47
Precious Metals	98	0.22
Non-Metallic and Industrial Metal Mining	2,948	6.52
Coal	1,279	2.83
Petroleum and Natural Gas	957	2.12
Communication	316	0.7
Business Services	285	0.63
Computers	187	0.41
Electronic Equipment	233	0.51
Measuring and Control Equipment	473	1.05
Business Supplies	1,011	2.23
Shipping Containers	261	0.58
Transportation	12,362	27.32
Total	45,246	100

Appendix 4E: ICB Industry Classification

ICB INDUSTRY NAME	Frequency	Percentage
Basic Materials	8,734	11.23
Consumer Goods	10,480	13.48
Consumer Services	13,837	17.8
Health Care	5,024	6.46
Industrials	21,200	27.27
Oil & Gas	4,275	5.5
Technology	8,752	11.26
Telecommunications	2,309	2.97
Utilities	3,129	4.02
Total	77,740	100

Chapter 5
Cash Holdings, Stock Returns, and Investment Organicity: Evidence from UK Investment Announcements

5.0 Summary

The chapter examines whether the market reaction to investment announcements is conditional on company *Cash Holdings* levels. Cash may convey significant price relevant information about the future cash flows and strategic direction of a company. Using a sample of 3,251 corporate investment announcements by firms listed on the London Stock Exchange over the period 2005-2016, I show that higher *Cash Holdings* at announcement result in increased market valuation of corporate investments. However, the impact becomes negative at higher levels of *Cash Holdings*. Furthermore, I provide evidence on the relationship between *Cash Holdings* and market valuation of various investment classes. The results reveal that organic investments are valued more highly by the market than inorganic investment, and the positive impact of *Cash Holdings* is more pronounced for the set of organic investment decisions, particularly R&D. Lastly, I evaluate how the motive for holding cash affects the market perception of *Cash Holdings*. When cash is held for survival purposes, markets see *Cash Holdings* as positive, while the effect is negative when cash is held for expansion.

Keywords: cash; cash holdings; motives for cash holdings; corporate investment; organic investment; inorganic investment; managerial entrenchment; R&D; event study; market

5.1 Introduction

The purpose of this chapter is to determine the impact of cash holdings on the valuation of investment decisions. I focus on the market valuation of investment announcements which has been a relatively neglected aspect of valuation studies due to the varied and inconsistent nature of investment information. Yet some studies attempt to determine how such information affects market values (See for example, Burton, Lonie and Power 1999; Jones, Danbolt and Hirst 2004). Developments in information technology, improved listing and governance requirements, and greater media attention have enhanced the information environment for conducting such studies. In this study, I examine the market valuation of investment announcements and focus in particular on the role of cash holdings. Results are consistent with my view that cash holdings affect market reaction to investment decisions and play a strategic role when new investment is announced. This implies that cash held conveys significant information regarding the success of an investment.

Early work on the role of cash was postulated by Keynes (1936) who argues that cash is held to meet specific needs, such as transactions, precautions against unexpected events and speculation. At the firm level, Myers (1984) and Myers and Majluf (1984) argue that firms require some financial slack if they are to pursue all investment opportunities with positive net present value (NPV), especially if there are imperfections in financial markets. Market imperfections could be an impediment to corporate value creation since firms will be compelled to reject positive NPV projects if they believe the cost of financing does not reflect the true value of their securities. An alternative view is proposed by Jensen (1986) who suggests that excessive cash holdings could fuel the agency problem, as managers can use internal financing to avoid monitoring by capital

markets. Hence, cash-rich firms are more likely to engage in suboptimal investments. Subsequent studies in the cash holdings literature were motivated mainly based on the arguments proposed by Myers and Majluf (1984) and Jensen (1986). Some studies model the determinants of cash holdings, others explore the relationship between cash holdings and corporate governance, corporate innovations, and Mergers and Acquisitions (Harford, 1999; Opler *et al.*, 1999; Almeida, Campello and Weisbach, 2004; Ozkan and Ozkan, 2004; Harford, Mansi and Maxwell, 2008; Acharya, Davydenko and Strebulaev, 2012).

Our study extends the existing body of literature by providing novel evidence on how firms' cash holdings is perceived by the market when investment decisions are announced. The arguments for cash holdings put forward by Jensen (1986) and Myers and Majluf (1984) address the role of cash holdings in inducing overinvestment or underinvestment. The perception of investment decisions by market participants may extend beyond these constructs as information content around investment decisions may carry additional strategic significance (Woolridge and Snow, 1990; Jones, Danbolt and Hirst, 2004). Building on these theoretical arguments and empirical observations, I extend the literature by providing evidence on how the firms' cash holdings policy affects market reactions to firms' investment announcements. Particularly, I examine how this effect varies with investment classification as well as firm motive for cash holdings.

To conduct my empirical tests, I use UK data. The UK provides an appropriate setting for this study since it is one of only a small number of countries which require firms to provide detailed information on investment decisions and in which the market has

sufficient diverse ownership and liquidity to examine the issue at hand (Barca and Becht, 2002). In a recent article in the Financial Times, cash held by FTSE 100 firms is reported to have risen from £12.2 billion to £73.9billion between 2008 and 2013. The report indicates that shareholders advocate for firm excess cash position to be divested into dividend payments and investments (Financial Times, February 12th, 2014). Figure 5.1 indicates a similar pattern of increasing average and total cash holdings by UK non-financial firms. The study reveals that the market rewards firms that hold significant cash reserves when they make investment announcements.

iv:Figure 5.1: Trends in Cash Holdings by UK-listed Non-financial Firms
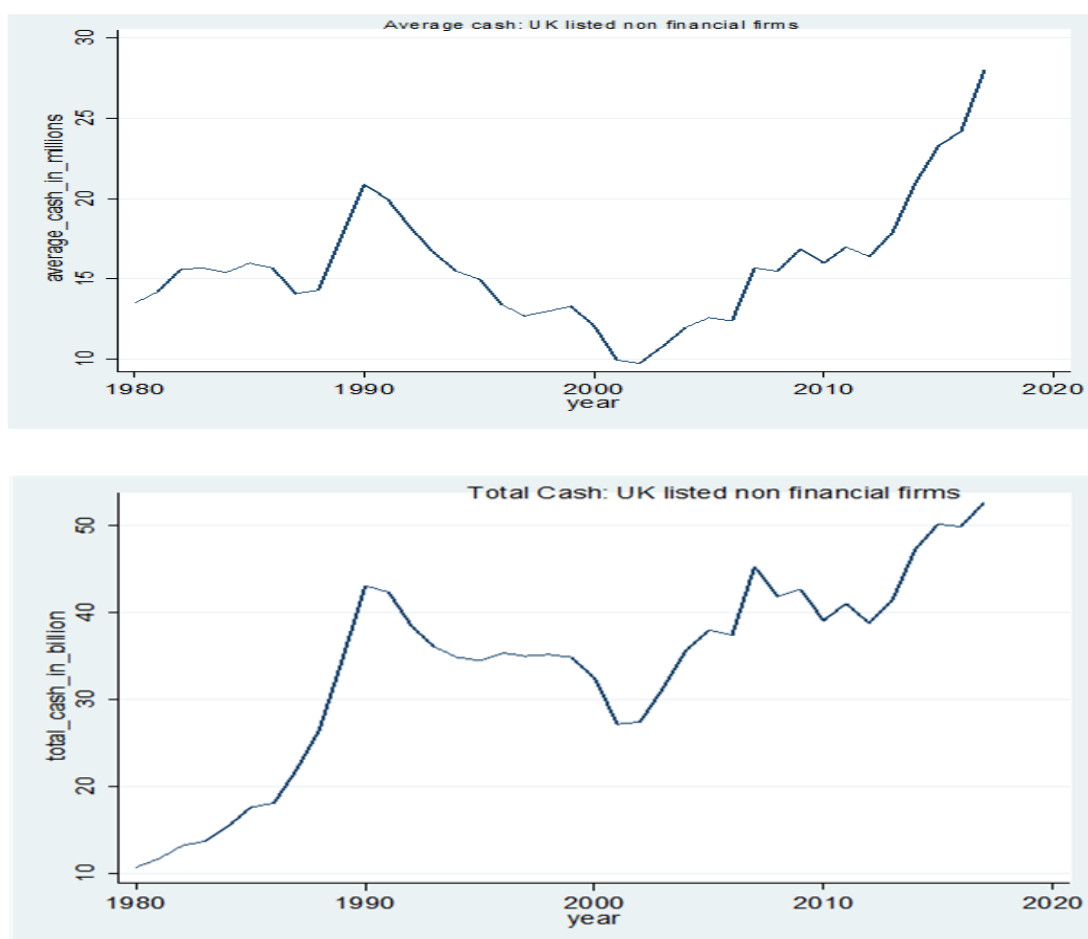
I offer three important contributions to the existing literature. Firstly, I provide insight on how cash holdings affect market valuation of corporate investment announcements. To the best of my knowledge, this research is the first in the literature to evaluate how the

degree of cash held is perceived by the market during various investment announcements. Distinct from the existing literature on the free cash flow hypothesis that focuses largely on the observable effect of cash on market valuation of mergers and acquisition (See for example Lang, Stulz and Walkling 1991; Mann and Sicherman, 1991; Harford, 1999), I present new evidence on the effect of free cash flow on various classes of investment announcements. Using a sample of organic and inorganic investments, I demonstrate how the effect differs between investment classes. Further, I demonstrate that differentiating investment announcements based on firms' growth strategies (i.e. organic or inorganic) may be more insightful to the market, as market reaction appears to differ based on this investment classification. Lastly, I show how agency cost implications vary with various hypothesised motives for cash holdings.

Our main findings are as follows. Using a sample of 3,251 corporate investment announcements by UK companies in the FTSE ALL share index between 2005 and 2016, I find that cash holdings increase market valuation of corporate investment decisions. My results suggest that there is a positive relationship between cash holdings and abnormal returns around corporate investment announcements. However, the positive relationship between cash holdings and market valuation of corporate investment is persistent only for research and development announcements. The motive for cash holding also shapes the way the market reacts to firm cash holdings during corporate investment announcements. These results suggest market participants infer information about agency costs, future cash flows and the strategic direction of the firm from the firm's cash position when new investments are announced. The results imply cash may be held for reasons of survival, expansion, and managerial entrenchment.

The rest of this chapter is structured as follows: Section 2 provides a review of the theoretical and empirical literature on cash holdings and corporate investment. Section 3 describes the data. Section 4 presents the empirical results. Section 5 concludes the study.

5.2 Hypothesis Development

5.2.1 Cash Holdings and Market Valuation of Company Investment

Increasing cash holdings can be a valuable tool for firms who wish to benefit from efficient financing of new investment projects (Myers and Majluf, 1984). Management have better information regarding firm value than potential investors ((Myers and Majluf, 1984). As a consequence of asymmetry of information between managers and providers of external finance, funding of investment opportunities by means of external finance can be expensive during periods of firm undervaluation. Thus, when in need of finance, firms may prefer to finance internally if they perceive external finance to be overpriced. Accordingly, they are compelled to reject investment opportunities when they have no financial slack (i.e. cash). Firms who have sufficient financial slack are able to exercise investment opportunities without requiring external finance, and at short notice.

The Myers and Majluf (1984) approach suggests that, firms with high financial slack should seek out acquisition targets with good investment opportunities, limited financial slack of their own, and about which investors have limited information. Smith and Kim (1994) provide evidence which highlights the benefit of cash-rich firms acquiring targets with severe cash shortages. Correspondingly, Ascioglu, Hegde and McDermott (2008) reveal that information asymmetry reduces firm investment, implying that firm's ability to exercise growth opportunities is constrained by high levels of information asymmetry. Similarly, companies with increased levels of information asymmetry may be forced to finance growth internally due to market undervaluation of the company and increased

costs of external capital. Easley and O'Hara (2004) find an association between elevated levels of information asymmetry and increased cost of equity. When information asymmetry is high, companies will be faced with higher external cost of finance or reliance on internal finance. In such cases, firm growth would be constrained by availability of internal funds and underinvestment. Chen (2008) suggests that cash holdings are only valuable when firms have high investment opportunities. Without growth opportunities, firms with cash will be subject to overinvestment.

An alternative approach is advocated by Jensen (1986) who argues that there are agency costs associated with free cash flow. Free cash flows, the cash flows in excess of operating costs, are available to be used by managers for expropriation of investors in the form of agency costs when corporate governance is imperfect. In this framework, corporate debt plays a central role in monitoring the activities of managers (Jensen, 1986). Debt lessens the agency problem by reducing the volume of cash available for discretionary spending. Furthermore, the monitoring role of debt is more important in corporations with limited growth opportunity but considerable cash flow. Managers with an excessive cash position are likely to invest in projects that may be suboptimal from a shareholder wealth perspective. Such expenditure may be motivated by private benefits of control rather than corporate value. A number of subsequent studies have been conducted based on the free cash flow approach. For example, Lang, Stulz and Walkling (1991) examine the free cash flow hypothesis in the context of takeovers and infer that high cash reserves induce rent-seeking behaviour and overinvestment. Harford (1999), Titman, Wei and Xie (2004) and Harford, Mansi and Maxwell (2008) provide evidence that firms with large cash holdings are more likely to invest in value-destroying projects. Hence, I expect that the market reaction to new investment decisions will be modified by the level of cash holdings. Hence, I hypothesise that:

H1: The level of cash holdings is associated with market valuation of corporate investment announcements.

5.2.2 Managerial Entrenchment and Value Creation

Following the literature on the determinants of cash holdings (See for example, Opler *et al.* 1999; Opler *et al.* 2001; Pinkowitz and Williamson 2001), I argue that cash is held for either survival, expansion or managerial entrenchment. In support of the expansion argument, Opler *et al.* (1999) and Ozkan and Ozkan (2004) argue that firms with superior growth opportunities hold more cash than rivals with fewer growth opportunities within the same sector. Hence, to cater for the problem of underinvestment, such companies require some degree of flexibility to meet their level of investment needs i.e. internal funds. By holding cash, the company is able to exercise valuable growth opportunities without the need to raise capital and at short notice. Such decisions may lead to either an increase or decrease in shareholder value.

Liquidity can threaten the going concern of a firm during downturns in the economic cycle or if adverse events affect an industry or sector (Opler *et al.*, 1999; Ozkan and Ozkan, 2004; Uyar and Kuzey, 2014). One of the biggest risks for any financial organisation is the risk of not meeting short-term financial obligations. To mitigate the impact of such occurrences, firms are compelled to hold cash as a form of hedging against uncertainty. Similarly, firms that encounter difficulties in accessing finance from the capital market increase their cash reserves to meet financing shortfalls (Almeida, Campello and Weisbach, 2004; Denis and Sibilkov, 2009). In addition, due to adverse exposure to fluctuation in interest rates, firms may be obliged to hedge with cash. Harford, Klasa and Maxwell (2014) discuss how exposure to adverse movement in interest rate

can prompt firms to increase cash reserves. Due to market conditions and investment requirements, some firms are forced to hold higher levels of cash.

Managerial entrenchment allows managers to use the resources of the company to pursue personal objectives rather than those of the organisation (Weisbach, 1988). Managers of firms can embark on investments that amplify their value to the shareholders (Shleifer and Vishny, 1989). Self-interested managers may expand the structure of the company to include various departments or lines of production, such that the operations become very complicated to manage or understand. As a result, managers acquire a high degree of artificial relevance and the perception that they are indispensable to the company. Managerial power over boards allows CEOs with significant control over their boards to undertake investment opportunities even if the NPV of the investment is negative (Demsetz, 1983). One tool which can be used by managers to entrench is the level of cash held in the treasury of the company. Managerial entrenchment manifests when firms that have low investment opportunities, stable cash flows, low financing constraints, or low exposure to refinancing risk may hold higher levels of cash. Ozkan and Ozkan (2004) and Anderson and Hamadi (2016) contend that firms with concentrated ownership tend to have higher levels of cash holdings. With cash at their disposal, managers are able reduce monitoring and operate without constraints imposed by the need to raise external finance. In turn, managers can operate at lower levels of monitoring and value-destroying investments are more easily pursued.

Managers can therefore use cash as a value creating or destroying tool. My second hypothesis is that cash holdings provide information about value creation or destruction associated with company investment decisions. The direction of the association between

the market valuation of company investment announcements and the level of cash holdings depends on the motive for cash holdings.

Our managerial entrenchment and value creation hypotheses are as follows:

H2a: High cash holdings are negatively associated with the market valuation of company investment announcements (Entrenchment hypothesis).

H2b: Stock market reaction to company investment announcements is higher for low cash holdings than high cash holdings (Cash monitoring hypothesis).

H2c: High cash holdings are positively associated with the market valuation of company investment announcements (Value creation hypothesis).

5.2.3 Organic and Inorganic Investment

Company investment is the commitment of financial, physical and intellectual resources of a firm to future generation of cash flow. In general, investment approaches employed by corporations can be organic or inorganic. Organic investment implies, stimulating the development of a firm by focussing on internal development. This encompasses growing sales, customer base/clientele, expansion or creation of a new product line based on an internal strategy (Bruner and Perella, 2004). Hence, organic investment includes capital investments such as purchase of assets, product launch, and R&D, whilst inorganic growth focuses on business expansion by growing the scope of the business externally including acquisitions and mergers.

Compared to inorganic investment, organic investment is a slower and more painstaking growth strategy (Bruner and Perella, 2004). Inorganic investment is a more short-term strategy which offers quicker rewards (Trautwein, 1990). The short-term bias on investment can be somewhat relaxed in most classes of organic investment (Bruner and Perella, 2004). Hence, organic investment should be more highly valued by an efficient

market. Thus, the presence of large cash balances is expected to indicate managerial entrenchment. Consequent to the above assertions, I hypothesise that:

H3a: For organic investments, the relationship between cash holdings and abnormal returns will be positive (Long term growth hypothesis).

H3b: For inorganic investments, the relationship between cash holdings and abnormal returns will be negative (Entrenched investment hypothesis).

5.3 Data and Methodology

Company investment announcements were collected from Morningstar.co.uk (Morningstar, 2017), the official national storage mechanism appointed by the UK Financial Conduct Authority (FCA). I collect data for the period from 2005 to 2016. I was limited to this period because of the available data on Morningstar.co.uk (Morningstar, 2017). Relevant categories of announcements were identified and an initial dataset of 9860 announcements was reviewed for relevance according to the procedure outlined in Appendix 5A. To avoid the problem of contemporaneous price information release, I exclude contaminated announcements. An announcement is categorised as contaminated if:

- During the event window, another event was announced that could alter price movement.

- If the announcement was made in conjunction with another announcement that could alter price movement.

- If the announcement was made by a firm in the financial services industry.

Among the final sample of 3,602 corporate investment announcements, 3182 were announcements on corporate acquisition, 193 were acquisition of assets, 158 were research and development announcements and, 69 were product launch. Firm level data were collected from Thomson Reuters DataStream. Following restrictions on the

availability of data on cash holdings, clean corporate investment announcements were limited to 3,251 announcements. Further details on the sample cleaning process and distribution of the sample among years and industry are presented in Appendix 5D.

5.3.1 Dependent Variable

First, I estimate market valuation of a corporate investment using an event study approach. I employ the Fama, French and Carhart model (FFC) to ensure that abnormal return is not driven by firm-level stock price momentum i.e. past stock performance. The estimates provided by the FFC model account for four factors which influence abnormal returns: market, size, growth, and momentum. An estimation period of -265 days to -11 days (i.e. about twelve trading months excluding weekends and holidays) was utilised in estimation of model parameters. Estimating the parameters over this period mitigates the problem of biased betas (MacKinlay, 1997). In addition, the post event estimation window reduces the forecasting error (Ahern, 2009). The abnormal return for corporate investment announcements is estimated by subtracting the actual return surrounding the event announcement from the expected return from the following equation:

$$R_{i_t} = \alpha_{it} + \beta_{i_t}(Rmt - Rft) + \beta_{i_t}(SMB) + \beta_{i_t}(HML) + \beta_{i_t}(UMD) + \varepsilon_{it} \qquad (5.1)$$

Where R_{it} is return for stock i at time t; R_{ft} is risk free return at time t; R_{mt} is return on the market portfolio at time t; *SMB* is the difference between small and big portfolio; *HML* is the difference between high and low portfolio; and *UM* is the difference between high momentum portfolio and low momentum portfolio. Data for the Fama, French and Carhart factors was collected from the repository of the Xfi Centre for finance and investment, Exeter University as developed by Gregory, Tharyan and Christidis, (2013). Simpler specifications such as the Market and Index models are also commonly used in

the literature on investment and I provide results from these models in my initial tests for comparison. Firstly, the Market model is estimated as follows:

$$R_{it} = \alpha_{it} + \beta_{it}R_{m_t} + u_{It} \tag{5.2}$$

Where R_{it} is the expected return for company i for period t; α is the alpha estimate of company i at time t; parameter estimate of the intercept; β *is* the beta estimate for firm i at time t; the slope coefficient; R_{mt} is the return on the market portfolio; and U_{it} is the error term of the company i at time t.

Secondly, an index model is estimated as follows:

$$AR_{it} = R_{it} - R_{mt} \tag{5.3}$$

Where AR_{it} is the abnormal return for company i at time t, R_{it} is the return for company i at time t and R_{mt} is the return on the market at time t.

5.3.2 Empirical Model

Following the existing literature on cash holdings and corporate investment (See for instance, Burton, Lonie and Power, 1999; Opler *et al.* 1999; Jones, Danbolt and Hirst 2004). I estimate the following econometric regression to evaluate the relationship between cash holdings and corporate investment announcement:

$$y_i = \alpha_i + \beta_1 \text{ (Cash holdings }_i) + \beta_2 \text{ (log Total Asset }_i) + \beta_3 \text{ (Organic }_i) + \beta_4 \text{ (Q)} + \beta_5 \text{ (Leverage }_i) + \beta_6 (\text{ROA}_i) + \beta_7 \text{ (Interest Rate }_i) + \beta_8 \text{ (Bid-Ask }_i) + \varepsilon_i \tag{5.4}$$

The α and β are true (unobserved) parameters of the model. Details of the potential direction of the relationship between market valuation and the explanatory variables are

discussed in section 5.3.3. The estimated value of ε is zero conditional on all values of the independent variables. ε is independent of the regressors and normally distributed.

5.3.3 Independent Variables

Cash holdings

The variable of interest in this study is cash holdings. Following Opler *et al.* (1999); Opler *et al.* (2001), and Pinkowitz, Stulz and Williamson (2006), I measure cash holdings by estimating the ratio of cash to net assets where net assets is total assets minus cash. Further details on variable definition are provided in the Appendix 5E.

Size

The asset pricing literature indicates the presence of a small firm effect in equity market returns (Banz, 1981; Fama and French, 1992; Berk, Green and Naik, 1999; Gomes, Kogan and Zhang, 2003). Chan, Lakonishok and Sougiannis (2001) suggest that most R&D investment is undertaken by small firms since R&D offers the easiest route to future growth. Furthermore, Loughran and Ritter (1996) argue that stock returns of small firms are largely driven by size, as they are more likely to be lowly priced compared to larger companies.

A growing number of studies reinforce Jensen's (1986) empire-building hypothesis as a possible motivation for investment projects. Larger firms imply more market power, which translates to higher executive compensation (Bebchuk and Fried, 2003; Bebchuk and Cohen, 2005). Brealey, Myers and Allen (2011) argue that managers are often hesitant to tear down unproductive structures when they should disinvest. Similarly, Titman, Wei and Xie (2004) suggest that market participants react less positively to investments motivated by empire building managers.

Organic

Following the arguments of Trautwein (1990) and Bruner and Perella (2004) I classify investments as either organic or inorganic. Organic investment such as purchase of assets, product launch, and R&D are assigned the value of 1, while inorganic investments such as acquisition are assigned the value of zero.

Growth Opportunity (Q)

The growth opportunities of a firm are the future growth prospects of a firm. Consequently, it shapes the market perception and valuation of capital investment decisions (Szewczyk, Tsetsekos and Zantout, 1996; Burton, Lonie and Power, 1999; Jones, Danbolt and Hirst, 2004). It is widely documented that the market reacts positively to investment announcements made by firms with higher growth opportunities (Chan, Martin and Kensinger, 1990; Zantout and Tsetsekos, 1994; Burton, Lonie and Power, 1999; Jones, Danbolt and Hirst, 2004).

Leverage

Jensen (1986) argue that debt is an important monitoring mechanism. Elevated levels of debt reduce the free cash flow problem and mitigate the entrenchment problem by forcing managers to meet short-term debt repayments. Furthermore, return can be leveraged upwards using high levels of debt due to cheaper cost of debt capital. Recent regulatory changes in various countries including the US and several European countries have reduced the benefits of debt financing but debt continues to be cheaper than equity (Carpenter and Petersen, 2002; Gaud, Hoesli and Bender, 2007).

Operating performance (ROA)

Although past performance does not necessarily predict future performance, the nature of a firm's past and present performance can help shape market reaction to a firm's investment decision (Wang and Xie, 2008). Results on the relationship between operating performance and market valuation of investment continue to diverge (See for instance, Harford 1999; Heron and Lie 2002). As in Wang and Xie (2008) I measure operating performance as ROA.

Interest Rate

Another significant variable in the valuation of investment is the rate of interest. Dixit and Pindyck (1994) propose that interest rate serves as a signal in pricing capital investment since it helps identify the minimal rate of return from a capital investment. According to Jones, Danbolt and Hirst (2004), there is an inverse relationship between interest rate and market valuation of a firm's capital investment decisions. The timing of the investment decision drives this relationship since, during periods of adverse interest rate movements, investors will favour decisions that create investment options and react negatively to decision which exercise options to invest.

Bid-Ask Spread

The quality of accounting information posted by a firm can also improve the efficiency of capital investment. Biddle and Hilary (2006) argue that higher quality of accounting increases the competence and proficiency of investment undertaken by a firm. They argue that this is achieved because information symmetry between managers and shareholders is enhanced. To measure the quality of accounting information, I follow Biddle and Hilary

(2006) and estimate the difference between the ask and the bid prices to capture this effect.

5.3.4 Categorical Variables

I categorise firms in my sample based on their percentile location. This approach ensures I can differentiate firms based on various qualities and infer their motivation for holding cash. For instance, typically I will find small firms in the lowest percentile and large firms in the highest percentile.

Following the literature on the determinants of cash holdings (See for example Opler *et al.* 1999; Opler *et al.* 2001; Pinkowitz, Stulz and Williamson 2006). I differentiate big firms from small firms based on their reported assets. Consistent with my hypothesised motives for cash holdings (i.e. survival, expansion and entrenchment motives), I identify firms in the lowest and highest quartile of total assets, leverage and ROA. This approach helps identify firms holding cash for liquidity and survival. Following this dichotomy I identify financially constrained firms on the basis of their size. Acharya, Almeida and Campello (2007) use a similar approach of splitting firms according their percentiles. Using this approach, I identify firms in the lowest quartile of total assets as small firms with limited collateral and hence financially constrained. Firms within the 75th percentile and above were regarded as large firms and not financially constrained.

Next, I split sample firms on the basis of their Q ratio to identify firms holding cash to exercise growth opportunities. Firms located within the lowest Q quartile are regarded as having low growth potential whilst firms located in the highest quartile are regarded as firms having high growth potential. Firms within the 75th percentile and above are hypothesised to hold cash primarily to meet the requirements of new investment projects

whilst firms within the lowest quartile, having lower cash requirements, may be holding cash for entrenchment purposes (Opler *et al.*, 1999; Opler *et al.*, 2001).

Similarly, consistent with the literature on the determinants of cash holdings, I split firms on the basis of their debt capacity. I identify firms with leverages within the 25th percentile and below as firms with high debt capacity while firms within the 75th percentile and above were identified as companies with limited ability to raise more debt. I identify firms within the lowest quartile as firms that hold cash for survival, whereas firms located within the 75th percentile may be regarded as firms not exposed to high degree of frictions in the debt market (Ozkan and Ozkan, 2004).

Lastly, I split firms on the basis of their return on assets (ROA). Firms located within the lowest quartile are identified as low profitability firms and firms within the highest quartile as high profitability firms. Low profitability firms may hold cash to help for survival whilst high profitability firms may hold cash for entrenchment purposes.

5.4 Empirical Results

Table 5.1 reports the abnormal return for the 9 days around corporate investment announcements. The average abnormal return on the event day (t) is 0.7% with some small variation in the second decimal place for all three models ($p<0.01$). There are no significant average abnormal returns on any other day in the event window for the FFC model, but abnormal returns are significant for day t+1 using both the Market and Index models of 0.2% and 0.15% respectively. The Index model exhibits significance on day t-1 but the magnitude is small.

xiv:Table 5.1: Daily Abnormal Returns

Day	Fama French and Carhart		Market Model		Index Model	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
-4	0.0010	0.0837	-0.0001	-0.0007	0.0003	-0.0004
-3	0.0014	0.1133	-0.0001	-0.0008	0.0001	-0.0006
-2	0.0021	0.1439	-0.0004	-0.0012	0.000	-0.0007
-1	0.0020	0.1159	0.0003	-0.0004	0.0008**	0
0	0.007***	0.1580	0.0065***	0.0044	0.0074***	0.0052
1	0.0035	0.1387	0.0015***	0.0008	0.0021**	0.0014
2	0.0022	0.1362	0.000	-0.0007	0.0003	-0.0004
3	0.0015	0.1182	-0.0002	-0.0009	0.0002	-0.0005
4	0.0015	0.1406	-0.0008**	-0.0014	-0.0006*	-0.0012

Notes: The sample consists of 3516 corporate investment announcements from companies listed on the London Stock Exchange (LSE) within the FTSE ALL SHARE index. Data on the announcement was collected from Morningstar.co.uk, the official mechanism for storing regulated information in the UK. The period covered is from 2005 to 2016. The table presents the ten (9) days pre and post event abnormal return using the Fama, French and Carhart model, the market model, and the index model. The values reported were verified by the event study metric software package. ***,**,* represents significance level at <1%, < 5% and <10% respectively.

Table 5.2 Panel A reports CARs estimated using the three models: the FFC model, the market model, and the index model. Panel B reports CARs by categories of investment.

xv:Table 5.2: Cumulative Abnormal Returns

	Panel A		
	FFC	**MM**	**IM**
Mean	0.009***	0.008***	0.010***
Median	0.004***	0.003***	0.005***
Max	3.53	3.52	3.512
Min	-0.587	-0.838	-0.845
S.D.	0.078	0.077	0.077

	Panel B				
	Inorganic Investment	**Organic Investment**	**R&D**	**Product Launch**	**Acquisition of Asset**
Mean	0.0069***	0.0182***	0.0373***	0.0047***	0.0075***
Median	0.0035***	0.0052***	0.0083***	0.0060***	0.0029***
Max	0.4526	3.5304	3.5304	0.2053	0.1844
Min	-0.3134	-0.5865	-0.5865	-0.1581	-0.1835
S.D.	0.0456	0.1886	0.3009	0.0493	0.0444
N	3182	420	158	69	193

Panel A presents the average three-day cumulative abnormal returns (CAR) from t-1 to t+ 1 for the sample of company investment announcements estimated using the Fama, French and Carhart model (FFC), the market model (MM) and the index model (IM). Median, max, min and standard deviation amongst the three models are reported. The CAR is reported for subsamples in Panel B. Organic investments include research and development, product launch, and asset acquisition. Inorganic investments are acquisition of shares in companies less than 50% of the market capitalisation. The reported significance levels are the t test of the means and the Wilcoxon test of the medians. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

Given the similarity in abnormal returns between models in Tables 5.1 and 5.2, I proceed using the FFC model as my preferred expected return generating mechanism. In Panel A, the FFC model indicates an average CAR of 0.9% and the range of CARs is narrow with only a 0.2% difference between the three models. Panel B indicates that CARs vary across the different categories of investment. Organic investments (1.82%) are more highly valued than inorganic (0.069%) on average. Among the organic investments, R&D (3.73%) is the mostly highly valued class on average whilst acquisition of assets (0.75% is surprisingly slightly higher than product launches (0.47%).

Prior studies in the UK evaluate similar classes of corporate investment. Burton, Lonie and Power (1999) classify investment decisions based on how quickly investments yield cash flow, reported CARs of 1.2% for R&D and 0.35% for capital investment. Whereas Jones, Danbolt and Hirst (2004) report average returns of 0.022%, 0.019% and 0.003% for R&D, product launch, and asset expenditures respectively. The figures are broadly similar to previous studies, but R&D and asset purchases appear to be more highly valued in the present sample whilst product launches are considered less valuable (Burton, Lonie and Power, 1999; Jones, Danbolt and Hirst, 2004). The results and those of Burton, Lonie and Power (1999) and Jones, Danbolt and Hirst (2004) indicate that the market reacts more favourably towards announcement of organic investment such as R&D and product launches than corporate acquisitions. In this framework, the motivation for undertaking the investment decision drives the market reaction. Unlike acquisitions, which can be driven by motives such as managerial entrenchment and short-termism, organic investment has a longer horizon.

xvi:Table 5.3: Descriptive Statistics and Correlation

Panel A

	Mean	S.D.	25%	75%	Skewness	Kurtosis
CAR_1TO1	0.80%	7.70%	-1.50%	2.70%	2.73	12.15
Cash Holdings	20.80%	56.10%	5.10%	17.90%	2.05	7.29
Size	14.105	2	12.715	15.322	0.58	2.99
Q	1.189	0.939	0.616	1.487	4.47	7.29
Organic	12.00%	32.50%	0.70%	85.40%	2.37	6.6
Leverage	35.30%	76.10%	9.40%	39.50%	1.4	4.89
ROA	0.49%	10.20%	-2.10%	3.70%	-0.56	3.76
Interest Rate	1.56%	2.02%	0.26%	1.18%	1.17	2.47
Bid-Ask	1.16%	8.48%	0.00%	0.30%	10.95	12.43

Panel B

Variable	Organic	Inorganic	Difference
CAR_1TO1	1.82%	0.71%	1.12%***
CAR_2TO2	1.75%	0.73%	1.02%***
CAR01	1.55%	0.71%	0.83%***
Total Asset	8465745	7777734	688011
Cash Holdings	24%	12%	12.16%***
Sales	6139321	5696103	443218
Q	1.31	1.15	0.16***
Market Capitalisation	9713751	7434196	2279555**
Leverage	23%	18%	4.29%***
Size	13.41	14.32	-0.91***
ROA	31%	20%	11.03%***

Panel C

	CAR_1TO1	Cash Holdings	Q	Organic	Leverage	Size	ROA	Bid-Ask
Cash Holdings	0.087***							
Size	-0.109***	-0.176***						
Q	0.004	0.056**						
Organic	0.058***	0.120***	0.049**					
Leverage	-0.045*	-0.032	-0.267***	0.145***				
ROA	-0.118***	-0.148***	0.233***	-0.104***	-0.091***	0.152***		
Bid-Ask	0.011	0.023	-0.058***	0.046**	0.052**	0.033	-0.038*	
Interest Rate	-0.007	-0.008	0.092***	0.013	-0.055**	-0.165***	-0.014	0

Notes: Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. Cumulative abnormal returns (CAR_1TO1) estimated using the Fama, French and Carhart model for t-1 to t+1. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is the reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity.   ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the bid and ask prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%. Panel B: The table presents the mean of the abnormal returns, total asset, cash holdings, sales, market to book ratio, market capitalisation, leverage, size and ROA of firms in the   organic and inorganic sample. The table also presents a T test for the difference in mean between the organic and inorganic sample. **, *** represents significance level at <10% and 5%.

Table 5.3 Panel A provides the summary statistics for dependent, explanatory and control variables used in the study. Cash holdings in this study are higher than values reported by Ozkan and Ozkan (2004). However, the data for these studies precedes the Global Financial Crisis, which may have encouraged higher cash holdings to mitigate for short term risks. Panel B presents the mean comparison of the abnormal return and firm level data for the organic and inorganic announcements. Results from the T test indicates organic investment is often undertaken by smaller firms. This supports the position of Chan, Lakonishok and Sougiannis (2001). They posit that organic investment is better suited for small firms. Panel C presents the correlation matrix for variables in the study. The coefficient for the relationship between Cash holdings and CAR is significant and positive, emphasising the relevance of the relationship between cash holdings and market valuation of firm investment decisions. Multicollinearity is low in the sample despite some significance between the independent variables. Results of the VIF multicollinearity are reported on Appendix 5C.

5.4.1 Cash Holdings and Corporate Investment Valuation

Table 5.4 presents the results of baseline regressions estimated using the FFC (Fama French and Carhart Model), Index and Market models. The dependent variable is the 3-day CAR (t-1 to t+1). I limit my CAR to the period t-1 to t+1 following result from the T test on daily abnormal returns. In addition, the graph on the daily abnormal return reported in Appendix 5G indicate abnormal returns were earned over this period in all models. The variable of interest is Cash holdings, measured as the ratio of cash to net asset. The results indicate that higher cash holdings are associated with higher stock market valuation of investment announcements.

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xvii:Table 5.4: Cash Holdings and Valuation of Company Investment Announcements

	(i)	(ii)	(iii)
Cash Holdings	0.0117***	0.00876***	0.00701**
	(4.98)	(3.61)	(2.87)
Size		-0.00398***	-0.00339***
		(-5.52)	(-4.57)
Q		-0.00361*	-0.00104
		(-2.25)	(-0.63)
Organic		0.0117**	0.00977*
		(2.68)	(2.23)
Leverage		-0.00611**	-0.00637***
		(-3.21)	(-3.36)
ROA			-0.0726***
			(-5.20)
Interest Rate			-0.000974
			(-1.42)
Bid-Ask			0.00725
			(0.45)
C	0.00610***	0.0675***	0.0588***
	(4.35)	(6.11)	(5.07)
n	3251	3251	3251
Adjusted. R-square	0.007	0.020	0.028

Notes: Model i presents the result of the base line model, model ii presents the result of including the key control variable and model iii presents the results including all explanatory and control variables. Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Fama, French and Carhart Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. . Interest Rate is the official bank rate of the Bank of England prior to an announcement.. Bid-Ask is the difference between the ask and bid prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

This finding is consistent across the three expected return generating mechanisms. One explanation for this finding is that high cash holdings firms undertake investments that are generally perceived as value enhancing. Theoretically this is hard to justify. Myers and Majluf (1984) argue that due to market imperfections and information asymmetry, managers are compelled to hold cash to meet shortages in finances and to ensure they are able to exercise valuable investment opportunities, they require the flexibility provided by large cash holdings. My results complement the work of Easley and O'Hara (2004) and Ascioglu, Hegde and McDermott (2008) who argue that information asymmetry increases the cost of financing. To compensate for these market imperfections, companies hold cash. In general, the results support the conjecture of H1: The level of cash holdings is associated with market valuation of corporate investment announcements.

Our results indicate that the market positively responds to new announcements of organic investment. This is good news for firms who can pursue such investments without fear of a discount on the stock prices due to the less immediate nature of cash flow from organic investment (Burton, Lonie and Power, 1999). Hence dispelling the case for market bias towards short term investment. To this effect, Laverty (2004) argues that managerial myopia occurs when organisations focus on short-term gains while foregoing long-term strategy. The evidence provided here supports the view that the market does not discourage long-term capital investments (Jones, Danbolt and Hirst, 2004).

The results in Table 5.4 also indicate that the size of a firm negatively affects market valuation of investment announcements. This implies that corporate investment announcements by small firms are highly valued by the market. Large firms are also more likely to engage in investments that are perceived as suboptimal such as empire building

(Shin and Kim, 2002; Moeller, Schlingemann and Stulz, 2004). Moeller, Schlingemann and Stulz (2004) acknowledge the existence of the size effect on the abnormal returns from acquisitions. Large firms with low investment opportunities engage in investments motivated by managerial motivation rather than shareholder value maximisation (Shin and Kim, 2002).

5.4.2 Investment Valuation and Levels of Cash Holdings

In Table 5.5, I examine the non-linear relationship between cash and market valuation of investment announcements. Model (IV) and (V) include the squared and cubed values of cash holdings. We follow the same approach as Martínez-Sola *et al.* (2013) and investigate if the relationship between cash holdings and market valuations of investment is concave. The motivation for evaluating the relationship from this angle is because it enables me test if there is in fact an optimal level of cash holdings and if deviation from this value is penalised by the market. The results reveal that the relationship between cash holdings and market valuation of corporate investment is non-linear. At a more concentrated level of cash holdings, the effect becomes negative. The finding provides support for the free cash flow perspective of Jensen (1986) and is consistent with Shin and Kim (2002) and Harford (1999) who reveal that cash-rich firms undertake investment decisions that are sub-optimal.

xviii: Table 5.5: Non-linear Relationship between Cash Holdings on Valuation

	(iv)	(v)
Cash Holdings	0.0206***	-0.0393***
	(3.37)	(-3.91)
Cash Holdings squared	-0.00212*	0.0319***
	(-2.43)	(6.87)
Cash Holdings cubed		-0.00330***
		(-4.21)
Size	-0.00316***	-0.00318***
	(-4.22)	(-4.28)
Q	-0.00189	-0.000239
	(-1.11)	(-0.14)
Organic	0.00816	0.00792
	(1.85)	(1.81)
Leverage	-0.00640***	-0.00567**
	(-3.38)	(-3.01)
ROA	-0.0674***	-0.0671***
	(-4.78)	(-4.80)
Interest Rate	-0.000948	-0.00108
	(-1.38)	(-1.58)
Bid-Ask	0.00607	0.00714
	(0.38)	(0.45)
C	0.0545***	0.0598***
	(4.65)	(5.13)
n	3251	3251
Adjusted R-square	0.030	0.046

Model iv and v add the square and cube of Cash holdings to test for non-linearity of the main explanatory variable. Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Fama, French and Carhart Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment.. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the ask and bid prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

5.4.3 Cash Holdings Motives and Market Valuation of Corporate Investment

Table 5.6 shows the results of dividing the sample into categories of variables which indicate the motivations for cash holding. The hypothesised motive for cash holdings for each variable is divided into either a survival or expansion motive and then the managerial entrenchment motive. I use four variables to indicate the motive of the cash holdings– *Collateral*, *Growth Opportunities*, *Debt Capacity* and *Efficiency*. In each case, I split the sample into percentiles and then use the highest and lowest percentiles to indicate the motive for cash holding. I describe the first variable used to indicate motives as *Collateral*, which involves splitting the sample on the basis of the tangible assets of the firm. Low *Collateral* indicates relatively low assets available to use as collateral to raise finance. This may compel firms to hold cash to compensate for this potential shortfall in finances. Hence, I term the motive for firms in the lowest percentile as the *Survival* motive for holding cash. Alternatively, firms with large asset bases (the highest quartile) may hold cash to avoid having to go to the market to raise capital. I term this motivation to be the *Entrenchment* motive since it allows managers to make investment without market discipline (Jensen 1986). In the *Collateral* test, the coefficient for Cash holdings is positive (p<0.001) for small firms (the lowest quartile of total assets) and insignificant for larger firms (the highest quartile). Market valuations recognise the level of cash held when investments are announced for the lowest quartile of total assets. The implication of this finding is that small firms, which are more likely to be financially constrained, hold more cash for the *Survival* motive.Such firms appear to be compensated for their cash holdings. Larger firms do not appear to hold cash for the *Entrenchment* motive according to this test. Hence, this does not support the entrenchment hypothesis (H2A) but confirms the position of the value creation hypothesis (H2C)

xix:Table 5.6: Abnormal Returns and Motives for Cash Holdings

	Collateral		Growth Opportunities		Debt Capacity		Efficiency	
	Survival	**Entrenched**	**Entrenched**	**Expansion**	**Entrenched**	**Survival**	**Survival**	**Entrenched**
Cash holdings	0.0308***	0.0162	-0.00216	-0.0275***	0.000538	0.0292**	0.00891	-0.00982
	(3.34)	(1.20)	(-1.05)	(-6.26)	(0.15)	(3.22)	(1.77)	(-1.25)
Size	-0.00471	-0.00147	-0.00306**	-0.00192	-0.00212*	-0.00174	-0.00386	-0.00303***
	(-0.73)	(-1.07)	(-3.06)	(-1.87)	(-2.03)	(-0.52)	(-1.31)	(-3.39)
Q	-0.00525	-0.0000870	-0.0248	-0.000728	-0.0135	-0.00306	-0.0149	-0.00337*
	(-1.38)	(-0.03)	(-1.55)	(-0.49)	(-1.64)	(-0.84)	(-1.44)	(-2.26)
Organic	0.00671	0.00603	-0.000141	0.00897	0.00830	0.00547	0.0271	0.00275
	(0.51)	(1.47)	(-0.02)	(1.84)	(1.43)	(0.42)	(1.66)	(0.61)
Leverage	-0.00717	-0.00234	-0.00536***	-0.0243	-0.00582***	0.203	-0.00273	-0.00789***
	(-1.79)	(-0.40)	(-3.37)	(-1.17)	(-3.78)	(1.25)	(-0.35)	(-4.94)
ROA	-0.103**	-0.0553*	-0.0147	-0.0249*	-0.0558	-0.0830*	-0.154***	0.0183
	(-3.08)	(-2.36)	(-0.71)	(-2.15)	(-1.94)	(-2.55)	(-3.67)	(0.72)
Interest Rate	-0.00283	0.000382	-0.000860	-0.000349	-0.000870	-0.00283	-0.00523	-0.000996
	(-1.26)	(0.51)	(-0.69)	(-0.48)	(-0.88)	(-1.27)	(-1.54)	(-1.31)
Bid-Ask	0.0155	-0.00234	0.0000422	0.589***	0.00477	0.793**	0.0172	0.191
	(0.25)	(-0.24)	(0.00)	(5.24)	(0.38)	(2.62)	(0.35)	(0.70)
C	0.0784	0.0253	0.0662***	0.0433**	0.0464**	0.0282	0.0633	0.0581***
	(0.99)	(1.04)	(4.00)	(3.03)	(2.70)	(0.63)	(1.40)	(4.21)
n	813	843	830	834	843	814	675	902
Adjusted R-square	0.045	0.005	0.016	0.076	0.018	0.051	0.034	0.038

Notes: Table 5.6 shows models of abnormal returns for subsamples of company investment announcements constructed using the four main motives identified in the study. Motives are identified on the basis of the amount of cash held as collateral, for exercise of growth opportunities, as debt capacity and for efficiency of operations. Each motive is divided into two categories the former is the lowest quartile and the latter is the highest quartile for the motive variable (indicated in parentheses under the identified motive). Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Fama, French and Carhart Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the ask and bid prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

The *Growth Opportunities* test follows the approach used for the *Collateral* test. The lowest quartile of Growth opportunities, measured by the Tobin's Q, captures cash held for *Entrenchment* purposes whilst the highest quartile indicates cash held for the exercise of growth opportunities held by the firm i.e. for *Expansion* purposes. The results indicate that cash holdings of firms with high investment opportunities negatively affects the market valuation of their corporate investment announcements. This finding is contrary to the view of Opler *et al.* (1999) who argue that some firms hold large cash reserves as flexibility to fund exercise of growth opportunities. A possible explanation for this is that firms with high growth opportunity may have the tendency to over invest. In my framework, this result indicates that cash is not held for the *Expansion* motive. There is also no significant association between the lowest quartile for growth opportunities and cash held. The result does not support hypothesis 2c, the value creation hypothesis.

For debt capacity, I also identify two motives for cash holdings. The first is the *Entrenchment* motive, which is identified using the lowest quartile of company leverage and *Survival* which is identified using the highest quartile of company leverage. Once again, in my framework, highly leveraged firms hold cash to ensure they do not default on interest payments. Similar to the previous *Entrenchment* categories, I conjecture that less heavily leveraged companies hold cash as a tool to expropriate by increasing managerial flexibility and enable the pursuit of non-optimal investments. In Table 6, the degree of indebtedness has a significant influence on the impact of cash holdings on market valuation of investments. Once again, the *Entrenchment* motive does not appear to hold with respect to cash held. However, market valuations are associated with cash holdings for the highest quartile of debt capacity indicating a *Survival* motive. The results support the position of hypothesis 2C, the value creation hypothesis. Hence, high cash

holdings are positively associated with the market valuation of company investment announcements.

Lastly in this section, I focus on the efficiency of the firm, captured by the industry-adjusted profitability. For this test, the lowest quartile of ROA indicates cash held for the *Survival* motive and the highest quartile indicates the *Entrenchment* motive. The results indicate no significance for either the lowest or the highest quartile of industry-adjusted ROA. Thus, the result does not support the entrenchment motive (H2a).

5.4.4 Cash Holdings, Type of Investment and Market Valuation of Investment

Table 5.7 presents the results of decomposing the sample into subcategories of investment. I classify investment as either organic or inorganic. Organic investment refers to investments excluding takeovers and acquisitions. This category includes growth activities that focus on internal development, such as increasing sales, growing clientele/customer base, and expansion/creation of a new product line. Inorganic investment refers to external growth strategies that include takeovers and acquisitions. The results indicate that cash holdings have a positive effect on market valuation of organic investment decisions. However, this effect is only pronounced in R&D ($p<0.01$) subcategory. Organic investments generally have a longer investment horizon, thus require a long-time span for the future cash flow to be generated. Furthermore, the working capital requirements and the outcome of these investments are inherently uncertain. The implication is that cash availability can provide the financial flexibility required to ensure the success and completion of the investment. I find no association between cash holdings and the CAR for inorganic investment.

xx:Table 5.7: Market Valuation of Investment Classes and Cash Holdings

	Organic	Inorganic	R&D	Acquisition of Assets	Product Launch
Cash holdings	0.0483**	-0.00202	0.0678*	-0.00696	-0.00953
	(3.13)	(-1.35)	(2.17)	(-1.01)	(-0.41)
Size	-0.00215	-0.00313***	-0.000265	-0.000564	-0.00231
	(-0.47)	(-6.84)	(-0.02)	(-0.30)	(-1.11)
Q	-0.0168	-0.00371***	-0.0255	0.00494	0.00248
	(-1.48)	(-3.44)	(-0.88)	(0.99)	(0.39)
Leverage	-0.00886	-0.00538**	-0.0117	-0.00477	-0.0154***
	(-1.55)	(-2.71)	(-1.11)	(-0.92)	(-4.99)
ROA	-0.169**	0.0206	-0.269*	-0.0333	0.0204
	(-2.99)	(1.91)	(-2.20)	(-0.78)	(0.75)
Interest Rate	-0.00638	-0.000776	-0.0233	0.00308	0.00100
	(-1.23)	(-1.91)	(-1.60)	(1.53)	(0.44)
Bid-Ask	0.0177	0.000558	0.707	-0.00462	0.729**
	(0.21)	(0.06)	(0.70)	(-0.20)	(3.45)
C	0.0633	0.0582***	0.0736	0.0132	0.0268
	(0.89)	(8.18)	(0.41)	(0.45)	(0.80)
n	384	2867	148	170	66
Adjusted R-square	0.064	0.018	0.086	-0.014	0.435

Notes: Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Fama, French and Carhart Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the bid and ask prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

5.4.5 Robustness Checks

Firstly, in Table 5.8, I estimate the impact of cash holdings on CARs over the period t-2 to t+2 and t-1 to t. Next, in Table 5.9, I produce my baseline model using the index model, market model and Fama and French three-factor model as a comparison with the FFC model results in the main study.

xxi:Table 5.8: Cash Holdings and CARs Estimates Using Different Event Windows

	(I)	(II)
Cash holdings	0.0052***	0.0076***
	(2.04)	(3.39)
Size	-0.0033***	-0.0031***
	(-4.34)	(-4.54)
Q	-0.0007	-0.0004
	(-0.41)	(-0.23)
Organic	0.0101***	0.0064
	(2.22)	(1.61)
Leverage	-0.0061***	-0.0048***
	(-3.09)	(-2.75)
ROA	-0.0737***	-0.0640***
	(-5.07)	(-5.01)
Interest Rate	-0.0006	-0.0008
	(-0.79)	(-1.20)
Bid-Ask	0.0098	0.0059
	(0.59)	(0.40)
C	0.0578***	0.0527***
	(4.81)	(5.00)
N	3251	3251
Adjusted R-square	0.024	0.027

The dependent variable in model I and II are the cumulative abnormal returns from t-2 to t+2 and t-1 and t0 respectively estimated using the Fama, French and Carhart Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment.. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the bid and ask prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

The findings are consistent with my prior estimates. I also estimate all other models reported in my main findings using the index model, market model and Fama and French three factor model but do not report them for brevity. However, the results remain consistent. Furthermore, I proceed by evaluating the impact of outliers in my models. To mitigate this effect, I winsorize my main models at 1%, although not reported, my results remain consistent.

xxii:Table 5.9: Estimates of CARs Using Different Expected Return Generating Models

	Index Model	Market Model	3 Factor Model	Index Model	Market Model	3 Factor Model
Cash Holdings	0.0073***	0.0074***	0.0073***	0.0078***	0.0079***	0.0080***
	-3.08	-3.15	-3.03	-3.27	-3.33	-3.32
Size	-0.0034***	-0.0031***	-0.0034***	-0.0033***	-0.0031***	-0.0033***
	(-4.61)	(-4.32)	(-4.61)	(-4.51)	(-4.23)	(-4.43)
Q	0.0004	-0.0002	-0.0014	0.0019	0.0013	0.0006
	-0.24	(-0.13)	(-0.88)	-1.18	-0.84	-0.39
Organic	0.0083***	0.0085***	0.0094***	0.006	0.006	0.0062
	-2	-2.07	-2.25	-1.41	-1.41	-1.43
Leverage	-0.0050***	-0.0056***	-0.0058***	0.0004	0.0004	0.0003
	(-2.73)	(-3.03)	(-3.10)	-0.73	-0.71	-0.61
ROA	-0.0697***	-0.0733***	-0.0714***	-0.0706***	-0.0747***	-0.0730***
	(-5.15)	(-5.44)	(-5.22)	(-5.19)	(-5.53)	(-5.32)
Interest Rate	-0.0012**	-0.001	-0.0021***	-0.0025***	-0.0021***	-0.0049***
	(-1.77)	(-1.45)	(-3.17)	(-2.37)	(-2.03)	(-4.61)
Bid-Ask	-0.0005	0.0109	0.0049	-0.0029	0.0084	0.0013
	(-0.03)	-0.69	-0.3	(-0.18)	-0.54	-0.08
C	0.0573***	0.0530***	0.0619***	2.291	2.058	4.6698***
	-4.97	-4.62	-5.31	-1.74	-1.57	-3.51
Year Dummy				YES	YES	YES
Industry Dummy				YES	YES	YES
n	3257	3257	3257	3257	3257	3257
Adjusted. R-square	0.03	0.029	0.031	0.028	0.027	0.031

Notes: Table 5.9 presents models of cumulative abnormal returns from t-1 to t+1 estimated using Index Model, Market Model, and the Fama and French 3 Factor Model. Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Fama, French and Carhart Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the bid and ask prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%

In addition, whilst industry and years effects are unlikely to affect a pooled regression of CARs, for robustness I estimate my main models again using controls for industry and year effects, the results remain consistent.

xxiii:Table 5.10: Market Valuation of Investment Classes and Cash Holdings

	Organic	Inorganic	R&D	Acquisition of Assets	Product Launch
Cash holdings	0.0433**	-0.00124	0.0614*	-0.00364	-0.0353
	(3.08)	(-0.89)	(1.90)	(-0.65)	(-1.36)
Size	-0.00253	-0.00310***	0.00101	-0.00155	-0.00395
	(-0.61)	(-7.21)	(0.08)	(-0.89)	(-1.61)
Q	-0.0202*	-0.000595	-0.0304	0.00471	0.00306
	(-2.26)	(-0.67)	(-0.97)	(1.09)	(0.44)
Leverage	-0.0168	0.000406	-0.0366	0.00727	-0.0174
	(-1.17)	(1.48)	(-1.02)	(1.22)	(-1.92)
ROA	-0.00543	-0.00103**	-0.0219	0.00214	0.00208
	(-1.19)	(-2.81)	(-1.51)	(1.26)	(0.85)
Interest Rate	0.0154	-0.00406	0.671	-0.0339	-1.223*
	(0.19)	(-0.42)	(0.66)	(-1.87)	(-2.17)
Bid-Ask	-0.160**	0.0155	-0.280*	-0.00731	0.0252
	(-3.19)	(1.60)	(-2.10)	(-0.18)	(0.42)
C	0.0744	0.0531***	0.0770	0.0249	0.0629
	(1.20)	(7.90)	(0.41)	(0.96)	(1.53)
n	423	3066	145	208	63
Adjusted R-square	0.063	0.035	0.077	0.013	0.247

Notes: Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Index Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the bid and ask prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

The results are presented in Table 5.9. In Tables 5.10 and Appendix 5C, I report the result of estimating my key findings using the index model. Similarly, my results remain

consistent. Finally, I conduct the Breusch-Pagan test and confirm my estimates are not heteroskedastic.

5.5 Conclusion

In this chapter, I examine the relationship between cash holdings and the market reaction to company investment announcements for UK-listed firms. I provide several novel results. Firstly, my results reveal that cash holdings have a positive effect on market valuation of corporate investment. Flexibility offered by cash holdings appears to reassure markets of the value and viability of the investment decision. In addition, I find that at more concentrated levels of cash holdings, the effect on market reactions becomes negative. This finding provides some support for the Jensen (1986) free cash flow argument, at higher cash holdings levels, companies have the tendency to engage in investment that may be perceived as value destroying.

I also show that managerial entrenchment is a weak incentive for cash holdings in my tests. Distinct from the results in previous studies, cash appears to be held for survival and expansion purposes in my sample rather than to provide free cash flow i.e. for managerial entrenchment purposes. For inorganic investments, I find that market valuation is driven by fundamentals rather than cash. For organic investment, and particularly R&D, cash holdings are particularly significant suggesting a prominence of cash in the financing hierarchy, which can be ascribed to the long-term nature of these investments. Cash will not be generated for some time for many of these projects (if at all).

Our finding has implications for investors, companies, and regulators. For investors, the results indicate that valuable signals are embedded in the cash holdings levels regarding firm value and investment. Cash holdings provide an effective tool for companies to

convey strategic information to the market enabling efficient pricing of companies and investment decisions. For regulators, I believe the current broad classification of investment can be improved upon. Detailed classification of investment announcement would improve the ability of investors to process new corporate investment announcement. I suggest splitting investment announcements based on the growth strategy employed by the company (i.e. R&D, new products and services, real asset purchases and stock acquisitions). My study empirically demonstrates that investors price investment decisions based on this categorisation.

Appendices to Chapter 5

Appendix 5A: Classification of Corporate Investment

I classify corporate investments based on the growth method adopted by the company. Investments where a firm's growth is engineered by natural processes, I label as organic investment and where otherwise I label as inorganic investment. Natural processes (organic growth) refers to the expansion of a company that comes from within a company's existing business processes as opposed to inorganic growth that entails buying an existing business. I classify all investment announcements that exclude the purchase of an existing business as organic investment whilst the purchase of existing business processes was classified as inorganic investment. Among organic investment, I included, research and development announcements, purchase of asset announcements, and product launches.

The motivation behind this classification is identifying investment decisions that implied commitment of resources that could potentially lead to the generation of new cash flow (organic investment) and identifying investment decisions that entailed committing resources for the purchase of existing cash flow (inorganic investment).

Organic Investment

To identify organic investment, I note company announcements that suggests organic growth strategy. Organic growth refers to corporate growth fuelled by expansion or improvement of existing processes within an organisation (Irvin *et al.*2003). Hence, any implicit or explicit commitment of resources for the improvement of existing processes such that it results in the increase of current and future cash flow or for the generation of new future cash flow from the existing process can be identified as organic investment. In this category, I group all investment announcements that do not involve the purchase of an existing cash generating process in this class.

Following this approach, based on the available data on Morningstar.co.uk (Morningstar, 2017), I identify the following announcements as organic; R&D, product launch, and purchase/acquisition of assets.

Research and Development Announcement (R&D)

R&D announcements are investments that involve the commitment of resources, implicitly or explicitly to "work directed towards the innovation, introduction, and improvement of products and processes" (Oxford Dictionary). Jones (1998) argues that R&D projects generally have a huge level of uncertainty embedded in them since where, when and how returns will be generated is often unclear. Hence, a significant portion of the value of an R&D is its option value.

Most of the announcements in this group were made by companies in the pharmaceutical industry. In selecting constituents of the group, it was not necessary for the amount invested to be stated. Company announcement within this group were drawn from the Morningstar.co.uk (Morningstar, 2017) classification "research and development".

Product Launch Announcement

Product launch announcement is an announcement of the introduction of new product or services. This refers to the debut of a product into the market; it is the process of introducing a new product or service into the market (Cambridge Dictionary). Announcements within this group were drawn from the Morningstar.co.uk (Morningstar, 2017), announcement classification "product launch".

Acquisition/Purchase of Asset Announcement

This refers to the commitment of resources for the acquisition of land, building, and machinery. They include expenditure on plants, equipment, and machinery for the

development and maintenance of existing processes (Jones 1998). Constituents within this group were hand collected from the general classification of announcements in "acquisitions" on Morningstar.co.uk (Morningstar, Data and News, 2017).

Inorganic Investment

This category comprises announcements of acquisitive growth/ inorganic growth activity. This involves the commitment of resources to the growth of firms by acquiring already operating business processes. The emphasis in determining if an investment falls into this category is in answering the question, does the investment constitute a commitment of resources to the purchase of an existing business?

To identify announcements within this category, I first collected all announcements under the heading acquisition, within the Moringstar.co.uk website. Next, I selected company investment announcements with the heading "acquisition". Thereafter, I included announcements of acquisition of shares in a company, and acquisition of a subsidiary of company. I exclude announcement of acquisition of land, properties, and building as well as announcements of takeovers. Acquisition announcement made by financial services companies were also excluded

Appendix 5A Continued: Classification Procedure
I follow the flow chart below in classifying the investment announcements:
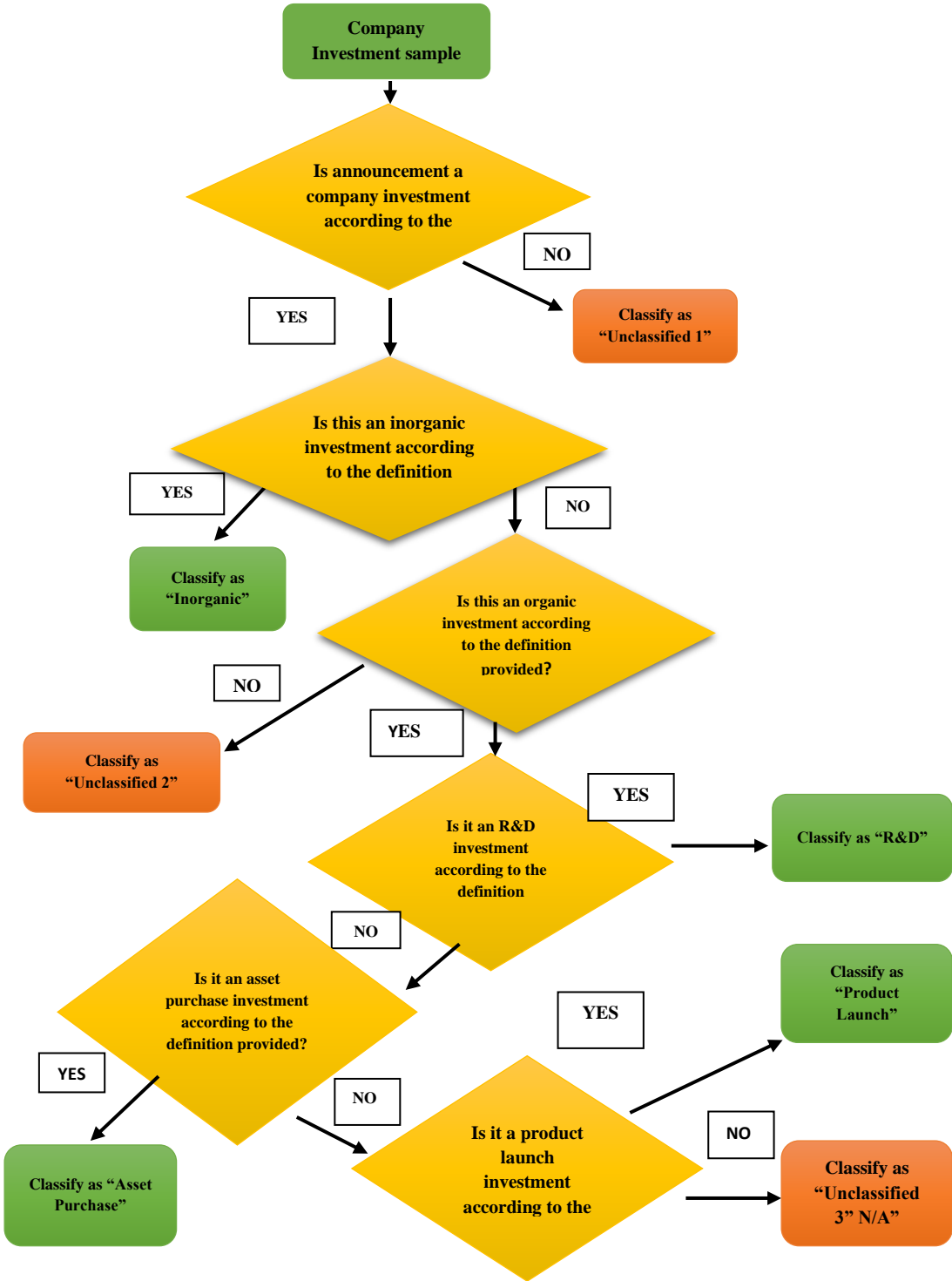
Appendix 5B: VIF Multicollinearity Table

Variable	VIF	1/VIF
Q	1.24	0.804053
Size	1.17	0.854187
ROA	1.14	0.877094
Leverage	1.11	0.898717
Organic	1.06	0.938979
Cash Holdings	1.06	0.940077
Interest Rate	1.03	0.966567
Bid Ask	1.01	0.991277
Mean VIF	1.1	

The table presents the result of the VIF of the descriptive variables included in the regression. A threshold below 10 indicates there is not enough case for multicollinearity.

Appendix 5C: Abnormal Returns and Motives for Cash Holdings

	Collateral		Growth Opportunities		Debt Capacity		Efficiency	
	Survival	**Entrenched**	**Entrenched**	**Expansion**	**Entrenched**	**Survival**	**Survival**	**Entrenched**
Cash holdings	0.0306***	0.0230*	-0.00117	-0.0258***	0.0322***	-0.00163	0.00888	-0.00804
	(3.33)	(2.06)	(-0.61)	(-6.31)	(3.57)	(-0.11)	(1.77)	(-1.16)
Size	-0.00325	-0.000616	-0.00400***	-0.00163	-0.00411	-0.00147	-0.00428	-0.00314***
	(-0.51)	(-0.54)	(-4.19)	(-1.70)	(-1.25)	(-1.56)	(-1.44)	(-3.97)
Q	-0.00398	0.00140	-0.00662	-0.000265	-0.00325	0.00264	-0.0158	-0.00188
	(-1.06)	(0.58)	(-0.44)	(-0.19)	(-0.84)	(0.93)	(-1.54)	(-1.43)
Organic	0.00728	0.00376	0.0000381	0.00950*	0.00572	0.00144	0.0243	0.00291
	(0.56)	(1.15)	(0.01)	(2.15)	(0.45)	(0.30)	(1.51)	(0.74)
Leverage	-0.00546	-0.00762	-0.00339*	-0.0284	0.0355	-0.00235	-0.00124	-0.00696***
	(-1.38)	(-1.63)	(-2.33)	(-1.47)	(0.46)	(-1.76)	(-0.16)	(-4.95)
ROA	-0.0982**	-0.0490*	-0.0287	-0.0171	-0.0697*	-0.0699**	-0.158***	0.0170
	(-2.96)	(-2.56)	(-1.51)	(-1.59)	(-2.28)	(-2.93)	(-3.78)	(0.76)
Interest Rate	-0.00323	-0.000274	-0.00136	-0.00106	-0.00272	-0.000616	-0.00522	-0.00160*
	(-1.44)	(-0.45)	(-1.19)	(-1.54)	(-1.16)	(-0.85)	(-1.55)	(-2.40)
Bid-Ask	0.0292	-0.0155*	-0.00992	0.623***	0.0974	-0.00156	0.0124	0.291
	(0.43)	(-2.01)	(-0.75)	(5.98)	(0.79)	(-0.10)	(0.25)	(1.22)
C	0.0601	0.0114	0.0712***	0.0412**	0.0650	0.0247	0.0696	0.0585***
	(0.77)	(0.57)	(4.38)	(3.05)	(1.42)	(1.60)	(1.50)	(4.78)
n	816	845	831	836	803	837	675	904
Adjusted R-square	0.042	0.013	0.026	0.088	0.037	0.017	0.036	0.052

Notes: Table 9 shows models of abnormal returns for subsamples of company investment announcements constructed using the four main motives identified in the study. Motives are identified on the basis of the amount of cash held as collateral, for exercise of growth opportunities, as debt capacity and for efficiency of operations. Each motive is divided into two categories the former is the lowest quartile and the latter is the highest quartile for the motive variable (indicated in parentheses under the identified motive). Data on corporate investment was collected from Morningstar.co.uk; firm level data was collected from Thomson Reuters DataStream. The dependent variable is the cumulative abnormal returns from t-1 to t+1 estimated using the Index Model. Cash holdings is cash divided by net assets. Size is the log of the value of total assets owned by the company. Q is the firm's Tobin's Q, estimated by dividing the market value of company's asset by book value of assets. Organic is a dummy variable that takes a value of 1 for organic investment and 0 for inorganic investment. Relative Size is reported cost of the investment divided by the market capitalisation of the firm. Leverage is the ratio of debt to equity. ROA is the industry adjusted return on assets and is estimated by dividing net income by total assets and then deflated by industry return on investment. Interest Rate is the official bank rate of the Bank of England prior to an announcement. Bid-Ask is the difference between the ask and bid prices of a stock. *, **, ***, represents significance at <5 %, < 1% and <0.1%.

Appendix 5D: Data Cleaning and Distribution

Panel A: Data Cleaning Procedure

Total Announcement	9860
Announcement by Firms in the Finance Industry	(5254)
Dirty Announcements	(835)
Unclassified	(169)
Incomplete firm data on cash holdings	(95)
Incomplete data on other variables	(256)
Total Clean Announcements	3251

Panel B: Distribution of Announcements by Industry

Industry	Percent	Cum.	
Aerospace & Defense	139	4.28	4.28
Automobiles & Parts	23	0.71	4.98
Beverages	20	0.62	5.6
Chemicals	30	0.92	6.52
Construction & Materials	133	4.09	10.61
Electricity	25	0.77	11.38
Electronic & Electrical Equipment	63	1.94	13.32
Fixed Line Telecommunications	31	0.95	14.27
Food & Drug Retailers	34	1.05	15.32
Food Producers	41	1.26	16.58
Forestry & Paper	17	0.52	17.1
Gas, Water & Multiutilities	69	2.12	19.22
General Industrials	61	1.88	21.1
General Retailers	96	2.95	24.05
Health Care Equipment & Services	65	2	26.05
Household Goods & Home Construction	52	1.6	27.65
Industrial Engineering	110	3.38	31.04
Industrial Metals & Mining	4	0.12	31.16
Industrial Transportation	56	1.72	32.88
Leisure Goods	10	0.31	33.19
Media	432	13.29	46.48
Mining	139	4.28	50.75
Mobile Telecommunications	27	0.83	51.58
Mobile Equipment	1	0.03	51.61
Oil & Gas Producers	64	1.97	53.58
Oil Equipment & Services	99	3.05	56.63
Personal Goods	14	0.43	57.06
Pharmaceuticals & Biotechnology	271	8.34	65.4
Software & Computer Services	143	4.4	69.79
Support Services	671	20.64	90.43
Technology Hardware & Equipment	55	1.69	92.13
Tobacco	14	0.43	92.56
Travel & Leisure	242	7.44	100
Total	3,251	100	

Panel C: Distribution of Announcement by Year

Year	Freq.	Percent	Cum.
2005	129	3.97	3.97
2006	308	9.47	13.44
2007	347	10.67	24.12
2008	308	9.47	33.59
2009	209	6.43	40.02
2010	303	9.32	49.34
2011	370	11.38	60.72
2012	313	9.63	70.35
2013	208	6.4	76.75
2014	243	7.47	84.22
2015	255	7.84	92.06
2016	258	7.94	100
Total	3,251	100	

Panel C: Distribution of Announcement by Year

Appendix 5E: Variable Definition

Variable	Definition
Cash Holdings	Cash and Cash Equivalent/ (Total Asset – Cash and Cash Equivalent)
Cash Holdings Squared	Cash holdings^2
Cash Holdings Cubed	Cash holdings^3
Size	Natural logarithm of Total Asset
Relative Size	Total Investment divided by market capitalisation
Organic Investment	1 if Investment announcement is = Organic investment and 0 if = Inorganic investment.
Q	Market value of company/Book value of total asset
Leverage	Total Debt/ Total Asset
ROA	(EBITDA/Total Asset) – Industry ROA
Interest Rate	Base Rate
Bid-Ask	Annual difference between Ask price minus Bid price

Appendix 5F:Daily Abnormal Returns Graph

Abnormal Returns
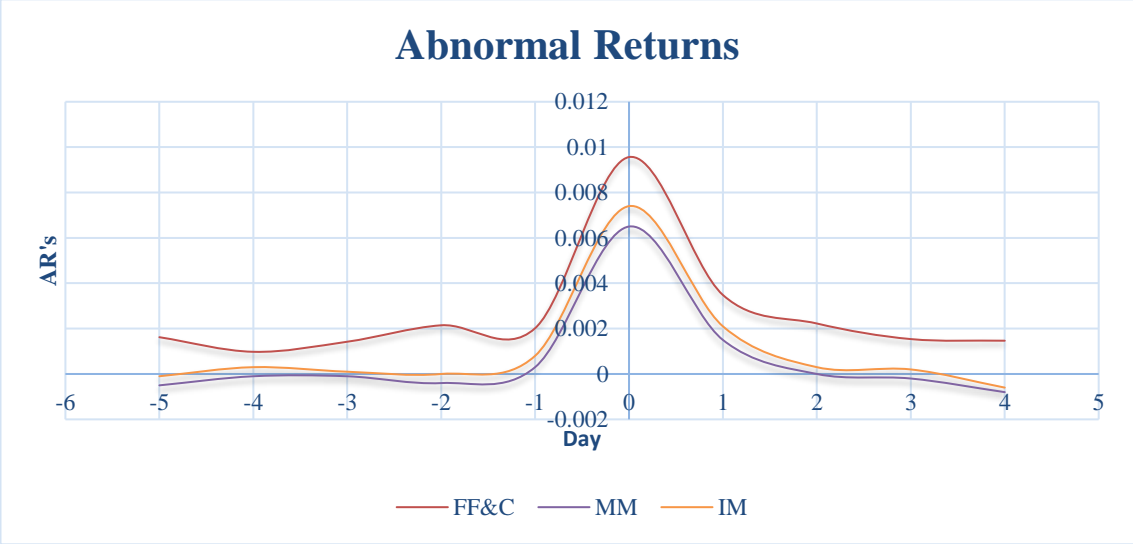
Chapter 6
Performance of Abnormal
Cash Holding Portfolios

6.0 Summary

Following the extensive literature on cash holdings that identify the merits of high cash reserves (See for example, Fresard 2010 and Lyandres and Palazzo 2016), I evaluate whether high cash holding firms outperform low cash holding firms and if this effect differs with levels of economic uncertainty. To test this, I examine the performance of abnormally high cash holding firms compared to that of abnormally low cash holding firms. My results suggest that a portfolio of abnormally high cash holdings outperforms an abnormally low cash holdings portfolio by 2.7% in a value weighted portfolio and 3.2% in an equally weighted portfolio. After adjusting for known asset pricing factors, the results remain consistent. I also examine the performance of abnormally high cash holdings portfolio under increased economic uncertainty, I find that the outperformance of the abnormally high cash holdings portfolio accelerates during periods of increased uncertainty, the findings remain robust after controlling for contemporary asset pricing models. Lastly, I investigate the impact of abnormally high cash holdings on firm performance and firm value. Across three measures of firm performance and two measures of firm value, I find a positive relationship between abnormally high cash holdings, firm performance, and firm value.

Key Words: Cash Holdings; Abnormal Cash Holding Portfolio; Economic Uncertainty; Firm Value.

6.1 Introduction

This chapter evaluates whether forming a portfolio based on abnormally high cash holdings yields any significant excess stock returns and if the level of this performance differs with the degree of economic uncertainty. High cash holdings can indicate the existence of strong growth opportunities, riskier future cash flow, and good performance (Opler et al., 1999, Ozkan and Ozkan, 2004, Denis and Sibilkov, 2009). Therefore, cash holding can be a proxy for modelling company future growth and performance. In this light, Fresard (2010) demonstrates that large cash reserves result in gains in market share at the expense of industry rivals. This underlines the strategic role of firm cash holdings. In effect, a firm's product market environment can determine their cash holdings (Haushalter et al., 2007). The role of cash to a firm has gone beyond the traditional transaction purposes (Kim and Bettis, 2014). With superior financial flexibility firms can pursue innovations aggressively (Greve, 2003). Also, during periods of high uncertainty cash can buffer the adverse effect of economic uncertainty (Courtney, 2001). Despite the theoretical implication for the role of cash, there is no consensus in the literature on the impact of cash on firm performance. For instance, Reuters (2013) posit that high cash reserves arouse interest from activist investors. Similar to this claim, Richardson (2006) argues that the problem of overinvestment is pronounced among cash-rich firms. All these put together indicate that embedded in a firm's cash holding is information about future and current performance. This study evaluates the interplay between firm cash holding and market performance by comparing the market performance of a portfolio of abnormally high cash holding and a portfolio of abnormally low cash holdings. I also examine whether the differences in the performance of these portfolios vary during periods of high economic uncertainty.

A key assumption in relying on cash as a signal for firms' future growth and performance is that managers of companies will use high cash for value enhancing investment. Rebutting this claim, Harford (1999) argues that cash-rich firms are more likely to engage in value-destroying investments. Contrary to the argument on value destruction, Pinkowitz et al. (2006) posit that the positive impact of cash holdings on firm value is amplified in countries with strong investor protection. Consistent with this finding, Harford et al. (2008) suggest that firms with weaker corporate governance structures hold more cash but spend cash quickly on investment rather than grow cash reserves. Consequently, poorly governed firms are unable to build large cash reserves. This also suggests that cash holdings are indicative of the strength of a firm's corporate governance structures as well as an indicator of a firm's future direction.

Following the proposition that information regarding the future performance of a firm is embedded in cash holdings level (Harford, 1999, Opler et al., 1999, Pinkowitz et al., 2006, Richardson, 2006, Harford et al., 2014), I conjecture that investing in companies with high cash holdings should reward an investor with excess stock returns. Relying on this assumption, I test if forming a portfolio on the basis of firm cash holdings produces an excess return. To test my conjecture, I follow the existing literature on the determinants of cash holdings (Opler et al., 1999, Ferreira and Vilela, 2004, Ozkan and Ozkan, 2004) and predict abnormal cash holding by estimating the residual value of predicted cash holding. Afterward, I create portfolios based on the degree of abnormal cash holdings in a given year. Thereafter, I compare the performance of stocks found in the highest quintile of excess cash holdings against stocks in the lowest quintile of excess cash holdings. I also examine how this effect changes during periods of high uncertainty. Lastly, I evaluate the relationship between the predicted level of excess cash holdings, firm performance, and firm value.

Our results indicate that an abnormally high cash holdings portfolio outperforms the low cash holdings portfolio by 5.86% annualised return. After adjusting for the Fama and French three factors portfolio sort, the portfolio of abnormally high cash holdings yields an alpha of 1.4% compared to -1.3% yielded by a portfolio of low cash holdings. I also test if the performance of the abnormally high cash holdings portfolio persists after controlling for well-known systematic factors. The results suggest that the portfolio of high cash holdings has an alpha of 4.4%, 4% and 2.5% after controlling for factors particular to the Capital Asset Pricing Model (CAPM), Fama and French three-factor model, and Carhart four-factor model respectively. Thereafter I evaluate if this finding is consistent during volatile periods. In particular, I examine how such portfolios perform during periods of high uncertainty. The findings demonstrate that the outperformance of the abnormally high cash holdings portfolio accelerates in periods of high uncertainty. The difference between the high cash holdings portfolio and low cash holdings portfolio increases to 7.01% annualised return during periods of high uncertainty. Upon considering the Fama and French 25 portfolio sorts, the high excess cash-holdings portfolio outperforms the low counterpart portfolio by an alpha of 3.6%. I also test if the alpha of the high excess cash holdings portfolio is robust after considering CAPM, Fama, and French 3-factor model and Carhart Four factor model. I find that in less tranquil periods after adjusting for contemporary asset pricing factors, the portfolio of abnormally high cash holding firms yields an abnormal alpha of 19%, 20%, and 20% respectively. Furthermore, I find a direct relationship between abnormally high cash holdings and accounting measures of firm performance and firm value. Measured by industry adjusted value of return on asset (ROA), return on capital employed (ROCE) and return on equity (ROE), I find a positive relationship between high cash holdings and firm performance.

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The results also indicate a positive relationship between excess high cash holdings, market to book ratio and enterprise value.

I extend the literature on cash holdings in a number of ways. Firstly, I provide the first evidence of the relationship between high cash holdings, firm performance and firm value particularly during periods of high uncertainty. In addition, I complement the work of Pinkowitz et al. (2006) and demonstrate the value of cash in a market with good investor protection. Also, I extend the work of Simutin (2010) and demonstrate how the performance of an excess cash holdings portfolios perform during periods of high uncertainty. Results of my study have implications for investors and companies. In the face of uncertainties, my findings demonstrate that investors can outperform the market by investing in firms with abnormally high cash holdings.

The remainder of this chapter is structured as follows: Section 2 details the literature review and hypothesis development. Section 3 discusses the methodology. Section 4 presents the findings. Section 5 concludes the study.

6.2 Literature Review and Hypotheses Development

A firm's cash reserves can be an indication of the perception of the companies' future outlook. Disadvantaged firms in the capital market with good growth opportunities can build up cash to ensure they can exercise most of their growth opportunity (Opler et al., 1999, Ozkan and Ozkan, 2004). As a result of good past performance, a company may be able to build up huge cash reserves, the cash reserves may be an indication of high profitability (Opler et al., 1999). High cash reserves may also be a sign of a high dividend-paying firm. To ensure dividend payments aligns with market expectation companies may

build up reserves (Al-Najjar and Belghitar, 2011). However, it is important to note that the cash holdings policy of a firm could also dictate firm's dividend policy (Soter, Brigham and Evanson, 1996). Another possible explanation for high cash holdings is that managers of cash-rich firms may build up cash reserves with the hope of embarking on value destroying investment or expropriating shareholders' resources (Harford, 1999). However, arguments against this position are well documented. For instance, Opler et al. (1999) argue that the short-run impact of excess cash on capital expenditure and acquisition spending is limited. Generally, firms with weak corporate governance hold less cash. They are unable to build high cash reserves because they dissipate cash on value-destroying investments (Harford et al., 2008). Notably, the amount of cash held provides an indirect indication of the strength of corporate governance of a company as well as the past performance of a firm (Pinkowitz et al., 2006).

An important strand of the cash holdings literature documents the value of cash to shareholders. One of the foremost studies in this strand is the seminal paper of Faulkender and Wang (2006). They suggest that the value of cash to shareholders is amplified among firms with low leverage, low cash holdings, and financially constraint. The value of cash increases with the level of governance in a firm. Well-governed firms build up cash reserves while poorly governed firms squander cash reserves quickly (Dittmar and Mahrt-Smith, 2007). Similarly, the value of cash increases with the level of investor protection inherent in a country. Countries with strong investor protection policies instil procedures that limit managerial misbehaviour (Pinkowitz et al., 2006).

In the product market, by means of the level of cash held, cash-rich firms make gains at the expense of their rivals (Fresard, 2010). Cash is a key strategic tool in competitive industries, it dictates winners and losers of industry. Deep-pocketed firms can increase

production to ensure a decline in prices in the industry. Likewise, such firms may use the level of cash held to send strong competitive signals to competitors (Bolton and Scharfstein, 1990). These signals help distort the actions of rivals in the product market. In addition, firms with huge cash reserves may simply focus on using internal resources to fund competitive strategies. Strategies that may be adopted include funding capabilities. Firm capabilities refer to improving production processes, such as upscaling skills of employees, hiring more efficient employees, improving supply chain or logistics, relocation of key production components, launching key media/advertisement campaigns against competitors, or researching into advancements in production/service delivery that disrupt existing hierarchy of an industry (Bolton and Scharfstein, 1990, Campello, 2006).

The theoretical and empirical evidence suggests that a firm's corporate cash holdings contain information about the firm's future performance. Inherently, the cash holdings policy of a firm could contain price relevant information that when harnessed can help model future and current stock returns. To this effect, Simutin (2010) and Lyandres and Palazzo (2016) suggest that the relationship between cash holdings and stock returns is positive. I extend the limited literature on the relationship between cash holdings and future stock returns by empirically testing if this relationship exists in a new setting, the UK. The UK setting is particularly interesting because of its unique corporate governance structure, which could dictate managerial choices (Filatotchev and Boyd, 2009). Following the existing theoretical and empirical literature on cash holdings and stock returns, I hypothesize that:

H1: Abnormally high cash holdings will lead to higher future stock returns

The body of literature on investment under uncertainty posits that firms may be exposed to frictions when accessing the capital market in the future (See for example, Lemmon and Roberts 2010, Campello et al. 2010). To mitigate this effect, Acharya et al. (2007) argue that cash reserves can transfer resources across future states of the world. Thus, in an uncertain state of the world, firms with large cash reserves can make great strides at the expense of competitors. Complementary to this, Ramirez and Tadesse (2009) argue that to avoid an undesirable state of the world, firms in country with high uncertainty avoidance hold high levels of cash reserves. During periods of high cash flow volatility, financially constrained firms can forgo current investments in favour of future investment, hence building up their cash reserves (Han and Qiu, 2007). Evidently, this underlines the role of cash during periods of uncertainty. In a similar light, Hanlon et al. (2017), argue that firms exposed to tax uncertainty increase their cash holdings. A potential explanation for this behaviour is that firms exposed to the adverse effect of uncertainty increase their cash holdings because the value of cash holdings is amplified among such firms (Harford et al., 2008). Lending credence to this explanation, Alimov (2014) and Im et al. (2017), disclose that the value of cash is higher for firms with high levels of uncertainty. When there is need to adjust to the adverse effect of turbulence in a firm's competitive space, cash-rich firms are able to navigate such periods with greater ease than counterparts, thus resulting in value creation during such periods of high uncertainty (Levinthal, 1997, Deb et al., 2017). Therefore, I conjecture that:

H2:   High cash holdings portfolio perform better than low cash holdings

portfolio during periods of increased uncertainty

High cash holdings may imply an adoption of a precautionary financing policy by managers (Ozkan and Ozkan, 2004, Ferreira and Vilela, 2004, Opler et al., 2001). Internal reserves limit the exposure of a firm to anomalies of external finance. In addition, firms

can draw on these cash reserves to propel growth (Kim et al., 1998, Opler et al., 1999). High cash reserves do not necessarily inhibit corporate performance since firms can disburse cash on profitable investments (Mikkelson and Partch, 2003). Fresard (2010) documents a positive relationship between firm cash holdings and firm performance. Although most studies on the relationship between cash holdings and firm value have predominantly found a positive relationship, there is no consensus in the literature regarding the relationship. For instance, Fresard (2010), and Martínez-Sola et al. (2013) document a positive relationship between cash holdings and firm value. Other studies find a negative relationship between cash holdings and firm value. For example, Lee and Lee (2009), document a negative relationship between cash holdings and firm value. A possible explanation for the found relationship is that the countries included in the sample (Philippines, Indonesia, Singapore, and Thailand) have weaker corporate governance structure. The value of cash is eroded for cash rich firms located in countries with poor corporate governance (Pinkowitz et al., 2006). In support of this claim, Deb et al. (2017) argue that cash can be used to amplify shareholder value especially when cash-rich firms operate in a competitive environment where adaptation is important. Also, complementing the argument of Pinkowitz et al. (2006), Deb et al. (2017) demonstrate that the impact of cash can be negative in poorly governed companies.

H3a: Abnormally high cash holdings is positively associated with firm performance

H3b: Abnormally high cash holdings is positively associated with firm value

6.3 Data and Methodology

I commence by constructing a panel data set that consists of UK listed non-financial firms for the period 1980 to 2017 from Thomson Reuters Datastream (2017). The sample includes survivors and non-survivors that appeared on Thomson Reuters Datastream over the sample period. A brief summary of the data is presented in Table 6.1.

xxiv:Table 6.1: Summary Statistics

	Mean	SD	P25	P75	Skewness	Kurtosis
Excess Return (Equal Weighted Portfolio)	-0.0001	0.4039	-0.2106	0.1305	1.0100	6.48
Excess Return (Value Weighted Portfolio)	-0.0013	0.4063	-0.2128	0.1302	1.0700	6.58
Annualised Return	0.0954	0.4437	-0.1122	0.2419	2.2900	16.2100
Beta	0.7016	0.7066	0.0828	1.1152	0.6500	3.2500
Capital Expenditure	0.0175	0.0947	-0.0086	0.0385	0.0600	10.6400
Cash Holding	0.1586	0.1840	0.0373	0.2025	2.0500	7.2900
Leverage	0.1293	0.1447	0.0029	0.2036	1.4000	4.8900
Market to Book	1.3521	1.6696	0.4729	1.5126	3.4900	17.800
Size	12.7271	3.4255	10.1725	15.0729	0.5800	2.9900
ROA	0.0307	1.9186	0.0507	0.1705	-0.5600	3.7600
Net Working Capital	0.0000	0.1826	-0.0872	0.0995	-0.5100	5.5500
Market Capitalisation	45900000	229000000	22237	2966330	26.900	1348.11
Total Asset	88800000	495000000	26159	3516200	156.2300	34995.52

The table presents the summary statistics. Excess return for the equally weighted portfolio is computed weighting every constituent of the portfolio equally. Excess returns of the value weighted portfolio are computed by weighting every constituent of the portfolio according to their value. Annualised return is the annualised value for the returns of constituent companies in the sample. Beta is the coefficient of the relationship between a stock and the market. Cash holdings refers to the ratio of cash to total assets. Leverage is the ratio of debt to total assets. Sales growth is the industry adjusted value of sales growth. ROA is the industry-adjusted ratio of Return on Assets. CAPEX refers to changes in PPE   Size refers to the natural logarithm of total assets. Leverage is the ratio of debt to total asset. Market to book is the ratio of the market value of equity to total asset. Research and Development is a dummy variable that take the form of 1 in years with R&D expenses and 0 otherwise. Capex is capital expenditure deflated by total asset. Net working capital is the ratio of net working capital to total asset.

Using the panel list, I estimate abnormally high cash holdings. The literature on the determinants of cash holdings (see for example, Opler *et al.* 1999; Ozkan and Ozkan, 2004) suggests that firm cash holdings differ with firm-level characteristics, industry and competitive state. I define excess cash holdings as cash holdings above the estimated value after adjusting for these factors. Excess cash holdings refer to the residual from the following equation:

$$C_{it} = \alpha_{it} + \beta_1 Size_{it} + \beta_2 Lev_{it} + \beta_3 MB_{it} + \beta_4 R\&D_{it} + \beta_5 CAPEX_{it} + \beta_6 NWC_{it} + \beta_7 DIV_{it} +$$

$$\beta_8 \sigma\, cash_{it} + \beta_9 Increased\, competion_{it} + \varepsilon_{it} \qquad\qquad (6.1)$$

C is the log of the ratio of cash to net assets. Net assets is the difference between total assets and cash and cash equivalence. Size is the natural logarithm of total asset. MB is market to book ratio. R&D refers to research and development expenditure, which takes a value of one in firm years with R&D expenses and zero otherwise. CAPEX refers to capital expenditure deflated by total asset. NWC is the working capital excluding cash divided by total assets. Dividend is a dummy variable that takes the value of one if a firm pays dividend and zero otherwise. σ is the industry standard deviation of cash holdings. Increased competition is a dummy variable that takes the value of one in industry years where there is an increase in competition and zero otherwise. ε is the error term of the model. The estimated value of ε is zero conditional on all values of the independent variables. ε is independent of the regressors and normally distributed.

xxv:Table 6.2: Estimation of High Cash Holdings

Size	0.0661***
	-29.72
Leverage	-1.5022***
	(-33.15)
Market to book	0.2061***
	(46.98)
Research and Development	0.3505***
	(26.32)
Capital Expenditure	-0.7882***
	(-12.17)
Net working capital	-0.6640***
	(-19.02)
Dividend	-0.3313***
	(-21.15)
Sigma (Industry cash holding)	3.3580***
	(35.05)
Increased Competition	0.5159***
	(2.32)
Intercept	-3.9407***
	(120.66)
N	50004
Adjusted. R-square	0.178

The table presents the results of the cross-sectional regression used to calculate excess cash holdings. Excess cash holdings are estimated from the residuals of this cross-sectional regression. Size refers to the natural logarithm of total assets. Leverage is the ratio of debt to total asset. Market to book is the ratio of the market value of equity to total asset. Research and Development is a dummy variable that take the form of 1 in years with R&D expenses and 0 otherwise. Capex is capital expenditure deflated by total asset. Net working capital is the ratio of net working capital to total asset. Dividend is a dummy variable that takes the value of 1 if a firm pays dividend and zero otherwise. Sigma is the industry standard deviation of cash holding. Increased competition is a dummy variable that takes the value of 1 in industry years where there is an increase in cash holding and 0 otherwise. *** implies significance at the 5% level and ** at the 10% level.

The results of this estimation are presented in Table 6.2. After estimating the residual from this estimation, I split firms into their residual cash holdings quintile. Firm years located on the fifth quintiles are classified as high cash holdings firms and firm-years located in the first quintile are considered low cash holdings firms.

I collect monthly stock price data for sample firm years. From the stock price, monthly stock returns were computed. Following Agarwal and Taffler (2008), Gregory et al. (2013), I form portfolios based on the estimated high cash holdings at the beginning of October of every year. Agarwal and Taffler (2008) argue that about 60% of UK firms report their financial accounts between December and March. Forming portfolios at the beginning of October gives a trader a 6-month period to assess and access firm financial reports and trade based on their fundamentals. This is a popular approach adopted by a number of studies in this area (see for example, Faulkender and Wang, 2006; Dittmar and Mahrt-Smith, 2007).

In addition, since the excess returns captured by the high cash holdings portfolio may mirror some systematic factors peculiar to popular asset pricing models (i.e. CAPM, Three Factor Model, and Carhart Four Factor Model). I dismiss this possibility by estimating contemporary asset pricing models and evaluate if the alphas from these regressions persist after controlling for these factors.

Based on portfolios formed on the quintile of high cash holdings. I estimate the alpha of the portfolios using the capital asset pricing model (CAPM), Fama and French three-factor model and the Carhart four model. The CAPM is estimated as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \varepsilon_{pt} \qquad (6.2)$$

Where R_{pt} is the equal weighted return on the portfolio of each quintile of excess cash holdings. $R_{mt} - R_{ft}$ is the excess return of the market portfolio at time t. It is computed by subtracting the one-month T-bill return (R_{ft}, risk free rate) from the return on the value-weighted portfolio of the FTSE all share.

. The three-factor model is estimated as follows:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \beta_p(SMB_t) + \beta_p(HML_t) + \varepsilon_{pt} \qquad (6.3)$$

The first factor $R_{mt} - R_{ft}$ is the excess return of the market portfolio at time t. SMB is the return on the portfolio of small firms minus the portfolio of large firms at time t. HML is the return on a portfolio of high book to market firms minus a portfolio of low book to market firms.

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \beta_p(SMB_t) + \beta_p(HML_t) + \beta_p(UMD_t) + \varepsilon_{pt} \quad (6.4)$$

Equation 6.4 differs from equation 6.3 only because of the addition of UMD. UMD is the return on a portfolio of high momentum stocks minus the return on low momentum stocks at time t. I test if the excess abnormal returns persist when the momentum factor is considered.

Following estimations of abnormally high cash holdings from equation 6.1, I estimate the following equation to evaluate the relationship between high cash holdings, and firm performance.

$$P_{it} = \alpha_{it} + \delta\widehat{H}_{it} + \theta'X_{it} + \varepsilon_{it} \qquad (6.5)$$

The dependent variable P refers to firm performance. It is measured by calculating the industry adjusted value of ROA, ROCE and ROE. The variable of interest in this equation is $\widehat{H}$ (Predicted high cash holding). It is derived from the residuals in equation 1. The vector X captures control variables that are associated with firm performance. I include

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leverage, firm size, dividend, investment ratio, market to book ratio, cash flow, sales growth, and firm beta. The Hausman test indicates a random effect model will yield robust estimates. Accordingly, this approach was employed in estimating the equation. Subscript $_{it}$ indexes firm and time respectively. ε is the error term of the model. The estimated value of ε is zero conditional on all values of the independent variables. ε is independent of the regressors and normally distributed.

Lastly, to estimate the effect of high cash holdings on firm value I estimate the equation below:

$$V_{it} = \alpha_{it} + \theta \widehat{H}_{it} + \varphi' X_{it} + \varepsilon_{it} \tag{6.6}$$

V is the value of a firm. It is estimated by calculating the market-to-book ratio and enterprise value of a firm. As in equation 6.2, the variable of interest is $\widehat{H}$ and the vector X captures control variables that affect firm value.

Because my results may be very sensitive to the deflators, I deflate each variable by transforming their normal value to their log value. To estimate high cash holdings, I calculate the residual of the equation below:

$$lnC_{it} = \propto_{it} + \beta_{it}(\ln TA) + \beta_{it}(\ln MB) + \beta_{it}(\ln CPX) + \beta_{it}(\ln CF) + \beta_{it}(\ln Debt) +$$
$$\beta_{it}(\ln DY) + \beta_{it}(\ln WC) + \beta_{it}(\ln \sigma \, ind) + \varepsilon_{it}$$
(6.7)

Where lnC is the log of cash holdings, lnTA is the log of total asset, lnMB is the log of market to book ratio, lnCPX is the log of capital expenditure, lnCF is the log of cash flow, lnDebt is log of debt, lnDY is the log of dividend yield, lnWC is the log of net working

capital, ln σ ind is the log of industry cash holdings sigma. Results of equation 6.7 is presented in Appendix 6A.

6.4 Findings

6.4.1 Portfolio of Abnormal Cash Holdings and Future Stock Returns

Firstly, from the monthly stock returns I compute the annualised firm returns for each firm-year. Then, based on the quintile of the estimated cash holdings residuals, I calculate the annualised return for each portfolio of high cash holdings.

v:Figure 6.1: High Cash Portfolio and Stock Returns

The graph presents the time series trend of the returns of a portfolio of high cash holding and a portfolio of low cash holdings. Annualised_excess_port1 refers to the portfolio of abnormally low cash holdings. Annualised_excess_port5 refers to the portfolio of abnormally high cash holdings.
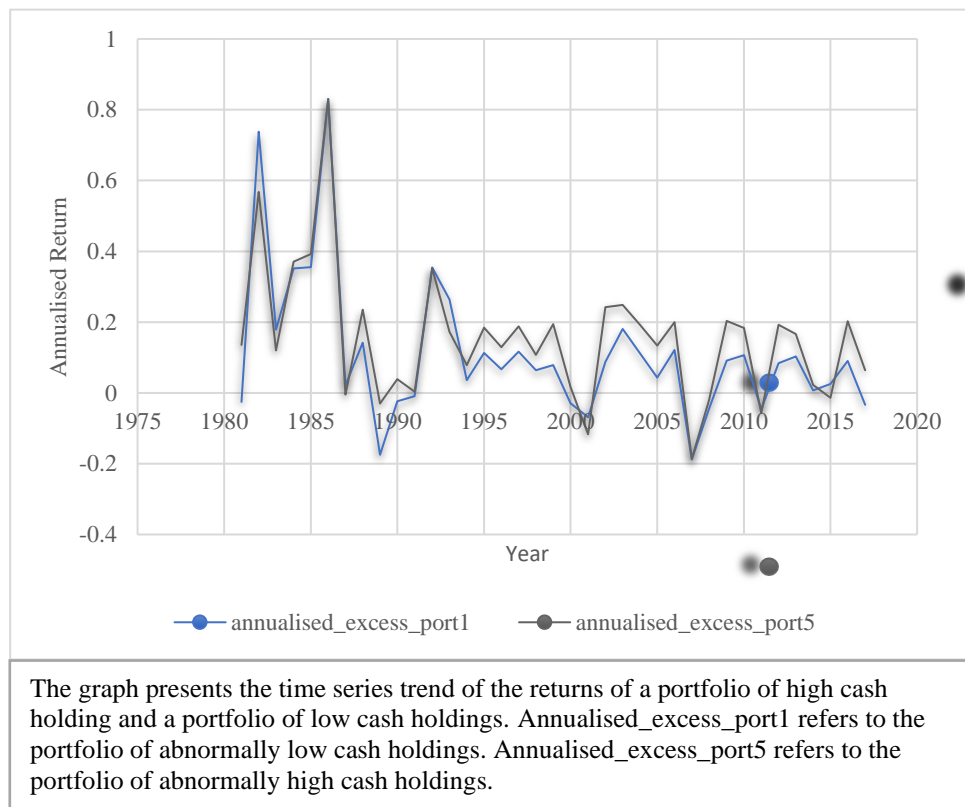
Figure 1 shows the returns of the lowest and highest portfolio of excess cash holdings. In most years, the portfolio of high cash holdings at the fifth quintile outperforms the portfolio of low cash holdings formed based on the first quintile. Using estimates from the annualised return for the portfolios, the result suggests that on average the portfolio of high cash holdings outperforms the portfolio of low cash holdings by 5.86%. This result is consistent with the findings of Simutin (2010), and Lyandres and Palazzo (2016). They find that high cash holdings are associated with superior future market performance.

xxvi:Table 6.3: Performance of High Cash Holdings Portfolio

	Low cash holdings	2	3	4	High cash holdings	High minus Low
Excess Return (Equal Weighted Portfolio)	-0.0128	-0.0016	-0.0045	0.0090	0.0188	0.032***
Excess Return (Market Capital Weighted Portfolio)	-0.0132	0.0012	-0.0023	0.0096	0.0136	0.027***
Annualised Return	0.0689	0.0888	0.0908	0.1187	0.1275	0.059***
Beta	0.6453	0.6662	0.7004	0.7212	0.7170	0.072***
Capital Expenditure	0.0183	0.0189	0.0176	0.0161	0.0180	0.000***
Cash Holding	0.0203	0.0744	0.1211	0.1916	0.3253	0.305
Dividend	0.7105	0.7460	0.7361	0.7151	0.6991	-0.011***
Leverage	0.1352	0.1444	0.1386	0.1269	0.1230	-0.012***
Market to Book	1.1927	1.3666	1.2462	1.2500	1.1411	-0.052**
Size	12.6003	13.7869	13.7963	13.1704	11.7415	-0.859
ROA	0.0022	0.0616	0.0755	0.0672	0.0419	0.040**
Net Working Capital	-0.0041	0.0041	0.0049	0.0042	-0.0015	0.003***
Market Capitalisation	£42,300,000	£73,400,000	£72,300,000	£52,100,000	£12,300,000	-£30,000,000
Total Asset	£83,600,000	£150,000,000	£137,000,000	£92,700,000	£26,600,000	-£57,000,000
Research and Development	0.3526	0.4980	0.4913	0.4220	0.2753	-0.077**

The table presents the result of splitting the estimated excess cash holdings into annual portfolios based on their quintile. High Excess cash holdings portfolio reports the firm annualised returns located at the fifth quintile of the estimated excess cash holdings. Low Excess Cash holdings refers to annualised returns located on the first quintile of the estimated excess cash holdings. An estimated T-test confirms the significant difference in the annualised return of the high excess cash holdings portfolio and the low excess cash holdings portfolio. *** and ** signifies difference in mean at below 5% and 10%

I create 25 benchmark portfolios following Fama and French (1993) by sorting firms based on size and book to market. I estimate the excess return of each firm-year by subtracting the benchmark portfolio annualised return from the annualised firm return. The procedure controls for risk related factors that may significantly affect firm returns and the discount rate. Following this procedure, I estimate a portfolio alpha of 1.4% for the high cash holdings portfolio and a portfolio alpha of -1.3% for the low cash holdings portfolio (Value weighted portfolio) and an alpha of -1.3% for the low cash holding portfolio and 1.9% for the high cash holding portfolio (Equally weighted portfolio). The results of this procedure are presented in Table 6.3.

In general, I find that firms in the high cash holdings portfolio have a higher ROA than the low cash holdings portfolios. Similarly, the results show that firms in the high cash holdings portfolio have a higher beta than the low cash holdings portfolio. The results also demonstrate that the high cash holdings portfolio consists largely of small firms compared to the portfolio of low cash holdings firms.

6.4.2 Fama and Macbeth Regression

Firm cash holdings may be highly correlated with some other firm-level variables. Therefore, the relationship between firm cash holdings and stock returns may mirror certain effects not directly attributable to cash held. To dismiss this possibility, I use the Fama and Macbeth (1973) model to control for variables known to be linked with firm stock returns. I regress the value of the predicted excess cash held on monthly stock returns.

xxvii:Table 6.4: Fama and Macbeth Model

	1	2	3	4	5	6	7	8	9
Excess Cash	0.0009***	0.0008***	0.0009***	0.0008***	0.0005***	0.0009***	0.0009***	0.0008***	0.0005***
	(5.35)	(5.33)	(5.28)	(5.08)	(3.19)	(5.58)	(5.44)	(5.06)	(3.14)
Beta		0.002							0.0013
		(1.14)							(0.72)
BM		-0.0012***							-0.0009***
		(-11.74)							(-10.62)
ME		0.0007***							0.0007***
		(3.32)							(3.63)
Asset Growth			0.0197***						0.0154***
			(7.04)						(5.73)
Net Working Capital				0.0084***					0.0054***
				(5.18)					(4.06)
R12					0.0346***				0.0330***
					(19.97)				(20.27)
Leverage						-0.0047**			-0.0028
						(-1.75)			(-1.46)
Sales Growth							0.0007***		0.0003
							(2.76)		(1.33)
ROA								0.0255***	0.0169***
								(8.74)	(6.78)
Intercept	0.0055***	-0.002	0.0052***	0.0055***	0.0021	0.0061***	0.0057***	0.0050***	-0.0059***
	(3.24)	(-0.67)	(3.03)	(3.25)	(1.26)	(3.33)	(3.38)	(2.91)	(-2.06)

The table presents the Fama and Macbeth regression of excess cash holdings on month stock returns. The dependent variable is the monthly stock returns of a firm. Excess cash is the residual estimate of predicted firm cash holdings. Beta refers to the beta coefficient of a stock. BM is the ratio of the book market of equity to market value of equity. ME is the log of market capitalisation. Asset growth is the growth in firm property plant and equipment. Net working capital. R12 is the 12month annualised return. Leverage is the ratio of debt to total asset. Sales growth is the industry adjusted sales growth. ROA is the industry adjusted return on asset.

Model 1 suggests that high cash holdings are a significant predictor of stock returns. This reinforces the results presented in Table 6.3. The portfolios of abnormally high cash holdings outperform the portfolio of low cash holdings firms. I test if this relationship persists after controlling for market risk, size, and book to market. Similar to Fama and French (1992), and Simutin (2010), I find that size and book to market are significant predictors of stock returns whereas beta is an insignificant determinant of stock returns. The result suggests that the predictive power of cash held is unchanged by the introduction of market risk, size and book to market. Following Cooper et al. (2008), I also introduce asset growth, however, high cash holdings remain a significant predictor of stock returns. Similarly, high cash holdings remain a significant predictor of stock returns after the joint and singular introduction of net working capital, holding period return, leverage, industry adjusted sales growth, and ROA as control variables. Results of this estimation procedure is presented in Table 6.4. In general, the results confirm the position of hypothesis H1: Abnormally high cash holdings will lead to higher future stock returns

6.4.3 Alpha of Abnormal Cash Holdings Portfolios

The alphas from the CAPM suggest that a high cash holdings portfolio yields an alpha of 4.4%. This implies a trading strategy in which is long on stocks with high cash holdings yields positive abnormal returns. Investing in a low cash holdings portfolio yields insignificant abnormal return.

xxviii:Table 6.5: Asset Pricing Models and High Cash Holdings Portfolio

	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
			CAPM		
Rmkt	0.4944***	0.5110***	0.5301***	0.5966***	0.5874***
	(19.85)	(20.62)	(20.91)	(21.66)	(20.43)
α	-0.0067	0.0200***	0.0193***	0.0359***	0.0438***
	(-1.53)	(4.77)	(4.54)	(7.65)	(8.82)
			Three Factor Model		
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.4677***	0.4760***	0.5033***	0.5519***	0.5350***
	(17.72)	(18.26)	(18.80)	(19.02)	(17.53)
SMB	0.2588***	0.2236***	0.1918***	0.2018***	0.2457***
	(6.51)	(5.75)	(4.83)	(4.66)	(5.33)
HML	0.1595***	0.0341**	0.1034***	0.1681***	0.1640***
	(7.89)	(1.73)	(4.87)	(6.61)	(6.31)
α	-0.0142***	0.0167***	0.0150***	0.0321***	0.0404***
	(-3.19)	(3.91)	(3.48)	(6.83)	(8.10)
			Four Factor Model		
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.5129***	0.5343***	0.5296***	0.5966***	0.5816***
	(16.74)	(17.96)	(17.70)	(18.94)	(17.57)
SMB	0.2595***	0.2238***	0.1923***	0.2054***	0.2538***
	(6.53)	(5.75)	(4.84)	(4.74)	(5.50)
HML	0.1685***	0.0469***	0.1100***	0.1852***	0.1794***
	(8.25)	(2.36)	(5.12)	(7.17)	(6.82)
UMD	0.0805***	0.0990***	0.0489***	0.0996***	0.1041***
	(2.91)	(4.06)	(1.97)	(3.64)	(3.63)
α	-0.0272***	0.0012	0.0074	0.0168***	0.0249***
	(-4.31)	(0.22)	(1.28)	(2.66)	(3.79)

The table presents results of the excess cash holdings portfolio from the Capital Asset Pricing Model (CAPM), the Fama and French Three Factor Model and the Four Factor Model. The variable of interest is the portfolio alpha from each model. T statistics are reported underneath the beta coefficients. *, **, and *** indicates significance at 5%, 1% and below 1%.

Next, I estimate whether or not the effect found in the CAPM persists after adjusting for the Fama and French (1993) three-factor model. Despite controlling for the small minus big factor and the high minus low factor, the excess abnormal returns from the high cash holdings portfolio remain significant. After adjusting for size and book-to-market, the high cash holdings portfolio yields an alpha of 4% whereas the low cash holdings portfolio has a negative alpha of -1.4%. A trading strategy that focusses on shorting the low cash holdings portfolio and going long on the high cash holdings portfolio will yield an excess abnormal return of 5.4%.

The introduction of the momentum factor results in a decrease in the excess abnormal return. This implies that high cash holdings may be capturing some variance explained by the momentum factor. However, a trading strategy that simultaneously shorts the low excess cash holdings portfolio and longs the high cash holdings portfolio results in an excess abnormal return of 5.1%. The results of this estimation are presented in table 6.5. In short, the result confirms hypothesis H1: Abnormally high cash holdings will lead to higher future stock returns.

6.4.4 Performance of Cash Holdings Portfolio during Periods of High Economic Uncertainty

Next, to evaluate how the portfolio of high cash holdings firms perform compared to their counterparts during periods of increased uncertainty, I identify periods of high economic uncertainty. Following measures identified from the policy uncertainty website (www.policyuncertainty.com), I identify years of high economic uncertainty as firm years located on the fifth quintile of the UK Economic Policy Uncertainty (EPU) measure. EPU is measured by identifying periods with increased economic uncertainty as evident in media articles (Baker et al., 2016). To identify periods of high uncertainty, I adopt the Baker et al. (2016) index of uncertainty. The index is based on the frequency of media coverage on issues that may characterise economic turbulence (Baker et al., 2016). The index captures the frequency in the use of the terms: "economic" or "economy"/ "uncertain" or "uncertainty" or "spending" or "policy" or "deficit" or "budget" or "tax" or "regulation" or "Bank of England" or "war" or "tariff". An excerpt from the graph detailing the UK economic policy uncertainty index from Baker et al. (2016) is reported

in Appendix 6G. Notably, periods of high uncertainty in the graph coincides with major

global/national events that increased the levels of national/global uncertainty.

xxix:Table 6.6: Descriptive Comparison of Performance of High and Low Cash Holdings Portfolio During Periods of High Uncertainty

	Low Cash Holdings Portfolio		2		3		4		High Cash Holdings Portfolio	
	Normal State	*Uncertain State*	*Normal State*	*Uncertain State*	*Normal State*	*Uncertain State*	*Normal State*	*Uncertain State*	*Normal State*	*Uncertain State*
Excess Return (Equal Weighted Portfolio)	-0.0123	-0.0157	-0.0054	0.0138	-0.0060	0.0013	0.0129	-0.0056	0.0176	0.0239
Excess Return (Market Capital Weighted Portfolio)	-0.0125	-0.0171	-0.0030	0.0185	-0.0042	0.0049	0.0129	-0.0029	0.0124	0.0193
Annualised Return	0.0704	0.0602	0.0867	0.0974	0.0913	0.0886	0.1267	0.0887	0.1268	0.1303
Beta	0.6582	0.5704	0.7007	0.5258	0.7515	0.5104	0.7792	0.5044	0.7556	0.5423
Capital Expenditure	0.0194	0.0118	0.0203	0.0131	0.0192	0.0115	0.0180	0.0090	0.0199	0.0094
Cash Holding	0.0192	0.0269	0.0716	0.0856	0.1191	0.1288	0.1864	0.2110	0.3179	0.3588
Dividend	0.7418	0.5301	0.7667	0.6616	0.7566	0.6601	0.7368	0.6339	0.7257	0.5789
Leverage	0.1346	0.1386	0.1443	0.1448	0.1353	0.1505	0.1263	0.1288	0.1194	0.1392
Market to Book	1.1754	1.2926	1.3414	1.4691	1.2497	1.2333	1.2492	1.2529	1.1317	1.1836
Size	12.4891	13.2409	13.6424	14.3758	13.6295	14.4158	13.0256	13.7119	11.6349	12.2233
ROA	0.0273	-0.1452	0.0643	0.0509	0.0812	0.0543	0.0738	0.0422	0.0516	-0.0027
Net Working Capital	0.0057	-0.0603	0.0088	-0.0150	0.0105	-0.0160	0.0081	-0.0101	0.0022	-0.0179
Market Capitalisation	£38,400,000.00	£65,100,000	£67,000,000	£99,500,000	£70,000,000	£81,100,000	£48,300,000	£66,000,000	£10,500,000	£20,100,000
Total Asset	£75,200,000.00	£131,000,000	£138,000,000	£201,000,000	£130,000,000	£161,000,000	£85,900,000	£118,000,000	£24,000,000	£38,400,000
Research and Development	0.3455	0.3935	0.4838	0.5556	0.4843	0.5172	0.4151	0.4476	0.2615	0.3377

The table reports the performance of High excess cash holdings portfolio under an uncertain state of the world. Using data from Policy Uncertainty (www.policyuncertainty.com) I identify periods that are highly uncertain as firm years located in the fourth and fifth quintile of UK EPU index.

The results presented in Table 6.6 indicate that during periods of high uncertainty the portfolio of high cash holdings outperforms the portfolio of low cash holdings by 6%. Similarly, after adjusting for the Fama and French (1993) 25 benchmark portfolios, the high cash holdings portfolio yields an alpha of 1.9% compared to an alpha of -1.7% yielded by the portfolio of low cash holdings firms. The results suggest that the difference in the performance of the portfolios is magnified during periods of heightened uncertainty. This supports hypothesis H2: High cash holdings portfolio perform better than low cash holdings portfolio during periods of increased uncertainty

Compared to periods of low uncertainty, firms increase their cash reserves and reduce capital expenditure when uncertainty increases. During periods of increased uncertainty, return on assets decreases and cost of external financing increases (Pástor and Veronesi, 2013, Brogaard and Detzel, 2015). High cash holding firms benefit during periods of high uncertainty. Hence, cash-rich firms may be are able to overcome the increased cost of equity and outperform their peers. Also, despite the decrease in performance and consequent decrease in asset returns, they are also able to maintain dividend payments (Brogaard and Detzel, 2015, Pástor and Veronesi, 2013).

6.4.5 Alpha of High Cash Holdings Portfolio during Periods of High Uncertainty

Using various asset-pricing models, I estimate periodic alphas after considering heightened levels of uncertainty. After considering the Capital Asset Pricing Model (CAPM), the result indicates that during periods of increased uncertainty, the alpha of the high cash holdings portfolio is amplified. The portfolio of high cash holdings yields an

excess abnormal return of 19.2% during periods of increased uncertainty compared to 0% for a portfolio of low cash holdings firms.

xxx:Table 6.7: Performance of High Cash Holdings Portfolio Under Economic Uncertainty

	CAPM									
	Normal State					*Uncertain State*				
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.5486***	0.4953***	0.5437***	0.5058***	0.6090***	0.3513	-0.1556	-0.0914	0.2038	-0.6480***
	(12.99)	(12.63)	(12.67)	(10.76)	(13.05)	(1.29)	(-0.98)	(-0.58)	(0.88)	(-2.43)
α	-0.0178***	0.0028	0.0153**	0.0093	0.0310***	0.0490	0.0802***	0.0712***	0.0842***	0.1920***
	(-2.08)	(0.37)	(1.82)	(1.01)	(3.22)	(1.43)	(4.06)	(3.59)	(2.86)	(5.61)

	Three Factor Model									
	Normal State					*Uncertain State*				
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.4422***	0.4720***	0.5110***	0.4382***	0.5146***	-0.3475	-0.7195***	-0.5519***	-0.7559***	-1.8196***
	(9.67)	(11.43)	(11.24)	(8.77)	(10.04)	(-0.82)	(-3.15)	(-2.42)	(-2.28)	(-4.85)
HML	0.2389***	0.1086***	0.1511***	0.1528***	0.2573***	-0.1448	-0.1358	0.5918***	0.9765***	1.4694***
	(6.04)	(3.22)	(3.98)	(3.41)	(5.25)	(-0.36)	(-0.56)	(2.45)	(2.91)	(3.33)
SMB	0.5416***	0.2204***	0.2512***	0.3672***	0.3569***	1.0243***	1.1429***	0.5879***	1.2945***	1.5726***
	(7.06)	(3.25)	(3.36)	(4.50)	(4.05)	(2.30)	(3.98)	(2.20)	(3.30)	(3.25)
α	-0.0141	0.0011	0.0118	0.0099	0.0300***	0.0573**	0.0640***	0.0743***	0.0850***	0.1999***
	(-1.60)	(0.14)	(1.37)	(1.05)	(3.00)	(1.69)	(3.21)	(3.77)	(2.95)	(5.74)

Table 6.7: Performance of High Cash Holdings Portfolio Under Economic Uncertainty Continued

	Four Factor Model									
	Normal State					*Uncertain State*				
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.5606***	0.5449***	0.5863***	0.4943***	0.5604***	-0.5307	-0.6506***	-0.5453***	-0.7510***	-1.8290***
	(11.02)	(11.56)	(11.60)	(9.13)	(10.48)	(-1.26)	(-2.75)	(-2.35)	(-2.21)	(-4.75)
HML	0.2661***	0.1240***	0.1698***	0.1684***	0.2801***	0.1582	-0.2056	0.5847***	0.9708***	1.4788***
	(6.71)	(3.65)	(4.44)	(3.74)	(5.66)	(0.38)	(-0.82)	(2.38)	(2.80)	(3.29)
SMB	0.5764***	0.2304***	0.2742***	0.3839***	0.3884***	-1.5340	1.9151***	0.6860	1.3551	1.4205
	(7.54)	(3.41)	(3.66)	(4.70)	(4.38)	(-1.36)	(2.63)	(1.00)	(1.41)	(1.01)
UMD	0.3133***	0.1497***	0.1795***	0.1483***	0.1879***	1.7724***	-0.5427	-0.0686	-0.0430	0.1010
	(5.18)	(3.18)	(3.37)	(2.66)	(2.93)	(2.46)	(-1.15)	(-0.16)	(-0.07)	(0.11)
α	-0.0614***	-0.0229***	-0.0166	-0.0129	0.0026	0.0391	0.0659***	0.0748***	0.0853***	0.1998***
	(-4.85)	(-2.12)	(-1.38)	(-1.02)	(0.19)	(1.14)	(3.29)	(3.72)	(2.92)	(5.72)

The table presents results of the regression for excess cash holdings portfolio estimated using the Capital Asset Pricing Model (CAPM), the Fama and French Three Factor Model and the Four Factor Model. The variable of interest is the portfolio alpha from each model in periods of increased uncertainty. Increased uncertainty is measured by identifying periods of high economic policy uncertainty. T statistics are reported underneath the beta coefficients. *, **, and *** indicates significance at 5%, 1% and below 1%.

Next, I evaluate if these abnormal excess returns persist after controlling for other systematic factors identified by Fama and French (1993). Despite introducing size and book to market, the results remain consistent. The portfolio of high cash holdings outperforms the portfolio of low cash holdings by 14%. Alternatively, because the level of cash held may be mirroring some aspects of momentum. For instance, the high cash holdings portfolio may consist majorly of recently profitable firms. To dismiss this possibility, I include the momentum factor and evaluate if the alpha from the high cash holdings portfolio remains positive and significant. In spite of the introduction of the momentum factor, the portfolio of high cash holdings still yields an excess abnormal return of 20%. The results are presented in Table 6.7. The results confirm the notion of hypothesis H2: High cash holdings portfolio perform better than low cash holdings portfolio during periods of increased uncertainty.

xxxi:Table 6.8: Performance of High Cash Holdings Portfolio During Periods of High Volatility

					CAPM					
			Normal State					Uncertain State		
	Low Excess Cash Holdings Portfolio	2	3	4	Excess Cash Holdings Portfolio	Low Excess Cash Holdings Portfolio	2	3	4	Excess Cash Holdings Portfolio
Rmkt	0.4958***	0.5716***	0.5434***	0.6353***	0.6027***	0.5797***	0.5144***	0.5727***	0.6018***	0.6781***
	(16.86)	(18.48)	(16.71)	(18.55)	(18.08)	(11.56)	(11.72)	(13.52)	(11.62)	(11.07)
α	-0.0013	0.0201***	0.0264***	0.0373***	0.0484***	-0.0348***	0.0019	-0.0134***	0.0200***	0.0070
	(-0.23)	(3.53)	(4.44)	(5.88)	(7.78)	(-4.49)	(0.29)	(-2.10)	(2.51)	(0.74)
					Three Factor Model					
			Normal State					Uncertain State		
	Low Excess Cash Holdings Portfolio	2	3	4	Excess Cash Holdings Portfolio	Low Excess Cash Holdings Portfolio	2	3	4	Excess Cash Holdings Portfolio
Rmkt	0.4980***	0.5602***	0.5403***	0.6314***	0.5999***	-0.0659	-0.1244	0.0784	0.0420	-0.5093***
	(15.61)	(16.46)	(15.01)	(17.06)	(16.42)	(-0.42)	(-0.92)	(0.61)	(0.27)	(-2.70)
HML	0.1792***	0.0570***	0.0914***	0.1842***	0.1532***	1.1530***	1.1834***	1.0157***	1.1821***	2.1371***
	(7.84)	(2.43)	(3.55)	(6.28)	(5.38)	(4.50)	(5.47)	(4.99)	(4.65)	(7.03)
SMB	0.3213***	0.2261***	0.2120***	0.2301***	0.1656***	0.4013***	0.3308***	0.0978	0.0878	0.7370***
	(6.69)	(4.42)	(4.03)	(4.21)	(3.00)	(2.73)	(2.63)	(0.81)	(0.58)	(4.12)
α	-0.0161***	0.0114**	0.0163***	0.0239***	0.0391***	0.0324**	0.0719***	0.0445***	0.0884***	0.1348***
	(-2.79)	(1.86)	(2.55)	(3.61)	(6.04)	(1.92)	(4.97)	(3.31)	(5.16)	(6.57)

Table 6.8: Performance of High Cash Holdings Portfolio During Periods of High Volatility Continued

		Four Factor Model								
		Normal State					Uncertain State			
		Low Excess Cash Holdings Portfolio	2	3	4	Excess Cash Holdings Portfolio	Low Excess Cash Holdings Portfolio	2	3	4	Excess Cash Holdings Portfolio
Rmkt		0.5615***	0.6675***	0.6143***	0.6992***	0.6900***	-0.0464	-0.1393	0.0556	-0.0314	-0.5439***
		(15.36)	(17.77)	(15.79)	(17.82)	(17.84)	(-0.29)	(-1.03)	(0.43)	(-0.20)	(-2.87)
HML		0.1868***	0.0705***	0.1023***	0.1996***	0.1703***	0.8702**	1.5531***	1.4408***	2.7221***	2.9438***
		(8.14)	(3.01)	(3.97)	(6.79)	(5.97)	(1.94)	(4.16)	(4.00)	(6.25)	(5.61)
SMB		0.3086***	0.2055***	0.2020***	0.2228***	0.1676***	0.3647***	0.3746***	0.1503	0.2864**	0.8395***
		(6.41)	(4.03)	(3.85)	(4.09)	(3.05)	(2.36)	(2.86)	(1.19)	(1.82)	(4.49)
UMD		0.1184***	0.1935***	0.1485***	0.1655***	0.2214***	-0.1906	0.2597	0.2911	1.0722***	0.5627**
		(3.54)	(6.64)	(4.95)	(5.12)	(6.91)	(-0.77)	(1.22)	(1.43)	(4.35)	(1.89)
α		-0.0375***	-0.0221***	-0.0094	-0.0047	0.0027	0.0502**	0.0471**	0.0174	-0.0126	0.0819***
		(-4.49)	(-2.79)	(-1.15)	(-0.54)	(0.33)	(1.75)	(1.89)	(0.75)	(-0.44)	(2.36)

The table presents the results of the regression for excess cash holding portfolios using estimated using the CAPM, Fama and French 3 Factor model, and Fama French and Carhart Model. Excess cash holding portfolios are spitted based on the degree of uncertainty indicated from the FTSE100 volatility index. The index is the implied volatility of options on the FTSE100. Hence it indicates the degree of uncertainty in the market. The variable of interest is the portfolio alphas of the low and excess cash holdings portfolio during periods of uncertainty. T statistics are reported underneath the beta coefficients. *** and ** indicates significance at <5% and 10% respectively.

In Table 6.8, I test if the results are consistent when using an alternative measure of uncertainty. I collect data on the FTSE100 volatility index. The FTSE volatility index is the implied volatility of the FTSE100 index (Allen et al., 2013). The volatility index indicates the degree of certainty in the market. To measure this, I identify periods of high implied volatility and mark such periods as an uncertain state of the world and periods of low implied volatility as tranquil periods. Using this measure, the results indicate that a portfolio of high cash holdings outperforms a portfolio of low cash holdings during periods of high uncertainty. A portfolio of high cash holdings outperforms a portfolio of low cash holdings during periods of high uncertainty by an alpha of 3.5%, 10.3%, and 3.2% using the CAPM, the Fama and French three factor model and the Carhart four factor model, respectively. Compared to more tranquil periods, the difference between both portfolios increases during periods of high uncertainty.

xxxii: Table 6.9: High Cash Holdings, Firm Performance and Firm Value

	Performance			Value	
	ROA	ROE	ROCE	Market to Book	Enterprise Value
High Cash holdings	0.0047***	0.0083***	0.0091***	0.0305***	0.0273***
	(6.52)	(3.63)	(5.92)	(8.71)	(10.58)
Leverage	0.0581***	0.1092***	-0.0250	-0.0635**	-0.2392***
	(7.44)	(4.50)	(-1.54)	(-1.69)	(-8.73)
Size	0.0064***	0.0101***	0.0111***	-0.0257***	0.2061***
	(10.72)	(6.53)	(10.67)	(-10.30)	(47.63)
Dividend	0.0203***	0.0805***	0.0598***	0.0334***	0.0098
	(7.57)	(9.81)	(10.87)	(2.61)	(1.05)
Investment	-0.0202***	0.0048	-0.0035	-0.1819***	-0.0170
	(-2.29)	(0.17)	(-0.18)	(-4.14)	(-0.51)
Market to book	0.0083***	0.0218***	0.0149***	0.5818***	
	(11.38)	(9.60)	(9.83)	(154.33)	
Cash Flow	-0.0036***	0.0087***	0.0051**	-0.0096**	-0.0161***
	(-2.75)	(2.20)	(1.93)	(-1.65)	(-3.62)
Sales growth	0.0001***	0.0000	0.0000	-0.0001	0.0001
	(2.54)	(0.21)	(0.42)	(-0.50)	(0.55)
Beta	-0.0007	-0.0079**	-0.0089***	-0.0097	-0.0177***
	(-0.48)	(-1.70)	(-2.87)	(-1.36)	(-3.36)
ROA	0.3390***			-0.0354	
	(66.15)			(-1.44)	
ROE		0.1056***			
		(21.21)			
ROCE			0.1918***		0.0073
			(38.38)		(0.85)
Enterprise value					0.7728***
					(184.47)
Intercept	-0.1139***	-0.2214***	-0.1945***	0.2424***	0.3120***
	(-14.77)	(-10.99)	(-14.34)	(7.75)	(14.50)
Observation	43305	43456	43433	43658	42799
Adjusted R-Square	0.3224	0.0612	0.126	0.5438	0.9705

The table presents the results of panel regressions of the effect of high on firm performance and value. ROA refers to the industry adjusted value of return on asset. ROE refers to the industry adjusted value of the returns on equity, it calculated by dividing operating profit by shareholders equity. ROCE is the industry adjusted value of returns on capital employed. It is derived by dividing operating profit by capital employed. High Cash holdings refers to the residual value of cash holdings from equation. Leverage is the ratio of debt to total asset. Size is natural logarithm of total asset. Dividend is a binary variable that takes the value of one if a firm pays dividend and zero otherwise. Investment is the ratio of capital expenditure to total asset. Market to book is the ratio of the market value of equity to the book value of total asset. Cash Flow is EBITDA divided by total asset. Sales growth is the industry adjusted value of firm growth in sales. Beta measures the correlation between a firms stock and the market portfolio. Enterprise value is the natural logarithm of market value of equity plus debt minus cash. *** and **,signifies significance at below 5% and 10% respectively.

6.4.6 High Cash Holdings Level, Firm Performance, and Firm Value

The results reported in Table 6.9 suggest that across three measures of firm performance (Industry adjusted: ROA, ROCE, and ROE) and two measures of firm value (Market-to-Book and Enterprise Value), I consistently find a positive relationship between abnormally high cash holdings level, firm performance and firm value. Cash can be used to make investment that drives positive growth and consequently enhance performance (Mikkelson and Partch, 2003). The results reported are contradictory to the position of Harford (1999) who suggests that cash holdings have a negative impact on firm performance. However, it is important to note that Harford (1999) focus on the absolute value of the ratio of cash to total assets held by a firm. The study focuses on the predicted level of abnormal cash to total asset. When it is important for a firm to adapt to an uncertain environment the level of cash held can aid value creation (Levinthal, 1997, Deb et al., 2017). Cash can also be a potent tool in the product market since firms use cash reserves to respond to competitive threats (Fresard, 2010, Kim and Bettis, 2014). Prior studies document a negative relationship between cash holdings and firm value in poorly governed firms (see for instance, Pinkowitz *et al.* 2006; Deb *et al.* 2017). It appears that given the track record of high corporate governance among UK firms (Pinkowitz et al., 2006), cash could be a moderating factor motivating the relationship between abnormally high cash holdings, firm performance and firm value. Therefore, I posit that this relationship may apply to other countries with robust corporate governance structure. In general, the results support the conjecture of H3a and H3b, abnormally high cash holdings is positively associated with firm performance and firm value.

6.4.7 Robustness

To ensure my definition of high cash holdings is robust, I follow a similar approach as in Simutin (2010). I define a modified regression specification, but rather than deflating all my regressors by total asset and market capitalisation. After estimating the residual from equation 6.7, I form 5 portfolios of high cash holdings based on the levels of the residuals. The modified regression confirms that high cash holdings portfolio outperforms low cash holdings portfolio. Forming a portfolio based on the new estimated residuals does not change my results. Consistent with my earlier findings, my result suggests that a portfolio of high cash holdings outperform a portfolio of low cash holdings by 2.5% in an equal weighted portfolio and 2.2% in a value-weighted portfolio.

I also test if the results are consistent after introducing known asset-pricing factors. I find that the previous findings are largely consistent after controlling for conventional asset-pricing factors. In addition, I find that the outperformance of the high cash holdings portfolio over the low cash holdings portfolio increases during periods of increased economic uncertainty.

Similarly, I estimate high cash holdings using the residuals of equation 7. Despite this estimation procedure, I find a positive relationship between high cash holdings, firm performance and firm value. Results of these estimates is presented in the Appendix 6F.

6.5 Conclusion

In this study, I document a positive relationship between abnormally high cash holdings and firm market performance. By sorting firms into a five by five-portfolio based on size and market-to-book ratio, I find that high cash holdings portfolio generates an excess return of 1.4% in a value weighted portfolio and 1.8% in equally weighted portfolio coupled with an annualised return of 12.7%. The alphas of the high cash holdings portfolio are robust even after controlling for the popular asset pricing factors such as market return, size, value and momentum.

I evaluate the performance of the portfolio of high cash holdings firms during periods of high economic uncertainty. I find that during periods of high uncertainty, the high cash holdings portfolio yields an excess return of 1.9% (value weighted portfolio return) and 2.4% (equally weighted portfolio return) based on the Fama and French (1993) 25 portfolio sorts. The results remain consistent after considering factors peculiar to the capital asset pricing model (CAPM), the Fama and French three-factor model and the Carhart model. Lastly, I investigate the relationship between high cash holdings, firm performance and firm value. Using various measures of firm performance and firm value, I find a positive relationship.

Our result has important implications for investors and firms. For investors, my findings suggest that for countries like the UK in which effective investor protection procedures have been installed, the high cash holdings portfolio performs better than low cash holdings portfolio. Therefore, an important element of stock picking should be the amount of cash held by a firm relative to competitors. In addition, high cash holdings can amplify the value of a firm especially during periods of economic uncertainty. To leverage the potentials of cash during such periods, it

advisable that managers build firm cash reserves. Firms should increase cash holdings during periods of increased economic uncertainty.

Appendices to Chapter 6

Appendix 6A: Robustness check- Determinants of Cash Holdings

LnTA	-0.0264
	(-0.92)
LnME	0.3786***
	(17.49)
LnCPX	-0.0725***
	(-7.67)
LnCF	0.0864***
	(2.90)
LnDebt	-0.0902***
	(-9.97)
LnDY	0.0146
	(0.75)
LnWC	-0.0611***
	(-5.39)
Ln(σ ind)	0.1653***
	(6.51)
Intercept	-4.7576***
	(-38.89)
N	10542
adj. R-sq	0.149

The table presents the results of a robustness cross sectional regression used to estimate excess cash holdings. Excess cash holdings are estimated from the residuals of this regression. LnTA refers to the natural logarithm of total assets. LnME is the natural logarithm of market capitalisation. LnCPX is the natural logarithm of capital expenditure. LnCF is the natural logarithm of cash flow. LnDbt is the natural log of the ratio of debt to total asset. LnDY is natural logarithm of the dividend yield of a firm. LnWC is the natural logarithm of the working capital. Ln (σ ind) is the natural logarithm industry standard deviation of cash holding. *** implies significance at the 5% level and ** at the 10% level.

Appendix 6B: Robustness-Performance of High Cash Holdings Portfolio

	Low Cash Holding Portfolio	2	3	4	High Cash Holding Portfolio
Excess Return Equal Weighted Portfolio	-0.0204	-0.0198	-0.0101	-0.0190	0.0049
Excess Return Market Cap Weighted Return	-0.0154	-0.0140	-0.0059	-0.0132	0.0073
Annualised Firm Return	0.0828	0.0838	0.1035	0.1096	0.1523
Beta	0.6380	0.5897	0.6473	0.7114	0.7722
Capex	0.0486	0.0406	0.0405	0.0407	0.0462
Cash Holdings	0.0131	0.0459	0.0802	0.1174	0.1893
Leverage	0.1307	0.1490	0.1348	0.1245	0.1202
Market to Book	1.0720	1.1469	1.0633	1.1502	1.0174
Size	13.0180	14.4708	14.3125	13.4801	12.2277
ROA	0.0752	0.0915	0.0812	0.0726	0.0652
Net Working Capital	0.1396	0.1189	0.1250	0.1293	0.1271
Market Capitalisation	39400000	106000000	116000000	54000000	4033460
Total Asset	59300000	183000000	197000000	92300000	7128389

Using the robustness cash holdings determinant model, this table presents the result of splitting the estimated excess cash holdings into annual portfolios based on their quintile. High Excess cash holdings portfolio reports the firm annualised returns located at the fifth quintile of the estimated excess cash holdings. Low Excess Cash holdings refers to annualised returns located on the first quintile of the estimated excess cash holdings. An estimated T-test confirms the significant difference in the annualised return of the high excess cash holdings portfolio and the low excess cash holdings portfolio.

Appendix 6C: Robustness-Asset Pricing Models and Performance of Excess Cash Holdings Portfolio

	CAPM				
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.5516***	0.4779***	0.5225***	0.5036***	0.5833***
	(13.45)	(12.88)	(13.01)	(11.12)	(12.76)
α	-0.0138**	0.0061	0.0155***	0.0156**	0.0370***
	(-1.71)	(0.89)	(2.06)	(1.84)	(4.06)
	Three Factor Model				
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.4349***	0.4454***	0.4899***	0.4224***	0.4811***
	(9.73)	(11.29)	(11.39)	(8.72)	(9.57)
SMB	0.2340***	0.0973***	0.1520***	0.1550***	0.2538***
	(6.05)	(3.00)	(4.22)	(3.57)	(5.29)
HML	0.5486***	0.2276***	0.2222***	0.3940***	0.3719***
	(7.52)	(3.61)	(3.24)	(5.14)	(4.41)
α	-0.0122	0.0036	0.0105	0.0143**	0.0355***
	(-1.48)	(0.51)	(1.38)	(1.66)	(3.80)
	Four Factor Model				
	Low Cash Holdings Portfolio	2	3	4	High Cash Holdings Portfolio
Rmkt	0.5386***	0.4925***	0.5362***	0.4672***	0.5106***
	(10.95)	(11.18)	(11.43)	(9.01)	(9.79)
SMB	0.2586***	0.1068***	0.1634***	0.1677***	0.2691***
	(6.67)	(3.27)	(4.51)	(3.84)	(5.55)
HML	0.5634***	0.2267***	0.2263***	0.3986***	0.3866***
	(7.75)	(3.60)	(3.30)	(5.20)	(4.58)
UMD	0.2791***	0.1028***	0.1170***	0.1248***	0.1270***
	(4.92)	(2.39)	(2.45)	(2.41)	(2.09)
α	-0.0545***	-0.0126	-0.0076	-0.0046	0.0172
	(-4.59)	(-1.30)	(-0.72)	(-0.40)	(1.34)

The table presents results of the excess cash holdings portfolio from the Capital Asset Pricing Model (CAPM), the Fama and French Three Factor Model and the Four Factor Model. The variable of interest is the portfolio alpha from each model. T statistics are reported underneath the beta coefficients. *, **, and *** indicates significance at 5%, 1% and below 1%.

Appendix 6D: Robustness Check-Performance of excess cash holdings portfolio under uncertainty

	Low Cash Holdings Portfolio		2		3		4		High Cash Holdings Portfolio	
	Normal State	Uncertain State	Normal State	Uncertain State	Normal State	Uncertain State	Normal State	Uncertain State	Normal State	Uncertain State
Excess Return Equally Weighted	-0.0233	-0.0219	-0.0125	-0.0236	0.0022	0.0092	-0.0084	0.0024	0.0099	0.0291
Excess Return Market Cap Weighted	-0.0190	-0.0166	-0.0095	-0.0187	0.0039	0.0220	0.0007	0.0129	0.0208	0.0390
Annualised Return	0.0823	0.0864	0.1109	0.1099	0.1544	0.0880	0.0686	0.0651	0.1074	0.1330
Beta	0.6558	0.6242	0.7049	0.7611	0.8063	0.4568	0.3944	0.3462	0.3998	0.4604
Capex	0.0505	0.0436	0.0433	0.0429	0.0478	0.0299	0.0237	0.0263	0.0270	0.0319
Cash Holdings	0.0120	0.0433	0.0755	0.1126	0.1842	0.0252	0.0609	0.1044	0.1475	0.2360
Leverage	0.1287	0.1472	0.1311	0.1205	0.1204	0.1512	0.1595	0.1541	0.1496	0.1178
Market to Book	1.0522	1.1295	1.0395	1.1322	0.9987	1.2740	1.2458	1.1877	1.2629	1.1884
Size	12.7571	14.1924	13.9790	13.2724	12.1321	15.6835	16.0495	16.0546	14.7825	13.1001
ROA	0.0639	0.0807	0.0720	0.0674	0.0578	0.1909	0.1524	0.1291	0.1051	0.1326
Net Working Capital	0.1444	0.1225	0.1278	0.1315	0.1294	0.0909	0.0986	0.1102	0.1154	0.1064
Market Capitalisation	31600000	92400000	103000000	42600000	3701320	119000000	183000000	183000000	125000000	7064230
Total Asset	45100000	159000000	171000000	66300000	6383929	204000000	319000000	331000000	255000000	13900000

The table reports the performance of High excess cash holdings portfolio under an uncertain state of the world. Excess cash holdings were predicted using the robustness model. Using data from Policy Uncertainty (www.policyuncertainty.com) I identify periods that are highly uncertain as firm years located in the fourth and fifth quintile of UK EPU index. Next, I estimate a T-test comparing the means of the performance of the portfolios. The result suggests a significant difference in the two reported values.

Appendix 6E: Robustness-Asset Pricing and Performance of High Cash Holdings Portfolio Under Uncertainty

CAPM

	Normal State					*Uncertain State*				
	Low Cash Holdings Portfolio	2	3	4	High cash holdings portfolio	Low Cash Holdings Portfolio	2	3	4	High cash holdings portfolio
Rmkt	0.5486***	0.4953***	0.5437***	0.5058***	0.6090***	0.3513	-0.1556	-0.0914	0.2038	-0.6480***
	(12.99)	(12.63)	(12.67)	(10.76)	(13.05)	(1.29)	(-0.98)	(-0.58)	(0.88)	(-2.43)
α	-0.0178***	0.0028	0.0153**	0.0093	0.0310***	0.0490	0.0802***	0.0712***	0.0842***	0.1920***
	(-2.08)	(0.37)	(1.82)	(1.01)	(3.22)	(1.43)	(4.06)	(3.59)	(2.86)	(5.61)

Three Factor Model

	Normal State					*Uncertain State*				
	Low Cash Holdings Portfolio	2	3	4	High cash holdings portfolio	Low Cash Holdings Portfolio	2	3	4	High cash holdings portfolio
Rmkt	0.4422***	0.4720***	0.5110***	0.4382***	0.5146***	-0.3475	-0.7195***	-0.5519***	-0.7559***	-1.8196***
	(9.67)	(11.43)	(11.24)	(8.77)	(10.04)	(-0.82)	(-3.15)	(-2.42)	(-2.28)	(-4.85)
HML	0.2389***	0.1086***	0.1511***	0.1528***	0.2573***	-0.1448	-0.1358	0.5918***	0.9765***	1.4694***
	(6.04)	(3.22)	(3.98)	(3.41)	(5.25)	(-0.36)	(-0.56)	(2.45)	(2.91)	(3.33)
SMB	0.5416***	0.2204***	0.2512***	0.3672***	0.3569***	1.0243***	1.1429***	0.5879***	1.2945***	1.5726***
	(7.06)	(3.25)	(3.36)	(4.50)	(4.05)	(2.30)	(3.98)	(2.20)	(3.30)	(3.25)
α	-0.0141	0.0011	0.0118	0.0099	0.0300***	0.0573**	0.0640***	0.0743***	0.0850***	0.1999***
	(-1.60)	(0.14)	(1.37)	(1.05)	(3.00)	(1.69)	(3.21)	(3.77)	(2.95)	(5.74)

		Four Factor Model									
				Normal State						*Uncertain State*	
		Low Cash Holdings Portfolio	2	3	4	High cash holdings portfolio	Low Cash Holdings Portfolio	2	3	4	High cash holdings portfolio
Rmkt		0.5606***	0.5449***	0.5863***	0.4943***	0.5604***	-0.5307	-0.6506***	-0.5453***	-0.7510***	-1.8290***
		(11.02)	(11.56)	(11.60)	(9.13)	(10.48)	(-1.26)	(-2.75)	(-2.35)	(-2.21)	(-4.75)
HML		0.2661***	0.1240***	0.1698***	0.1684***	0.2801***	0.1582	-0.2056	0.5847***	0.9708***	1.4788***
		(6.71)	(3.65)	(4.44)	(3.74)	(5.66)	(0.38)	(-0.82)	(2.38)	(2.80)	(3.29)
SMB		0.5764***	0.2304***	0.2742***	0.3839***	0.3884***	-1.5340	1.9151***	0.6860	1.3551	1.4205
		(7.54)	(3.41)	(3.66)	(4.70)	(4.38)	(-1.36)	(2.63)	(1.00)	(1.41)	(1.01)
UMD		0.3133***	0.1497***	0.1795***	0.1483***	0.1879***	1.7724***	-0.5427	-0.0686	-0.0430	0.1010
		(5.18)	(3.18)	(3.37)	(2.66)	(2.93)	(2.46)	(-1.15)	(-0.16)	(-0.07)	(0.11)
α		-0.0614***	-0.0229***	-0.0166	-0.0129	0.0026	0.0391	0.0659***	0.0748***	0.0853***	0.1998***
		(-4.85)	(-2.12)	(-1.38)	(-1.02)	(0.19)	(1.14)	(3.29)	(3.72)	(2.92)	(5.72)

Using the robustness model for determining excess cash holdings and different portfolio sorts. The table presents results of the excess cash holdings portfolios from the Capital Asset Pricing Model (CAPM), the Fama and French Three Factor Model and the Four Factor Model. The variable of interest is the portfolio alpha from each model in periods of increased uncertainty. T statistics are reported underneath the beta coefficients. *,**, and *** indicates significance at 5%, 1% and below 1%.

Appendix 6F: Robustness High Cash Holdings, Firm Performance and Firm Value

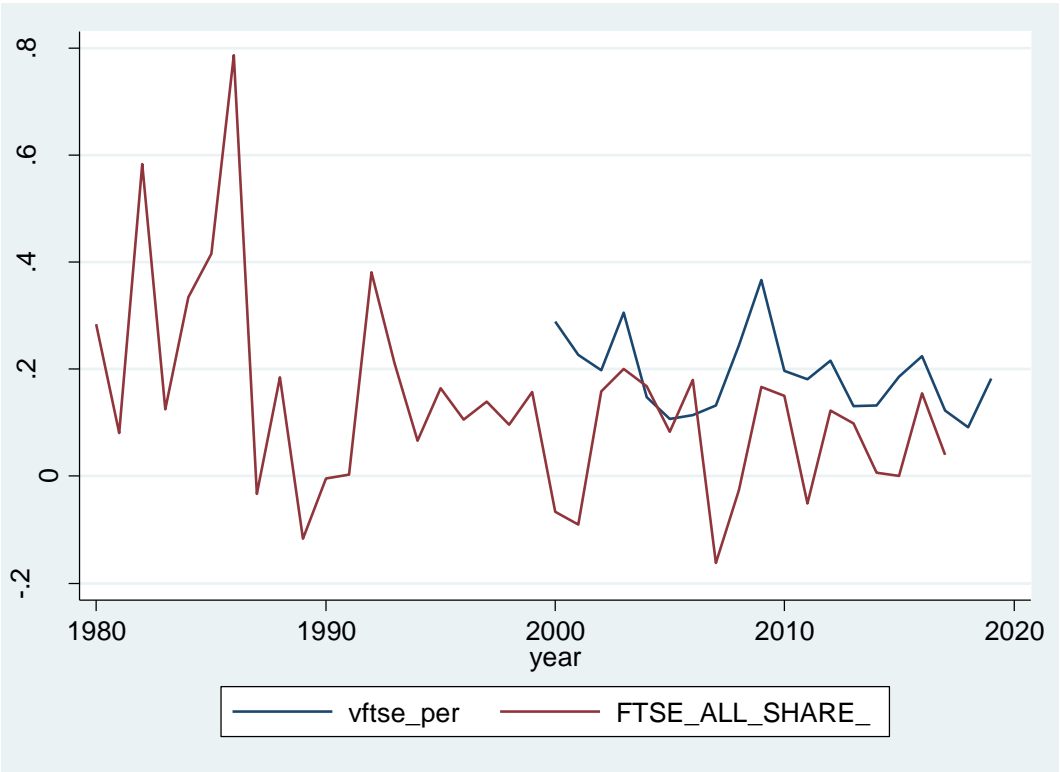|	Performance			Value	
	ROA	ROE	ROCE	Market to Book	Enterprise Value
High Cash holdings	0.0014**	0.0028	0.0042***	0.0132***	0.0220***
	(1.76)	(1.08)	(2.47)	(3.01)	(5.28)
Leverage	0.0170	-0.0221	-0.0599***	-0.1382***	-0.3122***
	(1.60)	(-0.65)	(-2.66)	(-2.41)	(-5.76)
Size	0.0026***	0.0054***	0.0047***	0.0061***	0.1580***
	(4.13)	(2.83)	(3.61)	(2.63)	(17.42)
Dividend	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Investment	0.0598***	0.0289	0.0129	0.1427	0.0014
	(3.57)	(0.53)	(0.36)	(1.41)	(0.02)
Market to book	0.0172***	0.0392***	0.0321***	0.7242***	
	(14.85)	(10.89)	(13.43)	(108.73)	
Cash Flow	-0.0857***	0.0041	0.0110	-0.0004	0.0412***
	(-22.42)	(0.37)	(1.55)	(-0.02)	(2.16)
Sales growth	-0.0000	-0.0002	-0.0001	-0.0007	0.0001
	(-0.54)	(-0.92)	(-0.65)	(-1.35)	(0.11)
Beta	-0.0038***	-0.0106**	-0.0084***	-0.0156	-0.0315***
	(-1.96)	(-1.71)	(-2.06)	(-1.47)	(-3.17)
ROA	0.6145***			0.1558***	
	(47.93)			(2.30)	
ROE		0.3049***			
		(22.09)			
ROCE			0.2923***		0.1313***
			(22.54)		(3.91)
Enterprise value					0.8370***
					(96.04)
Intercept	-0.0370***	-0.0788***	-0.0641***	-0.1512***	0.1165***
	(-4.28)	(-3.01)	(-3.55)	(-4.51)	(3.25)
Observation	9875	9885	9888	9889	9853
Adjusted R-Square	0.4552	0.1492	0.1903	0.6571	0.9798

The table presents the results of panel regression of the effect of high on firm performance and value. ROA refers to the industry adjusted value of return on asset. ROE refers to the industry adjusted value of the returns on equity, it is calculated by dividing operating profit by shareholders equity. ROCE is the industry adjusted value of returns on capital employed. It is derived by dividing operating profit by capital employed. High Cash holdings refers to the residual value of cash holdings from equation. Leverage is the ratio of debt to total asset. Size is natural logarithm of total asset. Dividend is a binary variable that takes the value of one if a firm pays dividend and zero otherwise. Investment is the ratio of capital expenditure to total asset. Market to book is the ratio of the market value of equity to the book value of total asset. Cash Flow is EBITDA divided by total asset. Sales growth is the industry adjusted value of firm growth in sales. Beta measures the correlation between a firm's stock and the market portfolio. Enterprise value is the natural logarithm of market value of equity plus debt minus cash. *** and **, signifies significance at below 5% and 10% respectively.

Appendix 6G: EPU index

Figure A10: EPU Index for the United Kingdom

Notes: The news-based EPU Index reflects scaled monthly counts of articles containing 'uncertain' or 'uncertainty', 'economic' or 'economy', and one or more policy-relevant terms: 'tax', 'policy', 'regulation', 'spending', 'deficit', 'budget', or 'central bank'. The series is normalized to mean 100 from 1997 to 2009 and based on queries in the following newspapers: The Times of London and the Financial Times.

Appendix 6H: Time series of FTSE100 volatility index and FTSE ALL SHARE annual returns

Chapter 7
Conclusion, Limitations and Future Research

7.0 Background and Introduction

The recent marked increase in firm cash holdings in the UK and around the world has drawn attention from media and academics alike. At the end of 2016, Moody reported that the cash reserves of firms in Europe, Middle East and Africa had hit £900bn. The Institute of Chartered Accountants of England and Wales (ICAEW) suggests that 70 percent of small firms are reluctant to disburse their excess cash position. They summarised that six in ten UK firms are sitting on a cash pile. The motivation for this action is that their cash surplus will help boost growth in the coming years (Telegraph, 31st October 2013). In another article published by Bloomberg in 2019, they report that UK firms are building up cash reserves. Deposits held by non-financial firms has grown by 3.5% and there has been a contraction in borrowing. In the academic literature, the reason for the trend has been subject to so much debate. However, in the UK, few studies have provided explanations for this trend. One of the notable studies on cash holdings in the UK by Ozkan and Ozkan (2004) posit that factors like managerial ownership, firm growth, leverage and cash flow dictates a firm's cash holding policy. Other studies like Ferreira and Vilela (2004) and Al-Najjar (2013) also argue that firm level characteristics dictate the amount of cash a firm holds. An aspect of the literature that remains largely unexplored is the relationship between firm cash holdings and product market outcome. While a firm's characteristics may be linked to corporate outcomes, most studies that evaluate the determinants of firm cash holdings do not consider the role of firms' interactions in the product market. Although, there are established theoretical interpretation for firm cash holdings. For instance, to mitigate the adverse selection bias of the capital market imperfection, disadvantaged firms have to build up reserves, thus ensuring they are not exposed to the problem of underinvestment (Myers and Majluf, 1984). An alternate proposition is that when managers build up cash reserves, they are able to circumvent capital market monitoring and as such engage in overinvestment,

hence destroying shareholders wealth (Jensen, 1986). Therefore, depending on the motivation for building up reserves, cash can be a constructive or destructive tool (Myers and Majluf, 1984; Jensen, 1986; Kim and Bettis, 2014). Empirical evidence on the implication and interpretation of the cash holding trend has received limited attention in the academic literature.

In this thesis, I address these gaps in the empirical literature on cash holdings. Using data on corporate investment announcements (3,602 corporate investment announcements) for the period 2005-2016 and firm level data for non-financial firms (8,835 firms) listed on London Stock Exchange over the period 1980 to 2017. Unlike previous studies that focus on how firm level characteristics dictate a firm's cash holdings regime, this thesis evaluates how a firms' corporate outcomes may shape firms' cash holding policy. Particularly, the thesis examines how changes in firm competitive environment may cause firms to alter their cash holdings policy. Next, complementing the theoretical interpretation for cash holdings, the thesis empirically tests how cash is perceived by the market. An examination of market perception of cash holdings during corporate investment announcements provides insights regarding the market opinion of firm cash holdings and cash holdings strategies. To further understand the implication of firm cash holdings, this thesis examines the link between firm cash holdings levels and firm market performance. In this light, the thesis examines how this link varies with the degree of cyclical turbulence/uncertainty. The central message of this thesis is that cash is a very important strategic tool with which firms can increase value. Therefore, managers must focus on the cash holdings level of their firms since this can dictate market performance and product market outcomes.

The rest of this chapter is structured as follows. In section 7.1.1 the thesis discusses the summary of the findings of the first empirical chapter (Chapter 4 of the thesis). Chapter 4 presents discussions on the interplay of firm cash holdings and changes in product market competition. Section 7.1.2 summarises the main results of the second empirical chapter (Chapter 5 of the thesis). Chapter 5   discusses how firm cash holdings affect market perception of corporate investment announcements. In section 7.1.3 the study summarises the findings of the third empirical chapter (Chapter 6 of the thesis). Chapter 6 examines the performance of high cash holdings firms and particularly how they vary during periods of high uncertainty. Section 7.2 presents the policy implications of the thesis. The final section (Section 7.3) discusses the limitations of this study and recommends areas for further study.

7. 1 Summary of Results

7.1.1 Cash Holdings and Firm Competitiveness

The first empirical chapter (Chapter 4) evaluates how changes in corporate outcomes particularly product market competition affects firms' cash holdings and how these changes vary with the degree of exposure to product market threat and financing frictions. In addition, the study examines if such changes in firm cash holdings result in gains in the product market and how these gains differ with firms' exposure to competitive threat and capital market imperfections. Previous studies in the product market literature neglect the role of cash and simply assume cash is negative debt and hence alternative inferences can be drawn from debt studies (For instance, Valta (2012), Haushalter *et al.* (2007). However, Acharya *et al.* (2007) posit that cash is not negative debt hence, inferences on debt-based product market studies may not apply directly to firm cash holding. This calls for more cash-based studies on the product market. Correspondingly, Valta (2012) posits

that during periods of increased competition the pledgeable income of a firm is adversely affected as a result of the cash flow risk synonymous with such periods. This ultimately results in the increase of default risk, which causes bank lending rate to increase. Following this proposition, firms may prefer building up cash reserves during periods of increased competition, thus buffering the adverse effect of increased cost of debt. Also, during periods of increased competition/uncertainty cash can offer a strategic advantage. Cash rich firms may use cash as a tool for discouraging new entrants into their industry (Akdoğu and MacKay, 2012; Lyandres and Palazzo, 2016). The benefit of financial flexibility in the product market differs with the degree of firm exposure to competitive pressure and capital market imperfections (Froot, Scharfstein and Stein, 1993; Kaplan and Zingales, 1997). All these put together indicate firms may increase their cash reserves during periods of increased competition and the degree of increase will vary with firm exposure to competitive pressure and financing frictions. In addition, the benefit of the increases in cash holdings relative to peers will differ with firm exposure to predatory threat and exposure to capital market imperfections.

Using various indicators of competition (increase in number of competitors, Gini coefficient, Theil Entropy Index (TEI), Herfindahl Hirschman Index (HHI) and changes in competition regimes) the findings of the first empirical chapter suggest that firms increase cash holdings during periods of increased competition. This complement the work of Valta (2012). As a response to the increase in cost of debt, firms increase cash holding. Furthermore, the findings lend support to the position Lyandres and Palazzo (2016). The degree of competitive pressure can shape firms' cash holdings policy. Using a similar approach as Alimov (2014) to measure firm exposure to predatory threat, the results suggest that firms exposed to high degree of predatory threat increase their cash

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holdings at a faster pace than their counterparts with lower exposure to predatory threat.[28] Firms with exposure to high predatory threat may lose investment opportunities to superior competitors during periods of increased competition (Mackay and Philips, 2005). The results also suggest that firms with high hedging needs respond by increasing cash holdings at a higher intensity than peers with low hedging needs when competition increases. Firms with high hedging needs prefer internal finance over external finance (Acharya, Almeida, and Campello 2007). Using various means to identify financial constraints (size and debt capacity), the results suggest that financially constrained firms increase cash holdings more than their counterparts. Using a two-stage least square approach (2SLS), the thesis also examines if increases in cash holdings result in gains in the product market. The results indicate that cash rich firms make gains in the product market at the expense of competitors. High cash reserves could be used to finance competitive strategies like investment in capabilities, such investment may result in gains in market share (Bolton and Scharfstein, 1990). Other approaches that cash rich firms may employ include aggressive pricing, deploying cash as a pre-emptive tool, and work force enhancement (Benoit 1984; Campello 2006). The gains in market share diminish with the degree of exposure to predatory threat. Similarly, financially constrained firms benefit more from increased cash during periods of intensified competition than their cohorts.

7.1.2 Cash Holdings, Stock Returns, and Investment Organicity: Evidence from UK Investment Announcements

The second empirical (Chapter 5 of the thesis) examines market perception of firms' cash holdings during corporate investment announcements. Theoretical arguments on the

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[28] Predatory threat refers to the degree of duplicability of firms' growth opportunity by rivals.

perception of firms' cash holdings suggest the perception of firms' cash holding can be positive or negative. Because managers have access to information about the firm not publicly available, they may decide to reject capital from the financial market when the market valuation of their firm does not align with the fair valuation of their firm (Myers and Majluf, 1984). During such periods, firms may be forced to finance existing growth opportunities using internal finance. Therefore, to overcome the potential problem of underinvestment, firms may be forced to build up cash reserves (Levinthal, 1997; Kim and Bettis, 2014). Thus, cash holdings could be positively priced to firm value. An alternative proposition is that, cash rich firms can evade capital market monitoring since they will not be subjected to the scrutiny of debtholders (Jensen, 1986). Furthermore, cash rich managers may resort to expropriating shareholders by investing in self-interested investment projects or growing the firm beyond its optimal level (Lang, Stulz and Walkling, 1991; Harford, 1999). This indicates cash rich firms could favour value destroying behaviour, thus underpinning the overinvestment problem. Following this proposition, it appears high cash holdings could impact firm valuation negatively. Despite the theoretical paradigms on the potential impact of cash holdings on firm valuation, very few studies have examined how cash holdings are perceived during events linked with corporate valuation (for instance, Harford, 1999). This indicates that depending on firm objective for holding cash, market perception of cash holdings will vary. To address this possibility, this thesis adds to the literature on cash holdings by evaluating how market perception of cash holdings vary with the motive for cash holding. In addition, since the problem of overinvestment/underinvestment could be inferred from the time span and nature of the investment (Asquith, Bruner and Mullins Jr, 1983; Bruner and Perella, 2004), the thesis fills the gap in the literature by evaluating how the perception of cash holdings differs with investment classification.

Using 3,251 corporate investment announcement from firms listed on the London Stock Exchange over the period 2005-2016, the thesis demonstrates that higher cash holdings at announcement results in an increase in market evaluation of corporate investment announcements. This corroborates the theoretical position of Myers and Majluf (1984). To mitigate the problem of capital market imperfections, companies build up internal finance in the form of cash reserves. Higher cash reserves at announcement implies a positive signal to the market Myers and Majluf (1984).The findings also complement the position of Levinthal (1997), Fresard (2010), and Kim and Bettis (2014) that high cash holdings may indicate a firm's competitive and strategic advantage. Next, I examine if the positive relationship between firm cash holdings level and market valuation of corporate investment persists at a more concentrated level of cash holding. Using a quasi-experiment, the results indicate that at a more concentrated level of cash holdings, the relationship between firm cash holdings level and market valuation of corporate investment announcement becomes negative. This lends support to the theoretical argument of Jensen (1986). When the cash available exceeds what is required to finance existing investment opportunities, managers could engage in investments perceived as value destroying (Jensen, 1986). Managers of cash rich firms could undertake investments that align with their self-interest instead of shareholders' value (Harford, 1999). This manifests when managers grow a firm beyond its optimal level (i.e. empire building) (Shin and Kim, 2002; Moeller, Schlingemann and Stulz, 2004).

Next, I examine how firm motive for cash holdings affect market valuation of corporate investment announcement. Using three hypothesised motives for cash holdings - survival, expansion, and managerial entrenchment - the thesis demonstrates that the impact of cash holdings on the market valuation of corporate investment announcements is pronounced among firms holding cash for survival. The results indicate cash is more valuable for

constrained firms. The results reinforce the argument of Fresard (2010), cash is of greater strategic value to financially constrained firms. Contrary to the position of Opler *et al.* (1999), the results demonstrate that cash is not positively priced for firms holding cash to exercise their growth opportunities. The results also indicate that cash may not be held as an entrenchment tool in the UK. This further lends support to the argument of Pinkowitz, Stulz and Williamson (2006) that under good corporate governance structures, managers may be unable to use cash as a tool for expropriating shareholders.

Lastly in the second empirical chapter, the thesis investigates how the effect of firm cash holdings vary with investment classification. Since the features of an investment decision may contain information regarding the motivation for undertaking the investment (Trautwein, 1990; Irvin, Pedro and Gennaro, 2003; Bruner and Perella, 2004), the thesis splits investments on the basis of the growth strategy (organic and inorganic). Organic investment implies, stimulating the development of a firm by focussing on internal development. This encompasses growing sales, customer base/clientele, expansion or creation of a new product line based on an internal strategy (Irvin, Pedro and Gennaro, 2003; Bruner and Perella, 2004). They include capital investments such as purchase of assets, product launch, and R&D. Inorganic growth focuses on business expansion by growing the scope of the business externally including acquisitions and mergers. The results indicate that the positive relationship between cash holdings level at announcement and market valuation of corporate investment announcements is pronounced among organic investments, particularly R&D. The implication is that cash availability can provide the financial flexibility required to ensure the success and completion of such investments. Organic investments generally have a longer investment horizon, thus require a long-time span for the future cash flow to be generated. I find no association between cash holdings and the CAR for inorganic investment.

7.1.3 Performance of Abnormal Cash Holding Portfolios

The third empirical chapter (Chapter 6 of the thesis) investigates the performance of high cash holding firms. Particularly, the study examines how high cash holding firm perform during periods of high uncertainty. Empirical evidence suggests high cash holdings may indicate high growth opportunities, good performance, competitive advantage, or risky future cash flow (Opler *et al.*, 1999; Ozkan and Ozkan, 2004; Denis and Sibilkov, 2009; Fresard, 2010; Simutin, 2010). This suggests that embedded in firms' cash holdings is information about current and future performance. In addition, high cash holdings could stimulate innovation (Greve, 2003; Lyandres and Palazzo, 2016). And thirdly, cash rich firms can make gains in the product market at the expense of their counterparts. All things been equal, if it is guaranteed that managers of cash rich firms will use firms' cash reserves appropriately, then cash rich firms have a significant strategic advantage over competitors. Dismissing this assumption, Harford (1999) argues that cash rich firms are more likely to engage in value destroying investments. However, Harford, Mansi and Maxwell (2008) suggest that firms with weaker corporate governance structures hold more cash but spend cash quickly on investment rather than grow cash reserves. Consequently, poorly governed firm are unable to build large cash reserves. Complementing this position, Pinkowitz, Stulz and Williamson (2006) argue that the impact of cash holdings on firm value is amplified in countries with strong investor protection. Put together, these arguments imply that firm cash holdings could be an indicator of the strength of the corporate governance of a firm. There are also strategic benefits of cash holdings. During periods of external uncertainty, cash can offer stability to cash rich firms, as they are able to navigate the tides of uncertainty better than their counterparts (Courtney, 2001). This indicates that the value of cash will be amplified during periods of uncertainty. In spite of the empirical and theoretical argument that underpins the importance of cash holdings, very few studies have examined the market

performance of high cash holding firms (for instance, Simutin, 2010), this thesis attempts to fill the gap in the literature by examining the performance of high cash holding firms. Also, despite the significance of cash holdings during periods of high uncertainty as discussed in Courtney (2001), no study, to the best of my knowledge, has examined the performance of cash rich firms during periods of high uncertainty. The thesis bridges this gap in the literature by examining the market performance of cash rich firms during periods of high uncertainty.

Using 8,835 firms over the period 1980 to 2017, the study commences by predicting abnormally high cash holdings. Following a similar approach as Opler *et al.* (1999) and Ozkan and Ozkan (2004), the study predicts abnormally high cash holdings. Thereafter, five portfolios are formed based on the level of cash holdings and sorted into one of the 25 portfolios of Fama and French (1993). After adjusting for the portfolio results based on these portfolio sorts, the results indicate that the highest cash holding portfolio outperform the lowest cash holding portfolio by 2.7%. Next, I test if the outperformance of the high cash holding portfolio persists after controlling for known systematic factors that affect stock returns. The results demonstrate that the portfolio of high cash holdings has an alpha of 4.4%, 4% and 2.5% after controlling for factors peculiar to the CAPM (Capital Asset Pricing Model), Fama and French three-factor model, and the Fama, French and Carhart four-factor model respectively. Next, the thesis examines how the portfolios perform during periods of high uncertainty. The difference between the high cash holdings portfolio and low cash holdings portfolio increases to 7.01% annualised return during periods of high uncertainty. Upon considering, the Fama and French 25 portfolio sorts, the high excess cash-holdings portfolio outperforms the low counterpart portfolio by an alpha of 3.6%. I also test if the alpha of the high excess cash holdings portfolio persists after modelling based on CAPM, Fama, and French 3-factor and Fama,

French and Carhart four factor approaches. I find that in less tranquil periods after adjusting the CAPM factor, Fama and French 3 factors and the Fama, French and Carhart Four factor model a portfolio of abnormally high cash holding firms yields an abnormal alpha of 19%, 20%, and 20% respectively. The results corroborate the position during periods of external uncertainty that cash can buffer the adverse effect economic uncertainty (Courtney, 2001). Furthermore, the thesis demonstrates that there is a direct relationship between abnormally high cash holdings, accounting measures of firm performance and firm value. Measured by industry adjusted value of return on asset (ROA), return on capital employed (ROCE) and return on equity (ROE), I find a positive relationship between high cash holdings and firm performance. In addition, the results suggest a positive relationship between high cash holdings, market to book ratio and enterprise value. The results support the view that cash can be used to amplify shareholder value especially when cash rich firms operate in a competitive environment where adaptation is important (Deb, David and O'Brien, 2017).

7.2   Policy Implications

The increasing level of cash holdings generally suggests a limitation in the ease of accessing finance in the capital market. For managers and policy makers, the tendency for firms to increase the volume of their cash reserves suggests that firms in the UK face considerable challenges in raising capital from the financial market. This points at the need to reform the existing opaque capital market to accommodate the needs of disadvantaged companies. Although existing regulations aimed at ameliorating the ease of access of capital by small and start-up companies already exist, there is a need to re-evaluate how efficiently these reforms have tackled the issue. Overall, the increasing cash holdings level inter-alia indicates the failings of capital market.

The thesis also underlines the importance of company investment classification in the valuation of investment announcements. Particularly, information as to whether an investment announcement signifies an internal or external investment decision is price sensitive. In addition, the level of cash held could shape market reaction to an investment announcement. In this regard, it pertinent that policies to ensure all price sensitive information regarding an investment decision be made available to the market. This will enhance the price discovery process. To this effect, I suggest that appropriate classification of an investment decision be made available to market participants. At the firm level, since embedded in a firm's cash holding is important information about investment valuation, in the face of market imperfection, it is vital that managers consider this factor when making investment announcements.

The increase in cash holdings during periods of increased competition intensity further reinforces the argument of an opaque capital market. It appears that the problem of financial constraint is amplified during periods of increased competition. To mitigate this effect, regulators could enact rules that attenuate the financing deficit during such periods. Hence, during certain threshold levels of increased competition, financing policies that lessen the opaqueness of capital markets may be installed. Such regulations should favour disadvantaged firms. The policy will ensure the survival of underprivileged companies. Markedly, the thesis reveals that cash is a key strategic tool in the product market, hence managers should pay close attention to their financial flexibility. At large this can enhance economic growth.

Abnormally high cash holdings levels have an important bearing on a firm's performance and value. This further reiterates how vital cash is to the survival of a firm. Shareholders and other stakeholders can pursue activist policies that actively monitor firm cash

holdings policies that maximise firm value. Finally, by investing in a portfolio of abnormally high cash holding companies, an investor can generate significantly positive abnormal stock returns. These returns are amplified during periods of economic uncertainty. For investors, in the face of economic uncertainty like BREXIT, investing in abnormally high cash holding companies can help buffer the negative effect of the uncertainty. For managers, cash is an important strategic tool, it is linked to firm value, and this link is amplified during periods of high economic uncertainty.

7.3 Limitations and Future Research

Despite the contribution of the thesis, there were a few limitations of the study. Firstly, the sample size used in the first empirical chapter fails to account for unlisted firms. Unlisted firms could alter competitive outcomes. Due to the unavailability of data points of industry classification and firm level data of unlisted firms, the study was restricted to a sample of listed firms. However, to ensure I control for monopoly and oligopoly, I excluded cases were not enough competitors (players) were included in an industry. Also, for investment announcements, the thesis was limited to the period 2005 to 2016 because this was the available data on Morningstar.co.uk (Morningstar, 2017). Examining corporate investment announcements prior to 2005 could provide more insight on the potential impact of time variation on corporate investment valuation. However, the study was limited to this time frame as the data available on Morningstar.co.uk (Morningstar, 2017) only covers this period.

So far, there are few studies that have examined the cash holding policy of private firms (e.g. Bigelli and Sánchez-Vidal (2012); Gao, Harford and Li (2013). Future studies can evaluate the competitive advantage afforded to cash rich private firms. It will also be interesting to know how private firms alter cash holdings in response to increased

competition. Since corporate finance practices are not uniform worldwide, country factors such as the legal system, culture, developmental status and institutional structure could shape corporate practices in specific jurisdictions (La Porta *et al.*, 1997; La Porta *et al.*, 2000; Gaud, Hoesli and Bender, 2007). It is important to examine how the expounded corporate practices differ with geographical location and cultural differences. For instance, it could be informative to know if other firms outside the UK increase cash in response to increase in competition.

Also, evidence on the market perception of cash holdings outside the UK could be insightful. Pinkowitz, Stulz and Williamson (2006) argue that the strength of corporate governance structures dictate how cash holdings are valued. Knowledge of the interdependency of firm cash holdings, strength of corporate governance and market valuation of corporate investment announcements will provide further understanding of the implication and perception of firm cash holdings. Particularly, since corporate governance structure/mechanisms differ across countries, it would be interesting to understand how cash is perceived in markets with weaker corporate governance structures as compared to countries with stronger corporate governance structures.

During periods of high uncertainty, deep pocketed firms can adjust better than their counterparts (Levinthal, 1997; Fresard, 2010; Kim and Bettis, 2014). Because economic policies differ with countries, the value and importance of cash during periods of high uncertainty may differ by country. Hence warranting a country wise examination of the value of cash. A study that evaluates the performance of high cash holding firms during periods of increased uncertainty by country will provide a better understanding mediating role of economical, geographical and cultural factors on firm corporate finance policies.

This thesis evaluates how corporate outcomes like changes in competition or changes in uncertainty levels inform firm financial policy, it will be interesting to see how other corporate outcomes alter firm financing policies, particularly their cash holdings policy. For instance, do firms alter cash holdings after a merger or demerger? How do firms alter their cash holdings after a bond downgrade? Knowledge of how such corporate outcomes affect firm cash holdings will inform policy formation.

Also, this thesis demonstrates that the positive impact of high cash holdings during corporate investment announcement is more pronounced among organic investment, particularly R&D announcements. Although I provide a potential explanation for the effect of cash holdings on market valuation of R&D, further justification of this effect will be insightful. An empirical study that examines why high cash at announcement is priced positively will provide an in-depth understanding of the link between firm cash holding and R&D.

Lastly, the results of the thesis indicate cash is more valuable to firms exposed to high predatory threat. Although theoretically this is justified. An empirical study that evaluates why and how firms exposed to high predatory threat deploy cash as a strategic tool would be valuable. Such a study would provide an understanding of how firms' financing policies alter competitive outcomes and vice versa.

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