



IE Business School

DOCTORAL DISSERTATION

"DOES CASH HOARDING REPRESENT EXCESSIVE CONSERVATISM
OR OPPORTUNISM OF CEOs IN PRE- AND POST- CRISIS OF 2008?"

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Doctoral Thesis Advisor: Garen Markarian

In memory of
my parents Alexandra and Peter Blinder
and
Dr. Ran Barniv a teacher, a mentor, a friend.

Guardian angels

Most kids believe in their existence, most adults don't, unless they come in direct contact with one. They come seemingly out of nowhere, when we most need them, offering their unconditional help and expecting nothing in return. We rarely know their names, but I am lucky to know who is my academic guardian - Dr. Uri BenZion.

Thank you , Uri , for all you have done for me !

TABLE OF CONTENTS

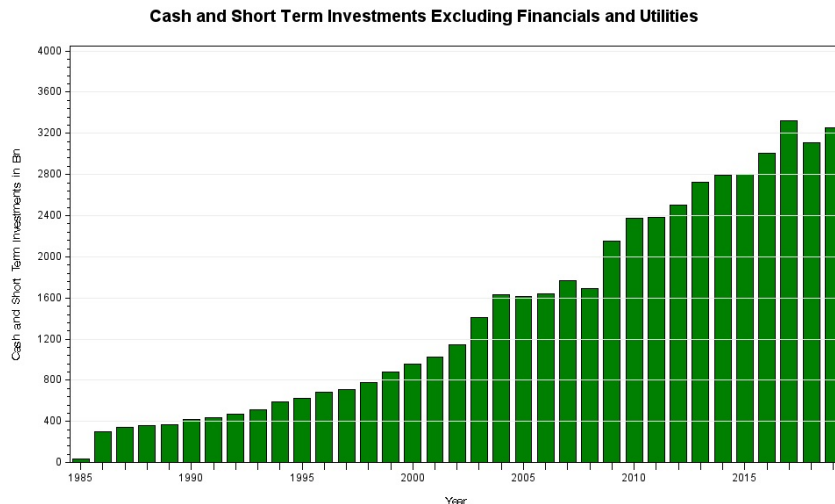
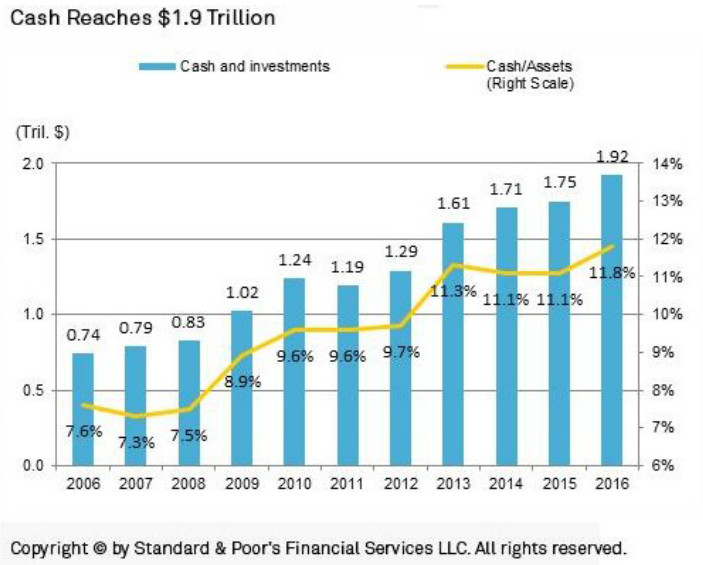
	Page
ABSTRACT	1
I. INTRODUCTION	2
II. LITERATURE REVIEW	6
II-(i) - The theoreticians	8
II-(ii) - The empiricists	9
II-(iii) - The post 2008 crisis analysts	15
III. THEORETICAL BACKGROUND AND MOTIVATION	21
III-(i) - "Market sentiment" defined	25
IV. THE DATA AND THE SAMPLE	27
V. METHODOLOGY	31
V-(i) - Model development and testing	33
VI. RESULTS	37
VII. APPLICATION OF FILTERS AND ROBUSTNESS CHECK	42
VII-(i) - Market approval	42
VII-(ii) - Did CEOs know what was coming ?	47
VIII. SUMMARY	51
REFERENCES	53
SUMMARY TABLES	57
EXHIBITS	65
DEFINITIONS	73
ADDENDUM: High Tech Industry	76

ABSTRACT

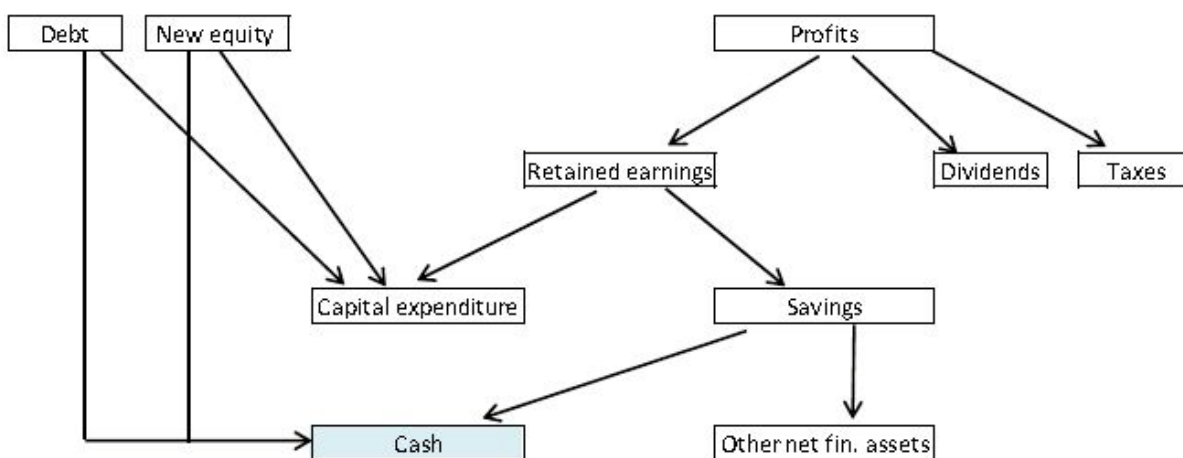
The aim of this paper is to define and isolate the drivers of speculative cash hoarding phenomena in publicly traded non-financial American firms before and after the financial crisis of 2008. The model presented in this paper uses previous literature defined drivers of transaction and precautionary motives for holding cash as control variables, and introduces new measures for market endorsement and economic conditions, that were never used before in this context. Empirical results show that cash accumulation is prominent among profitable firms, and that cash accumulation in excess of ongoing and precautionary needs of companies was endorsed by the financial markets both before and after the financial crisis of 2008. Results also support previous findings that financially unconstrained firms have a lesser need for market endorsement for cash hoarding. The contribution of this paper to the body of literature related to cash management and cash hoarding is five-fold: (i) it provides empirical evidence of market-endorsed cash hoarding in the US non-financial companies; (ii) it extends the existing models of transaction-related cash holdings to include, formally define and test the drivers of precautionary cash accumulation in the non-financial sector; (iii) it formally defines and tests a metric for market sentiment related to cash hoarding before and after the financial crisis of 2008; (iv) provides empirical evidence that the crisis of 2008 was anticipated by the corporate sector as early as 2005, and recovery from the crisis was predicted as early as Q2:08; and (v) defines and quantifies the border separating the precautionary and speculative motives for cash accumulation.

I. Introduction

For the last three decades, American non-financial companies have been choosing to hold immense reserves of cash. The motivations behind such behaviour, although of great interest to researchers, have eluded explanation. Underlying the research aimed to explain this phenomenon is the seminal idea proposed by Keynes (1936): firms may hold cash reserves for transaction, precautionary, and/or speculative motives.



According to classic theory, if the firm accumulates large cash reserves it has three possible courses of action : (i) to distribute dividends; (ii) to buy back shares, or (iii) to invest. If the firm fails to do so, from the theoretical point of view, an agency problem arises. While firms may be reluctant to increase dividend payouts due to uncertainty regarding their ability to sustain such dividends in the future, shares buybacks have not been used as a primary vehicle to reduce cash reserves, either^[1], but with notable exceptions. For example for ten years after the financial crisis, American firms spent upwards of \$5T to buy back their own shares. For giants like P&G and Eli Lilly, this behaviour sent their earnings per share up by 40%^[2].



Corporate decision making tree ^[3]

¹ See, for example, Faulkender and Wang (2006)

² See, <https://www.jpmorgan.com/insights/research/stock-buybacks> and <https://www.barrons.com/articles/blowback-against-buybacks-could-hurt-consumer-staples-stocks-51567212306>

³ Source: IMF country report 14/28, Feb.2014

So why do corporate CEOs chose to hold large cash balances? As an extreme example, Apple's war chest held US\$246 billion in cash and marketable securities (Dec 2015), mostly in off-shore accounts, and the company added approximately US\$3.6 million an hour, according to Wall Street Journal [4]. Professor Lee Pinkowitz from Georgetown University reacted to Apple's cash hoarding, saying: "If this a rainy-day fund, they're saving for a millennial flood" [5]. Five years earlier, Google launched an in-house trading floor to manage \$26.5 billion in cash and short term investments, arguing that until that time those funds were managed too conservatively.[6]

This research will add to the existing body of literature that attempted to answer this question by extending the scope of possible explanations. Additionally, this study will investigate whether a systemic agency problem exists, and why shareholders are silent about it.

More specifically, I will answer to the following two questions: **(i) how does time-varying uncertainty about financial conditions affect cash holdings? and (ii) does cash hoarding occur with the blessing of the capital market?**

To answer the first research question this dissertation will test whether the motivation for hoarding cash changed after the 2008 crisis.

This study will contribute to the existing body of literature by testing for (i) the existence of the speculative motive for holding cash, and (ii) the potential change in opportunistic behavior of CEOs in the non-financial companies before and after the crisis.

⁴ Wall Street Journal, May 1, 2017, "Apple's cash hoard set to top \$US250bn"

⁵ Ibid.

⁶Business Week, May 27, 2010, "Google's latest Launch: Its own trading floor"

Only one theoretical paper regarding the banking sector's speculative cash management has been recently published (D.Gale and T. Yorumazer, 2013). Most of the existing literature has addressed only transaction and precautionary reasons, based on works by Opler, Pinkowitz, Stulz, and Williamson. (1999), and Bates, Kahle, and Stulz, (2009).

Under the second research question, the empirical investigation will illustrate benefits to stock price, associated with high cash positions, while simultaneously addressing the issue of the potential agency problem associated with excessive cash holdings. Bates, Kahle and Stultz (2009) briefly addressed the agency issue without directly testing for its impact. This paper directly tests for the effect of the agency problem in the context of cash hoarding. Moreover, empirical results show that most capital markets supported such a cash management practice.

The logic behind the course of action and the methodology in this paper will rely on Keynes' three definitions of motivations for holding cash: once optimal cash holdings required for ongoing operations (the transaction motive) and factors related to the precautionary motive are accounted for, the residuals must be attributed to the speculative motive. The extended model presented in this paper treats variables used in Opler et al. (1999) and Bates et al. (2009) models as controls for the transaction motive for holding cash, while those identified in Garcia-Appendini, and Montoriaol-Garriga, (2010), Duchin, Ozbas, and Sensoy, (2010) and Dittmar and Mahrt-Smith (2007) among others, are treated as control variables for the precautionary motive. An additional variable attributed to speculative motive is introduced and tested for its power to explain additional cash accumulation in excess of the two abovementioned motives.

As expected, data shows the presence of opportunistic behavior in cash management before the 2008 crisis. In the years after the crisis, the practice continued but precautionary motivation was also periodically present except among highly profitable corporations. I also find that cash accumulation was endorsed by the markets.

II. Literature review

The ultimate goal of financial management is the maximization of shareholders' wealth. Managerial actions that can lead to achieving this goal span a large number of functions, but one of the more important of them all - continuous search and investment to assure firms' growth, competitiveness and viability. Classic theory addresses the need in mixing various types of financing instruments such as debt and equity [⁷], while equity financing is subdivided into internally generated funds (retained earnings) and externally raised equity. The source of retained earnings, ongoing operations and profitability of the firm, but is also subject to the dividend payout policy. The resulting cash reserves are used for financing new investments. The theory implies that in absence of investment opportunities the firm should distribute earnings to the shareholders, and since holding cash provides nearly zero return, firms should hold cash only to the point where the marginal benefit from holding cash and marketable securities equals the marginal cost of raising external financing. This concept may be extended to include net working capital management and not only cash and marketable securities [⁸].

The reality is much more complex than the theory, as the presence of numerous market imperfections makes the task of managing internally and externally generated funds a challenge, and may also create conflicts of interests between the shareholders and the management, known as the Agency Problem [⁹]. Market imperfections that must be taken into consideration include the existence of floatation costs, which make

⁷ Such as Modigliani and Miller theory of capital structure

⁸ Graham J.E., Firm value and optimal level of liquidity, Garland, New York, 2001, pp4-6.

⁹ Jensen, Michael C.; Meckling, William H. Journal of Financial Economics, October, 1976, V. 3, No. 4, pp. 305-360.

external financing expensive (even prohibitive for certain types of firms), access to capital markets, industry benchmarks, level of competition, corporate governance quality and general market and economic conditions.

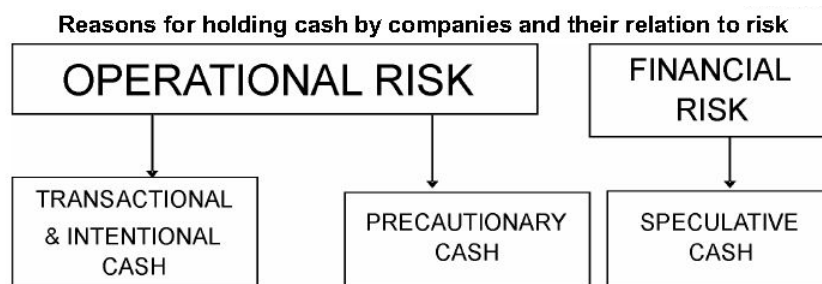
[insert Flow Chart 1 about here]

The evolution of literature on the topic of corporate liquidity management in the twentieth century and beyond can be subdivided into three distinct sub-periods: (i) the theoreticians' period pioneered by Keynes, (ii) the empiricists and, triggered by Oppler et al., and (iii) the post 2008 crisis analysts. This section follows this temporal progression of thought and research on the topic.

II-(i) The theoreticians

Many researches tried to define optimal amounts of liquidity a company should hold in their reserves. Keynes set the framework by defining three reasons for holding cash, and the literature that followed addressed various possibilities and suggested solutions. Early works by Baumol (1952) and Beranek (1963) were attempting to determine optimal cash balances needed for ongoing operations of the firm in the short term. The Miller-Orr (1966) model enhanced those works by both introducing uncertainty into firm's cash flows as well as accounting for the dynamic nature of the companies' inflows and outflows. Notably, Miller was among the first to discuss the possibility of speculative cash holdings, but framed it as a possible benefit for risk management, i.e. purchasing assets at attractive prices. Those models consider no minimal level of cash holdings, leaving to the managerial discretion, and are inventory management style models.

Edward Whalen (1965, 1966) directly followed Keynes' three motives for holding cash, and noted that both precautionary and speculative motives are driven by uncertainties, but while the precautionary is addressing the uncertainty associated with the pattern of receipts and distribution, the speculative, in his opinion, is driven by uncertainty in interest rates, and *de facto* is driven by desire to store wealth and is a reflection of the investment demand for cash . He concluded that based on Keynes' framework, transactional and precautionary motives are more closely related than precautionary and speculative motives of cash management. His argument contradicted Johnson (1961) which argued that the speculative motive is "really the precautionary in disguise" (p.8). Michalski (2008) revisited Whalen's concept and illustrated the interrelationship between reasons for holding cash and sources of risk in the chart below.



Source: Michalski G., 2008b, p. 26.

II - (ii) The empiricists

Mork, Shleifer, and Vishny (1990) focused on the drivers behind investments-related activities in corporations. They looked at four different models/concepts: (i) the stock market is a passive predictor of future activity, i.e. managers do not learn from or rely on the market to make investment decisions; (ii) managers rely on the market only as a source of information which may or may not be correct about future fundamentals; (iii)

the stock market affects the cost of financing and hence indirectly affects investment decisions; (iv) managers have to account for investors' opinions and hence the market has an impact on corporate investment decisions. They found that overall, very little if any explanatory power is attributed to the stock market sentiment and the most powerful predictors were the fundamentals.^[10]

A massive new wave of academic work on cash management was triggered by Kim, Mauer and Sherman [KMS] (1998) and Opler, Pinkowitz, Stulz and Williamson [OPSW] (1999). KMS argued that holdings in low return liquid assets can be explained by costly external financing, and as those costs increase, along with uncertainty of future cash flows and with higher expected returns of future investment opportunities, so will holdings in cash and marketable securities. They find that cash holdings are positively related to industry cash flow volatility. This result was supported by Harford (1999). They also noted that companies with higher market-to-book ratios will hold higher balances of liquid assets. In essence, they supported Whalen's (1966) position that the build up of liquidity is done in anticipation of future profitable investment opportunities. OPSW (1999) developed the Trade Off Theory that claims that firms trade off the costs and benefits of holding cash to derive optimal cash levels. They not only consider the transaction costs motive, but also the effect of asymmetric information and the agency costs of outside financing on the demand for cash holdings. They found that firms hold more cash when they are smaller, have higher investment and R&D expenditures, better investment opportunities, when they have higher and more volatile cash flows and lower net working capital. It was found that transaction costs and costs

¹⁰ This paper will prove the exact opposite.

due to asymmetric information are important factors in the Trade off Model. The model supports transaction and precautionary motives for holding cash, but is silent about the speculative motive.

The literature on cash management followed a number of directions in the years that followed. On one hand, one body of studies followed Keynes' three motives, seeking drivers explaining (mostly) the transaction and precautionary motives to support or dismiss arguments for cash accumulation practices. On the other hand, a parallel body of literature was dealing with company and economy specific factors that can explain cash accumulation, including corporate governance and potential agency problems. Finally, following the crisis of 2008, this new aspect in cash hoarding was examined from various points of view.

Almeida, Campello and Weisbach (2002) claimed that financially constrained firms may decide to hoard cash as they are unable to raise external capital for future investments, while cash holding for unconstrained firms seems to be irrelevant. This tendency of constrained firms to accumulate cash is even stronger during economic downturns, while financially unconstrained firms maintain a zero cash flow sensitivity effect due to business cycles. Their conclusions were supported in principle by Faulkender and Wang (2006), who found that the marginal value of an extra dollar held declines with larger cash holdings, higher leverage and better access to capital markets. They also found that financially stable and cash rich firms would rather distribute dividends than repurchase shares.

Carroll and Kimball (2001) argued that due to the convexity of marginal utility of consumers, they would tend to save more as a precaution and anticipation of future shocks. They claim that the precautionary reason is the driving force behind cash accumulation, as well as the liquidity constraint. Same sentiment was echoed by Mikkelson and Partch (2003) who argued in favor of cash accumulation without creation of an agency problem in smaller firms, further arguing that cash accumulation enhances firm value through higher R&D and lower NWC. Another angle of the same claim was discussed by Acharya, Almeida and Campello (2007). While implicitly addressing the precautionary motive for cash accumulation, they argued that for financially constrained firms, the trade-off between cash and debt levels would depend on their temporal hedging needs, and that cash cannot be viewed as negative debt. Their findings were supported and extended by Denis and Sibilikov (2010) which looked into reasons and levels of cash holdings of financially constrained firms. They concluded that higher cash positions in financially constrained firms are value enhancing.

In contrast to Acharya, Almeida and Campello (2007) and Bates, Kahle and Stultz (2009), Gao, Hardford and Li (2013) argued that private firms hold on average 50% less cash than public firms, and this is due to agency problems. They claim that well managed firms would use excess cash to reduce leverage, while poorly managed firms would spend on lower quality investments that would hurt the value of the firm.

Baum, Calgayan, Ozkan and Talavera (2006) found that firms that pay high dividends have lower sensitivity to macro effects, and only financially constrained firms and rapid growth firms have high sensitivity to macro economic uncertainty. Their

findings were in line with Almeida, Campello and Weisbach (2002), and also set the tone for further research come the 2008 crisis a few years later.^[11]

A widely quoted paper by Dittmar and Mahrt-Smith (2007) took the discussion about cash accumulation to the next level by defining two costs of holding cash and cash equivalents, as well as testing for the effect of corporate governance on cash management practices. They defined the costs for holding cash as either (i) lower return investment relative to existing alternatives (i.e. the cost of carry), or (ii) wasteful capital spending and acquisitions by managers. The first definition is in line with Keynes (1936) which stated that lower returns are a reflection of lower liquidity premium. The second definition supported arguments by Harford (1999) and Jensen (1986) that additional costs of holding cash may cause sub-optimal investments due to agency problems. While not defining the reasons for holding cash, they evaluated the cost of holding excess cash and concluded that cash policy has little value if the firms are well governed. They concluded that governance has "a greater influence on the use, rather than the accumulation, of cash holdings" (p.627) ^[12]. This conclusion by Dittmar and Mahrt-Smith (2007) was supported by findings of Fresard and Salva (2010) that claimed investors value excess cash based on their expectations for how cash will be used.^[13]

In another widely quoted paper, Bates, Kahle and Stultz (2009) were seeking explanation for steadily increasing cash ratios, and questioning whether cash accumulation can be strictly attributed to the precautionary motive or whether there is an element of speculation and subsequent agency problem. They claim that it is the

¹¹ This paper directly addresses this point by including dividend payout filter in robustness tests section

¹² For this reason model used in this paper does not include any governance variables.

¹³ This aspect will be further investigated in this paper.

precautionary motive that drives the increase in cash ratios due to changes in firms' characteristics over time. They suggested a strong precautionary effect and state that on aggregate they found no evidence for speculation or presence of an agency problem.

Strong support for the precautionary motive for holding excess cash was also reported by Duchin, Ozbas and Sensoy (2010). Most impacted are firms with low cash reserves or high short term debt, and those that are financially constrained or highly dependent on external financing.^[14] On the other side of the argument, Duchin (2010) claimed that diversified firms would hold lower cash reserves than specialized firms due to a less than perfect correlation between subsidiaries resulting from "diversification in investment opportunity and cash flow".

A rare attempt for dynamic modeling for optimal cash holdings was undertaken by Decams, Mariotti, Rochet and Villeneuve (2011). In essence, they support the concept presented by Faulkender and Wang (2006), and report an increase in marginal value of cash with higher issuance costs. They conclude that "marginal value of cash increases after decline in stock prices since cash holding decreases the risk of incurring issuance costs in the short term" (p.1503).

Two papers highlighted the strategic value of cash holdings. Fresard (2010) claims that cash holdings affect future performance of the firm in product market. Falling short of making connection to Keynes' reasons for holding cash, he has shown that since companies do not exist in isolation but rather as a part of a market, cash holdings

¹⁴ This was the first paper on cash management to use quarterly instead of annual observations.

improve their competitive position and block new entrants into the industry. This can be interpreted as both precautionary and speculative per Keynes' definitions. Boutin, Cestone, Fumagalli and Pica (2013) arrived at the same conclusion, arguing that cash hoarding can play a protective role for firms in the industry against potential newcomers.

II - (iii) The post 2008 crisis analysts

The crisis of 2008 provided researchers with a new angle for studies of corporate cash management. A number of studies looked at the crossover between financial and strategic considerations. Garcia-Appendini and Montoriaol-Garriga (2010) addressed the practice of more stable and liquid firms to support their clientele base by extending the pre-crisis terms of credit. This ability to help clients had its limitation, and at some point during the crisis those firms were forced to reduce trade credits to refill their own cash positions. In this case, the accumulation of cash is justified as a precautionary measure "just in case" firms would have to support their clients. In general, it is in line with the existing body of literature (Peterson and Rajan (1997), Wilner (2000), Cunat (2007)) that shows that suppliers would be willing to support their clients due to a vested interest in maintaining long-term business relationships, as long as it does not jeopardize their own liquidity positions. Highly liquid firms did not reduce investments during the crisis either, according to Duchin, Ozbas and Sensoy (2010). They find 'seemingly excess cash' is positively related to post-crisis investment and "relation between seemingly excess cash and post crisis investment is stronger for financially constrained firms, and during the crisis, so called excess cash is not in fact excessive" (p.431). They claim that the findings support the interpretation that financial liquidity had a value enhancing impact on investments during the crisis. They tested and found

no evidence of an agency problem. The authors were critical about the existing models and body of literature that failed to account for the risks of an extreme credit crunch that would significantly dry up external sources of funding. They also claimed that the crisis was NOT anticipated by the market. This argument was also supported by Fahlenbrach and Stultz (2011) who also claimed that bank CEOs did not reduce their holdings and suffered losses because they did not anticipate the crisis. Cornett, McNutt, Strahan and Tehranian (2011) concluded that in their attempt to manage liquidity during the crisis, banks limited lending and credit supply, and this may have caused the companies to retain cash for precautionary reasons even after the crisis. As noted by Barnes and Pancost (2010) [¹⁵], cash hoards before the recession were possible due to availability of external financing, while after recession hoarding was fuelled by internally generated funds.

Chen and Shane (2014) examined the effects of sub-optimal cash holdings using Bates et al. (2009) framework, and concluded that while market reaction to abnormal increases or decreases in cash holdings is asymmetrical, and that markets tend to overreact to decline in cash balances, but not to increases. They also found that diversion from equilibrium in either direction has no positive effect on future earnings.

An interesting result was reported by Acharya, Davydenko and Strbulaev (2012) : when cash-to-assets mean and median ratios were plotted against bond ratings of firms in their sample, the highest levels of cash were observed both for the strongest (AAA rated) firms and near-default (CC, C-rated) firms. Mid-range rated firms had lower

¹⁵ Barnes M.L., and Pancost N.A. in Internal sources and the Great Recession, Federal Reserve Bank of Boston, Working papers No.10-15, 2010.

cash-to-assets ratios. They argue that companies with higher probabilities of distress will have increasingly conservative cash management policies. This conclusion partially supports results reported by Acharya, Almeida and Campello (2007).

Bolton, Chen and Wang (2013) found that firms raise equity funds in good economic conditions even if they do not require funds, but by doing so they hedge themselves against potential market downturns. Higher probabilities assigned to market downturns induce firms to hoard cash. Also, firms may cut down on investments in good times in preparation for worsening market conditions. They were first to mention changes in market sentiment as a possible factor explaining managerial action leading to raising additional equity in favourable economic conditions. Even in cases when the cost of carrying cash is high, corporate savings may be explained by increase risk aversion and precautionary considerations. They also claim " As long as corporations put a non-zero probability on financial crisis occurring, the real effects of the financing shock would already be present before the realization of the shock . Any real response following the shock would merely be a residual response" (p.52).

The results of Marcum, Martin and Strickland (2013) were in line with those of Kim, Mauer and Sherman (1998). They argue that after the crisis smaller firms were taking defensive positions and paying off debt, large and profitable firms were more confident and maintained their debt levels and even reduced cash holdings. They state that shareholders of companies with high growth opportunities would place higher value on every dollar held in cash, compared to shareholders of firms with a low growth and low investment opportunities.

Pinkowitz, Stultz and Williamson (2013) argued that profitable companies (especially multinationals) holding abnormally large cash positions before the crisis can be defined as a "US-specific puzzle", but the increase in cash holding after the crisis is not. They implicitly address speculative arguments as defined by Whalen (1966) about higher investment opportunities but stopped short of calling them 'speculative'. They claim that besides lacking investment opportunities, they could not find any other explanation for the increase in cash holdings from the period before to after the crisis. In the follow up paper in 2016, same authors find that there is "no evidence that cross-sectional determinants of cash holdings have changed from before the crisis to after the crisis" (p.344).

Sanchez and Yurdagul (2012) [¹⁶] tested the argument that since taxes play a significant role in corporate decision to repatriate profits from subsidiaries, companies would rather hold cash reserves abroad and by doing so show high cash holdings on consolidated balance sheets. They concluded that the tax factor is *not* the reason for dramatic increase of cash position in U.S. corporations.

Hartford, Klasa and Maxwell (2014) suggested an interrelationship between firms cash holdings and refinancing risk. They stated that companies with high levels of refinancing risk may value cash balances higher, as they assure that those companies will not face underinvestment problems, and that companies with shorter maturity debt would hold higher cash balances. Both findings implied the precautionary motive for holding cash. In line with Hartford et al. (2014) and Han and Qui (2007), Breuer,

¹⁶ Can repatriation taxes explain the recent increase in cash holdings? Economic Synopses, 2012, 35, Federal Reserve Bank of St.Luis.

Oler and Picconi (2014) looked at the effect of a shortfall or excess cash on a company's performance. As opposed to most models, their model is forward-looking but in essence is a variant of the concept introduced by Opler (1999) and Kim (1998), despite the authors' claim that it is an *extended* and improved model. Their findings show that diversions from optimal cash holdings in either direction will eventually lead to lower levels of accounting profitability (return on net operating assets), and those results are stronger for cash-constrained companies. They claim that investors incorrectly price companies in the current period, but will adjust their valuation once the effect of under- or over- cash holding relative to the optimal cash levels will become apparent in the future.

More recently, Duchin, Gilbert, Harford and Hrdlicka (2017) reported that for the period between 2009 and 2012, about 40% of total corporate reserves were invested in risky assets and 35% of total reserves are illiquid. They claim that the COMPUSTAT based measure of cash is an inefficient measure of cash reserves and once investments in risky assets are included, the total reserves are much higher than defined by the cash to assets ratio. They find that because investors discount the value of investments in risky reserves, it is a sub-optimal asset management strategy, but they do not claim that this is an agency problem. They argue that large firms with significant cash reserves would invest in risky and illiquid assets. While stating that precautionary reserves are supposedly non-risky, and risky investments fall "outside of the traditional", they stop short of defining them as 'speculative'.

A study by Duchin et al (2017) highlights one of the fundamental problems in research on cash management - the inconsistency in the definition of corporate cash

across various studies. They conclude that actual total cash reserves are 17% higher than reported on balance sheets. Amess, Banerji and Lamousis (2015) point to the difference in definitions ranging from the classic cash+marketable short-term securities that are liquid and mostly risk-free, to the adjustment made by Duchin et al (2017) that includes information from annual reports footnotes, to alternative short-term risky investments that cannot be classified as liquid or cash substitutes, as described by Cardella, Fairhurst and Klasa (2015). They also note that companies without an immediate need for cash would practice investments in higher risk, lower liquidity assets as a higher yield remedy for low risk, low return Treasuries and repos. Moreover, Carella et al (2015) conclude that managers do not just park excess cash in short term investments, as they do not treat them as cash but rather do so as the result of an investment decision.

A number of recent studies researched additional factors that influence the level of cash held by American firms, such as the differences in cash holdings between financially solid and financially constrained firms and unlisted firms, as well as the impact of tax regulations. Graham and Leary (2018) concluded that the increase in cash holdings can be explained by cash trapped overseas due to repatriation taxes. Tax avoidance strategies cause cash balances to become trapped overseas where tax rates are lower than in the United States. This finding is in line with the results reported by Harford, Wang and Zhang (2017) definition of permanently reinvested earnings. Rieger and Soyapak (2017) addressed the issue of the increased importance of cash for financially constrained firms, and deepened the analysis by addressing the effect of investors' preferences on companies' cash policies. Their model shows the direct connection

between investors' behavioral bias and cash management. Asimakopoulos, Asimakopoulos and Fernandes (2019) compared cash management practices between listed and unlisted European firms. They found that unlisted firms hold higher cash balances due to precautionary reasons, and found a U-shaped relationship in cash holdings between listed and unlisted firms. They also found that unlisted firms are more likely to save cash from their cash flows than listed firms. This result echoes US-based findings of Acharaya et al. (2012) that also reported a U-shaped relationship between cash holdings of high risk and low risk firms, where high risk firms hold cash for precautionary reason, while low risk firms conserve cash due to pecking order considerations. Faulkender, Hankins and Petersen (2019) looked at the effect of tax laws on cash accumulation by multinationals. They separated domestic and foreign subsidiaries cash holdings and noted that due to lower taxes abroad, subsidiaries is where those corporations park most of their cash, since this cash is taxed only when it is repatriated. They state that " domestic cash is explained by precautionary savings variables, while taxes explain foreign cash. There is very little evidence of precautionary motives explaining foreign cash holdings" (p.3301). They claim that it was never the intent of U.S. corporations to hoard cash abroad, but it was a consequence of the American tax system and as such has nothing in common with the traditional precautionary cash accumulation.

In a recent article Cunha and Pollet (2020) build their case study in cash management around demographic patterns that affect demand for certain goods (like bicycles and pharmaceuticals). By analysing changes in demand driven by changing demographic factors they claim to be able to isolate the precautionary needs in those industries as far

as 10 years in advance. According to the authors, firms will increase cash holding in anticipation of increased demand for their goods, and add that financially constrained firms start saving earlier and keep high cash level longer due to inferior market access and market frictions. When faced with higher cash needs in the future, financially constrained firms faced with limited or expensive external financing would retain higher proportions of earnings to meet future investment needs implied by forecasted higher demand, often as early as 4 years ahead of financially solid firms in the same industry.

Boot and Vladimirov (2019) researched cash management practices from a new and surprising angle : firms hoarding cash in order to avoid dilution, and by doing so they would delay current investments. This approach goes against the classic corporate finance theory about value maximization. They found that having access to private financing would cause the firm to hoard less, and that product market competition would have a significant effect on the choice of source of financing. They conclude that private placements not only do not dilute ownership but also are less transparent, yet they fall short of calling such actions and agency problem.

A new twist on reasons behind higher cash holdings was introduced by Beuselinck, Markarian and Verriest (2018). Addressing the introduction of employee protection laws in the U.S., they reported significantly higher levels of precautionary cash holdings by companies to meet potential expenses related to employee dismissals. They also show that such increase in cash positions was looked upon favorably by investors.

III. Theoretical background and motivation

The theory on the topic of cash management based on the initial definitions presented by Keynes (1934) was initially strictly on a philosophical level (Baumol (1952) and Beranek (1963), Whalen (1964,1965), Johnson (1961)) and was extended to a quantifiable model by Miller-Or (1966). Most of this body of work discussed the existence and the merits of motives for cash holdings in a general economic framework. While there was a general consensus on the existence of the transaction and precautionary reasons for holding cash, the line separating the precautionary and the speculative motives was blurred and poorly defined.

A breakthrough in empirical research came with the model introduced by Opler et al. (1999). Their model defined equilibrium levels of cash necessary for company operations, and *de facto* quantified the transaction motive for holding cash. A multiple regression model accounted for the drivers that determine cash flow needs for ongoing corporate operations, setting the stage for extensions that followed, and defined the drivers that explain the precautionary motive. The speculative motive was generally unaccounted for and, for most, excess cash held by corporations was attributed to the precautionary motive. To date, no empirical research concentrated or attempted to quantify and isolate the speculative motive for hoarding cash.

Since mid-1980s, the American non-financial sector displayed a steady trend of increasing cash reserves. As of the late 1990s, the American economy enjoyed an unusually prolonged upward sloping business cycle coupled with a similar trend in the stock market. This trend culminated and abruptly ended with the implosion of the

housing market and a stock market collapse in 2008 followed by a global recession. Leading up to the crisis, the American non-financial sector enjoyed both favorable access to financing sources and steady profitability, which translated into record high levels of cash holdings. This level of cash balances could be hardly explained by a combination of the transaction and precautionary reasons for holding cash and gave rise to suspicion of speculative activity fuelled by rising markets and sheer amounts of available liquidity. As extreme examples, Apple's cash balances exceeded the value of the American Treasury, and Google established an in-house trading floor stating it will increase operational efficiency of liquidity management and overly conservative investment strategies.

This period of extreme cash accumulation leading up to the 2008 crisis provides a unique opportunity for a case study on existence of the speculative motive, and is the core of this research. By quantifying the transaction and precautionary motives for holding cash, factors driving those two motives are accounted for and are removed from the data. Following Keynesian theory, any remaining unexplained variance, must be attributed to the speculative motive.

By creating an all-inclusive multi-factor regression model using variables used in prior research on the transaction and precautionary motives, and extracting the error term of this model, I obtain the basis for analysing the speculative motive in its purest form defined to date. In econometric terms, the error of a regression represents the unexplained variance of the dependent variable, and the **null hypothesis #1** would imply that *there is no market support for cash accumulation*. Additionally, I define **null hypothesis #2: Corporate CEOs were not able to foresee the upcoming financial crisis**.

To assure statistical integrity of the model, potential problems with multicollinearity and time-dependency of the error term, are accounted for through appropriate statistical measures (adjusted R-sq. and the Durbin-Watson statistic, respectively). In my model, the dependent variable is the optimal cash balance for a firm, and the explanatory variables of the regression represent the combination of drivers of the transaction and the precautionary motives for holding cash, therefore the error term, in line with Keynes' definitions, would represent the speculative component of cash accumulation. This data is subsequently used to graphically show a clear trend of speculation-driven corporate actions leading up to the financial crisis and beyond. Analysing this trend, I argue that the corporate managers expected the crisis significantly in advance of the event, but chose to ride the tide of speculative cash management to the last moment. Data also shows that with one exception, cash hoarding was blessed by the capital markets, and those results reject both null hypotheses as stated above. Both the concept and the methodology were never used before, and this is one of the major contributions of this research.

In addition, by analysing the plots produced by cumulative error terms of the regressions, I disambiguate the mystery associated with the definition of the border separating the precautionary and the speculative cash accumulation motives. This research proposes that the error term of the regression represents speculative activity in cash management. This is illustrated through the position of the points of the cumulative error terms relative to the vertical axis: the points positioned in the positive area should represent the speculative motive, while those in the negative area represent the excessive precautionary motive ("negative speculative"). The trend over time illustrates

the shift from negative to speculative. In other words, the data shows the primary motive driving cash accumulation from the excessive precautionary to the speculative, as evidenced by the move from precautionary to speculative short-term investments, assuming the level of cash required to satisfy the transaction motive is fixed. This claim is in line with Duchin et al. (2017) and Cordella et al (2015) who claimed that there is a difference between the two types of short term investment assets in which companies park their cash reserves. The low-risk, low-return portion of those investments can indeed be attributed to the precautionary motive, even if it exceeds model-implied levels, while investments in high-risk, high-return short term assets are clearly driven by the speculative motive and plots of cumulative error term solidly places them in the positive area of the graphs.

In relation to the dataset used in this research, across all cases , I obtain clear evidence of when, for how long and under what circumstances the motives of financial managers changed. By definition, a horizontal line drawn from the point zero on the vertical axis, would represent the quantitatively defined border separating the precautionary and the speculative motives.

III - (i). "Market sentiment" - definition.

Another novelty this research contributes to the body of literature on cash management is the introduction of a metric to quantify market sentiment. The most widely used measure of market opinion regarding future corporate performance is the stock price. In this study I needed to create a metric that would directly measure market reactions to corporate cash hoarding. The new variable follows the logic behind the price-to-earnings ratio, which can be interpreted as the dollar amount investors are willing to pay for every dollar of earnings. The new variable is defined as price per share divided by per cent change in the cash position of a firm, and can be interpreted as the price investors are willing to pay for every per cent change in cash holdings. Should the per cent change in cash be positive, and the regression estimate be significant and positive, it can be interpreted as market endorsement of cash accumulation. Should the change in cash be positive and regression estimate be significant and negative, it would attest to market dissatisfaction with cash hoarding and by definition would imply the existence of an agency problem, where the managerial decision to accumulate cash is not in the best interests of the shareholders, and is not supported by the markets. In the case where the change in cash position is negative, similar logic applies. Considering that estimated coefficients are not sensitive to the sign of the variable in the original data, but rather measure correlation, a positive sign of the estimate would still imply market support, while a negative sign would attest to lack of support and point to an existing agency problem.

The actual value of the regression estimate for this variable holds additional information. By splitting the sample into two parts, before and after the crisis, and

running the model on two sub-samples, I measure the market sentiment in these two distinct periods, and can therefore draw conclusions about whether support for cash accumulation increased or declined following the financial crisis.

Additionally, the introduction of filters as a robustness check allows me to evaluate the effect of market sentiment for profitable companies, with increasingly strong criteria to measure corporate profitability. These filters address a company's ability to pay steady uninterrupted dividends, whether a company is ranked in the top profitability quartile (as defined by return on assets (ROA)) in the sample, having consecutive 8 quarters of positive earnings, and finally, whether a firm meets all these conditions, i.e. all filters combined.

The sign and the value of the estimate for the price-to-cash change ratio allow for a new interpretation of the impact of the crisis on financially unconstrained firms. Due to their financial position, those firms were most likely to be able to hoard cash.

IV. The data and the sample

For the empirical tests I use two datasets, drawn from COMPUSTAT quarterly databank, which exclude financial (SIC 6000-6999) and utilities (SIC 4900-4999) companies in the US for the period 1997Q1-2019Q4. This data is further split into pre- and post-crisis periods, 1997-2007 and 2009-2019, respectively. For the purpose of testing robustness, data for the quarters corresponding to the height of the crisis will be excluded in order to better distinguish the pre- and post- crisis effects. Overall, the total sample included 106231 company-quarter data points. A vast majority of prior research was conducted using annual observations. In my opinion, higher frequency quarterly data is capable of better capturing the dynamics of the decision-making process by corporate CEOs with regards to cash management policies.

Considering the variables proposed below in the model section, additional data was obtained from the Federal Reserve website, namely, data on T-bills and bond yields.

Summary statistics for the entire sample are presented in Table 1. The table contains results of ratios calculated on original component variables and have been winsorized at the upper and the lower end (1,99), and, in the case of leverage (similar to Pinkowitz et al. (2013)), restricted to the interval of (0,1). Table 1 represents descriptive statistics for the entire period 1997Q:1-2019Q:4, Table 2 shows descriptive statistics for same set of variables but for positive changes in cash only, and Table 3 reports the same set of variables for cases where the change in cash was negative. Data selection was restricted to positive values of total assets (ATQ), sales (SALEQ), cash and

marketable securities (CHEQ) and equity (SEQQ). Net assets are defined as total assets (ATQ) minus cash and marketable securities (CHEQ), net working capital to net assets ratio is defined as current assets (ATQ) minus current liabilities (LCTQ) minus cash (CHEQ), divided by total assets (ATQ) net of cash (CHEQ). Capital expenditures to net assets is calculated as one fourth of annual capital expenditure (CAPXY) to net assets (ATQ-CHEQ). This approximation was required due to lack of quarterly data for capital expenditures. Total debt to total assets is determined as the ratio of the sum of short term debt (LCTQ) and long-term debt (DLTTQ) to total assets (ATQ). Research and development to sales ratio is calculated as XRDQ/SALEQ. For the Market-to-Book ratio, market value is determined as a multiplication of shares of common stock outstanding (CSHOQ) by closing price per share (PRCCQ), divided by the book value, calculated as the sum of common equity (SEQQ) and deferred taxes (TXDITCQ) minus preferred equity (PSTKQ). Tobin's Q was calculated as the ratio of Total Assets plus Market Value less Book Value to Total Assets, or:

$$\frac{ATQ + PRCCQ \times CSHOQ - SEQQ + TXDITCQ - PSTKQ}{ATQ}$$

Share repurchases were calculated relative to total shares outstanding (CSHOPQ/CSHOQ), and Common Shares Issued (CSHIQ), Long Term Debt Issuance (DLTISY), Financing Activities Net Cash Flow (FINCFY), Acquisitions (AQCY) and Long-Term Debt Repurchases (DLTRY) were normalized by Total Assets (ATQ).

Cash flow to net assets was determined by dividing the sum of net income before taxes (PIQ), depreciation (DPQ) and total interest (XINTQ), by net assets (ATQ-CHEQ). This ratio is also used to calculate the industry sigma, which is the industry average of

the standard deviation of cash flows to net assets. Each standard deviation is calculated based on 5-year quarterly data but the restriction was imposed, following Pinkowitz et al. (2013), that a minimum of 3 data points are required for calculation. The process of sigma calculation was a rolling (one quarter at a time) standard deviation for each company, averaged by 2 digit SIC code. From a technical standpoint, I re-defined 'Industry sigma' as the average volatility within each sub-industry in the sample. However, instead of calculating it on 20 years of data, as in the work by Opler et al. (1999), I limit the focus to 5 years of quarterly data in order to isolate recent, rather than long term, volatility effects, similar to Pinkowitz et al (2013). This means that sigma was calculated on a block of 20 (quarters) observations, rolling one quarter at a time.

The Confidence Index was based on Federal Reserve data and was defined as the spread between Moody's yield on seasoned corporate bonds - all industries, BAA and Moody's yield on seasoned corporate bonds - all industries, AAA. This measure is normally considered a predictor of economic activity and I hypothesize that it may affect excess cash balances held by corporations.

Following a very limited number of articles, the concept of cash accumulation in order to support a company's clients during economic downturns, is also examined. It may be considered a part of the precautionary motive for holding cash, and thus assures the integrity and strength of a company's markets for finished goods. According to Garcia-Appendini and Montoriol-Garriga (2013), cash reserves are also used as a device by which to ensure the existence of a market for a firm's finished goods by protecting the client's ability to pay. However, since not all corporations acted this way, it may be worthwhile to test this concept using a separate variable, defined as Accounts

Receivables - to - Sales ratio.^[17] Companies pursuing this strategy are expected to show a significant regression coefficient for this financial ratio. My definition varies from Garcia-Appendini et al. (2013) who used the Accounts Receivables-to-Total Assets ratio. In my opinion, measuring this effect relative to Sales provides a more precise measure of customer protection phenomenon.

The metric to test for market sentiment to cash accumulation beyond the transaction and the ordinary precautionary reasons is defined as a ratio of price per share (PRCCQ) to per cent change of cash and marketable securities

$$PPRCCQ / \left\{ \left[\frac{CHEQ}{LAG(CHEQ)} - 1 \right] * 100 \right\}$$
. Similar to the logic behind the price-earnings ratio, this new ratio would measure how much in terms of price the investors would be willing to pay for every per cent change in cash position. Should its estimated coefficient prove to be significant and positive, it would signal the market's consent to cash accumulation. Should it be found to be significant and negative, it would imply that CEOs' cash hoarding hurts investors and destroys value, creating an agency problem.

The dividend dummy is defined as "1" if dividend was paid during a particular quarter, and "0" otherwise. Industry dummy is based on Fama and French (1997) 12 industries classification^[18]^[19], excluding the financial sector and the utilities sector that are also absent from the sample. The crisis dummy was set to "1" for each quarter between 2007Q:3 and 2009Q:2, and "0" otherwise.

[insert Tables 1, 2, 3 here]

¹⁷ Garcia-Appendini and Montoriol-Garriga, 2013

¹⁸ Fama, E. F., and K. R. French. "Industry costs of equity." *Journal of Financial Economics* 43 (1997), 153-193.

¹⁹ See Appendix for detailed definitions.

V. Methodology

The methodology applied in this study will reflect the multitude of dimensions associated with both the explanatory variables and data treatment.

Two classifications of companies are considered: (i) strong and financially stable, and (ii) hoarders. The need to separate companies in the sample stems from prior research that illuminated the asymmetry present in both cash management and corporate performance between stable cash-rich firms, and cash-poor companies. More specifically, not all stable firms can be defined as cash hoarders, and not all cash-poor firms are unstable. Another reason for the suggested sample separation is to first test the model on the entire sample, accounting for the possibility of holding excess cash in the sample at large, and then restrict the sample to financially strong firms only, with the intent of enhancing and better explaining the results. A sequence of filter rules discussed below will serve both as a robustness test for the results of the original model as well as a classification tool for financial stability and strength.

The second, more technical separation of the sample, is temporal, distinguishing between the two time periods before and after the 2008 crisis. Both sample breakdowns described so far are needed to address the second research question regarding whether we can identify differences in rationales for hoarding cash before and after the crisis.

In the first stage the model was tested on an unrestricted sample, including the crisis dummy variable. Then the model was run on a sub-sample representing positive cash change only, followed by all periods run for all cases that displayed negative

change in cash. All those regressions were run once without fixed effects and then repeated to include both industry and quarterly fixed effects.

In the next three steps, three different filters were applied, followed by the final step where all three filters were applied simultaneously. The filters were defined as dummy variables (flags) as following: (i) if no dividends were cut, flag#1 was set to "1" and "0" otherwise; (ii) if ROA was been positive for 8 consecutive quarters, flag#2 was set to "1" and "0" otherwise; (iii) if the company was in the top 25% of ROA in 10 consecutive quarters, flag#3 was set to "1" and "0" otherwise".

Finally, a sequence of regression runs were performed on all abovementioned cases twice again, to reflect the time periods before and after the financial crisis. The estimates of the market sentiment variable were extracted and reported in Table 7.

V-(i) Model development and testing.

Before defining the actual structural model for testing, two terms from the research questions should be defined more precisely in the context of cash hoarding: conservatism and opportunism. The aforementioned "time varying uncertainty about economic conditions" are both represented by specifically defined variable and also built into the way the model is tested. The model will also include fixed effects controlling for industry, time and the crisis period.

Most previous studies used the natural log of cash-to-assets as the dependent variable and based on Opler et al. (1999). Bates et al (2009), used the following array of explanatory variables: market-to-book ratio, industry cash flow risk, R&D-to-sales, size, NWC-to-assets, CAPEX/Assets , leverage, a dividend payment dummy, a year dummy, and the lagged cash-to-net-assets ratio. Pinkowitz, Stultz and Williamson (2013) included the following additional variables: acquisitions, debt issuance, and equity issuance. Jankensgard and Andren (2014)^[20] further added Tobin's Q as a measure of future opportunities, as well as an array of corporate governance variables: classified board, rights plan, executive directors, chairman=CEO, institutional ownership, and inside ownership. Corporate governance papers in the context of cash hoarding concentrated on cross-country comparison, and, considering strong governance laws in the U.S., corporate governance is not considered a determining factor for US firms and as such were not included in this paper's model.

²⁰ Tide of cash: corporate governance and management of large cash windfalls, Knut Wichsell , Lund University Working papers, 2014:1.

The aim of this paper is different from Opler et al. and Bates et al., both of which estimated the equilibrium of cash holding related to the transaction motive. I am testing for the presence of market-supported cash holdings beyond the transaction and precautionary needs of the company. In order to do so, I will have to account for the factors that drive both transaction and precautionary motives first and add the drivers that would represent the factors affecting corporate CEOs decisions to hoard cash beyond those two motives. By including the variables used by Opler et al. and Bates et al., I am controlling for the drivers of the transaction motive. Based on Pinkowitz et al, Dittmar et al, and Jankensgard et al., I add variables that account for the precautionary motive. These precautionary motive variables were never combined in order to create a more comprehensive set of drivers of the precautionary motive as I do in this study. In addition, I am including a variable that represents the macro economic outlook, namely the confidence index (the spread between the average yields of AAA bonds and average yields of BAA bonds), to test whether CEOs decisions took into the consideration market sentiment regarding future economic conditions. The ratio of price to per cent change in cash and marketable securities is used as a metric to test the market reaction to excessive cash accumulation. The results will also offer a solution to what Pinkowitz, et al. (2013) called a "puzzle" with regards to the reasons for hoarding cash prior to the crisis of 2008.

The model [²¹]:

$$\begin{aligned} \ln(\text{Cash to Net Assets}) = & \\ & = \beta_0 + \beta_1(\mathbf{\text{Price per Share to \% Change in Cash}}) + \beta_2(\text{Confidence Index}) \\ & + \beta_4(\text{Tobin's } Q) + \beta_5(\text{Market to Book Ratio}) + \beta_6(\text{Size}) + \beta_7(\text{Cashflow to Net Assets}) \\ & + \beta_8(\text{NWC to Net Assets}) + \beta_9(\text{Total Leverage}) + \beta_{10}(\text{CAPEX to Net Assets}) \\ & + \beta_{11}(\text{R\&D to Sales}) + \beta_{12}(\text{Sigma Industry}) + \beta_{13}(\text{Dividend Dummy}) \\ & + \beta_{14}(\text{Total Shares Repurchased}) + \beta_{15}(\text{Common Shares Issued}) \\ & + \beta_{16}(\text{Accounts Receivables to Sales}) + \beta_{17}(\text{Financing Activities Net CF}) \\ & + \beta_{18}(\text{Acquisitions}) + \beta_{19}(\text{Derivatives Gain Loss}) + \beta_{20}(\text{Securities Gain Loss}) \\ & + \beta_{21}(\text{Long Term Debt Reduction}) + \beta_{22}(\text{Long Term Debt Issuance}) \\ & + \beta_{23}(\text{Increase in Investments}) + \text{Industry} + \text{Quarters} + \text{Crisis} + \varepsilon \end{aligned}$$

This model is a representation of two of the three motives for holding cash, as defined by Keynes, encased in a single equation, and was never attempted before.

I argue that the classic Keynesian definition of the speculative (or opportunistic) motive for holding cash can be expanded by splitting it into two directions. CEOs hoard cash because (i) they have the ability to do so based on the company's performance, and (ii) because the investors and the markets allow them to do so. Both Dittmar et al. (2007) and Fresard (2010) tested for the first reason, i.e. the effect of governance variables on cash accumulation, and Fresard (2010) and Cleary et al (2013) also showed that cash-rich firms outperform cash-poor firms. This study is testing for the effect of market sentiment on CEOs decisions with regards to cash accumulation.

Finally, through calculating mean cumulative errors of the regression, and plotting them against time, (as in Fama, Fisher, Jensen and Roll's (1969) study of the Efficient Markets Hypothesis), I analyse the trend created by my data.

²¹ Main variable is in bold, control variables for transaction and precautionary motives are in *italic*.

Figure 1 - Cumulative average residuals in the months surrounding a split

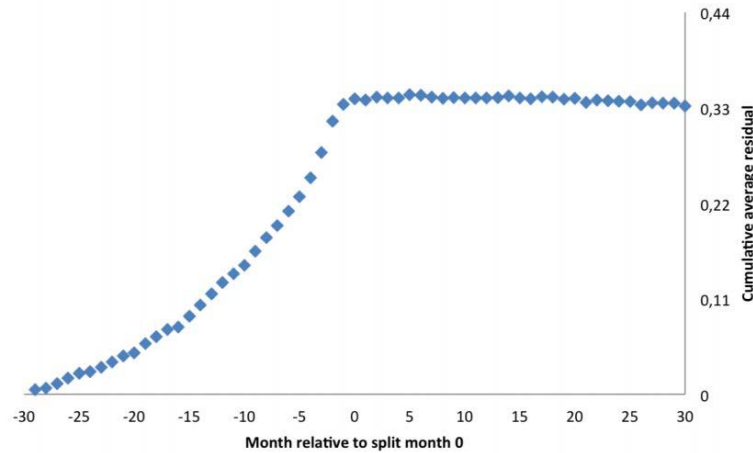


FIGURE 1. Cumulative average residuals in the months surrounding a split. Source: Fama, Fisher, Jensen, and Roll (1969).

Should cumulative errors display such a trend as in Fama et al. (1969), especially towards the market crash and economic downturn in 2008, it would be a joint test for Efficient Market Hypothesis and CEOs' abilities to predict changes in economic conditions, hence supporting the precautionary motive. Failure to obtain the maximum point on the graph at exact start of the crisis would imply that CEO actions outside of the traditional transaction and precautionary motives were driven by sheer speculation and opportunism. It follows from logic that there are three mutually exhaustive factors and two are eliminated as options, it must be the third that manifests. My results will show a clear trend in cash management that predicts the downturn in 2008 many quarters in advance of the event.

VI. Results

The model was tested under a number of scenarios and with application of additional filters as a robustness check. Overall, for all variants and filters, the model produces highly significant statistical results. The goodness of fit tests are very strong, with F-stat values ranging from 140 to 3200, and adjusted R-sq. between 35 and 52. While only the adjusted R-sq. were reported, as it is customary for multivariate regressions, the difference from the regular R-sq. was negligible, pointing to a lack of multicollinearity in the model, implying absence of interactive dependence between the explanatory variables. The model also does not display any problems with autocorrelation (lag dependency), as measured by the Durbin-Watson statistic.

[insert Table 4 here]

Initial results obtained from the unrestricted model across all periods are shown in columns (i) and (ii) of Table 4. Market sentiment variable is significant but small since the data includes both companies who increased their cash holdings and those who's cash balances declined. Estimates of control divers are highly significant. Overall, these results resemble previous studies and show highly significant estimates for transaction motive and precautionary motive variables (drivers). This pattern holds for both types of regressions, that include and exclude fixed effects. The Confidence Index is significant at 5% level for the no fixed effects case, but is insignificant for the case that includes fixed effects. Tobin's Q follows a similar pattern, while Industry sigma, as a measure of risk, is significant for both cases. With regards to financing activity, results show high significance. In the complete sample companies issued shares and bonds, repurchased

shares and retired bonds, made acquisitions and increased investments. The unrestricted results are mixed when it comes to supporting findings of Garcia-Appendini and Montoriol-Garriga (2013), with the estimate of Accounts Receivable to Sales being significant in the fixed effects regression but not otherwise. The column (ii) result (with fixed effects) is interesting in the sense that it shows that the phenomenon of clientele support was prominent not only among profitable and cash-rich firms, but for the entire sample at large.

[insert Exhibits 1A-2B here]

The cumulative residuals plot (Exhibits 1A-2B) shows that between 1997 and 2001 the dots on the plot are in the negative territory and hence cash accumulation was indeed driven by precautionary reasons, but in excess of what was found by Oppler et al (1999), Bates et al (2007) and others. This can be explained by market expectations of the upcoming recession of 2001. Starting in 2002 following a quick recovery from the short recession, the dots start moving into the positive territory and show a sharp increase up to 2005, attesting to financial managers' optimism and increasing speculative activity, and then declining again in expectation of the slowdown in 2008. The plot shows a brief dip below the zero line during the financial crisis of 2008, attesting to the shift to precautionary motivation during the economic slowdown [²²], followed by an increase in the speculative activity once the recession was over. Interestingly, the pattern of the cumulative residuals shows model's ability to predict both the short recession of 2001 and the market crash of 2008.

²² This result is in line with the findings of Duchin et al. (2010) regarding saving cash due to the crisis.

When the sample was restricted to companies with positive changes in cash, as shown in columns (iii) and (iv) of Table 4, a new picture emerges. Results show highly significant estimates for the market sentiment variables and their values are substantially higher relative to the estimates of the entire sample. The estimates for price per share to per cent change cash are both positive and highly significant in the sample overall with and without fixed effects. This can be interpreted as capital markets support for cash accumulation, and the corporate CEOs were acting based on current show of support from the markets. The significantly higher values of the estimates of the price to cash change ratio relative to the results of the entire sample implies that cash-rich firms enjoyed strong market support to hoard cash without creating an agency problem.

Some interesting observations from this restricted sample include a significantly higher value estimate for the Confidence Index, which would attest to CEOs' attention to macro-economic predictions, but lower coefficient for industry sigma, a measure of risk. This combination may provide a hint to what concluded from the residual plots with regards to CEOs knowing of what is yet to come while paying less attention to risk - a combination that prompts speculative behaviour. This phenomenon may reflect that they hoarded cash simply because they could, and would require further investigation from the angle of corporate governance. On the other hand, this result may support studies by Fresard (2010) and Cleary (2013) which showed that portfolios based on cash-rich firms showed higher stock profitability as compared to portfolios comprised of cash-poor firms. Those studies, however, did not address the pre- and post-crisis

differences. Tobin's Q, the measure of future earnings potential, is significant for the overall sample and the restricted sample, but only in regressions without fixed effects.

Addressing the financing activities of the firms in the sample, all types of financing activities show strongly significant results. Not surprisingly, the absolute values of the estimates for this sub-sample of cash-rich firms are higher than for the entire sample, probably because those firms had better and easier access to the capital market to raise capital, make acquisitions more easily, invest, repurchase shares and retire debt.

An important but unsurprising result is reported in columns (v) and (vi) of Table 4. In the sub-sample that included firms with negative changes in cash positions, the estimate of the price-to-change in cash ratio is negative and highly significant. In its absolute value it is much larger than comparable estimates of the positive change in cash balances sub-sample as well. This result is definite proof to strong market objection to speculative cash management practices by cash poor-firms, and any speculative action by CEOs of such firms were not in the best interests of the shareholders. It seems like they were trying to take advantage of strong capital market trends to better their financial position, despite objection by the market, and by doing so, were clearly creating an agency problem. As expected, in this sub-sample the estimates of the drivers of financing activity are also highly significant, but in absolute values much lower than in the positive change sub-sample.

Overall, both the unrestrictive and the restricted model provide support to the notion of market - supported cash accumulation, thereby solving the "puzzle" defined by

Pinkowitz et al. (2013). The puzzle was defined as unclear reasons for cash accumulation prior to the 2008 crisis. My results show that cash hoarding was driven by two *interchanging* motives (precautionary first, followed by speculative), under a support umbrella of the financial markets, but only for financially strong firms. For financially restricted companies market objection to speculative practices created an agency problem. All-in-all, significant estimates for the price-to-change in cash ratio imply that speculative cash accumulation is good, but only if you can really afford it, suggesting that financially constrained firms should stick to conservative cash management practices.

VII. Application of filters and robustness check

VII-(i): Market approval

For the purpose of testing the model under increasingly strict measures of profitability, and thereby answering the question whether only profitable companies were involved in hoarding cash, three filters were applied on the restricted model. First, a requirement was imposed that in order to be included in the sample, a company should not cut dividends for 10 consecutive quarters. Second, only companies that belong to the top 25% of ROA across the sample were included, and third, only companies with 10 consecutive quarters of positive ROA were included. Finally, all three filters were applied simultaneously.

Results of the restricted model with the no dividends cut filter are reported in Table 5 columns (i) and (ii). I consider this to be the weakest filter of the three due to the fact that, as a rule, companies would try to maintain a steady dividends pattern and cut dividends with great reluctance, and thereby the payment of dividends does not postulate a strong measure of profitability and ability to hoard cash.

[insert Table 5 here]

As can be seen from Table 5, companies that continuously paid dividends had a strong incentive to accumulate cash, expressed by highly significant estimates of the market sentiment variable. However, in their absolute values, those estimates are the lowest among the three filters used in this study. While common shares issuance estimates are significant, dividend-paying companies were also actively re-purchasing shares, as well as active in the bond market, making acquisitions and increasing their

investments. This attests to high levels of available liquidity and financing despite using profits to pay steady dividends. This is consistent with favourable stock market conditions, yet contrary to pecking order hypothesis. Also, while the dividend-paying companies sub-sample did produce highly significant estimates for R&D-to-total assets, the absolute values are the lowest among the three filters used. In view of significant increase in investments, coupled with highly significant estimates for capital expenditure to total assets ratio, this may be interpreted as a trend of buying rather than developing among this sub-set of corporations. Both Tobin's Q and the Confidence Index estimates were significant potentially implying that steady dividend-paying firms were indeed considering future profitability prospects and market sentiment regarding macro economic trends in their decision-making process. Industry sigma, a measure of riskiness of the cash flows, is significant as well, despite the findings of Han and Qiu (2007) who also used quarterly data and showed that unconstrained firms display no association between sigma and the level of cash held by corporations. Estimates for the ratio of accounts receivables-to-sales are highly significant, i.e. dividend-paying companies were also active in the preservation of their clientele base.

[insert Table 6 here]

Table 6 columns (iii) and (iv) report the results of the restricted model with the profitability filter including only companies that belong to the top 25% of ROA in each quarter. For this subset of data, the price-to-cash change estimates again produced significant results, and the absolute value of the estimates of price-to-cash change ratio are the highest among the three filters. This can be interpreted as a market blessing for cash hoarding, since the most profitable companies are most able to afford it. Since

companies in this sub-sample were actively investing, involved in acquisitions, invested in R&D, retired debt and taking overall advantage of favorable market conditions, it seems like the strong market endorsement for hoarding and speculation was based on the fact that this type of company could afford to do so. This follows the logic of Google's strategy whereby large amounts of cash are considered to provide greater benefit to the shareholders if invested in higher risk, higher potential return securities. Results also show that those companies were acting to protect their clients as reflected by the significant estimate for the ratio of accounts receivable to sales.

The next profitability filter identified and included only companies that had eight consecutive profitable quarters measured in terms of a positive return on assets ratio. These results are reported in Table 6 columns (i) and (ii). This sample differs from the previous case that isolated only the top 25% of the profitable firms by greater stability of the sample that includes steady performers rather than the variable rankings of top performers.

The results for the price-to-cash change ratio are consistent with previous findings and are highly significant. Both Tobin's Q and the Confidence Index are significant in the no fixed effects runs, but not in the regressions that include fixed effects. This may be interpreted as relative caution in CEOs attitude, where future profitability prospects were playing a role after all, alongside opportunistic behaviour. Also, despite the steady show of profitability, significant shares and debt issuance were coupled with acquisitions, increases in investments and long term debt reduction. This may be the result of favorable market conditions and some degree of conservatism on

behalf of the financial managers. As expected, those companies also show significant estimates for R&D and increases in investments, while acting to protect their clients.

Finally, when applying all three filters simultaneously, I obtain some very interesting results, as reported in Table 6 columns (iii) and (iv). The sample size shrunk dramatically to 5,606 observations from a total of 85,411 observations in the original sample. Hypothetically, this sample should represent the select group of elite companies that both produced steady positive return, remain in the top 25% of ROA and paid continuous dividends.

The model displays highly significant results for the market sentiment variable as well as the drivers of the transaction motive, and selected drivers of the precautionary motive, including highly significant estimates for increases in investments and acquisitions, but with some notable exceptions. CAPEX to total assets and R&D to sales are surprisingly insignificant, and there is no clientele support. Neither Tobin's Q nor Confidence Index produced significant estimates, but absolute values of the market sentiment variable are the highest of all previous cases. The fact that estimates for the Confidence index and Tobin's Q are insignificant, may suggest that CEOs accumulated cash disregarding the fundamentals, and the indicator of macro economic conditions, and did so enjoying the strongest market support for their actions. This attitude changed after the crisis when market sentiment stopped playing a role in CEOs decision-making process, pointing to a shift towards even higher levels of opportunism in their behaviour. As can be seen from the Standard & Poor's chart mentioned earlier, as well as the second chart with updated data to 2020, during the post-crisis period

cash accumulation continued to grow, and this elite group of companies were on the forefront of amassing mountains of cash, with Apple leading the pack.

Table 7 reports extracts of estimates of the price-to-cash change ratio from 12 different regression runs of the full model, and supports the analysis of shift in market support from before the crisis to post-crisis period for each one of the previously reported cases.

[insert Table 7 here]

At this stage, the entire sample and subsequently filter-based sub-samples were further divided into temporal sub-samples - before and after the crisis of 2008. The estimates of the market support variable are highly significant in all cases and draw a clear picture. Market sentiment towards cash hoarding was stronger before the crisis and weakened after the crisis in all cases except when the dividend filter was applied. Interestingly, market disapproval for companies with negative cash changes also weakened. The general trend shown by these results may be explained by some degree of caution in the market after the deep crisis, however, as will be discussed below, speculative actions by financial managers ignored weakening market support and, for as long as the support existed, they significantly increased speculative activity even more so than before the crisis. This can be clearly seen in residuals plots discussed in the next section.

VII-(ii). Did CEOs know what was coming ?

One of the main contributions of this thesis is the evaluation of the role of the speculative motive for holding cash in the context of a financial crisis as a 'natural' negative shock experiment while using a different approach, variables and methodology compared to the existing body of literature.

The intent is to try to discover whether the investors and markets encouraged excessive cash accumulations for some companies. The model estimates provide a clear answer regarding what type of companies can afford to hoard cash (based on profitability, investments, level of R&D, and other such factors). Further, the model elucidates whether the deep financial crisis transformed pre-crisis opportunism into post-crisis conservatism, as measured by the results of the split sub-samples.

It was expected that the empirical results would show that some of the cash piles accumulated by American non-financial sector before the crisis may be attributed to the speculative behaviour by corporate CEOs, while in the post-crisis era cash hoarding may be explained by a precautionary motive. It was also expected that cash hoarding prior to the crisis was endorsed by financial markets, giving further support to corporate CEOs' cash management policies. While expectations regarding pre-crisis era were supported by the results, the expectations regarding increased post-crisis conservatism were rejected by the model that displayed an even higher level of speculation in the post crisis years. The emergent picture was even more complex, showing selective market support for cash hoarding and speculative market activity by financially strong companies, but not for companies with weak liquidity positions.

While the expectations regarding market endorsement of cash hoarding were supported by data, the test for change in behavior of CEOs pre-and post- 2008 crisis produced a consistent and a surprising result. As the exhibits show, the speculative trend of cash accumulation was broken approximately 3 years before the crisis. The residual term from each regression reported so far, was assumed to represent cash accumulation attributed to speculative motive. Considering that both transaction and precautionary motives were accounted for in the model, the error term must represent what is left, i.e. the speculative motive for holding cash. In reality, I found that not all excessive cash hoarding was speculative after all, and some may be attributed to larger than implied by equilibrium conditions for precautionary accumulation, that eventually became speculative due to favorable market conditions.

The methodology used here mirrors that of Fama, Fisher, Jensen and Roll (1969). Across sample (or sub-sample) regression error terms were averaged and plotted against time, followed by a plot of cumulative error terms over time for each case discussed above.

Analysis of the residual plots (Exhibits 1 - 7) produces a very clear and consistent picture, with the exception of the case where all three filters are combined. Prior to 2002 I observe "negative speculation" (i.e., excessive precautionary cash accumulation), followed by a rapid move towards speculative activity that peaked around 2005. Speculative activity slows down towards the 2008 recession and consistently increases thereafter.

[insert Exhibits 1-7 here]

As for the case when all three filters were applied simultaneously, the plot past the 2008 crisis shows an excessive reaction of the error term leading up to the slowdown of 2014. In Exhibit 7-B, the magnitude of the drop exceeds even the reaction to the 2008 crisis. This plot is based on the entire sample from 1997 to 2019. When the regression was re-run on a narrower window around the 2008 crisis that included the 1997- 2014 period (Exhibit 7-A), the results are more in line with the rest of the cases. This illustrates that, as with any other model, results are sensitive to the temporal composition of the sample.

The model clearly displayed the forecasting power of the market and associated cash management by American corporations by correctly predicting the slowdown in 2001, the crisis of 2008 and the economic slowdown in 2014. In all cases financial managers either enhanced their precautionary cash management practices or curtailed their speculative actions at least 8 to 12 quarters in advance. This result cannot be attributed to misspecification of the model, since the appropriate variables were included, and there are no problems with serial correlation. Also, the model displays gradual adjustment in cash holdings in advance of the event, rather than instant reaction to bad news, like the market crash of 2008.

All exhibits tell the same story, despite the differences in the filters involved. Regardless of whether the regression was on entire sample, or on any sub-sample defined by the 3 filters, and accounting for the fact that each filtered sub-sample does not necessarily involve the same set of companies, I observe increasing speculative activity in cash management up to about the last quarter of 2004, where the trend turns negative leading up to the crisis of 2008. Following the crisis we observe a surge

followed by a slight dip around 2014. This implies that corporate managers could forecast the coming of the 2008 crisis 3 years in advance.

All in all, the model was able to reject both null hypotheses of this study, providing highly significant results in support of market-blessed cash hoarding by CEOs of profitable American non-financial corporations, and proving that the upcoming crisis of 2008 was indeed expected and acted upon by corporate managers. The 3-year long 'lead' factor of the model should not be viewed as a violation of market efficiency. That market participants correctly predicted the economic downturn, and at least partially adjust their cash management practices over the period leading up to the crisis, should be considered to be additional expectations-based support to the semi-strong form of market efficiency. Results show that after the crisis financial managers engaged in speculative activity with vigor, optimism and newly acquired enthusiasm.

VIII. Summary

In conclusion, this paper's goal was to test two hypotheses in a case study framework. The massive cash accumulation by American non-financial firms that started in the early 1990s could no longer be justified by the reasoning of transaction and precautionary motives as defined by Keynes. The speculative motive could be expected to play a role in this cash hoarding, but it was never quantified and/or tested before. The extensive body of literature on cash hoarding to date either ignores the speculative motive or treats it as mention but don't investigate case. This study filled this gap in the literature by quantifying the speculative aspect of cash management and testing it directly. The crisis of 2008, and the significant amount of cash hoarded by American companies leading up to the crisis provided a unique laboratory-like setting to test for opportunistic speculative behavior of financial managers of American non-financial firms. Also, this study filled yet another gap in the literature by defining and quantifying the border separating the precautionary and the speculative motives for holding cash.

Prior research produced models to explain drivers of the transaction motive. Additional studies defined and tested the precautionary drivers. By combining all those factors under the umbrella of a single model, I accounted for the transaction and precautionary drivers all at once, which was never done before. By definition, what could not be explained by the transaction and precautionary drivers, must be attributed to the speculative motive. In addition, a new variable measuring market sentiment was

introduced into the aggregate model and tested on quarterly data around the crisis of 2008.

The results turned the initial expectations on their heads instead of displaying a change from opportunism to conservatism following the 2008 crisis, I found that the picture is more complex and a shift in the opposite direction first happened long before the crisis when companies moved from excessive conservatism to speculation. Starting in the late 1990s cash hoarding, according to the model was a testament to excessive precautionary cash accumulation, which soon turned into speculative behavior peaking in 2004. However, following the crisis financial managers did not change their practices back to conservatism as initially expected, but rather increased up their speculative practices while still enjoying market-based support.

The results showed high statistical significance of the model, and proved beyond reasonable doubt the existence of the speculative motive and its presence in the actions of American CEOs leading up to the crisis of 2008 and beyond. It was also shown that such actions were endorsed by the broad market. Also, results supported the findings of Duchin, Ozbas and Sensoy (2010) which showed that financially unconstrained firms did not reduce investments during the economic crisis. Finally, this study solved the puzzle defined by Pinkowitz et al (2013) and provided empirical explanation for the reasons for cash accumulation leading up to the financial crisis.

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Summary tables

J.M.Keynes (1936)				
	<u>Theoreticians</u> Baumol (1952) Baranek (1953) Whalen (1964,1965)			<u>Inventory - style Models</u> Miller - Orr (1966)
<u>Empiricists - Transaction Motive</u> Kim et al. (1998) Opler et al. (1999) Harford (1999)	<u>Empiricists - Precautionary Motive</u> Dittmar et al (2007) Bates et al. (2009) Duchin et al. (2010)	<u>Empiricists - Speculative Motive</u> NONE		<u>Dynamic Models</u> Bolton et al. (2011) Decamps et al. (2011)
<u>Data Problems</u> Duchin (2017) Duchin et al. (2017) Amess et al. (2015)	<u>Crisis of 2008</u> Duchin et al. (2010) Fahlenbrach et al. (2011) Bolton et al. (2013)			

Flow Chart 1.

This flow chart illustrates the structure of the literature review.

Variable	N	Mean	Median	Std Dev	Maximum	Minimum
Price to cash change	106231	0.1096891	-0.0057279	7.7605373	42.6424819	-38.2290683
CF to net assets	106231	-0.0824470	0.0203655	0.3628187	0.2862337	-2.9642105
NWC to Total Assets	106231	-0.0014052	0.0632571	0.4651184	0.9294903	-5.5510204
R&D to Sales	106231	1.4868545	0.0940028	7.3621291	63.5496183	0.000013870
Tobin Q	90081	3.1257799	1.8946971	3.9821181	28.6059763	0.0909787
Market to book	106231	4.9712273	2.5443961	8.2608608	58.5227092	0
Cash to Net Assets	106231	0.8265081	0.2143660	1.8214103	11.8396197	3.2963266E-6
LN(Cash to Net Assets)	106231	-1.5709408	-1.5400703	1.7885232	5.2843125	-12.6227019
Confidence Index	104567	0.9889531	0.9000000	0.4078094	3.3800000	0.5500000
LN(TOA)	106231	5.0970923	4.7834670	2.6035648	13.1982424	-2.9374634
Total Leverage	106231	0.4002515	0.3857546	0.2000575	1.0000000	0.0097428
CAPEX to Net Assets	106231	0.0111980	0.0061075	0.0149086	0.0896624	0
Industry Sigma	103251	0.2560297	0.1541425	0.2751232	1.6044033	0.0014105
Shares Repurchase	106230	0.0015702	0	0.0105592	0.9308066	0
Common Shares Issued	106231	0.9385654	0.1075313	4.7627073	83.2075472	0
LT Debt Issued	106231	0.0576616	0	0.1328085	1.0647635	-0.1286934
Receivables to Sales	105090	0.8590075	0.6917877	0.8961936	7.6188341	0
Fin. Activity net CF	106231	0.0737596	0.0014290	0.2301938	1.5719424	-0.2550997
Acquisitions	106231	0.0166395	0	0.0516195	0.3141373	-0.0056385
LT Debt Reduction	106231	0.0429116	0.0067627	0.0971785	0.6859353	-0.0241417
Incr. in Investments	106231	0.0219041	0	0.0830470	0.5475393	-0.000891531

Table 1. Summary statistics - entire sample.

This table contains the descriptive statistics for the entire sample. Data definitions can be found in the text. All ratios are winsorized within (1,99) interval; total leverage is restricted to (0,1) interval.

Variable	N	Mean	Median	Std Dev	Maximum	Minimum
Price to cash change	51484	3.1606069	0.4949984	7.5461522	42.6424819	1.9589108E-7
CF to net assets	51484	-0.0392500	0.0307853	0.3210044	0.2862337	-2.9642105
NWC to Total Assets	51484	0.0116937	0.0723974	0.4544295	0.9294903	-5.5510204
R&D to Sales	51484	1.0617940	0.0809256	6.2548916	63.5496183	0.000015640
Tobin Q	43557	3.1562507	1.9000470	4.0244495	28.6059763	0.1608259
Market to Book	51484	4.8758090	2.6300971	7.7990250	58.5227092	0
Cash to Net Assets	51484	0.7871503	0.2274668	1.7572728	11.8396197	9.5642222E-6
LN(Cash to Net Assets)	51484	-1.4846002	-1.4807511	1.6303401	5.2843125	-11.5574813
Confidence Index	50672	0.9900260	0.9000000	0.4085528	3.3800000	0.5500000
LN(TOA)	51484	5.4057157	5.2657580	2.5857394	13.1982424	-2.9187712
Total Leverage	51484	0.3985618	0.3854903	0.1948438	1.0000000	0.0097428
CAPEX to Net Assets	51484	0.0107814	0.0062727	0.0137771	0.0896624	0
Industry Sigma	50070	0.2553637	0.1541425	0.2756620	1.6044033	0.0014105
Shares Repurchase	51483	0.0013199	0	0.0076563	0.4904621	0
Common Shares Issued	51484	0.7855654	0.0875422	4.4697447	83.2075472	0
LT Debt Issued	51484	0.0627269	0	0.1376223	1.0647635	-0.0562285
Receivables to Sales	51034	0.8029459	0.6735699	0.7819974	7.6188341	0
Fin. Activity net CF	51484	0.0816152	0.0033965	0.2302018	1.5719424	-0.2550997
Acquisitions	51484	0.0157103	0	0.0498034	0.3141373	-0.0056385
LT Debt Reduction	51484	0.0444909	0.0069092	0.0995835	0.6859353	-0.0241417
Incr. in Investments	51484	0.0212451	0	0.0802241	0.5475393	0

Table 2. Summary statistics, positive change in cash only.

This table contains the descriptive statistics for the companies that displayed positive changes in cash positions only.. Data definitions can be found in the text. All ratios are winsorized within (1,99) interval; total leverage is restricted to (0,1) interval.

Variable	N	Mean	Median	Std Dev	Maximum	Minimum
Price to cash change	54638	-2.6886295	-0.4618121	6.6261044	-1.196741E-6	-38.2290683
CF to net assets	54638	-0.1232612	0.0057838	0.3940018	0.2862337	-2.9642105
NWC to Total Assets	54638	-0.0140986	0.0544538	0.4748644	0.9088050	-5.5510204
R&D to Sales	54638	1.8895953	0.1120446	8.2569645	63.5496183	0.000013870
Tobin Q	46429	3.0977536	1.8903393	3.9440753	28.6059763	0.0909787
Market to Book	54638	5.0548444	2.4591921	8.6552654	58.5227092	5.4885339E-6
Cash to Net Assets	54638	0.8650267	0.2017529	1.8804567	11.8396197	3.2963266E-6
LN(Cash to Net Assets)	54638	-1.6428331	-1.6007117	1.9067466	5.0193670	-12.6227019
Confidence Index	53787	0.9879791	0.9000000	0.4072087	3.3800000	0.5500000
LN(TOA)	54638	4.8087194	4.3794483	2.5867101	13.1741794	-2.9374634
Total Leverage	54638	0.4015603	0.3857812	0.2047002	1.0000000	0.0097429
CAPEX to Net Assets	54638	0.0115977	0.0059360	0.0158998	0.0896624	0
Industry Sigma	53074	0.2566495	0.1543733	0.2745148	1.6044033	0.0017700
Shares Repurchase	54638	0.0018083	0	0.0127050	0.9308066	0
Common Shares Issued	54638	1.0765702	0.1358683	4.9803037	83.2075472	0
LT Debt Issued	54638	0.0528672	0	0.1279691	1.0647635	-0.1286934
Receivables to Sales	53947	0.9121195	0.7117300	0.9889558	7.6188341	0
Fin. Activity net CF	54638	0.0664158	0.000303753	0.2300900	1.5719424	-0.2550997
Acquisitions	54638	0.0175433	0	0.0533035	0.3141373	-0.0056385
LT Debt Reduction	54638	0.0414171	0.0065980	0.0948639	0.6859353	-0.0206922
Incr. in Investments	54638	0.0225603	0	0.0856838	0.5475393	-0.000891531

Table 3. Summary statistics, negative change in cash only.

This table contains the descriptive statistics for the companies that displayed negative changes in cash positions only.. Data definitions can be found in the text. All ratios are winsorized within (1,99) interval; total leverage is restricted to (0,1) interval.

NO FILTERS	Entire Sample No FX (i)	Entire Sample +FX (ii)	Positive Cash Change No FX (iii)	Positive Cash Change +FX (iv)	Negative Cash Change No FX (v)	Negative Cash Change +FX (vi)
Intercept	-0.04119 **	-0.83842***	-0.00036441	-0.54941***	-0.15865***	-1.03643***
Price to cash change	0.00719 ***	0.00637***	0.02079***	0.01676***	-0.03589***	-0.03127***
Confidence Index	0.02676**	-0.00249	0.03936***	0.01277	0.00927	-0.01626
Tobin's Q	0.00306***	-0.00060	0.00476***	0.00127	0.00092	-0.00274*
Market to book	0.02994 ***	0.02714***	0.02670***	0.02498***	0.02519***	0.02282***
LN (Total assets)	-0.11924***	-0.10614***	-0.13045***	-0.11611***	-0.16302***	-0.14481***
CF to net assets	-0.31589***	-0.35048***	0.12290***	0.06347***	-0.69452***	-0.69517***
NWC to net assets	-1.17352***	-1.01041***	-1.16116***	-1.01939***	-1.07287***	-0.90312***
Total leverage	-2.97347***	-2.71463***	-2.73381***	-2.48894***	-2.76953***	-2.54672***
CAPEX to net assets	6.86184***	11.83807***	4.72429***	9.17094***	8.92765***	13.66561 ***
R&D to sales	0.00771***	0.00580***	0.00844***	0.00792***	0.00757***	0.00462***
Industry sigma	0.08086***	0.03349**	0.06668***	0.03546*	0.10454***	0.04919**
Dividend dummy	-0.13018***	-0.00434	-0.11077***	-0.00422	-0.14718***	-0.01344
Total shares repurchased	4.62281***	3.06991***	5.25698***	3.74842***	4.78049***	3.27260***
Common shares issued	-0.02855***	-0.02849***	-0.02633***	-0.02676***	-0.02850***	-0.02822***
Long term debt issued	0.43075***	0.32303***	0.67624***	0.56241***	-0.06793	-0.12818*
AR's to sales	-0.00576	-0.01299**	-0.01219	-0.02215***	0.01410**	0.00644
Financing activity net cash flow	0.67853***	0.67463***	1.31088***	1.29977***	0.18873***	0.18989***
Acquisitions	-2.40574***	-2.46981***	-3.25714***	-3.29869***	-1.30918***	-1.42648***
Long term debt reduction	-2.18340***	-1.94323***	-2.22476***	-2.03438***	-1.85407***	-1.60372***
Increase in investments	2.63460***	2.26721***	2.34779***	2.03420***	2.73372***	2.35529***
Crisis dummy	0.00068437	0.42321***	0.01093	0.16518***	0.03570	0.60269***
F&F Industry fixed effects	NO	YES	NO	YES	NO	YES
Quarterly fixed effects	NO	YES	NO	NO	NO	NO
F-value	3203.62***	685.59***	1823.51***	384.62***	1752.02***	374.18***
Adj R-square	0.4405	0.4861	0.4805	0.5224	0.4556	0.5005
N	85411	85411	41378	41378	43940	43940
Durbin-Watson	1.905	1.939	1.910	1.952	1.870	1.936

Table 4: Model results

The table contains regressions of the firms natural LOG of the ratio of cash to net assets on a set of firm characteristics. No filters applied. Columns (i)+(ii) report the4 results of total sample with and without fixed effects. Columns (iii)+(iv) report only companies with positive %change in cash, while Columns (v)+(vi) report negative %change in cash only. (***) = Sig <.001, ** = Sig<.05, * =Sig<.10).

FILTERS	No Dividend	No Dividend	Top 25% ROA	Top 25% ROA
	Cut Filter	Cut Filter	Filter	Filter
	No FX	+ FX	No FX	+ FX
	(i)	(ii)	(iii)	(iv)
Intercept	-0.01700	-0.62405***	-0.42264***	-1.01091***
Price to cash change	0.00531***	0.00464***	0.00949***	0.00765***
Confidence index	0.03814**	0.00714	0.03898**	0.00263
Tobin's Q	0.00500***	0.00094	-0.00184	-0.00392**
Market to book	0.02957***	0.02621***	0.03079***	0.02731***
LN (Total assets)	-0.09846***	-0.11345***	-0.09311***	-0.07784***
CF to net assets	-0.41940***	-0.39307***	3.57300***	3.43610***
NWC to net assets	-1.05662***	-0.91530***	-1.34928***	-1.13103***
Total leverage	-3.11187***	-2.87266***	-2.93197***	-2.56159***
CAPEX to net assets	7.18611***	11.75819***	-1.29576*	3.41146***
R&D to sales	0.00740***	0.00396***	0.01241**	0.01285**
Industry sigma	0.11394***	0.06492***	0.07335***	0.04476
Dividend dummy	-0.10374***	0.01202	-0.11345***	0.00283
Total shares repurchased	3.08850***	2.28198***	6.60063***	3.77217***
Common shares issued	-0.02645***	-0.02550***	-0.01360***	-0.01833***
Long term debt issued	0.51007***	0.42365***	0.41878***	0.36312***
AR's to sales	-0.03560***	-0.03329***	0.09497***	0.03228*
Financing activity net cash flow	0.69757***	0.66993***	1.01895***	1.07375***
Acquisitions	-2.58459***	-2.39682***	-2.79940***	-3.08884***
Long term debt reduction	-2.18962***	-1.93086***	-2.24978***	-2.12972***
Increase in investments	2.37471***	2.14289***	2.38823***	1.74109***
Crisis dummy	-0.01110	0.47571***	0.04598	0.30951***
F&F Industry fixed effects	NO	YES	NO	YES
Quarterly fixed effects	NO	YES	NO	YES
F-value	1708.14***	361.91***	586.89***	140.22***
Adj R-square	0.4466	0.4894	0.3576	0.4264
N	44431	44431	22100	22100
Durbin-Watson	1.900	1.925	1.919	1.990

Table 5: Model results

The table contains regressions of the firms natural LOG of the ratio of cash to net assets on a set of firm characteristics. Columns (i)+(ii) report the results of total sample with and without fixed effects, including only companies that did not cut dividends. Columns (iii)+(iv) report results with and without fixed effects for companies that belong to the top 25% profitable firms in the sample , as measured by ROA. (***) = Sig <.001, ** = Sig<.05, * =Sig<.10).

FILTERS (cont'd)	10 Quarters Profit No FX (i)	10 Quarters Profit +FX (ii)	All filters Combined No FX (iii)	All filters Combined +FX (iv)
Intercept	-0.38833***	-1.10251***	-0.17709**	-0.39474***
Price to cash change	0.00826***	0.00685***	0.00985***	0.00770***
Confidence index	0.04692***	0.00351	0.00896	-0.02119
Tobin's Q	0.00387**	0.00009	0.00212	-0.00025
Market to book	0.03835***	0.03436***	0.04352***	0.03870***
LN (Total assets)	-0.10423***	-0.09304***	-0.07467***	-0.06954***
CF to net assets	3.86379***	3.84847***	3.14406***	2.99854***
NWC to net assets	-1.74016***	-1.34042***	-1.34312***	-1.17318***
Total leverage	-3.15400***	-2.64736***	-3.74292***	-3.36421***
CAPEX to net assets	-3.98034***	2.09368***	-1.77357	2.42437**
R&D to sales	0.04223***	0.03251***	0.00932	0.00474
Industry sigma	0.06436***	0.02793	0.12216**	0.12666**
Dividend dummy	-0.14585***	0.00006	0.01501	0.07249*
Total shares repurchased	5.74088***	2.85031***	4.18994***	2.67932***
Common shares issued	-0.01059***	-0.01694***	-0.01149**	-0.01524***
Long term debt issued	0.83215***	0.73336***	1.22728***	1.07350***
AR's to sales	0.15321***	0.06981***	-0.01626	-0.09298**
Financing activity net cash flow	1.14215***	1.11067***	1.34241***	1.30055***
Acquisitions	-3.09048***	-3.18380***	-3.23939***	-3.28325***
Long term debt reduction	-2.77840***	-2.65215***	-3.29462***	-3.12854***
Increase in investments	2.75013***	2.15279***	1.64234***	1.35910***
Crisis dummy	0.05566**	0.36613***	0.07579	0.16158
F&F Industry fixed effects	NO	YES	NO	YES
Quarterly fixed effects	NO	YES	NO	YES
F-value	760.43***	183.51***	181.86***	40.92***
Adj R-square	0.3469	0.4177	0.4039	0.4567
N	30030	30030	5606	5606
Durbin-Watson	1.899	1.964	1.970	2.012

Table 6: Model results.

The table contains regressions of the firms natural LOG of the ratio of cash to net assets on a set of firm characteristics. Columns (i)+(ii) report the results of total sample with and without fixed effects, including only companies that reported 10 consecutive profitable quarters. Columns (iii)+(iv) report results with and without fixed effects for companies that both belonged to the top 25% profitability in terms of ROA, did not cut dividends and showed 10 consecutive quarters of profitability. (** = Sig <.001, * = Sig <.05, * = Sig <.10).

	Positive Cash Before 2008 Crisis (I)	Positive Cash After 2008 Crisis (II)	Negative Cash Before 2008 Crisis (III)	Negative Cash After 2008 Crisis (IV)	Dividend Filter Before 2008 Crisis (V)	Dividend Filter After 2008 Crisis (VI)	ROA Filter Before 2008 Crisis (VII)	ROA Filter After 2008 Crisis (VIII)	10 Quarter Filter Before 2008 Crisis (IX)	10 Quarter Filter After 2008 Crisis (X)	3 Filters combined Before 2008 Crisis (XI)	3 Filters Combined After 2008 Crisis (XII)
Price to Cash Change Coefficient Estimates (sig)	0.02636 (<.0001)	0.01504 (<.0001)	-0.04502 (<.0001)	-0.02710 (<.0001)	0.00535 (<.0001)	0.00557 (<.0001)	0.01224 (<.0001)	0.00738 (<.0001)	0.00977 (<.0001)	0.00662 (<.0001)	0.01174 (<.0001)	0.00732 (<.0001)
DW	1.912	1.926	1.903	1.922	1.901	1.942	1.957	1.960	1.954	1.920	1.982	2.014
F-stat	1059.17	835.10	1053.65	770.22	1032.21	761.47	353.50	305.95	433.76	451.18	128.71	79.74
Adj R-sq	0.5023	0.4938	0.4726	0.4821	0.4553	0.4836	0.3788	0.4128	0.3692	0.4178	0.4240	0.4829

Table 7 : Comparison summary: before and after the crisis.

The table represents a summary of 12 separate regression runs. Only estimates of the Price -to-Cash Change ratio are reported. The values of estimates represent the changing attitude of corporate CEOs from before- to after the crisis of 2008, under different scenarios and filters. Columns (i) and (ii) report the estimate of the coefficient of Price to Cash Change ratio for firms with positive changes in cash. Columns (iii) and (iv) report similar estimates for firms with negative cash changes, while the rest of the columns report estimates when various filters are applied.

EXHIBITS

Cumulative Average Residuals: Entire Sample

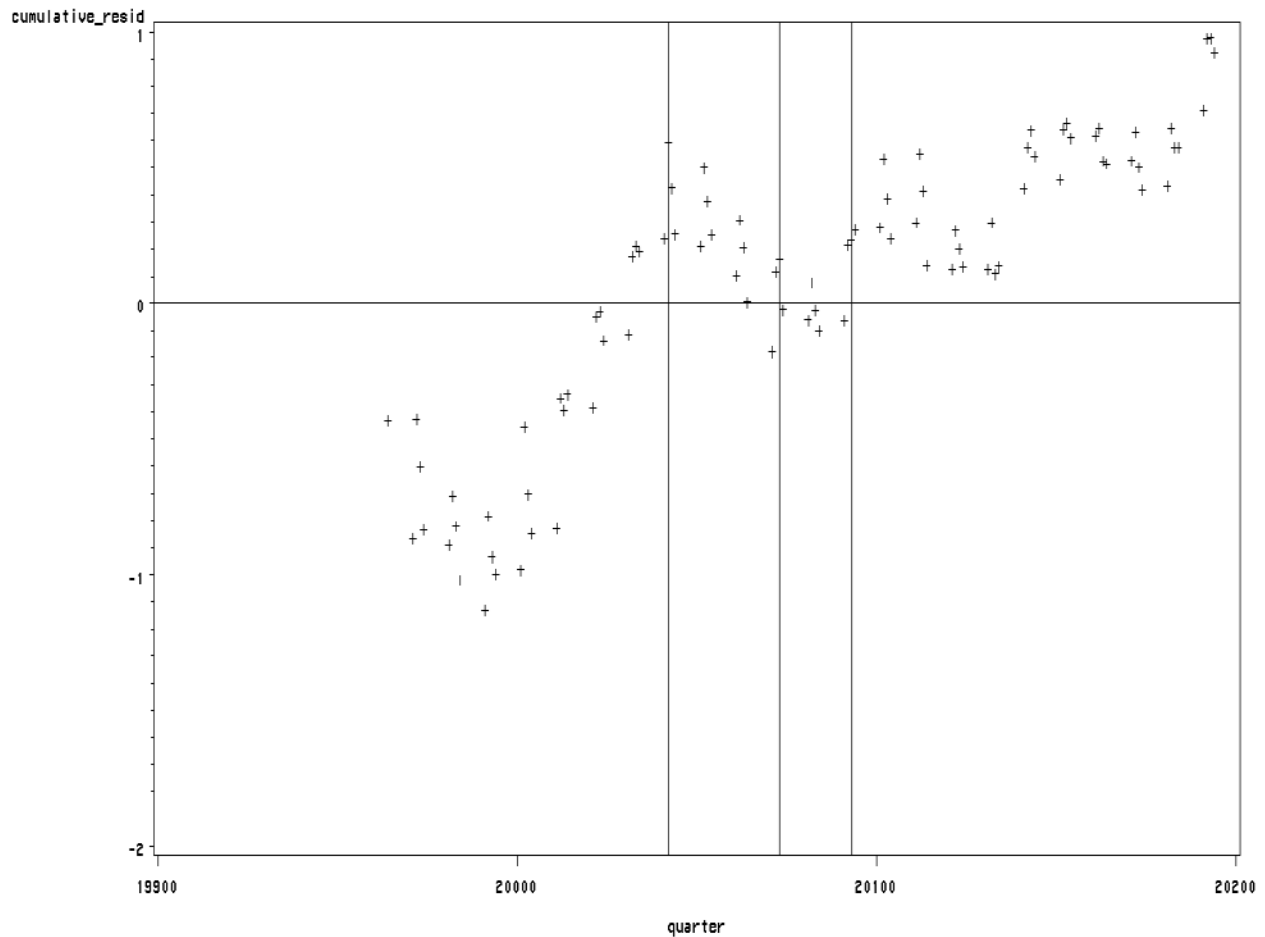


Exhibit 1. Cumulative Average Residuals plot - entire sample, no filters

This plot represents the behaviour of cumulative regression errors of the full sample. Each period error term is averaged across all companies in the sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis.

Cumulative Average Residuals: positive cash change

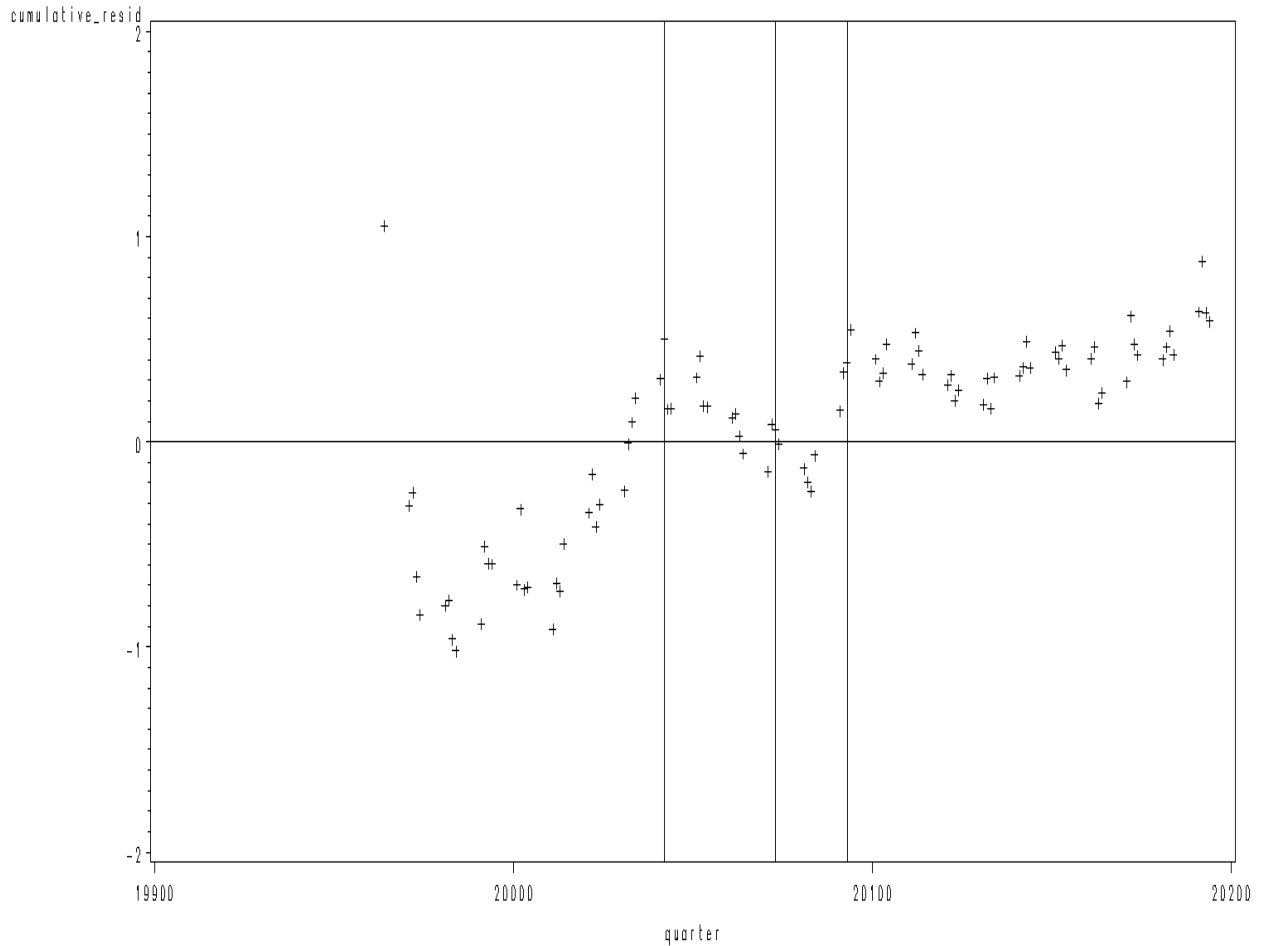


Exhibit 2. Cumulative Average Residuals plot - positive change in cash

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms with positive changes in cash holdings. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis.

Cumulative Average Residuals: negative cash change

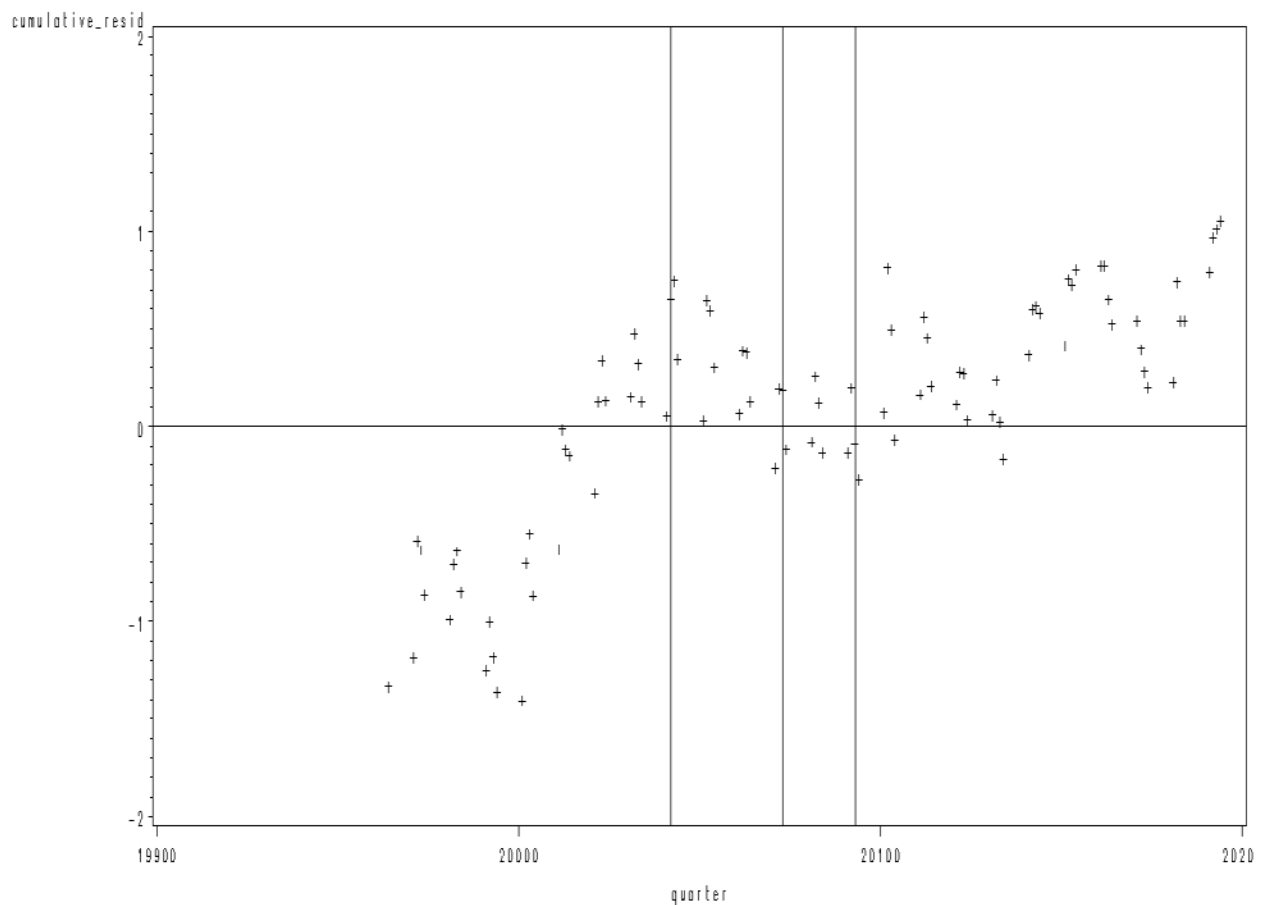


Exhibit 3: Cumulative Average Residuals plot - negative change in cash

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms with negative changes in cash holdings. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis.

Cumulative Average Residuals:dividend filter

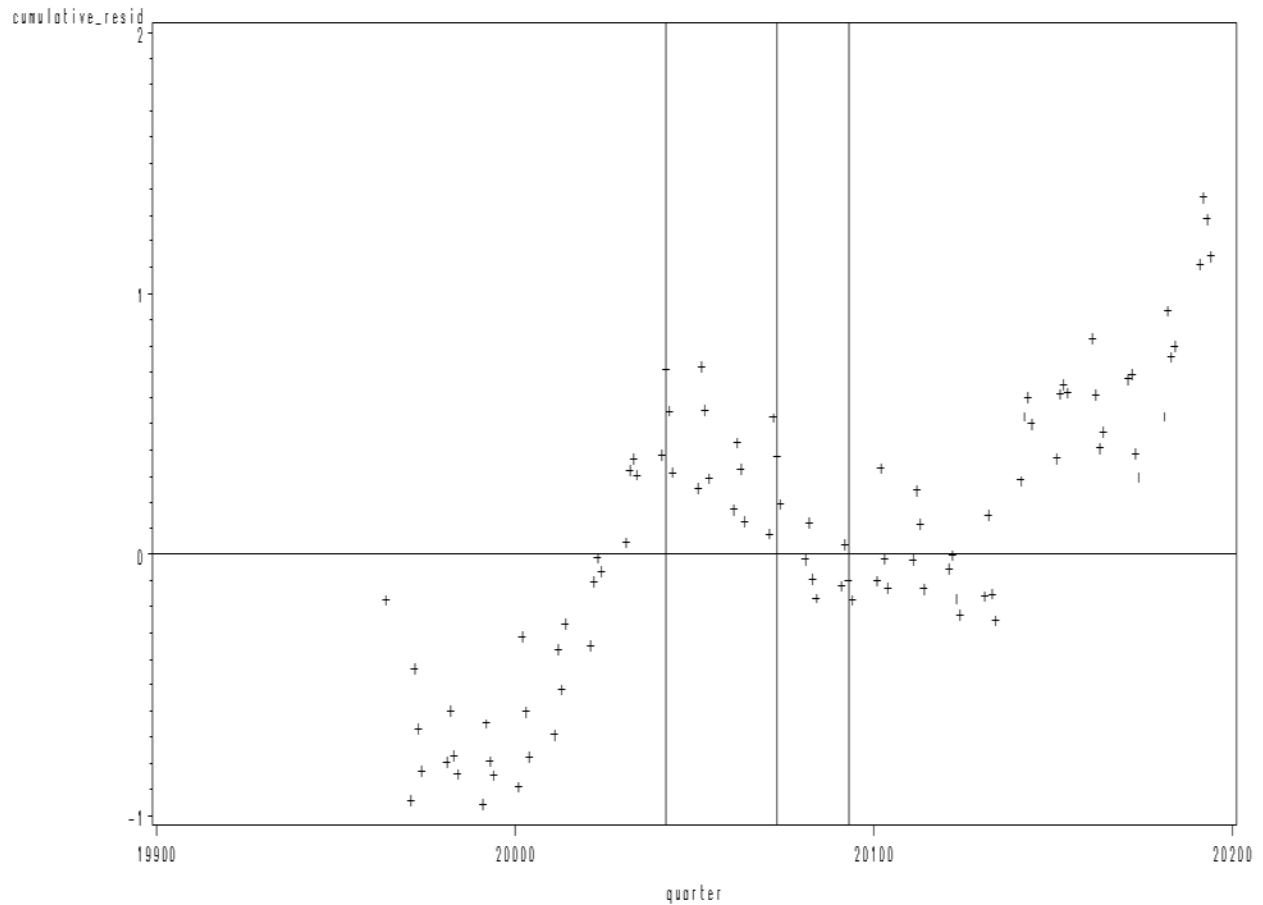


Exhibit 4: Cumulative Average Residuals plot - dividend filter

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms that did not cut dividends. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis.

Cumulative Average Residuals: top 25% ROA

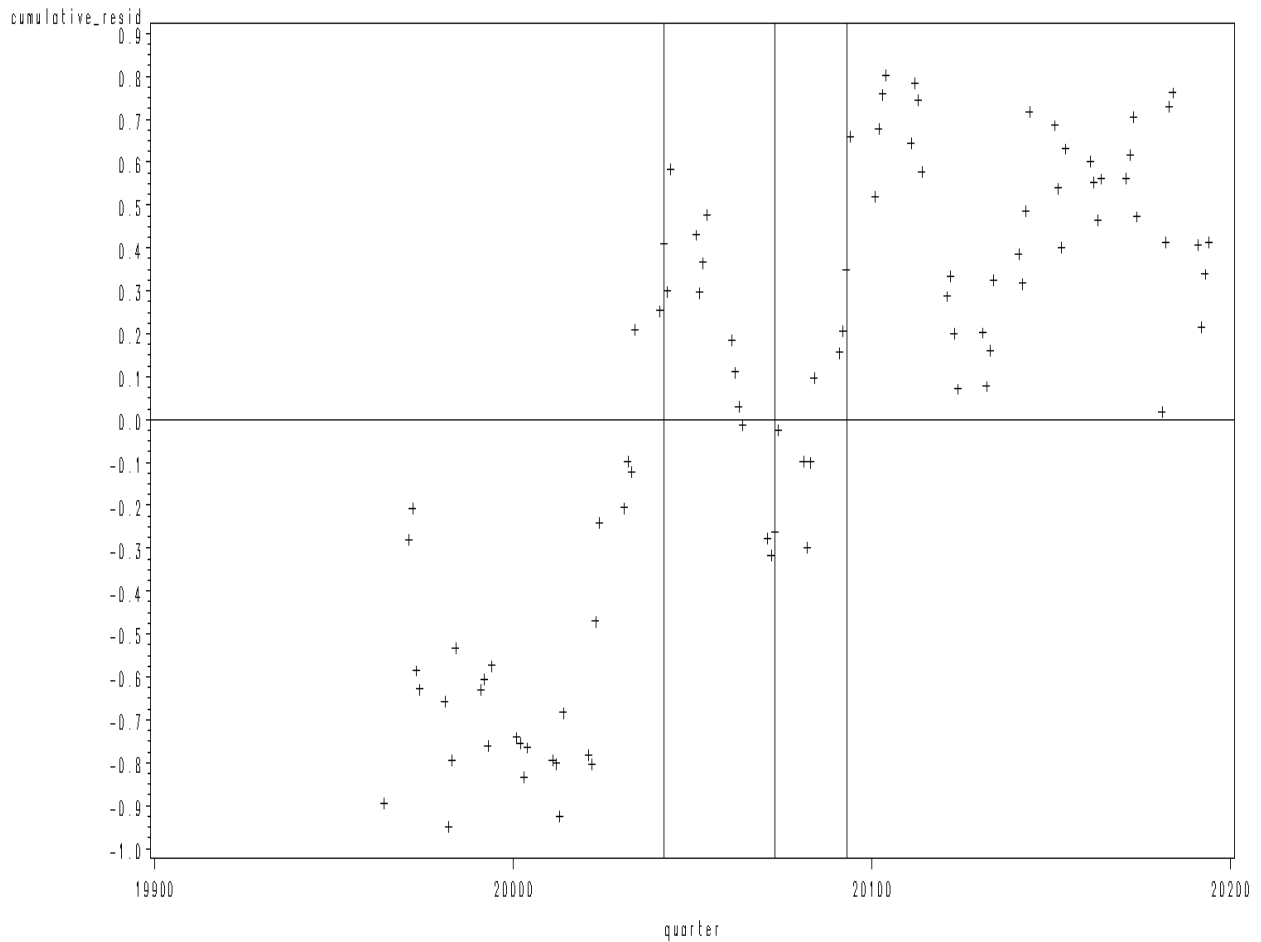


Exhibit 5: Cumulative Average Residuals plot - top 25% ROA companies filter

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms that belong to top 25% performers in the sample, as measured by ROA. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis.

Cumulative Average Residuals: 8 profit quarters

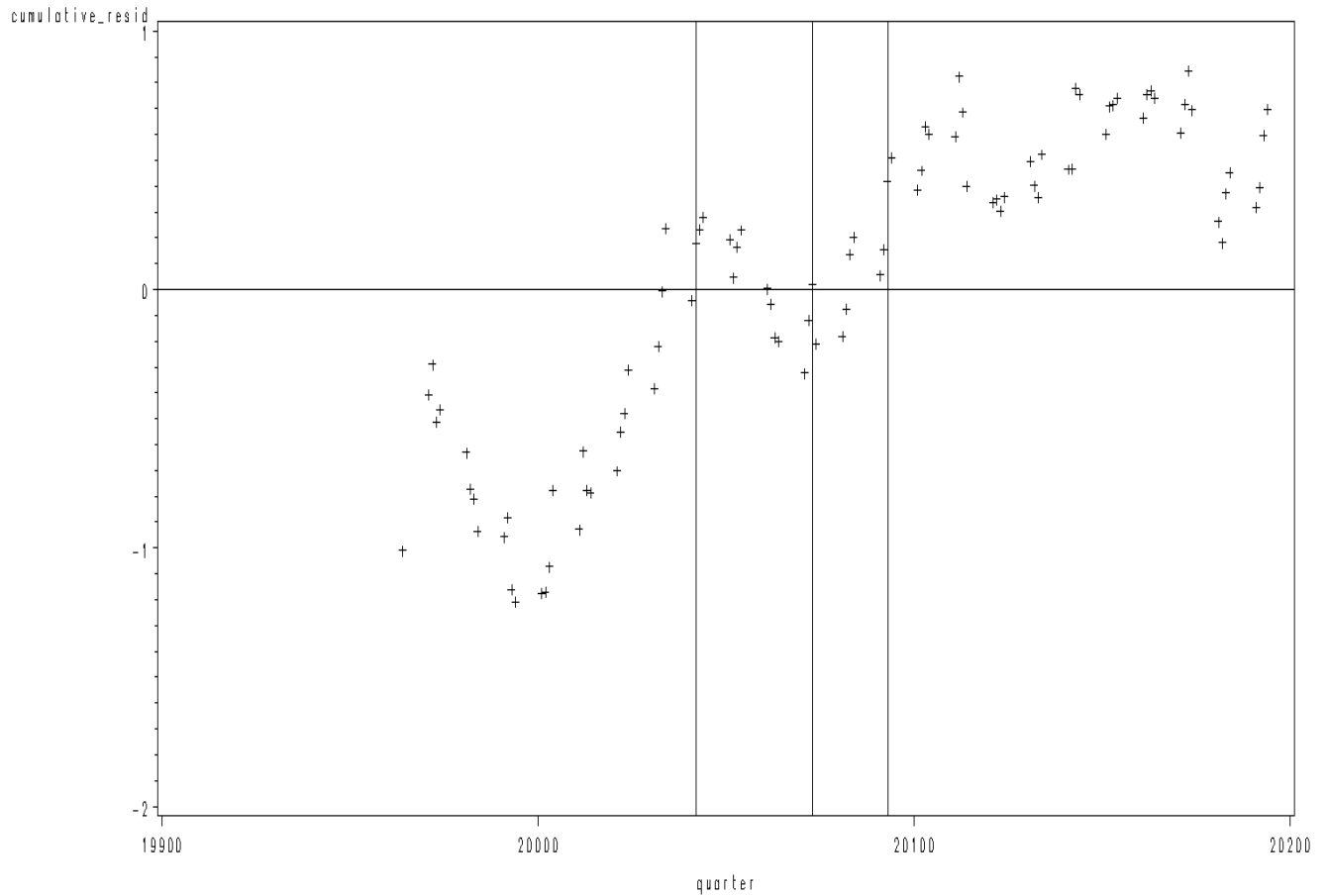


Exhibit 6: Cumulative Average Residuals plot - companies with 10 consecutive quarters of profitability filter.

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms with 10 consecutive profitable quarters. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis.

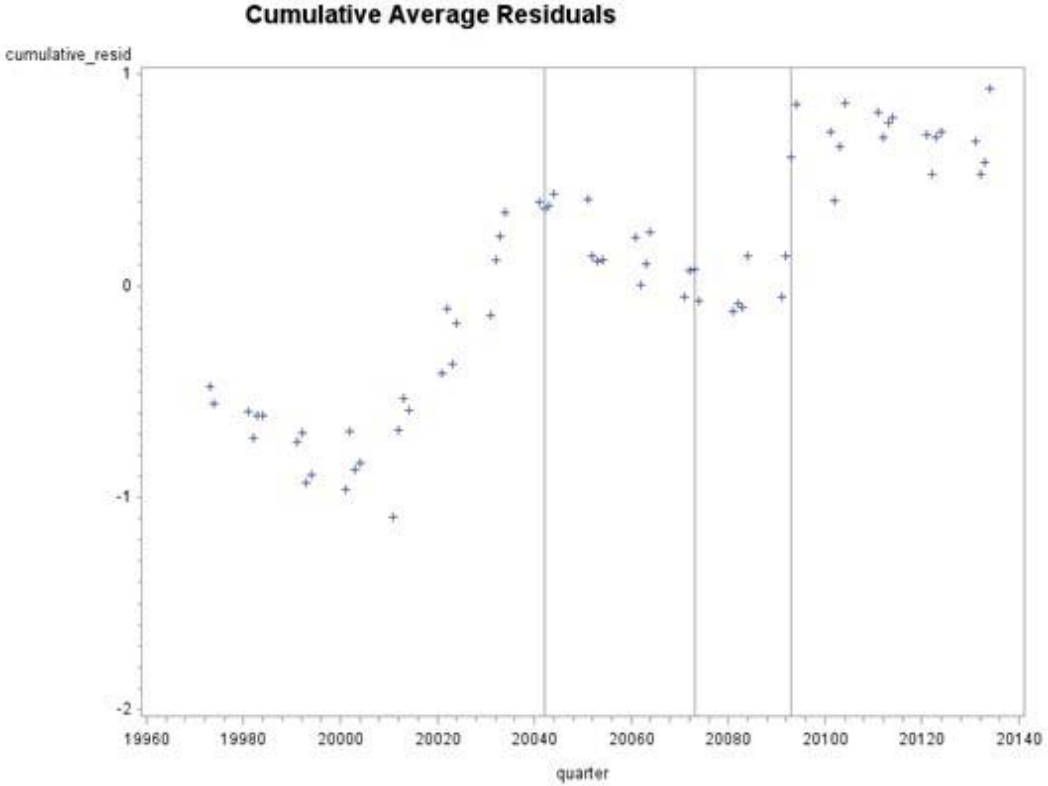


Exhibit 7-A: Cumulative Average Residuals plot - 3 filters combined (1997-2014).

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms that did not cut dividends, had 10 consecutive profitable quarters and belong to the top 25% performers in the sample. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis. The combination of Exhibit 7-A and 7-B is shown to highlight the sensitivity of the model to temporal size of the sample. Exhibit 7-A depicts a shorter sample, 1997-2014, while the plot in Exhibit 7-B covers a longer timeline 1997-2020.

Cumulative Average Residuals: 3 filters combined

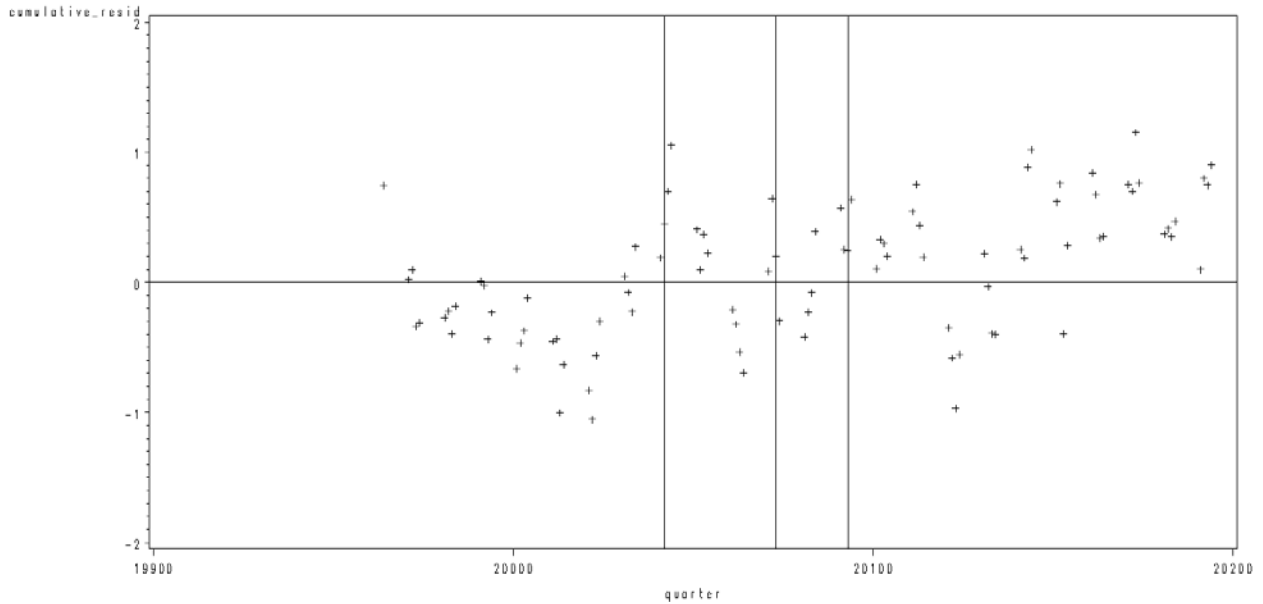


Exhibit 7-B: Cumulative Average Residuals plot - 3 filters combined (1997-2020).

This plot represents the behaviour of cumulative regression errors of the sub-sample of firms that did not cut dividends, had 10 consecutive profitable quarters and belong to the top 25% performers in the sample. Each period error term is averaged across all companies in the sub-sample and cumulative averages are plotted across the timeline. Horizontal (zero) line represents the border between excessive precautionary and speculative cash accumulations. The three vertical lines represent important dates: the beginning of the decline in speculative activity in anticipation of the 2008 crisis, the start and the end of the crisis. The combination of Exhibit 7-A and 7-B is shown to highlight the sensitivity of the model to temporal size of the sample. Exhibit 7-A depicts a shorter sample, 1997-2014, while the plot in Exhibit 7-B covers a longer timeline 1997-2019.

Definitions of variables

Variable	Description and calculation
Ratio of price per share to per cent change of cash and marketable securities	ratio of price per share (PRCCQ) to per cent change of cash and marketable securities $\{[(\text{CHEQ}/\text{LAG}(\text{CHEQ})-1)]*100\}$
Net assets	total assets (ATQ) minus cash and marketable securities (CHEQ)
Size (*)	Natural log of Total Assets (ATQ)
Net working capital to net assets(*)	current assets (ATQ) minus current liabilities (LCTQ) minus cash (CHEQ), divided by total assets (ATQ) net of cash (CHEQ)
Capital expenditures to net assets (*)	one fourth of annual capital expenditure (CAPXY) to net assets (ATQ-CHEQ). *This approximation was required due to lack of quarterly data for capital expenditures.
Total debt to total assets (**)	the ratio of the sum of short term debt (LCTQ) and long term debt (DLTTQ) to total assets (ATQ)
Research and development to sales ratio (*)	calculated as XRDQ/SALEQ
Market-to-book ratio (*)	market value is determined as a multiplication of shares of common stock outstanding (CSHOQ) by closing price per share (PRCCQ), divided by the book value, calculated as the sum of common equity (SEQQ) and deferred taxes (TXDITCQ) minus preferred equity (PSTKQ)
Tobin's Q	the ratio of {Total Assets (ATQ)+ Market Value (PRCCQ*CSHOQ) - Book Value (SEQQ+TXDITCQ-PSTKQ)} to Total Assets (ATQ)
Share repurchases	calculated relative to total shares outstanding (CSHOPQ/CSHOQ), and Common Shares Issued (CSHIQ)
Long Term Debt Issuance	(DLTISY)
Financing Activities Net Cash Flow (FINCFY) (*)	normalized by Total Assets (ATQ)
Acquisitions (AQCY)	normalized by Total Assets (ATQ)
Long Debt Repurchases (DLTRY)	normalized by Total Assets (ATQ)
Cash flow to net assets(*)	dividing the sum of net income before taxes (PIQ), depreciation (DPQ) and total interest (XINTQ), by net assets (ATQ-CHEQ)
Industry sigma	rolling industry average of the standard deviation of cash flows to net assets based on 5 years of quarterly date for each roll
Confidence Index	the spread between Moody's yield on seasoned corporate bonds - all industries, BAA and Moody's yield on seasoned corporate bonds - all industries, AAA
Accounts Receivables - to - Sales ratio (*)	
Dividend dummy	as "1" if dividend was paid during a quarter, and "0" otherwise
Industry dummy	based on Fama and French (1997) 12 industries classification excluding the financial sector and the utilities sector
Crisis dummy	set to "1" for each quarter between 2007Q:3 and 2009Q:2, and "0" otherwise

(*) - variable winsorized within (1,99) interval; (**) restricted to (0,1) interval

Fama and French Industry definitions

(Source: K. French website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

1 Consumer Non-Durables -- Food, Tobacco, Textiles, Apparel, Leather, Toys

0100-0999

2000-2399

2700-2749

2770-2799

3100-3199

3940-3989

2 Consumer Durables -- Cars, TV's, Furniture, Household Appliances

2500-2519

2590-2599

3630-3659

3710-3711

3714-3714

3716-3716

3750-3751

3792-3792

3900-3939

3990-3999

3 Manufacturing -- Machinery, Trucks, Planes, Off Furn, Paper, Com Printing

2520-2589

2600-2699

2750-2769

3000-3099

3200-3569

3580-3629

3700-3709

3712-3713

3715-3715

3717-3749

3752-3791

3793-3799

3830-3839

3860-3899

4 Energy, Oil, Gas, and Coal Extraction and Products

1200-1399

2900-2999

5 Chemicals and Allied Products

2800-2829

2840-2899

6 Business Equipment -- Computers, Software, and Electronic Equipment

3570-3579

3660-3692

3694-3699

3810-3829

7370-7379

7 Telephone and Television Transmission

4800-4899

8 Utilities

4900-4949

9 Shops Wholesale, Retail, and Some Services (Laundries, Repair Shops)

5000-5999

7200-7299

7600-7699

10 Healthcare, Medical Equipment, and Drugs

2830-2839

3693-3693

3840-3859

8000-8099

11 Money Finance

6000-6999

12 Other - Mines, Construction, Building Materials, Transportation, Hotels, Business Services, Entertainment

Industry	Distinct companies
Consumer Non-Durables	262
Consumer Durables	245
Manufacturing	880
Energy, Oil, Gas	118
Chemicals and Allied Products	229
Business Equipment	2632
Telephone and Television Transmission	162
Shops Wholesale, Retail	127
Healthcare, Medical Equipment, and Drugs	1602
Other	405

Total number of distinct companies (GVKEY) in the sample in each of Fama & French defined industries over the overall sample period.

ADDENDUM 1

High Tech vs Non High Tech Firms

3-Digit SIC	Industry
<i>Panel A: High-tech firms (HT)</i>	
283	Drugs
355	Special Industry Machinery
357	Computer and Office Equipment
362	Electrical Industrial Apparatus
363	Household Appliances
364	Electric Lighting and Wiring Equipment
365	Household Audio and Video Equipment
366	Communications Equipment
367	Electronic Components and Accessories
369	Misc. Electrical Equipment and Supplies
382	Measuring and Controlling Devices
481	Telephone Communications
489	Communications Services, NEC
573	Radio, TV, and Electronic Stores
737	Computer and Data Processing Services

Cash and Short Term Investments Excluding Financials and Utilities

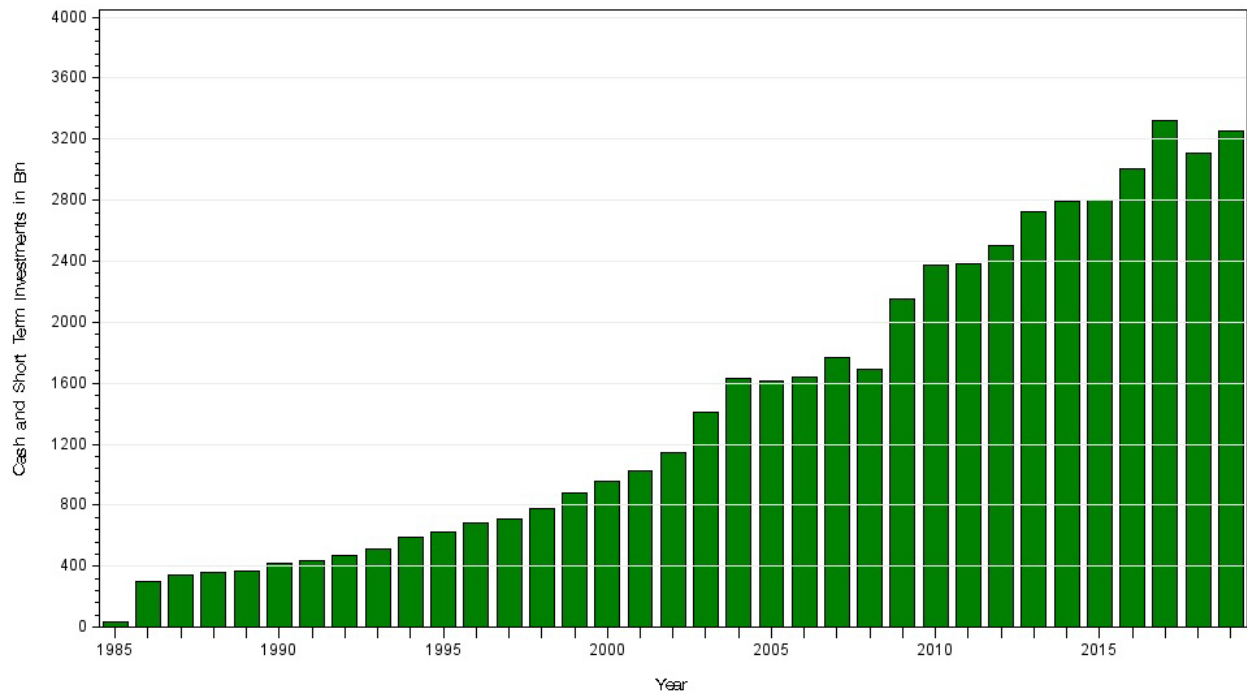


Exhibit A-1: Cash and Short Term Investments 1986-2020 Total Sample, Excluding Financials and Utilities (Source: COMPUSTAT)

Cash and Short Term Investments: Tech Companies

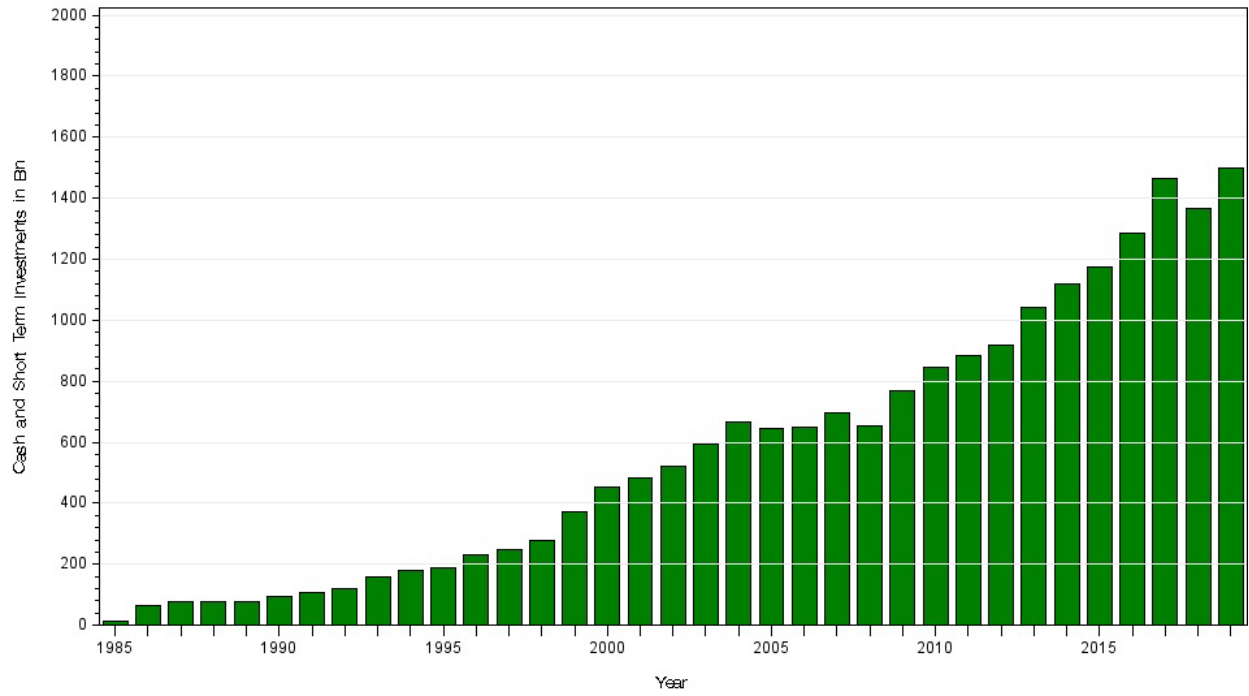


Exhibit A-2: Cash and Short Term Investments 1986-2020 High-Tech Companies

(Source: COMPUSTAT)

Cash and Short Term Investments: Non-Tech Companies

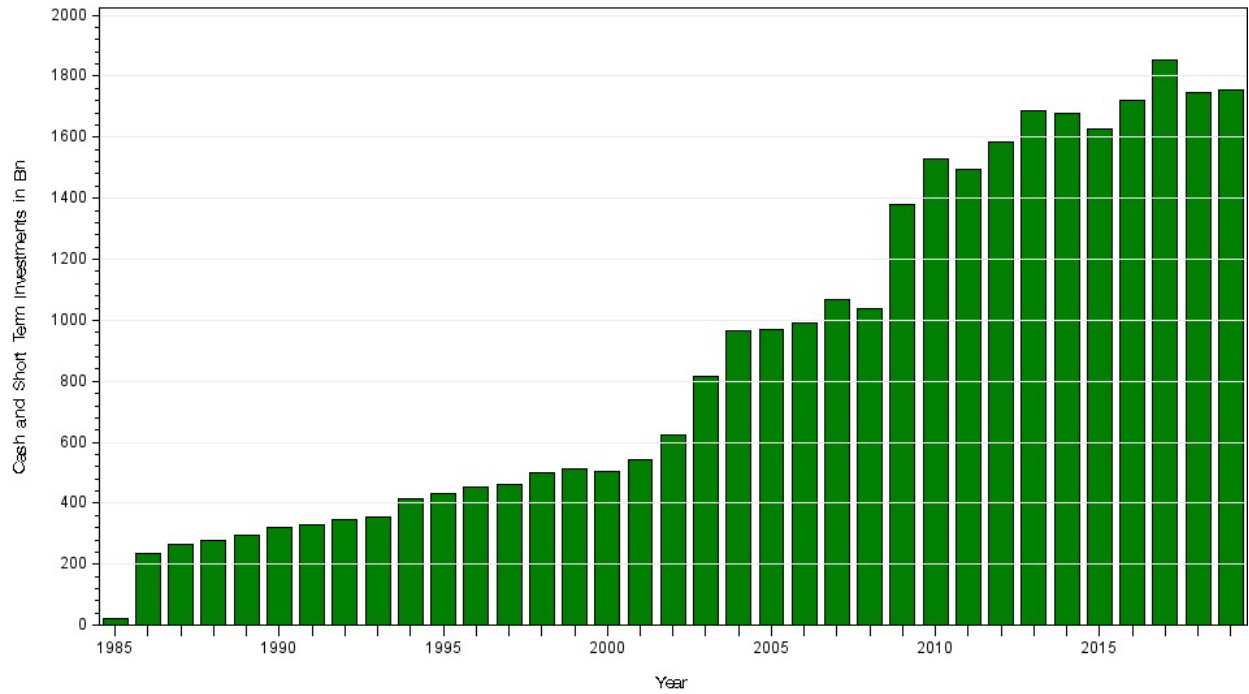
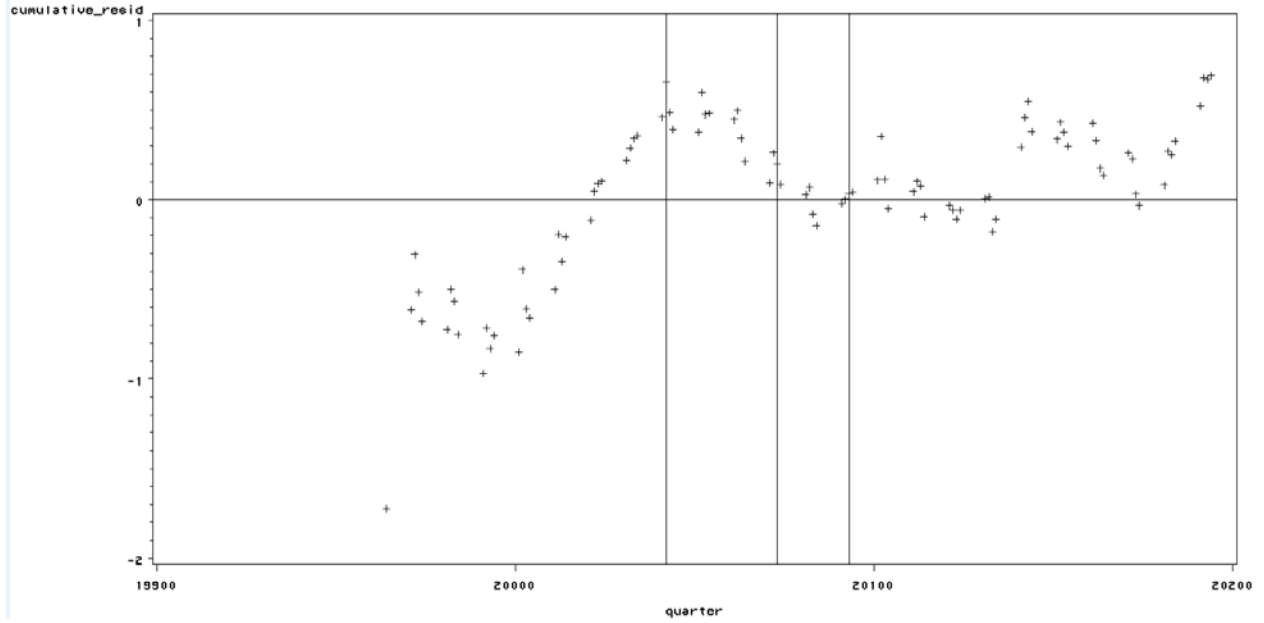


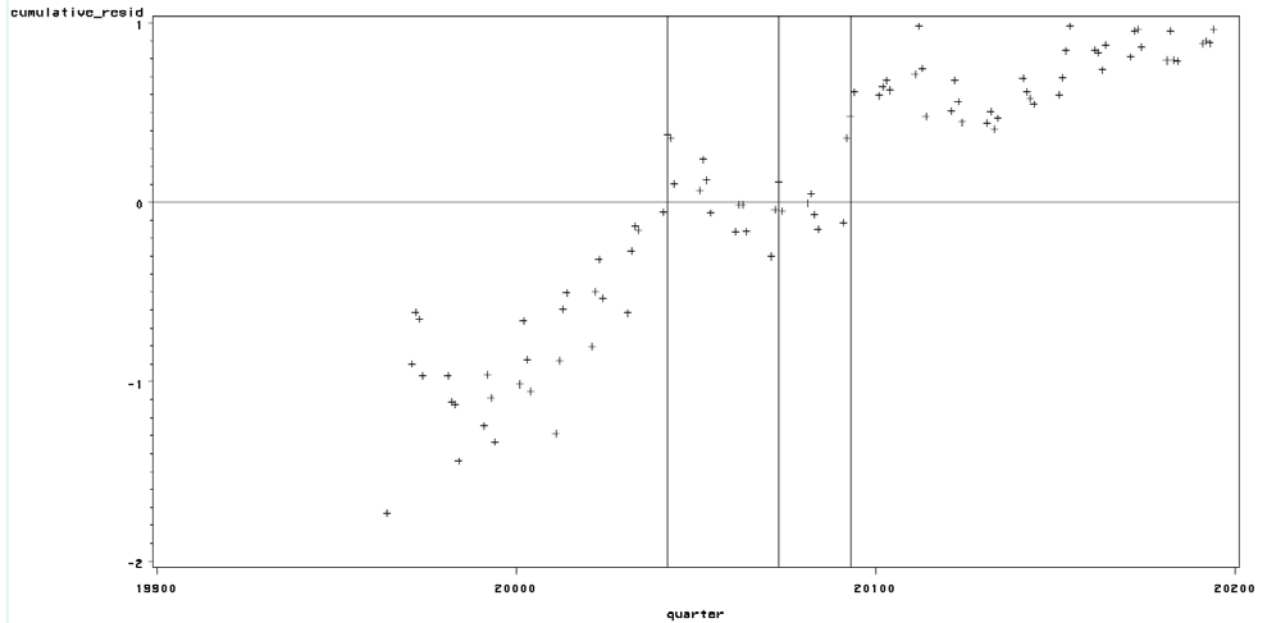
Exhibit A-3: Cash and Short Term Investments 1986-2020 Non High-Tech Companies (Source: COMPUSTAT)

**Exhibit A-4: Cumulative Average Model Residuals and Regression Results,
High-Tech and Non High-Tech Companies**

Cumulative Average Residuals: Hi-Tech companies



Cumulative Average Residuals: Non Hi-Tech companies



Hi Tech Companies

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	21	62677	2984.61570	1877.13	<.0001
Error	51072	81204	1.58999		
Corrected Total	51093	143881			

Root MSE	1.26095	R-Square	0.4356
Dependent Mean	-1.10756	Adj R-Sq	0.4354
Coeff Var	-113.84918		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-0.00901	0.02431	-0.37	0.7108
p_to_cash_ch	1	0.00541	0.00071404	7.58	<.0001
conf_index	1	0.01282	0.01352	0.95	0.3430
tobin_q	1	0.00255	0.00141	1.81	0.0708
market_to_book	1	0.02652	0.00073698	35.99	<.0001
LN_TOA	1	-0.07143	0.00267	-26.72	<.0001
cflow_to_na	1	-0.31116	0.02012	-15.46	<.0001
nwc_total_assets_1	1	-1.09174	0.01390	-78.54	<.0001
TOTAL_LEVERAGE	1	-2.96999	0.03182	-93.35	<.0001
CAPITAL_EXP_TO_NA	1	7.57100	0.33150	22.84	<.0001
RD_TO_SALES	1	0.00818	0.00073180	11.18	<.0001
sigma_industry	1	0.06567	0.01911	3.44	0.0006
div_dummy	1	-0.07464	0.01384	-5.39	<.0001
cshopq1	1	1.37292	0.79018	1.74	0.0823
cshiq1	1	-0.01519	0.00089421	-16.98	<.0001
dltisy1	1	0.59102	0.05811	10.17	<.0001
rec_to_sales	1	0.00008612	0.00005623	1.53	0.1256
fincfy1	1	0.48363	0.02806	17.24	<.0001
aqcy1	1	-2.06535	0.09136	-22.61	<.0001
dltry1	1	-1.30398	0.06487	-20.10	<.0001
ivchy1	1	1.02309	0.03517	29.09	<.0001
crisis_dum	1	0.01265	0.02069	0.61	0.5410

Durbin-Watson D	1.918
Number of Observations	51094

Non Hi-Tech Companies

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	21	32392	1542.46612	830.31	<.0001
Error	32573	60511	1.85770		
Corrected Total	32594	92903			

Root MSE	1.36297	R-Square	0.3487
Dependent Mean	-2.30625	Adj R-Sq	0.3482
Coeff Var	-59.09910		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	-0.49368	0.03469	-14.23	<.0001
p_to_cash_ch	1	0.00764	0.00099361	7.69	<.0001
conf_index	1	0.04432	0.01842	2.41	0.0162
tobin_q	1	0.00329	0.00189	1.74	0.0814
market_to_book	1	0.03162	0.00112	28.17	<.0001
LN_TOA	1	-0.10765	0.00316	-34.10	<.0001
cflow_to_na	1	-0.63016	0.03933	-16.02	<.0001
nwc_total_assets_1	1	-1.16963	0.02735	-42.76	<.0001
TOTAL_LEVERAGE	1	-3.07607	0.04611	-66.71	<.0001
CAPITAL_EXP_TO_NA	1	4.19088	0.53025	7.90	<.0001
RD_TO_SALES	1	0.00118	0.00216	0.55	0.5837
sigma_industry	1	0.09409	0.02560	3.68	0.0002
div_dummy	1	-0.18275	0.01905	-9.59	<.0001
cshopq1	1	12.43255	4.04849	3.07	0.0021
cshiq1	1	-0.00621	0.00049776	-12.48	<.0001
dltisy1	1	0.28718	0.09522	3.02	0.0026
rec_to_sales	1	-0.00101	0.00055786	-1.81	0.0703
fincfy1	1	0.70940	0.04517	15.70	<.0001
aqcy1	1	-2.16975	0.13333	-16.27	<.0001
dltry1	1	-1.08155	0.09871	-10.96	<.0001
ivchy1	1	1.12387	0.07040	15.96	<.0001
crisis_dum	1	-0.00694	0.02687	-0.26	0.7963

Durbin-Watson D	1.882
Number of Observations	32595