

# **The Impact of Cash Holdings on Firm's Financial Performance: Evidence from Listed Companies in the US.**



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## Abstract

In recent times companies worldwide considerably increased cash holdings. This thesis investigates the impact of corporate cash holdings on firms' financial performance among listed companies of the United States. The study examines whether excess cash has a negative impact or positive impact on firms performance ROA and ROE. It also investigates whether the relationship is linear or non linear. The thesis uses a balanced panel dataset of 100 non financial US listed firms over the period of 2015 to 2024, therefore total 1000 observations.

To measure the firm's performance, the study uses financial ratios of companies which includes Return on Assets (ROA), Return on Equity (ROE). Whereas Cash Ratio is used as key explanatory variables. The relationships between Cash Ratio and ROA, ROE are investigated using regression analysis including random effects and fixed effects model, quadratic specifications and first difference estimators. The Hausman test supports fixed effects model for unbiased estimation.

The empirical findings from panel regression analysis show a negative and significant relationship between cash holdings and both ROA, ROE in linear models. Which suggests that excess cash leads to lower ROA and shareholder returns. On the other hand, quadratic regressions find a non linear relationship between cash holdings and ROE which indicates a U shaped effect. Which means firms performance decreases while cash increases after certain point performance increases with cash increases. While no non linear effects observed for ROA. Furthermore, first difference estimations show the same negative linear relationships between cash holdings and firms performance like fixed effects models. Overall the findings support agency theory and free cash flow hypothesis, which highlights excessive cash leads inefficiencies and as a result firms performance decreases.

## **Preface**

The master thesis is submitted to fulfill the prerequisites of MSc Economics and Business Administration with a specialization in Finance at Aalborg University.

The main focus of this thesis is to find out the impact of cash holdings on firm's financial performance of US listed companies. The topic was chosen due to strong interest in corporate finance and recent increases of liquidity management among firms.

I would express my sincere gratitude to my supervisor, Douglas Eduardo Turatti, for providing continuous guidance and valuable insights on my research. Without his guidance and valuable feedback, this thesis would have been harder to complete. I also express my gratitude to Aalborg University Business School for providing access to academic resources and database that made this research possible.

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## 1.0 Introduction

Why do firms hold large amounts of cash? A popular explanation is that cash provides low cost financing for firms (Ozkan and Ozkan 2004). They also said managers trying to minimize the costs associated with external financing in imperfect capital markets may find it optimal to maintain sufficient internal financial flexibility. In recent decades, corporate liquidity management has become an important discussion in corporate finance.

Companies worldwide have considerably increased their cash holdings over the past two decades (Amess, et al., 2015). A recent report by Deloitte stated that “The top 1000 non-financial companies globally are holding \$2.8 trillion in cash. Firms hold cash when cash flow needed for investment is low and when outside capital is costly (Amess, et al., 2015). Hence, it is in line with the claim made by Myers and Majluf (1984) that businesses with more significant information asymmetry problems are more likely to secure "financial slack" in order to avoid having to raise outside capital. According to Amess, et al., (2015) Large cash holdings are not a phenomenon limited to firms located in the US. International studies also report that public firms around the world hold substantial cash on their balance sheets and present evidence consistent with the precautionary motive. For example, Ferreira and Vilela (2004) find that corporations in Continental Europe at the beginning of the 2000s held 15% of their total assets in cash and cash equivalents. Similarly, Ozkan and Ozkan (2004) examine cash holdings of UK firms and find a positive relation with firms' growth opportunities and a negative relation with bank debt but also report significant effects arising from firms' ownership structure.

Considerable attention is paid to the large cash holdings of American firms. According to a CNBC business report (22nd June 2011) due to the credit crisis, weak demand and a lack of incentives from the Obama Administration US companies are holding a record amount of cash. The sum of cash holdings by all US firms alone is estimated by Forbes (1st January 2014) to be \$5 trillion. From the 1990s to 2000s, the cash holdings of US firms more than doubled to about 13% of firms total assets, amounting to 10% of annual US GDP (Dittmar & Mahrt-Smith, 2007). In addition, Bates, Kahle, and Stulz (2009) report cash holdings increasing by 0.46% per annum over the 1980–2006 period, suggesting a long-term structural shift in liquidity management practices. Pinkowitz et al., 2015

There are two main benefits from holding liquid assets (Opler et al., 1999). First, the firm saves transaction costs to raise funds and does not have to liquidate assets to make payments. Second, the firm can use the liquid assets to finance its activities and investments if other sources of funding are not available or are excessively costly. Keynes (1936) describes the first benefit as the transaction cost motive for holding cash, and the second one as the precautionary motive. These benefits are motivating firms to stock cash.

However, there are also potential adverse effects of cash holdings. Central to this view is the argument that agency conflicts existing between shareholders and managers can be most severe when firms have large free cash flows (Jensen, 1986). Managers can pursue their own interests at the expense of shareholders and cash serves the interests of managers more than those of shareholders in this respect (Ozkan and Ozkan 2004).

This thesis attempts to a deeper comprehension of the Cash Holding and Firm's financial performance link as well as practical advice for practitioners, including investors and companies.

## **1.1 Problem Discussion**

In corporate finance, one of the most debated questions is the role of cash holding in influencing firms financial performance. Firms hold cash for many reasons such as finance investments, to protect from unexpected shocks, meet short term obligations. But is Cash Holding really better for Firms Financial Performance, especially in the US listed firms?

The problem becomes especially significant in the context of US listed Firms, because they are in a highly competitive and dynamic market. Over the past two decades, cash holdings of US firms has increased a lot which is raising concerns among investors and policymakers about whether firms are managing their liquidity efficiently (Bates, Kahle, & Stulz, 2009). Some studies argue that holding excess cash enhances flexibility of financial investment and supports long-term growth (Almeida, Campello, & Weisbach, 2004), while others suggest that it can lead to managerial inefficiencies and agency problems (Dittmar & Mahrt-Smith, 2007).

## 1.2 Research Question

Considering the aforementioned, the objective of this thesis is to provide insight into the relationship between Cash Holdings and Firms Financial Performance of US listed companies.

As a result, the following main research question has been formulated:

**How do cash holdings influence firms' financial performance among listed companies in the United States?**

### Supporting Questions:

Is the relationship between cash holdings and firm performance positive or negative?

Is the relationship between cash holdings and firm performance (ROA & ROE) linear or non-linear?

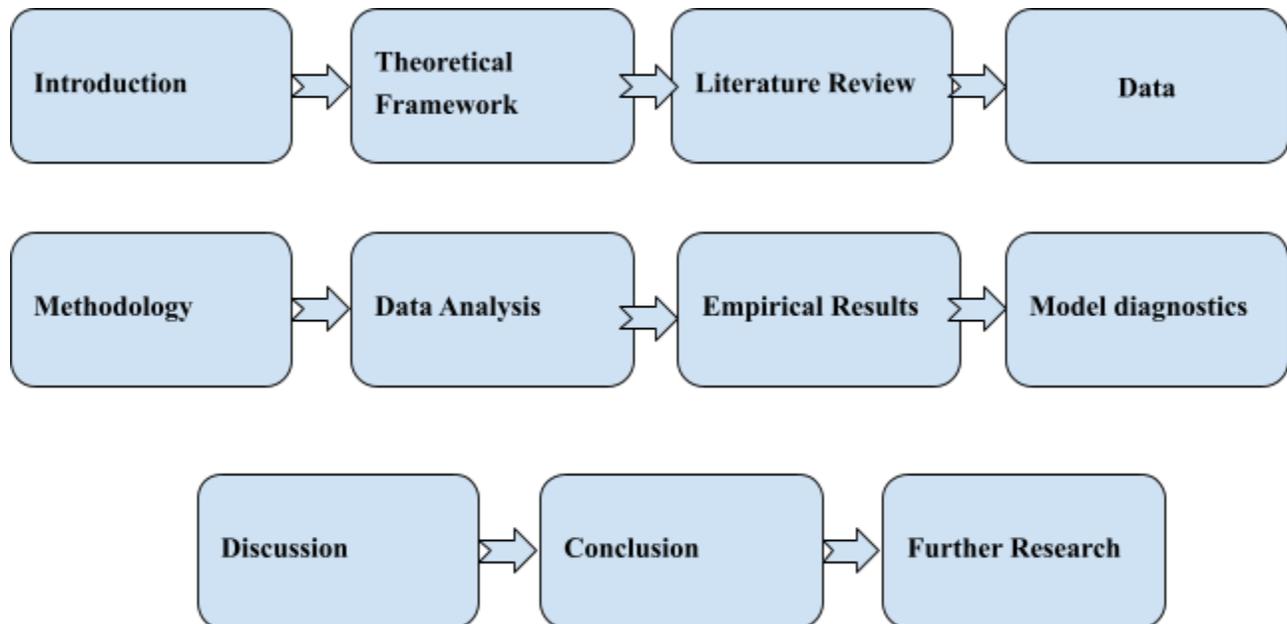
## 1.3 Background of Cash Holdings

Cash holdings of a company are liquid funds which are easily convertible to cash for using in crisis periods (Gill & Shah, 2012). The purpose of holding cash are transaction, precautionary and speculative which serves day to day operations, paying taxes, dividends and interests as well as fulfilling needs of cash in uncertain periods and investing in profitable projects (Banjade & David 2022). They added cash balances sometimes remain idle which represents and inefficiency but shortage of cash maybe costly due to loosing investment opportunities or borrowing with higher interest rates. According to Banjade & David (2022) firms hold optimal amounts of cash to invest profitable opportunities which can come suddenly. On the other hand excess amount of cash is that amount which firms hold after paying all financial obligations.

Further Banjade & David states that firms hold cash to pay expenditures, reward investors and business growth (2022). They mentioned that sufficient cash are good for utilizing growth opportunities which will improve firms performance. But holding an extreme amount of cash is harmful for the cost of capital as well as business risk. A study by Amess, et al., (2015) shows that cash holdings considerably increased in the past two decades. Han and Qiu (2007) discuss

financially constrained firms are not able to make any additional future investment without reducing current investments because they are already finished with external financing resources. Therefore these types of firms can invest more in the future by holding cash.

### 1.3 Thesis Structure



## 2.0 Theoretical Framework

### 2.1 Agency Theory

Agency Theory, originally developed by Jensen and Meckling (1976), explains the conflicts of interest that arise when the ownership and control of a firm are separated. Agency theory revolves around the issue of the agency problem and its solution (Jensen & Meckling, 1976; Ross, 1973). The central idea of the theory is that conflicts of interest may arise because managers may pursue their own objectives rather than those that maximize shareholder value (Jensen & Meckling, 1976). Agency theory discusses the problems that surface in the firms due to the separation of owners and managers and emphasises on the reduction of this problem (Panda & Lipsa 2017). They said this theory helps in implementing the various governance mechanisms to control the agents' action in the jointly held corporations. The joint stock company usually set ownership by individuals or groups as per stock exchange regulations, and shareholders give the authority to the managers (agents) to run the business on their behalf (Jensen & Meckling, 1976; Ross, 1973), but the major issue is whether these managers are performing for the owners or themselves.

According to Panda & Lipsa in 2017 agency relationship is a kind of contract between the principal and agent where principal is shareholders and agent is manager. And in this contract both the parties are focused on their self interest which actually creates agency conflicts. For minimizing these issues, principals implement various monitoring activities so that they can control agents activities as well as to control the agency cost. In the principal agent contract, the incentive structure, labour market and information asymmetry plays a crucial role and these elements helped in building the theory of ownership structure (Panda & Lipsa 2017).

Although agency theory is very pragmatic and popular, it still suffers from various limitations and this has been documented by many authors like Eisenhardt (1989), Shleifer and Vishny (1997) and Daily et al. (2003). The theory assumes a contractual agreement between the principal and agent for a limited or unlimited future period, where the future is uncertain (Panda & Lipsa 2017). The theory assumes that contracting can eliminate the agency problem, but

practically it faces many hindrances like information asymmetry, rationality, fraud and transaction cost described by Panda & Lipsa (2017)

When cash accumulates beyond what is necessary for operational and precautionary purposes, it can intensify agency problems because it provides managers with greater opportunity to engage in inefficient or self-interested behavior (Dittmar & Mahrt-Smith, 2007; Harford, 1999). Therefore, Agency Theory predicts that excess cash holdings can have a detrimental effect on firm performance. So, the theory suggests an expectation of a negative relationship between cash holdings and firm performance measures, including return on assets (ROA) and return on equity (ROE).

## **2.2 Free Cash Flow Hypothesis**

The free cash flow hypothesis advanced by Jensen (1986) states that managers who proceed with free cash flow will invest it in negative net present value (NPV) projects rather than pay it out to shareholders. Jensen identifies free cash flow as cash flow which is available after the firm has invested in all available positive NPV projects. According to Jensen (1986) this available cash should be distributed to shareholders as a dividend. However, managers usually prefer to retain these funds so that resources under their control increases and their corporate decision making ability increases.

Harford (1999) finds in his study that cash rich firms are more aggressive to undertake acquisitions which are value decreasing, supporting the view that excess liquidity can create agency related problems. In addition, Richardson mentioned (2006) that companies tend to invest too much when they have excess cash on hand, especially when they don't have better growth opportunities in the future. Firms with poor corporate governance might face negative results due to excess cash holdings (Dittmar and Mahrt-Smith 2007). They mentioned, because poor governance firms might face value losses when they maintain large cash holding.

Many researcher's empirical studies provide support for this hypothesis. For instance, Dittmar and Mahrt-Smith (2007) show that firms with poor corporate governance waste cash quickly in ways that significantly reduce operating performance and firm value. They also find that the

value of a dollar of cash is substantially less if a firm has poor corporate governance. \$1.00 of cash in a poorly governed firm is valued at only \$0.42 to \$0.88 whereas good governance approximately doubles this value stated by (Dittmar and Mahrt-Smith 2007)

Free Cash Flow Hypothesis predicts that high levels of cash specially with weak corporate governance results in reductions in firm's financial performance and shareholder returns. Therefore the hypothesis suggests an expected negative relation between cash holdings and firm performance, such as return on assets (ROA) and return on equity (ROE). Because managers might divert excess funds toward unproductive or projects earning low returns or negative returns.

### **2.3 Trade-Off Theory**

The Trade Off Theory evolved from the work of Modigliani and Miller (1958, 1963), who demonstrated that while capital structure is irrelevant in a world without frictions, the presence of taxes, bankruptcy costs, and agency conflicts makes financing decisions economically meaningful. The introduction of corporate taxes highlighted the advantage of debt financing because interest payments are tax deductible, creating a tax shield that increases firm value (Modigliani & Miller, 1963).

The trade-off theory (Miller, 1977; Miller and Modigliani, 1963; Myers 2001) predicts that there is an optimal level of capital structure for each firm derived from the tax benefits of debt and the financial distress costs that it creates. According to the trade-off theory, the manager should choose the debt ratio that maximizes firm value (Brealey and Myers, 2003). In addition, according to Myers (2001) debt offers firm a tax shield. The advantage is because the interest of debt is deductible before paying taxes, stated by Modigliani and Miller in 1963. This means, among other things, that the tax advantages of debt financing are somewhat greater than we originally suggested (Modigliani and Miller, 1963). So firms increase the level of debt in order to gain the maximum tax benefit but at the other side they increase the risk of a possible bankruptcy (Cekrezi 2013).

According to Opler et al (1999), holding cash minimizes financial distress during crisis period as well as transaction costs of external financing. They also mentioned that holding cash allows firms to undertake valuable investment opportunities promptly. These benefits are important for firms when they operate in a market where financing cost is very high or the market is very uncertain (Ferreira & Vilela, 2004). They also mentioned disadvantages of cash holdings such as low returns of idle cash, agency problems or inefficient spending. Therefore, beyond a certain point the disadvantages of holding additional cash exceeds its advantages (Ferreira & Vilela, 2004).

Excessive cash holdings is the reason for lower profitability, including reductions in return on assets (ROA) and return on equity (ROE), as firms move beyond their optimal liquidity levels and incur the costs of holding unproductive or inefficiently utilized cash balances.

Trade-Off Theory suggests that the relationship between cash holdings and financial performance may be non-linear. An optimal level of cash might increase profitability by taking advantage of valuable investment opportunities. However, excess cash may reduce profitability as a result ROA and ROE might decrease. This is because firms hold liquidity beyond their optimal levels which is the reason for unproductive and inefficient cash balances.

### **3.0 Literature Review**

The relationship between corporate cash holdings and firm financial performance (ex: ROA, ROE) has been a hugely studied topic in corporate finance. But findings are not always similar, some studies find positive relationships, some find negative relationships and fewer find non linear relationships. This section presents some empirical studies that have explored why firms hold cash, how cash holdings impact on profitability, and what is the relationship between cash holdings and financial performance.

### **3.1 Determinants of Corporate Cash Holdings**

John Maynard Keynes (1936), identified three motives for holding cash, firstly the transactional motive, secondly the precautionary motive, and thirdly the speculative motive. Recent studies build foundation on these ideas and stating that companies reserve cash so that they can face financial constrained situations very well, and make sure they have funds to invest when the capital markets aren't perfect. (Almeida, Campello & Weisbach, 2004).

Usually financially constrained firms or firms which have limited access to external finance tend to hold more cash to avoid risk (Opler et al. 1999). Similarly, According to Han and Qiu (2007) an increase in the volatility of cash flow increases cash holdings for firms that are financially constrained, but has no determinate effect on other firms. Bates, Kahle, and Stulz (2009) finds a huge rise in cash ratios among U.S. firms over recent decades (after 1986). They mentioned reasons are precautionary motive, minimizing transaction cost and uncertainty of macroeconomic shock.

### **3.2 Cash Holdings and Firm Performance**

Previous empirical research examining the direct impact of cash holdings on firm performance presents mixed results. Some studies present that cash holding increases profitability, which indicates a positive relationship between cash holdings and firm's financial performance. On the other hand others argue that excessive cash leads to inefficiencies of managers and agency problems as a result low financial performance of firms.

#### **3.2.1 Positive relationship**

Many researchers found that cash holdings can increase firm performance by increasing financial flexibility in bad macroeconomic situations and shocking periods. Also it helps grabbing investment opportunities and proceeds timely investments. For instance, Faulkender and Wang (2006) says that marginal increases in cash holdings increases firm value, particularly in firms facing financial constraints. They found that \$1 increase in cash holdings increases firm value by \$0.75 for the average firm, and up to \$1.47 for financially constrained firms. In addition,

(Pinkowitz et al., 2006) presented that cash is valued more in economies with strong investor protection, which suggests that cash can improve performance when good governance structures formed capital allocation are well done.

Moreover, (Almeida et al., 2004) show that financial constrained firms get value from holding cash because it allows them to invest in profitable projects during economic downturns without relying on expensive external financing. They found in their empirical study that cash holdings of financially constrained firms increase investment spending by 6.4% for every 1 unit increase in internal cash flow sensitivity.

### **3.2.2 Negative relationship**

Many studies argue that more cash holdings can harm firm performance. For instance, Harford (1999) finds in his study that cash rich firms are tend to undertake acquisitions which are value decreasing, and this happens due to managerial misuse of liquidity. According to Dittmar and Mahrt-Smith (2007) excess cash significantly reduces value in firms with weak governance because managers tend to waste liquid assets on unproductive or inefficient projects. These results match strongly with Agency Theory and the Free Cash Flow Hypothesis.

In addition, studies by Mikkelson and Partch (2003) find that firms maintaining high cash over long periods do not prove good operating performance as a result their financial performance such as ROA, ROE declines. Moreover, Richardson, S. (2006) found that Firms with high free cash flow overinvest by 20–25% in projects that later generate significantly lower financial returns, especially when governance is weak.

### **3.2.3 Non-Linear Relationship**

While some studies have presented positive and negative relationships between cash holdings and firm's financial performance, there is also research which argues that the effect of cash holdings on firm performance is not strictly linear. Rather, firms might benefit from moderate cash levels, while excessive cash holdings lead to declining performance resulting in an inverted U-shaped relationship.

For example, firms with optimal cash levels increase financial performance but decrease once cash ratio crosses an optimal threshold (Drobetz and Grüninger 2007). In addition, Mikkelsen and Partch (2003) similarly argue that cash reserves can support financial flexibility but they can also be bad if managers uses liquidity beyond operational needs. These findings support the Trade-Off Theory, which proposes that firms balance the benefits of holding cash such as flexibility, lower financing costs, and reduced risk against the costs associated with inefficient capital use.

## **4.0 Data**

This section presents the way of data collection, introduction of databases, data filtering, reason for region selection, time period and financial variables used in this analysis. The section starts by describing the reason for region selection, time period and ends with variables and data filtration and preparation process. The objective is showing how the dataset was developed for testing the relationship between cash holdings and firm's financial performance of USA listed companies.

### **4.1 Region**

This study focuses on companies listed in the United States across the NYSE and NASDAQ stock exchanges. The reason for selecting the U.S. market is mainly data availability and reliability of financial data over a long period. In addition, Financial markets in the United States are the largest and most liquid in the world stated by Select USA (2023). These attributes make it possible to get consistent measures of a company's cash holdings, leverage, liquidity, and performance over time. The study ensures a high level of comparability by choosing U.S. listed companies.

### **4.2 Time Horizon**

In this thesis, the primary study will be conducted over a ten-year period from 2015 to 2024. This time frame was chosen because it has enough variation over time to show how changes in a company's cash holdings affect its financial performance. A ten year horizon is perfect for the inclusion of different economic conditions, including periods of market expansion and economic instability such as covid19 and Russia-Ukrain war. Therefore, this ten year horizon strengthens the robustness of the findings. Furthermore, the selected period provides a balance between data completeness and newness. Which ensures that the analysis reflects current corporate financial behavior without being limited by missing or inconsistent data.

### **4.3 Financial Data**

The financial data used in this thesis were collected from the FactSet database. Factset is a worldwide recognized database for high-quality financial and accounting data for global public companies. FactSet was selected due to accessibility via AAU facilities and ease of data availability across multiple firms and years. The dataset includes five key variables required for empirical analysis which are Return on Assets (ROA), Return on Equity (ROE), Cash Ratio, Current Ratio, and Debt to Equity Ratio. These variables were collected for 100 U.S. listed firms over ten years, resulting in a balanced panel of 1,000 firm-year observations. To ensure the comparability of financial structures, all financial firms such as banks, insurance companies, and other financial institutions were excluded from the sample due to their fundamentally different cash requirements, regulatory constraints, and balance sheet structures.

### **4.4 Data Preparation and Filtering**

The data were prepared through a step by step process to ensure clean and usable data for analysis. At first we downloaded 100 firms variables in separate excel file. Then we retained ROA, ROE, Cash Ratio, Current Ratio, and Debt-to-Equity Ratio for years between 2015 and 2024 which are relevant to our analysis and rest of variables and years removed. After that we combined 100 firms in one excel file for a structured panel dataset. This dataset was subsequently imported into R for further cleaning steps. The final dataset consisted of 1,000 observations suitable for the statistical techniques employed in this analysis.

## 5.0 Methodology

The methodology section of the thesis will show an overall visualization of the methodology used in the study. At first the research paradigm is introduced in the thesis. Secondly, the variables and regression model is discussed. The final section presents model testing and the assumptions for the regression model's reliability.

### 5.1 Research Paradigm

In business and social science research, three dominant research paradigms are commonly identified: positivism, interpretivism, and critical paradigms (Creswell, 2014). This thesis adopts a positivist research paradigm, which is appropriate for studies that investigate measurable and observable phenomena using empirical data. Positivism assumes that reality is objective, external, and quantifiable, and that valid knowledge is obtained through systematic observation and statistical analysis (Kivunja & Kuyini, 2017). Because this thesis examines how cash holdings influence firm financial performance using numerical indicators such as ROA, ROE, liquidity ratios, and leverage, a positivist approach aligns strongly with the research aim.

The positivist paradigm encourages the use of a deductive research approach. Where established theories direct the development of hypotheses that are later tested against empirical data (Bryman & Bell, 2015). Therefore, this paradigm is relevant in the context of this research which describes Agency Theory, the Free Cash Flow Hypothesis, and Tradeoff Theory to predict how cash holdings theoretically affect firm performance. Because literature provides strong theoretical foundations regarding liquidity management and firms outcome therefore, deductive reasoning is appropriate.

Furthermore, this thesis employs a quantitative research approach, which is consistent with positivist principles emphasizing measurement, objectivity, and replicability (Saunders, Lewis, & Thornhill, 2019). For analyzing large panel databases (such as 1,000 observations) quantitative methods are suitable for finding results of relationships among variables. Also it is suitable for

finding statistical significance across firms and over time. This study will do hypothesis testing using econometric models such as random and fixed effects regression, quadratic model.

This study relies exclusively on secondary data obtained from the FactSet financial database. According to Johnston (2017), secondary data is widely used in quantitative financial research because it is highly reliable, and its standardized reporting system (Johnston, 2017).

## 5.2 Hypotheses

Based on the theoretical foundations discussed earlier including Agency Theory, the Free Cash Flow Hypothesis, and the Trade Off Theory, this study develops the following hypotheses to examine how cash holdings influence the financial performance of U.S. listed companies. To empirically test these competing theoretical predictions, the following hypotheses are formulated.

**H1:** An increase in cash holdings is expected to reduce firm performance, more specifically higher cash ratios leads to lower return on assets (ROA).

**H2:** An increase in cash holdings is expected to badly affect shareholder profitability, more specifically a negative relationship between the cash ratio and return on equity (ROE).

## 5.3 Variables

This study examines how cash holdings influence firm financial performance by conducting a series of panel regression analyses. The purpose of using regression analysis is to evaluate how the independent variable cash holdings affects dependent variables such as ROA, ROE which are key measures of financial performance. Therefore the analysis of this thesis includes dependent, independent, and control variables to isolate the specific effects of cash holdings on firms financial performance. The study includes control variables such as current ratio, D/E ratio to ensure that the results are not driven by unrelated financial factors which increase the reliability and validity of the findings.

### 5.3.1 Dependent Variables

#### Return on Assets (ROA)

Return on assets (ROA) is a measurement tool for measuring a firm's financial performance. It measures how efficiently a firm uses its total assets to generate net income (Brealey, et al., 2020). Higher ROA means company is effectively using its assets to generate net income, whereas low ROA indicates inefficiencies of using its assets. (Colla et al., 2015).

ROA is particularly relevant to this study because it captures the impact of cash holdings, more specifically it shows the relationship between cash holdings and firms performance.

Formula:

$$\text{Return on Assets (ROA)} = \frac{\text{Net Income}}{\text{Total Assets}}$$

#### Return on Equity (ROE)

The return, on equity (ROE) is a measure that shows how profitable a company is in relation, to the money invested by its shareholders. It is calculated by dividing the company's net income by the shareholders equity. It helps investors gauge how effectively the company is using its equity to make profits (Bach & Christensen, 2016). ROE is widely used by investors to assess a company's well being and performance (Colla et al., 2015). ROE is a key measure of profitability which indicates the amount of profit a company has generated using shareholder equity (Timothy, 2022).

Formula:

$$\text{Return on Equity (ROE)} = \frac{\text{Net Income}}{\text{Shareholder's Equity}}$$

### 5.3.2 Independent Variable

#### Cash Ratio

The cash ratio is widely used in corporate finance research as an indicator of a firm's immediate liquidity position which reflects a firm's ability to meet short term liabilities. (Ross, Westerfield, & Jordan, 2019). Cash ensures financial flexibility of a firm as well as reduces dependency of external financing (Keynes, 1936; Opler et al., 1999). According to Opler et al., (1999) firms who maintain higher cash ratios may benefit from lower transaction costs as well as operational flexibility specially in uncertain economic situations.

However the theories and literature also highlights the disadvantages of holding excess cash. According to Agency Theory and the Free Cash Flow Hypothesis excessive cash may increase managerial inefficiencies which can lead to inefficient investment decisions or resource misallocation (Jensen, 1986). In this thesis cash ratio is used as an independent variable which shows the impact of cash on financial performance.

Formula:

$$\text{Cash Ratio} = \frac{\text{Cash \& Cash Equivalents}}{\text{Total Current Liabilities}}$$

### 5.3.3 Control Variables

#### Current Ratio

The current ratio is included as a control variable to account for a firm's overall short term liquidity position. It measures a firm's ability to pay short term liabilities using current assets.

Formula:

$$\text{Current Ratio} = \frac{\text{Total Current Assets}}{\text{Total Current Liabilities}}$$

#### Debt-to-Equity Ratio (D/E Ratio)

The D/E ratio is used as a control variable to capture the financial leverage of a firm. It measures how much of the company's operations are financed through debt relative to equity. Firms with higher D/E ratios may face increased financial risk due to higher interest and financially worse situations during economic falldown situations.

**Formula:**

$$\text{Debt to Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Shareholder's Equity}}$$

## 5.4 Linear Panel Regression Model

In order to quantify the relationships between cash holdings and business financial performance, the research first uses a baseline linear panel regression model. This specification makes the assumption that cash holdings have a constant marginal influence on performance, which means that any increase in cash is anticipated to have the same directional effect regardless of its current level.

In this section I discuss both fixed effects (FE) and random effects (RE) models. The fixed effects model is simply a linear regression model in which the intercept terms vary over the individual units (Marno 2012). According to Marno (2012) this is a regression model in deviations from individual means and does not include the individual effects or unobservable firm characteristics which may bias the estimation. It is commonly assumed in random effects models that in regression analysis that all factors that affect the dependent variable, but that have not been included as regressors, can be appropriately summarized by a random error term (Marno 2012).

Marno said (2012) that the choice between a fixed effects and a random effects approach is not easy, and in many applications, particularly when T is small, the differences in the estimates for  $\beta$  appear to be substantial. However, even if we are not interested in the larger population of individual units, and a random effects framework seems appropriate, the fixed effects estimator may be preferred (Marno 2012). He mentioned the reason for this is that it may be the case that

unobserved effects and explanatory variables are correlated. But the random effects ignores this correlation which leads to inconsistent estimators.

Husman (1978) has suggested a test for the null hypothesis that unobserved effects and explanatory variables are uncorrelated. He said that this test is conducted to determine the appropriate estimator, with the results indicating whether FE or RE provides consistent and unbiased estimates (1978). The decision is based on the p value of the test statistic. If the p value is less than significance level 0.05 then null hypothesis that the RE estimator is consistent is rejected, and the FE model is selected because it remains consistent under correlation between regressors and unobserved effects.

## **5.5 Robust Standard Errors (Driscoll–Kraay or Clustered SE)**

The regression models might be affected by heteroskedasticity, serial correlation and multicollinearity which can misestimate the results. To remove these issues and ensure reliability results this study employs robust standard errors. The study use Driscoll-Kraay standard errors because it provide robustness to heteroskedasticity, serial correlation and cross sectional dependence in panels with a large number of cross sectional units. This makes them good fit firm level panel data where firms might be influenced by common shocks. The robust standard errors ensures that hypothesis testing is valid and significance of coefficients is not overstated or biased by adjusting potential violations of classical assumptions. This method strength the authenticity of the regression results and supports more accurate conclusions regarding the affects of cash holdings on firm performance.

## **5.6 Quadratic Model for Non-Linear Effects**

This study extends the baseline regression model by incorporating a quadratic model. Which will examine whether the relationship between cash holdings and firm performance exists non linear inverted U shaped pattern. By adding squared cash ratio allows for examining inverted U shaped relationships as suggested by trade off theory. According to trade off theory holding optimal level of cash can increase firms performance while excess cash is detrimental to performance. By estimating both linear term cash ratio and non linear term squared cash ratio the result can indicate whether firms performance increase with a level of cash holdings and then decrease due to excess level of cash. This model will finds more accurate results whether cash holdings has linear relation or non linear relation which will address the supporting research question concerning the linear vs non linear relationship between cash holdings and firm financial performance.

## **5.7 The First Difference Estimator**

An alternative way to eliminate the individual effects of unobservable firm specific factors is to first difference estimator (Marno 2012). The FD estimator depends on within firm variation which allows the analysis to test how changes in explanatory variables impact changes in dependent variables (Wooldridge 2010). The first difference estimator is close to the fixed effects model and is often used as a robustness check to support the results of the fixed effects model (Baltagi 2021).

## 5.8 Regression Models

### Linear Panel Regression Models

$$ROA_{i,t} = \beta_0 + \beta_1 CashRatio_{i,t} + \beta_2 CurrentRatio_{i,t} + \beta_3 DERatio_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 CashRatio_{i,t} + \beta_2 CurrentRatio_{i,t} + \beta_3 DERatio_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

Where:

- $ROA/ROE_{i,t}$ : Dependent variable for firm  $i$  at time  $t$
- $\beta_0$ : Constant term (intercept)
- $\beta_1, \beta_2, \beta_3$ : Coefficients of explanatory variables
- $\mu_i$ : Unobserved, firm specific characteristics (e. g. management quality, business strategy)
- $\lambda_t$ : Time specific effect (e. g. macroeconomic shocks, interest rate changes, covid 19)
- $\varepsilon_{i,t}$ : Idiosyncratic error term/random shocks for firm  $i$  at time  $t$

### Quadratic Model

$$ROA_{i,t} = \beta_0 + \beta_1 CashRatio_{i,t} + \beta_2 CashRatio_{i,t}^2 + \beta_3 CurrentRatio_{i,t} + \beta_4 DERatio_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

$$ROE_{i,t} = \beta_0 + \beta_1 CashRatio_{i,t} + \beta_2 CashRatio_{i,t}^2 + \beta_3 CurrentRatio_{i,t} + \beta_4 DERatio_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

Where:

- $ROA/ROE_{i,t}$ : Dependent variable for firm  $i$  at time  $t$
- $\beta_0$ : Constant term (intercept)
- $\beta_1, \beta_3, \beta_4$ : Coefficients of explanatory variables
- $\beta_2 CashRatio_{i,t}^2$ : Squared Cash Ratio to capture non linear effects
- $\mu_i$ : Unobserved, firm specific characteristics (e. g. management quality, business strategy)
- $\lambda_t$ : Time specific effect (e. g. macroeconomic shocks, interest rate changes, covid 19)
- $\varepsilon_{i,t}$ : Idiosyncratic error term/random shocks for firm  $i$  at time  $t$

## First Difference Estimator

$$\Delta ROA_{i,t} = \beta_1 \Delta CashRatio_{i,t} + \beta_2 \Delta CurrentRatio_{i,t} + \beta_3 \Delta DERatio_{i,t} + \Delta \lambda_t + \Delta \varepsilon_{i,t}$$

$$\Delta ROE_{i,t} = \beta_1 \Delta CashRatio_{i,t} + \beta_2 \Delta CurrentRatio_{i,t} + \beta_3 \Delta DERatio_{i,t} + \Delta \lambda_t + \Delta \varepsilon_{i,t}$$

Where:

- $\Delta ROA/ROE_{i,t}$ : Changes in firm performance (ROA, ROE) for firm  $i$  between period  $t - 1$  and  $t$
- $\beta_1 \beta_2 \beta_3 \Delta$ : Coefficients measuring the effect of changes in explanatory variables
- $\Delta \lambda_t$ : Change in Time specific effect (e. g. macroeconomic shocks, interest rate changes, covid 19)
- $\Delta \varepsilon_{i,t}$ : Change in Idiosyncratic error term/random shocks for firm  $i$  at time  $t$

## 5.9 Diagnostic Tests

To ensure model validity, several econometric tests were conducted.

**Unit Root Test (IPS Test):** The Im Pesaran Shin (IPS) test checks if variables are stationary for confirming suitability for regression analysis. The IPS test is appropriate for stationary check for individual unit root process for a balanced panel structure. If p value of IPS test is less than 0.05 then it confirms variables are stationary if greater than 0.05 then variables are not stationary.

**Multicollinearity (VIF Test):** Multicollinearity refers to a situation where independent variables in a regression model are highly correlated. The study performed the Variance Inflation Factor (VIF) test for assessing multicollinearity among the independent variables. The accepted threshold for VIF values are 10. If VIF is above 10 then serious multicollinearity exists whereas values below 10 are considered acceptable.

**Heteroskedasticity Test:** The Breusch Pagan test was performed on both ROA and ROE models to test heteroskedasticity. The test evaluates whether the error variance remains constant across observations. If p value  $> 0.05$  heteroskedasticity is not present if  $< 0.05$  heteroskedasticity is present.

**Autocorrelation Test:** The Autocorrelation Test was performed to check whether model's residuals follow a random pattern or not which is required by classical regression assumptions. The Wooldridge test was used to detect serial correlation. If p value is  $< 0.05$  autocorrelation is present if p value is  $> 0.05$  then no autocorrelation exists.

## 6.0 Data Analysis

### 6.1 Panel Unit Root Test (IPS)

Variable	Test	Statistic (W-t-bar)	p-value	Decision
ROA	IPS (Im-Pesaran-Shin)	-13.694	$< 0.05$	Stationary
ROE	IPS (Im-Pesaran-Shin)	-11.870	$< 0.05$	Stationary
Cash Ratio	IPS (Im-Pesaran-Shin)	-5.5206	$< 0.05$	Stationary
Current Ratio	IPS (Im-Pesaran-Shin)	-4.6044	$< 0.05$	Stationary
D/E Ratio	IPS (Im-Pesaran-Shin)	-9.0639	$< 0.05$	Stationary

Table 1: Panel Unit Root Test

The study led panel unit root tests using Im–Pesaran–Shin (IPS) test to check stationary in the variables. The IPS test is appropriate for stationary check for individual unit root process for a balanced panel structure. The study finds p value of all variables ROA, ROE, Cash Ratio, Current Ratio, D/E Ratio are less than 0.05 which confirms all variables are stationary. These findings ensure that no further changes are required and the regression analysis can proceed using the variables in their level form.

## 6.2 Descriptive statistics

Variable	Observations	Mean	SD	Min	Max
ROA	1000	0.0793	0.0812	-0.3611	0.5567
ROE	1000	0.3717	0.8494	-2.374	8.6452
Cash Ratio	1000	0.0073	0.0102	0.0001	0.1109
Current Ratio	1000	0.0161	0.0117	0.0034	0.1292
Debt-to-Equity Ratio (D/E)	1000	1.8721	5.5135	0.001	88.859

Table 2: Descriptive statistics

Descriptive statistics of a dataset provide an overview of the central tendency, dispersion, and range of values for each variable. These statistics illustrate how each variable behaves across firms and over time. The total sample consists of 1000 observations.

On average the study finds positive profitability such as mean of ROA 7.9% and ROE 37.2%. Though both of variables vary widely across firms and years which is reflected in their minimum and maximum values. The study also shows cash ratio and current ratio's variation which indicates some firms maintain high level of cash and some maintains very low level of cash. The debt to equity ratio shows substantial variation which indicates large differences in firms financial structure.

## 6.3 Correlation matrix

Variable	ROA	ROE	Cash Ratio	Current Ratio	D/E Ratio
ROA	1	0.338	0.264	0.302	0.049
ROE	0.338	1	-0.073	-0.066	0.362
Cash Ratio	0.264	-0.073	1	0.943	-0.088
Current Ratio	0.302	-0.066	0.943	1	-0.102
D/E Ratio	0.049	0.362	-0.088	-0.102	1

Table 3: Correlation matrix

Figure 3 presents the Pearson correlation coefficients for all variables used in the regression models such as ROA, ROE, Cash Ratio, Current Ratio, and D/E Ratio. Most of the variables are

positively and significantly correlated with each other. Such as ROA & ROE, ROA & Cash Ratio, ROA & Current & D/E Ratio. On the other hand Cash Ratio & ROE is significantly negatively correlated. Also same in ROE & Current Ratio. In addition, none of the correlations exceed the threshold 0.95 which means that no multicollinearity exists in the regression analysis.

Correlation matrix present simple relationships between all variables across firms and years. This relationships is showing results without controlling unobserved effects such as firm specific characteristics and time effects. Here positive relationships between cash ratio and ROA indicates on average firms with high cash ratio produce high ROA. This relationships basically reflects cross sectional differences across firms.

Whereas FE model shows relationships between variables by focusing within firm variation over time. It controls unobserved firm effects, time invariant firm characteristics such as management quality, economic recession, industry position etc. Therefore, correlation matrix shows a positive relationship between cash ratio and ROA does not indicate that regression results will also show the same relationships.

## 7.0 Empirical Results From Regression Model

### 7.1 Random Effect and Fixed Effect for ROA (Linear Regression)

	Coefficient (FE)	Coefficient (RE)
Cash Ratio	-4.119	-3.121
Current Ratio	3.353	3.367
D/E Ratio	-0.001	-0.0001

Table 4: Regression Results of ROA

Model	Observations	R-squared	Adjusted R-squared
FE	1,000	0.013	-0.099
RE	1,000	0.018	0.015

Table 5: Model Efficiency

The table above shows the regression results of ROA in the both FE & RE model. In the fixed effects model, the coefficient of the cash ratio is -4.119 which indicates that a one unit increase in the cash ratio leads to 4.119 unit decrease in ROA. That means the cash ratio has a negative relationship with ROA. The coefficient of the current ratio is 3.353 shows that a one unit increase in liquidity leads to 3.353 unit increase in ROA. Which is a positive relationship between these two variables and meaning short term liquidity boosts profitability. The debt to equity ratio has a negative coefficient -0.001 which suggests that a one unit increase in leverage reduces ROA by 0.001 units. So the conclusion is that increasing cash has a negative effect in ROA.

In the random effects model, the coefficient of the cash ratio is -3.121 which is a negative and statistically significant relationship indication between cash ratio and ROA. The coefficient of the current ratio is 3.367 which is almost similar to FE model. That means a one unit increase in liquidity leads to 3.367 unit increase in ROA. Which is a positive relationship between these two variables and meaning short term liquidity boosts profitability. The debt to equity ratio has a negative coefficient -0.0001 which suggests that a one unit increase in leverage reduces ROA by 0.0001 units. So the conclusion of the RE model is that increasing the cash ratio has a negative effect in ROA, same like FE model.

The R-squared value for RE model is 0.013 and FE model is 0.018. These R-squared value for both models are very low which means independent variables explain only 1-2% of the variation in ROA. The adjusted R-squared value is also quite low for both models which suggests that explanatory power of the model is relatively low.

## 7.2 Random Effect and Fixed Effect for ROE (Linear Regression)

	Coefficient (FE)	Coefficient (RE)
Cash Ratio	-20.324	-13.633
Current Ratio	12.943	7.646
D/E Ratio	-0.015	-0.005

Table 6: Regression Results of ROE

Model	Observations	R-squared	Adjusted R-squared
FE	1,000	0.017	-0.095
RE	1,000	0.006	0.003

Table 7: Model Efficiency

The table above shows the regression results of ROE in the both FE & RE model which indicates that a one unit increase in the cash ratio leads to 20.324 unit decrease in ROE. This finding highlights a strong negative impact of cash holdings on shareholder's return on equity. The coefficient for the current ratio is 12.943 shows that a one unit increase in liquidity leads to 12.943 unit increase in ROE. Which is a positive relationship between these two variables and meaning short term liquidity boosts profitability. The results for the debt to equity ratio is -0.015 shows leverage does not have much on ROE in FE model.

The coefficient for the cash ratio is -13.633 in the random effects model. That means cash ratio and ROE has a significant negative relationship and shows a one-unit increase in cash ratio leads to a 13.633 unit decrease in ROE. The current ratio has positive coefficient 7.646 which suggests that higher liquidity can make higher ROE. The debt to equity ratio has a negative coefficient -0.005 which suggests that a one unit increase in leverage reduces ROE by 0.0001 units. So the conclusion of the RE model is that increasing the cash ratio has a negative effect in ROE, same like FE model.

Like the previous regression model the R-squared values are very low for both models. The fixed effects model has an R-squared value 0.017 and the random effects model has 0.006. These explain about 1.7% and less than 1% of the variation in ROE. The adjusted R-squared value is also low for both models which suggests that explanatory power of the model is relatively low.

### 7.3 Model Selection: Fixed Effects vs. Random Effects

#### Hausman Test for ROA:

Chi-square	57.673
p-value	1.846e-12
df	3

The study used hausman test to select whether the fixed effects or random effects are more appropriate for the model. The hausman test finds p value  $< 0.0001$  which leading to rejection the null hypothesis. Therefore, the Fixed Effects model is the appropriate specification, and the interpretation of results focuses on the FE estimates.

#### Hausman Test for ROE:

Chi-square	728.37
p-value	2.2e-16
df	3

This extremely small p-value  $< 0.0001$  provides strong evidence that the Random Effects model is inconsistent. The random effects model is inconsistent because unobserved firm characteristics (such as quality of management, business strategy, risk culture, etc.) are correlated with explanatory variables (such as cash ratio, debt to equity ratio). And these unobserved firm characteristics affect explanatory variables as well as ROE. But the RE model treats these unobserved factors as random noise which lead to wrong assumptions and inconsistent coefficient estimates. Whereas fixed effects model removes these unobserved firm characteristics before estimating the effects. Therefore the FE model is consistent for coefficient estimates.

#### 7.4 ROA Model (Robust standard errors)

	<b>Coefficient</b>	<b>p-value</b>
Cash Ratio	-4.119	0.0089
Current Ratio	3.353	0.0284
D/E Ratio	-0.001	0.0118

Table 8

The table above shows the regression results after adjusting robust standard errors from the ROA model. In this result we find a statistically significant negative relationship between cash holdings and ROA. The coefficient of the cash ratio is -4.119 and p values is 0.0089 which indicates an increase in cash holdings of one unit is associated with a reduction in ROA by 4.119 units. This suggests that higher levels of cash are liable for decreasing operational efficiency. The coefficient of the current ratio is 3.353 and p values is 0.0284 says the current ratio is positive and statistically significant. On the other hand the debt-to-equity ratio has a small but significant negative effect which indicates that higher leverage slightly affects a firm's financial performance. So the conclusion is that holding excess cash has a negative effect in ROA.

#### 7.5 ROE Model (Robust standard errors)

	<b>Coefficient</b>	<b>p-value</b>
Cash Ratio	-20.324	0.0072
Current Ratio	12.943	0.0767
D/E Ratio	-0.015	0.1961

Table 9

The regression results after adjusting for robust standard errors from the ROE model are displayed in the above table. Which reveals a strong negative effect of cash holdings on shareholder returns. We find a statistically significant negative relationship between cash holdings and ROE. The coefficient of the cash ratio is -20.324 and p value is 0.0072 which

indicates an increase in cash holdings of one unit is associated with a reduction in ROE by 20.324 units. The coefficient of the current ratio is 3.353 and p values is 0.0284 says the current ratio is positive and statistically significant. On the other hand the debt-to-equity ratio is statistically insignificant with p value 0.196, indicating that leverage does not have a meaningful marginal impact on ROE in this specification. So the conclusion is that holding excess cash has a strong negative effect on shareholders return.

## 7.6 Quadratic Model for ROA

	Coefficient	p-value
Cash Ratio	-4.1680	0.0039
Cash Ratio <sup>2</sup>	0.8671	0.8991
Current Ratio	3.3375	0.0355
D/E Ratio	-0.0007	0.0104

Table 10

**Quadratic Relationship between Cash Ratio and ROA**

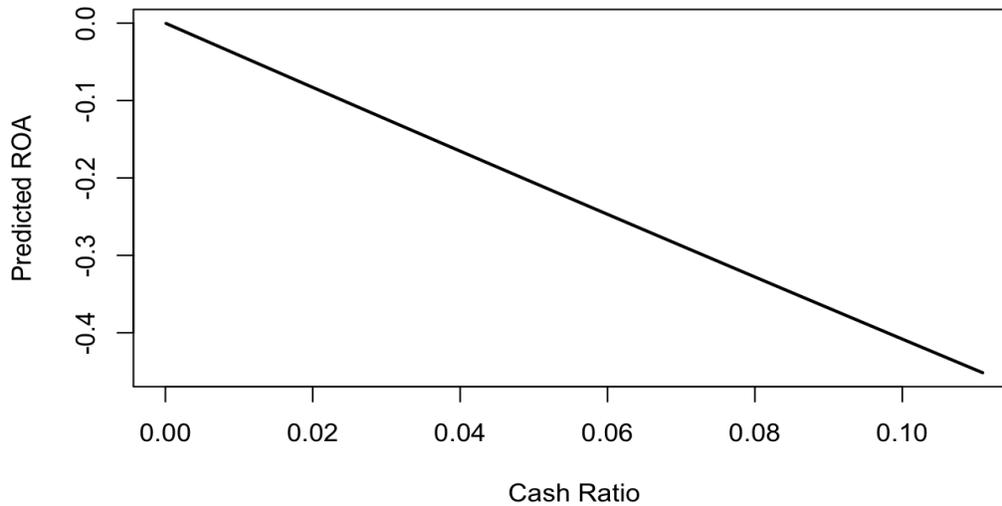


Figure 1

The coefficient of the cash ratio is -4.168 and p value 0.0039 indicates significant negative relationship. Which means holding more cash results in lower ROA. The coefficient of cash ratio<sup>2</sup> is 0.867 and p value is 0.8991 indicates a positive but not significant relationship. This relationship is insignificant because ROA reflects operational efficiency and less sensitive to financial structure. This implies that there is no evidence of an inverted U-shaped relationship between cash holdings and ROA. Instead, cash holdings exhibit a consistently negative effect on firm performance which is visualized in Figure 1.

### 7.7 Quadratic Model for ROE

	Coefficient	p-value
Cash Ratio	-26.7773	0.0012
Cash Ratio <sup>2</sup>	115.1246	0.0011
Current Ratio	10.9369	0.1203
D/E Ratio	-0.0152	0.1777

Table 11

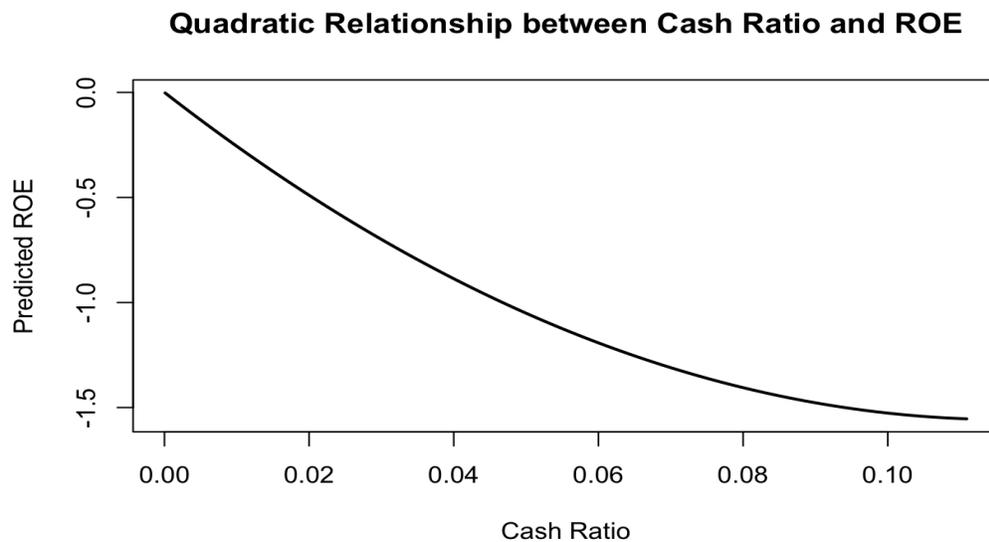


Figure 2

The coefficient of the cash ratio is -26.7773 and p value 0.0012 indicates a strong negative relationship. Which means holding more cash results in much lower ROE. The coefficient of cash ratio<sup>2</sup> is 115.1246 and p value is 0.0011 indicates a positive and highly significant relationship. That means This implies that there is a U-shaped relationship between cash holdings and ROE which has been shown in Figure 2.

## 7.8 First Difference Estimator for ROA

	Coefficient	p-value
CashRatio	-1.83864107	0.16711
CurrentRatio	2.10321542	0.08185
DERatio	-0.00021117	0.60969

The table above shows first difference estimation for ROA. The results show an increase in cash holdings of one unit is associated with a reduction in ROA by 1.839 units. This suggests that higher levels of cash are liable for decreasing operational efficiency. However, it is not statistically significant at the 0.05 (p-value 0.16711) level. On the other hand, increase in current ratio results in increasing ROA. And it is marginally significant at the 10% level.

## 7.9 First Difference Estimator for ROE

	Coefficient	p-value
CashRatio	-16.665760	0.2543
CurrentRatio	13.906395	0.2948
DERatio	-0.027714	1.574e-09

The table above shows first difference estimation for ROE. The results show an increase in cash holdings of one unit is associated with a reduction in ROE by 16.666 units. This suggests that higher levels of cash are liable for decreasing shareholders returns badly. However, it is not statistically significant at the 0.05 (p-value 0.2543) level. Overall first difference estimation also supports fixed effects results which showed previous in this thesis.

## 7.10 Coefficient Changes in FD Estimator

The first difference estimator focuses on year to year changes. It removes unobserved firm specific characteristics and it uses less information than the FE model. In addition, FD is more sensitive to noise and short term fluctuation. Therefore, coefficient changes between FE and FD are normal. Although estimates change, the direction of estimates remains consistent with the fixed effects results which supports the robustness of the main findings.

## 8.0 Model diagnostics

### 8.1 Multicollinearity

Predictor	VIF	Interpretation
Cash Ratio	9.04	Acceptable (<10)
Current Ratio	9.07	Acceptable (<10)
D/E Ratio	1.01	No multicollinearity

The results show that Cash Ratio has a VIF of 9.04, Current Ratio has a VIF of 9.07, D/E Ratio has a VIF of 1.01. VIF values for Cash Ratio and Current Ratio are slightly higher but still they are below the threshold value of 10. Which indicates that multicollinearity is present but not enough to threaten the reliability of the regression coefficients. Debt Equity Ratio has no multicollinearity

## 8.2 Heteroscedasticity

### ROA Model:

Breusch-Pagan test		
BP=28.039	df = 3	p-value = 3.565e-06

### ROE Model:

Breusch-Pagan test		
BP=148.52	df = 3	p-value = 2.2e-16

In this study Breusch Pagan test was performed to assess the presence of heteroskedasticity in the regression models. The test evaluates whether the error variance remains constant across observations. If p value  $> 0.05$  heteroskedasticity is not present if  $< 0.05$  heteroskedasticity is present.

The test results show that it is highly significant for both models. As the both of the p values are well below the 0.05 threshold, the null hypothesis of homoskedasticity is rejected. This indicates that heteroskedasticity is present in both regression models. It means the variance of the residuals is not constant across firms or years.

The heteroskedasticity can lead to biased standard errors which might misleading statistical significance. The study corrects these issues using cluster robust standard errors, which handle both heteroskedasticity and within firm correlation in panel data.

### 8.3 Autocorrelation

#### ROA Model:

Autocorrelation test		
F = 114.4	p-value = 2.2e-16	Reject null hypothesis

#### ROE Model:

Autocorrelation test		
F = 3.321	p-value = 0.0687	Fail to reject null hypothesis

The Wooldridge test was performed to assess serial correlation in the panel regression models for ROA and ROE.

For the ROA model, the results (p value < 0.001) indicate the presence of serial correlation. This means the error terms are correlated over time within firms, which violates classical regression assumptions. On the other hand, the ROE model does not have serial correlation at the (p = 0.0687). Therefore, the findings suggest robust standard errors to obtain unbiased inference.

## **9.0 Discussion**

This section discusses the empirical findings related to the research question, hypotheses, and the theoretical perspectives which presented earlier in this thesis. By examining the linear and quadratic models, the study provides a comprehensive understanding of how cash holdings influence firm financial performance among U.S. listed firms.

### **9.1 Linear Regression Model**

#### **9.1.1 Cash Holdings vs ROA**

The linear regression results shows a negative and significant relationship between cash holdings and ROA. Which is indicating that as firms increase their cash ratios their ROA declines.

This result aligns strongly with Agency Theory (Jensen & Meckling, 1976) and the Free Cash Flow Hypothesis (Jensen, 1986). Both of the theories stated that managers may misuse excess liquidity, leading to overinvestment, inefficient investment. According to Harford (1999) firms with excess cash holdings are significantly more likely to pursue value destroying acquisitions. Firms holding high cash over long periods experience declining financial performance (Mikkelson and Partch 2003).

Our findings support theories and literature which we mentioned earlier in this research paper. This suggests that excess cash does not improve operational efficiency for U.S. listed firms. Instead, it has a negative impact on financial performance of firms, more specifically cash holding declines Return on Assets.

### **9.1.2 Cash Holdings vs ROE**

The linear regression results also present a negative and significant relationship between cash holdings and ROE. Which is suggesting that more cash ratios are causing lower returns to shareholders.

This result is consistent with the predictions of Agency Theory and the Free Cash Flow Hypothesis, which suggest that excess liquidity gives managers greater flexibility to pursue projects that do not align with shareholder interests (Jensen & Meckling, 1976; Jensen, 1986). Firms with poor governance experience declines of shareholder returns when holding excess cash because of managerial misuse of liquidity (Dittmar & Mahrt-Smith, 2007). They also mentioned excess cash may allow managers to avoid difficult financing decisions, or pursue projects that do not maximize shareholder value (2007). Empirical evidence of Dittmar and Mahrt-Smith (2007) show that firms with poor governance lose up to 23% of firm value when holding excess cash, primarily due to managerial misuse.

The results in this thesis confirm that for USA listed firms, excess cash decreases equity-based performance, especially ROE. reinforcing the idea that holding too much liquidity may be detrimental to shareholder returns. Therefore, holding too much cash has a negative impact on financial performance of USA listed firms.

### **9.2 Quadratic Model**

We run quadratic regression to test whether the relationship between cash holdings and financial performance follows a non linear inverted U shape pattern, as predicted by Trade Off Theory. According to this theory, firms get benefit from holding cash up to an optimal level because liquidity reduces financing risk and allows firms to pursue valuable investments promptly (Opler et al., 1999). However, beyond that optimal level of holding additional cash has more costs than benefits such as low returns (Ferreira & Vilela, 2004). Therefore, these theories expect non linear inverted U shape relationships between cash holdings and firms financial performance.

### **9.2.1 Cash Holdings vs ROA**

Our quadratic regression results for ROA do not present inverted U-shaped relationships between cash holdings and financial performance more specifically ROA. Instead, performance declines consistently as cash increases, supporting the linear findings discussed earlier.

According to the Trade of Theory (Opler et al., 1999; Ferreira & Vilela, 2004 ) mentioned earlier we expect non linear relation relationships between cash ratio and ROA. But quadratic regression results did not provide evidence of such a non-linear relationship. Instead it provides negative results which indicates increasing cash continuously decreases USA listed firm's financial performance. Possible reason behind this might be USA listed firms already maintain cash levels which exceed optimal levels.

### **9.2.2 Cash Holdings vs ROE**

Our quadratic regression results for the ROE model finds a statistically significant U shaped relationship. The negative coefficient of the cash ratio and the positive coefficient of the squared cash ratio indicate that ROE initially decreases as cash holdings increase but after a certain point it starts increasing.

Trade-Off Theory, suggesting that very high cash balances may allow firms to engage in value enhancing actions such as strategic investments, dividend increases which ultimately raise shareholder returns (Drobtz & Grüninger, 2007; Faulkender & Wang, 2006). Therefore, we can conclude that excessive cash holdings can increase dividends which ultimately increase share holders return and as a result ROE increases.

## **9.3 First Difference Estimator**

We run the first difference estimator to test whether the relationship between cash holdings and financial performance follows a positive or negative relationships. The results indicates that increase in cash holdings are related to decreases of both ROA and ROE. These findings support agency theory which argue that increase in cash holdings may reduce efficiency and create

agency problems as a result managers may invest excess cash to low return or value destroying projects (Jensen & Meckling, 1976). Which leads to decrease operational efficiency and shareholders return. Overall first difference estimation support previous study like fixed effects model results that excess cash do not enhance firm performance rather it is harmful for ROA and ROE.

## 9.4 Comparison with Prior Studies

The negative linear effects found in both ROA and ROE models are consistent with many empirical evidence showing that excess cash is often harmful to financial performance such as ROA & ROE. Studies such as Harford (1999), Richardson (2006), and Mikkelson & Partch (2003) consistently report that firms with high cash ratios experience declining performance. A large number of research shows that excess cash is associated with poorer performance (Dittmar & Mahrt Smith 2007).

Holding large cash is helpful for companies to tackle unforeseen crises as well as to take growth opportunities (Almeida et al., 2004). In addition, availability of excess cash is associated with agency problem. A study by David et al., (2016) found that cash can be beneficial by nurturing investments but it can also be harmful because cash can easily be wasted. They also highlight that cash is beneficial for performance when firms operate in industries that are highly competitive, R&D based. But financial performance suffers in poorly governed firms when they hold excess cash (David et al., 2016). Another study by Drobetz and Grüninger (2007) finds that firms with optimal cash levels increase financial performance but decrease once cash ratio crosses an optimal threshold which indicates an inverted U shaped relationship.

Based on theoretical arguments and prior studies it is hard to define the relationships between cash holdings and firms performance. Our results from linear regression models suggest that cash holdings have a negative impact on financial performance of USA listed companies. While quadratic model for ROE shows negative impact of cash holdings and after a certain point it shows positive impact of excess cash which is a U shaped relationship. Although, the quadratic model for ROA supports first regression results by presenting a continuous negative relationship

between cash holdings and ROA. Furthermore, first difference estimation finds negative impact of excess cash on firms financial performance.

## 10.0 Conclusion

The purpose of this study was to investigate whether there is a linear or non linear relationship between cash holdings and firm performance. Also to know the relationship between cash holdings and firm performance, positive or negative from 100 USA listed firms between 2015 and 2024.

The financial data and Cash Ratio were collected from the Factset database. The regression models were constructed accordingly to investigate the relationships between cash ratio and the chosen company's financial performance.

The aim was to answer the following research question below:

**How do cash holdings influence firms' financial performance among listed companies in the United States?**

### Supporting Questions:

Is the relationship between cash holdings and firm performance (ROA & ROE) linear or non-linear?

Is the relationship between cash holdings and firm performance positive or negative?

### Summary of findings

The linear regression results demonstrate a consistently negative and statistically significant relationship between cash holdings and both ROA and ROE. This indicates that higher levels of cash holdings are generally associated with lower profitability, which suggest that firms may not be utilizing excess liquidity in a manner that improves operational efficiency or generates higher returns for shareholders. These findings strongly support the predictions of Agency Theory (Jensen & Meckling, 1976) and the Free Cash Flow Hypothesis (Jensen, 1986). In our quadratic regression results, ROA does not present inverted U-shaped relationships between cash holdings

and financial performance more specifically ROA. Rather it shows performance decrease as cash increases. While quadratic regression results for the ROE model find a statistically significant U shaped relationship. Which indicates when cash ratio increases initially performance decreases but after a certain point performance starts increases. It means when cash holdings hugely increase that cash is distributed among shareholders as a dividend. In addition, first difference estimation shows a negative impact on firms performance which supports linear regression models.

## **10.1 Truth Criteria**

A research is considered genuine and strong if it meets specific requirements including reliability, validity and generalizability. In this section I will describe each criterion and my efforts to fulfill them (Ali & Yusof's study in 2011).

### **10.1.1 Reliability**

A strong thesis should be reliable, reliability is measured by a thesis capacity to be repeated. Which means if the same data analysis techniques and procedures apply then any other researcher should get the same results stated by Ali & Yusof (2011). By using five methods it is possible to improve the dependability of the research process and results. Which are the use of tables, continuous data comparison, refutational analysis, utilization of data, and inclusion of outsider examples (Leung 2015). Examining the interpretation of findings from the available data is a data comparison of the study. Checking and validating contradiction between several findings as well as comparing between results is the task of refutational analysis. Arranging legal data and formally organized data are tasks of the other three options.

The data was collected from FactSet which is accessible through AAU email id. Any other researchers can collect the same type data for conducting same type research for replicating the analysis. Also it is possible to collect the same data and ratios according to variables from other databases such as bloomberg, S&P, LSEG. Therefore, it is not recommended that other researchers must collect data from FactSet. The data has been analysed and quantified

statistically so that my personal opinions do not influence the outcomes. However, the possibility human errors might have in the data.

### **10.1.2 Validity**

Validity explains how well the collected data covers the actual area of investigation (Ghauri and Gronhaug 2005). Validity basically means measuring what is intended to be measured (Field 2005). According to Taherdoost (2016) there are four types of validity namely; face validity, content validity, construct validity, criterion validity. Among these types of validity I have taken into account face validity. Face validity measures whether the sample size matches the concept under study. In my thesis I have used a sample of 100 firms for 10 years, that means a total 1000 observations used without misrepresenting the results. Which ensures the validity of my thesis.

### **10.1.3 Generalizability**

Ali & Yusof (2011) said that the generalizability means how well the results can be extended beyond the sample to the total population. This study has been done on the 100 US listed non financial firms from different industries such as technological, pharmaceuticals, food and beverages, energy media and telecommunications. It provides a moderate picture of the overall trend in the industries selected, which ensures generalizability of this thesis.

## **10.2 Theoretical Contributions**

This study dives into exploring the relationships between financial performance and cash holdings. To find out the relationships between financial performance and cash holdings the study conducted several regression analysis including linear regression, quadratic model, first difference estimator. This thesis selected financial performance matrices- ROA and ROE. Previous studies were also done for exploring relationships between FP and cash holdings. This research aims to understand how cash holdings impact US listed firms financial performance. By contributing to existing literature this study addresses the existing disparity in findings on the link between cash holdings and financial performance.

### **10.3 Practical Contributions**

This study provides valuable insights to higher management of US listed companies including board of directors as well as investors and shareholders when they look into practical results of cash holdings. Our findings of the negative relationship between cash holdings and financial performance implies that excess cash reduces firms operational efficiency, managerial efficiency and as a result ROA & ROE decreases. Therefore, we propose holding excess cash is disadvantageous for US listed companies in terms of financial performance.

### **10.4 Ethical Considerations**

I have done everything of this thesis transparent and truthful including research methodology and findings. The details can be found in the methodology section while data and findings are outlined in their respective section. This study has been done as per requirement of my masters degree and the topic has been selected from my self interest, therefore, no commercial interest exists which can influence findings. I always relied on the database which is accessible through AAU and did not use any previous results without citation and authorization. To ensure clarity, reliability on findings I have tested several econometric models and presented findings tables.

### **11.0 Further Research**

This thesis specifically looks at how cash holdings impact US listed firms financial performance. I think it would also be important to do research on non listed US firms. Therefore, further studies can be performed to see whether any difference is found in cash holdings impact between listed and non listed firms. In addition, further studies could be done on different regions and countries to see the actual impact of cash holdings. In that way findings can show if cash holdings impact is same everywhere or its varies region to region.

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## 13.0 Appendix:

### *Appendix 1: Panel Regression results*

#### *ROA:*

#### ROA Regressions: Fixed Effects vs Random Effects

Dependent variable:		
ROA		
	(1)	(2)
CashRatio	-4.119* (2.443)	-3.121** (1.586)
CurrentRatio	3.353 (2.207)	3.367** (1.455)
DERatio	-0.001 (0.001)	-0.0001 (0.0004)
Constant		0.048*** (0.013)
Observations	1,000	1,000
R2	0.013	0.018
Adjusted R2	-0.099	0.015

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

**ROE:**

**ROE Regressions: Fixed Effects vs Random Effects**

```

=====
                        Dependent variable:
-----
                                ROE
                        (1)                (2)
-----
CashRatio                -20.324**          -13.633**
                        (8.495)            (5.924)
CurrentRatio              12.943*              7.646
                        (7.342)            (5.329)
DERatio                   -0.015                0.005
                        (0.020)            (0.014)
Constant                  0.338***
                        (0.102)
-----
Observations              1,000                1,000
R2                        0.017                0.006
Adjusted R2               -0.095                0.003
=====
Note:                    *p<0.1; **p<0.05; ***p<0.01

```

## *Appendix 2: Robustness Standard error results*

### *ROA:*

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
CashRatio	-4.11943227	1.57145761	-2.6214	0.008905	**
CurrentRatio	3.35261747	1.52789346	2.1943	0.028471	*
DERatio	-0.00068885	0.00027291	-2.5241	0.011773	*

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

### *ROE:*

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
CashRatio	-20.324009	7.539037	-2.6958	0.007153	**
CurrentRatio	12.942682	7.303432	1.7721	0.076711	.
DERatio	-0.014519	0.011222	-1.2938	0.196072	

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

### *Appendix 3: Quadratic Model*

#### *ROA:*

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
CashRatio	-4.16803929	1.44165458	-2.8911	0.003931	**
CashRatio2	0.86712794	6.83707341	0.1268	0.899105	
CurrentRatio	3.33750982	1.58497895	2.1057	0.035507	*
DERatio	-0.00069392	0.00027008	-2.5693	0.010352	*

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### *ROE:*

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t )	
CashRatio	-26.777339	8.221192	-3.2571	0.001168	**
CashRatio2	115.124585	35.284284	3.2628	0.001145	**
CurrentRatio	10.936909	7.033762	1.5549	0.120319	
DERatio	-0.015192	0.011263	-1.3488	0.177739	

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## *Appendix 4: First Difference Model*

### *ROA:*

Coefficients:

	Estimate	Std. Error	t-value	Pr(> t )
(Intercept)	0.00395634	0.00230882	1.7136	0.08695 .
CashRatio	-1.83864107	1.32977338	-1.3827	0.16711
CurrentRatio	2.10321542	1.20736362	1.7420	0.08185 .
DERatio	-0.00021117	0.00041350	-0.5107	0.60969

### *ROE:*

Coefficients:

	Estimate	Std. Error	t-value	Pr(> t )
(Intercept)	0.013935	0.025367	0.5493	0.5829
CashRatio	-16.665760	14.610125	-1.1407	0.2543
CurrentRatio	13.906395	13.265217	1.0483	0.2948
DERatio	-0.027714	0.004543	-6.1002	1.574e-09 ***