LUND UNIVERSITY
School of Economics and Management

Department of Business Administration
FEKN90, Business Administration
Examensarbete på Civilekonomprogrammet
Spring 2016

A PENNY SAVED

Do cash holdings reduce profitability?

Authors

Andreas Lagerstedt

Oscar Ljunggren Westlundh

Truls Törnqvist

Supervisor

Anna Glenngård

Abstract

Title: A penny saved: Do cash holdings reduce profitability?

Seminar date: May 25, 2016

Course: FEKN90, For the degree of: Master of Science in Business and Economics, 30HP

Authors: Andreas Lagerstedt, Oscar Ljunggren Westlundh, Truls Törnqvist

Advisor: Anna Glenngård

Keywords: Cash holdings, profitability, Stockholm stock exchange, overinvestment, Jensen's free cash flow hypothesis.

Purpose: The overall purpose of this study is to investigate if profitability is negatively affected by cash holdings for firms on the Swedish market. The study will also determine if there are any differences in this aspect before, during and after the financial crisis of 2008-2009.

Methodology: This study uses a quantitative and deductive method using panel data. Data was mainly gathered using Thomson reuters datastream. The regression method is Ordinary Least Squares and is performed using eViews.

Theoretical perspectives: The theoretical perspective is based on costs associated with the principal-agent problem described in Jensen's free cash flow hypothesis (1986).

Empirical foundation: This study is based on 108 firms listed on the Stockholm stock exchange and covers the years 2004-2014. Profitability is the dependent variable and the variable investigated is cash holdings. Additional independent variables included are leverage, size and Tobin's Q.

Conclusions: The regression showed that no significant relationship between cash holdings and profitability could be found. No significant difference in this relationship could be found between the time periods before, during and after the financial crisis.

Sammanfattning

Titel: A penny saved: Does cash holdings reduce profitability?

Seminariedatum: May 25, 2016

Kurs: FEKN90, For the degree of: Master of Science in Business and Economics, 30HP

Författare: Andreas Lagerstedt, Oscar Ljunggren Westlundh, Truls Törnqvist

Handledare: Anna Glenngård

Nyckelord: Cash holdings, profitability, Stockholm stock exchange, overinvestment, Jensen's free cash flow hypothesis.

Syfte: Det primära syftet med studien är att undersöka om lönsamhet är negativt relaterat till likvida medel på den svenska marknaden. Studien kommer även undersöka om det föreligger skillnader i denna aspekt mellan perioderna före, under och efter den finansiella krisen 2008-2009.

Metod: Studien har en kvantitativ och deduktiv metod och använder paneldata. Thomson reuters datastream har varit den huvudsakliga datakällan och regressionen har utförts genom metoden minsta kvadrat metoden i programmet eViews.

Teoretiska perspektiv: Teorin som ligger till grund för studien baserar sig på kostnader hänförbara till principal-agent problemet som beskrivs i Jensen's free cash flow hypothesis (1986)

Empiri: Studien baseras på 108 företag noterade på Stockholmsbörsen och inkluderar åren 2004-2014. Lönsamhet är den beroende variabeln och den undersökta variabeln är likvida medel. De andra oberoende variablerna är skuldsättning, storlek och Tobin's Q.

Resultat: Regressionen visade inget signifikant samband mellan likvida medel och lönsamhet. Undersökning mellan perioderna före, under och efter den finansiella krisen kunde inte påvisa någon signifikant skillnad mellan perioderna.

Acknowledgements

First and foremost, we want to give our warmest thanks to our supervisor Anna Glenngård for her excellent guidance and helpful insights throughout the work process. We would also like to thank Jens Forssbaeck for allowing us to disrupt his office hours with statistical inquiries. Finally, we would like to give our thanks to Niclas Andrén for his inspirational suggestions and technical know-how.

Andreas Lagerstedt Oscar Ljunggren Westlundh Truls Törnqvist

Contents

Chapter 1. Introduction

This chapter will introduce the issue of cash holdings and profitability and how this study is positioned against previous research and theories such as Jensen's free cash flow hypothesis. The boundaries, issue and purpose of the study are presented and the chapter ends with the disposition of the study.

1.1 Background

One of the most influential and widely discussed theories in the area of corporate governance, and furthermore in corporate finance, is regarding the costs of agency conflicts within firms. These costs originate in managerial decisions that are not optimal for the shareholders of the firm (Jensen & Meckling, 1976). One of the more prominent agency problems were brought forward by Jensen's free cash flow hypothesis, developed in his paper from 1986, where he found evidence of overinvestment following large amounts of excess cash. Overinvestment in this sense pertains to investments in projects with an average return below the firm's cost of capital. Since Jensen's publication, several researchers have undertaken the objective to study the relationship between cash holdings and the tendency for overinvestment.

Jensen's theory has evolved through a theoretical discussion of a firm's cash holdings which has been ongoing since 1961 when Miller and Modigliani argued that there is no need to hold more cash than necessary for operations. Jensen and Meckling (1976) argued that there are agency costs to holding cash since this might result in wasteful expenditures and overinvestment, while Myers and Majluf (1984) argued that holding cash can be valuable due to the financial slack it creates. In their paper, Opler, Pinkowitz, Stulz and Williamson (1999) discussed how management hold cash to follow their own agenda instead of that of the shareholders, which has found support in studies performed by Richardson (2006) and Harford (1999) who provided evidence that cash reduces the profitability in firms.

1.2 Discussion of issue

The potential outcome of Jensen's free cash flow hypothesis represents a substantial risk of agency costs as a result of the firm's cash holdings. This could seriously impair the value of financial flexibility for a firm, and subsequently alter the potential value of having cash holdings as a mean of mitigating financial risk. Knowledge about the potential relationship between cash holdings and profitability is of great importance for owners, potential investors and the board of directors. If these parties are aware of the management's tendencies for discretionary spending or over-investment, it will enable them to make better informed decisions when choosing to invest in the firm, or when deciding on financial and investment policies of the firm.

Almeida, Campello and Weisbach (2004), who in their model of a firm's liquidity demand argued that companies anticipating financial constraints in the future, respond by saving cash today. This course of action is performed to optimize a firm's cash policy by weighing the profitability of investments available today and those available in the future. They further argue that exogenous shocks, such as a recession, change the relative profitability between future and current investments which have an effect on firm's propensity to save cash. The financial crisis in 2008 demonstrated that regulations had to be reevaluated in order to properly mitigate lending risks. This had the consequence of extensive changes, like the implementation of Basel III being undertaken in an attempt to reduce the likelihood of another financial crisis (Riksbanken, 2010). In the same way that the crisis had an effect on the market's view on risk, these changes may also have altered any potential relationships between profitability and cash holdings existing before or during the crisis. This is why it is of importance to investigate both the current state, and any differences in this relationship before and after the crisis.

The majority of previous studies have been conducted on the U.S. market, and no previous research investigating Jensen's free cash flow hypothesis on the Swedish stock exchange have been conducted. Swedish corporate governance differs compared to the U.S. in regards of having a higher ownership concentration and higher frequency of control owners. The U.S. is regarded as having one of the world's strictest corporate governance systems (Oxelheim & Randøy, 2005). Therefore, differences in regulations and ownership structure might influence managerial investment behavior and owner monitoring abilities differently in Sweden compared to the U.S.

1.3 Purpose

The overall purpose of this study is to investigate if profitability is negatively affected by cash holdings for firms on the Swedish market. The study will also determine if there are any differences in this aspect before, during and after the financial crisis of 2008-2009.

1.4 Boundaries

This study will investigate the relationship between cash holding and profitability on the Stockholm Stock Exchange. It will incorporate companies that have been listed on the small-, mid-, and large cap during the entire period of 2004-2014. This will allow for a sufficiently large sample of observations in relation to the number of independent variables included in the regressions after observation losses (Körner & Wahlgren, 2012). It will also provide the possibility to observe a period with substantial fluctuations in the state of the market. The reason for focusing on Stockholm OMX Nordic's small-, medium- and large cap segments is because of more transparent and extensive reporting regulations compared to First North (Nasdaq(a), 2016).

1.5 Target group

The content of this study is primarily intended for researchers and students possessing knowledge within the field of corporate finance and econometrics at an intermediate level, and a corresponding level of understanding technical and theoretical terms.

1.6 Disposition

The disposition of the chapters and an overview of the areas they cover are presented below.

Chapter 2 - Theoretical and practical frame of reference

In the theoretical frame of reference, previous studies and theories of relevance are presented. The chapter is divided into three parts, where the first one describes theories pertaining to the purpose of this study, and subsequently acts as a theoretical framework for the analysis and discussion of the empirical results. The second part presents the previous research within the field of cash holdings in relation to profitability. The third part extends the presented theory into the variables for this study.

Chapter 3 - Methodology

In this chapter, this study's course of action is described. Here the fundamentals of the study's research approach are thoroughly discussed and criticized in relation to literature on methodology. In addition to this, operationalization of variables and the regression model are presented.

Chapter 4 - Empirical results

In empirical results, descriptive statistics and results from the regression model are presented. The regression model is further discussed in relation to any potential configurations and validity tests deemed necessary, and what the consequences of these tests are.

Chapter 5 - Analysis

In this chapter, the empirical results from the regression model are discussed in relation to previous research and theories presented in the theoretical frame of reference.

Chapter 6 - Conclusions

In this chapter the purpose and formulation of issue of this study are discussed in relation to the analysis of the empirical results.

Chapter 2. Theoretical and practical frame of reference

This chapter defines the economic theory that this study is based on. Principal-agency theory is described and discussed, and set in relation to cash holdings and profitability. This provides an empirical and theoretical context for the study. Previous research relating to Jensen's free cash flow hypothesis is presented together with variables with an expected effect on profitability.

2.1 Theoretical framework

In the following section, the theoretical foundation of this study is presented. The focus lies on Jensen's free cash flow hypothesis and theories subsequently developed from this theory.

2.1.1 Jensen & Meckling (1976) Theory of the firm

In the theory of the firm, Jensen and Meckling (1976) formulate a theory which describes the issue of separation of control between the owners of a firm and those managing it. They also clarify what type of agency costs are associated with this problem and why they have come to exist. Principals are defined as individuals who delegate decision making authority to another person (agent), to act on their behalf. The underlying assumption of this theory is that both parties are utility maximizers who act with their own self-interest in mind. The principal-agent problem arises when the agent has incentive to act in a way that is not in the best interest of the principal. Jensen and Meckling point out that this problem exists in all types of organizations but when analyzing the agency costs stemming from this type of contract, they focus on the ones generated between top management of the corporation and the owners (Jensen & Meckling 1976).

On the one extreme, a fully-owned firm can be managed by the owner, and in that case he will maximize his own utility by making decisions that give him the most combined value from financial return and non-financial return such as a commendable office or computer, charitable contributions, personal relationships with employees or buying productions input from friends. Since the firm is fully owned, the owner has the possibility to balance his financial claims on the firm's profits with the value derived from non-financial value gained from the firm's expenditures

to find an optimal mix of utility. In cases where the manager does not fully own the firm, the outcome will be different. As the manager's portion of the firms stocks decreases, his claim on the profits will also decrease and will give him incentive to spend more of the firm's resources on perquisites at the expense of the other owners. The smaller the manager's portion of the firm's shares is, the more incentives the other owners have to monitor and control his behavior (Jensen & Meckling, 1976).

As the principal-agency problem exists, the outside owners try to find a way to align the manager's incentives with their own, for example by utilizing budget restrictions and compensation policies, where the cost of doing so is called agency costs. These agency costs can be both financial and non-financial, and stem from a range of actions taken. The agency costs can come from monitoring and controlling the manager's actions, or compensating the manager with a bonus when desired results have been met. Jensen and Meckling point out that it is generally impossible to ensure that the agent make optimal decisions on the principal's behalf at zero cost, and despite all their efforts there will still be some discrepancy between what would be optimal for the principal and the decisions made by the agent (Jensen & Meckling, 1976).

2.1.2 Jensen (1986) Agency cost of free cash flow

Jensen (1986) explains the costs a firm face that are associated with its free cash flow, what underlying incentives that cause them, and how debt can be used to lower them. Jensen begins by defining free cash flow as the excess cash after all positive NPV-investments available to the firm have been undertaken. The costs that he identifies as coupled to free cash flow is when management is undertaking investments made below the firm's cost of capital, or in other ways wasted due to skewed incentives. The motivators for management to invest in NPV-negative projects and growing the firm beyond its optimal size is that it increases the amount of resources they control, and the associated increase in their compensation and power. The costs mentioned are particularly severe in companies that have substantial free cash flows (Jensen, 1986).

As these agency costs constitutes a conflict of interest between what the managers have incentives to do, and what would benefit the owners of the firm, Jensen also tries to explain what can be done to align the interests of these parties. Companies that are experiencing large free cash flows and want to prevent NPV-negative investments could repurchase shares or increase its dividends to shareholders. The problems with these actions are that even if the raise in dividends is promised to be permanent, this can be altered in the future since it is controlled by

management. Jensen argues in his theory that a way for the management to be bound by their promise of future payouts are by taking on debt without retaining the proceeds from the issue, since this gives the stock owners the right to take the firm into bankruptcy court if management fail to make the payments of principal and interest. This threat is also an effective incentive to make the firm more efficient. Jensen further argues that debt reduces the agency costs by decreasing the available cash flow for management to spend at will, and also make them less likely to engage in low-benefit or value-destroying mergers. The control function of debt is especially crucial in firms that generate large cash flows and have poor growth opportunities or a need to become smaller. He recognizes that increased leverage also brings higher agency costs of debt, including bankruptcy costs, and that there is an optimal leverage level for the firm where the firm value is maximized (Jensen, 1986).

2.1.3 Opler *et al.* (1999) Agency cost of managerial discretion

According to Opler *et al*. (1999), the management of a firm may hold cash to follow their own agenda at the expense of the shareholders, which is called agency costs of managerial discretion. There are three main reasons for explaining the management's self-serving actions, where the first is that they are risk-averse and rather hold on to the cash in anticipation of unforeseen events, instead of distributing it to the owners (Opler *et al*., 1999)

Secondly, by amassing cash, management is more flexible to follow their own agenda and can invest in projects that would otherwise not have been financed by the market. Opler *et al*. points out that cash holdings are very similar to free cash flow, and management can't raise debt whenever it wants, but is able to freely use cash already in the firm. By avoiding the discipline that capital markets bring there is a possibility that they use it in a way that have a negative impact on firm value (Opler *et al*., 1999).

Thirdly, management may be reluctant to pay out cash to shareholders and rather prefer to keep the funds in the firm. Having idle cash in the firm increase the pressure for management to spend it, which forces them to employ the cash in poor projects in the absence of good ones (Opler *et al*., 1999).

Finally, Opler *et al*. points out that firms with valuable investment opportunities have a greater chance of shareholders and management sharing objectives, which results in the agency costs of managerial discretion being less important (Opler *et al*., 1999).

2.1.4 Theoretical arguments for cash holdings

Miller and Modigliani (1961) argued in their dividend irrelevance theory that in a perfect capital market there is no need for a firm to hold more cash than needed for operations, since it can easily and costless access capital for new investments. This theory is based on the assumptions that there are no bankruptcy costs, no taxes, no issuance costs related to new capital, and that all investors are rational and have access to the same information. These assumptions are opposed by Myers and Majluf (1984) with their pecking order theory, which states that there exist an information asymmetry between management, who know more about the risks and opportunities of the firm, than external investors. This is also assumed to be recognized by both parties. Since there is a discrepancy in accessible information, investors will interpret a new equity issue as management believing it to be overvalued and taking advantage of new investors. Believing that this will decrease the price, new investors are willing to pay less for the shares, and in turn making internal financing preferable for management to avoid such information asymmetry costs. By holding cash, the management can create financial slack, which have value because firms can sometimes be unwilling to issue equity due to information asymmetry costs, and in turn pass up on valuable investment opportunities. Almeida *et al*. (2004), who in their model of a firm's liquidity demand, argue that companies anticipating financial constraints in the future respond by saving cash today. Since cash holdings reduce the firm's current valuable investments, the firm has to try to optimize their cash policy by weighing the profitability of investments available today and those available in the future. They further argue that exogenous shocks, such as a recession, change the relative profitability between future and current investments which have an effect on the firm's propensity to save cash.

2.2 Previous research

Previous research has been chosen based on the purpose of studying cash holdings and its relationship to a profitability measure. Although the studies differ to a certain extent in approach and method, they all pertain to Jensen's free cash flow hypothesis.

2.2.1 Richardson (2006) Over-investment of free cash flow

From the perspective of Richardson (2006), earlier research results pertaining to the free cash flow hypothesis were in accordance with the expected outcome, but limited in sample sizes and variable definition. The criticism against earlier research points to the notion that a positive relationship between investments and cash flow merely could function as an indication for investment opportunities. Richardson (2006) therefore attempts to more directly measure over-

investment and free cash flow by utilizing firms accounting information. The study was conducted on publicly traded, non-financial, firms in the U.S. between 1988 and 2002, resulting in 58.053 firm-years of observation. Richardson concluded that approximately 20 percent of the average firm's free cash flow was used for over-investments. He also tried to determine if overinvestment can be linked to positive and negative aspects of governance structures and activities. The result of this highlighted that those aspects of governance that are meant to mitigate agency problems are generally associated with lower levels of over-investment, while negative aspects of governance structures such as insider appointment and anti-takeover provisions tend to increase over-investment (Richardson, 2006).

2.2.2 Harford (1999) Corporate cash reserves and acquisitions

Harford (1999) developed a model of normal cash holding in order to measure against the profitability of firm acquisitions and investigate if there is a suboptimal usage of cash in cash-rich firms. The model was used to estimate a baseline for cash holdings in U.S. firms for the period of 1950-1994. Harford (1999) estimates the baseline for cash holdings (cash/sales) by regressing market-to-book, cash-flow volatility, future cash-flows net-of-investment outlays, size, and a recession indicator variable. Cash-rich firm-years where then identified as cash holdings 1.5 standard deviations above the value predicted by the model. Furthermore, a probit model where used to estimate the likelihood of a bid for firms between 1977 and 1993. The model included average abnormal returns, sales growth, noncash working capital, leverage, market-to-book, price-to-earnings, size, size deviation, insider ownership, and yearly dummies to capture the acquisition boom of the 80's. This was then evaluated against both the market returns after the announcement, and the post-acquisition operating performance (measured as average cash-flow return-on-assets). The results concluded that all else equal, a firm with higher cash holdings experience lower abnormal return in comparison to firms with lower levels of cash holdings. Furthermore, cash-rich firms were more likely to make acquisitions, and experience negative stock price reactions as well as poor operating performance following the acquisition (Harford, 1999).

2.2.3 Simutin (2010) Excess cash and stock returns

Simutin (2010) examines the relationship between excess cash and stock returns, as well as profitability, for non-financial U.S. firms between 1960 and 2006. The study builds upon the determinants of cash holdings, developed by Opler *et al*. (1999), which consists of a number of variables with significant relationship to cash holdings. Simutin estimates excess cash measures

(ECM) as the residual from a cross-sectional regression including a number of firm-based characteristics in relation to assets (market-to-book, size, capital expenditures, working capital, long-term debt, R&D, cash flows, industry sigma, industry dummy, and dividends). Stock returns for different deciles of ECM were measured both with raw returns, and with Fama and Macbeth risk-adjustment from 1973. Level of investments was measured as capital expenditures plus acquisitions less sales of PP&E, divided by total assets. Level of profitability was measured as operating income before depreciation, divided by total assets. Simutin concluded that there is a positive correlation between cash holdings and future stock returns. Firms with higher cash holdings also have higher beta-values, indicating higher growth opportunities. However, in economic downturns, these companies performed worse than firms with lower cash holdings. This could be explained by the shift in value for growth opportunities in economic downturns. Also, higher cash holdings subsequently lead to higher amounts of investments, although no significant relationship were found between cash holdings and future profitability. Thus, firms with high cash holdings have higher betas, invest more, and have higher stock returns, but according to Simutin (2010) the subsequent poor accounting performance for high cash level firms could be explained by over-investing (Simutin, 2010).

2.2.4 Summary of previous research

Below in table 1 previous research are summarized with their respective method and results.

Research	Title	Tested	Results
Richardson (2006)	Overinvestment of Free Cash Flow	Measures overinvestment as a result of free cash flow on publicly traded non financial firms in the USA between 1988-2002.	Concluded that approximately 20 percent of the average firm's free cash flow were used for over-investments.
Harford (1999)	Corporate Cash Reserves and Acquisitions	Developed a model of normal cash holding and measured its effect on new investments, defined as acquisitions, between 1950 and 1994.	The results concluded that all else equal, a firm with higher cash holdings experience lower abnormal return in comparison to firms with lower levels of cash holdings.
Simutin (2010)	Excess Cash and Stock Returns	Examines the relationship between excess cash and stock returns, as well as profitability, for non-financial US firms between 1960-2006.	Concluded that there is a positive correlation between cash holdings and future stock returns. Also, higher cash holdings subsequently lead to higher amounts of investments although no significant relation were found between cash holdings and future profitability.

Table 1: Summary of previous research.

2.3 Variables

In order to isolate the effect of cash holdings, it is imperative to include other variables proven to have an effect on profitability. In the following section variables from previous research, which are to be included in the study, are presented.

2.3.1 Independent variables

The independent variables are chosen based on previous research and literature, where six variables have been proven to have an effect on the profitability of firms.

Cash holdings

Jensen (1986) found evidence of agency costs of free cash flow in his study, which also suggests a relationship between higher levels of cash holdings and lower profitability. Nagy, Newman and Nelson (2009) found a significant negative effect of cash holdings on profitability in one out of three model runs. Richardson (2006) and Harford (1999) also found evidence suggesting that cash has a negative effect on profitability. Simutin (2010) found no significant relationship between cash holdings and future profitability.

These findings suggest that cash holdings have a negative effect on profitability.

Firm size

Stierwald (2010) showed that size has a positive relationship to profitability, and also presents the possibility that size effect on profitability could implicitly reflect sector specific characteristics by differences in size and profitability across sectors. Size was also found to have a positive effect on profitability by Popa and Ciobanu (2014) and Nagy *et al*. (2014). This is opposed by the findings of Pattitoni, Petracci and Spisni (2014) which claim that size has a negative effect on profitability.

From these previous studies, firm size is believed to have a positive effect on profitability.

Leverage

The free cash flow hypothesis by Jensen (1986) suggests that leverage has a positive effect on profitability up to a certain level since it reduces free cash flow, and makes managers more efficient, which is known as the "control hypothesis". Burja (2011), also who found evidence of higher leverage having a positive relationship to performance.

Nagy *et al*. (2009) found that leverage had a negative effect on profitability and argues that since the study was performed cross-sectionally for every year, it could be explained by companies increasing their risk in the near-term by taking on debt but that the returns on those risks might come later, in future years. That leverage decreases profitability is supported by Pattitoni *et al*. (2014), who argued that the effect of debt on profitability is non-linear; positive when debt is low, and negative when debt is high, and that most of the companies in their study was highly leveraged.

These previous studies have led to the belief that leverage does have an effect on profitability, but it could be either a positive or a negative effect.

Tobin's Q

Lang, Stulz and Walkling (1991) use Tobin's Q to distinguish between firms with either positive or negative NPV investments available. They observed returns from takeovers through comparison of bidders Tobin's Q and cash levels. They found that for low Tobin's Q bidders, as the level of cash increased, the gain of a takeover would fall short in comparison to high Q bidders. Stierwald (2010) also found a significant positive correlation between Tobin's Q and profitability. Market-to-book can be interpreted as growth opportunities by measuring the equity of the firm in relation to the market value, and also be used as a proxy for Tobin's Q (Harford, 1999).

Tobin's Q is expected to have a positive effect on profitability.

State of the economy

Pattitoni *et al*. (2014) find that the economic cycle has an effect on firm profitability. This means that upward going economic trend leads to higher profitability and downward trend leads to lower firm profitability. Harford (1999) used a recession indicator variable for determining cash holdings and Simutin (2010) also includes whether economic conditions are strong or poor but measures this with market returns as a proxy. Saini and White (2015), who studied the relationship between GDP and firm earnings, used the variable GDP growth to measure the markets economic conditions.

The state of the economy is expected to have a positive effect on profitability.

Industry

Nagy *et al*. (2009) found that which industry firms belong to have an effect on profitability. They found that the parameter estimates for every sector variable in their study had a positive effect on profitability except from finance. Industry also has a significant effect on profitability according to Brush, Bromiley and Hendrickx (1999). These studies provide evidence that industry is a relevant factor to include when measuring profitability.

Independent variables	Expected influence on dependent	Source
Cash Holdings	Negative	Jensen (1986), Nagy et al. (2009), Richardson (2006), Harford (1999) & Simutin (2010)
Firm size	Positive	Stierwald (2010), Popa and Ciobanu (2014), Nagy et. al. (2014) & Pattitoni et al, (2014)
Leverage	Positive of Negative	Jensen (1986), Burja (2011), Nagy et.al (2009) & Pattitoni et al, (2014)
Tobins Q	Positive	Lang et al. (1991), (Harford, 1999) & (Stierwald, 2010)
GDP	Positive	Pattitoni et al. (2014), Harford (1999), Simutin (2010), Sani and White (2015) & SCB (2016)
Industry	N/A	Nagy et.al (2009) & Brush et al, (1999)

Table 2: Summary of independent variables.

Chapter 3. Methodology

The methodological approach that have been chosen in an effort to answer this study's purpose, and the way data has been collected and treated, are presented. The work process is described and the regression together with validity test is explained. The variables are defined and the chapter is ended with criticism against the methodology.

3.1 Properties of the study

A research study can have quantitative and qualitative properties. Since this thesis is in the field of finance, the purpose motivated usage of numerical and statistical information. Large amounts of data were used and in this data descriptive causal effects in structural occurrences was sought to be found. For these reasons, using quantitative method was best suited. (Lundahl & Skärvad, 1999)

Due to the observing nature of this study and that it serves the purpose of describing a relationship between real world observable variables, it fits the description of having a positivistic nature. This means that the collected theory and previous research helps to interpret the data and empirical results. Within the positivistic approach, the deductive perspective was chosen to suit the quantitative aspects of the study. It was classified as deductive since existing theory is used as the basis for the purpose and that the research strategy then is designed to test the hypothesis (Bryman & Bell, 2015).

Quantitative studies can be both experimental and nonexperimental. It is not possible to influence the actual values that are believed to have an effect on the research question and not possible to control the describing variables since the study investigates historical occurrences that has already taken place. It is although possible to standardize the test. Due to these factors, this study was classified as non-experimental. It is also descriptive in its character and is describing occurrences in the past and therefore classified as a historic study (Lundahl & Skärvad, 1999).

3.2 Research design

The section describes how the data has been treated and gives an overview of the process.

3.2.1 Data selection, sampling and missing variables

Firstly, the raw data was managed and structured to benefit the interpretation by organizing it alphabetically in a unified document. During this process, the data was checked for obvious flaws and corrected if such were found. This was carried out by making sample tests on the data and check if it corresponded to the values in the annual reports of companies. The maximum and minimum of different variables were observed and compared with the median and average values to see if the numbers were within reasonable levels. Any flaws discovered were double checked again in Thomson reuters datastream or in the firm's annual report.

Financial companies were excluded from the study since their cash holdings and profitability structure differ from that of other companies (Richardson, 2006) (Simutin, 2010). Companies that were not listed the entirety of the research period was excluded from the sample in order to create ease in the usage of the data and to create a balanced panel data sheet.

Data covers Stockholm stock exchange, small-, medium- and large-cap, during the years 2004-2014. The size of the data was determined large enough to enable statistical regressions. The Swedish market was chosen since similar research studies have not been made on this market so far and to ease the collection of data.

For the chosen market of interest, the entire population was included. A total number of 108 companies were included in the study and 12 had to be dismissed due to incompatibility with the data criterions (Appendix 1 & 2). The years 2004-2014 was chosen so that short term economic fluctuations would not disrupt the data and to make the time period large enough so that it would be representative for other periods as well. The total sample included 981 firm years.

The variables chosen to be included in the regression and the following analysis have been limited to those used and defined in previous published research. Variables that have been found to have a significant effect on profitability have been included with the purpose to isolate the effect cash holdings have on profitability. The number of independent variables have been limited to those that are customary and most relevant within the specific field of the study in

order to not have too many in relation to the number of observations in the sample (Körner & Wahlgren, 2012).

3.2.2 Collection of data

There are two types of data, primary data and secondary data. While primary data is collected by the researcher, secondary data is such that already exists and then has been collected by the researcher to use in the study (Lundahl & Skärvad, 1999). This study is based on secondary data since it is based on reports published by the companies themselves and then presented by Thompson reuters datastream.

Thomson reuters datastream was selected as the source of this data due to its wide range, well-known brand and in-depth data. The data sources were chosen to provide objectivity and lucidity in the study. The collected data was Thomson reuters datastream's presentation of the firm's annual reports from the end of their fiscal year. Firstly, the companies selected were checked to see if the data desired was available for each firm and if it was available for the entire time period. The companies that fitted these criteria were carried forward and the desired data was then collected. It was made sure that the variables were defined in the same way for each of the companies so that they were comparable. The data was collected in a manner that weighed time efficiency and accuracy. When all data had been collected, it was gathered in a unified Excel document, managed and structured to ease intake and processing into the chosen statistics program, eViews.

3.2.3 Literature review

The foundation of this thesis is built on previous research and theories in financial economics and the variables and methods used are based on the previous research. Thus, to formulate the issue, a literature review is required. Controversies in existing literature and clashes of evidence were examined as well as who the key contributors in the area are. The foundation of this study is built on publications by the main contributors in the area that is studied. This enhances the credibility of the study and makes its contribution to the existing research clearly defined (Bryman & Bell, 2015). Previous research was a source of information but was also viewed in a critical manner which created a clear narrative in the existing literature.

3.2.4 Data verification

The authors of this thesis are aware of the importance that the work process constitutes for the analysis and end result to be reliable and make a contribution. For this reason, after the first process of preparing for the study, all the material gathered and data collected was looked over once more and structured in preparation for the coming regression and statistical tests. When the literature review, data collection and data analysis had been completed, this last check was performed to determine the quality of the findings. The data was disseminated and thoroughly checked to see that it represented those aspects that were desired from it. It was made sure that the research question was in line with previous research and that the variables were compliant with the aspects they were meant to represent. Overall, the study was determined to be well structured, and that the data provided the foundation that the study needed. The theoretical standpoints were also determined well in line with the research question. On this basis, the study was carried forward and the regression and analysis was undertaken.

3.2.5 Ordinary least squares

The statistics program eViews was chosen and the Ordinary least squares regression was used. To make the data readable as panel data, the data was structured so the program would read it as such. To make sure that the regression would be done in a correct manner, several trial runs of the data were tested and it was made sure that the different settings available in eViews would be suitable with the data and the purpose. The results from the statistical validity tests are presented in "4.2 OLS and tests of validity".

Two levels of statistical significance were applied, the 1% level and the 5% level. This means that the risk of the sample showing a relationship between two variables, even though there is no such relationship, is one out of a hundred at the 1% level and five out of a hundred at the 5% level. The 5% level is the most commonly used in research of this kind, which is why it was used as the upper bracket of significance in this study. The 1% level was then also used to determine even more significant relationships when such occurs (Bryman & Bell, 2011).

When using OLS regression, it's necessary to check for a number of problems that could affect the results. If these aspects are ignored, the coefficient estimates cannot be determined to fulfil the requirements of "best linear unbiased estimators" (BLUE) and the results could be biased and inconsistent (Brooks 2014). When the regressions of the two data sets were done, these results were tested for the five OLS assumptions of multicollinearity, normality, autocorrelation,

heteroscedasticity, heterogeneity as well as for endogeneity (Brooks, 2014). If the data proved to have the problem tested for, this was accounted for and corrected so that the data would present reliable results.

Multicollinearity means that one or several independent variables are correlated to each other. This can be checked for by utilizing a correlation matrix to observe variables with high bivariate correlation. According to Brooks (2014), a maximum correlation of 0,8 can be tolerated before multicollinearity is considered a problem. If the data suffers from multicollinearity, one of the variables that are correlated should be excluded from the regression.

Another problem could be that the errors do not have a constant variance, which is known as heteroscedasticity. Testing for heteroscedasticity on panel data in eViews is possible through a manual application of a Breusch-Pagan-Godfrey test. This is done by squaring the residuals from the original regression and then applying these as the dependent variable with the original specification. Any indication of heteroscedasticity observed by a significant F-stat from the regression would suitably be accounted for by using White's robust standard errors (Brooks, 2014).

The data should also be tested for normality, which means that the residuals from the regression follow a normal distribution. This could be checked for by a Jarque-Bera test in eViews, and also by following the guidelines of a skewness of 0 and a kurtosis of around 3. However, this assumption can be ignored for large enough sample sizes. This especially pertains to panel data where usually the application of two dimensions results in a substantially higher number of observations (Brooks, 2014). For these reasons, the assumption of normality will be ignored.

Another assumption made for the OLS regression to be correctly interpreted, is that the error terms are uncorrelated with one another. If there is any serial correlation, the data has autocorrelation. Ignoring this would render the coefficient estimates to be unbiased, but inefficient in terms of potentially estimating faulty error terms, which is not BLUE. It is normally possible to check for first-order autocorrelation via a Durbin-Watson test, with an acceptable value of around 2 (Brooks, 2014).

It’s also appropriate to check for heterogeneity, where the error terms constantly deviate from zero. Initially, this can be done through a joint redundant fixed effects test with fixed effects in

both the cross-sectional and time-period dimensions (Brooks, 2014). Depending on if there are significant F-stat and Chi-square values, it could indicate heterogeneity. However, in this instance it would still be necessary to check for the most suitable specification to account for heterogeneity, which involves testing for the suitability of applying random effects instead of fixed effects. In eViews this is tested through a Hausman test after the application of random effects. In order to correctly check for the suitability of utilizing random effects, this would necessitate the application of random effects in one dimension, and simultaneously using fixed effects in the other. However, since eViews does not allow for a Hausman test with both random and fixed effects, it is necessary to estimate fixed effects through within estimators. This is done by subtracting the mean of each variable from every observation in order to simulate the effect of fixed effects.

With the possibility of endogenous explanatory variables, where one or several explanatory variables are correlated with the error term, it would be necessary to conduct a test for endogeneity (Wooldridge, 2009). In eViews, this is possible through a manual Hausman test for endogeneity, where the variable believed to be endogenous is included as dependent variable against the structural equation. If necessary, with the inclusion of instruments in order to correctly identify the equation. The residuals from this regression are then saved and included into the structural equation, where the null of exogeneity is rejected if the residuals are found significant.

3.3 Operationalization

General treatment of data included in the regressions and definitions of variables.

3.3.1 General descriptions

The value for balance sheet posts has been calculated as averages during the year. For example: Size for 2007 is calculated as the average value between end of 2006 and 2007. This has been done for all balance sheet posts expect from the market value used in Tobin's Q, since this is generally measured at a single period in time and not as an average.

In order to correct for the notion of potentially lagged effects between variables, two models were developed with difference in the amount of years lagged. This was done to investigate the effect of the variables in different length of time periods since a balance sheet post might not affect profitability in the same year, but rather one or some years after. Therefore, two models were

separately tested for statistical significance, one with a one year lag (model 1) and one with a two year lag (model 2) for variables derived from balance sheet posts (cash holdings, leverage and Tobin's Q). The use of lagged periods creates a disposition of the data so the periods, where the effect on profitability is investigated, starts at 2006 but uses data from 2004.

In order to investigate the potential influence that the financial crisis might have had on cash holdings effect on profitability, interaction variables were used. To investigate the effect of the financial crisis, the sample was divided in three time periods defines as before, during and after the crisis. The year of the crisis is determined to be 2008-2009 (Riksbanken, 2012). This leads to the time period being defined to, before as 2006-2007, during as 2008-2009 and after as 2010-2014. This is accounted for in the data by using an interaction variable that is calculated in the following manner:

The different periods were investigated through three different regressions. The regressions included a dummy variable for the given period, cash holdings, and the interaction variable which is calculated by multiplying the dummy variable with cash holdings.

3.3.2 Definition of dependent variable

The dependent variable measures the profitability of the companies. Operating profit and total assets are defined in line with the definitions used in Thompson reuters datastream. (Appendix 3 & 4). The definition for profitability in this study was based on Simutin (2010) and is defined as:

$$Profitability = (Operating\ profit\ /\ Total\ assets)$$

3.3.3 Definitions of independent variables

This section presents the operationalization of the independent variables.

Cash holdings

The definition of cash holdings was derived from Simutin's study, where it is defined as a ratio to assets in order to compare the level of cash holdings between companies (Simutin, 2010). The variable was collected as the "Cash & short term investments" in Thomson reuters datastream (Appendix 4 & 5).

$$Cash\ holdings = Cash\ and\ cash\ equivalents\ /\ (Total\ assets - Cash\ and\ cash\ equivalents)$$

Firm size

Sales is chosen as the definition of firm size as used in Nagy *et al*. (2009). The more in-depth definition of sales was borrowed from Thomson reuters datastream (Appendix 6). The number for sales was logarithmized since it is an absolute figure, and since using the logarithm improved the distribution of the data.

Firm size = Sales (log10)

Leverage

Firm's level of leverage was defined from and Pattitoni *et al*. (2014) and Nagy *et al*. (2009), where total debt was utilized instead of total liabilities. The in-depth definition of book value of total debt is derived from Thomson reuters datastream (appendix 7 & 8).

Leverage = (Book value of total debt / Book value of shareholders equity)

Tobin's Q

Harford (1999) utilizes market-to-book as a proxy for Tobin's Q, which is how it was defined in this study. Market-to-book was defined as it is in Thomson reuters datastream (appendix 8 & 9)

Tobin's Q = (Market value of shareholders equity / Book value of shareholders equity)

State of the economy

This study uses the GDP growth of Sweden gathered from SCB (2016) as a variable to determine the state of the economy (appendix 10).

GDP = Change in GDP from previous year (percentage)

Industry

This study used the ICB classification for determination of industry which is used by Nasdaq OMX Stockholm (Nasdaq (b), 2016) (appendix 11). The classification system has 10 different industries, and was operationalized as dummy variables.

Independent variables	Definition	Data source
Cash Holdings	Cash and cash equivalents / (Total assets - cash and cash equivalents)	Thomson reuters datastream
Firm size	Sales (log10)	Thomson reuters datastream
Leverage	Book value of total debt / Book value of shareholders equity	Thomson reuters datastream
Tobins Q	Market value of shareholders equity / Book value of shareholders equity	Thomson reuters datastream
GDP	Change in GDP from previous year (percentage)	Thomson reuters datastream
Industry	ICB industry classification	Thomson reuters datastream

Table 3: Summary of variable operationalization

3.4 Reliability, replicability and validity

Validity refers to the integrity in the conclusions and the absence of systematic errors. This means that the study actually measures those aspects it is said to measure. This is an important factor in quantitative research. The way data was collected and the analysis performed was in line with how it should be done in a study of this kind. It used independent variables that according to previous research and theories have the most significant effect on profitability. This makes the validity of this study satisfying (Bryman & Bell, 2015).

There is a separation made between inner and external validity. The inner validity measure the strength in the causality between the dependent and independent variables. This means that if a relationship is found between two variables, one can be sure that the effect in the dependent actually is caused by the independent one, and not by something else. This study used statistical regression analysis which is an appropriate method for the purpose and has relevant independent variables that are chosen on basis of previous studies and theories. The regression and analysis is performed carefully step by step and has a well thought out method. That said, to provide an exhausting definition of the variance in the dependent variable is outside the scope of this study. Given the circumstances and the construction of the research, the inner validity is at a satisfying level (Bryman & Bell, 2015).

External validity means that the results from the study can be generalized on other samples and beyond this particular research context. The results in this study can be applied to samples in markets with similar investment opportunities, regulations and market concentration but cannot

be generalized to samples in all market and to all subsamples of companies. The conclusion is that the external validity in this study is satisfying (Bryman & Bell, 2015).

Reliability refers to whether the study can be repeated. The measures used in this study were consistent with previous research, well known financial theory and no specialized measures outside of the area of finance are used. This makes the study replicable in the sense that variables and research area could be replaced to test another purpose or the same purpose but with different independent variables or on different markets and with different companies (Bryman & Bell, 2015). This is possible since the study is performed in accordance to research methods commonly used and suited to the field of finance. The method, data selection and regression analysis has all been well documented so that the reliability reaches a satisfying level.

Replication is closely related to reliability and means if the study could be replicated by another researcher. This study is stringent in its description of the process and presents the way it is carried out in a detailed manner. It is also meticulous is its description of variables, methodology and regression analysis. These factors provide a solid basis for another researcher to test the results which makes the study replicable (Bryman & Bell, 2015).

3.5 Methodological criticism

This section presents the authors' criticism against various aspects of the study.

3.5.1 Criticism against research design

The initially chosen method to investigate the relationship between cash holdings and profitability, and if there were any differences in this relationship between the different time periods, was to do cross-sectional regressions for every studied year and compare both p-values and the coefficients. Due to linearity problems in the cross-sectional model, panel data regression was chosen, with the purpose to perform three regressions, one for every time period. This was not possible due to the problem of receiving a warning of the estimated coefficient covariance matrix being of reduced rank, which indicated that the result could not reliably be interpreted. Solving this by including time-period dummy variables in the panel data was also unattainable due to the regression having fixed effects in both the cross-sectional dimension and the time dimension.

As a result of this, a panel data method which covered the entirety of the years studied was chosen to investigate the relationship between cash holdings and profitability. To investigate any time-differences in the hypothesized relationship, an interaction variable test was the only method available. These tests measure if a certain variable in combination with a certain time period differs from how the same variable interacts with the other time periods. The problem with this method is that the other time periods are measured as one which gives an erroneous mean and standard deviation in comparison to if they could be measured separately in the test, and makes any real differences between time periods harder to detect. Also, since only cash holdings, profitability and the interaction variable are included in the regression, any impact from other variables are unaccounted for and further skews the results.

3.5.2 Criticism against variables

The independent variables that were chosen to isolate the effect of cash holdings on profitability were chosen on the basis of their significant effect and representation in previous studies. Despite this, they do not represent the entirety of factors that could have an effect on profitability and should not be seen as exhaustive list of factors. This means that it is possible that the result of this study is skewed to some extent and that the conclusion is somewhat biased due to the effect of factors that are not included in the study.

All variables included in the final regression are based on tangible numbers from sources such as balance sheet posts. The implication of this is that the regression fails to account for other qualities not reflected in these variables which are of more intangible nature such as culture or organizational structure since these are difficult to measure but still could have an impact on firm's profitability.

3.5.3 Criticism against boundaries and selection

Since companies that did not have data available for the entire time period was excluded from the data collection, this might constitute a problem of self-selection in the sense that companies that had lower profitability might have gone bankrupt and thus has been excluded from the sample. This means that the test performed in this study could be somewhat skewed towards representing those companies with comparably higher profitability.

The big financial crisis of 2008 was included in the period that was investigated in this study, which might skew the results to represent profitability in times of financial difficulties, and might therefore not be as representative to other time periods.

3.5.4 Criticism against data losses

Since companies that did not have available data in all time periods were excluded, this meant that some observations and companies that generally should have been in the sample, were not. This means that some companies that are or was on the market of interest but were missing certain data were excluded for the research which could decrease the validity of the results.

3.5.5 Criticism against secondary data

The use of secondary data exposes this study to the possibility that the primary sources have not treated the data in a correct manner. Since this aspect cannot be controlled and is hard to check for, this constitutes a risk in the reliability of the results.

3.5.6 Criticism against previous studies

Previous studies are conducted on other markets and on other time periods than this study. The definitions of variables also vary to some degree across previous studies. These aspects might reduce the comparability between previous research and this study.

Chapter 4. Empirical results

In this chapter descriptive statistics for the raw data are presented. Also, the regressions results with from the two different models are presented alongside the results from the regressions with interaction variables. Furthermore, the outcome of the statistical assumptions for OLS regressions is discussed.

4.1 Descriptive statistics

The descriptive statistics are calculated from outgoing values for each year and presents an overview of the properties of the data the study is based on (table 4 & 5). The average mean for cash holdings is more than two times as high as its median, suggesting that there are some companies with very high cash holdings in the sample. Tobin's Q has a similar relationship between mean and median which is more likely since there will be some companies with almost no equity but large growth possibilities. The mean for sales is almost nine times the median. In this case the there are some companies with extremely high values of sales that skews the distribution. This is quite likely since it is well known that Sweden has large companies in proportion to its size. That the max for the ratio of cash holdings is above eight is quite remarkable but this is explained by the fact that for example some medical companies in early research stages hold large amounts of cash to finance research and by cash being subtracted from total assets in the denominator.

Year	Operating profit		Cash		Firm size		Leverage		Tobin's Q	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2004	0,030	0,069	0,440	0,150	14278912	1414393	0,166	0,137	5,07	2,40
2005	0,045	0,069	0,309	0,123	15653234	1603214	0,176	0,144	6,16	2,96
2006	0,054	0,091	0,283	0,132	16751491	1693996	0,163	0,125	6,65	3,05
2007	0,077	0,087	0,258	0,100	18173287	2013516	0,189	0,156	5,37	2,31
2008	0,058	0,082	0,227	0,095	19229638	2181590	0,208	0,194	2,70	1,09
2009	0,030	0,063	0,242	0,113	17813982	2143015	0,182	0,168	4,08	1,71
2010	0,055	0,074	0,314	0,092	18456450	2235600	0,162	0,133	4,43	2,17
2011	0,071	0,087	0,249	0,087	19499835	2513950	0,173	0,151	3,33	1,63
2012	0,040	0,069	0,260	0,093	20078229	2623450	0,192	0,165	3,47	1,78
2013	0,041	0,067	0,265	0,109	19644299	2535958	0,182	0,156	4,42	2,41
2014	0,059	0,074	0,225	0,100	20779166	2863850	0,180	0,159	4,83	2,48
2004-2014	0,051	0,075	0,279	0,107	18214411	2134337	0,179	0,149	4,59	2,21

Table 4: Mean and median for independent variables (firm size in Kkr).

Year	Operating profit		Cash		Firm size		Leverage		Tobin's Q	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2004	0,380	-0,642	7,430	0,005	210401000	2846	0,591	0,000	102,66	0,41
2005	0,398	-0,535	2,750	0,008	240559000	2715	0,635	0,000	77,56	0,85
2006	0,432	-0,772	2,127	0,003	258835000	11064	0,776	0,000	76,62	0,82
2007	0,450	-0,479	4,005	0,004	285405000	12077	0,578	0,000	65,90	0,41
2008	0,403	-0,860	3,269	0,002	303667000	24800	0,601	0,000	40,76	0,16
2009	0,407	-1,469	2,330	0,003	218361000	10772	0,545	0,000	40,06	0,42
2010	0,424	-0,894	8,271	0,008	264749000	10153	0,521	0,000	61,36	0,51
2011	0,379	-0,580	5,472	0,004	310367000	21615	0,552	0,000	39,36	0,21
2012	0,828	-1,755	6,071	0,004	303647000	10276	0,584	0,000	35,30	0,23
2013	0,345	-0,512	3,879	0,005	272622000	34944	0,793	0,000	44,07	-0,87
2014	0,537	-0,787	1,987	0,002	282948000	10399	0,897	0,000	68,72	-0,47
2004-2014	0,828	-1,755	8,271	0,002	310367000	2715	0,897	0,000	102,66	-0,87

Table 5: Max and min for independent variables (firm size in Kkr).

4.2 OLS and tests of validity

This section describes the validity tests carried out on the regression results.

4.2.1 Multicollinearity

The highest correlation was found between cash holdings and firm size for both model 1 and 2, with values of -0,4165 and -0,4105 respectively (appendix 12). On this basis, it was concluded that there is no sign of multicollinearity within either models.

4.2.2 Heterogeneity and autocorrelation

The joint redundant fixed effects tests resulted in significant F-stat and Chi-square values, indicating heterogeneity in the cross-sectional and time-period dimension for both model 1 and 2 (appendix 13). The p-values from the Hausman tests with random effects in the cross-sectional dimension were found significant (appendix 14). However, the time-period tests were not statistically significant, which does not allow for the rejection of random effects as a suitable specification (appendix 15). Therefore, within-estimators were used in order to simulate cross-section fixed effects while simultaneously running random effects in the time-period (appendix 16). Significant results for both models are interpreted as random effects not being suitable in the time-period dimension. Utilizing fixed effects in both dimensions allows the intercepts to vary both cross-sectionally and in the time-period, which also solves for any potential autocorrelation (Wooldridge, 2009). This resulted in the exclusion of both industry dummies and GDP as independent variables in order to allow for fixed effects in both dimensions.

4.2.3 Heteroscedasticity

The F-stat from the manual Breusch-Pagan-Godfrey test proved significant for both models, indicating heteroscedasticity (appendix 17). To account for this, White's diagonal standard errors were used for both models.

4.2.4 Normality

Jarque-Bera test of normality proved significant for both models and thereby the null of normality could be rejected (appendix 18). Model 1 had a skewness of -1,485 and a kurtosis of 30,895 while model 2 had a skewness of -1,678 and a kurtosis of 36,462, which clearly deviates from the guidelines of normality. However, as explained in the methodological chapter, this assumption can be ignored.

4.2.5 Endogeneity

Firm size (log sales) was suspected to be endogenous which allowed for a test of endogeneity. Since the equation was unidentified according to the order condition, industry dummies were added to the second equation. The residuals from this regression was saved and then added to the original regression as an independent variable. The test was done for both models and the p-value for the residuals in model 1 was 0,5032 and 0,4157 in model 2 (appendix 19). On this basis, the null hypothesis of exogeneity could not be rejected and the data was concluded to not experience

endogeneity. No other variables than firm size (log sales) was suspected to be endogenous, therefore, no extra treatment for endogeneity was done in the data set.

4.3 Results of regression

Below are the results from the final specification of model 1 presented (table 6). The model explains 73,6 % of the variance in the dependent variable, and has an adjusted R^2-value of 0,699. The significant independent variables in the model being leverage, has a p-value of 0,0082, and firm size which has a p-value of 0,0000 (appendix 20).

Model 1		
Variables	**Coefficient**	**P-value**
Cash holdings	-0,0309	0,4370
Firm size (log10)	0,2837	0,0000
Leverage	-0,1279	0,0082
Tobin's Q	0,0012	0,0845
R-squared: 0,736		
Adjusted R-squared: 0,699		

Table 6: Regression results from model 1.

The results from model 2 differ somewhat as it had an R-squared value of 0,749 and only one significant explanatory variable, which was firm size with a p-value of 0,0000 (table 7, appendix 20). The adjusted R-squared values are also quite similar where model 1 has a value of 0,699 and model 2 has a value of 0,709.

Model 2		
Variables	**Coefficient**	**P-value**
Cash holdings	-0,0047	0,9005
Firm size (log10)	0,2934	0,0000
Leverage	-0,0035	0,9275
Tobin's Q	-0,0011	0,3590
R-squared: 0,749		
Adjusted R-squared: 0,709		

Table 7: Regression results from model 2.

The interaction variable tests to see whether there were any differences in the effects cash holdings had on profitability during the different time periods provided insignificant p-values which means that none of the time periods significantly differed in how cash holdings affected

profitability (appendix 21). The results from the one-year lag can be seen in table 8. The two-year lag model was not possible to regress due to the coefficient covariance matrix being of reduced rank.

Interaction variables		
Time period	**Coefficient**	**P-value**
Before crisis	-0,0341	0,4895
During crisis	-0,0619	0,4089
After crisis	0,0589	0,2377

Table 8: Regression results for interaction variables from model 1.

As can be deducted from the results presented, no statistically significant relationship between a firm's cash holdings and its profitability could be found. Further could no differences be found in this relationship before, during and after the financial crisis of 2008-2009. These results will be further discussed in the following analysis.

Chapter 5. Analysis

In this chapter the empirical results are discussed in relation to previous studies and the underlying theoretical framework for the study. The results are interpreted and discussed by their expected relationship to the dependent variable. A broader discussion revolves around the explanatory variable and the potential outcome of the results found in this study.

5.1 General discussion

The results below from the regressions in model 1 and model 2 are presented in comparison to the expected relationships based on theory and previous research results. From table 9 & 10 it is possible to conclude that the regression results provide mixed interpretations in relation to the expected outcomes based on previous research. In model 1 the variables which were found to have a statistically significant effect on the dependent variable were leverage which had a negative coefficient, and firm size which had a positive coefficient. Both were significant at the 1 % level.

Model 1		
Variable	**Expected result**	**Result**
Cash holdings	Negative	N/A
Firm size **	Positive	Positive **
Leverage **	Negative or positive	Negative **
Tobin's Q	Positive	N/A

** Significant at 1% level

Table 9: Expected results compared to results of model 1.

In model 2, the only statistically significant variable was firm size which had a positive coefficient at the 1 % level. Leverage was not found to be statistically significant in model 2, compared to the negative relationship found in model 1.

Model 2		
Variable	**Expected result**	**Result**
Cash holdings	Negative	N/A
Firm size **	Positive	Positive **
Leverage	Negative or positive	N/A
Tobin's Q	Positive	N/A

** Significant at 1% level

Table 10: Expected results compared to results of model 2.

The R^2-value of model 1 was 0,736 and 0,698 in model 2 (appendix 28 & 29). This means that approximately 74% in model 1 and 70% in model 2 of the variation in the dependent variable can be explained by the independent variables. This level of explanation is slightly lower in model 2 with two year time lag, suggesting that the independent variables are more closely related to the profitability in a shorter time spectrum and decreases over time. The high R^2-value can partly be explained by the use of fixed effects dummies in both cross-sectional and time-period dimension as these function as additional explanatory variables in the regression.

5.2 Cash holdings

The final regression results from both model 1 and 2 showed no significant relationship between cash holdings and profitability. This result does not lend support to the expected relationship of a negative effect. Subsequently this also contradicts the cash flow hypothesis formulated by Jensen (1986), and previous research by Richardson (2006) and Harford (1999). Jensen explained cash holdings negative effect on profitability by the differences in incentives between managers and owners. From this perspective, no such differences in incentives could be significantly proven to exist in the market this study is based on. Harford (1999) argued that firms who build up cash reserves in excess of financing requirements suffer from poor investments and lower profitability. Since this study doesn't show the same result as Harford, it could not be determined that cash holdings in firms are too large in relation to financial requirements.

Miller and Modigliani (1961) argued in their dividend irrelevance theory that in a perfect capital market, firms have no benefit of holding more cash than what is necessary for operations. Opler *et al*. (1999) argued that the management of a firm may hold cash to follow their own agenda at the expense of the shareholders. From the discussion above it does not seem that managers in firms, which holds relatively high amounts of cash, expropriate wealth from shareholders. Opler *et al*. (1999) also points out that firms with valuable investment opportunities have a greater

chance of shareholders and management having mutual interests. These results might suggest that there are enough investment opportunities available to align the interest of management and shareholders, and thereby reduce the agency costs of managerial discretion.

Another possible explanation to the lack of significant relationship between cash holdings and profitability in this study could be that it is made on Swedish firms as opposed to previous studies conducted on U.S. firms. Regulations and corporate governance structures differ between the two countries and could impact to what extent cash holdings affect profitability. These results can seem contradictory as the U.S. corporate governance system is considered one of the world's strictest. On the other hand it might suggest that firm's ownership structure have a larger influence on reducing agency costs in regards to overinvestment and excess expenditures than previously considered. As Swedish firms generally have a higher concentration of control owners compared to U.S. firms, this could infer that Swedish firms are being closer monitored compared to their U.S. counterparts, but rather because of ownership structure than legislation.

The projected relationship between cash holdings and profitability was assumed to have changed during the crisis, either in the relationship ceasing to exist or a change in the strength between the two variables. As the results showed from the interaction variable tests, there were no statistically significant differences between the three periods, before, during, and after the financial crisis, in the way cash holdings affected profitability. This does not support the authors' initial beliefs on how financial regulations, and an altered mindset of risk-exposure, could have affected firms' wasteful expenditures of cash holdings and its impact on profitability. Almeida *et al*. (2004) theorized that exogenous shocks, such as a recession, change the relative profitability between future and current investments. Simutin (2010) contributed to the discussion of the effect of exogenous shocks by suggesting that there are less valuable growth opportunities for companies with higher levels of cash holdings during an economic downturn. The results from this study offer no support to this notion or those presented by Almeida *et al*. (2004).

These results could imply either of two possibilities. One of them regards Simutin's (2010) explanation for the negative outcome of high-level cash firms during an economic downturn, where the results from this study would suggest otherwise. The other possibility pertains to the notion that Simutin's explanation upholds, but that the Swedish economic downturn during the financial crisis was not severe enough to highlight a significant difference.

5.3 Firm size

The regression output illustrate that firm size has a positive coefficient and a significant relationship at the 1% level in model 1 and 2. Based on the findings of Stierwald (2010) and Popa and Ciobanu (2014) firm size was expected to have a positive effect on profitability. Pattitoni *et al*. (2014) contradicted that size has a positive effect on profitability and instead argued that firm size is negatively related to profitability. Subsequently, this study supports the two first and opposes the latter.

The reason why firm size has a positive effect could be due to benefits of economies of scale. It could also be that larger companies have the benefit of reaching new and emerging markets more efficiently and at a relatively lower cost than smaller companies. Larger size also provides better exposure and generally better access to information channels.

5.4 Leverage

From the regression results, leverage proved to have a significant negative relationship to profitability in model 1, with a p-value of 0,0082. For model 2, no significant relationship was found. The significant negative relationship is supported by the findings of Nagy et.al (2009), who argued that debt increases risk in the short term and may instead produce profitability in the long term. What constitutes long term according to Nagy is unspecified, and as the results from this study show, leverage is not significantly related to profitability with a two-year lag. Pattitoni *et al*. (2014) also found a significant negative relationship and argued that debts effect on profitability is nonlinear and negative when the level of leverage is high.

Burja (2011) found that leverage has a positive effect on profitability, which is supported by Jensen (1986) who argues that debt is an important control mechanism. This is due to decreased amounts of available cash flow for management to use as discretionary spending which forces them to become more efficient to meet future interest- and debt payments to avoid bankruptcy.

As the measurement of profitability used in this study is the operational return on assets, leverage has to negatively affect either cost of goods sold, revenues, or both. As a higher leverage increases a firm's risk, it could affect the way stakeholders perceive the firm and the way they conduct business with it. Suppliers might have to increase the price of their goods sold to the firm when accounting for the higher risk of not being able to collect their accounts payable for

delivered goods due to the firm defaulting on their payments. These types of costs can be seen as indirect bankruptcy costs discussed in Jensen (1986), as a result of increased debt. Another way debt could affect profitability is that it might lower revenues for the firm's products, as consumers are willing to pay less when accounting for the risk of the firm not being able to uphold their warranties or provide the services or spare parts as promised.

Another aspect relates to financial flexibility, which can be created by the levels of cash holdings that a firm has (Myers & Maluf, 1984). Since cash holdings can be seen as negative debt, the argument can be made that due to high levels of leverage, firms become restrained in their abilities to finance new projects, and simply lose out on NPV-positive investments. Furthermore, this also relates to firms prone to underinvestment. This pertains to firms with amounts of leverage high enough to prevent the management from undertaking investments. If these actions are founded in the management being risk averse due to fear of increasing the likelihood of default and losing their positions, despite it being valuable to the shareholders, it can be seen as a sign of self-serving behavior presented in Jensen and Meckling's theory of the firm (1976). This is due to elevated levels of risk, where any benefit to shareholders weigh against the management's accountability if the firm defaults. Ultimately this could result in firms rejecting to undertake investments that would be beneficial for the shareholders. This kind of agency problem could also be directed towards the lender where the firm refuses to undertake NPV-investments since a considerable share of the profits would be paid in interest, and therefore not be beneficial enough for the shareholders.

With the different regression results from model 1 and 2, it is possible to conclude that leverage with a one-year lag affects profitability, while the 2-year lag does not have any significant impact. With the arguments above relating to stakeholders' perception of a firm's risk exposure, as well as the firm's investment-capability, this could imply that a firm's leverage is being evaluated both externally and internally within a relative short time horizon.

5.5 Tobin's Q

No significant relationship was found between Tobin's Q and profitability in either of the models. While model 1 found a positive coefficient with a p-value of 0,0845, and model 2 a negative coefficient with a p-value of 0,3590, it would seem that model 1 is closer to the expected outcome from previous studies, even though it's not possible to draw a definitive conclusion. Based on the research by Stierwald (2010), Tobin's Q was believed to have a positive effect on profitability. With result from both models in mind, it is possible to speculate in the probability of finding a significant relationship within a shorter time period than estimated for this study. While it is not possible to declare model 1 as significant, there is still a relative difference between the p-value which could indicate that model 1 is closer to a significant relationship than model 2. Therefore, the most suitable time-span to estimate a relationship between Tobin's Q and profitability is likely less than that of model 1.

Compared to previous studies, it is possible that firms listed on Stockholm stock exchange differ in relation to industries, compared to other markets where a significant relationship has been found. This would originate in the different valuations between industries and their expected profitability. For example, a higher proportion of medical companies with a high Tobin's Q but necessarily not high profitability.

Chapter 6. Conclusions

The conclusions drawn from the analysis are discussed from a wider perspective. The general implications from this study's analysis are presented and the result of cash holdings effects on profitability is discussed further.

Cash holdings was not found to have any significant effect on profitability in the firm's listed on the Swedish stock exchange during the years 2004-2014. This contradicts Jensen's free cash flow hypothesis and previous research by Richardson (2006) and Harford (1999). In other words, theories revolving around the notion of agency costs related to cash holdings discussed in Jensen (1986), Jensen and Meckling (1976) and Opler *et al*. (1999) found no support in the results of this study.

The interaction variable tests established that there were no statistically significant differences between the three periods, before, during, and after the financial crisis, in the way cash holdings affected profitability. One possible explanation could be that Simutin's (2010) conclusion of the negative outcome of high cash level firms during economic downturns is not suitable for the Swedish market, which this study would suggest. Another is that the economic downturn in the Swedish market was not severe enough to create a significant difference.

Leverage and size were proven to have a significant effect on profitability while no such conclusion could be drawn about Tobin's Q. The positive coefficient of size was in line with previous studies, and could be explained by benefits of economies of scale in production or reaching new and profitable markets. Leverage had a negative effect on profitability which contradicts the reasoning of debt being a control mechanism for agency costs relating to excessive expenditures and overinvestment, presented by Jensen (1986). Although, following the argument of Myers and Maluf (1984) regarding financial flexibility, the significant relationship supports the claim that leverage reduces financial flexibility, which could lead to firms missing out on profitable investments. As leverage was significant with a one year lag but not significant

with the two year lag, this could suggest leverage has a larger effect on profitability in a short term perspective.

Finally, the contradicting results regarding cash holdings effect on profitability, could stem from different regulations and governance structures between the market in this study, and the markets previous studies has been conducted on. This might suggest that firms' ownership structure have a larger influence on reducing agency costs in regards to overinvestment and excess expenditures than previously considered. As Swedish firms generally have a higher concentration of control owners compared to U.S. firms, this could infer that Swedish firms are being closer monitored compared to their U.S. counterparts, but rather because of ownership structure than legislation.

6.1 Future research

During the course of this study, the limitations and improvement areas of its execution have become clearer. As a way of drawing upon these experiences and realizations we will present our suggestions for future research.

The risk of management using cash for discretionary purposes could be greater in firms listed on Stockholm stock exchange's small cap list compared to those listed on the large cap due to the possible differences in media coverage and external monitoring. This due to many mutual funds having minimum requirements on the market value in the firms they invest in, which could make companies with lower market values less monitored. For this reason, a comparison between how cash holdings affect profitability differs between list segments could be of interest to investigate. Since the level of cash holdings and financial flexibility affects the level of new investments made, it would add to the research to carry out an in-depth analysis of profitability on new investment as a result of cash holdings. The author's suggestion is to either look at acquisitions or to do an in-depth analysis of all investment made by companies.

There could be differences across industries in how cash affects profitability. It would therefore be of value to investigate how cash holdings affects profitability within industries and see if there is a difference between industries.

Sources

Literature

Bryman, A. & Bell, E. (2011). Företagsekonomiska forskningsmetoder, Stockholm: Liber.

Bryman, A. & Bell, E. (2015). Business Research Methods, New York: Oxford University Press Inc.

Körner, S. & Wahlgren, L. (2012). Praktisk Statistik, Lund: Studentlitteratur AB

Lundahl, U. & Skärvad, H. (1999). Utredningsmetodik för samhällsvetare och ekonomer, Lund: Studentlitteratur AB.

Brooks, C. (2014). Introductory Econometrics for Finance, new York: Cambridge University Press.

Wooldridge, J. (2009). Introductory Econometrics - A Modern Approach, Michigan , Michigan University: South-Western Cengage Learning.

Articles and Periodicals

Almeida, H., Campello, M., Weisbach, S. (2004). The Cash Flow Sensitivity of Cash, *The Journal of Finance*, vol. 59, no. 4, p. 1777-1804

Burja, C. (2011). Factors influencing the companies' profitability, *Annales Universitatis Apulensis Series Oeconomica, vol. 13*, no. 2, p. 215-224

Brush, T., Bromiley, T., & Hendrickx, M. (1999). The Relative Influence Of Industry And Corporation On Business Segment Performance: An Alternative Estimate, *Strategic Management*

Journal, vol. 20, p. 519-547

Harford, J. (1999). Corporate Cash Reserves and Acquisitions, *Journal of Finance,* vol. 54, issue 6, p. 1969-1997

Jensen, M. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers, *The American Economic Review* vol. 76, no. 2, p. 323-329

Jensen, M. & Meckling, W. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, *Journal of Financial Economics* vol. 3, issue 4, p. 305–360

Lang, L., Stulz, R. & Walkling, R. (1991). A Test of the Free Cash Flow Hypothesis: The Case of Bidders Returns, *Journal of Financial Economics*, vol. 29, issue 2, p. 315-336

Miller, M. & Modigliani, F. (1961). Dividend Policy, Growth, and the Valuation of Shares, *The Journal of Business,* vol. 34, no. 4, p. 411-433

Myers, S. & Majluf, N. (1984) Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have, *Journal of Financial Economics*, vol. 13, issue 2, p. 187-221

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

Oxelheim, L. & Randøy, T. (2005). The Anglo-American Financial Influence on CEO Compensation in Non-Anglo-American Firms, *Journal of International Business Studies,* vol. 36, nor. 4, s. 470-483

Richardson, S. (2006). Over-investment of Free Cash Flow, *Review of Accounting Studies,* vol. 11, no. 2-3, p. 159-189

Simutin, M. (2010). Excess Cash and Stock Returns, *Financial Management,* vol. 39, issue 3, p. 1197-1222

Pattitoni, P., Petracci, B. & Spisni, M. (2014). Determinants of Profitability in the EU-15 Area, *Applied Financial Economics*, vol. 24, issue 11, p. 763–775

Popa, E. & Ciobanu, R. (2014). The financial factors that influence the profitability of SME's, *International Journal of Academic Research in Economics and Management Sciences,* vol. 3, no. 4, p. 177-185

Saini, J. & White, T. (2015). The effects of volatility and leverage on the earnings-GDP relation, *Academy of Accounting and Financial Studies Journal,* Volume 19, Number 3, p. 267-282

Stierwald, A. (2010). Determinants of profitability, an analysis of large Australian firms, *Melbourne Institute of Applied Economic and Social Research.* Melbourne Institute Working Paper no. 3/10

Nagy, N. & Newman, I., & Nelson, M. (2009). Determinants of Profitability: What factors play a role when assessing a firm's return on assets? Senior project, University of Akron.

Electronic sources

Nasdaq OMX, First North (A), Accessible online: http://www.nasdaqomxnordic.com/tietoaporssista/firstnorth?languageId=3&Instrument=SSE101 [Downloaded March 21 2016]

Nasdaq OMX, Stocks (B), Accessible online: http://www.nasdaqomxnordic.com/aktier [Downloaded March 9 2016]

Riksbanken (2010) *Den nya bankregleringen,* Accessible online: http://www.riksbank.se/sv/Finansiell-stabilitet/Finansiella-regelverk/Aktuella-regleringsforandringar/Den-nya-bankregleringen-Basel-III/ [Downloaded March 21 2016]

Riksbanken (2012), *Riksbankens penningpolitiska åtgärder under finanskrisen – utvärdering och lärdomar*, Accessible online: http://www.riksbank.se/Documents/Rapporter/POV/2012/rap_pov_artikel_1_121017_sve.pdf [Downloaded March 21 2016]

Statistiska centralbyrån (2016), Nationalräkenskaper, BNP kvartal 1993-2015:4, Accessible online: http://www.scb.se/sv_/Hitta-statistik/Statistik-efter-amne/Nationalrakenskaper/Nationalrakenskaper/Nationalrakenskaper-kvartals--och-arsberakningar/#c_li_377031 [Downloaded March 21 2016]

Financial Data / Databases

Thomson reuters datastream

Appendices

Appendix 1. Included companies

#	Company	Segment	#	Company	Segment
1	ABB Ltd	LARGE	55	Nolato AB	MID
2	Alfa Laval AB	LARGE	56	OEM International AB	MID
3	ASSA ABLOY AB	LARGE	57	Proffice AB	MID
4	AstraZeneca PLC	LARGE	58	SAS AB	MID
5	Atlas Copco AB	LARGE	59	SECTRA AB	MID
6	Axfood AB	LARGE	60	SkiStar AB	MID
7	Axis AB	LARGE	61	SWECO AB	MID
8	BillerudKorsnäs AB	LARGE	62	Unibet Group Plc	MID
9	Boliden AB	LARGE	63	ÅF AB	MID
10	Electrolux, AB	LARGE	64	Acando AB	SMALL
11	Elekta AB	LARGE	65	AddNode Group AB	SMALL
12	Ericsson, Telefonab. L M	LARGE	66	Anoto Group AB	SMALL
13	Getinge AB	LARGE	67	Aspiro AB	SMALL
14	Hennes & Mauritz AB, H & M	LARGE	68	Beijer Electronics AB	SMALL
15	Hexagon AB	LARGE	69	BioInvent International AB	SMALL
16	Holmen AB	LARGE	70	Biotage AB	SMALL
17	Lundin Petroleum AB	LARGE	71	Bong AB	SMALL
18	Meda AB	LARGE	72	Concordia Maritime AB	SMALL
19	Millicom International Cellular S.A.	LARGE	73	Consilium AB	SMALL
20	Modern Times Group MTG AB	LARGE	74	CTT Systems AB	SMALL
21	NCC AB	LARGE	75	Cybercom Group AB	SMALL
22	NIBE Industrier AB	LARGE	76	DORO AB	SMALL
23	Peab AB	LARGE	77	Duroc AB	SMALL
24	SAAB AB	LARGE	78	Elanders AB	SMALL
25	Sandvik AB	LARGE	79	Enea AB	SMALL
26	Securitas AB	LARGE	80	Feelgood Svenska AB	SMALL
27	Skanska AB	LARGE	81	Geveko, AB	SMALL
28	SKF, AB	LARGE	82	Intellecta AB	SMALL
29	SSAB AB	LARGE	83	KABE AB	SMALL
30	Svenska Cellulosa AB SCA	LARGE	84	Knowit AB	SMALL
31	Tele2 AB	LARGE	85	Malmbergs Elektriska AB	SMALL
32	TeliaSonera AB	LARGE	86	MSC Konsult AB	SMALL
33	Tieto Oyj	LARGE	87	MultiQ International AB	SMALL
34	Trelleborg AB	LARGE	88	Net Insight AB	SMALL
35	Volvo, AB	LARGE	89	NOTE AB	SMALL
36	Active Biotech AB	MID	90	NOVOTEK AB	SMALL
37	Addtech AB	MID	91	Opcon AB	SMALL
38	Beijer Alma AB	MID	92	Ortivus AB	SMALL
39	Betsson AB	MID	93	PartnerTech AB	SMALL
40	Bilia AB	MID	94	Poolia AB	SMALL
41	BioGaia AB	MID	95	Precise Biometrics AB	SMALL
42	Clas Ohlson AB	MID	96	Pricer AB	SMALL
43	Eniro AB	MID	97	Probi AB	SMALL
44	Fagerhult, AB	MID	98	ProfilGruppen AB	SMALL
45	Fingerprint Cards AB	MID	99	RaySearch Laboratories AB	SMALL
46	Gunnebo AB	MID	100	Rederi AB Transatlantic	SMALL
47	Haldex AB	MID	101	RNB RETAIL AND BRANDS AB	SMALL
48	HiQ International AB	MID	102	Rottneros AB	SMALL
49	Industrial & Financial Systems AB	MID	103	Semcon AB	SMALL
50	Lagercrantz Group AB	MID	104	SinterCast AB	SMALL
51	Medivir AB	MID	105	Studsvik AB	SMALL
52	Mekonomen AB	MID	106	VBG GROUP AB	SMALL
53	New Wave Group AB	MID	107	Vitrolife AB	SMALL
54	Nobia AB	MID	108	XANO Industri AB	SMALL

Image 1.1. Included companies listed on Nasdaq OMX Stockholm between 2004-2014.

Appendix 2. Excluded companies

Excluded financial companies

#	Company	Segment
1	Castellum AB	LARGE
2	Fabege AB	LARGE
3	Hufvudstaden AB	LARGE
4	Industrivärden, AB	LARGE
5	Intrum Justitia AB	LARGE
6	Investor AB	LARGE
7	JM AB	LARGE
8	Kinnevik, Investment AB	LARGE
9	Latour, Investmentab	LARGE
10	Lundbergföretagen AB, L E	LARGE
11	Nordea Bank AB	LARGE
12	Skandinaviska Enskilda Banken	LARGE
13	Swedbank AB	LARGE
14	Svenska Handelsbanken	LARGE
15	Wallenstam AB	LARGE
16	Avanza Bank Holding AB	MID
17	Bure Equity AB	MID
18	Fast Partner AB	MID
19	Fastighets AB Balder	MID
20	Heba Fastighets AB	MID
21	Klövern AB	MID
22	Kungsleden AB	MID
23	Nordnet AB	MID
24	Vostok Nafta Investment Ltd, SDB	MID
25	Öresund, Investment AB	MID
26	Havsfrun Investment AB	SMALL
27	Midway Holding AB	SMALL
28	Novestra AB	SMALL
29	Svolder AB	SMALL
30	Traction AB	SMALL

Excluded companies

#	Company	Segment
1	Autoliv Inc. SDB	LARGE
2	Lundin Mining Corporation SDB	LARGE
3	Oriflame Cosmetics S.A, SDB	LARGE
4	Stora Enso Oyj	LARGE
5	Cloetta AB	MID
6	Fenix Outdoor International AG	MID
7	Lifco AB	MID
8	Karo Bio AB	SMALL
9	Bergs Timber AB	SMALL
10	BTS Group AB	SMALL
11	Sensys Traffic AB	SMALL
12	Transcom WorldWide AB	SMALL

Image 2.1. Excluded companies listed on Nasdaq OMX Stockholm between 2004-2014.

Appendix 3. Operating profit

All Industries except banks:

OPERATING INCOME represents the difference between sales and total operating expenses

Banks:

OPERATING INCOME for banks is calculated by:

= Interest Income-Total (01016) + Non-Interest Income (01021) – Interest Expense-Total (01075) – Non-Interest Expense (01245) – Provision for Loan Losses (01271).

Appendix 4. Total assets

All Industries:
TOTAL ASSETS represent the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets.
Banks:
TOTAL ASSETS represent the sum of cash & due from banks, total investments, net loans, customer liability on acceptances (if included in total assets), investment in unconsolidated subsidiaries, real estate assets, net property, plant and equipment and other assets.
Insurance Companies:
TOTAL ASSETS represent the sum of cash, total investments, premium balance receivables, investments in unconsolidated subsidiaries, net property, plant and equipment and other assets.
Other Financial Companies:
TOTAL ASSETS represent the sum of cash & equivalents, receivables, securities inventory, custody securities, total investments, net loans, net property, plant and equipment, investments in unconsolidated subsidiaries and other assets.
Footnotes:
B. Excludes contra items (contingent liabilities)
L. No standard text
M. No standard text
O. Adjusted to exclude deferred taxes
Ongoing update discontinued from Oct 2012
C. Includes trust business assets
D. Adjusted to exclude foreign currency translation gains/losses
F. Adjusted to exclude provision for bad debt/loan losses
G. Adjusted to exclude treasury stock
H. Adjusted to exclude investment in own bonds
I. Adjusted to exclude foreign currency translation losses and provision for bad debts
J. Adjusted to excluded treasury stock and investment in own bonds
K. Adjusted to excluded unappropriated net loss
N. Increased by payments on work in progress that has been treated as a current liability

Appendix 5. Cash and Cash equivalents

"CASH AND SHORT TERM INVESTMENTS represents the sum of cash and short term investments. It includes but is not restricted to:
Cash on hand, Undeposited checks ,Cash in banks, Checks in transit, Cashier's checks, Credit card sales, Drafts, Cash in escrow, Restricted cash, Money orders, Letters of credit, Demand deposits, (non-interest bearing), Mortgage bond proceeds held in escrow, Bullion, bullion in transit, Short-term obligations of the U.S. Government, Stocks, bonds, or other marketable securities listed as, Short-Term Investments, Time Certificates of Deposit, Time deposits, Eurodollar bank time deposits
U.S. Government treasury bills, Corporate Securities - stocks, bonds, Municipal securities, Commercial Paper, Money market mutual fund shares, Post Office checking/GIRO accounts (non-U.S. corporations only), Post Office savings accounts (non-U.S. corporations only), Post Office time, deposits (non-U.S. corporations only), Central Bank Deposits, Temporary Investments, It excludes:
Commercial Paper issued by unconsolidated subsidiaries to Parent company (included in receivables), Amount due from sale of debentures (included in receivables), Checks written by the, company but not yet deposited and charged to the company's bank account, Promissory Notes, Footnotes:, Ongoing update discontinued from Oct 2012, A. Includes non-liquid current assets, D. Includes cash and securities held for regulatory purposes, **"**

Appendix 6. Sales

Firm size - "Net sales or revenues"
Net sales or revenue include:
Franchise sales when corresponding costs are available and included in expenses.

Consulting fees, Service income, Royalty income when included in revenues by the company., Contracts-in-progress income, Licensing and franchise fees, Income derived from equipment lease or rental when considered part of operating revenue, Commissions earned (not gross billings) for advertising companies, Income from leased departments It excludes: Non-operating income, Interest income, Interest capitalized, Equity in earnings of unconsolidated subsidiaries, Rental income, Dividend income, Foreign exchange adjustment, Gain on debt retired, Sale of land or natural resources, Sale of plant and equipment, Sale of investment, Sales from discontinued operations, Security transactions, Income on reserve fund securities when shown separately, Operating differential subsidies for shipping companies, Net mutual aid assistance for airlines companies, General and Service Taxes, Value-Added taxes, Excise taxes, Windfall Profit Taxes, Banks, Insurance and Other Financial Companies: REVENUES represent the total operating revenue of the company.It includes but is not restricted to: For Banks:Interest and fees on loans, Interest on Federal Funds, Interest on Bank Deposits, Interest on State, County and Municipality Funds, Interest on U.S. Government and Federal Agencies Securities, Federal Funds sold and securities purchased under resale agreements, Lease Financing, Net leasing revenue, Income from Trading Accounts, Foreign, Exchange Income, Investment Securities gains/losses, Service Charges on Deposits, Other Service, Fees, Trust Income, Commissions and Fees, For Insurance Companies: Premiums Earned Investment income (if the company reports this item net of expenses then the net amount is shown after excluding interest expense), Other operating income, Gains/Losses on sale of securities (pre-tax), For Other Financial Companies, Investment income/loss, Interest income, Income from trading accounts, Trust income, Commission and fees, Rental Income,Securities purchased under resale agreements, Investment Banking income, Principal Transactions

Appendix 7. Total debt

TOTAL DEBT represents all interest bearing and capitalized lease obligations. It is the sum of long and short term debt.

Appendix 8. Total shareholder equity

Total Shareholders' equity

"represents the sum of Preferred Stock and Common Shareholders' Equity.

This item is available in the annual time series and the quarterly, semi-annual and trimester interim time series. It is only available at the company level."

Appendix 9. Market value

Market value on Datastream is the share price multiplied by the number of ordinary shares in issue. The amount in issue is updated whenever new tranches of stock are issued or after a capital change.

§ For companies with more than one class of equity capital, the market value is expressed according to the individual issue.

§ Market value is displayed in millions of units of local currency.

Appendix 10. GDP in Sweden 2004-2015 and change per year in percent

Year	GDP	Years change
2004	3 323 508	4,30
2005	3 417 175	2,8
2006	3 577 376	4,7
2007	3 699 184	3,4
2008	3 678 578	-0,6
2009	3 487 857	-5,2
2010	3 696 742	6,0
2011	3 795 238	2,7
2012	3 784 371	-0,3
2013	3 831 343	1,2
2014	3 918 199	2,3
2015	4 078 596	4,1

Appendix 11. Industry - ICB classification

Oil and Gas, Basic Materials, Industrials, Consumer Goods, Healthcare, Consumer Services, Telecommunications, Utilities, Financials, Technology.

Appendix 12. Test of multicollinearity (model 1 & 2)

	CASH	LEVERAGE	MARKET_BOOK	LOGSALES
CASH	1.000000	-0.311910	0.112460	-0.416502
LEVERAGE	-0.311910	1.000000	0.012963	0.299725
MARKET_BOOK	0.112460	0.012963	1.000000	-0.077925
LOGSALES	-0.416502	0.299725	-0.077925	1.000000

Table 12.1. Bivariate correlation between independent variables for model 1.

	CASH	LEVERAGE	MARKET_BOOK	LOGSALES
CASH	1.000000	-0.314596	0.112266	-0.410466
LEVERAGE	-0.314596	1.000000	0.018825	0.286016
MARKET_BOOK	0.112266	0.018825	1.000000	-0.070404
LOGSALES	-0.410466	0.286016	-0.070404	1.000000

Table 12.2. Bivariate correlation between independent variables for model 2.

Appendix 13. Test of heterogeneity (model 1 & 2)

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	13.142272	(107,852)	0.0000
Cross-section Chi-square	947.454100	107	0.0000
Period F	4.878605	(8,852)	0.0000
Period Chi-square	43.536143	8	0.0000
Cross-Section/Period F	12.386869	(115,852)	0.0000
Cross-Section/Period Chi-square	955.285010	115	0.0000

Cross-section fixed effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 10:39
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.275200	0.034511	-7.974357	0.0000
CASH	-0.108804	0.009861	-11.03342	0.0000
LEVERAGE	-0.239868	0.031917	-7.515304	0.0000
MARKET_BOOK	0.002584	0.000474	5.446327	0.0000
LOGSALES	0.060571	0.005229	11.58274	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.300756	Mean dependent var	0.053654
Adjusted R-squared	0.292007	S.D. dependent var	0.165953
S.E. of regression	0.139637	Akaike info criterion	-1.086259
Sum squared resid	18.69901	Schwarz criterion	-1.021000
Log likelihood	540.9218	Hannan-Quinn criter.	-1.061422
F-statistic	34.37348	Durbin-Watson stat	0.979021
Prob(F-statistic)	0.000000		

Period fixed effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 10:39
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.551649	0.136195	-11.39281	0.0000

CASH	-0.028091	0.012926	-2.173270	0.0300
LEVERAGE	-0.139556	0.050023	-2.789837	0.0054
MARKET_BOOK	0.002090	0.000626	3.336995	0.0009
LOGSALES	0.253276	0.021113	11.99625	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.724099	Mean dependent var	0.053654
Adjusted R-squared	0.688488	S.D. dependent var	0.165953
S.E. of regression	0.092624	Akaike info criterion	-1.812512
Sum squared resid	7.378085	Schwarz criterion	-1.250282
Log likelihood	992.8808	Hannan-Quinn criter.	-1.598531
F-statistic	20.33386	Durbin-Watson stat	1.983304
Prob(F-statistic)	0.000000		

Cross-section and period fixed effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 10:39
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.276270	0.034473	-8.014148	0.0000
CASH	-0.108387	0.009854	-10.99909	0.0000
LEVERAGE	-0.241846	0.031831	-7.597827	0.0000
MARKET_BOOK	0.002733	0.000469	5.821953	0.0000
LOGSALES	0.060666	0.005222	11.61806	0.0000

R-squared	0.295100	Mean dependent var	0.053654
Adjusted R-squared	0.292184	S.D. dependent var	0.165953
S.E. of regression	0.139619	Akaike info criterion	-1.094663
Sum squared resid	18.85027	Schwarz criterion	-1.069564
Log likelihood	537.0064	Hannan-Quinn criter.	-1.085111
F-statistic	101.2065	Durbin-Watson stat	0.986248
Prob(F-statistic)	0.000000		

Table 13.1. Joint redundant likelihood test from regression with fixed effects in both dimensions for model 1.

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	13.622887	(107,745)	0.0000
Cross-section Chi-square	936.603416	107	0.0000
Period F	6.060424	(7,745)	0.0000
Period Chi-square	47.849469	7	0.0000
Cross-Section/Period F	13.046716	(114,745)	0.0000
Cross-Section/Period Chi-square	948.166540	114	0.0000

Cross-section fixed effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:51
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.288222	0.037460	-7.694057	0.0000
CASH	-0.088452	0.010848	-8.153379	0.0000
LEVERAGE	-0.230068	0.034729	-6.624708	0.0000
MARKET_BOOK	0.001947	0.000501	3.886737	0.0001
LOGSALES	0.061788	0.005651	10.93404	0.0000

Effects Specification

Period fixed (dummy variables)

R-squared	0.257351	Mean dependent var	0.053591
Adjusted R-squared	0.247763	S.D. dependent var	0.164341
S.E. of regression	0.142536	Akaike info criterion	-1.044655
Sum squared resid	17.30963	Schwarz criterion	-0.978522
Log likelihood	463.2909	Hannan-Quinn criter.	-1.019342
F-statistic	26.84046	Durbin-Watson stat	0.939871
Prob(F-statistic)	0.000000		

Period fixed effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:51
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.679934	0.148227	-11.33356	0.0000
CASH	-0.000168	0.013783	-0.012163	0.9903
LEVERAGE	0.009325	0.053790	0.173366	0.8624
MARKET_BOOK	-0.000470	0.000621	-0.757167	0.4492
LOGSALES	0.269221	0.022869	11.77230	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.734511	Mean dependent var	0.053591
Adjusted R-squared	0.695323	S.D. dependent var	0.164341
S.E. of regression	0.090712	Akaike info criterion	-1.841824
Sum squared resid	6.188004	Schwarz criterion	-1.224583
Log likelihood	907.6679	Hannan-Quinn criter.	-1.605572
F-statistic	18.74334	Durbin-Watson stat	2.095106
Prob(F-statistic)	0.000000		

Cross-section and period fixed effects test equation:
Dependent Variable: OP__PROFIT

Method: Panel Least Squares
Date: 04/20/16 Time: 11:51
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.288387	0.037530	-7.684196	0.0000
CASH	-0.087696	0.010867	-8.069642	0.0000
LEVERAGE	-0.225868	0.034722	-6.504982	0.0000
MARKET_BOOK	0.001980	0.000497	3.987143	0.0001
LOGSALES	0.061639	0.005660	10.89033	0.0000

R-squared	0.247345	Mean dependent var	0.053591
Adjusted R-squared	0.243841	S.D. dependent var	0.164341
S.E. of regression	0.142907	Akaike info criterion	-1.047475
Sum squared resid	17.54285	Schwarz criterion	-1.019920
Log likelihood	457.5094	Hannan-Quinn criter.	-1.036928
F-statistic	70.57347	Durbin-Watson stat	0.954513
Prob(F-statistic)	0.000000		

Table 13.2. Joint redundant likelihood test from regression with fixed effects in both dimensions for model 2.

Appendix 14. Test of specification for cross-sectional heterogeneity (model 1 & 2)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	76.179162	4	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CASH	-0.028091	-0.051840	0.000034	0.0000
LEVERAGE	-0.139556	-0.168122	0.000719	0.2869
MARKET_BOOK	0.002090	0.002007	0.000000	0.7722
LOGSALES	0.253276	0.103702	0.000345	0.0000

Cross-section random effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 10:41
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.551649	0.136195	-11.39281	0.0000
CASH	-0.028091	0.012926	-2.173270	0.0300
LEVERAGE	-0.139556	0.050023	-2.789837	0.0054
MARKET_BOOK	0.002090	0.000626	3.336995	0.0009
LOGSALES	0.253276	0.021113	11.99625	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.724099	Mean dependent var	0.053654
Adjusted R-squared	0.688488	S.D. dependent var	0.165953
S.E. of regression	0.092624	Akaike info criterion	-1.812512
Sum squared resid	7.378085	Schwarz criterion	-1.250282
Log likelihood	992.8808	Hannan-Quinn criter.	-1.598531
F-statistic	20.33386	Durbin-Watson stat	1.983304
Prob(F-statistic)	0.000000		

Table 14.1. Hausman test with random effects in cross-sectional dimension for model 1.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	88.042215	4	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CASH	-0.000168	-0.023265	0.000039	0.0002
LEVERAGE	0.009325	-0.082915	0.000879	0.0019
MARKET_BOOK	-0.000470	0.000050	0.000000	0.0594
LOGSALES	0.269221	0.103298	0.000413	0.0000

Cross-section random effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:52
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.679934	0.148227	-11.33356	0.0000
CASH	-0.000168	0.013783	-0.012163	0.9903
LEVERAGE	0.009325	0.053790	0.173366	0.8624
MARKET_BOOK	-0.000470	0.000621	-0.757167	0.4492
LOGSALES	0.269221	0.022869	11.77230	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.734511	Mean dependent var	0.053591
Adjusted R-squared	0.695323	S.D. dependent var	0.164341
S.E. of regression	0.090712	Akaike info criterion	-1.841824
Sum squared resid	6.188004	Schwarz criterion	-1.224583
Log likelihood	907.6679	Hannan-Quinn criter.	-1.605572
F-statistic	18.74334	Durbin-Watson stat	2.095106
Prob(F-statistic)	0.000000		

Table 14.2. Hausman test with random effects in cross-sectional dimension for model 2.

Appendix 15. Test of specification for time-period heterogeneity (model 1 & 2)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	5.047420	4	0.2825

** WARNING: estimated period random effects variance is zero.

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CASH	-0.108804	-0.108387	0.000000	0.2218
LEVERAGE	-0.239868	-0.241846	0.000005	0.3875
MARKET_BOOK	0.002584	0.002733	0.000000	0.0311
LOGSALES	0.060571	0.060666	0.000000	0.7262

Period random effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 10:43
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.275200	0.034511	-7.974357	0.0000
CASH	-0.108804	0.009861	-11.03342	0.0000
LEVERAGE	-0.239868	0.031917	-7.515304	0.0000
MARKET_BOOK	0.002584	0.000474	5.446327	0.0000
LOGSALES	0.060571	0.005229	11.58274	0.0000

Effects Specification
Period fixed (dummy variables)

R-squared	0.300756	Mean dependent var	0.053654
Adjusted R-squared	0.292007	S.D. dependent var	0.165953
S.E. of regression	0.139637	Akaike info criterion	-1.086259
Sum squared resid	18.69901	Schwarz criterion	-1.021000
Log likelihood	540.9218	Hannan-Quinn criter.	-1.061422
F-statistic	34.37348	Durbin-Watson stat	0.979021
Prob(F-statistic)	0.000000		

Table 15.1. Hausman test with random effects in time dimension for model 1.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	8.062587	4	0.0893

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CASH	-0.088452	-0.087724	0.000000	0.0984
LEVERAGE	-0.230068	-0.226021	0.000006	0.1113
MARKET_BOOK	0.001947	0.001979	0.000000	0.6692
LOGSALES	0.061788	0.061645	0.000000	0.5638

Period random effects test equation:
Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:53
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.288222	0.037460	-7.694057	0.0000
CASH	-0.088452	0.010848	-8.153379	0.0000
LEVERAGE	-0.230068	0.034729	-6.624708	0.0000
MARKET_BOOK	0.001947	0.000501	3.886737	0.0001
LOGSALES	0.061788	0.005651	10.93404	0.0000

Effects Specification			
Period fixed (dummy variables)			
R-squared	0.257351	Mean dependent var	0.053591
Adjusted R-squared	0.247763	S.D. dependent var	0.164341
S.E. of regression	0.142536	Akaike info criterion	-1.044655
Sum squared resid	17.30963	Schwarz criterion	-0.978522
Log likelihood	463.2909	Hannan-Quinn criter.	-1.019342
F-statistic	26.84046	Durbin-Watson stat	0.939871
Prob(F-statistic)	0.000000		

Table 15.2. Hausman test with random effects in time dimension for model 2.

Appendix 16. Test of specification for time-period heterogeneity with cross-sectional fixed effects (model 1 & 2)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	21.876582	4	0.0002

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
(CASH-MEANCASH)	-0.030889	-0.029214	0.000001	0.0322
(LEVERAGE-MEANLEVERAGE)	-0.127883	-0.134880	0.000042	0.2790
(MARKET_BOOK-MEANMARKET_BOOK)	0.001120	0.001696	0.000000	0.0000
(LOGSALES-MEANLOGSALES)	0.283722	0.265441	0.000027	0.0004

Period random effects test equation:
Dependent Variable: OP__PROFIT-MEANOP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 10:53
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.01E-17	0.002751	3.69E-15	1.0000
CASH-MEANCASH	-0.030889	0.012014	-2.571142	0.0103
LEVERAGE-MEANLEVERAGE	-0.127883	0.047104	-2.714933	0.0067
MARKET_BOOK-MEANMARKET_BOOK	0.001120	0.000606	1.849912	0.0646
LOGSALES-MEANLOGSALES	0.283722	0.020688	13.71430	0.0000

Effects Specification
Period fixed (dummy variables)

R-squared	0.199809	Mean dependent var	-9.03E-19
Adjusted R-squared	0.189796	S.D. dependent var	0.095288
S.E. of regression	0.085770	Akaike info criterion	-2.061006
Sum squared resid	7.054910	Schwarz criterion	-1.995747
Log likelihood	1014.649	Hannan-Quinn criter.	-2.036169
F-statistic	19.95530	Durbin-Watson stat	2.006311
Prob(F-statistic)	0.000000		

Table 16.1. Hausman test with period random effects and cross-sectional fixed effects through within-estimators for model 1.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Period random	13.464167	4	0.0092

Period random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
(CASH-MEANCASH)	-0.004722	-0.003131	0.000001	0.0376
(LEVERAGE-MEANLEVERAGE)	-0.003540	0.000316	0.000031	0.4888
(MARKET_BOOK-MEANMARKET_BOOK)	-0.001100	-0.000873	0.000000	0.0327
(LOGSALES-MEANLOGSALES)	0.293406	0.284879	0.000011	0.0093

Period random effects test equation:
Dependent Variable: OP__PROFIT-MEANOP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:59
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-6.47E-18	0.002820	-2.30E-15	1.0000
CASH-MEANCASH	-0.004722	0.012663	-0.372911	0.7093
LEVERAGE-MEANLEVERAGE	-0.003540	0.050070	-0.070705	0.9436
MARKET_BOOK-MEANMARKET_BOOK	-0.001100	0.000595	-1.849304	0.0648
LOGSALES-MEANLOGSALES	0.293406	0.021625	13.56801	0.0000

Effects Specification			
Period fixed (dummy variables)			
R-squared	0.205202	Mean dependent var	1.04E-18
Adjusted R-squared	0.194940	S.D. dependent var	0.092388
S.E. of regression	0.082895	Akaike info criterion	-2.128687
Sum squared resid	5.854621	Schwarz criterion	-2.062554
Log likelihood	931.5927	Hannan-Quinn criter.	-2.103374
F-statistic	19.99727	Durbin-Watson stat	2.090834
Prob(F-statistic)	0.000000		

Table 16.2. Hausman test with period random effects and cross-sectional fixed effects through within-estimators for model 2.

Appendix 17. Test of heteroscedasticity (model 1 & 2)

Dependent Variable: SQRESID01
Method: Panel Least Squares
Date: 04/20/16 Time: 10:58
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.022116	0.048450	-0.456463	0.6482
CASH	0.014382	0.004370	3.290645	0.0010
LEVERAGE	0.010344	0.017136	0.603671	0.5462
MARKET_BOOK	-0.000116	0.000220	-0.527395	0.5981
LOGSALES	0.003761	0.007526	0.499709	0.6174

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.458125	Mean dependent var	0.007258
Adjusted R-squared	0.382441	S.D. dependent var	0.039705
S.E. of regression	0.031202	Akaike info criterion	-3.981504
Sum squared resid	0.829494	Schwarz criterion	-3.379115
Log likelihood	2055.011	Hannan-Quinn criter.	-3.752239
F-statistic	6.053107	Durbin-Watson stat	2.255392
Prob(F-statistic)	0.000000		

Table 17.1. Breusch-Godfrey-Pagan test with squared residuals from regression with fixed effects in both dimensions for model 1.

Dependent Variable: SQRESID01
Method: Panel Least Squares
Date: 04/20/16 Time: 12:01
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.053875	0.049450	1.089469	0.2763
CASH	-0.030478	0.004474	-6.811520	0.0000
LEVERAGE	-0.008479	0.017693	-0.479238	0.6319
MARKET_BOOK	0.000649	0.000210	3.087686	0.0021
LOGSALES	-0.006277	0.007641	-0.821446	0.4117

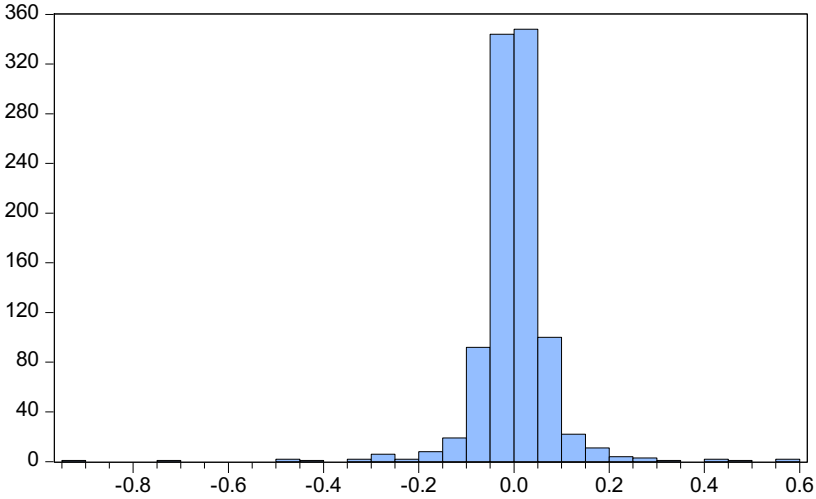
Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.545627	Mean dependent var	0.006776
Adjusted R-squared	0.473659	S.D. dependent var	0.040375
S.E. of regression	0.029292	Akaike info criterion	-4.095720
Sum squared resid	0.639232	Schwarz criterion	-3.439902
Log likelihood	1888.351	Hannan-Quinn criter.	-3.844703
F-statistic	7.581551	Durbin-Watson stat	2.417844
Prob(F-statistic)	0.000000		

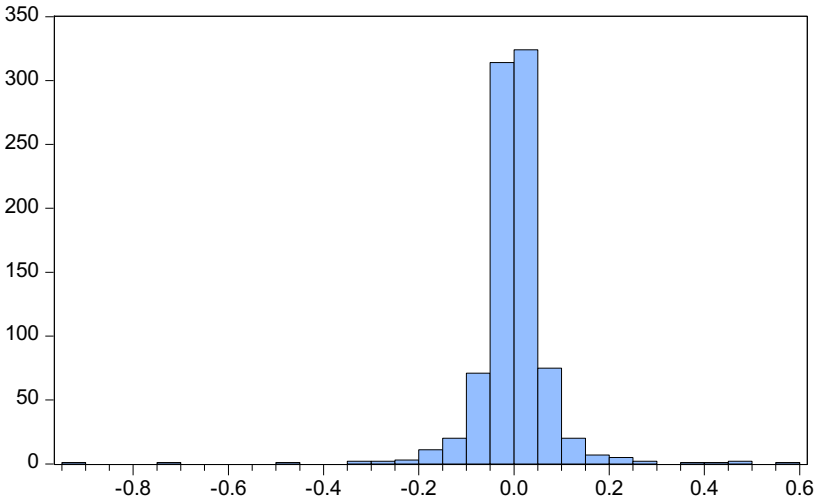
Table 17.2. Breusch-Godfrey-Pagan test with squared residuals from regression with fixed effects in both dimensions for model 2.

Appendix 18. Test of normality (model 1 & 2)



Series: Standardized Residuals	
Sample 2006 2014	
Observations 972	
Mean	-2.70e-17
Median	0.000659
Maximum	0.568738
Minimum	-0.910539
Std. Dev.	0.085239
Skewness	-1.484686
Kurtosis	30.89496
Jarque-Bera	31871.31
Probability	0.000000

Table 18.1. Test for normal distribution of residuals for model 1.



Series: Standardized Residuals	
Sample 2007 2014	
Observations 864	
Mean	-2.13e-17
Median	0.000952
Maximum	0.565006
Minimum	-0.920944
Std. Dev.	0.082365
Skewness	-1.678138
Kurtosis	36.46195
Jarque-Bera	40714.81
Probability	0.000000

Table 18.2. Test for normal distribution of residuals for model 2.

Appendix 19. Test of endogeneity (model 1 & 2)

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:05
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.210482	0.104115	-2.021636	0.0435
CASH	-0.115166	0.014129	-8.151158	0.0000
LEVERAGE	-0.229406	0.036863	-6.223152	0.0000
MARKET_BOOK	0.002691	0.000474	5.680958	0.0000
LOGSALES	0.050396	0.016201	3.110746	0.0019
RESIDLOGSALES	0.011461	0.017115	0.669676	0.5032

R-squared	0.295427	Mean dependent var	0.053654
Adjusted R-squared	0.291780	S.D. dependent var	0.165953
S.E. of regression	0.139659	Akaike info criterion	-1.093070
Sum squared resid	18.84152	Schwarz criterion	-1.062950
Log likelihood	537.2320	Hannan-Quinn criter.	-1.081607
F-statistic	81.00870	Durbin-Watson stat	0.984387
Prob(F-statistic)	0.000000		

Table 19.1. Manual Hausman test with residuals from regression with sales as dependent and industry dummy inclusion for model 1.

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 12:07
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.201800	0.112762	-1.789612	0.0739
CASH	-0.096644	0.015456	-6.252896	0.0000
LEVERAGE	-0.210746	0.039382	-5.351298	0.0000
MARKET_BOOK	0.001935	0.000500	3.872495	0.0001
LOGSALES	0.048181	0.017470	2.757968	0.0059
RESIDLOGSALES	0.015037	0.018466	0.814318	0.4157

R-squared	0.247927	Mean dependent var	0.053591
Adjusted R-squared	0.243544	S.D. dependent var	0.164341
S.E. of regression	0.142935	Akaike info criterion	-1.045933
Sum squared resid	17.52930	Schwarz criterion	-1.012867
Log likelihood	457.8431	Hannan-Quinn criter.	-1.033277
F-statistic	56.56925	Durbin-Watson stat	0.952755
Prob(F-statistic)	0.000000		

Table 19.2. Manual Hausman test with residuals from regression with sales as dependent and industry dummy inclusion for model 2.

Appendix 20. Final regression results (model 1 & 2)

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:07
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.744138	0.295359	-5.905140	0.0000
CASH	-0.030889	0.039718	-0.777712	0.4370
LEVERAGE	-0.127883	0.048223	-2.651889	0.0082
MARKET_BOOK	0.001120	0.000649	1.726906	0.0845
LOGSALES	0.283722	0.046492	6.102628	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.736184	Mean dependent var	0.053654
Adjusted R-squared	0.699336	S.D. dependent var	0.165953
S.E. of regression	0.090997	Akaike info criterion	-1.840841
Sum squared resid	7.054910	Schwarz criterion	-1.238452
Log likelihood	1014.649	Hannan-Quinn criter.	-1.611576
F-statistic	19.97918	Durbin-Watson stat	2.006311
Prob(F-statistic)	0.000000		

Table 20.1. Final regression output with fixed effects in both dimensions and White's diagonal standard errors for model 1.

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 12:09
Sample: 2007 2014
Periods included: 8
Cross-sections included: 108
Total panel (balanced) observations: 864
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.829149	0.345664	-5.291700	0.0000
CASH	-0.004722	0.037771	-0.125016	0.9005
LEVERAGE	-0.003540	0.038896	-0.091017	0.9275
MARKET_BOOK	-0.001100	0.001198	-0.917848	0.3590
LOGSALES	0.293406	0.053767	5.457034	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.748815	Mean dependent var	0.053591
Adjusted R-squared	0.709030	S.D. dependent var	0.164341
S.E. of regression	0.088648	Akaike info criterion	-1.881002
Sum squared resid	5.854621	Schwarz criterion	-1.225183
Log likelihood	931.5927	Hannan-Quinn criter.	-1.629984
F-statistic	18.82150	Durbin-Watson stat	2.090834
Prob(F-statistic)	0.000000		

Table 20.2. Final regression output with fixed effects in both dimensions and White's diagonal standard errors for model 2.

Appendix 21. Regression results with interaction variables (model 1)

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:47
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.063016	0.011963	5.267678	0.0000
CASH	-0.049766	0.038895	-1.279479	0.2011
BEFORE	0.028934	0.008001	3.616536	0.0003
INTER__C1	-0.034108	0.049327	-0.691463	0.4895

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.679080	Mean dependent var	0.053654
Adjusted R-squared	0.638080	S.D. dependent var	0.165953
S.E. of regression	0.099837	Akaike info criterion	-1.663421
Sum squared resid	8.581966	Schwarz criterion	-1.106210
Log likelihood	919.4224	Hannan-Quinn criter.	-1.451350
F-statistic	16.56284	Durbin-Watson stat	1.991229
Prob(F-statistic)	0.000000		

Table 21.1. Regression result with interaction variable for period before crisis (2006-2007) for model 1.

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:47
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.070689	0.012433	5.685643	0.0000
CASH	-0.052165	0.034575	-1.508768	0.1317
DURING	0.002167	0.010261	0.211152	0.8328
INTER__C2	-0.061915	0.074933	-0.826271	0.4089

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.681027	Mean dependent var	0.053654
Adjusted R-squared	0.640276	S.D. dependent var	0.165953
S.E. of regression	0.099534	Akaike info criterion	-1.669507
Sum squared resid	8.529895	Schwarz criterion	-1.112296
Log likelihood	922.3802	Hannan-Quinn criter.	-1.457436
F-statistic	16.71173	Durbin-Watson stat	1.981094
Prob(F-statistic)	0.000000		

Table 21.2. Regression result with interaction variable for period during crisis (2008-2009) for model 1.

Dependent Variable: OP__PROFIT
Method: Panel Least Squares
Date: 04/20/16 Time: 11:48
Sample: 2006 2014
Periods included: 9
Cross-sections included: 108
Total panel (balanced) observations: 972
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.083986	0.011850	7.087609	0.0000
CASH	-0.102849	0.041340	-2.487887	0.0130
AFTER	-0.019886	0.010994	-1.808773	0.0708
INTER__C3	0.058859	0.049809	1.181696	0.2377

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.682165	Mean dependent var	0.053654
Adjusted R-squared	0.641558	S.D. dependent var	0.165953
S.E. of regression	0.099356	Akaike info criterion	-1.673078
Sum squared resid	8.499482	Schwarz criterion	-1.115868
Log likelihood	924.1161	Hannan-Quinn criter.	-1.461008
F-statistic	16.79954	Durbin-Watson stat	1.966960
Prob(F-statistic)	0.000000		

Table 21.2. Regression result with interaction variable for period after crisis (2010-2014) for model 1.