Corporate Cash Holdings and Shareholder Risk

Investigating the relationship between corporate cash holdings and the risk of stocks listed on the Stockholm Stock Exchange.

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Sincerely
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Abstract

Corporate cash holdings is a topic constantly under review, companies hoarding cash are criticized by shareholders who rather have companies using their cash for new investments or dividend payouts. Recent academic research has discovered that levels of cash holding are high in times when risk is deemed to be high and found that levels of corporate cash holdings are substantially higher than they used to, making more coverage and a better understanding of the phenomenon crucial. This thesis is investigating an aspect of the interconnection between corporate cash holdings and shareholders by examining if there is a relationship between the level of corporate cash holdings and the risk of the company stock. This research is conducted on the Stockholm Stock Exchange during the four year period of 2009-2012 and investigates for a relationship not only on the entire stock exchange but also for each size and sector individually. In order to investigate this relationship a cash to assets ratio has been employed to represent the level of corporate cash holdings and the measures of stock beta and volatility are used to represent the risk of the stock. The cash holding ratio is tested for a relationship with both beta and volatility separately using the Spearman’s rank correlation coefficient. This thesis have adopted a quantitative research and implemented an archival research strategy by using official records and numbers. Through these statistical tests this thesis establishes significant relationships between both the cash holding ratio and stock beta and stock volatility separately for the entire stock exchange and some differences arises between different sizes and sectors. For cash holding and stock beta a negative correlation relationship has been discovered for the entire sample, the medium cap size and the health care and industrial sectors. For cash holdings and stock volatility positive correlation findings have been made for the entire sample as well as the small cap size and the sectors of basic materials, health care and technology. This finding implicates that cash holdings to some extent relates stock risk and several potential explanations to this relationship are given and connected to well-established financial theories.

Keywords: Corporate Cash Holding, Stock Risk, Stockholm Stock Exchange, Cash Management
Glossary

**Cash;** is defined as coins and notes according to the Oxford Online dictionary. In this thesis, cash is used as the cash and cash equivalence that are available on the corporate statement of cash flows.

**Corporate Cash Holding;** is the level of cash a company holds in reserve. This thesis has used a ratio of cash holding by weighting the cash and cash equivalence towards the company’s total assets.

**Capital structure;** refers to the chosen mixture of debt and equity the firm has taken on in order to finance their operations (Brealey et al., 2010 p. 32)

**Market risk;** is the risk of losing money that investors are facing when holding assets in financial markets.

**Beta;** is a measure of risk of a selected stock in comparison to the market. The value of the beta is the ratio of the change of the selected stock towards the corresponding market changes (Brealey et al. 2010, p. 202)

**Volatility;** Denoted as either sigma or standard deviation is a measure of how much the chosen stock fluctuates in its price over a chosen time period (Brealey et al., 2010, p. 191-193)
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1. Introduction

The aim for this chapter is to provide the problem background to the thesis to understand the purpose behind the research and the question which this thesis seeks to answer. It also states the knowledge gap, which the authors will seek to fill as well as goals that the authors have in respect to both theoretical and practical contribution.

1.1 Problem Background

“Cash is king” is an expression commonly referred to in finance, although the meaning might not be as simple as the expression suggests. There are two opposing views at looking on the level of cash a firm should hold.

One of the more extreme arguments is that the optimal level of cash holdings in a firm should be zero (Maness & Zietlow, 2004, p. 16). This is related to the old saying “you have to spend money to earn money” (Plautus). Holding excess cash might lead to a loss of an opportunity that could have increased the firm’s value. Instead of holding on to the money a company could have either invested in a new project earning a potential return or distributed it among shareholders to let them invest elsewhere, also this resulting in a potential return. This is not just a theoretical perspective as around the new millennium increasingly many companies were striving for decreased cash balance; financial managers globally advocated the benefits of small cash holdings (Mintz, 2000). It is not only financial managers within companies that advocate small cash holdings, recent examples of shareholder activism has been due to shareholders opposing a long going trend of increased corporate cash holdings, instead arguing that cash hoarding companies should be subject to dividend payouts (Becht et al., 2009, p. 3097; Bates et al., 2009, p. 1988). This is in line with the first proposition made by Miller and Modigliani which states that the value of a firm is unaffected by the capital structure of the company in a perfect capital market (Miller & Modigliani, 1958, p. 268). Since there are no restrictions from external financing under these conditions, holding cash is only associated with costs.

Contrary to the arguments of zero cash holdings there are several reasons for a firm to hold cash. Maness and Zietlow (2004, p. 18) give the following four reasons for holding cash and/or short-term investments:

- Cash for day-to-day operations
- Cash as a marketing tool -- strength of balance sheet in comparison to competitors
- Cash as a buffer for corporate shocks such as bankruptcy or litigation
- Cash for strategic purposes such as acquisitions.

Berk and DeMarzo (2011, p. 860) propose the following similar reasons for holding cash:

- To meet its day-to-day needs
- To compensate for the uncertainty associated with its cash flows
- To satisfy bank requirements
Using cash for strategic purposes like new investments and acquisitions is well researched and have led to different models and theories, including the pecking order theory and trade-off theory. Pecking order theory tells us that firms prefer to, when they invest, first use their internal funds. Secondly they should seek debt financing such as bank loans or issue bonds. As a last resort a firm should if the first and second options are not feasible, issue new equity (Brealey et al., 2010, p. 490). Reasons behind the Pecking order theory are that if a firm borrows money or issues new equity, both the lender and the investor will require a certain amount of return thus making those options more expensive for the company. Miller and Modigliani also propose this in their second proposition where due to that cost of capital if affected by the degree of leverage there are benefits to holding cash (Miller & Modigliani, 1958, p. 271). The trade-off theory concerns the balancing of financing activities through debt and other alternatives. It shows that capital structure policies should be decided with the consideration of the advantages of holding debt, interest is not subject to taxes and thus companies should prefer issuing debt as long as there is a certainty that the debt obligations will be covered (Kraus & Litzenberger, 1973, p. 911-912).

Maness & Zietlow is discussing the strategic value of holding cash as a buffer to mitigate risks that rise from unforeseen costs such as lawsuits or product recalls (Maness & Zietlow, 2004, p.18). Therefore holding cash leads to a reduction in the short-term risk of default (Acharya et al., 2012, p. 3572). Showing that a firm holds cash can then be used to positively signal the investors about the level of liquidity.

Agency cost theories also argues that managers might have intrinsic reasons for holding cash beyond optimal cash holding levels (Jensen, 1986, p. 323). As managers typically prefer to run larger businesses in contrast to smaller ones there is an incentive to hold on to cash or invest in below average projects rather than paying dividends which might serve shareholders to a higher extent (Brealey et al., 2010, p. 319; Hull, 2012, p. 13).

Liquidity problems have been one of the main reasons behind the latest financial crisis that started in the United States during 2008. Banks had given loans to people not qualified and when they started defaulting on their loans, banks lost huge amount of money and had problem meeting payments in order to sustain themselves and some went into bankruptcy. The crisis in the United States spread throughout the world. The banks in Sweden were not that heavily affected however the stock market fell with over 40 percent during the year of 2008 (Österholm, 2010, p. 265).

So we can see that the consequences after the financial crisis affect the attitude towards risks by investors. Risk is something every investor faces and evaluates when entering the financial markets. The risk premium that investors are willing to take goes up during recession and down with recoveries but also the variation in risk premiums varies more during economic downturns (Graham & Harvey, 2009, p. 7).

If investors did know how their assets were to develop there would be no risk, because risk concerns the uncertainty of future outcomes (Hull, 2012, p. 1). But since this is not the case, investors have to associate themselves with risk and account for it in their investments. In return investors are demanding a risk premium, the reward for being subject to risk (Hull, 2012, p. 2).
As an investor, there is an abundance of research on what factors to consider when investing money in stocks. There are a number of different valuation methods as well as a number of portfolio management theories. There are several ways to measure the risk of a stock in order to determine an appropriate risk premium of an investment, but as far as the authors have been able to determine, there has been no previous research that has used cash holdings as a variable when it comes to the assessment of the risk of a stock. This variable is what the authors of this paper want to investigate.

In order to appropriately manage risk, investors are carefully monitoring their portfolios and holding assets they believe to increase in value. Due to the nature of stocks their value will fluctuate, not only increasing but also decrease from time to time. To effectively offset the risk of losing money on investments investors have to measure the risk of each individual investments and its contribution to the overall risk of a portfolio of investments.

There are thus two kinds of risks faced by investors, the specific or individual risk of an asset and the systematic risk which is change in risk an asset will cause by adding or removing it to a portfolio. The total risk is the sum of these two. Risks are measured by either volatility (historical or implied) for the total risk or beta for the systematic risk (Hull, 2012, p. 205-208). The historical volatility looks at variations in stock price and is used to assess the risk of an asset but the possibility of using historical volatility to forecast future risk is debatable and argued to be limited (Mayhew, 1995, p. 8). The implied volatility on the other hand is based on the principle that the expected future volatility is embedded in the price of an asset and can be derived by excluding the other variables from a pricing model. It does not however take into account the past behavior and volatility of the asset (Hull, 2012, p. 208). The beta is also based on the historical fluctuation of a stock in regard to the market movements and does therefore measure the exposure of an assets risk to the overall market risk (Hull, 2012, p. 9).

As the authors were unable to find any research investigating if there is any relationship between the amounts of cash held by a corporation and the risk faced by investors, they found it interesting to examine if a relationship exists and what it is. By using the variable of corporate cash holdings against both volatility and beta the authors are researching the connection between the level of cash holdings and the market and total risk of an asset.

1.2 Research Question and Objective
As stated in the problem background, there are two contradicting views on how a firm should handle its cash holdings. There is research concerning the level of cash holdings but not on the risk faced by investors due to different levels of corporate cash holdings. This attitude is what the authors of this thesis strive to investigate by answering the following research question:

- What is the relationship of the level of cash holding and the risk of Swedish stocks?
1.3 Research Purpose
By connecting theories and models of both the fields of corporate finance and financial markets this thesis is further developing the knowledge of the link between corporate cash holdings and the behavior of Swedish stocks. The authors will try to find if the level of cash holdings in Swedish companies is a significant variable for investors by investigating the correlation between the beta as well as the volatility of the stock price during the years 2009 to 2012. The results will then be discussed and analyzed over different sizes and sectors of the Stockholm Stock Exchange. The result will help investors understand the underlying risks of the stocks by answering how the level of corporate cash holdings relates to it and thus contribute to more informed investment decision. The result of this thesis also helps to further explain the behavior of stocks and deepen the understanding of the relationship between corporate finance and financial markets.

1.4 Research Gap and Contribution
The existing research surrounding cash holdings is extensive but it is still an area with conflicting views and implications. The focus of these studies has been mostly on balancing the benefits of holding cash against its costs to determine an appropriate level of cash holding. Since there is no consensus over what factors and to what extent to include in developing cash holding policies it is an area that needs to be examined further. In investigating the relationship between the risk of a stock and the level of corporate cash holdings the authors were unable to find any precedence. Simutin (2010) investigated the relationship between corporate cash holdings and stock performance but did not include the risk of the stock. Acharya et al. (2012) are discussing the impact of cash holdings on the corporate risk of company’s ability to meet its debts payments but not on the risks faced by investors in a financial market. Further there does not seem to be any analysis examining these variables between companies of different sectors and sizes, especially on the Stockholm Stock Exchange.

This thesis strives to fill this gap and provide a higher level of understanding to the field, this will not only lead to an academic contribution but also a practical one for investors in the following ways.

This paper will determine whether the cash holding level of a company has any relationship with the risk of the stock. This will be done by looking at both the historical volatility and beta of the stocks and testing for correlation between these variables and the level of cash holdings. Our contribution if a correlation is found would be to develop the understanding of stock behavior and what influences it as well as provide an implication for further studies to further explain that relationship. In lack of any significant correlation this thesis has contributed with determining that the level of cash holdings is not significantly relevant to the risk of the corresponding Swedish stocks.

1.5 Limitations
Firstly, the authors have limited themselves to the years 2009 to 2012. There are two reasons for that. The first reason is that since there has been a recent economic crisis, there were concerns that the data would be skewed and hard to draw any conclusions
from. In addition to that, this paper was made during a degree project with a limited time of completion, which made the authors limit their data collection in order to be finished on time.

Secondly, the chosen area for the thesis has been limited to the Stockholm Stock Exchange. There are several reasons for this, the first one being the availability of data for the researchers. The researchers also have a familiarity with this stock exchange and a better understanding of it than other stock exchanges around the world. Due to its moderate size it has not been as researched as much as its larger counterparts and the size makes it more viable to sufficiently research over a limited period of time.

Thirdly the authors have chosen to compare and evaluate all listed companies on the exchange with the exception of those operating within the finance and real estate sectors since these sectors are differently and more heavily regulated in regard to the investigated variables than other sectors. The authors also chose to exclude companies that got listed during the time horizon of this thesis as it could distort the comparison of results due to the lack of data the years before becoming listed. Companies were also excluded on the basis of outlier values as it would also distort the result due to a large impact of a few observations.

Finally there are other measures of risk not considered in this thesis, for example volatility is measured only with historical volatility and an evaluation of implied volatility is not included. The authors have chosen to do so because the focus of this thesis is historical data and it makes no attempt to forecast future risk or behavior.
1.6 Model of Research
This model is outlining the research of this thesis. The thesis can be divided into three parts. In the first part the authors present the theoretical framework and where the data is collected from. Second part is regarding the treatment of the data collected. Finally an analysis will be presented which will lead up to the author’s conclusion.

![Diagram](image.png)

Figure 1: The Model of Research
Source: The Authors

1.7 Disposition
This section will explain how the thesis will be structured and a summary of what each chapter will contain.

1. Introduction
In this chapter the background of the research is presented. The reader is provided with the overall subject of the research. The purpose of the research together with the research question will be presented as well as how the thesis will contribute in both practical and academic ways.

2. Theoretical Methodology
This chapter explains the theoretical methodical framework that has been used in this thesis. The authors reasoning for choosing the subject and from what perspective they will investigate the subject from, the authors methodological standpoints are also presented in this section. The later part of the chapter is a detailed step-by-step explanation on how the research has been conducted.

3. Theoretical Framework
The purpose of this chapter is to provide the reader with the necessary background knowledge in order to better understand the contents of the thesis. It is divided into; the reasons for a company to hold cash, the theories regarding using the cash for investments and the concepts of the risk on the financial markets. The chapter ends
with a literature review about the theoretical sources that the theoretical framework was based on.

4. Practical Methodology
The difference between the theoretical and practical methodology is that in the practical methodology, the authors present how they collected the data and how it was treated. It is explained which companies were excluded from the sample, how the calculation for cash holdings, beta and volatility was made and what tests was conducted on the data. In the end of the chapter the different hypotheses that will be used to answer the stated research question has been listed.

5. Empirical Findings
This chapter presents the results of the statistical tests. The first part presents the descriptive statistics on the data, which is displayed in a both numerical and graphical manner. Following the sample data is analyzed to assess normality of the data distribution. Finally the results of the correlation tests are presented in tables showing the result for the entire sample, the different sizes and the different sectors.

6. Discussion
In this chapter the authors have discussed the results from the empirical findings presented in chapter five. The discussion is divided into three parts that begins with the results on the whole sample and then moves on to discussing the different size and sectors. The chapter ends with general discussion which fully discloses all the aspect of the research question and connects back to existing theories.

7. Conclusion
The final chapter starts with a concluding section that links the discussion, the answer to the research question back to the purpose in chapter one. The authors list the contribution of their research both practical and theoretical. The chapter ends with a list of suggestion for further research.
2. Research Methodology
This chapter will show the theoretical thinking of the authors regarding the approach and structure of the thesis. The philosophical standpoint is both presented and discussed here since it will be the base for the chosen research strategy and design, which is included later in this chapter.

2.1 Choice of Subject and Preconceptions
As a research could be affected by the values, biases and backgrounds of the researchers, it is of importance to acknowledge these to help the reader understand and reinforce the objectivity of the study, Bryman and Bell uses the concept of reflexivity to define this (Bryman & Bell, 2011, p. 700). Riach discussed reflexivity as being concerned to “...warnings of biases caused by the disposition of the researcher” which emphasizes the importance of providing a basic background of the authors (Riach, 2009, p. 357).

Both the authors have studied business administration as part of the International Business Program at Umeå School of Business and Economics and have chosen to specialize within the field of finance. Due to a large interest the authors have developed a broad understanding and knowledge in this area acquired from various finance courses, mainly at Umeå School of Business and Economics but also from other universities internationally. As a result of recent financial turmoil and falling stock prices the authors have been discussing the relationship between corporate finance and financial markets.

Since there is a link between stocks and the level of corporate cash holdings the relationship needs to be investigated in order for investors to better understand how different levels of cash holdings could affect them, not just concerning corporate risk as Acharya et al. (2012) researched or stock performance as Simutin (2010) examined, but also how corporate cash holdings relates to the risk faced by investors.

The authors’ knowledge in the fields of finance and statistics and input from both the supervisor and peers contribute to ensure that the right tests were conducted and that conclusions were correctly derived.

2.2 Perspective
Perspective can be linked back to the purpose of this thesis. The authors are aiming this thesis mainly towards investors and will try investigating the impact of cash holdings on the risk of stocks. Therefore the authors, even though objectivity is an important aspect of the research have tried to take on the perspective of investors, asking themselves what contribution this thesis would bring to them. But even through the lenses of the investor, the results can be of interest for managers or analysts, in the sense that they would help them to understand the investor’s attitude towards corporate cash holdings.
2.3 Research Philosophy
In research philosophy there are two main branches, epistemology and ontology. Ontology has been described as “the science of what truly is” (Ferrier, 1854, p.44) and the question dates back to the Greek philosophers. But before answering what truly is, the question of what is knowledge has to be answered first (Ferrier, 1854, p. 46).

2.3.1 Epistemology
James Ferrier (1854, p. 46) named epistemology as the “doctrine or theory of knowledge”. Therefore epistemology describes the way people accept knowledge and how it is acquired. In order to determine what kind of knowledge is acceptable the laws of knowing and thinking have to be decided (Ferrier, 1854, p. 45).

Epistemology can be divided into two philosophical standpoints. The first one, interpretivism, tells us that knowledge should not be only what we can experience with our senses, one should also consider and try to understand the interactions between social entities (Bryman & Bell, 2011, p. 16). This leads scientists to take a more subjective view on their research and is mostly applicable in social sciences research. The other view, positivism, contradicts interpretivism by accepting only what a person can interpret using his or her senses. Therefore scientists and researchers that embrace this philosophy try to explain their theories objectively by asking hypothesis that they later either accept or reject in their research (Bryman & Bell, 2011, p. 15). This philosophy is more closely related to research in natural sciences.

2.3.2 Ontology
Once the question of epistemology has been answered and what knowledge is has been established, one can move on to determine or try to answer what truly is or as Bryman and Bell defines ontology as “the philosophy, which deals with the nature of how social entities interact with one another” (Bryman & Bell, 2011, p. 20). Same as for epistemology there exists two contradicting views, constructionism and objectivism. The constructionism tells us that social actors and entities are constantly evolving through social interactions and therefore are not predetermined and thus need to be on constant revision (Bryman & Bell, 2011, p. 22). The opposite view, objectivism says that social entities and actors are not dependent on social phenomena (Bryman & Bell, 2011, p. 21).

Looking back at the research question and purpose of this thesis, the authors are asking themselves “What is the relationship of the level of cash holding on the risk of Swedish stocks?” The authors have two parts to investigate; cash holdings and risk, therefore the authors have chosen the stance of positivism. This will allow the authors to collect the data needed in an objective manner and answer their research question by forming relevant hypotheses to either accept or reject. For the ontological standpoint the authors have chosen objectivism because the nature of the data will not involve any social interaction and there the objectivistic approach is more suitable than constructionism.
2.4 Research Approach

In general there are two distinct approaches to how one can theorize a research, inductive or deductive. When taking a deductive approach the goal is to revise and contribute to the strength of already existing theories (Bryman & Bell, 2011, p. 11). The researcher starts with gathering the relevant theories needed to form hypotheses necessary to answer their research question. After the data collection they either reject or confirm their hypothesis and then they write their contribution to the chosen theoretical field (Bryman & Bell, 2011, p. 11). On the other hand a researcher can have an inductive approach with the research, instead of testing a hypothesis based on already existing theories, an inductive research aims to establishing new ones. It can add or revise to already existing theories but then the researcher first has to identify the missing parts of the theories and then revise them.

In practice however, they are usually defined as qualitative and quantitative research. Qualitative research, which is mostly conducted in accordance to the inductive approach, has six main steps according to Bryman and Bell (2011). The first step is to formulate a research question, which in the end will generate a theory (Bryman & Bell, 2011, p. 386) Once that is decided the researcher has to select the place or what kind of subjects to investigate and then collect relevant data. After the data has been collected it has to be interpreted and then analyzed. The fifth step in qualitative research is to conclude the findings and if the data is insufficient or incomplete, the researcher has to go back and collect more data or redefine the research question. Last step is then to present the findings and provide a conclusion of the research (Bryman & Bell, 2011, p. 11).

While the inductive approach is related to qualitative research, deductive is related to quantitative. As already stated in the previous section, quantitative research is aimed to revise or elaborate already existing theories. The steps are similar to qualitative research with the exception that before the actual data is collected, the researcher has to collect relevant theory and devise appropriate hypotheses to answer. After the data has been collected, it has to be analyzed to see the results of the researchers hypothesis testing. As a last step the conclusions are provided and contribution to the theory is added (Bryman & Bell, 2011, p. 11).
There is however a third option when it comes to practical research. Some researchers combine methods of both quantitative and qualitative research in order to answer their research questions. Problem is that there is a link between the research philosophies in the previous section and the chosen approach. Positivism and objectivism usually relate to deductive approach and interpretivism together with constructionism is associated to the deductive approach. So if the researchers combine elements of both approaches they will have contradicting philosophies. A way to solve this issue is to make the research in two steps and triangulate the research (Bryman & Bell, 2011, p. 632). This can be done by either start with a quantitative research and further deepen the research by following with a qualitative one, or start off with a qualitative and then further develop or generalize through a quantitative. If both researches produce similar results then the results will be more valid and reliable.

Given our research philosophies the choice for this thesis was to take a deductive quantitative approach. The reasons are that the authors have used already defined theories and will not produce any new ones. As stated in the purpose the authors are trying to bridge two concepts from corporate finance and financial markets, so the first step was to gather the entire necessary theoretical framework. The hypotheses will be presented later in chapter four. The data collected will then be analyzed and a conclusion will follow with the goal to contribute to the already existing theoretical framework. Thus the authors will follow the steps of a quantitative research as as shown in figure 2.

**Figure 2: Quantitative and Qualitative**

Source: Left figure; Bryman & Bell, 2011, p 11. Right figure; Bryman & Bell, 2011, p 390.
2.5 Research Strategy

Saunders et al. (2009) described the following three types of studies depending on the purpose of the research; exploratory, descriptive and explanatory. An exploratory study tries to explore a subject where there might not be enough previous information to provide a clear background of the topic, since this approach is more adaptable to change in the middle of the research process. The descriptive study aims to describe a phenomenon to a very detailed extent but might fall short of providing actual new insights. Finally, an explanatory study investigates the relationship between variables, often but not necessarily through the use of quantitative data (Saunders et al., 2009, p. 139-141). The nature of this research closely resembles that of the explanatory as the relationship between corporate cash holdings and stock risk is examined in a quantitative manner.

This research is mainly collecting data through administrative records, such as official annual reports and data sources. This is in accordance with an archival strategy, which according to Saunders et al. “… allows research questions which focus upon the past and changes over time to be answered” (Saunders et al., 2009, p. 150). This also entails that the data collected was not originally gathered for the same purpose as the research, which could impair the ability to reach a conclusion answering the research question with this kind of data. By designing the research with this in mind, establishing what data exists and is available, and making sure that the topic can be sufficiently covered with this data helps overcome this concern (Saunders et al., 2009, p. 150). The use of official records and statistics also ensures that the observations are unaffected by a rather unnatural setting being created due to a research being conducted, these methods are referred to as unobtrusive measures (Bryman & Bell, 2011, p. 330).

2.6 Research Design

Having an appropriate research design is crucial for a good study as it provides the framework for collecting and analyzing data; it reflects what the researchers are considering the most important and how they are proceeding to conduct the study (Bryman & Bell, 2011, p. 40-41). It also shows that the authors have considered all the aspects of the both the philosophy and the practical options of chosen research method (Greener, 2008, p. 38).

There are five different research designs; experimental, cross-sectional, longitudinal, case study and comparative (Bryman & Bell, 2011, p. 45-66). An experimental design is a controlled environment in which the researcher tries to find a dependent variable. It is not very common in business research since the level of control needed to manipulate the situation is difficult to achieve (Bryman & Bell, 2011, p. 45). Cross-sectional design seeks to find a pattern between more than two variables and investigates at one point in time or over a short time horizon (Bryman & Bell, 2011, p. 53-54). Changes over time are better investigated in the longitudinal design and depending on the research, can discover casual relationships (Bryman & Bell, 2011, p. 57-58). The case study design researches a single case, which could be in the form of an organization, a person, an event or a location (Bryman & Bell, 2011, p. 59-60). The last design, comparative design, has similarities with the case design but distinguishes itself in that it studies two or more cases and highlights contrasts, similarities and differences between them (Bryman & Bell, 2011, p. 63).
The authors have conducted this research in accordance with a cross-sectional design entailing that it focuses on more than one case with data collected at a single point in time (Bryman & Bell, 2011, p. 53-54; Greener, 2008, p. 36). It is highly associated with quantitative research (Bryman & Bell, 2011, p. 57). The cross-sectional design is appropriate examining the relationship between variables, which this thesis aims at doing, and provides a high level of objectivity as “... the researcher does not (invariably because he or she cannot) manipulate any of the variables.” (Bryman & Bell, 2011, p. 54). The drawbacks are however that in most cases causality cannot be established using the cross-sectional design and in those cases where it is possible, the credibility of these claims is weaker due to the low level of internal validity associated with this approach (Bryman & Bell, 2011, p. 56).

2.7 Research Method Summary
This model summarizes the philosophical and design choices the authors have taken and how they have lead up to a cross-sectional design.

![Diagram: Research Summary]

Source: The Authors

2.8 Literature and Data Sources
In this research, the authors have used both primary and secondary sources. The authors have created their own database with the cash holding information of the selected firms used in their research. The data is collected from the firm’s annual reports and are considered by the authors to be reliable due to the requirement of publicly listed companies to be independently audited.

Other than the created database a number of other secondary sources have been used. There are both advantages and disadvantages with having secondary sources according to Bryman & Bell (2011). The relevant advantages for the sources that this thesis has used are firstly, that it has saved both cost and time in the data collection process. Secondly, the data collected has higher quality than the authors would have been able to produce by themselves and finally it allows the authors to conduct their
study over a number of years in the past. The disadvantage is that the authors might lack familiarity with the data since they have not collected the data by themselves, might lack understanding on the complexity of the data and don't have any control over the data (Bryman & Bell, 2011, p. 320-321). However the data collected was of the nature that the authors had previously encountered academically.

Given the advantages and disadvantages the authors have chosen to use the following secondary sources. The database Thomson Reuters Datastream has been used in order to collect the historical stock prices of the firms that have been researched. Thomson Reuters Datastream is a widely used database when it comes to business research and has a high quality of data. Since the authors are students at Umeå University they have had access to the university library database for relevant literature as well as articles from peer reviewed academic journals. The majority of the articles comes from the database Business Source Premier. Keywords that have been used in our searches have ranged from, cash holdings, cash, corporate finance, risk and stock markets for mentioning a few. In addition to articles a wide variety of textbooks have been used in this thesis. These books are mostly related to risk and corporate finance but textbooks in the fields of business research and statistics have also been utilized.

2.9 Reliability and Validity
Two of the major concerns when conducting business research are those regarding reliability and validity, these criteria are essential when evaluating the strength of a thesis as it assesses its credibility and quality. Reliability relates to the consistency of the measures implemented by the researchers, if similar studies would produce similar results (Bryman & Bell, 2011, p. 41). Validity on the other hand is concerning whether the measures used in a study really are measuring what it claims to be doing (Bryman & Bell, 2011, p. 42). Researchers aim to provide high reliability and validity as this indicates a stronger case and a better study.

More specifically for quantitative research the reliability criteria is concerned with inter-observer and intra-observer consistency. The degree of inter-observer consistency focuses on the extent in which different observers investigating the same behavior are reporting it in the same way (Bryman & Bell, 2011, p. 279). Intra-observer consistency is regarding the degree of which a researcher observes the same behavior at different points in time and still reports it similarly (Bryman & Bell, 2011, p. 279). Fulfilling these criteria’s to a satisfactory extent is difficult but crucial in order to assure the quality of a quantitative business research. The authors aim at minimizing the risk of different interpretations of the findings both over time and between other researchers through describing the process of this research comprehensively and emphasizing objectivity throughout the thesis.

Validity is relating to whether the measures used to conduct a research are actually measuring what it is designed to do and thus assesses the accuracy of the results, a low degree of validity indicates that the results of the research are highly disputable. Both Bryman & Bell (2011, p. 42) and Greener (2008, p. 37-38) describes validity as often the most important criterion and divides it into four different types; measurement validity, internal validity, external validity and ecological validity.

The first type, measurement or construct validity, is concerning if a test or measure is
accurately representing what it is intended to. A high level of measurement validity would thus indicate that the employed measures are describing the intended phenomenon appropriately (Greener, 2008, p. 37). For this research this raises the question if the beta and volatility are appropriate variables for describing risk, but as the thesis is directed to investors and the employed measures are popular among investors when evaluating the risk among stocks, the authors find them suitable.

Internal validity regards the issue of causality, if one of the variables is actually causing changes in another, and if a conclusion can actually be made based on the research conducted (Bryman & Bell, 2011, p. 42-43; Greener, 2008, p. 37). In this thesis there is no assumption about causality as the links between variables are just investigated in regard to correlation. The cross-sectional design of research cannot achieve a sufficient degree of internal validity, but this research is conducted with this in mind and no assumptions of causality are made (Bryman & Bell, 2011, p. 54). In the discussion of this thesis, the authors have indirectly assumed causality in some arguments in order to be able to connect to the theoretical framework and existing theories and explain how they might relate with the research to the reader. However due to how the research is conducted the authors are not able to assume full cause and effect in this thesis.

The external validity concerns the generalizability of the results, if it is applicable outside of the research setting and if for example the chosen sample is accurately representing the population (Bryman & Bell, 2011, p. 43; Greener, 2008, p. 38). As this research covers most of the listed companies on the Stockholm Stock Exchange it provides a reliable result for the included sectors at the time, however without supplementary research the findings are not able to be generalized to another time period or geographical location.

Finally the ecological validity is about whether due to a research being conducted, an unnatural setting is created and the results are being affected (Bryman & Bell, 2011, p. 43; Greener, 2008, p. 38). By implementing an archival strategy in the research, official records are being used and the researchers cannot affect the data collected as it represents occurrences in the past.

2.10 Ethical Considerations
Ethical considerations when conducting business research are largely concerned with handling data, clearly stating the purpose, the involvement of others in the research and the treatment of participants (Greener, 2008, p. 43). According to Diener & Crandall (1978) the ethical principle relevant to participants is whether some deception or harm is done to them, physical or psychological. The structure of this study as well as employing an archival strategy results in few to no participants, which entails that these ethical considerations are of a small significance and little relevance in this thesis.

Importantly for deriving fair and correct results is that there is no interest or circumstances that could affect the objectivity of the study, implying that a similar research done on the same time horizon and geographical focus should yield the same results regardless of the researchers or their affiliations. To ensure the objectivity the authors have structured the research in a quantitative manner and are only using
official and audited records and databases, peer-reviewed articles, acknowledged textbooks in finance and business research and news articles from highly reputable sources. This so the risk of influencing the findings is if not eliminated at least minimized (Greener, 2008, p. 44-45).

The authors also need to be considered when assessing the compliance with ethics in a business research, how are their motives affected by affiliations and if they possess the sufficient knowledge to choose the appropriate measures to research the subject and properly evaluate the findings (Greener, 2008, p. 42). It is therefore crucial to provide what affiliations exist and the nature of these. The only existing affiliation relevant to this research is between the authors and Umeå School of Business and Economics, which is where this research is conducted, as a result this thesis is conducted according to the standards and requirements of this institution. Through this institution the authors are given access to information needed for the research but not publicly available, such as academic articles and databases, and the support of a supervisor. Both authors had several courses in finance and business research and through the assistance of an experienced supervisor are able to determine what tests to employ, how to do them and how to interpret the results.

As the result of this research will help investors make more informed decisions due to a more extensive understanding of the level of risk they are facing as well as making an academic contribution, it is crucial that the entire research process is thorough and just. If objectivity is not ensured and the results somehow affected it would do more harm than good as false assumptions could lead to poor decisions, concluding that the results are only useful if the research is done correctly. With this in mind the authors have designed their research carefully to ensure that the findings and conclusions made from this thesis is of benefit for investors.

The publication of this thesis means that it has gone through an extensive scrutinizing, including oppositions by peers and being approved by a grading committee. This does not only indicate an overall quality of the thesis but also ensures a correct assessment of the result based on the empirical findings.
3. Theoretical Framework

The theoretical framework for this thesis has been structured in the following way. Firstly follows a definition of cash and how it can be used in a company. To provide a better understanding on why companies might save cash a number of reasons have been listed and discussed. Secondly, the theories regarding investment decisions have also been added since all of them are regarding the use of either cash or other sources of financing. Thirdly this thesis strives to provide the readers with the basic terms of the risks on the stock market. Lastly a literature review has been conducted on similar studies to this thesis and its chosen area.

3.1 Cash

Everyone is familiar with the term cash, and the Oxford Online Dictionary defines it as “coins and notes”. As a person, you have a certain income of cash that preferably should cover your outflow of cash. Companies face the same problem every day. Should a company not be able to get enough cash inflows from their operations to cover obligated outflows such as rents or wages, they are facing liquidity problem that could end up in bankruptcy. Companies present information about their cash situation in their cash flow statements, which are often included in financial reports. The cash flow statement is divided into three cash flows; cash flow from operations, financing and investments (Maness & Zietlow, 2004, p. 32). Also included in this statement is the starting and ending balance of cash and cash equivalence at the year-end, which in this thesis is used to derive the cash holding ratio.

There are a number of reasons for a company to either spend or hold cash and some of them will be presented in the sections below. The trend for holding more or less cash has shifted over time, however the general trend for US firms has been that company’s cash holding has had an upward trend since the 1980’s according to the research done both by Sánchez & Yurdagul (2013) and Bates et al. (2009).

3.2 Time Value of Money

Time value of money is one of the most basic principles in finance. “One dollar today is worth more than a dollar tomorrow” is perhaps one of the most famous quotes in the field. It means that if a person should invest one dollar today it will earn interest and will therefore be worth more the day after. The interest rate would be dependent on the investment and has to adjust by subtracting the amount of inflation on the currency (Berk & DeMarzo, 2011, p. 87-88, 135). Both investors and firms use the concept of time value of money in order to calculate the present as well as the future value of their operations. For example they calculate the present value of the cost and benefits for a project in order to determine if the project is profitable or not. Another example is to calculate if their current cash level is worth enough to cover their future expenditures (Berk & DeMarzo, 2011, p. 97).

\[ PV = \frac{FV}{(1 + i)^n} \]

The formula shows the calculation for PV, which is the present value calculated by the future value FV, the interest i, and the time period n as shown in the formula.
Thus, this leads to the argument that the optimal level of cash that a firm should hold is zero, since it is then considered as an idle resource for the company that do not provide any or little additional value. (Maness & Zietlow, 2004, p. 16).

### 3.3 Reasons to Hold Cash

According to both Berk & Demarzo (2011) and Maness & Zietlow (2004) there are several reasons why a firm should hold a level of cash in reserves.

#### 3.3.1 Cover the Day-to-day Operations

Each and every firm has cash or operating cycle that can be calculated using the cash conversion cycle which is calculated using the following formula:

\[
\text{Cash Conversion cycle} = \text{Accounts receivable + Inventory day} - \text{Accounts payable days}
\]

This formula calculates the length in days for how long it takes from the day the cash is spent in the firm’s production to the day when the cash comes in from the customers. A company sometimes refers to its operating cycle instead of the cash conversion cycle, which concerns itself with the firms’ use of credit instead of cash but otherwise is similar (Maness & Zietlow, 2004, p. 38). Depending on the firm, the length of the cash cycle varies but the longer the cycle the more cash the firm has to hold in order to conduct their day-to-day business. According to Maness & Zietlow (2004, p. 15) reduced cash cycle has two benefits: the firm’s reduction in the cash cycle will lead to more free cash flow which can be used for other things and secondly it will inspire the firm to become more efficient which will in the long run lead to higher earnings.

#### 3.3.2 Compensate for the Uncertainty with its Cash Flow

Uncertainty with a firm’s cash flow is a normal concern for most firms. A reduction in sales, higher costs, more competitors, inflation or an economic downturn are a few reasons why a firm’s cash flows might fluctuate. The uncertainty of undertaking a new project is another reason for holding cash, as the calculated returns from the project are just projections and does not always coincide with reality. Berk & Demarzo (2011, p. 861) suggests that a firm should have a dedicated cash account, a so-called precautionary account that should hold enough cash in order to be able to compensate for these uncertainties, an argument reinforced by Bates et al. (2009, p. 1988).

#### 3.3.3 To Satisfy Bank Requirements

There are two reasons why firms should keep a certain level of cash holdings in order to satisfy the bank requirements. Firstly it is common with an agreement between companies and banks where a certain minimum level of cash holdings is established for the firm when arranging loans, so banks can remain confident that the company can meet the debt payments (Berk & Demarzo, 2011, p. 861). The second reason why a firm must hold a certain level of cash is dependent on whether the firm operates within the financial sector or not. This is because companies within the financial
sector have different regulations and requirements concerning cash holding as well as other objectives (Sánchez & Yurdagul, 2013, p. 5).

3.3.4 Marketing Tool
A strong cash reserve on the balance sheet may show rigid cash balances that are larger than that of competitors, which can be used to attract investors that prefer firms with higher liquidity (Maness & Zeitlow, 2004, p. 18). On the downside high levels of cash holdings might attract corporate raiders or activist shareholders with the aim to change corporate polices. A common objective of shareholder activism is to increase the dividend payouts to shareholders (Croci, 2007, p. 950).

3.3.5 Buffer for Corporate Shocks
Although the reason of holding cash as a buffer for corporate shocks might seem similar to the reason in section 3.3.3 of compensating for uncertainty of cash flows, the difference is that Maness & Zeitlow (2004, p. 18) for this reason emphasized the importance to have enough cash to cover unexpected outflows of cash such as litigation cost.

3.3.6 Strategic Purposes such as Acquisitions
Investing in new projects or acquiring more assets could be vital for the survival and expansion of a company. However, only using internal cash flows to finance these projects is uncommonly sufficient at a single point in time (Frank & Goyal, 2003, p. 241). Companies therefore before making new large investments stock up on cash to use this source of financing to a higher extent. If cash is not enough to cover the investments, companies have to consider financing using external sources, a choice between debt and equity, which will be explained in the following section.

3.4 Capital Structure
Capital structure refers to the way firms finance their assets. There are basically three sources of finance to consider. Firstly a firm can use its own accumulated cash in their financing. The second way is to issue new stock in order to raise more money through equity financing. Lastly a firm can borrow money through debt (Brealey et al., 2010 p. 32). There are many ways of doing this but the idea is basically the same, the mixture of debt and equity is what defines the capital structure of a firm. From an accounting standpoint one might picture the capital structure as:

\[
\text{Assets} = \text{Debt} + \text{Equity}
\]

3.4.1 Miller and Modigliani
In the year of 1958 Merton Miller and Franco Modigliani published their article “The cost of Capital, Corporate finance and the theory of investment” in the American Economic Review. The result of their work has been divided into two propositions hence referred to as MM proposition 1 and MM proposition 2.
The first proposition can be summarized as; “in a perfect capital market the total value of a firm is equal to the market value of the total cash flow generated by its assets and is not affected by its choices of capital structure” (Berk & Demarzo, 2011, p. 455). They assumed that under perfect capital markets, meaning that there is no taxes, transaction cost or issuance cost on securities (Berk & Demarzo, 2011, p. 455), investors and firms have access to the same markets. Therefore the market prices of securities will be the same as the present value of their future cash flows. Under these conditions the value of a firm’s cash flow does not change depending on its capital structure policy as shown in the following formula.

\[ E + D = U = A \]

The second proposition states that “the cost of capital of levered equity increases with the firms debt-equity ratio” (Berk & Demarzo, 2011 p. 455). It is only under a very basic assumption that the first proposition would hold, therefore in their second proposition, Miller and Modigliani (1958) added risk and leverage to the cost of capital. The following formula shows that the cost of equity will be higher depending on the amount of debt a firm has.

\[ r_E = r_U + \frac{D}{E}(r_U - r_D) \]

### 3.4.2 Trade Off Theory

The trade off theory seeks to find the optimal level of debt a firm can take on in order to maximize its value (Kraus & Litzenberger, 1973, p. 918). The theory has two sides to consider; the tax advantages of debt and the risk of financial distress due to the undertaken amount of debt. The tax advantage from the level of debt is derived from the interest tax shield that the firm receives. On the other hand, when a firm increases its debt, the interest cost and the risk that the firm will default on their debt will increase. Therefore the trade off for the firm is to find where these two sides meet, which is where the optimal level of leverage that they can take on for their investments is (Berk & DeMarzo, 2011, p. 520-522). The validity for trade off theory on the Stockholm Stock Exchange has been tested and affirmed by Dedes (2010). The formula shows the relationship of how the value of a levered firm is derived from its unlevered value, the present value of the interest tax shield and the present value of the costs of financial distress.

\[ V^L = V^U + PV(\text{Interest Tax Shield}) - PV(\text{Financial Distress Costs}) \]

### 3.4.3 Pecking Order Theory

In the article Corporate Financing and Investment Decision When Firms Have Information that Investors do Not by Stewart Myers and Nicholas Majluf from 1984 the pecking order theory, first suggested by Donaldson (1961), was adopted and improved to explain companies’ choice in source of financing. Pecking order deals with the financing options available for firms when they are considering investing in new projects. As already stated there are three options for firms seeking financing for new investments: cash, debt and equity. The pecking order theory suggests that companies will firstly and most likely use its own cash to the highest extent possible, although usually this is not sufficient (Frank & Goyal, 2003, p. 241). If cash from
internal sources is not sufficient, the firm has to choose from either equity or debt. Pecking order theory then suggests that debt is the second choice of financing after internal cash and raising new equity is the last resort. According to Myers & Majluf (1984) there is an asymmetric relationship regarding the information of a company known by investors and the information possessed by corporate managers. Since the managers should know more about their own firm than outside investors they would be able to predict their assets performance more accurately, this information would enable corporate managers to determine if their stock is undervalued or overpriced. If they determine that their own stock is undervalued then debt will be a more desirable option. However, should they view their stock to be overpriced, they will consider issuing new stock instead as it would be considered a bargain and therefore raise more capital through equity, a result of an imperfect market (Myers & Majluf, 1984, p. 189). Dedes (2010) confirmed that the pecking order theory is to some extent valid for firms’ listed on the Stockholm Stock Exchange preference in the choice of sources for financing.

3.5 Holding Cash over Time
Up to this point, the different reasons to spend or hold cash have been presented, although mostly from a corporate perspective. The problem is that to the best of the author’s knowledge, there has not been much research done on how investors consider the level of cash a firm holds. However, in their article, *Excess Cash Holdings and Shareholder Value*, Edward Lee and Ronan Powell (2011) adopt a shareholder perspective on the Australian market. Depending on how long and how much excess cash the firms held, they were divided into persistent excess cash holding firms and transitory cash holdings firms, where persistent firms held excess cash for more the two consecutive years. The result of their study was that persistent companies underperformed the transitory ones. They also found that the marginal value of the cash held decreased the higher the balance but also dependent on how long the cash was held. The conclusion they made is that if a firm holds excess cash persistently will provide a lower shareholder value.

3.6 Agency Theory
Agency theory is employed in many fields and concerns itself with the problem of ensuring that someone acting on the behalf of another, an agent representing a principal, serves the interest of the principal. The issue at hand is that the agent might have other goals and interests than the principal and could act to achieve these at the expense of the principal (Eisenhardt, 1989, p. 58). The theory assumes that in certain situations if possible the agent would act to serve his or her objectives and the solution in these situations comes from aligning the interests of the principal and the agent. The relationships where agency theory needs to be considered are numerous, for example lawyer-clients, employer-employee and shareholders-managers (Harris & Raviv, 1978, p. 21). Agency problems that might arise in a shareholder-manager situation concerns among other things the optimal level of cash holdings. Managers have motives for having higher levels of corporate cash holdings than what is optimal for shareholders (Jensen, 1986, p. 323).
3.7 Signaling Theory
Under perfect market conditions all information is available for all market actors but this is not the case in the real world, managers and insiders do usually have better information than investors. Information that is not available for everyone is usually referred to as asymmetric information (Berk & DeMarzo, 2011, p. 575). To overcome this inefficiency people lacking information are observing the actions of those believed to have this information and try to interpret the implications of that behavior. The insiders could then choose to reduce the information asymmetry by sending clear messages by certain actions, for example a potential employee could demonstrate his quality by obtaining a higher education, these actions then functions as signals to remove the information gap between the two parties (Connolly et al., 2011, p. 42-43; Spence, 1973, p. 158). These signals does not however have to be deliberate, people knowing negative information might not want to share it but could unintentionally do so by the same principles. For example managers believing the stock price to be overvalued could use the opportunity to raise new equity but the market realizing this would adjust accordingly (Myers & Majluf, 1984, p. 195).

A good signal is constructed so that the qualities attributed to it are well related and designed in such a fashion that it would not be beneficial to signal dishonestly, otherwise the signal would turn useless as receivers would learn to ignore it (Connolly et al., 2011, p. 45). This is mainly accomplished through high signal costs which are substantially higher for those who do not accurately represent the qualities associated with the signal. Reliable signals therefore “... must show that signal cost (or benefit) is quality-dependent” (Bird & Smith, 2005, p. 236).

3.8 Market Risk
Investors face two kinds of risk when managing portfolios, nonsystematic risk, also called specific risk, and systematic risk. The total risk of an asset is the sum of the systematic and nonsystematic risk as shown from the formula.

\[
Total \ Risk = Systematic \ Risk + Nonsystematic \ Risk
\]

The total risk of holding a single asset is measured by its volatility. The nonsystematic risk is the risk that is associated with each company individually and can be diversified away by investing a wide array of different securities (Brealey et al., 2010, p. 198; Hull, 2012, p. 8). Even when holding a well-diversified portfolio the systematic risk still remains and can only be altered by investing in or selling off assets with higher or lower risk than the aggregate risk of the portfolio. The risk for systematic risk in a portfolio is measured by beta (Hull, 2012, p. 8). Although the nonsystematic risk is negligible in larger portfolios it is still important when assessing the total risk of an individual company and it is considered even by well diversified investors. Since the impact of the specific risk can be extracted from portfolios there is no reward in form of a risk premium for holding this kind of risk (Berk & DeMerzo, 2011, p. 313).

In order to offset the systematic risk faced by an investor the expected return of a risky asset must exceed that of safer investments, the difference between the expected return on risk free assets and the return on other riskier investments is defined as the risk premium. Simply put, if investors are to buy riskier assets they would only do so
if expecting a higher return (Brealey et al., 2010, p. 220).

3.9 Risk Measures
How risky an asset is can be evaluated by looking at how much the price of the stock varies throughout a year, alone or within a portfolio. Volatility concerns the spreads of stock prices and is summarized by calculating variance and standard deviation, commonly denoted as sigma (Brealey et al., 2010, p. 191-193), and beta. Variance is the most basic measure of risk but due to the nature of how it is calculated has the potential to amplify the impact of exceptional values, standard deviation offsets that possibility (Fernandes, 2009, p. 68). High values of variance and standard deviation show that a stock price fluctuates a lot during the year and is regarded as riskier due to the high degree of fluctuations makes it more unpredictable.

Variance is calculated through the following formula

\[ Var(R) = \frac{1}{T-1} \sum_{t=1}^{T} (R_t - \bar{R})^2 \]

Standard deviation is the square root of the Variance.

\[ SD(R) = \sqrt{Var(R)} \]

Beta is used to measure the risk of a stock compared to the market risk, it represents the sensitivity of an asset to movement in the market. Beta also reflects the diversification benefits possible to gain from attaining a security (Berk & DeMarzo, 2011, p. 360; Brealey et al., 2010, p. 202). Beta is also used to describe the possible attainable result from undertaking systematic risk (Hull, 2012, p. 13).

Beta is calculated as the ratio of covariance between the returns of an individual asset, denoted as \( R_i \) and the returns of the market, \( R_{Mkt} \), over the variance of the returns of the market as shown from the following formula:

\[ \beta_i = \frac{Cov(R_i, R_{Mkt})}{Var(R_{Mkt})} \]

The value of the beta is depicted as a ratio of changes in stock price to the corresponding market movements where a positive value represents the stock moving in the same direction as the market and stocks with negative betas moves against the market. Smaller values of beta are considered less risky as higher betas than 1.0 amplifies the market movements (Brealey et al., 2010, p. 202; Hull, 2012, p. 13).

The usefulness of beta has been discussed throughout academic literature but in the recent article from Estrada & Vargas (2012) the application of beta as a measurement for risk and an important useful tool for investors is reinforced. The article has through extensive research reached the conclusion that investors employing a beta-based strategy in evaluating and managing portfolios are outperforming passively managed investments (Estrada & Vargas, 2012, p. 78). Beta is more relevant from a portfolio management perspective rather than from a corporate finance perspective,
indicating that it is more of use for investors instead of corporate management as investors can diversify more easily than a company (Brealey et al., 2010, p. 205-206; Estrada & Vargas, 2012, p. 78).

3.10 Cash Holding Ratio
In order to better compare the level of cash holdings in the chosen companies, a ratio was used. The authors chose to divide each of the companies’ cash and cash equivalence with the company’s total assets minus the cash and cash equivalence. Dividing with total assets provides fairness to each company since the ratio would be fair even between companies of different sizes. The legitimacy of this ratio has been reinforced when conducting research about corporate cash holdings by previous studies such as those made by Bates et al. (2009) and Sánchez & Yurdagul (2013). The following formula shows how the cash holding ratio is calculated:

$$CHR = \frac{\text{Cash and Cash Equivalence}}{\text{Total Assets} - \text{Cash and Cash Equivalence}}$$

3.11 Stockholm Stock Exchange
NASDAQ OMX Stockholm, commonly referred to as the Stockholm Stock Exchange, was created in 1863, is the largest stock exchange in Sweden and is since 2008 part of NASDAQ OMX Nordic. Also included in NASDAQ OMX Nordic are the stock exchanges of Copenhagen, Helsinki, and Iceland. Stockholm Stock Exchange is also the largest in the Nordic list with 251 out of 541 companies listed with Stockholm as its home exchange and 2 additional cross-listed companies are also traded on the Stockholm Stock Exchange (NASDAQ OMX, 2013a).

Companies on the Stockholm Stock Exchange are divided into three groups depending on the size of the company as well as into ten different groups regarding what industry it is operating in. The largest group in regard to sizes is the large cap, companies with a value exceeding one billion euros, followed by medium cap, value between 150 million and 1 billion euros, and finally small cap which contains the listed companies valued below 150 million euros. As of February 26th 2013 large cap on the Swedish stock exchange had 61 listed companies, medium cap 67 and small cap 125 (NASDAQ OMX, 2013a). The companies are subsequently divided into ten different segments based on industries according to the Global Industry Classification Standard, which are the following:

<table>
<thead>
<tr>
<th>1. Basic Materials</th>
<th>6. Industrials</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Consumer Goods</td>
<td>7. Oil &amp; Gas</td>
</tr>
<tr>
<td>3. Consumer Services</td>
<td>8. Technology</td>
</tr>
<tr>
<td>5. Health Care</td>
<td>10. Utilities</td>
</tr>
</tbody>
</table>

Table 1: Sectors on the Stockholm Stock Exchange
Source: NASDAQ OMX, 2013a

3.12 Literature Review
There is an abundance of research concerning corporate cash holding and capital structure where several theories and observations have been produced. Frank & Goyal
(2003) investigated the pecking order theory and its validity on internal financing. They found that although somewhat accurate, companies did not follow the pecking order theory to the extent which they had expected. Dedes (2010) confirmed that the pecking order theory is also valid for Swedish listed companies.

Ross (1977) researched the implications of signaling theory on capital structure and the choice of financing, reaching the conclusion that in imperfect market conditions where managers possess information which others lack, rational outsiders interpret the actions of these managers to overcome issues of asymmetric information. Managers give away information voluntarily or involuntarily through their choice for source of financing, resulting in the capital structure being influenced by how managers expect their choices will be interpreted.

Jensen (1986) investigated the link between agency theory and corporate cash holdings and found that managers prefer to control larger companies, resulting in management retaining earnings beyond the optimal level. He suggested that managers might even invest in projects with worse potential than those usually accepted by the company for just this reason (Jensen, 1986, p. 323).

The use of a cash to total assets ratio when investigating cash holdings is suggested in several academic articles. Sánchez & Yurdagul (2013) argued about the benefits of using this ratio when researching the reasons behind higher levels of corporate cash holdings in order to offset the effects of inflation and growth of companies. The appropriateness of using this ratio is reinforced by Bates et al. (2009) and Simutin (2010), both investigating high levels of corporate cash holdings.

The relationship between the level of corporate cash holdings and corporate risk has been investigated by both Acharya et al. (2008) and Harford et al. (2012). Acharya et al. (2008) found that this relationship is not as simple as instincts might suggest, rather than companies with high cash holding levels being regarded as safe they are often subject to lower credit ratings. A similar finding was made by Simutin (2010) when researching the relationship between cash holding levels and stock returns, he explained this relationship with the notion that holding cash is an indicator for large risky future investments. Harford et al. (2012) describe the increase in cash holdings over time to be proportional of the increase in refinancing risk, a general trend towards shorter debt maturities.

In addition to Simutin (2010), more research has been conducted on cash holdings and stock behavior; Lee & Powell (2011) examined the effects of cash holding policies on stock returns in Australia and discovered that firms constantly adapting their level of cash holdings outperformed those with more rigid levels of cash holdings. Décamps et al. (2011) developed a model to explain the relationship between the marginal value of cash and stock price and stock volatility of a company. They found that with negative movements in the stock price or an increase in the volatility of the stock is related to an increase in the value of cash. Finally Faulkender & Wang (2006) studied marginal value of cash by examining stock returns and found that it is affected by current level of corporate cash holdings, leverage and degree of access to capital markets.
4. Practical Method

In this chapter the practical steps in the data collection and treatment are provided. The aim is to, in a detailed manner, show how the empirical results in the next chapter was derived. It ends with listing the hypotheses that will be answered and discussed in the following chapters.

4.1 Population and Sample Data

Since the authors have chosen to investigate all of the firms listed on the Stockholm Stock Exchange the sample is then to be considered as the population since it is the entire group available that is investigated (Moore et al., 2008, p. 178). However the total population of companies was 253 as of March 18, 2013, out of them a number of companies has been excluded for several reasons provided below. Firstly all companies operating in the financial sector of the stock market has been excluded. This because firms in this sector have different rules to follow than the other sectors regarding cash management, thus their reasons to hold cash are different (Sánchez & Yurdagul, 2013, p. 5). Secondly the firms that follow a different fiscal year than the regular calendar year have been removed due to the risk that these reports are reporting substantially different values because of seasonality. Thirdly companies that had not been listed on the stock exchange during the whole chosen time period have been excluded since they would not have the same number of stock return observations as the others. This reason removed the utilities sector since the two companies in this sector was not listed during the whole time period. Fourthly companies that have done major changes in their firms such as changes in accounting principles or changes in reported currencies during a fiscal year was also removed. Finally the outliers in the sample data were removed. This was because outliers are values that deviate from the overall pattern of the data (Moore et al., 2008, p. 22). The correlation tests are not resistant to outliers and the result would have been strongly affected by the outliers, thus they were removed for the sample (Moore et al., 2008, p. 113). The two sets of data that contained outliers were the cash holding ratio and volatility. In the cash holding ratio the authors deemed companies as outliers if they had a ratio above 2.0 and in volatility they considered values above 0.75 as outliers. The table below shows how many companies were removed for the different listed reasons.

<table>
<thead>
<tr>
<th>Reasons for exclusion</th>
<th>Number of companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different Fiscal Year</td>
<td>16</td>
</tr>
<tr>
<td>Got listed during the chosen time period</td>
<td>16</td>
</tr>
<tr>
<td>Changes in accounting principles</td>
<td>8</td>
</tr>
<tr>
<td>Financial Sector</td>
<td>41</td>
</tr>
<tr>
<td>Outliers &amp; Extreme values</td>
<td>12</td>
</tr>
<tr>
<td>Total excluded companies</td>
<td>93</td>
</tr>
</tbody>
</table>

Table 2: Excluded Companies

The chosen index for our beta calculations was the NASDAQ SPI, Stockholm Price Index. This index contains all the stocks on the Stockholm Stock Exchange and therefore is an appropriate measurement for beta calculations (NASDAQ OMX, 2013).
4.2 Time Horizon
The following table shows the number of observations over the selected time frame, 2009-2012. It shows all included variables in this research and how many observations of these were made each year and total. As shown stock prices and the market index data were collected daily and the cash holding, beta and standard deviation was calculated annually.

<table>
<thead>
<tr>
<th>No of observations (Per company)</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock Prices (listed companies)</td>
<td>261</td>
<td>261</td>
<td>260</td>
<td>261</td>
<td>1043</td>
</tr>
<tr>
<td>Market Index (SPI)</td>
<td>261</td>
<td>261</td>
<td>260</td>
<td>261</td>
<td>1043</td>
</tr>
<tr>
<td>Cash Holding Ratio</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Beta</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>No of companies</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
</tr>
</tbody>
</table>

Table 3: Observations

4.3 Sample Segmentation
In order to deepen the understanding and to provide the reader with a more thorough answer to our research question, the authors have divided the sample in size and sector. Doing this enabled the authors to conduct the statistical tests six times on the chosen variables. This was done in order to investigate if there might be an individual correlation within a specific size or sector. The table below shows how our sample was divided and how many companies are listed in each group.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Large Cap</th>
<th>Medium Cap</th>
<th>Small Cap</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Materials</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Consumer Services</td>
<td>4</td>
<td>8</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Financial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Health care</td>
<td>3</td>
<td>2</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>Industrials</td>
<td>15</td>
<td>11</td>
<td>33</td>
<td>59</td>
</tr>
<tr>
<td>Oil &amp;Gas</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Technology</td>
<td>3</td>
<td>2</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Utilities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total companies</td>
<td>38</td>
<td>33</td>
<td>93</td>
<td>160</td>
</tr>
</tbody>
</table>

Table 4: Segmentation

4.4 Data Collection Method
In order to collect data about the companies being investigated this thesis has concerned itself with secondary data, exclusively through annual reports produced by the individual companies and a database named Thomson Reuters Datasream. These are both reliable data sources as the annual reports have passed through independent auditing and the database is highly reputable and considered a very trustworthy source. These sources do fit in the classification as documentary secondary sources as this category include reports to shareholders, administrative records and raw data sources (Saunders et al., 2009, p. 258). The daily stock prices of the included firms and the price index have been collected from Thomson Reuters Datasream and then used to calculate daily log returns, which later are used to determine the yearly beta
and volatility. The yearly cash balance and total assets of the investigated companies have been collected manually from corresponding annual reports and then used to derive the cash holding ratio. Afterwards the data collected has then been subject to statistical tests and measures in the statistical software package SPSS (Statistical Package for the Social Sciences).

Special caution has been taken in regard to the manual transfer of variables from the annual reports due to the risk of human error, the risk that some values were not transcribed correctly. To offset this, the authors have made sure to compare the noted values to the annual report after the process of transcription was completed. The issue of noise in the data collection, the risk that the data somehow gets distorted and does not accurately represent what it is supposed to, has been offset in this research as only printed sources has been utilized and the transcribing of this data has been done carefully and thoroughly.

4.5 Data Treatment
In this section the different steps the data has gone through once collected are presented, as well as the implications of these measures.

4.5.1 Log Returns
From the retrieved stock prices the authors used Excel to calculate the returns of the stock prices. The authors used the returns of each stock instead of its price which is the change in price from one day to another. This was chosen because it provides a more fair view since the measure is not dependent on for example the value of the stock price as it is scale free (Ruppert, 2004, p. 76). The authors have also deemed it more appropriate to use log returns, this makes the returns becomes continuously compounded (Ruppert, 2004, p. 77). The benefit of using log returns are that the sum of all returns will be equal to the total return for the whole period, which makes the data more appropriate for statistical purposes (Tsay, 2010, p. 5).

\[ R_t = \ln \left( \frac{P_t}{P_{t-1}} \right) \]

In this formula \( R_t \) is the calculated log return that has been used. It was derived by logging the price of one day divided by the price of the previous day.

4.5.2 Normality
In order to test that our population and samples are following a normal distribution, the authors conducted two tests using SPSS. These two were Q-Q plots and histograms which are presented graphically. If the observations closely follow the expected normal function, the distribution can be regarded and treated as normal. A histogram illustrates the distribution and if a plotted normal distribution curve approximately fits the data it can also be considered normally distributed. The benefits of having a normal distribution are that it enables some statistical tests that require normality of the data (Moore et al., 2008, p. 56). The advantages of these visual measurements of normality is that it allows assessing normality when numerical measures would be overly sensitive, as in the case of this research when there is a large sample size (Lund & Lund, 2013a).
4.5.3 Beta
The beta calculation in this thesis was calculated manually in Excel using the daily log returns of our sample and the log returns of our chosen index, SPI. For each individual stock the covariance between its return and the index return has been calculated using the following formula:

$$Covar(R_i, R_{Mkt}) = \frac{1}{T - 1} \left( \sum_{t=1}^{T} (R_{it} - \bar{R}_i)(R_{Mkt} - \bar{R}_{Mkt}) \right)$$

The covariance was then divided by the calculated variance of index deriving the beta for the chosen company:

$$\beta_i = \frac{Covar(R_i, R_{Mkt})}{Var(R_{Mkt})}$$

4.5.4 Volatility
The other measure of risk employed in this research is volatility which is a measure of the total risk of an individual asset. Standard deviation can be calculated to measure volatility and in order to assess the volatility fairly between stock prices of various values daily log returns have been calculated. From these returns an annual variance has been deducted in accordance with the following formula:

$$Var(R) = \frac{1}{T - 1} \sum_{t=1}^{T} (R_t - \bar{R})^2$$

Once the variance, Var(R), was derived it was used to calculate the standard deviation by:

$$SD(R) = \sqrt{Var(R)}$$

4.5.5 Cash Holding Ratio
To measure the cash holding level of each individual firm, the authors chose a ratio in order to make the measurement more comparable than using only the cash and cash equivalence post noted on cash flow statements. Therefore the total assets presented in company balance sheet and cash and cash equivalence was used to calculate the cash holding ratio in the following manner:

$$CHR = \frac{\text{Cash and Cash Equivalence}}{\text{Total Assets} - \text{Cash and Cash Equivalence}}$$

4.5.6 Correlation
Correlation is a statistical measure that is used to determine the strength of a
relationship between two variables. It uses quantitative data and the value varies anywhere between -1 and 1, where values of correlation closer to 0 represent a weak relationship and closer to 1 or -1 indicate a strong positive or negative relationship (Moore et al., 2008, p. 110-113). Correlation makes no distinction between the explanatory and response variables but simply assesses the relationship between the two. It does not affect the result what variable is represented as either but it also means that causality cannot be deducted from measuring correlation (Bryman & Bell, 2011, p. 346).

There are different kinds of correlation test to choose from, which test to use depends on the nature of the variables. The authors have considered two tests for testing the correlation, the Pearson or Spearman Correlation. The Pearson Correlation test has four criteria that have to be fulfilled if the test is to be employed. Firstly the variables should be measured as either intervals or ratios. Secondly each variable should be approximately normally distributed. Thirdly there should be a linear relationship between the two variables. Lastly outliers have heavy impact on the results so they should be kept to as few as possible. (Lund & Lund, 2013b; Moore et al., 2008, p.113)

If the assumptions for Pearson Correlation are not met, the authors will choose the Spearman Correlation test instead. The main difference between Pearson and Spearman is that the Spearman is more suitable if the variables are not normally distributed or if the relationship is not linear (Lund & Lund, 2013c). The formula for both Pearson ($r$) and Spearman ($p$) are the same, the only difference is that Spearman ranks the variables (Lund & Lund, 2013c). The formula for correlation is presented below:

$$r(p) = \frac{\sum^n_i (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum^n_i (X_i - \bar{X})^2} \sqrt{\sum^n_i (Y_i - \bar{Y})^2}}$$

4.5.7 Significance test

In order to assess if the findings of this research are reliable the statistical significance needs to be derived. This is done to ensure that the results generated from a research actually represent true phenomena and does not occur by chance (Bryman & Bell, 2011, p. 353). Moore et al. define something statistically significant as: “An observed effect so large that it would rarely occur by chance...” (Moore et al., 2008, p. 201), so rather than telling with certainty testing for statistical significance indicates how likely it is that a finding accurately depicts reality.

When reaching a statistical significance the researchers need to determine what is strong enough to claim that the results are true, for what level of significance the findings are accepted. To answer this, an assessment has to be made regarding the effects of accepting or rejecting a finding. If a too high significance level is set the risk of rejecting a phenomenon that is actually valid is high, described as a Type I error, and a small significance level can result in incorrectly accepted results, a Type II error (Bryman & Bell, 2011, p. 354; Moore et al., 2008, p. 384). The authors of this thesis have determined a statistical significance level of 95% to be appropriate, which
is common in business research, to balance the risks of Type I and Type II errors. Findings accepted at this significance level have a probability of 5% or less to occur by chance and not represent a true phenomenon (Bryman & Bell, 201, p. 353).

4.6 Hypotheses
To answer this thesis research question, a number of hypotheses have been stated and will be tested. The hypotheses will be listed in pairs containing the null hypothesis together with the alternative hypothesis and have been divided into the whole sample, the size of the companies and the different sectors. Given the number of hypotheses tested in this thesis, the authors have chosen to present only the hypotheses regarding the entire sample written and in a table. The following hypotheses regarding size and sector have been designed in a similar way but to make it easier for the reader they will be presented in tables instead.

4.6.1 Sample Correlations
Hypothesis 1: Cash holdings has no relationship with stock $\beta$. Then, there is no correlation between the cash holding ratio and stock beta.

$H_0: p(CHR, \beta) = 0$

$H_1: p(CHR, \beta) \neq 0$

Hypothesis 2: Cash holdings has no relationship with stock $\sigma$. Then, there is no correlation between the cash holding ratio and stock standard deviation.

$H_0: p(CHR, \sigma) = 0$

$H_1: p(CHR, \sigma) \neq 0$

<table>
<thead>
<tr>
<th>Sample</th>
<th>$\beta$</th>
<th>$\sigma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0$: $p(CHR, \beta) = 0$</td>
<td>$H_0$: $p(CHR, \sigma) = 0$</td>
<td></td>
</tr>
<tr>
<td>$H_1$: $p(CHR, \beta) \neq 0$</td>
<td>$H_1$: $p(CHR, \sigma) \neq 0$</td>
<td></td>
</tr>
</tbody>
</table>

Table 5: Total Sample Hypothesis

4.6.2. Correlation within Sizes

<table>
<thead>
<tr>
<th>Size</th>
<th>Beta</th>
<th>$\sigma$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>$H_0$: $p(CHR_{\text{Large}}, \beta_{\text{Large}}) = 0$</td>
<td>$H_0$: $p(CHR_{\text{Large}}, \sigma_{\text{Large}}) = 0$</td>
</tr>
<tr>
<td></td>
<td>$H_1$: $p(CHR_{\text{Large}}, \beta_{\text{Large}}) \neq 0$</td>
<td>$H_1$: $p(CHR_{\text{Large}}, \sigma_{\text{Large}}) \neq 0$</td>
</tr>
<tr>
<td>Mid</td>
<td>$H_0$: $p(CHR_{\text{Mid}}, \beta_{\text{Mid}}) = 0$</td>
<td>$H_0$: $p(CHR_{\text{Mid}}, \sigma_{\text{Mid}}) = 0$</td>
</tr>
<tr>
<td></td>
<td>$H_1$: $p(CHR_{\text{Mid}}, \beta_{\text{Mid}}) \neq 0$</td>
<td>$H_1$: $p(CHR_{\text{Mid}}, \sigma_{\text{Mid}}) \neq 0$</td>
</tr>
<tr>
<td>Small</td>
<td>$H_0$: $p(CHR_{\text{Small}}, \beta_{\text{Small}}) = 0$</td>
<td>$H_0$: $p(CHR_{\text{Small}}, \sigma_{\text{Small}}) = 0$</td>
</tr>
<tr>
<td></td>
<td>$H_1$: $p(CHR_{\text{Small}}, \beta_{\text{Small}}) \neq 0$</td>
<td>$H_1$: $p(CHR_{\text{Small}}, \sigma_{\text{Small}}) \neq 0$</td>
</tr>
</tbody>
</table>

Table 6: Sizes Hypothesis
### 4.6.3 Correlation within Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>Beta</th>
<th>σ</th>
</tr>
</thead>
</table>
| Basic Materials         | $H_0: \beta_{Basic\ materials} = 0$  
                          | $H_1: \beta_{Basic\ materials} \neq 0$  
                          | $H_0: \sigma_{Basic\ materials} = 0$  
                          | $H_1: \sigma_{Basic\ materials} \neq 0$  |
| Consumer Goods          | $H_0: \beta_{Consumer\ goods} = 0$  
                          | $H_1: \beta_{Consumer\ goods} \neq 0$  
                          | $H_0: \sigma_{Consumer\ goods} = 0$  
                          | $H_1: \sigma_{Consumer\ goods} \neq 0$  |
| Consumer Services       | $H_0: \beta_{Consumer\ services} = 0$  
                          | $H_1: \beta_{Consumer\ services} \neq 0$  
                          | $H_0: \sigma_{Consumer\ services} = 0$  
                          | $H_1: \sigma_{Consumer\ services} \neq 0$  |
| Health care             | $H_0: \beta_{Health\ care} = 0$  
                          | $H_1: \beta_{Health\ care} \neq 0$  
                          | $H_0: \sigma_{Health\ care} = 0$  
                          | $H_1: \sigma_{Health\ care} \neq 0$  |
| Industrials             | $H_0: \beta_{Industrial} = 0$  
                          | $H_1: \beta_{Industrial} \neq 0$  
                          | $H_0: \sigma_{Industrial} = 0$  
                          | $H_1: \sigma_{Industrial} \neq 0$  |
| Oil & Gas               | $H_0: \beta_{Oil\ &\ gas} = 0$  
                          | $H_1: \beta_{Oil\ &\ gas} \neq 0$  
                          | $H_0: \sigma_{Oil\ &\ gas} = 0$  
                          | $H_1: \sigma_{Oil\ &\ gas} \neq 0$  |
| Technology              | $H_0: \beta_{Technology} = 0$  
                          | $H_1: \beta_{Technology} \neq 0$  
                          | $H_0: \sigma_{Technology} = 0$  
                          | $H_1: \sigma_{Technology} \neq 0$  |
| Telecommunications      | $H_0: \beta_{Telecommunication} = 0$  
                          | $H_1: \beta_{Telecommunication} \neq 0$  
                          | $H_0: \sigma_{Telecommunication} = 0$  
                          | $H_1: \sigma_{Telecommunication} \neq 0$  |

Table 7: Sector Hypothesis
5. Empirical Findings

This chapter shows the empirical findings using the data that was presented in the previous section. The descriptive statistics shows the nature of the data and the normality distributions give the reason for the employed statistical tests. The results of the correlation test are presented in the tables at the end.

5.1 Descriptive Statistics

In order to conduct the research and investigate the relationship between the cash holding ratio and beta and the standard deviation of the stock separately, data has been collected and put through statistical tests. Information about the data has also been summarized and put into categorizes to describe its aspects in the following sections.

5.1.1 SPI

To determine the risk of individual stocks the returns of these stocks have been compared to the returns of a market index. For this research the Stockholm Price Index is employed which is composed of all stocks on the Stockholm Stock Exchange. Figure 4 shows the development of the Stockholm Price Index over the chosen time period of 2009-2012. Figure 4 illustrates a period of overall recovery from the economic slump attributable to the recession in mainly 2008. Over the chosen time period the return of the Stockholm Price Index has been 68.42% with annual returns depicted in table 5:

<table>
<thead>
<tr>
<th>Annual Returns</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total 09-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPI</td>
<td>46,66%</td>
<td>23,05%</td>
<td>-16,69%</td>
<td>12,02%</td>
<td>68,42%</td>
</tr>
</tbody>
</table>

Table 8: SPI Returns

Figure 4 and table 5 both show a period of strong recovery during 2009 which later diminishes in 2010 and ends up with an overall negative trend in 2011 due to a large drop in the period of a week in the beginning of August 2011. The drop was due to global financial turmoil regarding the sovereign debt of European countries and the downgrading of the U.S credit rating and resulted in highly volatile stock markets for the remainder of the year (BBC News, 2011). During the last year of the time period the trend have turned positive again although more modestly than previous periods.
The stock index has been collected for the same time period as the rest of the data as well as with the same database, resulting in an equivalent amount of observations for the SPI to that of the stocks as shown in table 6.

<table>
<thead>
<tr>
<th>No of Observations</th>
<th>Range</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPI Returns</td>
<td>1042</td>
<td>0.12495</td>
<td>-0.06381</td>
<td>0.06114</td>
</tr>
</tbody>
</table>

Table 9: SPI Descriptives

The amount of observations gathered from the database was 1043 but as the returns measures the return between two days the observations end following the pattern of:

\[ \text{No of Observations of Returns} = \text{No of Observations} - 1 \]

Resulting in 1042 observations of returns for the SPI in this research as denoted in table 6.

<table>
<thead>
<tr>
<th>SPI</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2009-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation</td>
<td>0.016886</td>
<td>0.011556</td>
<td>0.016651</td>
<td>0.01112</td>
<td>0.014331</td>
</tr>
</tbody>
</table>

Table 10: SPI Volatility

Table 7 shows the yearly volatility of Stockholm Price Index as well as the total volatility over the time period. As also seen from the graph in figure 4 the movements in the price index are larger in 2009, where there is a large increase in the price index and 2011 when the market drops substantially. These periods with large upward and downward shifts are regarded as riskier than periods where the index does not move as much, as is the case of 2010 and 2012.

5.1.2 Cash Holding Ratio
Table 8 shows the basic statistic information about the cash holding ratio adopted in this thesis. The number of observations corresponds to that the cash holding ratio is derived annually from each company, with a total of 160 companies included in the sample over a time period of 4 years 2009-2012 resulting in 640 observations.

<table>
<thead>
<tr>
<th>Cash Holding Ratio</th>
<th>No of Observations</th>
<th>Range</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>640</td>
<td>1.98</td>
<td>0.00</td>
<td>1.98</td>
<td>0.1747</td>
</tr>
</tbody>
</table>

Table 11: CHR Descriptives
The cash holding ratio is subject to a natural lower limit of 0, which is the actual value of one observation, since companies cannot report negative balances of cash and cash equivalents in annual reports. This is further shown in the histogram figure 5 as most observations are close to zero but none is negative.

**5.1.3 Beta**

Beta shares the same amount of observations as the other two variables as shown in table 9. As in the case of standard deviation, beta is calculated on an annual basis based on daily log returns, both stock returns and the returns from the Stockholm Price Index.

<table>
<thead>
<tr>
<th>No of Observations</th>
<th>Range</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td>640</td>
<td>0,91</td>
<td>-0,06</td>
<td>0,85</td>
</tr>
</tbody>
</table>

Table 12: Beta Descriptives

Beta can assume negative values, examples from the sample is observable both in table 9 where the minimum observed beta is -0,06 and in the figure 6 which shows that there are several observations below the value of 0, in other words negative values. Beta is thus not subject to a natural lower limit of zero as is the case for standard deviation and the cash holding ratio.
5.1.4 Volatility
Volatility, measured by the standard deviation, just as the cash holding ratio is extracted from 160 companies annually for 4 years, resulting in 640 observations as denoted in table 10.

<table>
<thead>
<tr>
<th>No of Observations</th>
<th>Range</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation</td>
<td>640</td>
<td>0.0686</td>
<td>0.0096</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Table 13 : Volatility Descriptives

Standard Deviation also shares another trait with the cash holding ratio as shown from table 10 and figure 7, neither can assume a negative value. The lowest value that standard deviation could have is zero which would indicate that the corresponding asset price did not move at all throughout a full year. The sample in this thesis had no such observation and the lowest value observed, the observation which varied the least through any of the years between 2009-2012, as written in table 10 is 0.0096.

5.2 Normality
5.2.1 Stockholm Price Index
As stated in the descriptive statistics there are 1042 observations for SPI returns and the histogram in figure 8 shows that most observations are heavily centered around the mean. The Q-Q plot and the Detrended Q-Q plot in the appendix show a distribution that resembles a normal distribution; the observations are closely following the expected normal.
Table 11 expresses a skewness relatively close to 0 which is also suggesting a normal distribution. The kurtosis however, which conveys how much of the distribution is centered on the mean, is a much higher value. This is also illustrated from figure 8 where the peak in the histogram far exceeds the distribution curve. This suggests that tests which assume normality might not be appropriate for this data as both skewness and kurtosis should be close to zero in a normal distribution (Ruppert, 2004, p. 25-27).

### 5.2.2 Cash Holding Ratio

The histogram in figure 5 shows the distribution of observations in the cash holding ratio. As depicted from this figure most the observations are centered closely to zero which is also the lowest value the cash holding ratio can assume. The Normal Q-Q plot on cash holding ratio in the appendix does clearly and substantially deviate from the expected normal value, a strong indicator that the distribution is not normal.

Table 12 depicts that the values for skewness and kurtosis are considerably higher than in the case of the returns on the Stockholm Price Index. A positive high skewness is interpreted as the distribution being rightly skewed and thus most of the observations are centered among the lower values, although there is a higher range between the values above the mean (Moore et al., 2008, p. 52-53). This is observable in the histogram in figure 5. The high kurtosis, far from the desired 0 in a normal distribution is among all other indicators for the cash holding ratio indicating that the distribution for the cash holding ratio is not normal.

### 5.2.3 Beta

The beta data sample shows significant differences compared with the others with a normal Q-Q plot which does not deviate as much from the expected normal values as the others. As the Q-Q plot in the appendix shows it still deviates noticeably from the expected normal values but not as gravely as for the cash holding ratio and the standard deviation.

As table 13 shows the kurtosis is assuming a relatively low value, which indicates that the observations are evenly distributed within the range between -0.06 and 0.85, as listed in table 9 in the descriptive statistics. This is something that could indicate a
normal distribution. The skewness is not as high as for some of the other variables but still not as close to zero as would be desired if it would indicate a normal distribution, ending up neither confirming nor rejecting normality among this data. Figure 6 depicts the distribution and a determination of normality in the case of beta would be subjective.

5.2.4 Volatility
The standard deviation from the sample follows a similar pattern as the cash holding ratio but to a smaller extent. The Q-Q plot shows a similar pattern where the distribution seems to be skewed to the right.

<table>
<thead>
<tr>
<th>Standard Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,790</td>
<td>4,784</td>
</tr>
<tr>
<td>Table 17: Volatility Normality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This is reaffirmed by table 14 which shows a relatively high skewness and kurtosis. Although much smaller values than for the cash holding ratio these values are not close to 0 and thus does not indicate a normal distribution. The histogram in figure 7 in section 5.1.3 illustrates this pattern where most observations are close to the lower values in the range of observed values. The positive value of the skewness indicates that the distribution is right-skewed and the other pointers confirm that this is true and the distribution cannot be considered normal.

5.3 Correlation
A total of six correlation tests have been performed in SPSS and will be presented in the following sections. The tests have all been a bivariate analysis using the Spearman correlation formula. The Spearman was chosen since it was proven in the previous sections that the data for all variables used are not normally distributed which makes Spearman correlation more appropriate than Pearson, which require normality of the data. In order to investigate the different sizes and sectors the split file function has been used in SPSS. The results are presented with both the correlation coefficient (P) and the significance (Sig). As mention before all significance below 0.05 will be regarded as statistically significant at the chosen 95% confidence interval and will be marked with one * in the following tables. The authors have chosen to display the results having a significance of below 0.01, significant even at a 99% confidence interval with **. All the insignificant results are included in the tables but noted in red.

5.3.1 Correlation between Cash Holding Ratio and Beta
The first test conducted on the correlation between cash holding ratio and beta was for our entire sample and gave us the following results.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>-0.202</td>
<td>0.000**</td>
</tr>
<tr>
<td>Table 18: Correlation Beta</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This result shows that there is a highly significant negative relationship, significant even at a higher 99% confidence interval, between the companies’ cash holding ratio and the beta.

<table>
<thead>
<tr>
<th>Size</th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Cap</td>
<td>0.034</td>
<td>0.676</td>
</tr>
<tr>
<td>Mid Cap</td>
<td>-0.175</td>
<td>0.045*</td>
</tr>
<tr>
<td>Small Cap</td>
<td>-0.099</td>
<td>0.061</td>
</tr>
</tbody>
</table>

Table 19: Correlation Beta Size

When the sample was broken down into the different sizes present on the Stockholm Stock Exchange the only significant finding between the cash holding ratio and beta was for the Mid Cap companies. The relationship is still negative although a weaker correlation coefficient compared to the total sample, -0.175 compared to -0.202. With a significance of 0.045 the relationship is significant at a 95% confidence interval.

<table>
<thead>
<tr>
<th>Sector</th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Materials</td>
<td>-0.214</td>
<td>0.144</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>-0.008</td>
<td>0.944</td>
</tr>
<tr>
<td>Consumer Services</td>
<td>0.068</td>
<td>0.608</td>
</tr>
<tr>
<td>Health Care</td>
<td>-0.361</td>
<td>0.003**</td>
</tr>
<tr>
<td>Industrials</td>
<td>-0.170</td>
<td>0.009**</td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>0.286</td>
<td>0.493</td>
</tr>
<tr>
<td>Technology</td>
<td>-0.117</td>
<td>0.187</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>-0.119</td>
<td>0.713</td>
</tr>
</tbody>
</table>

Table 20: Correlation Beta Sector

From table 17 above we can see that when our sample is divided into the different sectors of the stock market, the only sectors that remain with a significant correlation coefficient are the health care sector with a negative correlation of 0.170 and the industrial sector with a negative 0.361.

5.3.2 Correlation between Cash Holdings and Volatility

The same tests that were conducted on cash holdings and beta has also been conducted to test the relationship between cash holdings and volatility and will be presented in the same order below.

<table>
<thead>
<tr>
<th>Size</th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>0.098</td>
<td>0.013*</td>
</tr>
</tbody>
</table>

Table 21: Correlation Volatility

There exist a positive relationship between companies’ cash holding ratio and their standard deviation. Although the relationship isn’t as significant as the relationship between cash holdings and beta, it is still above the chosen significance level of 95 percent.
Broken down into sizes the table shows that only the companies in the small cap size have a significant positive relationship between cash holdings and standard deviation.

<table>
<thead>
<tr>
<th>Size</th>
<th>Cash Holdings</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Cap</td>
<td>-0.030</td>
<td>0.713</td>
</tr>
<tr>
<td>Mid Cap</td>
<td>-0.113</td>
<td>0.197</td>
</tr>
<tr>
<td>Small Cap</td>
<td>0.123</td>
<td>0.020*</td>
</tr>
</tbody>
</table>

Table 22: Correlation Volatility Size

Lastly the correlation coefficients for the different sectors were calculated as well and as shown the only sectors that have a significant correlation coefficient is basic materials, the technology and the health care sector.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Cash Holdings</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Materials</td>
<td>0.360</td>
<td>0.012*</td>
</tr>
<tr>
<td>Consumer Goods</td>
<td>-0.148</td>
<td>0.178</td>
</tr>
<tr>
<td>Consumer Services</td>
<td>-0.099</td>
<td>0.453</td>
</tr>
<tr>
<td>Health Care</td>
<td>0.277</td>
<td>0.027*</td>
</tr>
<tr>
<td>Industrials</td>
<td>0.106</td>
<td>0.104</td>
</tr>
<tr>
<td>Oil &amp; Gas</td>
<td>-0.524</td>
<td>0.183</td>
</tr>
<tr>
<td>Technology</td>
<td>0.234</td>
<td>0.008**</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>-0.056</td>
<td>0.863</td>
</tr>
</tbody>
</table>

Table 23: Correlation Volatility Sector
6. Discussion
The aim for this chapter is to discuss the empirical findings that were presented in chapter five. The chapter’s structure begins with a discussion of each hypothesis where the null hypothesis was rejected. It is divided into total sample, size and sector and will end with a general discussion regarding all the results in relation to the research question. Here the authors also connect their findings to previous literature and theories that were presented in chapter three.

The research question in this thesis that was presented in chapter one and that the hypotheses was designed to answer is the following:

- What is the relationship of the level of cash holding and the risk of Swedish stocks?

The weakness of correlation tests is that the authors cannot determine causality. It will be further discussed in the concluding chapter. Causality has not been tested in the statistical measures and can thus not be concluded. However to investigate the nature of the relationships the authors when referring to different theories have looked at both approaches, both that the stock risk is dependent on the levels of cash holdings but also the other way around. This is because different theories have different approaches, some are regarding the effects of different levels of cash holdings and do therefore assume that this is an independent variable as such. The signaling theory is one of those which tell us that investors that do not have all information tend to interpret and follow that action of companies before they make decision on which companies to invest in. Other theories are concerning the determinants of cash holding levels and take the view that levels of cash holdings are a result of several factors.

6.1 Hypotheses Revised
In the following tables the hypotheses stated in chapter 4 are restated and whether the null hypothesis in them are accepted or rejected. If a significant correlation was found the null hypothesis is rejected and implications and possible explanations are discussed in later sections of this chapter. If the null hypothesis is accepted as no significant correlation was discovered the hypothesis will not be discussed, even though the data is not strong enough to be significant the authors cannot conclude that there is no relationship as they have not tested for that.

<table>
<thead>
<tr>
<th>Size</th>
<th>Beta</th>
<th>σ</th>
<th>Null Hypothesis accepted or rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>$H_0: \rho (CHR, \beta) = 0$</td>
<td>$H_0: \rho (CHR, \sigma) = 0$</td>
<td>Rejected for both Beta and σ</td>
</tr>
<tr>
<td></td>
<td>$H_1: \rho (CHR, \beta) \neq 0$</td>
<td>$H_1: \rho (CHR, \sigma) \neq 0$</td>
<td></td>
</tr>
</tbody>
</table>

Table 24: Total Sample Hypotheses Revised
6.2 Sample Correlation

There have been significant findings regarding the entire sample both in the cases of relationship between cash holdings and beta and also the relationship between cash holdings and volatility. Hypotheses 1 and 2 concerns the undivided sample and are used to derive the relationship between cash holding and stock risk, the result of which are both presented below.

**Hypothesis:** Cash holding has no relationship with stock $\beta$.

$H_0: p(\beta) = 0$
Shown in above table, extracted from table 18 in chapter 5, there is a negative correlation between the cash holdings of the entire sample and the calculated beta. The correlation coefficient is -0.202, which indicates that for the total sample higher levels of cash holdings are associated with lower values of beta. With a significance of 0.000 the null hypothesis is rejected at a 99% confidence interval, well above the selected 95% confidence interval, the alternate hypothesis is accepted and thus the authors can conclude that there is indeed a relationship between cash holdings and beta.

The relationship can have a logical explanation such as companies with higher levels of cash holdings have a larger part of its assets idle in a form that does not drastically change in value (Maness & Zietlow, 2004, p. 16). With a larger portion of assets in cash which value does not shift greatly, the total movements of the company decrease (Bates et al. 2009, p. 1988). This would make the total movements in the company stock to move away from the market movements.

Beta is a highly useful tool when it comes to diversifying portfolios, so it can be helpful for investors to consider that cash holding has a negative impact on stock beta (Estrada & Vargas, 2012, p. 78). If investors choose company because of their beta value, they could look at the cash policies and level of cash holdings since they might have a negative impact on the portfolios total beta.

**Hypothesis**: Cash holdings has no relationship with stock $\sigma$.

<table>
<thead>
<tr>
<th>Hypothesis:</th>
<th>$p (CHR, \beta) \neq 0$</th>
<th>$p (CHR, \sigma) \neq 0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_0$:</td>
<td>$p (CHR, \beta) = 0$</td>
<td>$p (CHR, \sigma) = 0$</td>
</tr>
<tr>
<td>$H_1$:</td>
<td>$p (CHR, \beta) \neq 0$</td>
<td>$p (CHR, \sigma) \neq 0$</td>
</tr>
</tbody>
</table>

Table 21 in section 5.3.2 indicates that there is a positive correlation of 0.098 between cash holding and the calculated $\sigma$. With a significance level of 0.013 the results are significant at the 95 percent confidence interval chosen for this research and thus the null hypothesis is rejected in favor for the alternative hypothesis.

Company’s total risk on stock is affected by many factors and relates to many different variables. Through these tests of cash holding and stock volatility the authors can determine that the level of cash holdings is one of these variables. Although a rather weak relationship in terms of correlation coefficient it is still relevant and significance value is low enough to conclude that there is in fact a relationship.

A positive relationship between these variables indicate that higher level of cash holdings are associated with higher stock risk, a result of which Lee & Powell (2011) suggests that investors penalize cash hoarding firms. This argument gives one explanation to why the stocks of companies with higher cash holdings have a higher volatility. Acharya et al. (2012), Harford et al. (2012) and Bates et al. (2009) all gave another explanation to this relationship, they argued for a precautionary motives for a company to hold more cash, which is aligned with the reason for holding given by
Berk & Demarzo (2011, p. 861) that companies hold cash to offset for uncertainty with future cash flows. The relationship found in this research reaffirms the theory that companies which believe their risks to in the near future to increase also increase their level of cash holdings. A high level of cash holding can also be a result of a highly volatile stock and managements attempt to reduce the volatility by decreases the company’s short term risk (Harford et al., 2012).

As seen the authors can determine that there is a correlation between cash holdings and both beta and standard deviation for the entire sample of companies, a negative beta correlation and a positive correlation with standard deviation. As discussed in the theoretical framework there are a number of reasons why a company should hold cash in its reserves.

6.3 Correlation within Sizes
Out of the six hypotheses listed in section 4.6.2, four hypotheses had their the null hypothesis accepted as no significant relationship has been found, This leaves two hypotheses where significant relationships have been found and will be further explained below.

**Hypothesis:** Mid Cap companies’ cash holdings have no relationship with stock $\beta$.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid Cap</td>
<td>-0.175</td>
<td>0.045*</td>
</tr>
</tbody>
</table>

As shown in table 19 there is a significant relationship between the cash holding ratio and the stock beta of -0.175 for the companies listed in the medium cap on the Stockholm Stock Exchange. This negative relationship which is significant at the 95% confidence interval shows that the risk of these companies with higher level of cash holdings are more uncorrelated with the overall market risk than those with smaller cash holdings. As presented in the descriptive statistics section the value of individual companies’ beta are rarely below zero, which indicate that most companies vary to different extent in the same direction as the market. The explanation of which can be attributed to the difficulty of seeking external financing compared to larger companies as suggested by Sánchez & Yurdagul (2013).

**Hypothesis:** Small Cap companies’ cash holdings have no relationship with stock $\sigma$.

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Cap</td>
<td>0.123</td>
<td>0.020*</td>
</tr>
</tbody>
</table>

The tests made for this hypothesis shows a positive relationship of 0.123 between the cash holding ratio and standard deviation for companies listed on the small cap. This finding illustrate that for small cap companies a higher level of cash holding is associated with riskier stocks. A similar finding was made by Bates et al. (2009) who when they investigated the relationship between cash holding and credit risk found that high levels of cash holdings were associated with lower credit ratings and considered more risky, the opposite to what they argued intuition would suggest.
They used a precautionary motive to explain this observation, companies stock up on cash when they expect to future bad times. This explanation could explain the finding in this research as companies on the small cap expecting the risk to grow are more likely to stock up on cash. This is also true for the entire sample in this research as it also exhibits a significant positive relationship with volatility but the correlation coefficient for the Small Cap is much higher for the small cap making the argument even more relevant for the Small Cap companies.

Another explanation to this observation is given by Simutin (2010) who found companies often hold cash to finance future risky investments, especially for smaller companies which have a harder time seeking external sources of financing. Sánchez & Yurdagul (2013) reached the same conclusion for small companies since they experience more difficulties in obtaining loans and a higher uncertainty about future investments. The companies listed on the small cap do therefore hold more cash to offset an increased risk in the future.

6.4 Correlation within Sectors
Given the number of hypotheses presented in section 4.6.3, only the hypotheses where the null hypothesis is rejected will be discussed. Shown in table 20 and 23 only two sectors have a significant relationship with beta and three have a significant relationship with volatility. Thus in 11 hypotheses the null hypothesis is accepted and it is determined that there is no significant relationship between cash holdings and beta or standard deviation. The five hypotheses were significant findings were made will be discussed below.

**Hypothesis**: Cash holdings within the health care sector have no relationship with stock $\beta$.

\[
H_0: p(CHR_{Health\; care}, \beta_{Health\; care}) = 0 \\
H_1: p(CHR_{Health\; care}, \beta_{Health\; care}) \neq 0
\]

<table>
<thead>
<tr>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.361</td>
<td>0.003**</td>
</tr>
</tbody>
</table>

Shown in table 20 the health care sector has a highly significant relationship between cash holdings and beta and therefore the alternate hypothesis is accepted. The correlation is -0.361, which again is larger than for the entire sample. The nature of health care companies is that a large part of their business is passed in research, which is highly costly. Thus in orders to both fund their research and maintain them in business during the research process to make it to the actual production and sales, they need cash. So given both the significance and coefficient the authors can conclude and agree with Sánchez and Yurdagul (2013) that for firms that are highly innovating, holding cash is important and it is a variable that affects the beta.

**Hypothesis**: Cash holdings within the industrial have no relationship with stock $\beta$.

\[
H_0: p(CHR_{Industrial}, \beta_{Industrial}) = 0 \\
H_1: p(CHR_{Industrial}, \beta_{Industrial}) \neq 0
\]

<table>
<thead>
<tr>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.170</td>
<td>0.009**</td>
</tr>
</tbody>
</table>

45
Table 20 exhibits the correlation between the cash holding ratio and the beta on companies listed in the industrial sector on Stockholm Stock Exchange. It shows a similar relationship found in the significant findings between cash holdings and beta for the entire sample, strongly negative correlation. Explanations for a relationship like this has been given earlier and are not much different for industrial firms, with a lot of assets in the form of idle cash the stock tend to move away from the movements of the market. The strong significance, significant at a 99% confidence interval, could be attributable to the large number of companies listed in this sector, table 4 shows that 59 out of the total 160 companies included in the sample are from the industrial sector.

**Hypothesis:** Cash holdings within the basic materials sector have no relationship with $\sigma$.

$H_0: p(CHR_{Basic\ materials}, \sigma_{Basic\ materials}) = 0$

$H_1: p(CHR_{Basic\ materials}, \sigma_{Basic\ materials}) \neq 0$

<table>
<thead>
<tr>
<th>Basic Materials</th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.360</td>
<td>0.012*</td>
</tr>
</tbody>
</table>

With a significant result of 0.012 the null hypothesis is rejected and thus the alternate hypothesis is accepted showing that there is a relationship between cash holdings and volatility in the basic materials sector. The correlation coefficient is 0.360, which is higher than the correlation for the entire sample, this indicates that for this particular sector the relationship between cash holdings and standard deviation is stronger. With the assumption that increased cash holding would lead to a higher volatility of the stock, companies in this sector with higher levels of cash holdings are associated with riskier stocks. Even though companies’ stocks in this sector are less risky with lower levels of cash holdings, companies will still need to consider a buffer in order to offset the risk of a downturn in the economy (Berk & Demarzo, 2011, p. 861).

**Hypothesis:** Cash holdings within the health care sector have no relationship with $\sigma$.

$H_0: p(CHR_{Health\ care}, \sigma_{Health\ care}) = 0$

$H_1: p(CHR_{Health\ care}, \sigma_{Health\ care}) \neq 0$

<table>
<thead>
<tr>
<th>Health Care</th>
<th>P</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.277</td>
<td>0.027*</td>
</tr>
</tbody>
</table>

Following the results presented in table 23 there is a significance of 0.027 which is accepted as significant at the 95% confidence interval chosen for this research. Therefore the null hypothesis is rejected and the authors can conclude a relationship with a correlation coefficient of 0.277 between the cash holding ratio and the volatility for companies in the health care sector. This is consistent with several previous research which states that companies largely concerned with innovation and through this have risky and costly projects often use cash to fund future these projects (Simutin, 2010, p. 1197). Sánchez & Yurdagul (2013, p. 7) made a similar argument that companies which are spending a lot of resources on research, such as those in the health care and technology sector, have higher incentives to hold more cash due to the higher uncertainty associated with the research. Therefore higher levels of cash holdings for these kinds of companies are associated with higher future risk, which might explain the positive relationship between the cash holding and stock volatility. The precautionary motive previously discussed can also be an explanation to this finding.
**Hypothesis:** Cash holdings within the technology sector have no relationship with $\sigma$.  

$H_0: p \left( CH_{Technology}, \sigma_{Technology} \right) = 0$  
$H_1: p \left( CH_{Technology}, \sigma_{Technology} \right) \neq 0$

<table>
<thead>
<tr>
<th>Technology</th>
<th>$P$</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.234</td>
<td>0.008**</td>
</tr>
</tbody>
</table>

The technology sector show similar patterns as other highly R&D dependent sectors, for example health care, with a positive relationship between cash holdings and volatility which indicates that higher levels of cash holdings are related to higher stock risk. The relationship for the cash holding ratio and the volatility are in the technology sector is highly significant, at the value of 0.008 it is significant at a 99% confidence interval. The explanation to this relationship can be attributed to arguments made in previous sections such as precautionary motives and risky growth projects that are to be funded by an increase in cash holdings. Technology, just as health care is a sector characterized by a large focus on innovation with a lot of resources being allocated to uncertain research and development projects. Companies operating in these sectors try to offset the high risk by having higher level of cash holdings (Sánchez & Yurdagul, 2013, p. 7). The results could also reflect an attempt made by management to cool down a highly volatile stock by reducing the short term risk of the company (Harford et al., 2012).

### 6.5 General Discussion

The previous sections answered the hypotheses that were established to reach a conclusion regarding the research question of what is the relationship of the level of cash holding and the risk of Swedish stocks. Relationships were found for the entire sample between cash holdings ratio and both employed measures of risk, beta and volatility. Some significant relationships were also found within certain sizes and sectors as presented in section 6.3 and 6.4 respectively.

From the testing of the hypotheses some general conclusions can be drawn about the findings of this thesis. First of all significant findings between cash holdings and beta have a negative correlation, in contrast all significant findings for cash holdings and volatility show a positive correlation. That these relationships are the opposite of each other can be seen as contradicting as both are measures of risk, but as they are measuring different kinds of risk, total risk measured by the standard deviation compared to systematic risk measured by the beta, it could be complementary instead. In the following sections the two relationships are discussed more thoroughly.

As mentioned earlier in this thesis the total risk consists of adding the systematic risk and nonsystematic risk. For the findings made by the authors this would indicate that with larger levels of cash holdings, when the beta (systematic risk) goes down and the standard deviation up (total risk), the nonsystematic risk is increasing at a higher rate than the systematic risk is decreasing. This means that the stocks of a company with high levels of cash holdings are not less risky, rather the other way around. This is an indication that investors need to consider both measures of risk as relying solely on beta or volatility in itself does not provide such a clear view as reviewing the both of them.
A reason that significant findings were made in some sectors with similar characteristics as other sectors, for example sectors heavily dependent on innovation, were no significant correlation was found could be explained by the sectors sizes. As the Stockholm Stock Exchange is limited in size and some sector are larger than others it is not a surprise that a sector with few companies fail to produce significant findings, usually with testing statistics a large sample produce more results.

For the relationship between the cash holding ratio and stock beta, significant negative correlation coefficients were discovered through the statistical tests for the entire sample, the mid cap size and the sectors of health care and industrials. No significant positive relationships were revealed in these tests of the data collected. This is consistent with notions earlier made about companies having larger portions in cash, an asset that does not fluctuate as much in value as other parts of company operations, would produce a lower value of beta. This because the total assets of a company with high levels of cash holdings vary less in value less due to the low fluctuations in the value of cash. This could shift away the movements of stocks from the general movements of the market. By mainly relying on internal financing, as suggested by the pecking order theory, companies also limits their exposure and dependence on financial markets which might also serve as an explanation to why higher levels of cash holdings are associated with lower values of stock beta (Myers & Majluf, 1984, p. 187).

For the standard deviation relationship with the cash holding ratio significant correlations were established for the entire sample, the small cap size and the sectors of basic materials, health care and technology. All observed significant relationship between the cash holding ratio and stock standard deviation had a positive correlation, indicating that companies holding higher levels of cash holdings also have a riskier stock due to high degrees of fluctuations. A common explanation to the phenomenon that more cash is associated with more risk is summarized by Simutin (2010) who described holding more cash as a proxy for future risky growth options, similar to the strategic purposes such as acquisitions reason for holding cash given by Maness & Zietlow (2004, p. 18). This is aligned with the pecking order theory, which stated that companies prefer using their own cash to finance new investment, the relationship found in this research could indicate that these assumptions might be true for the observed companies. Using the trade off theory approach where the benefits of debt are emphasized, companies should prefer debt up to the point where the costs of financial distress exceeds these benefits (Kraus & Litzenberger, 1973, p. 911). When that point is met companies seek other sources of financing for example internal cash, a higher level of cash holdings could then indicate that the company is already highly levered and might thus be considered riskier.

Acharya et al. (2012) had a different approach to a similar observation, they argued that in times when a company is performing poorly or expecting their risk to increase it is more likely to stock up on cash to be able to offset the risk, thus higher levels of cash holdings due to an expected increase in risk. This is an explanation reinforced by Décamps et al. (2011) who discovered that increased movements in stock prices, especially negative movements, leads to companies to increase their level of cash holdings. A less common explanation which stills needs to be considered is that the investors might be disgruntled due to an agency problem, Jensen (1986, p. 323) argued that managers typically wants to run larger business, as a result they might
keep cash as retained earnings instead of using it for dividend payouts which might better serve shareholder. Realizing this, shareholders might disfavor investing in companies where this behavior is noticeable resulting in shifts in the stock price.

Especially the precautionary motive to hold cash, discussed by Acharya et al. (2012) and Bates et al. (2009), needs to be considered in the presence of asymmetric information, in the data observed management of the included companies are highly likely to possess information that shareholder and potential investors lack. In these cases Connolly et al. (2011) inferred that these shareholder are interpreting the action of managers as signals about company performance, for this result that would indicate that shareholders interpret higher cash holdings as a sign for risker times to come which then affects the share value.

Generally from these results it can be derived that there is a relationship for companies on the Stockholm Stock Exchange between the level of cash holdings and the risk of the stock. The negative relationship discovered between the cash holding ratio and stock beta for the entire sample indicate that stocks of companies with higher level of cash holdings vary to a less extent in the same direction as the market than companies with lower cash holdings. The nature of this relationship has been discussed by connecting to the pecking order theory and attempts to derive an explanation to this phenomenon. The positive relationship found between the cash holding ratio and the standard deviation of the stock indicate that the stock price of companies with higher level of cash holdings tend to vary more than the stocks of other companies. To provide an explanation to this relationship the results have been discussed and connected to the pecking order theory, the tradeoff theory, agency theory and signaling theory as well as several arguments made in academic literature about reasons to hold cash. Differences in strength and magnitude has been found in different sizes and sectors of the Stockholm Stock Exchange but all significant findings are pointing in the same directions, the stock price of companies with higher levels of cash holdings vary less in the same directions as the market and vary to a higher extent than companies with lower levels of cash holdings.
7. Conclusion
The final chapter of this thesis starts with the conclusion of the thesis where the results and answers to the research question is linked back to chapter one. It states the reached contribution that the thesis has provided both practical and academic. The chapter ends with the authors’ suggestions for further research.

7.1 Conclusion
The purpose of this thesis has been to investigate the relationship between corporate cash holdings and risk. The authors wanted to find if there was a correlation between the corporate view of the reasons to hold cash and the risk perceived by investors on company stock. This has been done by evaluating theories from both corporate finance and financial markets and then bridging the two together.

By investigating 253 companies on the Stockholm Stock Exchange the authors have sought to answer the following research question:

- What is the relationship of the level of cash holding and the risk of Swedish stocks?

To answer this question the authors split the concept of stock risk into the measures of beta and volatility, these measures were employed because they are both considered by investors and they describe stock risks very differently. Beta describes the impact of a stock for a well-diversified investor while the volatility concerns the total risk of a stock, measured by its fluctuations. The level of cash holdings was measured through the cash holding ratio, as it measures how much cash a company is holding in relation to its size it facilitates comparison. The methodology employed in this research has been a cross-sectional design with a quantitative approach. The data has been collected in an archival manner from annual reports of the researched companies as well as the Thomson Reuters Datastream. The correlation tests show that there is a significant relationship between the level of corporate cash holdings and both the beta and volatility on the stocks investigated. But the authors cannot conclude if some variable cause an effect on the other. To further explain the relationship, the authors divided the sample into both sizes and sectors. This shows a stronger relationship for the companies listed in the Mid and Small cap sizes as well as those operating in sectors where cash is highly needed, such as the health care and technology sectors. The tests also indicate that companies that are more susceptible to economic changes have stronger relationships between cash holdings and stock risk.

The goals for this thesis has been, as stated in chapter 1.4 to deepen the understanding of why companies hold cash and to fill the knowledge gap between the relationship of cash holdings and stock risk. By finding a relationship between cash holdings and risk the authors has managed to contribute to further understand the behavior of stocks on the Stockholm Stock Exchange. This thesis has also contributed to the understanding of the different reasons for firms to hold cash and how the level of cash holding are perceived out of a risk perspective on the financial market by investors. From a corporate perspective this is useful to keep in mind if they want to decrease there perceived risk they may want to modify their level of cash holdings. The academic contribution of this thesis has been to determine that the level of cash holding is a significant variable when evaluating risk on stocks and has increased the
understanding of risk for stocks on the Stockholm Stock Exchange. For investors, this thesis has shown that they should consider both the total risk, volatility and the systematic risk, beta and not focus on only one of them in isolation.

7.2 Reliability, Validity and Ethics
In chapter two, the authors concerns of reliability and validity were discussed. Both inter- and intra-observer validity has been fulfilled to the following extent. If the authors would use the same measurement for observing the same time period and employing the same source for the data they would reach the same conclusion. Inter observer consistence has been achieved by thoroughly explaining each step in both the data collection in chapter four as well as the data treatment. Another researcher doing the same research and following these steps would reach a similar conclusion.

Internal validity has been considered in the discussion of the nature of the relationship between cash holdings and risk. Both the choice of a cross-sectional research design and the tests that have been used to examine the relationship in this thesis has been carefully interpreted and made with consideration that the measures and structure of this research renders it unable to determine causality. External validity has been reached by firstly employing a sample for this research that is large in comparison to the entire population, 160 out of the 253 companies that are listed on the Stockholm Stock Exchange were included. Secondly, the framework provided in this thesis is replicable in another setting, such as different time periods or investigated populations.

In the ethical consideration section in chapter two, the authors stated the ethical approach that would be taken on in this thesis. The chosen research path has led to objective results without bias and how these have been reached are clearly presented in the different chapters. All data and sources have been scrutinized in order to assess their objectivity. Each step in the research has been thoroughly explained and the ethical considerations regarding each step have been discussed with the intention to provide a clear and objective structure. As already mention the only affiliation the authors has had is with their university, Umeå School of Business and Economics. During the research this involvement has concerned supervising and advice about the process and structure of the thesis, the objectivity of the results and findings of this thesis are however unaffected by the aid received through this affiliation.

7.3 Suggestions for Further Research
Based on the results, discussion and the limitations of this thesis several suggestions for further research will be presented in this section.

Firstly, the choice of a cross sectional design has limited the time frame of the study to the years of 2009-2012. Employing a longitudinal research design that stretches over more than the selected time period may show if the observed relationship is constant or if it fluctuates over different time periods.

Secondly, this thesis only investigates the Stockholm Stock Exchange. Given that the research structure provided in this thesis is replicable, conducting the same research on a bigger scale or at another location would be possible to investigate if the results remain similar over different times and locations.
A third option could be to conduct different statistical tests on the data. This thesis has only checked the correlation with the actual values on cash holdings, beta and volatility. Researching the same variables with different data sets might suggest other statistical measures to be appropriate which could provide additional understanding. A suggestion could be to investigate if the year-to-year changes on cash holding, beta and volatility had a similar relationship. Another research could investigate the observed relationship further by for example examining whether there is a potential causal link between these variables.

A fourth suggestion is to change the measures chosen to represent the different variables chosen in this thesis. The chosen cash holding ratio could be changed to another measure of cash or liquidity and another measure of risk on stocks, instead of beta and volatility, could be employed to see to enhance the understanding of the relationship between cash holdings and stock risk.

A final suggestion is to do a similar study investigating the same variables but having a qualitative approach to further discover the aspects of this relationship. This could investigate this relationship deeper but also confirm the result provided by this thesis by another means of measure and therefore provide a higher understanding of this relationship.
Reference List


Appendix 1 Q-Q Plots

Detrended Normal Q-Q Plot of CHR

Normal Q-Q Plot of CHR