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# Does hedging of macroeconomic risk effect corporate credit ratings?

*- An empirical investigation on the role of hedging of  
macroeconomic risk by the use of derivatives in  
determining corporate credit ratings*

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# Abstract

- Title:** Does hedging of macroeconomic risk affect corporate credit ratings? - *An empirical investigation on the role of hedging of macroeconomic risk by the use of derivatives in determining corporate credit ratings.*
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- Key words:** Risk Management, Credit rating, Macroeconomic risk, Hedging, Derivative contracts.
- Purpose:** To investigate if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on the New York Stock Exchange.
- Methodology:** This paper has an inductive approach and consists of statistical comparisons of gathered explanatory data and regression analysis.
- Theoretical perspectives:** We emphasize on theories explaining the field of risk management and hedging of macroeconomic risk by the use of derivatives. We also discuss corporate credit ratings and their perceived determinants. Finally we enlighten the professed connection between corporate credit ratings and hedging of macroeconomic risk.
- Empirical foundation:** Explanatory variables, deemed as determinants of credit ratings along with a defined hedging of macroeconomic risk variable, from 91 corporations, listed on NYSE, are gathered. Also, Credit ratings are gathered for all companies included. The empirical data is analyzed through statistical comparison and regression analysis to investigate the above stipulated purpose.
- Conclusions:** The determination coefficient of 60,8% in the regression and the number of corporations included in our research are deemed as insufficient for generalization purposes which means that we cannot give a formative answer to our stated research question. However, the significance of the defined hedging variable, gives us an indication that hedging of macroeconomic risk by the use of derivative contracts might have an effect on the credit rating of a firm listed on NYSE.

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We hope that this thesis will contribute to research regarding risk managements affect on a firms credit rating.

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David: I would like to send special thanks to my close family and friends for understanding and patience during this thesis.

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# 1 Introduction

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*In this chapter we will present the background to the selected problem area and describe the problem at bay for our investigation. Further we will outline the existing research within the field and the purpose of the thesis alongside the delimitations made. The intention of this chapter is to create an overall understanding of the problem being studied whilst capturing the reader's interest.*

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## 1.1 Background

There is extensive theory that outlines what justifies the conductance of risk management. According to theory, as will be shown in chapter three, risk management is said to, when conducted correctly, reduce the volatility of cash flows and thus move the firm further away from the bankruptcy line. If one adapts this point of view, there is in our opinion a connection to corporate credit ratings. Corporate credit ratings assess the ability of a firm to repay its debt and interest as they come due. By reducing the volatility of cash flows and thus decreasing the probability of cash flow downturns, the ability to repay debt, all else being equal, should be increased. Thus it seems reasonable that the conductance of risk management that reduces the volatility of cash flows should have an impact on the credit rating of a firm. Although this connection might seem obvious it is not widely covered in the academic world or by the credit rating agencies who assign credit ratings to corporations. During the latest decade, these rating agencies have been criticized for not conducting ratings that correctly signals the total risk inherent in a corporation. (Kim & Nofsinger, 2007) This criticism leaves one to wonder if rating agencies are failing to see the entire picture, or as accused by some, deliberately manipulating credit ratings in order to please their customers, namely the corporations being rated. (Kim & Nofsinger, 2007) By examining risk management and its possible affect on corporate credit ratings, we hope to determine if there is an aspect not emphasized by the rating agencies and thus give a clearer signal to corporations if risk management is connected to their credit rating. This background has triggered an interest in our minds to investigate the following problem described below.



## 1.2 Problem discussion

It is not evident to explain why corporations should conduct risk management, since corporations are owned by many dispersed investors with different interests, where each investor only bears a part of the firms aggregated risk. (Berle & Means, 1968) Investors can manage this risk themselves by diversifying their portfolio, leaving no reason for firms to mitigate risk on behalf of their investors. (Froot, Scharfstein, & Stein, 1994) With this argument as a basis it is hard to grasp why firms should handle and reduce risk on a corporate level.

This view is based on the Miller-Modigliani (M&M) theorem and renders the conclusion that hedging is obsolete since it is purely a financial transaction that has no effect on the value of the firm. The shareholder of the firm can perform the management of risks equally well by themselves. Also, conducting the hedging individually each investor can account for own risk preferences that can be widely differed, which cannot be accounted for on a corporate level. (Jorion, 1991)

However, when the M&M theorem is analyzed in more detail it is evident that it does not hold in reality due to existing market imperfections. These market imperfections are the starting point for the different supportive theories of risk management. These existing market imperfections makes it less expensive to mitigate risks on a corporate level. According to these theories, correct corporate risk management leads to reduced volatility in cash flows measured as the standard deviation, which in turn leads to a reduced variance in firm value. This means that firm value fluctuates less with proper risk management and more importantly low values occur with less probability than they would without risk management. (Bartram, 2000) Hence, reduced cash flow volatility leads to reduced costs associated with the capital market imperfections, leading to larger cash flows and thus, increased firm value.

One of the risks that corporations are exposed to is macroeconomic risk, which refers to the risk linked to common and changeable global economic conditions. The performance of any given corporation will thus be affected by developments and shocks within this macro economy. The risk associated with the macro economy refers to specific risks that have an impact on the cash flows of a firm. (Oxelheim & Wihlborg, 2008) This risk is normally dealt with by the use of various derivative contracts, set out to offset the exposure (Stulz, 2003). If

this hedging of macroeconomic risk by the use of derivatives is performed correctly then, according to theory, the volatility of cash flow is reduced and thus the negative impact on the cash flows from these risks should be mitigated. (Oxelheim & Wihlborg, 2005)

Since correctly performed hedging of macroeconomic risk by the use of derivatives reduces the volatility of cash flows, theoretically, a firm that conducts this type of risk management should have a better ability to service debt as it comes due. Credit ratings, in turn, are based on the firm's ability to service debt in due time. (Bilardello & Ganguin, 2005) This means that if hedging of macroeconomic risk by the use of derivatives reduces volatility of cash flows and, as explained above, reduces the costs associated with capital market imperfections, leading to less volatile cash flows; this type of risk management should have a positive effect on the credit rating of the firm. This could be an additional reason for managers to conduct risk management, to improve the credit rating, which improves access to capital markets.

The largest stock exchange in the world is the New York Stock Exchange (NYSE). If the explained connection between hedging of macroeconomic risk by the use of derivatives and corporate credit ratings could be found in this stock exchange it increases the ability to generalize the results over other stock exchanges and markets, which evidently makes this stock exchange a suitable subject to conduct the research on. (Clarke, 2007)

This problem discussion leads us to the following question to be answered in this thesis:

- Does hedging of macroeconomic risk by the use of derivative contracts significantly affect the credit rating of corporations listed on the New York Stock Exchange?

### **1.3 Purpose**

The purpose of this thesis is to investigate if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on the NYSE.

### **1.4 Previous research and practitioners guidelines**

The existing research on credit rating and more specifically the determinants of credit rating are very much in line with the guidelines given by practitioners. The modeling of credit ratings involves the analysis of both financial and non-financial criteria, none of which include the conductance of risk management. S&P gives a thorough explanation of their methodology and variables included in their assessment of a firm's credit rating, none of which include risk management. (Bilardello & Ganguin, 2005)

Moody's also gives guidelines for the determinants of credit ratings, which to a large degree matches the guidelines given by S&P and effectively does not include hedging of macroeconomic risk by the use of derivatives. However, Moody's acknowledges that in specific industries, mainly commodity industries, risk management is an important factor to be factored into a credit rating. Moody's does not however distinguish risk management of various types nor do they include risk management as a determining factor in industries beyond commodities. Moody's has also developed a methodology for attaching different levels of risk-taking to their various credit ratings. The emphasis of Moody's in respect to risk management is thus on a corporation's risk taking and if it is in line with the level of risk required to attain a certain credit rating. They do not focus on the hedging activity and how that could affect the credit rating of a firm. ([www.moodys.com](http://www.moodys.com)) Every corporation is affected by macroeconomic risk and thus every corporation that could mitigate this risk would have a better ability to generate cash flows and thus service debt, which all together should improve the credit rating. Moody's assessment is only applied in the commodity industry whereas we claim every industry should have the same premises. ([www.moodys.com](http://www.moodys.com))

Much of the past research is concentrated to determine why credit ratings develop in a certain direction over time. (Carty & Fons, 1994) The variables included in this past research consist of many financial determinants later being enlightened in this thesis, but hedging or risk management is not one of them. (Duff & Einig, 2009) More recent studies involve the possible effect of non-financial aspects such as corporate governance and management quality on credit ratings and evidently do not include risk management as a possible factor. (Ashbaugh-Skaife, Collins, & LaFond, 2006)

Some research even outlines the possible effect of macroeconomic risk on credit ratings but do not enlighten the possibility of mitigating this risk by hedging and thus indirectly improve credit rating. (Figurowski, Frydman, & Liang, 2006)

From the existing bulk of research it appears that credit ratings is a field with much research but in our opinion there is lacking research concerning hedging of macroeconomic risk by the use of derivatives and its possible effect on corporate credit ratings.

## **1.5 Hypotheses**

The above stated problem and the outline of the previous research and practitioner guidelines have led us to stipulate a hypothesis regarding the outcome of our research. This hypothesis is that hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. The intention is that the analysis of the empirical findings will either accept or reject this hypothesis, in order to stipulate policy conclusions for corporations.

## **1.6 Delimitations**

We are only considering hedging of macroeconomic risk. By macroeconomic risk we mean commodity risk, exchange rate risk, interest rate risk and inflation rate risk. We are thus delimiting the thesis against other risks inherent in a business such as equity price risk and business risk.

We focus on the use of derivative contracts as hedging tools. We thereby delimitate the thesis towards hedging methods and techniques that do not involve the use of derivative contracts. We further delimitate the thesis towards natural hedges. By natural hedges we mean the occurrence of corporations that through vertical or horizontal integration hedge their exposure towards the specific commodity provided by the entity being integrated. If firms do not implement derivatives to hedge macroeconomic risk but have natural hedges they will still be classified as firms that do not hedge.

When the work on this thesis commenced, the latest data from the financial year 2009 was not yet released for all corporations. This means that we use data from the year 2008 for consistency reasons and in order to capture the most recent available data. We thereby

delimitate the thesis towards events occurring after December 31, 2008 and before January 1, 2008. For simplicity and availability we only use the credit ratings provided by Standard & Poor (S&P). Although the credit ratings provided by different agencies would not be any different in terms of scale there might be difference between attained credit ratings from different agencies. We, as a result, delimitate the thesis towards different credit ratings from different agencies. The credit ratings, as will be explained in chapter two, are gathered as of yearend 2008. This means that we also delimitate the thesis towards changes in the attained credit rating during 2008 and use the credit rating assigned on the 31 of December 2008. Also the study focuses on the US stock market and particularly on NYSE. This means that we delimitate the thesis towards other countries, stock markets and stock exchanges.

Further, we only include corporations belonging to the corporate sector according to S&P's classification. This means that we delimitate the thesis towards corporations belonging to any other sector classification.

Also, corporations although not actively hedging in 2008 might have old hedging programs that still are in place in 2008 despite the company stating that they currently do not hedge. For the sake of consistency these companies have also been excluded.

Credit ratings, as will be explained in chapter three, are effected by both financial and non-financial criterions. Some of the non-financial criterions such as management's ability to operate the business efficiently and the firm's competitive position in the market are hard to quantify. Due to time considerations we do not deem it possible to enlighten this area, we therefore delimitate the thesis towards the non-financial criterion determining credit ratings. Although as will be explained later one non-financial criterion, industry risk, is deemed possible to quantify.

Also, some corporations may utilize derivatives for other purposes than hedging of macroeconomic risk. These reasons may be for speculations or to hedge the equity risk associated with its shares by holding stock options. Since the nature of these derivatives is not the management of macroeconomic risk we deem corporations only utilizing the derivatives for these reasons as companies not hedging macroeconomic risk by the use of derivatives.

## **1.7 Thesis outline**

In chapter two we will outline the methodology used in this thesis. Further in chapter three we will present the theoretical foundation relevant to this thesis including references from literature and scientific articles. In chapter four we will present the results from our empirical research and in chapter five we will analyze the results of the conducted research and make the relevant connections to theory. Finally, in chapter six we will present a discussion of our results, the answers to the stipulated question, state a policy conclusion for corporations and give further research proposals.

## **2 Methodology**

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*In this chapter we will outline the method chosen to investigate the stipulated problem. The method is used for the collection of the empirical information that is later analyzed in order to answer the question and hypotheses outlined in chapter one.*

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### **2.1 Choice of subject**

When the thesis work commenced, we wanted to investigate a subject we believed to be relevant and at the research frontier. The economic crisis has shown the need for firms to handle their risk and it has also shown the importance of credit ratings and their signal to the financial market regarding creditworthiness. We believe that risk management and its effect on credit rating is an area in need of further research which we hope to contribute to.

### **2.2 Perspective**

We are investigating if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. This problem is looked at from a corporation's perspective. If hedging of macroeconomic risk is shown to affect credit ratings we can stipulate corporate policies regarding hedging of macroeconomic risk and if it can be used as a tool by corporations to improve their credit rating.

### **2.3 Research approach**

This thesis has its starting point from the lack of theory regarding if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of a firm. Theories today enlighten different components and determinants of credit ratings but neglect the possible affect of risk management. Based on this we have stipulated the

hypothesis in chapter one and it is the intention that the empirical findings will either accept or reject this hypothesis, by answering the thesis stipulated question.

In order to answer the thesis question and make an assessment of the stated hypothesis we are going to conduct a statistical research where information is gathered and analyzed. The data gathered is analyzed in two different ways; first a study is conducted where firms that hedge macroeconomic risk by the use of derivative contracts are compared to firms that do not hedge. The variables compared are credit ratings along with various financial variables described in chapter four, in order to determine if there are any statistical differences between the two different groups. Second, these financial variables are analyzed through a regression analysis in order to identify the variables that significantly affect the credit rating of a firm. The variables are extended to include a hedging variable that accounts for if the firms hedges macroeconomic risk by the use of derivatives or not. We are then able to draw conclusions regarding our findings, and determine if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. The regression analysis is supported by a heteroscedasticity and autocorrelation test in order to assess the relevancy of the result.

This statistical research is conducted in order to investigate if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. This means that the analysis either would contribute to new theory or be in line with existing research concerning the determinants of credit ratings. Our thesis thus has an inductive research approach where we compare and analyze empirical data to see if there are any shortcomings of the existing theory regarding the determinants of credit ratings.

## 2.4 Definitions

- **Risk management** – By risk management we mean the use of derivative contracts to hedge macroeconomic risk.
- **Macroeconomic risk** – By macroeconomic risk we mean the risk of unanticipated changes in the prices of commodities, interests, currencies and domestic money.
- **Hedging** – By hedging we mean the use of derivative contracts to hedge macroeconomic risk.



## **2.5 Research method**

The purpose of the thesis is to investigate if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. To be able to investigate this we have gathered the credit rating of 91 corporations and grouped the corporations that use derivative contracts to hedge macroeconomic risk and corporations that do not into two different groups. To see if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE we are going to conduct a statistical analysis where we compare the data of our groups to see if there are any statistical differences. We are also conducting a regression analysis using earlier researchers explanatory variables combined with a hedging variable explaining if the firms hedge macroeconomic risk by the use of derivatives or not. This research method means that the thesis is considered a quantitative research method.

## **2.6 Sample selection and non response**

This research involves listed corporations on NYSE that are classified as corporates by S&P. Corporations that are listed on NYSE but not classified as corporate by S&P are thus not included in our research. We have chosen corporations from NYSE because it has approximately 3600 listed corporations that are under very strict supervision of rules and regulation, ([www.nyse.com](http://www.nyse.com)) which attests to its credibility. NYSE, located in the US market, is considered to be the largest and most powerful stock exchange in the world where the largest corporations are listed regardless of origin. (Clarke, 2007) Due to these reasons we choose to focus our research on the NYSE. However these 3600 corporations is not our target population since all of them are not classified as corporates by S&P nor do all of them have credit ratings assigned by S&P. Our target population is therefore all corporations listed on NYSE, with a credit rating assigned by S&P and classified as corporate by S&P. From this target population we extracted our sample consisting of 91 corporations which we include in this thesis.

The firms included in the research have been chosen based on their conductance of hedging of macroeconomic risk by the use of derivatives. These firms were structured into two different groups; those firms that hedge and those that do not. The first problem we encountered was

that the two different groups was not equally large since the number of firms that do not use derivative contracts to hedge macroeconomic risk are less than the firms that do. However, by the use of stratified random sampling we overcame this problem.

Stratified random sampling is a probability sampling involving the dividing of the population into sub-groups called strata. From that sample one selects each stratum, either proportionally or non-proportionally. As explained below we use a non-proportional selection; the proportion of the size of the sample from each stratum is not consistent with the proportions of the population. (Sharma, Shenoy, & Srivastava, 2002)

We extracted from the population two different sub-groups, the ones who use derivative contracts to hedge macroeconomic risk and the ones who do not. Since the numbers of firms that do not use derivative contracts are less, we chose to include every firm matching this criterion. From the group that does use derivative contracts we randomly and non-proportionally chose a sample representing the whole group using a simple random selection. Simple random sampling is a sample where you randomly extract a number of entities that are going to represent the whole group and each entity in the population has the same chance to be included. (Sharma, Shenoy, & Srivastava, 2002) This approach gave us a total of 91 corporations where, the number of corporations that do not use derivative contracts in our thesis equals 26 and the number of corporations that do use derivative contracts equals 65.

## **2.7 Data collection**

The research period is during 2008 and is concentrated to the US market. To see if the corporations use derivative contracts or not, every annual report and Form 10-k for corporations listed on NYSE that matched our criterion was analyzed. We chose the annual reports and the Form 10-k as sources since corporations are obliged to disclose information and values of their hedging positions in these reports. If the corporation do not disclose information about any hedging or state that they do not use derivative contracts to hedge macroeconomic risk we include them in the group that do not hedge. If the firm state that they do use derivative contract to hedge macroeconomic risk or they disclose values of such hedges we include them in the group that do hedge.

The credit ratings are then gathered from S&P's database, and are taken as of yearend 2008. When gathered, we neglected the prognosis of credit ratings given by the rating agencies since we delimited the thesis from possible changes in credit rating. The relevant metrics used to conduct the statistical comparison and regression analysis in our empirical study are extracted from the corporation's annual reports of 2008.

Since many of the explanatory variables used in the empirical study are various ratios calculated from the corporation's annual report and the credit ratings gathered are taken from S&P's database it means that our data is secondary data from different sources.

## **2.8 Reliability**

High reliability in a thesis is when it can be redone several times with the same results; the thesis thus will not be affected by the chosen method or the authors. (Bell & Bryman, 2003) Since we are only investigating if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE during 2008, it is hard to state that the result will be the same during following years. Since corporations can change their accounting principles that will affect the metrics leading to different results and conclusions. One must also consider that corporations often round up or down their metrics in their annual reports and since we calculate financial ratios for the regression analysis there is a possibility that it also can affect the results and conclusions if the thesis is redone. Since we have done many calculations during the thesis one must also consider that there can be miscalculations. Although we believe that the reliability in this thesis is satisfying since corporations have to disclose information about changes in accounting principles so if it is done one more time, one have to consider a possible change in accounting principles.

## **2.9 Validity**

Validity describes the ability to measure what you want to measure with as high accuracy as possible. Hence a high validity means that the presented theory and empirical facts should be coherent. (Anderssen, 1998)

We cannot with confidence state that our explanatory variables capture all the factors needed to answer our stated question; Does hedging of macroeconomic risk by the use of derivative contracts significantly affect the credit rating of corporations listed on NYSE? We have chosen a majority of explanatory variables from earlier research within the same field but there is a risk that it may not fit our research in a satisfying way. We can miss variables that are important or include variables that are not. This could affect the validity of the thesis. Again, there is also a risk of miscalculations because of the broad range of metrics collected.

## **2.10 Criticism of method**

Since we are only considering hedging of macroeconomic risk, methods and techniques in ways to handle these risks, criticism can be directed towards neglecting other risks such as sovereign risk and business risk. We only focus on the US market and NYSE which means that criticism can be directed towards the neglecting of other countries, stock markets and stock exchanges. Furthermore, criticism can be directed towards the evasion of non-financial components determining a credit rating which can have an effect on the results. Criticism can be acknowledged to our sample selection and non response. The sample selection was chosen because of fitting criteria where the firms had to have specific characteristics. The included firms had to either use derivative contracts or not, have a credit rating from S&P and belong to the corporates sector established by S&P. This means that we excluded other firms that may fit one criterion but fails another which limits our sample.

Since our research period is during 2008, criticism can also be acknowledged for the time period since it can be difficult to investigate if hedging of macroeconomic risk by the use of derivative contracts significantly affect the credit rating of corporations listed on NYSE during one year. However, if the time period is prolonged firms can use derivative contract during one year but not during the next, meaning that the firm would fail our criterion, thus

decreasing our sample further. Since the research period is set during 2008, the evident financial crisis during that time period can have an adverse affect on our results, making conclusions hard to generalize.

Another aspect that can be criticized is the calculation of one of the included financial variables, the equity beta. As will be explained in chapter four, for the calculation of the equity beta we used the S&P 500 index which can be criticized for not matching perfectly with our research. Since there are many indexes to use we followed theoretical guidelines and therefore chose the S&P 500 index. (Goedhart, Koller, & Wessels, 2005)

The use of regression analysis can also be criticized because the method assumes that all potential explanatory variables are identified and included. To identify all explanatory variables can be very difficult since there is no outline to follow.

## **2.11 Criticism of theory**

We have applied relevant theories regarding components or determinants of credit ratings and why corporations should conduct risk management. Criticism can be directed towards the theories we have used since there is a possibility that the theories may not have a perfect fit with our research. To limit this misfit we have complimented relevant literature with scientific articles to reach a broad range of information regarding the studied subject. We also try to span the time horizon of theory to include a broad range of studies from different epochs.

## **2.12 Criticism of sources**

The sources used for the thesis are deemed reliable since the majority is from published and audited literature like educational literature, scientific articles and annual reports. We have used NYSE which we also believe to be a reliable source since it is subject to strict regulations under The Unites States legislation and listed corporations are closely monitored to comply with set out rules and regulations.

Although there can be mistakes in the used literature that can have an effect on our results and conclusions. The use of annual reports can also affect our research since corporations can give misleading results and often round up or down their financial metrics.

## **3 Theoretical framework**

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*In this chapter we will present the theoretical framework relevant to our investigation. The intention is to give the reader a fundamental understanding for the subject risk management and credit rating alongside an understanding of the stipulated problem. This chapter will be the basis for our analysis of the empirical study.*

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### **3.1 Choice of theory**

Risk management is a broad subject that encompasses numerous theories and empirical findings. The theories we have chosen to enlighten are included in order to give the reader a strong understanding for the subject risk management but also a full understanding of the problem being studied and why the problem exists. The thesis has its starting point in the theories surrounding risk management and why firms should conduct risk management. This is relevant since it will give the reader an understanding of the fundamental reasoning within this subject. This theory is then extended to include an explanation of hedging macroeconomic risk by the use of derivatives and the area of credit rating. Finally we implicitly try to outline the connection between risk management and credit rating.

### **3.2 Risk management**

In today's economy, risk management is a central debated subject, arguing for and against the creation of value. There exist both positive theories on risk management and theories supporting its irrelevance. With these two sides of the same coin one may think that risk management is a new phenomenon, but this is not the case. The world's most printed book, the bible, tells the story of a Pharaoh who has a dream about sick livestock and spoiled corn fields. He turned to a prophet, Joseph, to explain what the divine meaning of this dream was. According to the prophet the dream foretold seven years of plenty followed by seven years of scarcity. In order to mitigate the effect of the realization of the dream, the pharaoh butchered

and preserved sheep's and bought and stored large amounts of corn, in order to ensure future consumption. When the seven years of scarcity came Egypt prospered, Joseph became a powerful man and the Israelites followed him to Egypt, and the rest as they say are part of ancient history. (The holy bible, 0) This is an excellent example of risk management and hedging and it was made some thousands of years ago.

Further, risk management can also be found in non biblical history, where future markets were created as early as the middle ages. Instead of purchasing and storing agricultural goods, consumers could ensure future consumption and price of a certain good by purchasing it for delivery on a future date. This acts as a hedge for farmers who could handle the risk of price movements on their products by selling them for delivery at a later date for a predetermined price. (Froot, Amihud, & Levich, 1994)

### **3.2.1 Why conduct risk management?**

It is straightforward to see why the Pharaoh and the farmers would want to hedge. To generate an income the farmer must sell his crop, which means that his income is connected to the price of the crop. This means that any risk-averse farmer would want to reduce adverse effects on his income coming from fluctuations in the price of the good. Without hedging the risk of having seven years of scarcity the pharaoh leaves open the possibility of mass starvation and eventual ruin.

Although it is straight forward why these two should hedge it is not as clear why corporations should hedge, since corporations are owned by many dispersed owners with different interests, where each investor only bear a part of the firms aggregated risk. The traditional classical capitalist firm is often claimed to be developed just for the sake of diversifying risk to many small investors. (Berle & Means, 1968) With this argument as a basis it is hard to grasp why firms should handle and reduce risk since investors can manage this risk themselves by diversifying their portfolio. The logic here is that the investor does not want to be exposed to risk that he or she can diversify away themselves. Since investors have this state of mind there is no reason for firms to mitigate risk on behalf of their investors. (Froot, Amihud, & Levich, 1994)



### **3.2.2 The irrelevance of risk management**

The above described logic is based on the M&M theorem which states that value is created on the credit side of the balance sheet when corporations make good investments but how corporations finance those investments on the debit side only affect how the value created is divided among its investors, not the amount of value created. Hence, in an efficient and well-functioning capital market, they cannot affect the overall value of those investments. According to the M&M propositions, the capital structure of a firm has no impact on firm value if certain assumptions hold such as efficient capital markets without information asymmetries, taxes, or transaction costs. (Modigliani & Miller, *The Cost of Capital, Corporation Finance, and the Theory of Investment*, 1958) When these assumptions hold it renders ability for the investor to always be able to replicate the financial policies of the firm with transactions in the capital market. Thus, the only way to increase firm value is by taking positive net present value investments. How these investments are financed thus is irrelevant, whether they are financed with equity or debt has the same impact, meaning that financing decisions does not increase the value of the firm. (Modigliani & Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment: Reply*, 1959)

When the M&M theorem is applied to risk management it leads to the conclusion that hedging is obsolete since it is purely a financial transaction that has no effect on the value of the firm. The shareholder of the firm can perform the management of macro economical risks equally well as shareholders have widely differing preferences, which can be accounted for when hedging individually, but not when hedging at the firm level. (Jorion, 1991)

These arguments, that supports the inconsequence of risk management is based on various international parity conditions between currencies and interest rates like the international fisher parity and the purchasing power parity. When one assumes that these hold, the international capital market is assumed to be in an equilibrium which means that an adverse effect in one economic factor is offset by a compensating development in another factor. However, this does not explain why firms are dedicating resources to risk management programs. Although empirical studies show that international parity conditions only hold in the long run which justifies risk management, it does not, from an economic stand point, state who should conduct the risk management, firm or shareholder, according to M&M. (Bartram, 2000)

### 3.3 Theories justifying risk management

When analyzed it is evident that the M&M propositions does not hold in reality, due to that the assumptions made are not actually true. The existing capital market imperfections are, therefore, the basis for various positive theories about the economic impact of corporate risk management on firm value. Only if the increase in value exceeds the cost of hedging and if the value augmentation cannot be realized through risk management by the shareholders at lower cost, risk management at the firm level is justified on economic grounds. Total firm value,  $VF$ , is defined as the sum of all expected future free cash flows ( $FCF$ ) discounted at the Weighted Average Cost of Capital,  $wacc$ :

$$VF = \sum_{t=0}^T \frac{E(FCF_t)}{(1 + wacc)^t}$$

This formula stipulates that firm value can be increased either by increasing and growing firm cash flows or by reducing the discount rate. Corporate risk management leads to reduced volatility in cash flows measured as the standard deviation which in turn leads to a reduced variance in firm value. This means that firm value fluctuates less with proper risk management and more importantly low values occur with smaller probability than they would without risk management. (Bartram, 2000)

Theories that supports and argues for the need of risk management, argue that firm value is a concave function because of the capital market imperfections that exist. Hence, reduced cash flow volatility leads to reduced costs associated with these capital market imperfections, leading to larger cash flows to the owners of the firm, and thus increased firm value. The capital market imperfections and economic factors that have been enlightened in the academic world to justify risk management are now explained.

### **3.3.1 Agency cost**

Hedging can reduce agency cost related to the underinvestment and asset substitution problem. Agency costs can arise due to differences in the risk fondness of agents and principals, which can be improved by the means of risk management. (Jensen & Meckling, 1976)

#### **3.3.1.1 Underinvestment problem**

Conflicts of interest between creditors and stockowners can arise when a firm is highly levered and its value very volatile. Though it is most favorable to undertake positive net present value (NPV) investments and to reject those with negative NPV, managers who operate in the best interest of their stockowners may not undertake all positive NPV investment when the firm is highly levered. (MacMinn, 1987) This is due to that the value of the firm is volatile and increases in value go to debt holders first to satisfy their senior claim in the capital structure. (Bartram, 2000) Risk management creates a manner to purge these conflicts of interest and the related loss due to non taken positive NPV investments by reducing firm value volatility.

#### **3.3.1.2 Asset substitution**

The interests of shareholders and debt holders deviate also due to that shareholders of a highly levered firm can have incentives to take on highly risky investments. (Jensen & Meckling, 1976) This is best explained by using option theory, where an equity claim can be described as a call option on the firm's assets. With options, value is positively correlated with the volatility of the underlying asset, meaning that higher volatility equals higher expected value. Hence, by captivating highly risky investments increases the residual claimant's value since firm value volatility increases. Hedging reduces the agency costs associated with the asset substitution problem if it is structured to decrease the risk of the investment portfolio. Thus, both equity and debt capital providers have an incentive to take on less risky positive NPV projects. (Bartram, 2000)

### **3.3.2 Cost of financial distress**

By reducing the possibility of bankruptcy, the expected cost of financial distress is reduced. (Dolde, 1995) (Haushalter, 2000) At the same time, information asymmetries between management and investors may render hedging on the corporate level more effective and efficient. (Stulz, Rethinking Risk Management, 1996) Risk management reduces the likelihood of financial distress by lowering the volatility of cash flows, thus lowering the expected costs of financial distress. (Mayers & Smith, On the Corporate Demand for Insurance, 1982) This reduction of expected distress costs would boost firm value already by itself but it also increases value further by increasing firm ability to carry debt. (Leland, 1998) (Graham & Rogers, 2002) Due to the information asymmetry and the fact that managers have superior information, corporate risk management allows investors to make more optimal investment decisions. (Smith & Stulz, 1985)

### **3.3.3 Cost of external financing**

Market imperfections make the marginal cost of external financing to be increasing, meaning that a shortage of internally generated funds equals higher cost of capital or erosion due to forgone positive NPV projects. (Froot, Scharfstein, & Stein, 1994) Risk management, on the other hand, can help coordinate investment and thus synchronize the availability of resources. (Bartram, 2000) This theory is based on the idea that firm value is created by taking on positive NPV projects. These investments can only be realized if the financing of them has been secured. Because cash flows are volatile due to the risks they are exposed to, the financing of investments by the use of internally generated funds is not certain at every point in time. (Froot, Scharfstein, & Stein, 1994) Hence, the volatility of cash flows stimulates the volatility of external financing and thus the volatility of the investments. This dexterity of investments increases value, as it assures the undertaking of positive NPV investments, while avoiding higher cost of capital. (Bartram, 2000)

### **3.3.4 Taxes**

When a firm faces a convex tax schedule, risk management can increase value because the average tax burden is lower when the pre-tax income is less volatile. (DeAngelo & Masulis, 1980) (Smith C. , 1995) (Graham & Smith, 1998) In a convex tax system the marginal tax rate increases gradually with taxable income. When the tax schedule is convex, increased fluctuations in pre-tax income over various time periods will result in an increased tax burden than if income was less volatile and with less fluctuation. Hence, the volatility and the fluctuations of pre-tax income can be reduced by risk management, which reduces the taxes to be paid. (Smith & Stulz, 1985)

### **3.3.5 Cost of hedging**

In order for any type of risk management program to be value creating, the benefit must exceed the cost of that program and the risk management cannot be conducted cheaper by the investors themselves. Only when these two criteria are fulfilled can risk management create value. (Fite & Pflleiderer, 1995) The significant benefits of a risk management program stems from its positive effect on a firms cash flows and can consequently not be achieved by the owners of the firm by themselves. (Rawls & Smithson, 1990) The firm is more likely to be able to conduct risk management cheaper than the owners due to the information asymmetry and the fact that management has superior information. (Hakkarainen, Kasanen, & Puttonen, 1994)

## **3.4 What is macroeconomic risk?**

Macroeconomic risk refers to risk associated with common and changeable global economic conditions. According to theory, no corporation can command developments within this macro economy. The performance of any given corporation will thus be affected by developments and shocks within this macro economy. The risks associated with this macro economy generally refer to specific risks that have an impact on the cash flows of a firm. (Oxelheim & Wihlborg, 2008) These risks can be divided into the following:

- **Commodity risk** – Refers to the magnitude and likelihood of unanticipated changes in commodity prices that has an affect on corporations. E.g. a corporation using a commodity as input would be adversely impacted by price increases of that same commodity. (Oxelheim & Wihlborg, 2008)
  
- **Interest rate risk** – Refers to the magnitude and likelihood of unanticipated changes in interest rates that influence both the costs of different sources of capital in a particular currency and the demand for product and services denominated in this currency. E.g. when the interest rate increases, firms having outstanding debt would be adversely affected by increases in their interest expense. Also, increases in the interest rate affect the general demand for goods and services since it becomes more expensive for the public to borrow money for their consumption. (Oxelheim & Wihlborg, 2008)
  
- **Exchange rate risk** – Refers to the magnitude and likelihood of unanticipated changes in exchange rates that have an influence on the value of foreign money. E.g. if a corporation buys inputs in another country and the exchange rate increases it would adversely impact their cost of goods since they would cost more of the domestic currency to buy foreign currency. Also, corporations could be adversely affected by decreases in their currency in relation to other currencies since it would be cheaper for competitors to enter the market and set lower prices. (Oxelheim & Wihlborg, 2008)
  
- **Inflation risk** – Refers to the magnitude and likelihood of unanticipated changes in the price of domestic money. E.g. increases in the price of domestic money would increase the price of inputs bought from that country, adversely affecting the costs of the corporation. (Oxelheim & Wihlborg, 2008)

### 3.4.1 The importance of consolidation of macroeconomic risks

Macroeconomic risk should be treated consolidated due to the interdependence of the different variables. Interdependence arises since the different variables adjust simultaneously to shocks in the macroeconomic environment. In general, handling any risk category separately would seem to imply that the changes derived from unanticipated fluctuations in one macroeconomic variable are believed to be independent of other variables, which is not

the case. Exchange rate for instance can fluctuate due to fluctuations in the interest rate, meaning that if one of these variables were handled separately the same exposure would be measured twice. (Oxelheim & Wihlborg, 2008)

### **3.5 Derivative contracts**

When a firm looks to hedge macroeconomic risks they often turn to the derivative contract market. A derivative contract is the collective name used for a broad class of financial instruments where the value of the contract is linked to the price of another financial instrument or by a specified event or condition. (Culp, 2002) The derivative contracts used for hedging of macroeconomic risk are the following:

#### **3.5.1 Futures**

The most commonly used derivative contract is the future contract. Such a contract implies that the price of and the amount of delivery on a specific future date is determined today. One contract refers to a specific amount of a certain commodity or currency to be delivered on one date in the future. (Oxelheim & Wihlborg, 2008)

#### **3.5.2 Swaps**

A swap contract refers to the simultaneous buying of one variable and the selling of another. A currency swap means the buying of one currency whilst selling another, effectively swapping currency with a counterparty. An interest rate swap implies the simultaneously purchase and sale of liabilities with different payment conditions. A firm borrowing at a fixed rate may trade or swap loans with another firm which is borrowing at a variable rate. The reason for swapping is that the two firms are unable to obtain loans with the desired conditions from their capital markets. (Culp, 2002)

### **3.5.3 Options**

An option is a contract that gives the holder the right, not the obligation to buy or sell something in the future. These contracts can be set out to cover various commodities or currencies. It thereby gives the holder the right to buy a certain amount of a currency or commodity in the future, thus locking in the future price today. The advantage of an option is that it would only be exercised if the price movement is favorable, that is, when the contract is in the money. Also an option can give the holder the right to sell a certain commodity or currency, thus mitigating the risk of price movements both on selling and buying. (Oxelheim & Wihlborg, 2005)

## **3.6 Credit ratings**

A credit rating helps to distinguish superior borrowers from the poor. A credit rating is an assessment of the ability of a firm to meet its outstanding debt payments in time, as they come due. Credit ratings may be attached to specific issues of debt instruments or as a credit rating assessing the whole firm's ability to service its debt as it comes due. (Bilardello & Ganguin, 2005)

### **3.6.1 Why is credit rating important?**

Credit ratings are crucial for firms since they have an impact on the firm's access to capital markets and therefore affect the firm's cost of debt. The worse of a credit rating a firm has the more expensive it would be for them to borrow money, since the spread over the risk free rate demanded from the lender increases when the credit rating decreases. Ratings, and more specifically the possible effect on a rating, have been found to be of most importance when deciding to issue more debt or not, from a management perspective. (Graham & Harvey, 2001)

Credit ratings are also important from a counterparty risk point of view. Many corporations have developed credit policies that prevent the firm to engage in contractual agreements with firms that do not have a certain credit rating. Credit ratings thus also affect the ability for



firms to attract and attain business customers. Further, some firms also have specific clauses that charge the counterparty with a penalty or even terminate the contract if their credit rating is downgraded.

### 3.6.2 Who conducts credit ratings?

Rating agencies are the ones who assign credit ratings to corporations. The biggest rating agencies in the world are S&P, Moody's and Fitch. (Bilardello & Ganguin, 2005) These agencies base the credit ratings on information available for the public but also private information given by the corporation being rated. The corporation being rated is the entity that pays the rating agency for their credit rating services.

The different rating agencies have different quotations for their credit ratings. One thing they have in common is that they all have a barrier rating. This barrier divides credit ratings into investment grade and non-investment grade ratings, as shown by the bolded line in table 3.1. It is generally accepted that the different credit ratings have their counterpart or equivalent in the other rating agent's quotations, however it is not certain that the credit rating for one specific corporation would be the same between the different agencies. (Bilardello & Ganguin, 2005)

<b>S&amp;P</b>	<b>Moody's</b>	<b>Fitch</b>
AAA	AAA	AAA
AA+	Aa1	AA+
AA	Aa2	AA
AA-	Aa3	AA-
A+	A1	A+
A	A2	A
A-	A3	A-
BBB+	Baa1	BBB+
BBB	Baa2	BBB
<b>BBB-</b>	<b>Baa3</b>	<b>BBB-</b>
BB+	Ba1	BB+
BB	Ba2	BB
BB-	Ba3	BB-
B+	B1	B+
B	B2	B

B-	B3	B-
CCC+	Caa1	CCC+
CCC	Caa2	CCC
CCC-	Caa3	CCC-
CC	Ca	CC
C, D	C	C, DDD, DD, D

Table 3.1 Rating agencies quotations

### 3.6.3 Investment grade ratings

Rating agencies, although using different quotation for their credit rating, uses a threshold rating level, commonly known as investment grade rating. A firm is considered to have an investment grade rating if the credit rating exceeds BBB- by S&P, Baa3 by Moody's or BBB- by Fitch. The investment grade rating is an indication that the corporation is considered to be sufficiently likely to meet debt obligations as they come due. When a credit rating reaches levels lower than the investment grade threshold the probability of default increases and the spread implied by the credit rating increase due to the increase in risk. The lower the credit rating, under the investment grade threshold, the more speculative are investments in the corporation's debt. (Bilardello & Ganguin, 2005)

### 3.6.4 Rating agencies and conflicts of interest

There is a conflict of interest when it comes to rating agencies and their credit ratings. As mentioned above, the corporations being rated are the ones who hire the rating agencies and pay them for providing their services. The rating agencies could thus, be disinclined to lower a credit rating based on fear of losing a customer to a competitor whom offers a better credit rating. (Kim & Nofsinger, 2007) The idea is that rating agencies, due to competition and fear of losing customers, could give too high credit ratings to large customers who pay more money, which leads to wrong signals to the capital market regarding the creditworthiness of the firm. (Kim & Nofsinger, 2007)

### 3.6.5 Determinants of credit ratings

The determinants of credit ratings can be divided into two areas, the financial side and the non-financial side. (Gray, Mirkovic, & Rangunathan, 2006) The financial side in turn is usually divided into the following different areas:

- **Interest Coverage** – Ratios that assess the ability of the firm to meet interest payments as they come due.
- **Profitability** – Credit analysis cannot focus on absolute levels of net income to determine credit quality since it is cash that pays debt obligations not accounting adjusted earnings. Instead profitability ratios are used to evaluate the firm's performance and to indicate the value of the business.
- **Leverage** – Ratios that assess the amount of debt being utilized in comparison to the total capital employed or equity capital attained.
- **Liquidity** – This area assesses the firm's ability to access cash from various sources in times of need.
- **Cash flow adequacy** – A corporation's cash is its most important and liquid asset. This is so since, as explained above, debt, interest and all of a corporation's expenses are paid with cash, not accounting adjusted incomes. The ratios here give an indication of the corporation's ability to pay back its outstanding debt in the long term, pay interest on that debt in the short term and to finance its operating activities.
- **Systematic risk** – Systematic risk is also a variable that is included as a determinant of credit rating, by defining the firm's equity beta. The basis for it is that a corporation will be less able to service debt as its equity risk increases. (Gray, Mirkovic, & Rangunathan, 2006)

The non-financial side consists of:

- **Management quality** – Management clearly has an evident impact on the performance of a firm. The performance in turn would affect the financials of the corporations that also impacts the credit rating. Therefore, credit ratings are affected by management and the degree to which they affect credit quality. (Bilardello & Ganguin, 2005)
  
- **Sovereign risk** – Every corporation operates within a country, which has its laws, regulations, tariffs, economic development, labor market and technology. These aspects have an effect on the ability for a firm to operate efficiently and thereby have an effect on credit rating. (Bilardello & Ganguin, 2005)
  
- **Competitive position of the firm** – The corporation competitive position effects their ability to pay its debt as it comes due. Research shows that leaders within the industry have relatively better credit ratings than the followers which indicate the importance of competitive position. There are elements within the industry that have an impact on the competitive position of a firm such as market share, sales diversity and strategy. (Bilardello & Ganguin, 2005)
  
- **Industry risk** – Every industry has its own characteristics and specific risks that affect the performance of a corporation which in turn affects its ability to generate cash flows to service debt. Therefore industry characteristics have an evident effect on credit rating. (Bilardello & Ganguin, 2005) Further the firm's business environment is also a determining factor when it comes to credit rating. (Chan, Edwards, & Walter, 2009) Several industry characteristics including competitiveness, barriers to entry, exposure to technological change, regulatory environment and vulnerability to economic cycles can have a significant influence on the level of business risk a firm faces. Ultimately, the inclusion of industry differences into a model of credit ratings as a measure of industry effects may improve the explanatory power. (Emery & Iskander, 1994)

### **3.7 Risk management and the connection to credit rating**

Since hedging reduces the volatility of cash flows, theoretically a firm, that conducts risk management, should have a better ability to service debt as it comes due. This means, in effect, that theoretically a reduction in the volatility of cash flows can have an effect on the firm's ability to meet debt obligations. Again, credit ratings are in turn based on the firm's ability to service debt in due time. (Bilardello & Ganguin, 2005) This means that if risk management reduces volatility of cash flows and, as explained above, reduces the costs associated with capital market imperfections, leading to less volatile cash flows; corporate risk management should have a positive effect on the credit rating of the firm. This could be an additional reason for managers to conduct risk management, to improve credit rating, which ultimately improves access to capital markets.

## **4 Hedging of macroeconomic risk by the use of derivatives effect on the credit rating of a firm**

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*In this chapter we present our empirical findings with help of tables and graphs. The empirical data is presented in order to determine whether hedging of macroeconomic risk by the use of derivative contracts significantly affect the credit rating of corporations listed on NYSE. The results of this chapter will then be analyzed in chapter five.*

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### **4.1 The empirical findings**

This chapter is divided into two different sections. In the first section of this chapter we will present the results of our empirical study with help of charts, tables and graphs. For the reader's convenience we will present the data in two different groups. The first group consists of 65 corporation that use derivative contracts for hedging of macroeconomic risk. The second group consists of 26 corporations that do not use derivative contracts for hedging of macroeconomic risk. First we will present the data individually for each group, than we will compare the data of the two groups. In order to compare the groups we will recalculate the various metrics into averages.

In the second section, we will present our regression analysis where we test our data to determine if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listen on NYSE. We will also complement the regression analysis with a Durbin-Watson test and Whites test in order to see if our regression analysis is subject for autocorrelation and heteroscedasticity which can have an effect on our results.

Before these two sections, we will firstly explain how and why we chose the explanatory variables included in the study. Due to space considerations tables, graphs and diagrams have been adjusted accordingly and some placed in the appendix.

## 4.2 Explanatory variables

To determine if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE we will conduct a statistical comparison between the two determined groups and a regression analysis. The dependent variable being tested is the credit rating of the corporation and we are basing the explanatory variables on previous research done within the area alongside practical guidelines given by rating agencies. (Bilardello & Ganguin, 2005)

The first area of variables included is based on an approach whereby the credit rating is modeled as a function of the financial aspects given by interest coverage, profitability and leverage. (Gray, Mirkovic, & Rangunathan, 2006) To these variables we add an assessment of the firm's liquidity which is considered important, especially when financial distress is emerging. (Bilardello & Ganguin, 2005) Further, we include a measure of cash flow adequacy. The cash flow adequacy is considered important since debt obligations and interest payments are not paid with accounting adjusted earnings, but with cash. (Bilardello & Ganguin, 2005) It is therefore important to include a cash flow based assessment on the ability to meet debt obligations and interest payments.

These different areas are included to assess the financial ability of a firm to meet its debt obligations in the long-term, meet interest payments in the short term and service capital requirement to efficiently operate the business. All of these aspects are defined in theory to have an effect on the credit rating of a firm. (Bilardello & Ganguin, 2005)

To these financial metrics we also include an assessment of the systematic risk by including the equity beta for each firm. Past research argues that corporation's ability to service debt will be reduced as its equity risk increases. The implication of this is that the higher the equity beta the lower the expected ability for the firm to pay debt obligations as they come due. Other things being equal, this should mean that corporations with higher equity betas should have lower ratings. (Blume, Lim, & Mackinlay, 1998) In order to capture this possible effect on the credit rating of a firm we chose to include this variable in the analysis.

Again, adding on to the explanatory variables, an industry classification variable is included. The logic is that corporate credit ratings, should account for the specific business environment

of the firm which can have a significant effect on the level of the business risk a firm is exposed to. This environment includes industry characteristics such as, competitiveness, barriers to entry, law & regulation and technological development. (Emery & Iskander, 1994) Past research has chosen to include industry classification which we also do since we believe it will increase the explanatory power of the analysis. We here follow the approach of previous research and add an industry classification by reclassifying industry belonging of the different corporations into numerical values. (Emery & Iskander, 1994)

As a final variable we include the hedging of macroeconomic risk by the use of derivatives variable. The firms hedging policies is recoded into a number scale, where corporations hedging macroeconomic risk by the use of derivatives receives the value 0, and the corporations not hedging receives the value 1. In order not to double count exposures as explained in chapter three, we chose to recode this variable into a dichotomy variable to capture management of the four macroeconomic risks described. The variable is then regressed alongside all the other variables to investigate if the conductance of hedging of macroeconomic risk by the use of derivatives significantly affects the credit rating of a firm.

The specific ratios included in each area are calculated to capture the financial information given by these ratios and assess their impact on the credit rating. The ratios are the following:

➤ **Interest Coverage**

- *EBITDA-to-Interest coverage* – Is calculated by dividing earnings before interest, taxes, depreciation and amortization of 2008 by total interest expense of 2008. Total interest expense of 2008 is inclusive of interest payments on operating leases in order to capture off balance sheet financing. (Bilardello & Ganguin, 2005)
- *EBIT-to-Interest coverage* – Is calculated by dividing earnings before interest and taxes of 2008 by total interest expense of 2008. Total interest expense of 2008 is inclusive of interest payments on operating leases in order to capture off balance sheet financing. (Bilardello & Ganguin, 2005)



➤ **Profitability**

- *Return on Equity* – Is calculated by dividing net income of 2008 by the total Equity of 2008. (Berk & DeMarzo, 2008)
- *Return on Assets* – Is calculated by dividing the net income of 2008 by the total assets of 2008. The total assets are inclusive of operating leases since they are deemed as asset equivalents. (Berk & DeMarzo, 2008)
- *Profit Margin* – Is calculated by dividing net income of 2008 by the total revenues of 2008. (Berk & DeMarzo, 2008)
- *Operating Margin* – Is calculated by dividing earnings before interest and taxes of 2008 by total revenues of 2008. (Berk & DeMarzo, 2008)

➤ **Leverage**

- *Debt-to-equity ratio* – Is calculated by dividing total interest bearing debt of 2008 by total equity of 2008. The total interest bearing debt of 2008 is inclusive of operating leases of 2008 in order to capture off balance sheet financing. (Goedhart, Koller, & Wessels, 2005)
- *Debt-to-capital ratio* – Is calculated by dividing the total interest bearing debt of 2008 by total interest bearing debt of 2008 plus total equity of 2008. The total interest bearing debt of 2008 is inclusive of operating leases of 2008 in order to capture off balance sheet financing. (Berk & DeMarzo, 2008)

➤ **Liquidity**

- *Cash-to-capital ratio* – Is calculated by dividing total cash of 2008 by total amount of capital of 2008. Cash is inclusive of cash, marketable securities, short term investments, bank guarantees and undrawn lines of credit, in order to capture the total financial flexibility of the firm. (Gray, Mirkovic, & Ragnathan, 2006)

➤ **Systematic risk**

- *Equity beta* – Is calculated by regressing 52 weekly observations, ending on 31<sup>st</sup> December 2008, of the firm's stock returns against the S&P 500 index. (Goedhart, Koller, & Wessels, 2005)

➤ **Industry classification**

- *Numeric industry classification* – Is calculated by re-classifying industry-belonging into numeric variables ranging from 1 to 7. The industry classification is taken from NYSE since the corporations are listed there.

➤ **Hedging of macroeconomic risk**

- *Dichotomy hedging variable* – Is calculated by reclassifying hedging of macroeconomic risk by the use of derivatives. Firms that do hedge are given a 0 and firms that do not hedge are given a 1.

➤ **Cash flow adequacy** – Cash flows are calculated by the following formula: revenues – cost of goods sold – selling, general and administration costs – depreciation – taxes + depreciation – investments. Investments are defined as the change in operating assets from the 31 December 2007 to 31 December 2008. Operating assets include working capital, operating fixed assets, intangible assets and operating leases. (Goedhart, Koller, & Wessels, 2005) Cash flow adequacy includes the following ratios:

- *Cash flow-to-Debt* – Is calculated by dividing cash flows of 2008 by the total amount of outstanding interest bearing debt of 2008.
- *Cash flow-to-interest* – Is calculated by dividing cash flows of 2008 by the total amount of interest expense of 2008.

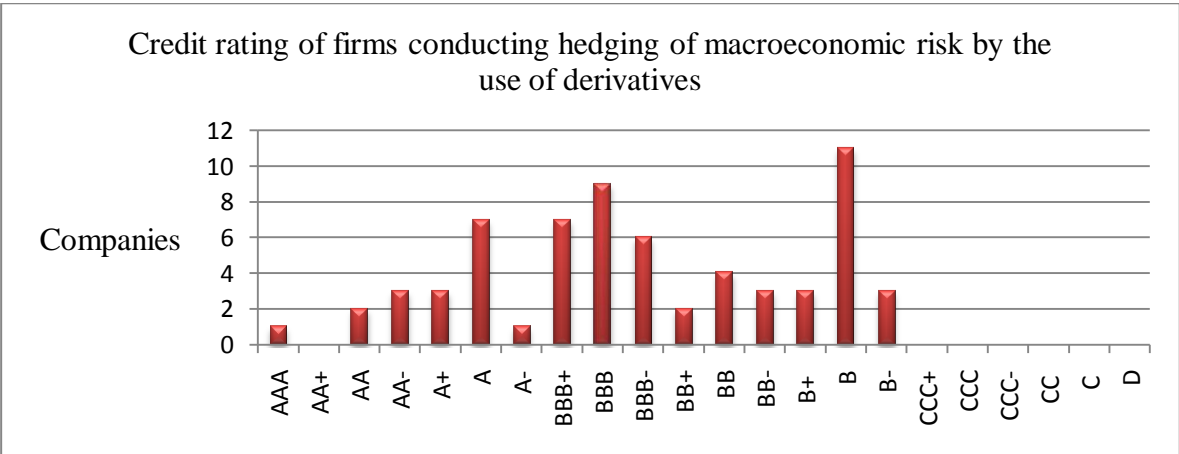
### 4.2.1 Explanatory variables not included

In the regression analysis some variables that should be included are not due to unavailability of information. Rating agencies, as outlined in chapter three, base their credit rating on both financial and non-financial criteria. Although, the financial criteria are being captured, the non-financial criteria are not. These variables include an assessment of the sovereign risk of the firm, an analysis of the quality of management and the competitive position of the firm. These variables are deemed by the authors to be subjective and not in the scope of this thesis and are excluded due to time consideration and absence of information.

## 4.3 Corporations conducting hedging of macroeconomic risk by the use of derivatives

### 4.3.1 Credit rating

Graph 4.1 shows the credit ratings attained by corporations that hedge macroeconomic risk by the use of derivatives. As shown by the graph, more than 50% of the observations have an investment-grade rating above the BBB threshold. The lowest credit rating of the group is B- and there is a concentration of corporations attaining a B rating. The highest credit rating attained for the groups is AAA and there is some concentration of observation in the A, BBB+ and BBB ratings.



Graph 4.1 Credit rating of firms conducting hedging of macroeconomic risk by the use of derivatives

### 4.3.2 Interest coverage

Table 4.1 shows the interest coverage ratios for each corporation in forms of EBITDA-to-interest and EBIT-to-interest ratios. The table shows that the spread for each ratio is between 1447 to -6.67 and 590 to -100,74 respectively. These observations creates a average value of 41,2 for EBITDA-to-interest and 18,1 for EBIT-to-interest, meaning that on average this group of corporations manage to pay interest as it comes due. However, 19% of the EBIT-to-interest ratios are negative implying that 19% of the corporations cannot pay interest as it comes due, the same negative group in EBITDA-to-interest is 1,5%.

Interest coverage	EBITDA-to-Interest	EBIT-to-Interest
3M Co.	28,22	21,98
ABB Ltd.	37,17	33,44
American Express Co.	9,66	3,89
AMN healthcare services, Inc.	6,73	4,41
Amphenol Corp.	15,69	14,82
Analog devices, Inc.	139,96	162,7
Baker hughes, Inc.	11,83	5,66
Baldor electric Corp.	2,36	1,94
Ball Corp.	8,06	5,59
BCE, Inc.	10,04	4,39
Blackrock, Inc.	26,06	16,44
Boardwalk Pipeline Partners L.P.	8,77	6,11
BorgWarner, Inc.	5,59	0,93
Boston Scientific Corp.	12,13	5,61
Bristow group, Inc.	7,03	6,39
Brookfield Properties Corp.	2,02	1,95
Brown shoe Co. Inc.	6,48	5,66
Burger king Holdings, Inc.	7,64	5,97
Cabot Corp.	8,37	-2,4
Campbell Soup Co.	14,73	10,81
Canadian Pacific Railway Co.	6,68	3,44
Canon, Inc.	1447,5	590
Cardinal Health, Inc.	11,52	8,62
Eastman Kodak Co.	5,01	-7,09
Harley-Davidson, Inc.	228,65	153,04
Kellogg Co.	8,25	6,3
Landry's Restaurants, Inc.	10,25	9,8
Liz Claiborne, Inc.	3,16	-100,74
Marriott International, Inc.	5,26	0,95
Media General, Inc.	2,65	-19,97
MetroPCS Communications, Inc.	3,38	1,98
Mueller Water Products, Inc.	28,5	24,74

NBTY, Inc.	12,17	7,56
NCR Corp.	9,05	14,14
New York Times Co.	79,05	0,93
OMNOVA Solutions, Inc.	8,05	4,44
Orbitz Worldwide, Inc.	2,08	-5,21
Polypore International, Inc.	2,42	-1,87
Praxair, Inc.	12,37	9,51
Procter & Gamble Co.	13,56	11,96
Quest Diagnostics, Inc.	8,63	6,49
Quicksilver Resources, Inc.	5,24	-4,36
Smithfield Foods, Inc.	1,04	-0,77
Stanley Black and Decker, Inc.	8,86	5,45
Steinway Musical Instruments, Inc.	2,07	1,72
Stone Energy Corp.	23,06	-14,2
Taiwan Semiconductor Manufacturing Co. Ltd.	217,68	113,49
Target Corp.	9,48	6,48
Teck Resources Ltd.	22,76	4,72
Teekay Tankers Ltd.	2,77	2,4
Telecom Corp. of New Zealand Ltd.	4,89	4,6
UDR Inc.	2,05	0,68
United Parcel Service, Inc.	13,01	8,56
United States Steel Corp.	-6,67	-9,9
United Technologies Corp.	12,32	8,36
Universal Health Services, Inc.	17,18	8,49
USG Corp.	0,27	-1,04
Walgreen Co.	55,54	39,12
Wal-Mart Stores, Inc	15,05	10,6
VeriFone, Inc.	9,29	-9,3
Verizon Communications, Inc.	19,63	6,37
Vulcan Materials, Inc.	7,08	4,41
Xerox Corp.	3,26	1,52
YUM! Brands, Inc.	13,66	8,71
Zimmer Holdings, Inc.	26,25	17,7

Table 4.1 Interest coverage

### 4.3.3 Profitability

Table 4.2, in appendix 1 shows the profitability ratios for each corporation in forms of Return on Equity, Return on Assets, profit margin and operating margin. The table shows that the spread for each ratio is -128 to 234%, -11 to 15%, -67 to 34% and -73 to 37%, respectively. These observations creates a average value of 6,68%, 4,55%, 1,49% and 9,63% respectively for each of the ratios, meaning that on average this group of corporations are profitable in

every aspect included in this category. However, 27%, 9%, 28,4% and 9% respectively of the observations have negative ratios, meaning that these observations are not profitable.

#### **4.3.4 Leverage**

Table 4.3, in appendix 1 shows the leverage ratios for each corporation in forms of debt-to-equity and debt-to-capital ratios. The table shows that the spread for each ratio is 0,03 to 21,28 and 0,03 to 0,96 respectively. These observations create an average value of 2,45 and 0,55 respectively. Also, 62% of the observations utilize more debt in comparison to equity, represented by a debt-to-equity ratio above one.

#### **4.3.5 Cash flow adequacy**

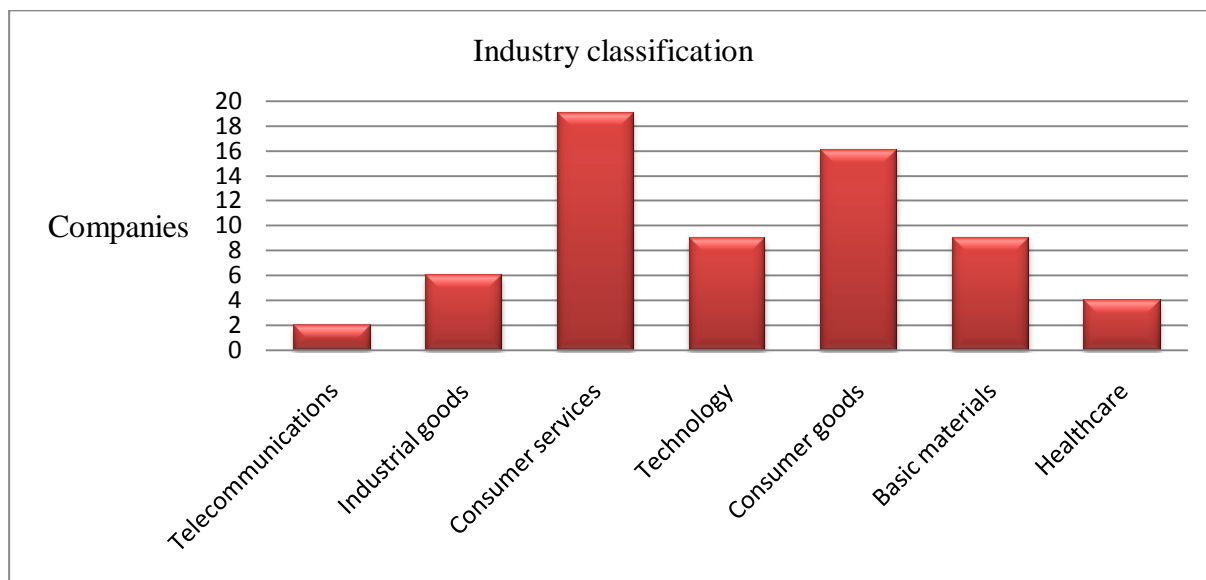
Table 4.4, in appendix 1 shows the cash flow adequacy ratios for each corporation in forms of cash flow divided with debt and cash flow divided by interest. The table shows that the spread for each ratio is between -0,11 to 14,87 and -1,26 to 1615 respectively, These observations creates a average value of 0,59 and 41,57 respectively, meaning that on average this group of corporations are able, based on their cash flows, to pay interest as it comes due and have on average cash flows that cover more than 50% of their debt. Also, 3% of the corporations have cash flow to interest ratios that are negative, implying that three percent of the group cannot manage to pay their interest as it comes due with their cash flows.

#### **4.3.6 Liquidity and Systematic risk**

Table 4.5, in appendix 1 shows the liquidity and systematic risk ratios for each corporation in forms of cash-to-capital ratios and equity beta. The cash-to-capital spread is ranging from 0 to 0,99 and the equity beta spreads from 0,26 to 3,96. These observations create an average of 0,14 and 1,57 respectively.

### 4.3.7 Industry classification

Graph 4.2 shows the different industries that the corporations in our group are operating in. The most common industry in the group that do use derivative contracts is consumer services (19) followed by consumer goods (16).

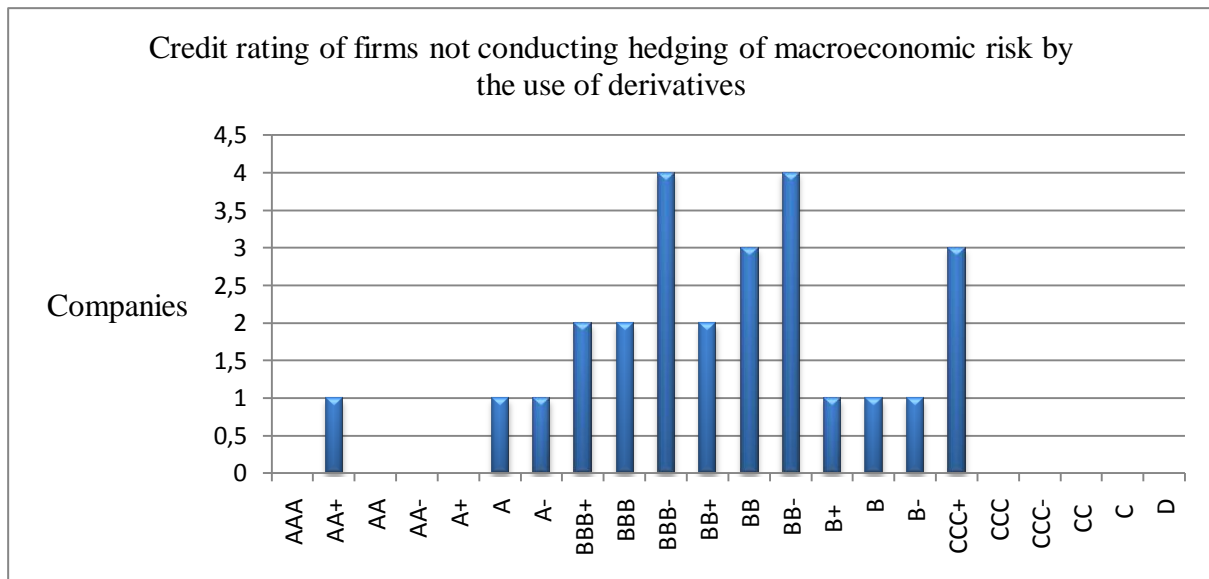


Graph 4.2 Industry classification

## 4.4 Corporations not conducting hedging of macroeconomic risk by the use of derivatives

### 4.4.1 Credit rating

Graph 4.3 shows credit ratings attained by corporations that do not hedge macroeconomic risk by the use of derivatives. As shown by the graph, 59% of the observations have a credit rating below an investment-grade rating of BBB. The lowest credit rating of the group is CCC+ and there is a concentration of firms attaining a CCC+, BBB- and BB- rating. The highest credit rating attained for the groups is AA.



Graph 4.3 Credit rating of firms not conducting hedging of macroeconomic risk by the use of derivatives

#### 4.4.2 Interest coverage

Table 4.6 shows the interest coverage ratios for each corporation in forms of EBITDA-to-interest and EBIT-to-interest. The table shows that the spread for each ratio is between -1,36 to 210,82 and -11,03 to 176,73 respectively. These observations creates a average value of 26,3 for EBITDA-to-interest and 17,45 for EBIT-to-interest, meaning that on average this group of corporations manage to pay interest as it comes due. However, 26% of the EBIT-to-interest ratios are negative implying that 26% of the corporations cannot pay interest as it comes due; the same negative group in EBITDA-to-interest is 3,7%.

<b>Interest coverage</b>	<b>EBITDA-to-Interest</b>	<b>EBIT-to-Interest</b>
Actuant Corp.	7,27	1,06
AGCO Corp.	17,12	6,93
American Greetings Corp.	7,56	-11,03
Amerigroup Corp.	14,36	13,38
AmerisourceBergen Corp.	76,75	60,24
Ametek, Inc.	6,28	5,29
Bally Technologies, Inc.	14,57	11,28
Belden, Inc.	4,04	0,18
Belo Corp.	2,65	-1,6
Benchmark Electronics, Inc.	72,12	38,11
Best Buy Co. Inc.	56,66	31,87
Big Lots, Inc.	210,82	176,73
BJ Services Co.	11,77	8,13



Bowne & Co. Inc.	6,5	-2,38
Brinker International, Inc.	14,02	3,6
Brinks Co.	26,87	15,72
MGM Mirage	1,46	-1,6
Rite Aid Corp.	1,58	-4,41
Standard Pacific Corp.	0,76	-1,31
USEC, Inc.	7,52	5,14
Vail Resorts, Inc.	5,9	3,89
Valmont Industries, Inc.	17,98	15,35
Washington Post Co.	17,17	5,71
V.F. Corp.	11,99	8,62
Wimm-Bill-Dann Foods OJSC	6,88	4,22
W.W. Grainger, Inc.	91,15	81,69

Table 4.6 Interest coverage

#### 4.4.3 Profitability

Table 4.7, in appendix 2 shows the profitability ratios for each corporation in forms of Return on Equity, Return on Assets, profit margin and operating margin. The table shows that the spread for each ratio is -84 to 52%, -3 to 14% -22 to 15% and -11 to 25%, respectively. These observations creates a average value of 5,2%, 5,3%, 1,3% and 7,1% respectively for each of the ratios, meaning that on average this group of corporations are profitable in every aspect included in this category. However, 26%, 3,7%, 25,9% and 4% respectively of the observations have negative ratios, meaning that these observations are not profitable.

#### 4.4.4 Leverage

Table 4.8, in appendix 2 shows the leverage ratios for each corporation in forms of debt-to-equity and debt-to-capital. The table shows that the spread for each ratio is 0,34 to 21,10 and 0,26 to 0,95 respectively. These observations create an average value of 2,82 and 0,59 respectively. Also, 70,4% of the observations utilize more debt in comparison to equity, represented by a debt-to-equity ratio above one.

#### **4.4.5 Cash flow adequacy**

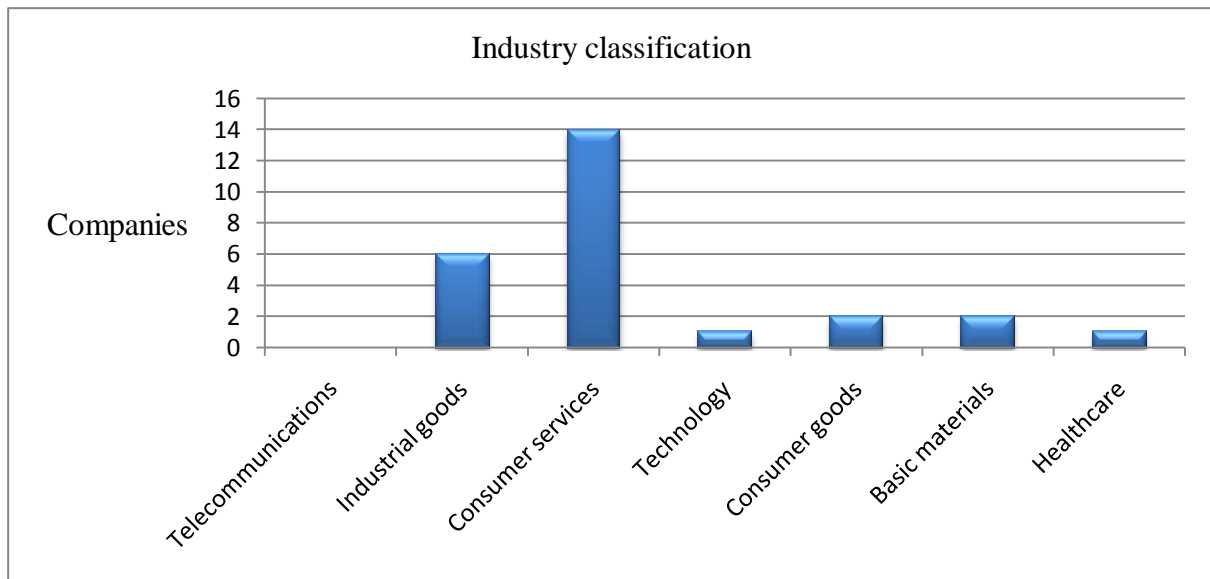
Table 4.9, in appendix 2 shows the cash flow adequacy ratios for each corporation in forms of cash flow divided by debt and cash flow divided by interest. The table shows that the spread for each ratios is between -0,3 to 0,68 and -0,67 to 213 respectively, These observations creates a average value of 0,23 and 25,79 respectively, meaning that on average this group of corporations manage, based on their cash flows, to pay interest as it comes due and have on average cash flows that cover more than 50% of their debt. However, 7,5% of the corporations have negative cash flow to interest ratios, implying that 7,5% of the group cannot manage to pay their interest as it comes due with their cash flows.

#### **4.4.6 Liquidity and Systematic risk**

Table 4.10, in appendix 2 shows the liquidity and systematic risk ratios for each corporation in forms of cash-to-capital and equity beta. The cash-to-capital spread is ranging from 0 to 0,32 and the equity beta spread from 0,58 to 4,94. These observations create an average of 0,12 and 1,82 respectively.

#### **4.4.7 Industry classification**

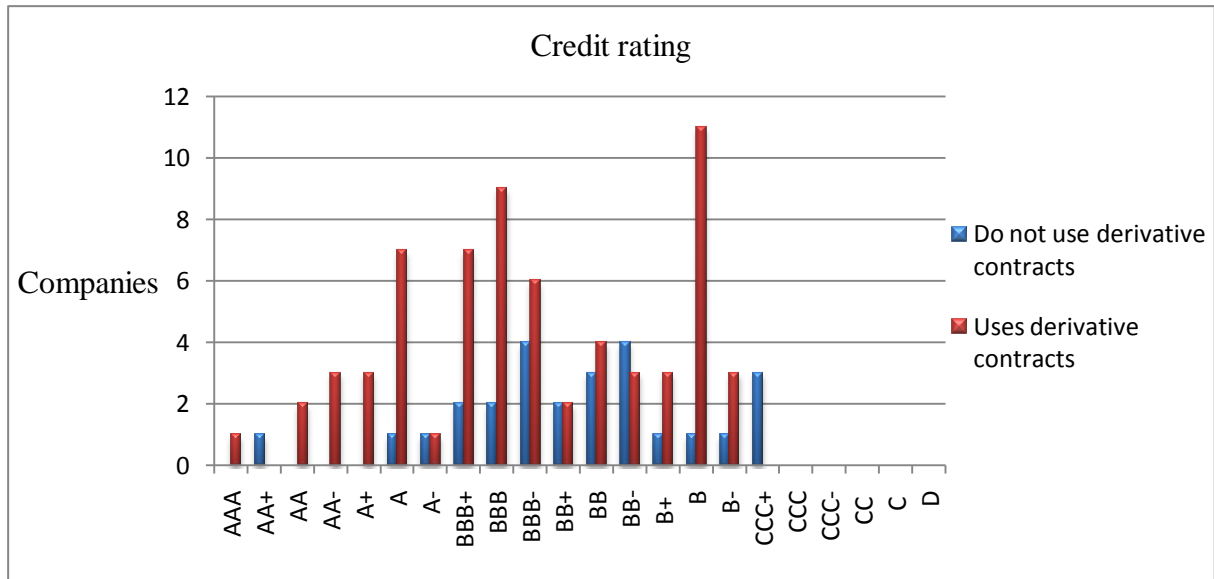
Graph 4.4 shows the different industries which our corporations in our group are operating in. The most common industry in the group that does not use derivative contracts is consumer services (14) followed by industrial goods (6).



Graph 4.4 Industry classification

#### 4.5 Comparison of the two groups

When comparing the two different groups evident differences appear, as shown by graph 4.5. The firms that hedge macroeconomic risk by the use of derivatives show a larger concentration of observations from investment grade ratings and above. The firms that do not conduct hedging of macroeconomic risk by the use of derivatives show a larger spread, but more observations fall under the threshold for investment grade rating. Although corporations conducting risk management has the highest number of observations concentrated into a B rating. Also the lowest credit rating in the sample is from a corporation not conducting risk management while the highest observation is from a corporation conducting risk management.



Graph 4.5 Credit rating

When examining table 4.11 the differences between the two groups are major. Corporations that do hedge macroeconomic risk by the use of derivatives have on average 57% higher EBITDA-to-interest ratio and a slightly higher EBIT-to-interest ratio. This shows that on average, corporations that do hedge have higher ability to pay interest on debt as it comes due. The cash flow-to-interest suggests the same; corporations hedging macroeconomic risk by the use of derivatives have almost 60% higher ability to cover interest expenses by their cash flows.

	Corporations that does not hedge macroeconomic risk	Corporations that do hedge macroeconomic risk
Credit rating	BB+	BBB
EBITDA-to-interest coverage	26,31	41,2
EBIT-to-interest coverage	17,49	18,1
Return on equity	5,19%	6,87%
Return on assets	5,26%	4,50%
Profit margin	1,23%	1,50%
Operating margin	7,09%	9,66%
Debt-to-equity ratio	2,81	2,46
Debt-to-capital ratio	0,59	0,56
Cash flow/debt	0,23	0,59
Cash flow/interest	25,79	41,57
Cash-to-capital ratio	0,12	0,14
Equity beta	1,82	1,56

Table 4.11 Comparison of the two groups

The profitability area shows that on average, corporations conducting hedging of macroeconomic risk by the use of derivatives have higher profitability in all aspects except Return on Assets. The table shows that in our sample corporations that conducts hedging of macroeconomic risk has higher profitability and generates higher returns to their equity holders. Also, the operating and profit margins suggest that on average the profit margin and operating margin of these corporations are higher than the corporations not hedging.

The leverage area shows that corporations hedging macroeconomic risk by the use of derivatives are on average lesser leveraged than corporations not hedging. The leverage is less both in terms of total capital and in relation to the equity portion. The table also shows that corporations hedging macroeconomic risk by the use of derivatives hold on average more cash in relation to total capital than corporations not hedging. Also, corporations not hedging macroeconomic risk by the use of derivatives have higher equity betas than corporation's that do hedge, suggesting that the equity risk of these firms are higher.

Table 4.12 shows the average size, measured in terms of EBITDA and EBIT, of the two different groups. As shown in the table, there is a size difference between the two groups. The group of corporations that do hedge macroeconomic risk by the use of derivatives is on average approximately ten times the size than corporations not hedging macroeconomic risk by the use of derivatives measured in terms of EBITDA and almost 16 times the size measured in terms of EBIT.

Average EBITDA and EBIT ( <i>in millions</i> )	EBITDA	EBIT
Corporations hedging macroeconomic risk	5534	479
Corporations not hedging macroeconomic risk	1623	104

Table 4.12 Average EBITDA and EBIT

#### **4.6 Re-coding of explanatory variables for the regression analysis**

Some of the explanatory variables outlined above are not given in a numeric form, which means that they cannot be included in the regression analysis without recoding. These variables include the credit rating of the firm, the hedging of macroeconomic risk by the use of derivatives and the industry belonging. These variables thus need to be recoded into numeric values.

The hedging of macroeconomic risk by the use of derivatives variable is re-coded by giving the corporations that hedge macroeconomic risk by the use of derivatives the value 0, and the corporations that do not hedge macroeconomic risk by the use of derivatives the value 1, as shown in table 4.13.

<b>Hedging of macroeconomic risk by the use of derivatives</b>	<b>Re-coding</b>
Yes	0
No	1

Table 4.13 Hedging of macroeconomic risk by the use of derivatives

The industry classification is re-coded by giving each industry classification a numeric value. Each industry is assigned a number from one to seven starting from top to bottom, as shown in table 4.14.

<b>Industry</b>	<b>Re-coding</b>
Basic Materials	1
Telecommunications	2
Consumer goods	3
Healthcare	4
Industrials	5
Consumer services	6
Technology	7

Table 4.14 Industry

As table 4.15 shows, the credit rating of the firm is re-coded by giving each individual credit rating a numeric value. The credit ratings are lined up in terms of superiority and then given a value from one to 22, starting from top to bottom.

<b>Credit ratings</b>	<b>Re-coding</b>
AAA	1
AA+	2
AA	3
AA-	4
A+	5
A	6
A-	7
BBB+	8
BBB	9
BBB-	10

BB+	11
BB	12
BB-	13
B+	14
B	15
B-	16
CCC+	17
CCC	18
CCC-	19
CC	20
C	21
D	22

Table 4.15 Credit ratings

## 4.7 Regression analysis

To determine if a variable has a significant influence on the model's dependent variable, in this case the credit rating of the firm, the level of significance has to be under 0,05. The determination coefficient is a measure of how much the depending variable is explained by our explanatory variables. E.g. if the determination coefficient is 50%, it means that 50% of the depending variable is explained by the selected explanatory variables. (Damodar, 2006)

<b>Regression analysis</b>					
<i>Determination coefficient: 60,8%</i>	B	Std. Error	Beta	T	Significance
Constant	6,18	1,53		4,039	0
EBITDA-to-interest coverage	0	0	0,088	1,196	0,235
EBIT-to-interest coverage	-0,01	0,009	-0,192	-1,127	0,263
Return on equity	-0,216	1,013	-0,026	-0,213	0,832
Return on assets	-24,226	11,266	-0,284	-2,15	0,035
Profit margin	-1,079	4,674	-0,039	-0,231	0,818
Operating margin	-0,204	4,542	-0,007	-0,045	0,964
Debt-to-equity ratio	0,038	0,124	0,035	0,303	0,762
Debt-to-capital ratio	5,399	2,36	0,299	2,288	0,025
Cash flow/debt	-0,152	0,236	-0,059	-0,646	0,52
Cash flow/interest	-0,001	0,003	-0,028	-0,196	0,845
Cash-to-capital ratio	3,951	1,979	0,179	1,997	0,049
Equity beta	0,985	0,413	0,23	2,386	0,019
Industry classification	-0,065	0,16	-0,032	-0,406	0,686
Hedging of macroeconomic risk by the use of derivatives	1,4	0,69	0,16	2,028	0,046

Table 4.16 Regression analysis

The regression analysis shows that 60,8% of the depending variable is explained by our explanatory variables. The results of our regression analysis is that the variables ROA, debt-to-capital ratio, cash-to-capital ratio, equity beta and hedging of macroeconomic risk by the use of derivatives has a significantly affect on the credit rating of corporations listed on NYSE.

## 4.8 Autocorrelation

When conducting a regression analysis it is important to control for autocorrelation. Autocorrelation is a measure of how much correlation there is between the regression analyses different observations. The Durbin-Watson test is conducted in order to control for autocorrelation, if the coefficient for this test is under 2,0 there is evidence that a degree of autocorrelation exists. If the coefficient is greater than 2,0 it indicates that the variables are negatively correlated with each other. (Damodar, 2006)

As table 4.18 shows, there is evidence that autocorrelation exists in our regression, meaning that there is a correlation between the explanatory variables included in the regression analysis.

<b>Autocorrelation</b>	
Durbin-Watson	1,833

Table 4.18 Autocorrelation

## 4.9 Heteroscedasticity

In a regression analysis, explanatory variables are heteroscedastic if they have different variances and thus different standard deviations. Heteroscedasticity can cause the regressions estimates of coefficients to be unfair since it can cause the variance and the standard errors of the coefficients to be underestimated. Thus, a regression analysis consisting heteroscedastic variables may deem a connection to be statistically significant when in reality it is too weak to be assertively separated from null. In order to control for heteroscedasticity we conduct a



Whites-test that will determine if the significance of the explanatory variables is valid or not. (Damodar, 2006)

Table 4.19 shows the same regression analysis conducted previously, only this time we consider the possibility of heteroscedasticity and conduct a White-test. The test shows that all the variables that were shown to be significant in the regression analysis are still proven to be significantly affecting the credit rating of a firm. This renders the conclusion that our regression analysis is not subject for any widespread heteroscedasticity.

<b>Regression analysis – Whites Heteroscedasticity test</b>	
	Significance
Constant	0,002
EBITDA-to-interest coverage	0,2441
EBIT-to-interest coverage	0,1273
Return on equity	0,8277
Return on assets	0,0335
Profit margin	0,8259
Operating margin	0,9746
Debt-to-equity ratio	0,8336
Debt-to-capital ratio	0,0098
Cash flow/debt	0,5212
Cash flow/interest	0,9784
Cash-to-capital ratio	0,0427
Equity beta	0,0183
Industry classification	0,6235
Hedging of macroeconomic risk by the use of derivates	0,0381

Table 4.19 Whites Heteroscedasticity test

## 5 Analysis

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*This chapter analyzes the results from the empirical study to be able to answer the stated question in chapter six. This chapter begins with a presentation of the results and continues with an analysis of the results in connection to the theoretical framework that has been presented in chapter three.*

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### 5.1 Analysis of the empirical findings

The tables presented in chapter four and in the appendix show large differences between the two different groups. Corporations hedging macroeconomic risk by the use of derivatives show a larger concentration of observations from investment grade ratings and above. The corporations not conducting hedging of macroeconomic risk by the use of derivatives show a larger spread, but more observations fall under the line of investment grade ratings. Also, the group using derivative contracts has the strongest credit rating (AAA) whilst the group that do not use derivative contract has the weakest (CCC+). The average credit rating attained by corporations conducting hedging of macroeconomic risk by the use of derivatives is BBB, implying an investment grade rating, whilst corporations not conducting hedging of macroeconomic risk by the use of derivatives attain on average a BB+ rating, implying a non investment grade rating. Corporations within the group that hedge macroeconomic risk by the use of derivatives also has on average stronger EBITDA-to-interest ratio, EBIT-to-interest ratio, profit margin, operating margin and at the same time, less leverage. The group that do not use derivative contracts are thus more leveraged, leading to higher interest expense which will lower their cash holdings as table 4.11 confirms, where the group that do hedge macroeconomic risk by the use of derivative contracts has higher cash to capital ratios.

Again, the empirical findings shows that on average, corporations that conduct hedging of macroeconomic risk by the use of derivatives are superior in every aspect included, except return on assets, than the corporations not conducting hedging of macroeconomic risk by the use of derivatives. However, noticeable is that the corporations that do not conduct hedging of macroeconomic risk are significantly smaller in size, where size is measured as absolute values of EBITDA and EBIT.

Directing attention to Table 4.6, enlightening that a large portion of corporations not hedging macroeconomic risk by the use of derivatives have negative interest coverage ratios, implying that they cannot pay their interest in due time, indicating that these corporations are in financial distress, which should imply a lower corporate credit rating. When added to the equation that corporations not conducting hedging of macroeconomic risk by the use of derivatives are on average more leveraged, it indicates that these corporations will on average have a harder time meeting debt obligations and interest expenses. Further, the negative interest coverage ratios and the higher level of leverage alongside lower operating and profit margins, indicates that these corporations have less cash available to invest in future positive NPV projects since the funds left after tight margins goes to service relatively larger portions of debt and interest. This indicates that these corporations are suffering from underinvestment; since their interest coverage is negative they cannot afford to invest at a desired rate. The incentive for these corporations to set aside funds for hedging purposes could therefore be small since that capital is wanted to invest in projects that lead to the generation of cash flows that increases and improves their interest coverage ratios.

When analyzing the empirical results it is apparent that the individual credit rating observations of the group that do hedge macroeconomic risk by the use of derivative are for a number of observations not high and consequently below the investment grade threshold. One explanation for this is that these corporations may conduct hedging of macroeconomic risk by the use of derivatives, but they may not conduct it properly and therefore not attain the desired results. These observations could affect our results since if their conductance of hedging is not done properly it means that these corporations will not achieve the desired impact on the volatility of their cash flows and thus their credit rating. Also, the differences between the two groups concerning investment grade ratings implies that corporations not conducting hedging of macroeconomic risk have on average non investment grade ratings; they have more expensive conditions attained by the capital markets due to the higher default probability associated with non investment grade ratings. The research further shows that on average, corporations conducting hedging of macroeconomic risk by the use of derivatives are superior in every aspect included in the thesis except return on assets. This suggests that corporations that hedge macroeconomic risk by the use of derivatives are on average more profitable, less leveraged, more liquid, and exposed to less systematic risk and have stronger cash flow adequacy.

In addition to these mentioned findings, the regression analysis shows that hedging of macroeconomic risk by the use of derivatives has a significant effect on the credit rating of a firm. The regression analysis describes 60,8% of the credit rating of a firm and shows that a number of variables have a significant effect on the credit rating of a firm. These variables are return on assets, debt-to-capital ratio, cash-to-capital ratio, equity beta and hedging of macroeconomic risk by the use of derivatives.

The first four variables are in line with previous research that suggests that profitability, leverage, liquidity and systematic risk have an effect on the credit rating of a firm. The significance of some of these variables can be explained by their connection to each other, a connection that the level of autocorrelation, shown in table 4.18, testaments to. Leverage and systematic risk has a clear connection since leverage increases the risk taken by equity investors. The more debt a corporation adds to its balance sheet, the more subordinated equity holders would become. In the case of default, the value left for equity holders once debt claims have been settled decreases as leverage increases. The equity investors that invest capital in highly leverage firms are aware of this and would thus require higher returns on their investments, in order to compensate for the higher risk taken. This increase in the required return of investors would be an effect of the increase in equity beta, which increases the cost of equity, due to the increases in risk associated with higher leverage.

Profitability is found in previous research to be significantly affecting corporate credit ratings. However, our study suggests that return on assets, not the other profitability measures has a significant effect on the credit rating of a firm. The interesting fact is that return on assets is the only financial metric where corporations not conducting hedging of macroeconomic risk has superior average values. However, the corporations included in the group that do not hedge macroeconomic risk have a higher concentration of consumer service firms than the group who does hedge, as shown in graph 4.2 and 4.4. This can explain why return on assets is on average higher for the group that do not hedge macroeconomic risk by the use of derivatives; these corporations are more concentrated to the consumer service industry leading to less tangible assets that, all else being equal, increases the percentage return on those assets.

That cash-to-capital ratio is found to have a significant effect on the credit rating of a firm can be explained with previous research and is also in line with practitioners guidelines. As

explained in chapter three, when assessing the creditworthiness of a firm, agencies assess the firm's ability to meet debt obligations and interest payments as they come due. The payment of debt obligations and interest expenses is made with cash, not accounting adjusted earnings. The cash ratio thus becomes important in a credit rating assessment and therefore found to be significant. Even if a corporation shows large incomes on their income statement or profit and loss account, it does not necessarily mean that they have enough cash freed up in the organization to pay debt obligations as they come due. Cash is therefore an important aspect and shown to be significant due to its relevancy when it comes to debt payments.

Finally, the regression analysis shows that our defined hedging of macroeconomic risk variable is found to significantly affect the credit rating of firms listed on the NYSE. Although, the determination level of the analysis along with the limited number of companies included in the analysis, limits our ability to generalize our results over the entire population and make widespread conclusions. The determination coefficient is deemed as insufficiently high for generalizing purposes and the restricted numbers of companies included in the research limits the generalizing power of this thesis. This renders the conclusion that the results found to be significant does not attach itself with enough explanatory power to generalize and make widespread conclusions. The results thus only offer an indication that the proposed relationship between hedging of macroeconomic risk by the use of derivatives and corporate credit ratings might exist.

## **5.2 Summary of the analysis**

It is found through the regression analysis that hedging of macroeconomic risk by the use of derivatives along with additional variables has a significant effect on the credit rating of the firm. Although, the significance shown in the regression analysis gives an indication that there is a connection between hedging of macroeconomic risk by the use of derivatives and the credit rating of a firm. However, the low sample of companies included in the thesis and the insufficient level of determination for generalizing purposes cannot be neglected and must be considered as a factor dampening the generalization power of this research.

## **6 Discussion and conclusion**

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*In this chapter we will first present our own reflections in forms of a discussion of the research results. We will then give a conclusion to our results where we answer the stipulated research question and either accept or reject the stated hypotheses in chapter one. We will then present suggestion for future research.*

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### **6.1 Discussion**

Hedging of macroeconomic risk by the use of derivatives is, as mentioned in chapter four and five, found by the regression analysis to have a significant effect on the credit rating of firms listed on NYSE. This suggests that the hypothesis stated in chapter one is valid and accepted. The result becomes hard to generalize and conclude when adding the insufficient level of determination along with the low sample of corporations included. The results can thus not be generalized but do give us an indication that the proposed relationship might exist. The results are hence subject for discussion of relevant areas that can increase the explanatory power of this research.

#### **6.1.1 The size difference**

The size difference can have a large effect on the comparison between the two different groups. The corporations that are hedging macroeconomic risk by the use of derivatives, shows both an average higher credit rating and larger size measured in terms of EBITDA and EBIT than corporations that do not hedge macroeconomic risk by the use of derivatives. The corporations that hedge are larger in size and therefore may be further away from the bankruptcy line than corporations that do not hedge macroeconomic risk by the use of derivatives. This gives an indication that corporations may hedge, until one point where they cannot afford it because bankruptcy is moving closer. They thus impede hedging because they cannot afford it which explains why the regression analysis shows a relationship between hedging of macroeconomic risk by the use of derivatives and the credit rating of a firm.

Also, the corporations that do not hedge macroeconomic risk by the use of derivatives show on average higher levels of leverage along with lower EBITDA and EBIT levels while holding lower cash in relation to capital. These corporations, being more leveraged and showing lower levels of incomes thus suffers more from relatively larger interest expenses. Since the level of cash is lower, these corporations can have difficulties finding attractive debt agreements on the capital market since banks often require covenants in the form of certain cash levels. These corporations thus will have higher spread on their cost of debt and thus pay more in interest expenses. This evil spiral that appears means that effectively these corporations might not afford to hedge macroeconomic risk by the use of derivatives and thus, alongside all of these negatives also have to bear with macroeconomic fluctuations, adding on to the spiral.

### **6.1.2 Is risk management affordable?**

Hedging of macroeconomic risk by the use of derivatives is attached to costs associated with the hedging contracts. Since the corporations that do not conduct hedging of macroeconomic risk by the use of derivatives have on average, lower income levels and profit margins, they might not afford the costs associated with these contracts. The lower levels of income and margins that leads to inability to cover the costs associated with hedging, could explain why hedging of macroeconomic risk is shown to have a significant effect on credit rating.

This stems from bad profitability and high levels of debt and interest expenses, which are part of the criteria, looked at by rating agencies. Hence, the corporations that do not hedge macroeconomic risk by the use of derivatives do not do so based on the same aspect as why they have on average a weaker credit rating, their business do not allow them a good credit rating nor the funds to cover the costs associated with conducting hedging of macroeconomic risk by the use of derivatives.

Corporations must also have the right knowledge in order to conduct risk management properly and thus reduce the volatility of cash flows by mitigating the adverse effects of fluctuations in macroeconomic variables. This knowledge or hedging know-how could come at a price that is too expensive for the smaller corporations to afford. The corporations not conducting hedging of macroeconomic risk by the use of derivatives are, as shown in chapter

four, smaller in terms of EBITDA and EBIT, but more leveraged. The corporations not conducting hedging of macroeconomic risk by the use of derivatives also show that they on average have lower cash holdings. This means that these corporations, on average, have less financial flexibility, where the smaller income levels must cover relatively larger debt levels. These corporations thus, could be more limited to use funds to acquire hedging expertise since their funds would go to service the leverage, which must be considered priority over acquiring risk management personnel. Hence, this could be a contributing factor to why corporations not conducting hedging of macroeconomic risk by the use of derivatives has on average lower credit ratings; they cannot afford to acquire the knowledge necessary to initiate a correctly formed risk management program.

### **6.1.3 The conflict of interest**

Corporations being rated are customers to the credit agencies which could affect the objectivity of these rating agencies. A rating agency could be resistant to lower a credit rating for a major customer from fear of losing business, since this customer could try to attain a better credit rating from one of the other rating agencies. The corporations in our research that do hedge macroeconomic risk by the use of derivatives show on average higher level of EBITDA and EBIT alongside lower levels of leverage, meaning that they have more funds available for various investments. The higher level of funds available in these corporations could be an incentive for rating agencies not to reduce these corporations credit rating, even when justified, in order not to lose a big client.

Since the corporations not conducting hedging of macroeconomic risk by the use of derivatives has on average smaller levels of cash and incomes, they may not be attractive customers for the rating agencies and thus can attain a justified credit rating that is ultimately low. However, larger clients could attain higher credit ratings than justified on the premises that they are a large income source for the rating agencies, a large income source that the agencies are afraid of losing to competitors. This can have a large effect on our result and could explain why the hedging variable is found to be significant, since it could lead to unjustified high credit ratings for the corporations conducting hedging of macroeconomic risk by the use of derivatives simply because they have more funds to use for credit rating purposes.



#### **6.1.4 Irrelevance of risk management**

Corporations not conducting hedging of macroeconomic risk by the use of derivatives may simply not do so because they deem it unnecessary. They might deem international parity conditions to be valid and therefore a change in one macroeconomic variable would be offset by a development in another or they might deem changes today to be offset by opposite changes tomorrow. In connection to our results, this suggests that smaller corporations, that might not afford the hedging know-how, does not have the sufficient knowledge regarding risk management and therefore are not aware of the outlined theory regarding why they should hedge. They therefore do not hedge, deeming it unnecessary, and as a result, attain a lower credit rating because they do not mitigate the adverse affect on cash flows by fluctuations in macroeconomic variables.

#### **6.1.5 Are corporations not hedging macroeconomic risk by the use of derivative unaware of their exposure?**

One reason behind corporations not conducting hedging of macroeconomic risk could be that the corporations are unaware of their exposure. Again, since the corporations that do not hedge macroeconomic risk by the use of derivatives are smaller in terms of income levels, they might lack the ability to attain the relevant knowledge regarding risk management. Therefore these corporations might lack the personnel to identify exposures and act accordingly to reduce adverse affects from such exposure. This affects our result since these corporations would attain a lower credit rating being more exposed than corporations actively trying to reduce such exposure, simply because they are unaware of the exposures existence.

#### **6.1.6 The exclusion of non-financial variables**

As stated in chapter three, management quality has an evident impact on the performance of a firm. Management can affect the financials of the corporations that also impact the credit rating. Therefore, credit ratings are affected by management and the degree to which they affect credit quality. However, the guideline is that the management quality cannot raise a credit grade, only lower one if the management quality is considered poor. (Bilardello &

Ganguin, 2005) By not assessing this management factor, important information might be missed which has an effect on our result and could contribute to our imitating ability to generalize our results. .

Every company operates within a country, which has its own laws and regulations which have an effect on the ability for a firm to operate efficiently and thereby have an effect on credit rating. Every company also operates in an industry and every industry has its own characteristics and specific risks that affect the performance of a company which in turn affects its ability to generate cash flows to service debt. Thus, industry characteristics have an evident effect on credit rating and in our regression analysis we accounted for industry by giving re-code each industry giving them a number value from 1 to 7. By including this variable, the loss of information from not including other non-financial variables is mitigated.

#### **6.1.7 The impact of the financial crisis**

The financial crisis that evidently consumed most of the financial year 2008 will have a major impact on our thesis. Although it is hard to state how big effect this crisis have, it is a factor that has to be recognized to have an impact on our research. The financial crisis will impact the studied observations in a way that makes the variables included in the statistical research deviate from their normal distribution. This means that the results from our study might not be generalized for the future, since it is not conducted under normal macroeconomic circumstances.

#### **6.1.8 The non-response**

As stated in chapter two we are only focusing on the US market and especially corporations deemed as corporates by S&P that are listed on NYSE. Since there is approximately 3600 corporations listed on NYSE and we only included 91 corporations there is a significant number of corporations that are not examined because they did not fit our stated criteria. The number of corporations not included would most probably have an effect on this thesis. However, the purpose of the thesis was to investigate if hedging of macroeconomic risk by

the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. This stated purpose limits the number of corporations that can be included in this thesis.

#### **6.1.9 Does the wide range of industries affect the results?**

Following the guidelines of Moody's, ([www.moody.com](http://www.moody.com)) the research could have been focused on specific industries that are to a high extent connected to the macro economy, like for instance commodity industries. This might have increased our ability to generalize our results and given us a more coherent analysis. However, we argue that all industries are subject to fluctuations in macroeconomic risk, some to a more extent than others, but no industry should be excluded in order to capture a satisfying picture of reality.

#### **6.1.10 Can the re-coding of credit ratings affect the results**

The re-coding of the various credit ratings into numbers can affect the results of the regression analysis. When recoding, we assume that all credit ratings have an equal distance for moving upwards or downwards in the credit rating hierarchy. This means that we assume that it is equally hard to move from AA to AAA rating as it is to move from BB+ to BBB rating. It is on our opinion not so because evidently it would be relatively harder to move from a non investment grade to investment grade rating than moving between various ratings within investment grade ratings. This therefore could have a large impact on our results and reduces the generalizing power of this thesis.

#### **6.1.11 Is the effect of hedging implicitly included in the other explanatory variables?**

As explained above, hedging of macroeconomic risk, when performed correctly, will reduce the volatility of cash flows. Since cash flows is one of the variables included as determinants of credit ratings, both by the academic and practitioner world, one can argue that the effect of hedging is implicitly included in the determination variables. This means that it is possible

that rating agencies capture the effect of hedging of macroeconomic risk by the use of derivatives, via the financial variables assessed when conducting a credit rating. As shown in chapter four, the level of autocorrelation between the explanatory variables also suggests that they are interdependent, which further adds to this argument. However, even if the effect of hedging is implicitly included in the explanatory variables, the explicit highlighting of hedging of macroeconomic risk and its effect on credit rating would help corporations stipulate policies regarding macroeconomic risk management and its connection to credit rating. We therefore deem it necessary to track the connection between the two entities, even if the effect is already included in the explanatory variables.

#### **6.1.12 Who are we to say what rating agencies should look at? – After all, credit ratings are their invention**

A credit rating is assessed and given by the rating agencies. It is therefore valid to say that the rating agencies can include variables of their liking in the assessment. However, the investigation of hedging of macroeconomic risk and its effect on credit rating can be used as a tool for corporations in order to improve their credit rating. Even if rating agencies do not consider hedging of macroeconomic risk when they determine a credit rating, the effect of proper risk management would be acknowledged in the financial variables included, such as cash flows. However, corporations may not be aware of how to improve cash flows and by highlighting hedging of macroeconomic risk by the use of derivatives and its effect on credit rating it can give an indication to corporations that proper management of macroeconomic risk by the use of derivatives may have an effect on their credit rating, by reducing the volatility of cash flows.

### **6.3 Conclusion**

The purpose of this thesis was to examine if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listed on NYSE. We saw evident differences between the two groups when we compared their different ratios taken from earlier research. In order to achieve the purpose of our thesis we tested our

depending variable, credit rating to our explanatory variables explained in chapter four, to see if hedging of macroeconomic risk by the use of derivative contracts had a significant effect on the credit rating of firms' listed on NYSE. The result from the regression analysis shows that hedging of macroeconomic risk by the use of derivative contracts has a significant effect on the credit rating of a firm, at a explanatory power of 60,8%.

Due to limitations in the number of companies included and an insufficiently high determination coefficient for generalizing purposes, it is hard to generalize the results and give a formative answer to our stated research question; Does hedging of macroeconomic risk by the use of derivative contracts significantly affect the credit rating of corporations listed on the New York Stock Exchange? However, the significance of the defined hedging of macroeconomic risk by the use of derivatives variable the regression analysis give us an indication that hedging of macroeconomic risk by the use of derivative contracts might have an effect on the credit rating of a firm listed on NYSE. This indication however, is not deemed enough to accept our stated hypothesis, nor is the evidence enough to reject it, which renders the conclusion that we cannot with certainty, accept nor reject our stated hypothesis.

### **6.3.1 Corporate policy conclusion**

Due to our results, we cannot with certainty state if hedging of macroeconomic risk by the use of derivatives has an effect on the credit rating on the firm. What we can say is that our thesis gives an indication that this relationship might exist. Being that this thesis is written from the perspective of corporations and therefore give corporations insight in how they can improve their credit rating, the policy conclusion is that, corporations might be able to improve corporate credit rating by mitigating adverse effect from macroeconomic variables and thus reduce the volatility of cash flows by correctly conducting hedging of macroeconomic risk by the use of derivatives. However, this policy conclusion is subject for further research since we cannot determine the connection between hedging of macroeconomic risk by the use of derivatives and corporate credit ratings with sufficient certainty.

## **6.4 Further research proposal**

Since the results of this thesis does not give a clear answer to if hedging of macroeconomic risk by the use of derivative contracts significantly affects the credit rating of corporations listen on NYSE, we suggest a more extended quantitative research covering several years or a case study covering one or more firms trying to affect their credit rating by the use of derivative contracts.

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## **7.1 Annual reports**

3M Co.

ABB Ltd.

Actuant Corp.

AGCO Corp.

American Greetings Corp.

Amerigroup Corp.

AmerisourceBergen Corp.

Ametek, Inc.

AMN Healthcare Services, Inc.

Amphenol Corp.  
Analog Devices, Inc.  
American Express Co.  
Vulcan Materials, Inc.  
Baker Hughes, Inc.  
Baldor Electric Corp.  
Ball Corp.  
Bally Technologies, Inc.  
BCE, Inc.  
Belden, Inc.  
Belo Corp.  
Benchmark Electronics, Inc.  
Best Buy Co. Inc.  
Big Lots, Inc.  
BJ Services Co.  
Blackrock, Inc.  
Boardwalk Pipeline Partners L.P.  
BorgWarner, Inc.  
Bowne & Co. Inc.  
Brinker International, Inc.  
Brinks Co.  
Bristow Group, Inc.  
Brookfield Properties Corp.  
Brown Shoe Co. Inc.  
Burger King Holdings, Inc.  
Cabot Corp.  
Campbell Soup Co.  
Canadian Pacific Railway Co.  
Canon, Inc.  
Cardinal Health, Inc.  
Eastman Kodak Co.  
Harley-Davidson, Inc.  
Kellogg Co.  
Landry's Restaurants, Inc.

Liz Claiborne, Inc.  
Marriott International, Inc.  
Media General, Inc.  
MetroPCS Communications, Inc.  
MGM Mirage  
Mueller Water Products, Inc.  
NBTY, Inc.  
NCR Corp.  
New York Times Co.  
OMNOVA Solutions, Inc.  
Orbitz Worldwide, Inc.  
Polypore International, Inc.  
Praxair, Inc.  
Procter & Gamble Co.  
Quest Diagnostics, Inc.  
Quicksilver Resources, Inc.  
Rite Aid Corp.  
Smithfield Foods, Inc.  
Standard Pacific Corp.  
Stanley Black and Decker, Inc.  
Steinway Musical Instruments, Inc.  
Stone Energy Corp.  
Taiwan Semiconductor Manufacturing Co. Ltd.  
Target Corp.  
Teck Resources Ltd.  
Teekay Tankers Ltd.  
Telecom Corp. of New Zealand Ltd.  
UDR Inc.  
United Parcel Service, Inc.  
Boston Scientific Corp.  
United States Steel Corp.  
United Technologies Corp.  
Universal Health Services, Inc.  
USEC, Inc.

USG Corp.  
V.F. Corp.  
Vail Resorts, Inc.  
Valmont Industries, Inc.  
VeriFone, Inc.  
Verizon Communications, Inc.  
W.W. Grainger, Inc.  
Walgreen Co.  
Wal-Mart Stores, Inc  
Washington Post Co.  
Wimm-Bill-Dann Foods OJSC  
Xerox Corp.  
YUM! Brands, Inc.  
Zimmer Holdings, Inc.

## 8 Appendix

### 8.1 Appendix 1 – Tables of corporations conducting hedging of macroeconomic risk by the use of derivatives

Profitability	ROE	ROA	Profit margin	Operating margin
3M Co.	28%	12%	14%	22%
ABB Ltd.	23%	8%	9%	13%
American Express Co.	17%	6%	13%	27%
AMN healthcare services, Inc.	-54%	4%	-16%	4%
Amphenol Corp.	21%	10%	11%	17%
Analog devices, Inc.	13%	8%	16%	21%
Baker hughes, Inc.	6%	5%	4%	9%
Baldor electric Corp.	7%	4%	4%	12%
Ball Corp.	29%	6%	5%	9%
BCE, Inc.	10%	6%	10%	20%
Blackrock, Inc.	5%	1%	19%	32%
Boardwalk Pipeline Partners L.P.	5%	3%	18%	33%
BorgWarner, Inc.	1%	1%	1%	1%
Boston scientific Corp.	7%	4%	5%	8%
Bristow group, Inc.	9%	4%	10%	13%
Brookfield Properties Corp.	6%	3%	12%	32%
Brown shoe Co. Inc.	2%	3%	0%	2%
Burger king Holdings, Inc.	21%	8%	8%	13%
Cabot Corp.	-4%	2%	-2%	4%
Campbell Soup Co.	78%	14%	11%	18%
Canadian Pacific Railway Co.	10%	4%	14%	22%
Canon, Inc.	5%	4%	4%	7%
Cardinal Health, Inc.	15%	6%	1%	2%
Eastman Kodak Co.	-49%	1%	-3%	2%
Harley-Davidson, Inc.	3%	3%	-1%	9%
Kellogg Co.	65%	12%	10%	17%
Landry's Restaurants, Inc.	-3%	4%	-1%	10%
Liz Claiborne, Inc.	-81%	-5%	-10%	-5%
Marriott International, Inc.	-27%	0%	-3%	0%
Media General, Inc.	-26%	3%	-5%	8%
MetroPCS Communications, Inc.	8%	5%	5%	15%
Mueller Water Products, Inc.	-91%	0%	-44%	0%
NBTY, Inc.	19%	11%	8%	13%
NCR Corp.	-7%	2%	-1%	3%
New York Times Co.	0%	4%	1%	8%
OMNOVA Solutions, Inc.	120%	8%	5%	6%
Orbitz Worldwide, Inc.	-119%	3%	-46%	8%

Polypore International, Inc.	-35%	4%	-23%	18%
Praxair, Inc.	27%	7%	14%	18%
Procter & Gamble Co.	18%	8%	16%	21%
Quest Diagnostics, Inc.	19%	10%	10%	18%
Quicksilver Resources, Inc.	-61%	-9%	-67%	-73%
Smithfield Foods, Inc.	-6%	0%	-2%	0%
Stanley Black and Decker, Inc.	12%	5%	6%	10%
Steinway Musical Instruments, Inc.	3%	2%	2%	5%
Stone Energy Corp.	-46%	-11%	-30%	-43%
Taiwan Semiconductor Manufacturing Co. Ltd.	18%	10%	30%	31%
Target Corp.	17%	7%	4%	7%
Teck Resources Ltd.	14%	5%	24%	32%
Teekay Tankers Ltd.	24%	5%	34%	37%
Telecom Corp. of New Zealand Ltd.	18%	6%	9%	12%
UDR Inc.	-6%	0%	-15%	6%
United Parcel Service, Inc.	30%	8%	5%	9%
United States Steel Corp.	-29%	-7%	-13%	-15%
United Technologies Corp.	21%	8%	7%	14%
Universal Health Services, Inc.	16%	8%	5%	10%
USG Corp.	-63%	-2%	-24%	-5%
Walgreen Co.	15%	9%	3%	6%
Wal-Mart Stores, Inc	21%	9%	4%	6%
VeriFone, Inc.	224%	4%	6%	7%
Verizon Communications, Inc.	9%	6%	3%	18%
Vulcan Materials, Inc.	0%	2%	0%	4%
Xerox Corp.	7%	3%	3%	7%
YUM! Brands, Inc.	234%	15%	10%	15%
Zimmer Holdings, Inc.	13%	10%	18%	28%

Table 4.2 Profitability

<b>Leverage</b>	<b>Debt-to-equity</b>	<b>Debt-to-capital</b>
3M Co.	1,13	0,53
ABB Ltd.	1,52	0,6
American Express Co.	2,19	0,69
AMN healthcare services, Inc.	0,38	0,28
Amphenol Corp.	0,56	0,36
Analog devices, Inc.	0,15	0,13
Baker hughes, Inc.	0,57	0,36
Baldor electric Corp.	1,87	0,65
Ball Corp.	3,1	0,76
BCE, Inc.	1,24	0,55
Blackrock, Inc.	0,47	0,32
Boardwalk Pipeline Partners L.P.	0,96	0,49
BorgWarner, Inc.	1,2	0,55
Boston scientific Corp.	0,25	0,2
Bristow group, Inc.	0,59	0,37
Brookfield Properties Corp.	3,24	0,76

Brown shoe Co. Inc.	0,44	0,3
Burger king Holdings, Inc.	0,91	0,48
Cabot Corp.	1,36	0,58
Campbell Soup Co.	7,32	0,88
Canadian Pacific Railway Co.	1,58	0,61
Canon, Inc.	0,43	0,3
Cardinal Health, Inc.	0,24	0,19
Eastman Kodak Co.	1,24	0,55
Harley-Davidson, Inc.	2,67	0,73
Kellogg Co.	3,37	0,77
Landry's Restaurants, Inc.	4,62	0,82
Liz Claiborne, Inc.	6,42	0,87
Marriott International, Inc.	1,67	0,63
Media General, Inc.	4,68	0,82
MetroPCS Communications, Inc.	2,23	0,69
Mueller Water Products, Inc.	2,99	0,75
NBTY, Inc.	0,42	0,3
NCR Corp.	0,03	0,03
New York Times Co.	4,11	0,8
OMNOVA Solutions, Inc.	21,38	0,96
Orbitz Worldwide, Inc.	8,95	0,9
Polypore International, Inc.	2,83	0,74
Praxair, Inc.	1,26	0,56
Procter & Gamble Co.	0,43	0,3
Quest Diagnostics, Inc.	0,86	0,46
Quicksilver Resources, Inc.	2,05	0,67
Smithfield Foods, Inc.	1,81	0,64
Stanley Black and Decker, Inc.	1,4	0,58
Steinway Musical Instruments, Inc.	1,29	0,56
Stone Energy Corp.	1,68	0,63
Taiwan Semiconductor Manufacturing Co. Ltd.	0,17	0,15
Target Corp.	1,9	0,66
Teck Resources Ltd.	0,91	0,48
Teekay Tankers Ltd.	2,53	0,72
Telecom Corp. of New Zealand Ltd.	0,84	0,46
UDR Inc.	2,18	0,69
United Parcel Service, Inc.	1,25	0,56
United States Steel Corp.	0,72	0,42
United Technologies Corp.	0,49	0,33
Universal Health Services, Inc.	0,62	0,38
USG Corp.	3,41	0,77
Walgreen Co.	0,18	0,15
Wal-Mart Stores, Inc	0,64	0,39
VeriFone, Inc.	14,55	0,94
Verizon Communications, Inc.	1,49	0,6
Vulcan Materials, Inc.	0,48	0,32
Xerox Corp.	2,41	0,71



YUM! Brands, Inc.	5,97	0,86
Zimmer Holdings, Inc.	0,38	0,28

Table 4.3 Leverage

<b>Cash flow adequacy</b>	<b>Cash flow/Debt</b>	<b>Cash flow/Interest</b>
3M Co.	0,34	22,56
ABB Ltd.	0,19	31,73
American Express Co.	0,19	6,92
AMN healthcare services, Inc.	0,91	9,24
Amphenol Corp.	0,77	14,69
Analog devices, Inc.	1,54	143,14
Baker hughes, Inc.	0,3	9,47
Baldor electric Corp.	0,12	1,92
Ball Corp.	0,11	4,78
BCE, Inc.	0,24	6,99
Blackrock, Inc.	0,25	21,21
Boardwalk Pipeline Partners L.P.	0,13	6,94
BorgWarner, Inc.	0,13	6,14
Boston scientific Corp.	1,02	11,55
Bristow group, Inc.	0,26	5,66
Brookfield Properties Corp.	0,04	0,82
Brown shoe Co. Inc.	0,48	7,72
Burger king Holdings, Inc.	0,34	5,31
Cabot Corp.	0,18	9,17
Campbell Soup Co.	0,23	11,27
Canadian Pacific Railway Co.	0,07	2,62
Canon, Inc.	0,52	1615
Cardinal Health, Inc.	1,09	10,47
Eastman Kodak Co.	-0,11	-1,26
Harley-Davidson, Inc.	0,1	118,39
Kellogg Co.	0,34	5,32
Landry's Restaurants, Inc.	0,05	4,15
Liz Claiborne, Inc.	0,15	51,73
Marriott International, Inc.	0,38	5,33
Media General, Inc.	0,05	0,78
MetroPCS Communications, Inc.	0,18	3,33
Mueller Water Products, Inc.	0,16	54,87
NBTY, Inc.	0,4	5,45
NCR Corp.	14,87	10,14
New York Times Co.	0,1	63,37
OMNOVA Solutions, Inc.	0,23	9,16
Orbitz Worldwide, Inc.	0,09	1,67
Polypore International, Inc.	0,07	0,87
Praxair, Inc.	0,43	10,96
Procter & Gamble Co.	0,57	11,68
Quest Diagnostics, Inc.	0,32	5,38
Quicksilver Resources, Inc.	0,25	5,61

Smithfield Foods, Inc.	0,07	1,59
Stanley Black and Decker, Inc.	0,19	8,47
Steinway Musical Instruments, Inc.	0,09	2,01
Stone Energy Corp.	0,88	23,77
Taiwan Semiconductor Manufacturing Co. Ltd.	1,87	203,92
Target Corp.	0,2	8,32
Teck Resources Ltd.	0,37	19,74
Teekay Tankers Ltd.	0,19	2,03
Telecom Corp. of New Zealand Ltd.	0,68	5,72
UDR Inc.	0,07	1,45
United Parcel Service, Inc.	0,55	11,89
United States Steel Corp.	-0,02	-0,38
United Technologies Corp.	0,55	7,76
Universal Health Services, Inc.	0,56	12,63
USG Corp.	0,04	0,84
Walgreen Co.	1,75	49,76
Wal-Mart Stores, Inc	0,63	12,48
VeriFone, Inc.	0,54	20
Verizon Communications, Inc.	0,51	17,36
Vulcan Materials, Inc.	0,43	6,76
Xerox Corp.	0,13	5,34
YUM! Brands, Inc.	0,23	8,73
Zimmer Holdings, Inc.	0,52	19,87

Table 4.4 Cash flow adequacy

<b>Liquidity and Systematic risk</b>	<b>Cash-to-capital</b>	<b>Equity beta</b>
3M Co.	0,11	0,79
ABB Ltd.	0,27	1,54
American Express Co.	0,05	1,015
AMN healthcare services, Inc.	0,07	1,34
Amphenol Corp.	0,2	1,29
Analog devices, Inc.	0,75	1,08
Baker hughes, Inc.	0,14	1,45
Baldor electric Corp.	0,01	2,16
Ball Corp.	0,03	0,59
BCE, Inc.	0,02	1,09
Blackrock, Inc.	0,28	1,55
Boardwalk Pipeline Partners L.P.	0,01	0,5
BorgWarner, Inc.	0,07	1,49
Boston scientific Corp.	0,07	0,92
Bristow group, Inc.	0,06	1,4
Brookfield Properties Corp.	0,01	2,04
Brown shoe Co. Inc.	0,16	2,27
Burger king Holdings, Inc.	0,08	0,46
Cabot Corp.	0,09	1,61
Campbell Soup Co.	0,02	3,9

Canadian Pacific Railway Co.	0,05	1,34
Canon, Inc.	0,21	1,05
Cardinal Health, Inc.	0,16	0,89
Eastman Kodak Co.	0,94	1,48
Harley-Davidson, Inc.	0,15	2,34
Kellogg Co.	0,05	0,5
Landry's Restaurants, Inc.	0,05	2,13
Liz Claiborne, Inc.	0,01	1,99
Marriott International, Inc.	0,03	1,51
Media General, Inc.	0,04	2,9
MetroPCS Communications, Inc.	0,16	0,72
Mueller Water Products, Inc.	0,07	2,47
NBTY, Inc.	0,1	1,65
NCR Corp.	0,99	1,5
New York Times Co.	0,01	1,67
OMNOVA Solutions, Inc.	0,1	2,64
Orbitz Worldwide, Inc.	0,07	2,75
Polypore International, Inc.	0,11	2,69
Praxair, Inc.	0	0,88
Procter & Gamble Co.	0,04	0,54
Quest Diagnostics, Inc.	0,08	0,47
Quicksilver Resources, Inc.	0	1,95
Smithfield Foods, Inc.	0,06	2,15
Stanley Black and Decker, Inc.	0,08	1,26
Steinway Musical Instruments, Inc.	0,15	1,44
Stone Energy Corp.	0,08	2,75
Taiwan Semiconductor Manufacturing Co. Ltd.	0,34	0,99
Target Corp.	0,05	1,04
Teck Resources Ltd.	0,08	3,96
Teekay Tankers Ltd.	0,02	1,09
Telecom Corp. of New Zealand Ltd.	0,05	1,03
UDR Inc.	0	1,38
United Parcel Service, Inc.	0,12	0,78
United States Steel Corp.	0,15	2,74
United Technologies Corp.	0,15	1
Universal Health Services, Inc.	0	1,22
USG Corp.	0,17	2,73
Walgreen Co.	0,2	0,82
Wal-Mart Stores, Inc.	0,05	0,26
VeriFone, Inc.	0,75	2,2
Verizon Communications, Inc.	0,02	0,62
Vulcan Materials, Inc.	0,13	2,08
Xerox Corp.	0,16	1,47
YUM! Brands, Inc.	0,05	1,06
Zimmer Holdings, Inc.	0,1	1,1

Table 4.5 Liquidity and systematic risk

## 8.2 Appendix 2 – Tables of corporations not conducting hedging of macroeconomic risk by the use of derivatives

<b>Profitability</b>	<b>ROE</b>	<b>ROA</b>	<b>Profit Margin</b>	<b>Operating Margin</b>
Actuant Corp.	4%	4%	2%	9%
AGCO Corp.	6%	3%	2%	4%
American Greetings Corp.	2%	5%	1%	8%
Amerigroup Corp.	16%	7%	3%	4%
AmerisourceBergen Corp.	20%	5%	1%	1%
Ametek, Inc.	14%	7%	10%	17%
Bally Technologies, Inc.	29%	14%	15%	25%
Belden, Inc.	-4%	4%	-2%	8%
Belo Corp.	-84%	5%	-18%	22%
Benchmark Electronics, Inc.	5%	3%	3%	3%
Best Buy Co. Inc.	23%	8%	3%	5%
Big Lots, Inc.	23%	13%	4%	7%
BJ Services Co.	0%	0%	0%	1%
Bowne & Co. Inc.	-8%	2%	-2%	2%
Brinker International, Inc.	18%	10%	3%	10%
Brinks Co.	52%	6%	6%	6%
MGM Mirage	-33%	1%	-22%	7%
Rite Aid Corp.	-3%	2%	-2%	1%
Standard Pacific Corp.	-3%	1%	-1%	3%
USEC, Inc.	5%	2%	3%	5%
Vail Resorts, Inc.	3%	2%	3%	6%
Valmont Industries, Inc.	21%	11%	8%	13%
Washington Post Co.	3%	3%	2%	5%
V.F. Corp.	13%	8%	6%	12%
Wimm-Bill-Dann Foods OJSC	17%	8%	5%	9%
W.W. Grainger, Inc.	21%	12%	7%	11%

Table 4.7 Profitability

<b>Leverage</b>	<b>Debt-to-equity</b>	<b>Debt-to-capital</b>
Actuant Corp.	1,1	0,52
AGCO Corp.	1,11	0,53
American Greetings Corp.	1,71	0,63
Amerigroup Corp.	1,03	0,51
AmerisourceBergen Corp.	4	0,8
Ametek, Inc.	1,07	0,52
Bally Technologies, Inc.	1,02	0,5
Belden, Inc.	1,94	0,66
Belo Corp.	21,1	0,95
Benchmark Electronics, Inc.	0,34	0,26
Best Buy Co. Inc.	2,41	0,71

Big Lots, Inc.	0,67	0,4
BJ Services Co.	0,46	0,32
Bowne & Co. Inc.	0,83	0,45
Brinker International, Inc.	2,01	0,67
Brinks Co.	2,51	0,72
MGM Mirage	4,82	0,83
Rite Aid Corp.	7,94	0,89
Standard Pacific Corp.	3,27	0,77
USEC, Inc.	1,63	0,62
Vail Resorts, Inc.	1,46	0,59
Valmont Industries, Inc.	0,66	0,4
Washington Post Co.	0,76	0,43
V.F. Corp.	0,7	0,41
Wimm-Bill-Dann Foods OJSC	1,45	0,59
W.W. Grainger, Inc.	0,72	0,42

Table 4.8 Leverage

<b>Cash flow adequacy</b>	<b>Cash flow/Debt</b>	<b>Cash flow/Interest</b>
Actuant Corp.	0,18	6,65
AGCO Corp.	0,13	15,84
American Greetings Corp.	0,08	3,2
Amerigroup Corp.	0,14	9,04
AmerisourceBergen Corp.	0,1	76,75
Ametek, Inc.	0,22	5,3
Bally Technologies, Inc.	0,32	7,42
Belden, Inc.	0,14	3,63
Belo Corp.	0,05	1,25
Benchmark Electronics, Inc.	0,33	88,33
Best Buy Co. Inc.	0,17	33,34
Big Lots, Inc.	0,59	213,06
BJ Services Co.	0,29	17,27
Bowne & Co. Inc.	0,21	7,01
Brinker International, Inc.	0,26	10,08
Brinks Co.	0,15	17,27
MGM Mirage	0,03	0,76
Rite Aid Corp.	-0,03	-0,68
Standard Pacific Corp.	0,29	8,85
USEC, Inc.	0,23	25,63
Vail Resorts, Inc.	-0,02	-0,66
Valmont Industries, Inc.	0,68	22,18
Washington Post Co.	0,29	20,69
V.F. Corp.	0,37	11,33
Wimm-Bill-Dann Foods OJSC	0,33	7,01
W.W. Grainger, Inc.	0,47	83,55

Table 4.9 Cash flow adequacy

Liquidity and Systematic risk	Cash-to-capital	Equity beta
Actuant Corp.	0,01	1,71
AGCO Corp.	0,13	1,72
American Greetings Corp.	0,04	2,3
Amerigroup Corp.	0,32	0,58
AmerisourceBergen Corp.	0,07	0,72
Ametek, Inc.	0,08	0,9
Bally Technologies, Inc.	0,08	1,74
Belden, Inc.	0,19	2,04
Belo Corp.	0	3,77
Benchmark Electronics, Inc.	0,29	1,01
Best Buy Co. Inc.	0,12	1,3
Big Lots, Inc.	0,17	1,08
BJ Services Co.	0,05	1,35
Bowne & Co. Inc.	0,05	3,55
Brinker International, Inc.	0,06	1,66
Brinks Co.	0,08	0,85
MGM Mirage	0,09	4,24
Rite Aid Corp.	0,01	2,65
Standard Pacific Corp.	0,32	2,21
USEC, Inc.	0,04	1,03
Vail Resorts, Inc.	0,03	1,64
Valmont Industries, Inc.	0,14	1,71
Washington Post Co.	0,17	0,86
V.F. Corp.	0,11	0,88
Wimm-Bill-Dann Foods OJSC	0,16	1,79
W.W. Grainger, Inc.	0,12	0,9

Table 4.10 Liquidity and systematic risk

### 8.3 Appendix 3 – Regression results

Model Summary			
	R	R Square	Std. Error of the Estimate
	,780 <sup>a</sup>	0,608	2,738

ANOVA <sup>b</sup>					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	892,065	16	63,719	8,646	,000 <sup>a</sup>
Residual	582,244	74	7,37		
Total	1474,309	90			

## 8.4 Appendix 4 – Whites-test results

<b>Whites-test</b>	
Sum squared resid	582,244
Log likelihood	-219.2599
Mean dependent var	10.27660
S.D. dependent var	3.982230
Akaike info criterion	5.026806
Schwarz criterion	5.486764

Table8.4 Whites-test