ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics

Master Thesis Accounting, Auditing and Control

Risk and reward: The impact of CEO compensation on the usage of derivatives.

The relation between managerial bonus, options, share ownership and hedging

Evidence from European firms

Name student: Asma Ouja
Student ID number: 361805

Supervisor: Dr. Michael Erkens
Second assessor: xxx

Date final version: xxx

Abstract

This study aims to test whether CEO compensation affects the usage of financial derivatives in European firms. The usage of financial derivatives for hedging purposes is measured by the total fair value of derivatives. The compensation packages of CEOs is divided in three components: cash bonus, stock options and stock ownership compensation and are measured as the total value as reported in the annual reports. For each compensation component, the effect is tested on financial derivatives usage. An initial sample of 191 European non-financial listed firms are analyzed for the period 2014 and 2015.

The main test provide evidence that CEOs holding stock options in the firm have a significant negative effect on the usage of derivatives. This evidence confirms prior research such as those of Smith and Stulz (1985) who argue that managers with higher option holdings will hedge less, since the value of the options will increase as the riskiness of the firm increases.

Furthermore, this research provides also evidence that cash bonus incentives inherent in CEO compensation packages influences CEOs to increase or decrease the usage of derivatives. Since the results show a positive and highly significant sign, it indicates that many CEOs were expecting to reach the cap in their cash bonus compensation and are therefore more risk averse and therefore use derivatives to hedge their risk exposure. Finally, this research suggests that also other firm characteristics, such as firm size and capital structure, affect hedging activities.

Keywords: Derivatives; CEO compensation; hedging

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1. Introduction

In numerous studies, executive compensation have been examined in various contexts. For example, executive compensation in the context of firm performance, principal-agent-theory and corporate governance. While the compensation of executives is closely tied to the extent of their risk taking, the relation between executive pay and risk management is not a fully clear area in the field of finance. Prior studies hypothesized and empirically investigated the link between derivatives and executive pay and show that the results are somewhat contradictory. Therefore, it is interesting to carry out a further investigation in this area.

Risk management has to do with the extent to which companies wish to control their financial risk due to price fluctuations. Covering risk to which a company is exposed to is also known as hedging. The purpose of a hedging strategy may include: minimization of real economic influences of changes on the prices of financial titles. The exposures can be divided into accounting- and economic exposures.

Depending on firms' attitude regarding risk, firms often use derivatives as a tool to manage their exposure to risk.

If we have to believe the popular press, derivatives are dangerous and responsible for numerous scandals. This is partly due to the fact that derivatives are also used for speculative purposes. Therefore firms such as Barings, Procter & Gamble, Allied Lyons, Metallgesellschaft and in the Netherlands, for example, the housing foundations such as Vestia, are not yet so long ago in the news because of big losses taken by positions in swaps, futures, options and / or futures. Although in these situations, derivatives were sometimes used unauthorized or used for speculative purposes, also firms who used these instruments correctly and rationally even reach the news in a negatively way. This is obviously not right since the use of derivatives may be valuable under the condition these derivatives are used to hedge the risk to which a company is exposed to. Therefore, the focus in this study is on the use of financial derivatives for hedging purposes.

Since the compensation of executives is among other things related to their own behavior regarding risk and executive compensation is a much-discussed topic it seems to be interesting to test the relation between the two constructs derivatives usage and CEO compensation. As Stulz (2003) explains in his study that CEO compensation contracts, which include cash bonuses, stock options and ownership stocks could be a reason for companies to use or use not risk management tools. This indicates that compensation plans may influences CEOs to increase or decrease the use of financial derivatives. Company boards, at least in principle, try to use compensation contracts to align executives' actions with company success. The idea is that CEO performance provides value to the organization.

Hence, the purpose of this master thesis is to investigate the relation between CEO compensation and the usage of financial derivatives for a sample of 191 non-financial European listed companies. More specifically, this master thesis will investigate how executive compensation affects the usage of financial derivatives in non-financial European listed firms. In this study the focus will be on the structure of executive compensation which consist of short term compensation (cash based compensation) and long term compensation (stock options and holdings). For the usage of derivatives, the focus will be on derivatives which are held by companies to hedge their risk exposure. These derivatives includes foreign exchange, interest rate, and commodity derivatives.

According to the bank of International Settlement (BIS), the notional amount of outstanding derivatives contracts was $553 trillion at end-June 2015 (BIS 2016). The purpose of a hedging strategy may include: the minimization of changes of real economic impact on the prices of financial titles. According to the Modigliani and Miller theory, it does no matter how to apply risk management. Due to the absence of capital market imperfections such as taxes, bankruptcy, transaction and information costs, this theory assumes that the capital market is irrelevant.
In practice, the market is not perfect. Due to certain capital market imperfections (taxes) and according to some theories (financial distress, underinvestment and managerial theories) hedging activities may add value to the company.
Derivatives can be used to hedge risks to which a company is exposed to or for speculation purposes. Typically, firms use derivatives to hedge their risk and if derivatives are in the right hands and are used for the purpose for which they were developed, it can be a means to a healthy risk management strategy. Depending on firms' attitude regarding risk, firms often manage their risk by reducing the volatility of cash flows which may lead to a reduce in the probability of financial distress (Berkman & Bradbury 1996; Geczy, C., Minton, B., & Schrand, C 1997; Smith & Stulz 1985). The use of derivatives also stabilize investment spending and can lead to lower tax payments by smoothing tax payments (Froot, Scharfstein, & Stein 1993; Gay & Nam 1998; Geczy et al. 1997). As a result, risk management strategies potentially increase firm value (Allayannis & Weston 2001), and if we assume the idea that CEO compensation is based on firm performance, using derivatives should increase the level of CEO compensation. However practice, such as the Ahold and Enron scandal, shows misalignment of CEO compensation and the use of derivatives. This emphasizes the consequences if CEO compensation packages are not correctly aligned with firm risk.

These scandals lead to an improvement of the accounting standards on derivatives: IFRS 7 and IAS 39. These standards are created with the purpose to improve the transparency regarding the use of derivatives. The standard *IFRS 7 Financial Instruments: Disclosures,* requires disclosure of information about the

significance of financial instruments to an entity, and the nature and extent of risks arising from those financial instruments both in qualitative and quantitative terms. *IAS 39 Financial Instruments: Recognition and Measurement,* is the standard that describes the recognition and measurement of financial instruments.

As mentioned, several studies have examined the relation between executive compensation and the use of financial derivatives. This study distinguishes itself from prior studies in two important ways. First, due to the lack of data availability in databases of derivatives usage and executive compensation from European firms, a limited number of studies examine the relation between executive compensation and derivative usage of European firms. Second, given the complex nature of derivatives, the catastrophic consequences, the rise in the usage of derivatives as discussed before and the limited but mixed evidence, it is interesting to examine the relation between executive compensation and the usage of financial derivatives. Therefore, in this study I will investigate the following research question:

RQ: Does the structure of CEO compensation pay has an effect on a firm's use of derivatives?

To answer the research question, I analyze a sample of 191 non-financial listed European companies drawn from the EuroStoxx 600 (representing the largest 600 companies in Eastern and Western Europe). The focus in this thesis is not on financial companies, because of their nature. Financial firm often deal with derivatives. The data was hand collected for the years 2014 and 2015, retrieved from the annual reports of 2015.
Data regarding the dependent variables, usage of derivatives is measured by the fair value of the total derivatives usage. Data regarding the independent variables, executive compensation, are segregated in cash compensation, stock option compensation and stock ownership compensation.

The companies included in the sample are all listed, which means that the companies are required to report according to the international financial reporting standards (*IFRS 7 Financial Instruments: Disclosures)*. IFRS requires these companies to report on the use of derivatives, report on financial risk management, and report on CEO compensation, stock- options and holdings. Therefore, all data regarding financial derivatives and executive compensation is available in the annual reports and is collected by hand. For data regarding the control variables as firm size, growth and capital structure, I consulted DataStream and is available in the databases within the Warton Research Data Service (WRDS) system. The university library is subscribed to the WRDS system so necessary data is collected from this source.

The structure of this thesis is as follows. Chapter two of this thesis describes the theory and literature review regarding executive compensation and financial derivatives with the focus on usage for hedging

purposes. In chapter three, the motivation and development of the hypotheses will be discussed. Thereafter, chapter four describes the research design and methodology of this thesis, followed by chapter five which discussed the data and methodology used for this study. In chapter six, the empirical results and the interpretation of the regression results will be discussed. Chapter seven presents the conclusion followed by the last chapter which provides the limitations of this study and recommendations for further research.

2. Theoretical background, accounting standards and literature review

This chapter provides theory, explains the accounting standards IAS 39 and IFRS 7 and discussed literature review regarding executive compensation and the usage of derivatives for hedging purpose. The first paragraph elaborates on executive compensation including the components of executive pay. The second paragraph is about financial derivatives and the types of derivatives. Paragraph 2.3 discusses the incentives of firms to hedge. Thereafter, paragraph 2.4 provides an overview of the applicable accounting standards IAS 39 and IFRS 7 and paragraph 2.5 discusses some prior empirical evidence regarding the relation between derivatives usage and executive compensation. This chapter concludes with a summary.

2.1. Executive compensation

There are several ways to motivate executives and encourage its effort in a positive way for the company. Executive compensation can be divided in two parts: short and long term pay. According to Stulz (2003), in most cases the total pay of an executive include four basic components, namely (1) base salary, (2) cash bonuses, (3) stock options and (4) ownership stocks. The short term pay of the executives covers the base salary and bonuses. These components are paid on the basis of the immediate performance of the organization. The short term pay component is usually a fully cash based executive compensation.
The long term pay covers the stock options and stock shares. The shareholders use these long term compensation components to protect the value of the organization. The long term pay component is usually non-cash based. These compensation components that form the compensation packages could be a reason for companies to use or use not risk management tools to increase firm value.

2.1.1. Base salary

The base salary is one of the short term components of executive compensation packages. This component represent a form of fixed periodic payment from an employer to an employee, which may be specified in an employment contract. The level of the base salaries are typically determined by comparing market pay rates for people performing similar work in similar industries in the same region. Salary is also determined by leveling the pay rates and salary ranges established by an individual employer. Salary is also affected by the number of people available to perform the specific job in the employer's employment locale.

2.1.2. Cash bonus

Bonus payments are in many cases provided in addition to the base salary. In contrast to the base salary, a bonus is in general variable and depends on certain criteria such as the annual turnover, the stock value or the magnitude of acquired customers.

The purpose of a bonus is to serve as an incentive for CEOs to act in the interest of shareholders. Bonuses are (often) based on the concept 'pay for performance'. It includes a reward to the executive when participation of the executive contributes to the success of the company.
Unfortunately, there is in recent times a lot of criticism on this form of compensation and especially on the level of bonus payments. Bonuses are often not related to the results. Even worse is if bonuses are related to irresponsible risks and encourage the pursuit of short-term profits.
Setting up good compensation contracts may be a means to mitigate this undesirable behavior of CEO's.

2.1.3. Stock options

Stock option is a form of equity compensation and is used to reward top management and key employees to link their interests with those of the company and other shareholders for long term. Stock options gives an employee a property right to buy a certain number of shares in a company at a predetermined share price, the exercise price, during a certain period. With this right the employee gain control of this option after working for the company for a certain period of time.
Employees who have been granted stock options hope that the share price will go up and that they will be able to "cash in" by exercising (purchasing) the stock at the lower grant price and then selling the stock at the current market price.
Like all forms of compensation, equity compensation has its advantages and disadvantages. It is clear that the benefits of offering stock options is that it encourages employees to pursue the interests of the shareholders without affecting the company's cash position. But on the other side, with options risk can get badly skewed. Stock options usually have very little downside risk for employees. When the value of shares increases, executives can make big profits with it, but when the value decreases, investors will loss while executives are no worse off than before. Consequence is that executives will focus on the share price, keeping the price upward so that options will stay "in the money". This provoked short term behavior and manipulation of accounting numbers by executives which is not in line with shareholders' interests and ultimately creates more dispersal between CEOs and shareholders.

2.1.4. Ownership stocks

Stock ownership is a form of compensation whereby the executives are compensated by holding shares in the company. Academic studies suggests that stock ownership is one of the most crucial performance driver. So, one way for CEOs to truly align the interest of CEOs with that of shareholders is to own shares instead of granting them with options for example by providing CEOs with bonuses on the condition they use the money to buy shares. In this way, CEOs will be forced to act more like owners because they have a stake in the business.

Both components, stock options and stock ownership, are covered by equity compensation. Equity compensation is a non-cash compensation that gives a company's employees equity ownership rights. The general idea for providing these compensation components, is to align the interest of shareholders with that of managers. If they have a stake in the value of the company's shares, they may try harder to drive sales, profits and other financial metrics that investors and research analysts look for in stocks. Employees who have this option are not considered stockholders and therefore do not share the same rights as shareholders.

2.2. Derivatives

Financial derivatives are investment instruments that derive their value from the value of another property, such as stocks, commodity, oil or foreign currency. The other is well known as the underlying asset in the jargon. A derivative gives the buyer the right to buy or sell something at a specified price. The value of a derivative depends on the underlying asset as the value of a stock.

Derivatives roughly have two goals: reducing risk or speculate to achieve investment earnings. In financial risk management, derivatives are often used to hedge their risk exposure in order to achieve stable profits. In this research the focus is on market risks, which includes interest rate risk, foreign currency risk and commodity risk. These risks are often hedged by the use of various types of derivatives. First, I will discuss the main types of derivatives according to IAS 39. Thereafter, I will discuss the derivatives per type of risk category.

2.2.1. Types of derivatives

Options: These derivatives give the investor the right to buy or sell a underlying asset (e.g. a share) at a certain price. The price is already fixed in advance. Options are divided into two types: call options and put options. Call options give the investor the right to buy, while put options just give the right to sell a particular underlying value. Under both options, there is a predetermined price and date by which the transaction must take place.

Futures: A future is a contractual obligation that is sealed by two parties and which refers to a "value". The value can be a package of shares, indices, bonds, currencies, commodities, etc. These type of derivatives have much in common with options. The main difference is that a futures contract entails an obligation to buy or sell and an option is a choice to buy or sell.
A future is harder to sell than an option because the price is not fixed but moves along with the underlying asset and therefore depends on the volatility of the stock market. Further, a future has no expectation value (time value) such as an option.

Forwards: Forwards and futures are very similar. Forward contracts are contractual agreements between two parties to buy a value or sell at a certain time at a certain value. However, there are two important differences between forward contracts and futures. The first difference is that forward contracts by definition are traded OTC (Over-The-Counter) and futures via derivatives exchanges, which means that forward contracts are traded by specialist desks at banks or brokers and are not freely accessible to everyone. The party is known in the case of OTC transactions. Futures on the contrary are traded via the exchange, which is accessible to everyone and with an unknown party.

Swaps: A swap is a derivative in which one party exchanges a stream of cash flow or risk against that of another party.

Caps and floors: Caps and floors are examples of interest rate instruments that operate on a similar principle as options: they provide protection against undesirable interest rate movements without completely excluding it also benefited from a favorable interest rate development.

2.2.2. Derivatives per type of risk category

Companies use the above described derivatives based on the type of risk exposure. This thesis focuses on market risk exposure which includes the risk on foreign exchange rates, interest rate and commodities. Therefore, for this study data is collected regarding the usage of financial derivatives for risk on foreign exchange rates, interest rate and commodities.

Foreign exchange rate risk: companies operating in countries with other currencies are faced with currency risks by fluctuation in exchange rates. This risk exposure may have a negative impact on the cash flows. In order to manage these risk, the company can enter into foreign exchange rate derivatives.

Interest rate risk: interest rate risk is the risk that the value of an investment will change due to a change in the interest rate level. Such changes can be hedged by the use of interest rate derivatives, such as an interest rate swap.

Commodity risk: Commodity risk is the risk that a business's financial performance or position will be adversely affected by fluctuations in the prices of commodities. The company can hedge this risk by entering a derivatives contract.

2.3. Incentives to hedge risk exposure

A general statement in the financial economics literature is that undertaking a particular activity is only valuable when the net present value of this activity is positive. Adding value to the company in this context is crucial for the viability of the company. This also applies for undertaking risk management activities. Applying these activities should contribute positively to the value of the company. If this is not the case, then it is not of value added in order to carry out these risk management activities.

A company can reduce certain financial and operational risks by carrying out various activities. A frequently asked question is whether hedging increases the value of an enterprise, and how hedging activities influences the value of the company.

The most cited financial theory concerning risk management is that of Modigliani and Miller (M&M), which claimed that risk management activities are irrelevant and not value creating. In reality, however, it appears that risk management is an important part of the business strategy.
In the literature, there are two major streams of theories that explain why managers perform risk management activities. The first theory is based on maximizing shareholder value while the second theory is based on diversification motives of owners or personal utility maximization of managers. These two streams in the literature have different implications, as hedging only in the first theory would have a positive impact on the value of the company. First, we discussed the Mogdigliani and Miller theorem. Then we went more into detail on the two main streams of risk management theories which refute this theorem.

2.3.1 Modigliani and Miller

According to the paradigm of Modigliani and Miller (1958) buying and selling of options does not create value for the company. Their research shows that an individual investors can buy the same contracts in the company and sell these contracts in order to diversify their portfolio. So anything that an enterprise can achieve by applying hedging activities can also be achieved by investors acting for their own account. As an investor it is possible to independently hedge the costs, by holding well-diversified portfolios, they do not benefit from risk management activities at the enterprise level. However, the premise of the paradigm of Modigliani and Miller is that the company has nothing to do with taxes, bankruptcy costs, transaction costs or other market imperfections. Since the market is not perfect, this argument is not valid in the real world. Within business risk management several market imperfections are already identified that cause volatility in cash flows. Imperfections include expensive external financing, taxes, costs associated with management of risk aversion and costs of financial distress. The occurrence of such market imperfections has ensured that the above theorem is often disputed. Companies can have rational reasons to hedge in the absence of perfect capital. If companies, for instance, are exposed to economic risks in an imperfect environment, they may cause additional costs. Hedging could help to reduce these

costs and therefore can be regarded as an indirectly value-creating strategy for the company. Various theories shows that hedging reduces the volatility of the cash flows of a company which, in the case of market frictions, additional enterprise value can be created. Jin and Jorion (2006) make a subdivision in two mainstreams why companies use hedging activities. The first is to maximize shareholder value. The second is diversification motives of the owner or maximizing personal wealth of the managers. These findings are discussed further below.

2.3.2 Maximizing shareholder value

The first theory is based on maximizing shareholder value. Managers within a company work in the function for the shareholders. By using hedging activities managers seek to reduce certain costs, mainly those that are caused by highly volatile cash flows, with the goal of increasing shareholder value. In the literature this theory already repeatedly examined which slid further three incentives for risk management. These three reasons rely on the abnormalities in the M&M model, namely financial distress, tax shield and underinvestment problems. Through hedging, the company can reduce the costs that accompany them, and therefore increase the market value of the company. Hereafter, the various incentives to apply risk management activities are further discussed in detail.

2.3.2.1 Costs due to financial distress

A first incentive for the use of risk management tools is to reduce the likelihood of financial distress, together with the expected costs associated with this (Mayers & Smith 1982; Smith and Stulz 1985; Stulz 1984). These are transaction costs associated with the bankruptcy, reorganize or restructure companies in financial difficulties and can be divided into two groups, namely direct and indirect costs. Direct costs can be made both consist of legal expenses during the reorganization of debt and other liquidation costs of a company in bankruptcy. On the other hand, indirect costs relate to increased costs for attracting and maintaining a relation with concerned customers, suppliers and employees. The higher costs are primarily the result of difficult negotiations, for example moving associated with fewer sales, less profit etc. Hedging can reduce the expected bankruptcy costs by reducing the volatility of cash flows (Smith and Stulz, 1985). In the literature, the leverage[1] is used as a measure of financial distress. The lower the volatility, the lower these costs and the higher the market value of the company. This is because additional profits can be distributed to shareholders.

Finally, Stulz (1996) shows that eliminating the costly left-tail outcomes is the primary objective of risk management. These results may lead to financial difficulties on the one hand and on the other hand

[1] Leverage is a measure of the degree of debt financing in a company, specifically the ratio of debt relative to equity of the company. Source: http://lexicon.ft.com/Term?term=leverage

ensures that a company is unable to carry out its investment strategies. The costs associated therewith, may have a negative impact on the value of the company in unfavorable times.

2.3.2.2 Tax motives

A second incentive for companies to carry out risk management activities resulting from potential tax benefits (Stulz 1996). There are two incentives related to taxes to hedge. Firstly, there is the possibility to reduce the expected tax at a convex tax function and second, the debt capacity and the interest subtraction may be increased.

Convexity of the valuation function

A first incentive to perform hedging activities, is created as enterprises are facing convex tax functions (Mayers & Smith 1982; Smith & Stulz 1985; Stulz 1984). In this case, hedging, by reducing the volatility of taxable income, ensures a reduction in the expected taxes. In such a way companies can spread their revenues over time. In other words, if a company makes in a given year big profits, but is in the next year limited profitable, then they will have to pay in total a lot more taxes than a company that gain average earnings each year. Therefore, volatility is very expensive for companies with tax convex functions.
In order to benefit from this advantage, it is important that the company is taxed according to a progressive income tax, so that the expected debt is a convex function of taxable income (Graham & Smith 1999). The marginal tax rate in the tax system ensures that payable taxes increase with an increase in the tax base. This implies that a company's interest to minimize the tax basis increases. They can lower or keep the level of its taxable income constant through the use of derivatives such as futures, forwards or options in order to reduce its final tax liability.

Increase in debt capacity

The second tax incentive refers to the ability to increase the debt capacity of the enterprise. By reducing the volatility of cash flows and the risk of financial difficulties, hedging can provide an increase in the debt capacity. Enterprises can then choose to increase their leverage and create an increase in the interest deduction. In the literature, this is described as the increase of the tax shield, which entails a decrease in the future tax liabilities and therefore has a positive effect on the value of the company (Leland 1998; Ross 1996). These lower taxes has the result that more money is left to distribute to shareholders. Stulz (1996) also shows that hedging can be used in order to reduce the possibility of left-tail outcomes and thus to raise up the debt capacity and the interest subtraction.

2.3.2.3 Underinvestment problem

Third, risk management can be used to hedge against the underinvestment problem (Bessembinder 1991; Froot, Scharf Stein & Stein 1993). The underinvestment problem is the risk that managers reject positive net present value (NPV) projects because of insufficient internal cash flows to meet the investments. The above problem is particularly applicable to companies that have a lot of growth opportunities and volatile cash flows. Here, the assumption is made that external financing is more expensive than internal funds. External financing would include deadweight entail costs that arise due to information asymmetry, bankruptcy costs, agency costs, etc. Stulz (1996) confirms the importance of hedging by referring to the occurrence of lower tail outcomes.

The underinvestment problem can for example occur when managers in companies with significant growth potential, are under pressure to meet interest payments or forecasts of analysts. This risk is very real when a company is in difficulty and there is extra pressure on short-term cash flows. In this case, it is possible that managers will reject particular projects if the marginal costs of external funds are greater than the marginal benefit to the shareholders (Froot et al. 1993).

By setting up hedging programs, risk managers can reduce the volatility in cash flows. Because of this they ensure a minimum level of capital, so managers encouraged to continue to draw on positive NPV projects and thus continue to invest in the future of the company. The risk of underinvestment is particularly applicable where the investment opportunities are negatively correlated with cash flows (Froot et al. 1993).

The above-mentioned findings show that hedging can alleviate the problem of underinvestment when the cash flow is volatile and access to external financing is very costly. By matching cash inflows and outflows better to each other, hedging creates added value. This is very important because volatility in an environment with expensive external financing is very costly. Suppose a company is confronted with low cash flows, they have to do either rely on expensive external financing or refuse profitable investment opportunities. Implementing risk management programs can ensure that the probability that a company will face a cash deficit is reduced, as the additional costs associated with external financing. This may an enterprise to be able to continue to finance worthwhile investment projects and this has a positive effect on the value of the company.

2.3.2.4 Others

Besides the three most frequently reported market imperfections, namely financial distress costs, progressive tax functions and insufficient cash flows (underinvestment problem), there is still a whole range of other possible factors that may affect a hedging decision. Hedging, for example, may also be useful in the presence of asymmetry information, or differences in transaction costs (Eun et al. 2011). In

the case of information asymmetry, management is much more aware of the risks to which a company is exposed to than the shareholders. The management would have to manage this exposure and not the shareholders. This means that the argument that an individual shareholder can achieve the same results by managing the exposure by itself as entering into a hedging contract, may be rejected. This is because the company is able to hedge at lower cost than individual shareholders.

The discussed theoretical models have been tested by several researchers. A good summary of the empirical findings of various studies was given by Smithson and Simkins (2005). Based on their research in 2004, they argue that it appears that there is a belief among academics that risk management increases the value of the company.

Allayannis and Weston (2001) studied the use of interest expense and / or currency risk management among 720 non-financial companies. They found a positive result from the use of risk management and the value of the company. They measure the value of the enterprises, by using Tobin's Q. This is the ratio between the market value of the company and the replacement value of the assets. They found that companies that hold derivatives in order to hedge their risks have proximately on average 5% higher value compared to companies that hold not derivatives.

2.3.1. Maximizing managers' personal utility function

This theory focuses on managers who want to maximize their personal utility function or hedging purposes for their own diversification. The theory relates to managers who are risk averse and have invested a lot of money in the company they control. They are personally affiliated with the company because their own wealth and human capital are invested in the company. Managers are willing to perform risk management activities when it is cheaper to manage their risks through the company rather than independently. Implying that they only will hedge when the costs of hedging the risk for its own account is higher than the cost to do so at the company level (Smith and Stulz 1985; Stulz 1984).

The hedging strategy of the management is determined by their compensation plan and reputational considerations. Smith and Stulz (1985) show that the more option-based facilities are included in the remuneration of managers, the more they are encouraged to take risks and, consequently, the less they will hedge. If their income is, however, dependent on the volatility of business income, they are more likely to develop hedging programs. It also appears that the more of their own wealth they have invested in the equity of the company, the greater the urge to manage risks. Because they often are unable to diversify their company-specific risks, risk-averse managers try to reduce the variability in the revenue of the company through hedging activities (Smith and Stulz 1985; Stulz 1984).

The main reason why risk averse managers are willing to hedge, is perhaps because of the exposure to

volatile share prices. Guay and Kothari (2003), also take into account the possibility that managers use derivatives to smooth their income fluctuations as their bonuses are tied to accounting performance. Other motives include agency and contracting costs, which will be discussed hereafter in further details.

2.3.2. Agency theory

The agency theory can be an explanation for firm's hedging activities. In a principal-agent relationship, the principal 'rents' an agent to perform a task.. The agency theory focusses on the conflict of interests between the principal and agent, in which the agent (manager) pursues his own private interests through risk management activities that conflict with the principal's (shareholders) interests. The manager will maximize his own utility at the expense of the shareholders. This represents "agency costs" to firm owners which is the difference between net profits of the firm had the owners been the managers and the net profits under the agent's stewardship.

In the presence of agency conflicts between managers and shareholders, risk management can lead to the improper resource allocation and the destruction of shareholder value.
Agency theory-based solutions to managerialism tendencies include among other things, incentives to make managers think and act like shareholder. According to the agency theory, it is important that the managers pursues the objective of the shareholder. The objective of a shareholder is to maximize the value of the company. In accordance with the agency theory, compensation should be dependent on the degree to which the value of the company is increasing.
This is a motivation for the executive to pursue activities that are value enhancing for the firm in order to meet the objectives of the shareholders rather than its own interests. The more the executive increases the value of the company, the higher the compensation.

Since executives typically have invested a greater welfare in the company they manage, they are more risk averse compared to shareholders. Shareholders holding a more diversified portfolio compared to executives, with the result that shareholders can spread their risk better in contrast to executives. Therefore shareholders will be less risk averse compared to managers. As a result, managers have an incentive to reduce their risk exposure and can refuse profitable but risky activities at the expense of the shareholders. In the case that managing this risks is less costly for companies than for CEOs to do so on their own account, hedging decisions will be a function of CEO compensation.

2.3.5 Contract theory

In microeconomics the contract theory examines how economic agents construct contractual arrangements, generally in the presence of asymmetric information. A prominent application of contract theory is the design of optimal schedules for the remuneration of managers.

Performance-based contracts that rely on observable and verifiable output can often be used to establish incentives for the agent also in the interest of the principal. When agents are risk averse (concave utility function), however, such contracts will generally be second-best, because incentivisation excludes full insurance. So, the contract theory suggests that shareholders should structure a compensation contract that is convex (risk-seeking behavior) in order to compensate the risk averse behavior of managers. Examples of such convex compensation contracts could include bonuses and stock options (Hemmer, Kim and Verrecchia 1999). Because derivatives are often used by managers as a risk management tool to increase the value of the company, the structure of compensation packages is crucial to elicit the correct behavior.

2.4. Accounting standards IAS 39 and IFRS 7

2.4.1 Recognition and measurement

The treatment of financial instruments under IFRS takes place in IAS 39 and IFRS 7. IAS 39 deals with the principles for the recognition and measurement of financial instruments and IFRS 7 deals with the requirements on provision of information disclosure of financial instruments. The requirements for the presentation of financial instruments are set up in IAS 32.

Application of the normal rules on financial instruments may lead to undesirable effects in case of a hedge. Based on the accounting standards, fluctuations in financial instruments include to the result of the period in which these fluctuations occur (IFRS). To illustrate the undesirable effect, I follow up with an example (J.C. Hull 2009). Suppose a company closed a future contract on December 1, 2011 to buy 100,000 kilograms of rice on February 1, 2012 for the December 1 prevailing market price of 1.40 euros per kilogram. The market price of one kilogram of rice December 31, 2011 amounts to 1.45 euros. On February 1, 2012 the market price of one kilogram of rice 1.47 euros.

Normally, the allocation of the profit for accounting purposes is as follows:
100,000 x (1.45 - 1.40) = 5,000 euros realization in 2011,
100,000 x (1.47 - 1.45) = 2,000 euros realization in 2012.

However, if the above situation for accounting purposes qualifies as a hedge, the results of both the financial instrument and the hedged item are reported in the same period. This is called hedge accounting (J.C. Hull, 2009). Hedge accounting can thus be defined as the value associated with the hedged item and the financial instrument that covers a particular position.

If the above future qualifies as a hedge for the purchase of 100,000 kilogram of rice on February 1, 2012, then the full result of 7,000 euros (for accounting purposes) is realized in 2012. The purpose of the hedge

is to ensure that the company must pay on February 1, 2012 140,000 euros for the purchase of 100,000 kilograms of rice. Due to entirely allocation of the positive result of 7,000 euros to 2012, it is ensured for the accounting that in February 2012 140.000 euros incurred in costs for the purchase of 100,000 kilograms of rice. The hedge accounting rules introduced in the financial reporting leads to a better representation of reality compared to the normal applicable regulation for financial instruments.

2.4.2 Conditions hedge accounting

Hedge accounting under IFRS can only be applied if a financial instrument qualifies as a hedging instrument. IAS defines a hedging instrument as an instrument whose value in the economic transactions or cash flows of the value changes in the economic traffic or cash flows of the hedged position compensates (IAS 39.9).

Not all financial instruments can be designated as a hedging instrument. A financial instrument can be qualified as a hedging instrument if the following conditions are cumulatively be satisfied:

1) the value of the instrument is dependent on the value of other financial instruments (e.g. exchange rates, interest rates and prices of financial products) or goods (e.g. commodities). If, however, the value of the instrument is dependent upon a non-financial variable (such as the latter commodities) and the variable specifically for one party, then this instrument does not qualify as a hedging instrument. After all, this means that no cash settlement takes place, but that the goods actually be delivered. The instrument is seen as a purchasing contract and does not qualify as a hedge;
2) The net initial investment is nil or minimal in the relevant instrument for other types of contracts that respond similarly to changes in market factors, and;
3) The instrument is settled at a future date.

2.4.3 Types of hedge accounting

The hedge accounting rules can be applied by using three methods. Namely, fair value hedge accounting (fair value hedge), cash flow hedge accounting (cash flow hedge) and hedge accounting of net investment in a foreign operation (Hedge of a net investment in a foreign entity).

Fair value hedge

The method of fair value hedge accounting embraces hedging risk changes in the fair value of a recognized asset or liability or an unincorporated firm commitment, associated with a particular risk and

might have an impact on the results (IAS 39.86). Thus, fair value hedge accounting can be applied, if by means of a hedge the risk of changes in the fair value of an asset is hedged. Fair value hedge accounting may prevent a mismatch in the valuation, as well as a mismatch in the processing. Gains or losses deriving from this hedge is directly recognized in profit and loss (IAS 39.86).

Cash flow hedge

The method of cash flow hedge accounting embraces hedging potential variability in cash flows that is attributable to a particular risk associated with a recognized asset or liability or a highly probable forecast transaction and could affect the results (IAS 39.86). Gain or losses deriving from this hedging instrument is recognized in other comprehensive income (IAS 39.95).

Hedge of a net investment in a foreign entity

The method of net investment hedge in foreign operations embraces hedging the currency risk associated with the translation of the net assets of these foreign operations into the group's currency. IAS 39 permits hedge accounting for such a hedge of a net investment in a foreign operation.

2.5. Preliminary findings: relation between executive compensation and derivatives

According to the theoretical literature on hedging by maximizing shareholder value, we have seen in paragraph *2.3 Incentives to hedge risk exposure*, that non-financial firms focuses on four rationales to hedge. These rationales are as follows:

1) Optimization of the capital budget due to the reduction of cash-flow uncertainty (Froot et al. 1993);
2) Reduction of the probability of financial distress (Smith and Stulz 1985);
3) Reduction of expected taxes (Nance et al. 1993) and
4) Expansion of debt capacity (Leland 1998; Graham and Rogers 2002).

Smitz and Stulz (1985) were the first who examined the relation between hedging behavior by managers and their ownership in the company they managed. According to their study, Smitz and Stulz posit that managers with a concave utility function of the firm would only bear risk if they were rewarded with a higher expected return. This means that a firm will completely hedge the risks if there are no hedging costs and the expected return of the hedging activity is equal. A manager with a convex utility function of the firm value has a higher expected utility by not hedging at all. Consequence of this, is that the manager will behave as a risk-seeker.

The black and Scholes option-pricing model describes that the value of an option is dependent of the underlying stock. If the value or volatility of the underlying stock increases, the option increases also.

This relates to risk-seeking behavior of managers. Managers with a large proportion of stock options will be willing to increase the volatility of the firm without increasing expected return.

So, with other words, Smith and Stulz (1985) argue that the bigger the managers stake in the firm, the more risk averse the manager. This is due to the fact as managerial ownership increases. Consequence is that managers are less likely to hold well diversified portfolios which lead to more incentives to hedge firms risk exposure. In addition, Smith and Stulz also argue that managers with higher option holdings will hedge less. This, because the value of the options will increase as the riskiness of the firm increases.

Consistent with Smith and Stulz's (1985) hypothesis, is the study of Chen et al. (1998). They found for depository institutions, that an increase in managerial ownership is associated with a decrease in risk-taking behavior. According to the study of Haushalter (2000), managers with more option-like features in their compensation plan will take higher risks and hedge less (Haushalter 2000). Industry-level studies of gold mining (Tufano 1996) and savings and loans (Schrand & Unal 1998) show empirical relation between compensation and hedging choices that support the theory.

Tufano (1996), find in his study that managerial stock ownership is positively associated with hedging, while being in the possession of stock options is negatively associated with hedging. This suggests that, managers with greater stock ownership hedges more, while managers with greater stock option holdings hedges less.

Tufano (1996) shows with a graphical example in his study the difference between the value and expected utility for risk-averse managers (with a concave utility function of the firm) of hedged and unhedged stocks and options with the expected utility function: $Utility = \sqrt{\text{Stock}}\, value$.

Figure 1 shows the value of a stock and the underlying option of the stock. The exercise price of the options is equal to 100 dollar.

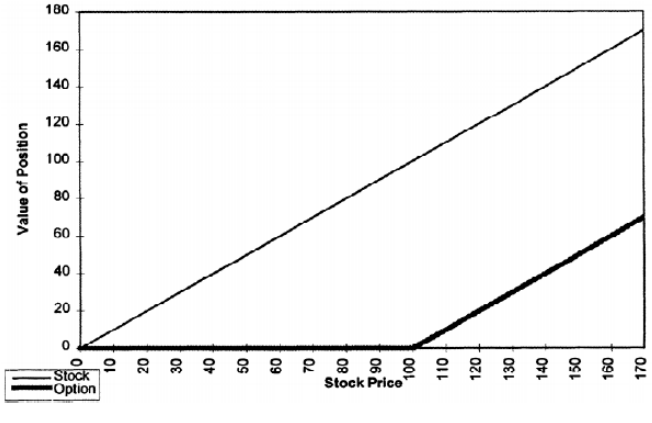

Figure 1.
Source: Tufano (1996)

Suppose that there is an equal probability that the value of a stock is equal to fifty or hundred fifty dollar. In order to reduce the risk, the manager could also enter into a hedging contract. If the manager enters into a hedging contract the stock price will be locked up to hundred dollar. Assuming that a manager has to do with the scenarios: holding a stock with unhedged position S(UH), a stock with hedged position S(H), an option with unhedged position O(UH) and an option with a hedged position O(H). Comparing these positions, graph 2 shows that holding a hedged stock yields higher expected utility than not hedging at all. In the position where a manager holds an option, hedging generates no utility. In this case, a manager who holds stocks may prefer to hedge in order to generate value, while a manager who holds options may not. Therefore, stockholders are rather triggered to hedge than option holders. The incentive to enter into a hedging contract is for stockholders more value generating compared to option holders.

Figure 2 shows the expected utility of a risk-averse manager $U = W^{1/2}$.
Suppose that the value of a stock is with an equal probability equal to 100 or 150 dollar and that the exercise price is equal to 100 dollar. If the manager enters into hedging contract, the stock price will be locked up to 100 dollar. According to graph 2, holding an unhedged option, O(UH), generates a greater expected utility than holding a hedged option, O(H). If the option is hedged, the option will be worthless, because in this position the stock price is locked up to 100 dollar, which is equal to the exercise price. If the manager chooses not to hedge the option, there is still a probability of 50% that the value of the option is 150 dollar. Because the exercise price is 100 dollar, in this position the option will be worth 50 dollar. If we compare the expected utility of a hedged with an unhedged stock, the expected utility of a hedged stock is equal to:

- $S(H) = 100^{1/2}$, which is higher than when the manager is not hedging the stock
- $S(UH) = \frac{1}{2}(50^{\frac{1}{2}} + 150^{1/2})$. Therefore, we can assume that stockholders are more likely to hedge compared to option holders.

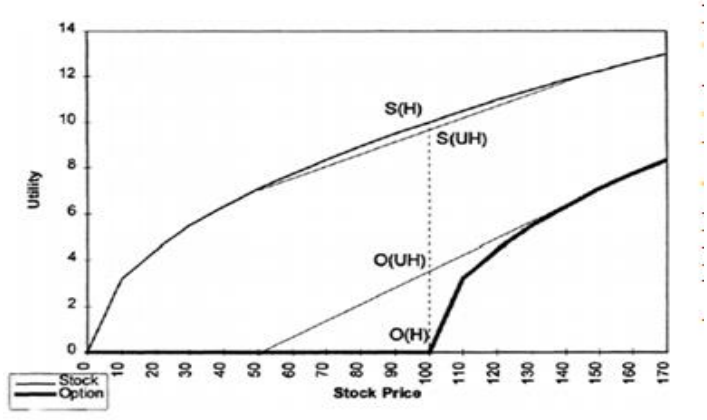

Figure 2.
Source: Tufano (1996)

$$U = W^{1/2}$$

Whereas the above mentioned studies support the theory that indicates that hedging increase firm value, several empirical researches has found evidence which is not consistent with the theory.
The study of Galai and Masulis (1976), confirm that managers with greater equity ownership will have incentives to increase the risk of the firm. This is because they argue that the common stock of a firm can be viewed as a call option. So in that case, it becomes more valuable as risk increases (Galai and Masulis 1976).
This findings are consistent with that of Saunders et al. (1990). In their bank-study they find that the bank becomes riskier if managers own more equity in the firm.

2.6. Summary

In most cases the total pay of an executive exist of four basic components (Stulz 2003), namely (1) base salary, (2) cash bonuses, (3) stock options and (4) ownership stocks. The short term pay of the executives covers the base salary and bonuses and the long term pay covers the stock options and stock shares.
Financial derivatives are investment instruments that derive their value from the value of another property. Derivatives roughly have two goals: reducing risk or speculate to achieve investment earnings. The main types of derivatives according to IAS 39, are futures, forwards, swaps, options and caps and floors. Companies use these types of derivatives based on the type of risk exposure. In this thesis the focus is on market risk exposure which includes the risk on foreign exchange rates, interest rate and commodities.
According to the theoretical literature on hedging by maximizing shareholder value, non-financial firms focuses on four rationales to hedge. These rationales are: optimization of the capital budget due to the

reduction of cash-flow uncertainty (Froot et al.1993), reduction of the probability of financial distress (Smith and Stulz 1985), reduction of expected taxes (Nance et al. 1993) and expansion of debt capacity (Leland 1998); (Graham and Rogers 2002). The results of prior studies regarding the relation between executive compensation and derivative usage are somewhat contradictory. Several studies find mixed evidence about the effect of holding a stock or option on the hedging activities.

3. Hypotheses development

Chapter three will develop and motivate the hypotheses concerning the relation between executive compensation and derivative usage.

3.1. Hypothesis 1: Performance based bonuses and derivative usage

Normally, compensation in the form of a bonus payment is often face a target and is restricted to a cap. During analyzing the annual reports of my sample size, the cap is in the most cases fifty percent of the fixed salary. Bonus payments which are bonded to a target and a cap may have an influence on the hedging behavior. This is researched by Kim, Nam and Thornton (2008). They have examined in their research the effect of risk management incentives resulting from managerial bonus plans on firms' derivatives usage. The researchers have divided the sample into firms whose managers are more likely to face convexity or concavity in the bonus payoff function. They found evidence that managers who are not expecting to reach the cap are more risk seeking and therefore hedging less compared with managers who were expecting to reach the cap.

This indicates that managers who were expecting to be in the convex region are those managers who are not expecting to reach the cap and were hedging less compared to managers who were expecting to be in the concave region. This, because managers with a convex function are risk-seeking and are less likely to hedge their risk exposure, while managers with a concave function are risk averse and are more likely to hedge their risk exposure. These results provide evidence that the incentives inherent in managerial bonus plans influences managers to increase or decrease firm risk in order to maximize their bonus payments.

Based on this findings, I expect that firm performance based cash bonus payments has an effect on the usage of financial derivatives. Hence, the first hypothesis is formulated as follows:

H1: Performance based cash bonus compensation has an effect on the use of derivatives.

3.2. Hypothesis 2: Stock options and derivative usage

Stock options gives managers certain rights to buy or sell shares. Smith and Stulz (1985) argue that managers with higher option holdings will hedge less. This, because the value of the options will increase as the riskiness of the firm increases. This is consistent with Murphy's hypothesis, namely that holding options create the incentive to engage in riskier investments, because the value of options increases with the stock price volatility (Murphy 1999). Also consistent with Smith and Stulz's (1985) hypothesis, are the findings of Haushalter (2000). He argues that managers with more option-like features in their compensation plan will take higher risks and hedge less (Haushalter 2000). Thereafter, Tufano (1996), find in his study that managers who are being in the possession of stock options are negatively associated with hedging, because executives who are holding stock options have a convex expected utility function of the value of the firm, which indicates that they will behave as risk-seekers.

Taking into consideration the above consistent findings, in particular, a compensation package which consist mainly of option-like features induces executives to behave as a risk-seeker to increase the value of the option (Smith and Stulz 1985; Tufano 1996). Hence, I expect that compensation based on stock options, results in less hedging and therefore the second hypothesis is formulated as follows:

H2: Stock option-based CEO compensation has a negative effect on the use of derivatives.

3.3. Hypothesis 3: Stock ownership and derivative usage

Equity-based compensation are usually provided to align the interests of shareholders and executives. In the case that executives compensation is tied to the firm's stock price, executives are less likely to hold diversified portfolios which lead to more risk-averse behavior and therefore more incentives to hedge. Smith and Stulz (1985) indicate that shareholders can affect managerial risk aversion through the compensation structure. They argue that executives who hold an excess of the firm's share may become more risk-averse.

According to Murphy (1999), compensating executives with a meaningful stake in the company through holding stocks, provides the most direct relation between shareholders and managers wealth. This, because holding stocks in a company means for an executive that the value of their shares changes in the same proportion as that of the shareholders returns. This means that only stock holdings compared to stock options can result in executives suffering real and immediate reductions in their current wealth (Sanders 2001). Thus, indicating that the downside risk associated with stock ownership may lead executive to be more risk averse. So executives with more wealth invested in a firm's equity are predicted to have greater incentives to manage the firm's risks (Haushalter 2000).

This findings are consistent with that of Smith and Stulz (1985). They find that managers with a bigger stake in the firm are more risk averse compared to managers with a smaller stake in the firm. This is due to the fact as managerial ownership increases. Consequence is that managers are less likely to hold well diversified portfolios which lead to more incentives to hedge firms risk exposure.

Based on the above discussed prior findings, I expect a positive relation between Equity-based compensation, in the form of stock ownership, and the use of derivatives for hedging purposes. Hence, the following hypothesis is proposed:

H3: Stock ownership-based CEO compensation has a positive effect on the use of derivatives.

The hypotheses above are stated in alternative form. The corresponding null hypotheses are as follows:

H1: Cash bonus-based CEO compensation has no effect on derivatives usage.

H2: Stock option-based CEO compensation has no negative effect on derivatives usage.

H3: Stock ownership-based CEO compensation has no positive effect on derivatives usage.

4. Research design and methodology

In this chapter the focus is on the research design and methodology of this study. In the first paragraph, we will discuss the variables of interest. Thereafter, the second paragraph will discuss the control variables and the last paragraph elaborates on the research methodology.

4.1 Variables of interest

Because the purpose of this study is to examine the effect of CEO compensation on the usage of derivatives, the dependent variable "Y", which is continuous, is created to determine the usage of derivatives. During the data collection regarding this dependent variable, financial derivatives, I have determined which companies use derivatives for hedging purposes and which not and since this research focuses on derivatives usage for hedging purposes, I take only derivatives for hedging purposes in scope. In order to measure the usage of derivatives, I use the total fair value amount in terms of LOG, as disclosed in the annual reports for the total of all types of derivatives, namely foreign exchange (FX) derivatives, interest rate (IR) derivatives and commodity (CO) derivatives. In prior studies, researchers such as Supanvanij and Strauss (2010) and Barton et al. (2001) have used the national value of derivatives for the measurement of derivative usage. Because not all firms disclose the notional value in my sample, this measure will not benefit my research and in addition, measurement based on the fair value gives a better reflection of the market value of the derivatives.

For the independent variable "X", CEO compensation, I make a distinction between cash bonus based compensation (CASHBONUSCOMP), stock-option based compensation (STOCK-OPTIONCOMP) and stock-ownership based compensation (STOCK-OWNERCOMP). A cash bonus payment refers to a reward to the CEO based on the financial performance of the company, which may include a bonus in addition to the salary. Compensation in the form of stock option is classified as an option held by an executive, not an obligation, to buy or sell stocks in the company at a predetermined price within a certain period. Stock ownership compensation refers to a form of remuneration by providing executives a stake in the firm by means of holding shares in the company. In order to measure all these compensation components, I use the amounts disclosed in the annual reports and convert these amounts into LOG terms to make the dependent and independent variables comparable.

In order to analyze the effect of the three compensation components on the firm's use of derivatives, I will conduct three separate regression analyses for each compensation component.

4.1. Control variables

In order to avoid any omitted variables and to reduce any biases, I control for firm-level characteristics that might affect the use of financial derivatives by adding control variables. Following prior studies such as Nance, Smith & Smithson (1993), Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993) and Géczy, Minton and Schrand (1997), the following control variables are included in the model to control for factors known to influence the usage of financial derivatives: firm size and growth, industry, capital structure and education.

To measure the control variable **firm size**, I use the proxy **total assets** of a firm. According to previous studies like Zhou (2000) and Nance, Smith & Smithson (1993), firm size plays a crucial role in the usage of derivatives. Nance, Smith & Smithson (1993) explain and provide four arguments in their study why it is important to control for firm size. First of all, they suggest that financial distress firms might face legal bankruptcy costs and this may relative decreasing the firm size. Besides that, compared to larger firms, smaller firms are likely to face progressive tax which lead to more hedging activities. The authors also suggest that an increase in firm size is usually accompanied with an increase in the number of managers. This may lead to an increase in the knowledge about risk management which could lead to higher hedging activities. Last but not least, the transaction cost of the derivative market is facing a scale of economics structure which implies that larger firms uses more derivatives in order to hedge their risk. So, there are several reasons to control for firm size and in order to measure this control variable I used the logarithm of total assets.

1) Firm size measured by the logarithm of the total assets.

According to the study of Géczy, Minton and Schrand (1997), firms with more **growth opportunities** are more likely to use derivatives. For the measurement of the control variable growth, I used the proxy **sales**. In a prior study, Core et al. (1999) suggest that this ratio is a suitable indicator of firm's growth. Consistent with these arguments, Smith and Stulz (1985) and Froot, Scharfstein and Stein (1993) indicate that when a firm has more growth opportunities, the benefits of hedging increase. Also they control for firm growth by using the sales growth. I measured the firm growth on the basis of the sales growth over the past five years.

2) Firm growth measured by growth in the sales of the firm.

Based on the study of Jin & Jorion (2006), the use of derivatives depends, among other things, on the type of **industry** (number of industry segments) in which a company operates. Firms in certain industries are more likely to hedge and the reason therefore is because of the fact that risk exposure varies across

industries and that the ease to hedge these risk exposures also varies per industry. In order to determine to which industries the companies are categorized, I consult the Global Industry Classification Standard (GICS). According to the GICS, the industries are as follows: energy, materials, industrials, consumer discretionary, consumer staples, health care, financials, information technology, telecommunication services, utilities and real estate. All these 11 industries are divided into 24 industry groups, 68 industries and 157 sub-industries. In this study we take the industry level into account, which consist of 11 industries and are all dummy variables. Appendix I provides an overview of all firm sorted by industry.

3) Industry classification determined by Global Industry Classification Standard.

Issuing **debt** is associated with interest payments which results in less tax payments. On the one hand these tax benefit will increase the value of the company, but on the other hand the more debt, the greater the likelihood of financial distress. According to Smith and Stulz (1985), firms can reduce the likelihood of financial distress by using derivatives as risk management tools by means of issuing more debt. For the measurement of the company's capital structure, I used the proxy **leverage**, which can be measured as follows:

$$\text{Leverage} = \text{total debt} \div \text{total assets}$$

4) Company's capital structure is measured by the proxy leverage.

Following the study of Dionne, Chun and Triki (2012), directors with financial/economic knowledge (background/education) affect the behavior regarding risk management. In order to capture the effect of the **education** of CEOs on the use of derivatives, I develop the control variable education, which takes the form of a dummy variable that is equal to the value of "1" if the CEO has a finance/economic background/education and the value "0" otherwise. Based on this study, I expect that CEOs with an education in finance/economics have more financial knowledge and therefore use more derivatives in order to hedge risk exposures compared to CEOs who have no background/education in finance/economics. In order to determine whether a CEO has a background/education in finance/economics, I will consult the database BoardEx and if needed, additional data from firms' annual report.

5) Education determined by education/background of CEO in the field of finance/economics.

4.3 Research methodology

Since the usage of derivatives (DRVTUSAGE) is a continuous variable, I use OLS regression models with robust standard errors to test the hypotheses.

To test the first hypothesis, *H1: Cash bonus-based CEO compensation has a negative effect on the use of derivatives*, I use the following regression model:

(1)

$$(LOGDRVTUSAGE) = \alpha + \beta1(LOGCASHBONUSCOMP) + \beta2(SIZE) + \beta3(GROWTH) + \beta4(IND_{ENERGY}) + \beta5(IND_{MATERIALS}) + \beta6(IND_{INDUSTRIALS}) + \beta7(IND_{CONSUMER}) + \beta8(IND_{HEALTHCARE}) + \beta9(IND_{IT}) + \beta10(IND_{TELECOMM}) + \beta11(IND_{Utilities}) + \beta12(LEVERAGE) + \beta13(EDUCATION) + \varepsilon$$

To test the second hypothesis, *H2: Stock option-based CEO compensation has a negative effect on the use of derivatives,* I use the following regression model:

(2)

$$(LOGDRVTUSAGE) = \alpha + \beta1(LOGSTOCKOPTIONCOMP) + \beta2(FIRMSIZE) + \beta3(GROWTH) + \beta4(IND_{ENERGY}) + \beta5(IND_{MATERIALS}) + \beta6(IND_{INDUSTRIALS}) + \beta7(IND_{CONSUMER}) + \beta8(IND_{HEALTHCARE}) + \beta9(IND_{IT}) + \beta10(IND_{TELECOMM}) + \beta11(IND_{Utilities}) + \beta12(LEVERAGE) + \beta13(EDUCATION) + \varepsilon$$

To test the third hypothesis, *H3: Stock ownership-based CEO compensation has a positive effect on the use of derivatives,* I use the following regression model:

(3)

$$(LOGDRVTUSAGE) = \alpha + \beta1(\text{LOGSTOCKOWNERCOMP}) + \beta2(SIZE) + \beta3(GROWTH) + \beta4(IND_{ENERGY}) + \beta5(IND_{MATERIALS}) + \beta6(IND_{INDUSTRIALS}) + \beta7(IND_{CONSUMER}) + \beta8(IND_{HEALTHCARE}) + \beta9(IND_{IT}) + \beta10(IND_{TELECOMM}) + \beta11(IND_{Utilities}) + \beta12(LEVERAGE) + \beta13(EDUCATION) + \varepsilon$$

For hypothesis 1, I expect that cash bonus compensation has an effect on the usage of derivatives wherein $\beta 1$ may be either > 0 or <0. For hypothesis 2, I expect $\beta 1$, < 0 and significant if derivative usage is sensitive to option based compensation. For hypothesis 3 I expect $\beta 1$, > 0 and significant if derivative usage is sensitive to stock ownership based compensation.

In the above described OLS regression models, the variables are as follows:

- LOGDRVTUSAGE: the total fair value amount of derivatives, which is calculated by extracting the derivatives liabilities from the derivatives assets in terms of LOG.
- LOGCASHBONUSCOMP: total amount of cash bonus based compensation which is based on the financial performance of the firm in terms of LOG.
- LOGSTOCKOPTIONCOMP: total amount of option based compensation in terms of LOG.
- LOGSTOCKOWNERCOMP: total amount of stock based compensation in terms of LOG.
- SIZE: Firm size, measured as the log of total assets
- GROWTH: Firm growth, measured by growth in the sales of the firm over period of 5 year.
- INDENERGY: Dummy variable for firms which operates in the energy industry.
- INDMATERIALS: Dummy variable for firms which operates in the materials industry.
- INDINDUSTRIALS: Dummy variable for firms which operates in the industrials industry.
- INDCONSUMER: Dummy variable for firms which operates in the consumer discretionary/staples industry.
- INDHEALTHCARE: Dummy variable for firms which operates in the health care industry.
- INDIT: Dummy variable for firms which operates in the Information technology industry.
- INDTELECOMM: Dummy variable for firms which operates in the telecommunication services industry.
- INDUTILITIES: Dummy variable for firms which operates in the utilities industry.
- LEVERAGE: Measurement of the company's capital structure by dividing the total debt with the total assets.
- EDUCATION: Dummy variable which takes the value “1” if the CEO has a finance/economic background/education and the value “0” otherwise.
- ε: Error term

Since the sample consist of firms that report their annual report in several currencies, I translate all currencies to the currency EUR in thousand units,. This makes it possible to make the dependent and independent variables comparable. This is done by using the source currency converter oanda taking into consideration the currencies on 31-12-2014 and 31-12-2015.

5. Data

This section will discuss the collected data that is used to carry out this study. The first paragraph of this section will elaborate on the total sampling process and used data sources. Thereafter, the second paragraph is about the data collection and the third paragraph will discuss the sample size per hypotheses.

5.1 Total sample and data sources

To answer the research question, I analyze a sample of 191 non-financial listed European companies drawn from the EuroStoxx 600 (representing the largest 600 companies in Eastern and Western Europe). The focus in this thesis is not on financial companies, because of their nature. Financial firm often deal with derivatives. The data regarding the main variables, derivatives and CEO compensation, are manual collected for the years 2014 and 2015, retrieved from the annual reports of 2015. The companies included in the sample are all listed, which means that the companies are required to report according to the international financial reporting standards (IFRS). IFRS requires these companies to report on financial risk management, including the use of derivatives and on CEO compensation. Therefore, all data regarding financial derivatives and CEO compensation is available in the annual reports. For data regarding the control variables as firm size and capital structure, I consulted DataStream. Since the university library is subscribed to the Warton Research Data Service (WRDS) system, I used the databases within the WRDS system to retrieve the data concerning the control variables. For the control variable firm size, growth, leverage and industry I consulted the database Compustat - Capital IQ in the section Global. For the control variable CEO education, I consulted the database BoardEx. So, with the exception of the dependent and independent variables, all data is collected from databases within the WRDS system.

Given the research design and data availability, I consulted the statistical program STATA to manage, compute and merge the sets of retrieved data in order to run the regressions for the hypotheses tests.

5.2 Firms in sample

Due to the fact of a lack of data availability in the annual reports regarding CEO compensation and that not all firms in the initial sample uses derivatives, a gap between the initial and final sample size exist. This gap can be explained by dropping companies from the initial sample because of the following reasons. First, I dropped a total of 15 companies from the total sample size of 191 firms which do not use derivatives at all, remaining a sample of 176 unique companies and 351 firm-year observations. Due to the fact that not all firms compensate their CEO with a variable cash bonus in addition to their fixed salary, I dropped 25 firms ending up with 151 unique firms and 295 firm year observations for hypothesis 1.

For hypothesis 2 regarding option based compensation, I dropped 83 companies due to the fact that not all companies compensate their CEO with options and/or not all companies are transparent enough about

their option based compensation. So, for hypotheses 2, the final sample consist of 89 firm year observations and 49 unique firms. For the third hypotheses regarding stock based compensation, I end up with 136 firm year observations and 68 unique firms. This, because not all firms disclose the value of stocks granted.

For the companies including in the sample, please refer to appendix F and for an overview of firms sorted by industry, please refer to appendix G.

6. Empirical results

This chapter will discuss the empirical results of this study. The first paragraph gives an overview of the descriptive statistics which describe the basic features of the variables in this study. The second paragraph discusses the regression results per hypotheses following with the third paragraph which gives an analysis and summary about the regression results.

6.1. Descriptive statistics

The basic features, such as the description and measurement, of the variables in this study are provided in appendix B. This table provides an overview of the descriptive statistics of all regression variables: the dependent variable derivatives usage, the independent variable CEO compensation which is distinguished in three components and the control variables.

The total observations per variable varies from 352-89 in which observations denotes the number of firm-year observations. The sample period covers the years 2014 and 2015. Hence, the total unique firms included in sample varies from 151-49. The mean of the usage of derivatives in terms of log equals 4.294212, which is equal to 2.652.434, 68 TEUR. CEO compensation is divided in three components, namely: cash bonus compensation, stock option based compensation and stock ownership compensation. As appendix B shows, the mean of cash bonus compensation, stock ownership compensation and stock option compensation is respectively 2.683157, 2.554449 and 2.507879 in terms of LOG. The dummy variable education reveals an average of 55%, which indicates that more than half of the CEOs have a finance/economic background. What we also see in appendix B, is that most of the companies including in the sample, operates in the industrials industry (28, 4%). Thereafter the shares of industries in the sample from large to small is as follows: consumers, materials, healthcare, utilities, energy, telecom and IT.

6.2. Pearson's correlation

The correlation coefficients among the dependent and the independent variables, derivatives usage and CEO compensation components respectively, are provided in Appendix D.

The usage of financial derivatives is positively and statistically significant correlated with cash bonus based CEO compensation. This is consistent with the regression results provided in Appendix E – Table 1. Derivatives usage is negatively and statistically significant correlated with stock option based compensation. Also this is consistent with the regression results provided in Appendix E – table 2. Concerning the relation between derivatives usage and stock ownership compensation, we see a positive but however not significant correlation. Surprisingly is the positive and significantly correlation between stock option based and ownership based compensation on the basis of a 1% significance which means that these variables, stock option and stock ownership compensation can predict each other. Finally, also

positive and significant correlated are the variables cash bonus compensation and stock option based compensation.

6.3. Regression results

In order to test all the three hypotheses three different OLS-regressions with robust standards errors are performed in which derivatives usage is the dependent variable and the CEO compensation components the independent variables. Derivative usage is hereby calculated as the LOG of the total fair value of derivatives held by a company. The total fair value of derivatives is calculated as the total fair value of derivatives assets minus the total value of derivatives liabilities retrieved from annual reports. The independent variable, CEO compensation, is divided into three components: cash bonus, stock option and stock ownership compensation and are retrieved from annual reports. The main focus of this research is to test the effect of different CEO compensation components on the usage of financial derivatives. This section will elaborate on the regression results per hypothesis.

Hypothesis 1 - *Performance based cash bonus compensation has an effect on the use of derivatives.*

For the first hypothesis, I expect that cash bonus compensation based on performance has an effect on the usage of derivatives. The regression results show that cash bonus compensation has a positive effect on the usage of derivatives. The results indicate that if cash bonus increases by 1 in terms of LOG, the total amount of derivatives in terms of LOG, increases with 0.578. In addition, the regression results indicate that the effect of cash bonus based compensation on derivative usage is significant with a p-value 0.009 on the basis of a 5% significance level. Besides the variables of interest, the regression results show that the control variable firm size is significant with p-value 0.000. This result indicate that firm size is almost perfectly correlated with the usage of derivatives. An increase in firm size by 1 lead to an increase in the use of derivatives by 0.638 in terms of LOG. The control variable leverage is also positive and significant related with the use of derivatives with a p-value of 0.017. An increase in the leverage by 1 indicates an increase of derivative usage by LOG 1.560. On the basis of the regression results, the first hypothesis is initially supported, indicating that cash bonus based CEO compensation has an effect on the usage of derivatives. Overall I can conclude that hypothesis 1 is accepted. For the regression results regarding hypothesis 1, please refer to Appendix E, table 1.

Hypothesis 2 - *Stock option-based CEO compensation has a negative effect on the use of derivatives.*

For hypothesis 2, I expect that option based CEO compensation has a negative effect on the usage of derivatives. The regression results show a negative effect of option based CEO compensation on the

usage of derivatives. The results indicate that an increase of the variable option based compensation by 1 in terms of LOG leads to a decrease in derivatives usage of 0.519 in terms of LOG. This negative effect of stock based CEO compensation on the usage of derivatives is significant with p-value 0.073 on the basis of a 10% significance level. The results also confirm that the control variable firm size is positive and significant related with the use of derivatives. An increase of 1 in the firm size leads to an increase of LOG 0.839 in the usage of derivatives. These results are consistent with the expectation, hence hypothesis 2 is accepted. For the regression results regarding hypothesis 2, please refer to Appendix E, table 2.

Hypothesis 3 - *Stock ownership-based CEO compensation has a positive effect on the use of derivatives*.

For the third hypothesis, I expect that CEO compensation based on stock ownership in the company has a positive effect on the use of derivatives. The regression results provide conflicting evidence, namely that stock owner based CEO compensation has a negative effect on the usage of derivatives. The results indicate that if the variable stock ownership compensation increases by 1 in terms of LOG, the total amount of derivatives in terms of LOG, decreases with 0.079. However the regression results indicate contrary to what was predicted, the effect with p-value of 0.730 is not significant. Therefore, there is no evidence that stock ownership based CEO compensation has an effect on the usage of derivatives which means that hypothesis 3 is rejected. Interesting in these regression results, is the outcome regarding the control variable firm size. Firm size is positively and significant related with the use of derivatives on the basis of a 5% significance level. An increase of 1 in the firm size leads to an increase 0.740 in the usage of derivatives in terms of LOG.
Overall I can conclude that hypothesis 3 is rejected. For the regression results regarding hypothesis 3, please refer to Appendix E, table 3.

6.4. Regression analysis and summary

In this paragraph, an analysis and summary is provided concerning the regression results in appendix E table 1, 2 and 3.

Hypothesis 1
The first hypothesis test the effect of performance based cash bonus compensation on the usage of derivatives. Taken the results from the regression results revealed in appendix E table 1, which indicates that compensation based on bonus payment is positive and statistically significant, hypothesis 1 is accepted. This means that cash bonus incentives inherent in CEO compensation plans influences CEOs to increase or decrease firm risk by the usage of derivatives. As specified in the hypothesis, it was not sure

whether the variable cash bonus based CEO compensation could have a positive or negative effect, since theory points in both directions. Since the regression results show a positive and highly significant sign, it indicates that many CEOs were expecting to reach the cap in their cash bonuses compensation and are therefore more risk averse which leads to derivatives usage to hedge their risk exposure.
Based on prior research of Kim, Nam and Thornton (2008) and on the theory of Smitz and Stulz (1985), a possible explanation for this effect is that the included firms in this research sample may consists largely of companies that has a concave bonus payoff function faced by the CEOs and therefore hedging more compared to companies with a convex bonus payoff function.
In order to obtain more comfort about this potential explanation, I followed the method of Kim, Nam and Thornton (2008) and divided the sample into firms whose CEOs are more likely to face convexity or concavity in the bonus payoff function. I collected the net income as the accounting performance of all firms over the period 2013-2015 by using database Capital IQ – Global. Thereafter, for each company I calculated the ratio of the realized performance to the estimated target level by dividing the realized performance by the performance of previous year. Then, I used this ratio to partition
the sample into two sub-groups, firms whose managers are more likely to have a convex bonus payoff and firms whose managers are more likely to have a concave bonus payoff. Based on the methodology of Kim, Nam and Thornton (2008), I define the convex payoff group as those firms whose ratio is less than or equal to 1.0, and the concave payoff group as those firms whose ratio is greater than 1.0. Based on these steps, I found that 165 firms of the total sample of 295 firms (52%) are firms whose ratio is greater than 1 which means that those firms have a concave payoff bonus function and hedges more compared to the convex payoff group. Please refer to appendix G, for the divided sample into convex payoff firms and concave payoff firms.

The control variable education, which determines whether the education/background of the CEO affects derivatives usage, is statistically significant with a negative sign on the basis of a 10% significance level. This indicate that the usage of derivatives decreases with 0.340 in terms of LOG if a CEO goes from not being in the possession of a finance/economic education to being in the possession of a finance/economic education. This result provide conflicting evidence with respect to the expectation that CEOs with an education in finance/economics are more likely to have (more) financial knowledge and therefore use more derivatives to hedge their risk exposures. A possible explanation could be that CEOs who are in the possession of a finance/economic education are more careful in the use of derivatives, hence making them less inclined to use derivatives and first look for other options to hedge their risk exposure.
The regression results show that the variable leverage, which measures the capital structure of a firm, is significant and positive. An increase of leverage by 1 leads to an increase of derivatives usage by 1.560 in terms of LOG. This result is consistent with previous theory of Smitz and Stulz, which states that an

increase in the firms' debt ratio should positively affect derivative usage (Smith and Stulz 1985).
The theory regarding firm size and its effect on the usage of financial derivatives was somewhat unclear. However, this research provides evidence that firm size, which is measured as the LOG of total assets, has a positive and significant effect on the usage of financial derivatives. The results shows that an increase in the firm size by 1 in terms of LOG, increases derivatives usage by 0.638 in terms of LOG. Regardinig the industry variables, I found that the industries Consumer, Industries, IT and Utilities were positively statistically significant.
The regression results point out that sufficient evidence is obtained to fully support hypothesis 1.

Hypothesis 2

As for CEOs who are compensated with stock options, I find evidence for a statistically significant negative effect with the use of derivatives. The regression results in appendix E, table 2 show that the effect with coefficient -0.519 indicates that the usage of financial derivatives decreases with 0.519 in terms of LOG if a CEO is granted with one stock option more in the company. This is consistent with theory and prior research of Smith and Stulz (1985), Murphy (1999), Haushalter (2000) and Tufano (1996) which generally suggests that managers with higher option holdings will hedge less, due to the fact that value of the options will increase as the riskiness of the firm increases.
The regression results also provide evidence that the variable firm size significantly affect derivatives usage, which means that an increase of 1 in terms of LOG in the firm size increases derivatives usage with 0.839.
The effect of the variables growth, leverage and education on the usage of derivatives were not statistically significant. Hence, there is not enough evidence to determine that these variables affect the usage of financial derivatives. For the industry variables, I found that the industries Healthcare and Telecommunication were positively statistically significant.
Overall, sufficient evidence is obtained to accept hypothesis 2.

Hypothesis 3

Further this research focuses on the relation between share ownership based CEO compensation and derivatives usage. As for CEOs who are compensated with stock ownership in the company, I find that stock ownership based compensation is negatively related with the usage of financial derivatives. This is contrary to what was predicted. However the regression results indicate contrary to what was predicted, the effect with p-value of 0.730 is not significant and hence provide no evidence that stock ownership based CEO compensation has an effect on the usage of financial derivatives.
In addition the regression results show that the variable firm size significantly affect derivatives usage. An increase of 1 in terms of LOG in the firm size increases derivatives usage with 0.740. This indicates that

larger firms have a higher probability of using derivatives compared to smaller firms.
The effect of the variables growth, leverage and education on the usage of derivatives were not statistically significant. Hence, there is not enough evidence to determine that these variables affect the usage of financial derivatives. For the industry variables, I found that the industries Materials, Industries, Healthcare and Telecommunication were statistically significant.
Based on the regression results of hypothesis 3, no sufficient evidence is obtained to confirm that stock ownership based CEO compensation has an effect on the usage of derivatives which means that hypothesis 3 is rejected.

7. Conclusion

The purpose of this study is to examine whether CEO compensation affects the usage of financial derivatives for hedging purposes and is based on European listed firms. Data regarding derivatives and CEO compensation are manually collected from annual reports of 191 non-financial listed European firms covering the period 2014-2015. To test whether various CEO compensation components have an effect on derivatives usage, I ran three ordinary least squares (OLS) regressions, for each hypothesis one OLS-regression. In all regressions the dependent variable, derivative usage, and independent variable, CEO compensation, are continuous variables. All OLS-regressions are performed with robust standards errors.

The research question which is tested in this study is as follows:

Does the structure of CEO compensation pay has an effect on a firm's use of derivatives?

In order to answer this research question, I developed the following three hypothesis:

H1: Performance based cash bonus compensation has an effect on the use of derivatives.
H2: Stock option-based CEO compensation has a negative effect on the use of derivatives
H3: Stock ownership-based CEO compensation has a positive effect on the use of derivatives.

This research find evidence that option-based CEO compensation have a statistically significant negative effect on the usage of derivatives. The regression I ran shows a statistically significant value for the variable stock option. This evidence confirms prior research such as those of Smith and Stulz (1985) who argue that managers with higher option holdings will hedge less, since the value of the options will increase as the riskiness of the firm increases. This research finding is also consistent with Murphy's hypothesis, the findings of Haushalter (2000) and Tufano (1996), who find in their research that managers who are being in the possession of stock options are negatively associated with hedging, since the value of options increases with the stock price volatility.

In addition, this research provides also evidence that cash bonus incentives inherent in CEO compensation packages influences CEOs to increase or decrease the usage of derivatives. The results indicates that compensation based on bonus payment is positive and statistically significant. As specified in the hypothesis, it was not sure whether the variable cash bonus based CEO compensation could have a positive or negative effect, since theory points in both directions. Since the regression results shows a positive and highly significant sign, it indicates that many CEOs were expecting to reach the cap in their cash bonuses compensation and are therefore more risk averse and therefore use derivatives to hedge their risk exposure.

Although, I expected a positive relation between CEOs who hold shares in the firms and derivatives usage, the results concerning this relation was not positive and not significant.
However, the result was not statistically significant and negative, according to Galai and Masulis (1976), a potential explanation for the negative effect of stock ownership compensation on derivatives usage could be that CEOs with greater equity ownership in the company will have incentives to increase the risk of the firm, because common stock of a firm can be viewed as a call option. In that case, it becomes for a CEO who owns stock in the company more valuable as risk increases. Hence, the CEO will be reluctant regarding hedging activities.

Further, we also found it interesting to control for firm size and the education background of the CEO. In all the regressions I ran, firm size is highly significant, which indicates that larger firms have a higher probability of using derivatives compared to smaller firms.
For the control variable education, the expectations was that CEOs with a finance/economic education should have more knowledge about risk management and therefore use more derivatives. In contrast to the expectation, the regression results suggest for all three hypotheses a negative relation between derivatives usage and the education of the CEO. A possible explanation could be that CEOs who are in the possession of a finance/economic education be more careful in the use of derivatives, hence making them less inclined to use derivatives and first look for other options to hedge their risk exposure.

The answer to the research question, is that the structure of CEO compensation pay has an effect on a firm's use of derivatives. Components of CEO compensation have different effect on derivatives usage, which means that that the structure of CEO compensation packages is crucial to elicit the correct behavior to increase the value of the company.
Contrary to prior studies such as Haushalter (2000) and Stulz (1985) I found no statistically significant evidence regarding the relation between stock ownership and derivatives usage.
Further, consistent with prior studies, I found evidence that CEOs holding stock options in the firm have a statistically significant negative effect on the usage of derivatives. And at last, this research found that the use of derivatives is positively and significantly affected by cash bonus based compensation. Based on prior research of Kim, Nam and Thornton (2008) and on the theory of Smitz and Stulz (1985), a possible explanation for this effect is that the included firms in the research sample consists largely (52%) of companies that has a concave bonus payoff function faced by the CEOs and therefore hedging more compared to companies with a convex bonus payoff function.

8. Limitations

This research is subjected to some limitations and with regards to further research - though the data collection is time consuming – it may be useful to take the following limitations and recommendation into account.

First of all, a limitation of this study is that the sample which is used to test the hypotheses can be interpreted as relatively small. Since manually collection of data is time consuming the initial sample was 191 unique firms over a two years period. After the data preparation, the sample was reduced and varies between 151 - 49 unique firms and 295 - 89 firm year observations. This is due to the fact that the greater part of the data was not publicly available in databases. Therefore most of the data needed to be manually collected. Besides that, data regarding stock options- and stock ownership based compensation is not always disclosed or available in firms' annual reports. A recommendation for further research is to capture this lack of data in annual reports by using the Black Scholes model to calculate the theoretical price of European stock options.

Due to the fact that the sample of this research is limited, it is not plausible to come to a strong conclusion which indicates that this study may not be representative enough. A recommendation for further research is to expand the sample size and period.

Finally another limitation is the endogeneity concern. It may be that some regressors of the model, such as some elements of CEO compensation, are correlated with the error term. This means that the one or more elements of CEO compensation in the regression suffers from endogeneity. If this is the case, the OLS method is not appropriate. A recommendation for further research is to correct for potential endogeneity concern by for example using the Wu-Hausman (DWH) test.

Last, also interesting for further research is to go deeper into the investigation regarding hypothesis 1 by testing the differences in derivatives usage for European companies that has a convex and concave bonus payoff.

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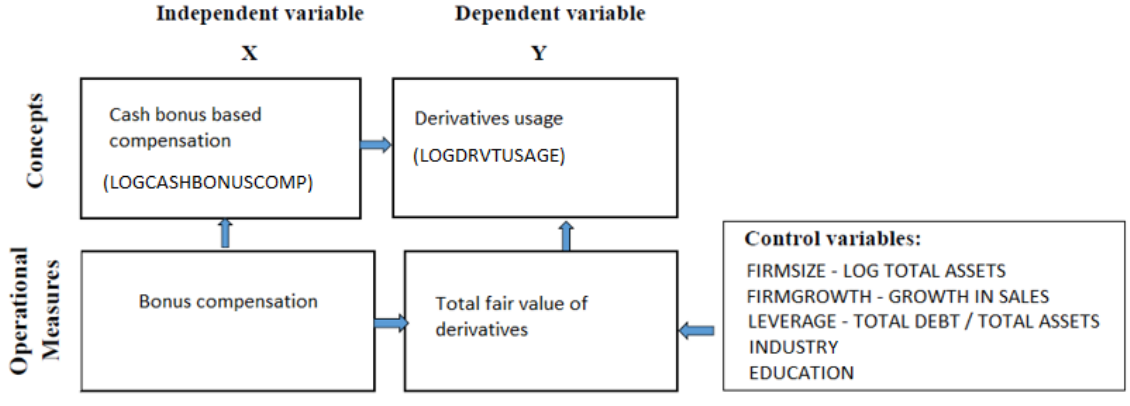
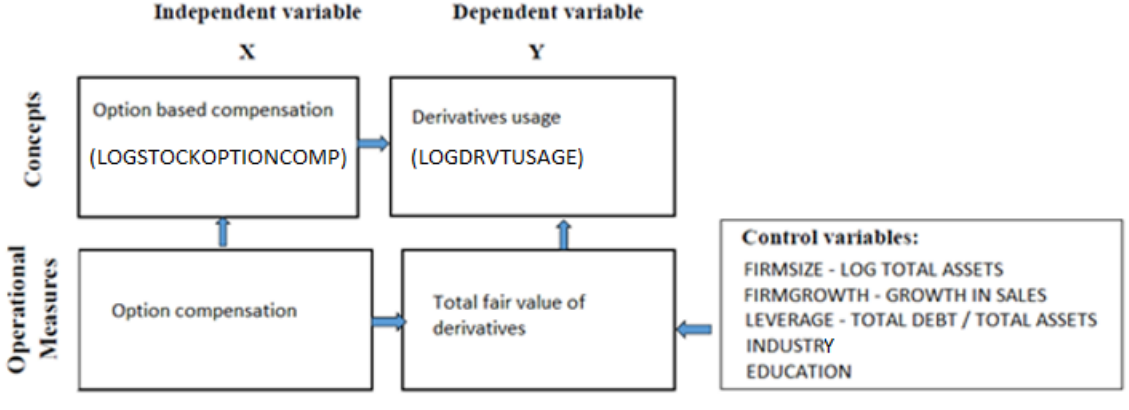
Appendices

Appendix A - Libby boxes hypotheses

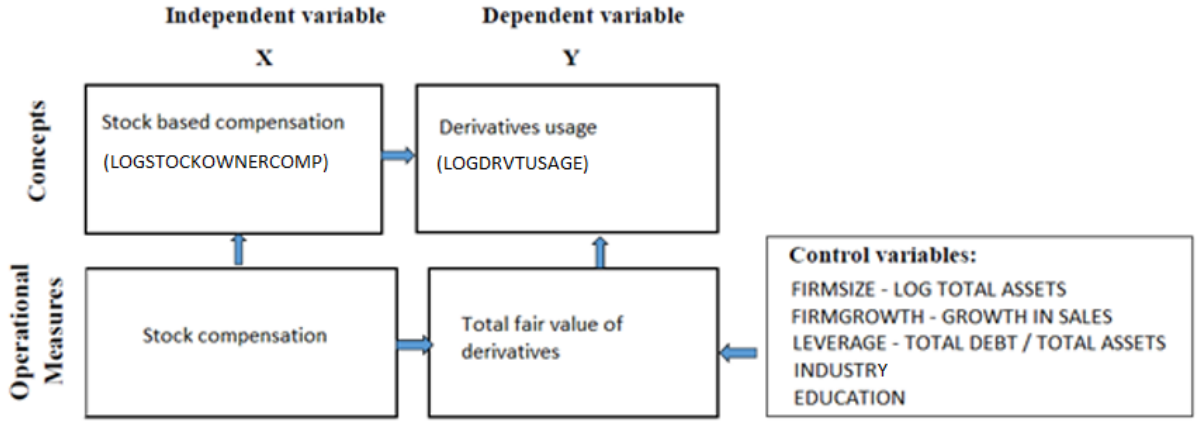
Libby box for hypothesis 1:



Libby box for hypothesis 2:



Libby box for hypothesis 3:



Appendix B – Regression variables description

Regression Variables Description		
Variable	**Description**	**Measurement**
Dependent Variable		
LOGDRVTUSAGE	Total fair value amount of derivatives	The log of the total fair value amount of derivatives
Independent Variables		
LOGCASHBONUS	Total amount of cash based compensation	Cash bonus based on firm performance revealed in annual reports/corporate governance reports
LOGSTOCKOWNERCOMP	Total amount of granted stock options	Total amount of option based compensation granted revealed in annual reports/corporate governance reports
LOGSTOCKOPTIONCOMP	Total amount of granted stock ownership	Total amount of shares granted revealed in annual reports/corporate governance reports
Control Variables		
FIRMSIZE	Size of the firm	The log of total assets
GROWTH	Growth rate of firm	Growth ratio of firm over 5 years (2010-2015)
LEVERAGE	Firm's capital structure	Total debt/total assets
EDUCATION_Dummy	Education of CEO	Dummy variable which takes the value "1" if the CEO has an finance/economic education/background and the value "0" otherwise
IND_Energy_Dummy	Firms which operates in the energy industry	Dummy variable which takes the value "1" if firm operates in the energy industry and the value "0" otherwise
IND_Materials_Dummy	Firms which operates in the materials industry	Dummy variable which takes the value "1" if firm operates in the materials industry and the value "0" otherwise
IND_Industries_Dummy	Firms which operates in the industries industry	Dummy variable which takes the value "1" if firm operates in the industries industry and the value "0" otherwise

IND_Consumer_Dummy	Firms which operates in the consumer discretionary/staples industry	Dummy variable which takes the value "1" if firm operates in the consumer industry and the value "0" otherwise
IND_Healthcare_Dummy	Firms which operates in the health care industry	Dummy variable which takes the value "1" if firm operates in the health care industry and the value "0" otherwise.
IND_IT_Dummy	Firms which operates in the IT industry	Dummy variable which takes the value "1" if firm operates in the IT industry and the value "0" otherwise
IND_Telecomm_Dummy	Firms which operates in the telecommunication industry	Dummy variable which takes the value "1" if firm operates in the telecommunication industry and the value "0" otherwise
IND_Utilities_Dummy	Firms which operates in the utilities industry	Dummy variable which takes the value "1" if firm operates in the utilities industry and the value "0" otherwise

The sample period covers the years 2014 and 2015.

Appendix C – Descriptive Statistics

Descriptive Statistics Regression Variables					
Variable	Obs.	Mean	St. Dev.	Min.	Max.
Item	352	88.5	50.878	1	176
LOGDRVTUSAGE	352	4.294	1.732	-.301	8.242
LOGCASHBONUS	295	2.683	.490	.609	3.765
LOGSTOCKOWNERCOMP	136	2.554	.692	.303	4.217
LOGSTOCKOPTIONCOMP	89	2.507	.795	.301	4.697
FIRMSIZE	351	3.995	.635	2.227	5.994
GROWTH	352	10.856	121.306	0	1738.929
LEVERAGE	352	.241	.158	0	1.072
EDUCATION_Dummy	352	.553	.498	0	1
IND_Energy_Dummy	352	.068	.252	0	1
IND_Materials_Dummy	352	.142	.350	0	1
IND_Industries_Dummy	352	.284	.452	0	1
IND_Consumer_Dummy	352	.205	.404	0	1
IND_Healthcare_Dummy	352	.097	.296	0	1
IND_IT_Dummy	352	.045	.209	0	1
IND_Telecomm_Dummy	352	.063	.242	0	1
IND_Utilities_Dummy	352	.097	.097	0	1

Obs. denotes the number of firm-year observations. The sample period covers the years 2014 and 2015. Hence, total unique firms included in sample varies per hypothesis between 151-49. All variables are defined in Appendix B.

Appendix D – Pearson's correlation

Correlation Matrix of the Main Dependent and Independent Variables

Pearson Correlation				
	LOGDRVTUSAGE	LOGCASHBONUS	LOGSTOCKOWNERCOMP	LOGSTOCKOPTIONCOMP
LOGDRVTUSAGE	1			
LOGCASHBONUS	0.257***	1		
LOGSTOCKOWNERCOMP	0.059	0.051	1	
LOGSTOCKOPTIONCOMP	-0.138*	0.114*	0.256***	1

, **or * indicate significance of the coefficients at 10% (* p < 0.10), 5% (**p < 0.05) and 1% (*** p < 0.01) confidence level, respectively. Only the correlations between the main regression variables are reported.*

Appendix E – Regression results

Table 1 shows the results of the OLS-regression with robust standard errors for hypothesis 1 in which the cash bonus based compensation is the independent variable and derivatives usage the dependent variable.

Number of obs.	=	295
F (12 , 338)	=	7.68
Prob. > F	=	0.0000
R – squared	=	0.1995
Root MSE	=	1.5677

Table 1 – Regression results hypothesis 1

LOGDRVTUSAGE	Coefficient	Robust Std. Err.	T	P-value	95% conf. interval	
LOGCASHBONUS	.578***	.220	2.630	0.009	.145	1.010
FIRMSIZE	.638***	.152	4.200	0.000	.339	.937
GROWTH	-.000	.000	-1.580	0.115	-.001	.000
LEVERAGE	1.560**	.648	2.410	0.017	.284	2.837
EDUCATION_Dummy	-.340**	.195	-1.740	0.083	-.724	.045
IND_Energy_Dummy	.611	.559	1.090	0.276	-.490	1.712
IND_Materials_Dummy	.217	.484	0.450	0.654	-.736	1.170
IND_Industries_Dummy	.751***	.449	1.670	0.095	-.132	1.635
IND_Consumer_Dummy	1.039**	.450	2.310	0.022	.153	1.923
IND_Healthcare_Dummy	.787	.506	1.550	0.121	-.210	1.783
IND_IT_Dummy	.892*	.479	1.860	0.063	-.050	1.834
IND_Telecomm_Dummy	0	(omitted)				
IND_Utilities_Dummy	1.209***	.456	2.650	0.008	.312	2.105
_cons	-.741	.854	-0.870	0.387	-2.422	.941

OLS regression is performed with derivatives usage as dependent variable. All the variables in this regression results table are defined in Appendix B – Regression variable description including their respective measurement. The number of observations is expressed in firm-year observations and is equal to 136. R2 is the model specification power, which indicates that 19.95% of the response variable variation is explained by the OLS regression model.
*, ** or *** indicate significance of the coefficients at 10%, 5% and 1% confidence level, respectively. Other variables are as defined before.

Appendix E – Regression results

Table 2 shows the results of the OLS-regression with robust standard errors for hypothesis 2 in which the stock option based compensation is the independent variable and derivatives usage the dependent variable.

Number of obs.	=	89
F (12 , 338)	=	10.52
Prob. > F	=	0.0000
R – squared	=	0.2563
Root MSE	=	1.766

Table 2 – Regression results hypothesis 2

LOGDRVTUSAGE	Coefficient	Robust Std. Err.	T	P-value	95% conf. interval	
LOGSTOCKOPTIONCOMP	-.519**	.281	-1.82	0.073	-1.071	.050
FIRMSIZE	.839**	.386	2.17	0.033	.070	1.608
GROWTH	.004	.013	0.29	0.775	-.022	.030
LEVERAGE	.117	1.308	0.09	0.929	-2.488	2.722
EDUCATION_Dummy	-.021	336	-0.06	0.951	-.690	.649
IND_Energy_Dummy	0	(omitted)				
IND_Materials_Dummy	.007	.533	0.01	0.990	-1.054	1.068
IND_Industries_Dummy	.350	.569	0.62	0.540	-.783	1.482
IND_Consumer_Dummy	.821	.680	1.21	0.231	-.533	2.175
IND_Healthcare_Dummy	1.322*	.670	1.97	0.052	-.012	2.656
IND_IT_Dummy	-.316	.772	-0.41	0.684	-1.853	1.221
IND_Telecomm_Dummy	-1.954**	.957	-2.04	0.045	-3.860	-.048
IND_Utilities_Dummy	.832	.633	1.31	0.193	-.430	2.093
_cons	1.955	1.929	1.01	0.314	-1.889	5.797

OLS regression is performed with derivatives usage as dependent variable. All the variables in this regression results table are defined in Appendix B – Regression variable description including their respective measurement. The number of observations is expressed in firm-year observations and is equal to 136. R2 is the model specification power, which indicates that 25.63% of the response variable variation is explained by the OLS regression model.
*, ** or *** indicate significance of the coefficients at 10%, 5% and 1% confidence level, respectively. Other variables are as defined before.

Appendix E – Regression results

Table 3 shows the results of the OLS-regression with robust standard errors for hypothesis 3 in which the stock ownership based compensation is the independent variable and derivatives usage the dependent variable.

Number of obs.	=	136
F (12 , 338)	=	5.58
Prob. > F	=	0.0000
R – squared	=	0.2509
Root MSE	=	1.5717

Table 3 – Regression results hypothesis 3

LOGDRVTUSAGE	Coefficient	Robust Std. Err.	T	P-value	95% conf. interval	
LOGSTOCKOWNERCOMP	-.079	.228	-0.35	0.730	-.531	.373
FIRMSIZE	.740***	.233	3.18	0.002	.279	1.201
GROWTH	-.013	.014	-0.93	0.352	-.040	.0142
LEVERAGE	1.439	1.080	1.33	0.185	-.699	3.576
EDUCATION_Dummy	-.447	.304	-1.47	0.144	-1.049	.155
IND_Energy_Dummy	0	(omitted)				
IND_Materials_Dummy	-.932**	.362	-2.57	0.011	-1.649	-.215
IND_Industries_Dummy	-1.009***	.387	2.61	0.010	-1.775	-.243
IND_Consumer_Dummy	.368	.520	0.71	0.480	-.661	1.398
IND_Healthcare_Dummy	-.884	.540	-1.64	0.105	-1.953	.190
IND_IT_Dummy	-.264	.414	-0.64	0.525	-1.083	.555
IND_Telecomm_Dummy	-2.487***	.627	-3.97	0.000		-1.246
IND_Utilities_Dummy	-.174	.447	-0.39	0.698	-3.728	.711
_cons	2.031*	1.158	1.75	0.082	-.261	4.322

OLS regression is performed with derivatives usage as dependent variable. All the variables in this regression results table are defined in Appendix B – Regression variable description including their respective measurement. The number of observations is expressed in firm-year observations and is equal to 136. R2 is the model specification power, which indicates that 25.09% of the response variable variation is explained by the OLS regression model.
*, ** or *** indicate significance of the coefficients at 10%, 5% and 1% confidence level, respectively. Other variables are as defined before.

Appendix F – Firms including in sample

SECURITAS AB	MEDA AB	RED ELECTRICA CORP SA	MTU AERO ENGINES AG
BHP BILLITON GROUP (GBR)	YIT CORP	NIBE INDUSTRIER AB	SEADRILL LTD
POSTNL NV	ALSTOM SA	GIVAUDAN AG	PETROFAC LTD
HELLENIC PETROLEUM SA	MERCK KGAA	DIXONS CARPHONE PLC	ISS A/S
SWISSCOM AG	KEMIRA OY	VEOLIA ENVIRONNEMENT	DUFRY AG
VALMET CORP	RAISIO PLC	BASWARE OYJ	LEGRAND
INFINEON TECHNOLOGIES AG	STATOIL ASA	ACTELION LTD	ARKEMA
CARNIVAL CORP/PLC (GBR)	TELIASONERA AB	GAMESA CORP TECNOLOGICA SA	HUSQVARNA AB
TENARIS SA	GAS NATURAL FENOSA	SYNGENTA AG	AUSTEVOLL SEAFOOD ASA
ANTOFAGASTA PLC	AIRBUS GROUP NV	NOVOZYMES A/S	ORIOLA-KD CORP
ATOS SE	EDF	DEUTSCHE POST AG	AEROPORTS DE PARIS
PROXIMUS SA	EUTELSAT COMMUNICATION	ANHEUSER-BUSCH INBEV	SWEDISH ORPHAN BIOVITRUM AB
CHRISTIAN DIOR SE	ORANGE	RAMIRENT OYJ	EXPERIAN PLC
ENEL GREEN POWER SPA	ENGIE SA	CRAMO OYJ	OUTOTEC OYJ
GROUPE EUROTUNNEL SE	LAGARDERE (GROUPE)	COMPASS GROUP PLC	GALP ENERGIA SGPS SA
FRESENIUS SE & CO KGAA	JERONIMO MARTINS SGPS SA	GEK TERNA HLDG REAL ESTATE	SYMRISE AG
WILLIAM DEMANT	ADIDAS	IND DE DISENO TEXTIL SA	PRYSMIAN SPA
PROSIEBENSAT.1 MEDIA SE	COCA-COLA HBC AG	FRAPORT AG	GERRESHEIMER GROUP
CLARIANT AG	ELEKTA AB	ANDRITZ AG	MONDI PLC/LTD (GBR)
HEINEKEN NV	TELENOR ASA	TEMENOS GROUP AG	REN-REDES ENERGETICAS NACIO
SONAE SGPS SA	DEUTSCHE TELEKOM	DAVIDE CAMPARI SPA	NYRSTAR NV
SCHIBSTED ASA	GETINGE AB	LUNDIN PETROLEUM AB	HEXPOL AB
TITAN CEMENT CO SA	RECKITT BENCKISER GROUP PLC	BILLERUDKORSNAS AB	EDP RENOVAVEIS SA
TULLOW OIL PLC	OLVI OYJ	SNAM SPA	SUEZ ENVIRONNEMENT SA
ABB LTD	CIE D'ENTREPRISES CFE	PUBLIC POWER CORP SA	TIKKURILA OYJ
RENAULT SA	FLUGHAFEN WIEN AG	MOTOR OIL CORINTH REFINERIES	AMADEUS IT HLDGS
NOKIAN TYRES OYJ	ACTIVIDADES CONSTR Y SERVICI	INTRUM JUSTITIA AB	CHR.HANSEN HOLDINGS AS
ORION CORP	TELE2 AB	ALFA LAVAL AB	EVONIK INDUSTRIES AG
SONOVA HOLDING AG	EIFFAGE	ENAGAS SA	PANDORA AS
NATIONAL GRID	DUERR AG	NORWEGIAN AIR SHUTTLE ASA	CNH INDUSTRIAL NV
SEMAPA-SOC DE INVEST GESTAO	KERING	YARA INTERNATIONAL ASA	KION GROUP GMBH
SHIRE PLC	ELLAKTOR SA	GLENCORE PLC	DISTRIBUIDORA INTERNACIONAL
MEDIASET SPA	ASSA ABLOY AB	ELIA SYSTEM OPERATOR SA	DKSH HOLDING LTD
IMPERIAL TOBACCO GROUP PLC	BARRY CALLEBAUT AG	BRENNTAG AG	OCI NV
FRESENIUS MEDICAL CARE AG&CO	VESTAS WIND SYSTEMS A/S	TELENET GROUP HOLDING N.V.	CAVERION CORP
VIOHALCO SA	FORTUM OYJ	GEMALTO	OSRAM LICHT AG
DE SAMMENSLUTTEDE VOGNMAEND	VOESTALPINE AG	AMS AG	ROYAL MAIL HOLDINGS
KONECRANES PLC	SANOMA CORP	MEDIASET ESPANA COMUNICATION	NUMERICABLE SFR SA
FLUGHAFEN ZUERICH AG	STRAUMANN HOLDING AG	TERNA SPA	ALTICE NV
CENTRICA PLC	GEBERIT AG	AKER ASA	AKER SOLUTIONS ASA
STADA ARZNEIMITTEL AG	FF GROUP	FERROVIAL SA	ZALANDO SE
MARINE HARVEST ASA	LONZA GROUP AG	LANXESS AG	SUNRISE COMM GROUP AG
DORMA KABA HOLDINGS AG	NOS SGPS SA	NESTE OYJ	AENA SA
PKC GROUP OYJ	ELISA CORP	CARGOTEC OYJ	

Appendix G – Firms sorted by industry

Industry	Total sample	% Share of total
IND_Energy_Dummy	12	7%
IND_Materials_Dummy	25	14%
IND_Industries_Dummy	50	28%
IND_Consumer_Dummy	36	20%
IND_Healthcare_Dummy	17	10%
IND_IT_Dummy	8	5%
IND_Telecomm_Dummy	11	6%
IND_Utilities_Dummy	17	10%
Total	176	100%

According to the GICS, the number of industries in which companies are classified is equal to 11. Due to a low number of Observations, I exclude 2 industries (Financials and Real estate) and combine 2 industries (Consumer discretionary and Consumer staples) to one consumer industry.

Appendix H – Firms sorted by a convex or concave bonus payoff function

Industry	Total sample	% Share of total
Firms with convex bonus payoff function	73	48%
Firms with concave bonus payoff function	78	52%
Total	151	100%

The total sample consist of 151 unique firms and 295 firm-year observations.