

The Ministry of Education of Azerbaijan Republic

Riskiness of CEO investments and Tenure

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JUNE 2019

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Riskiness of CEOs and Tenure

Chapter 1

1.1 Introduction

The concept of agency theory suggests that CEOs are usually more risk-averse than shareholders would want them to be (Eisenhardt, 1989). One of the reasons for that is most of their money and the reputation of CEOs is tied to the company which they manage. If company fails the reputation of CEO is damaged (Milgrom & Roberts, 1992). Because of these factors managers tend to avoid large risks. On the other side, shareholders are usually well diversified and therefore are not neutral in risk-taking and try to maximize their earnings. Because making big returns requires risk-taking, shareholders want their managers to be more risk-taking. Regarding this, agency theorist developed a concept of financial economics which argues that risk and return go hand in hand, which suggests that in order to have big returns one needs to take bigger risks (Fama, 1976; Sharpe, 1964; Core et al., 2003).

Theorists suggest that one of the main problems is that CEOs are worried about the losses and this prevents them from taking risks (Amihud & Lev, 1983). The solution which was proposed is the use of stock options in order to induce CEOs for bigger risks. This solution is seen as the most direct solution of agency problem because grant of stock options brings into one line the interests of managers with the interest of shareholders (e.g., Jensen and Meckling, 1976; Hall and Liebman, 1998). It has become a widely used practice to use stock options based compensation for managers over the past 30 years. Moreover, it is believed that stock option based compensation incentivizes managers to take risks. A number of researchers suggest that executive stock options provide incentives to a manager to become riskier and to invest in high risk projects (e.g. Jensen and Meckling (1976), Hemmer et al. (2000), Lambert (1986)).

In most cases CEOs are interested in maximizing their private earnings. Analysts argued that the priority for the CEOs is often to build empire than in maximizing the firm value. CEOs are ready to invest capital in not profitable projects in case if these investments would increase the size of

the firm (Aoki, 1984; Jensen, 1988; Jensen & Meckling, 1976; Marris, 1964). Shleifer and Vishny (1989) stated that CEOs make investments where they would have a relative benefit in managing. These kinds of investments would not always increase the value of the shareholders. The purpose is to become more valuable to the firm as a CEO and reduce the probability of being replaced (Shleifer and Vishny, 1989). This is in line with agency theory which states that agents, in this case CEOs, are expected to be self-interested (Eisenhardt, 1989).

Taking into account that a big number of studies have done tests in order to check whether stock options incentivize managers to become riskier, as shareholders want them to be, this thesis makes an attempt to go further and check whether tenure makes CEOs to become riskier in their investments. Tenure is a number of years CEO has been occupying the position in the current company. Previous studies usually tested whether tenure affect the power of CEO which afterwards affected riskiness of firm and firm policies. The study which would check the effect of tenure on CEO riskiness was not found.

1.1 Research question

Taking into account the above stated factors, the aim is to investigate the relationship between the tenure of CEOs and the riskiness of the investments they make over the time they work in the company. The purpose of this thesis is to examine the relation between CEO tenure and the riskiness of the investments that CEOs make. More specifically, the thesis investigates whether the CEOs become more risky when choosing investments with tenure in a company. The aim is to answer the following research question:

“Do CEOs of a listed company become more risky when making investments when they obtain tenure?”

Answering this research question is important, in order to help shareholders to make a choice of selecting a CEO. If CEOs become riskier in investments with tenure, and according to agency theory managers lack riskiness in their decisions, then shareholders would not favor choosing a new CEO, whose tenure would be lower. Shareholders would want to have CEOs with longer tenure, because that would be in line with their preferences and lower the agency costs.

1.2 Practical relevance

The findings of the research are important for management practice. Taking into account that stock options are the largest component of compensation for CEOs in many countries and especially in USA, understanding the conditions of whether stock option pay induces risk-taking behavior of the manager is important (e.g. Lambert 1986; Guay 1999). Most of the studies which were done regarding the influence of stock options on managers' riskiness cover the period until year 2000. Taking into consideration that this research covers the period from 2009-2014 the thesis has practical relevance today. In previous years there have been a number of changes which may affect the dynamics of CEO compensation. One of those changes was made by Federal Accounting Standards Board (FASB). The FASB made a decision that companies must begin to expense the payment of stock options starting from December 2004.

1.3 Theoretical relevance

There are two opinions on how stock options influence managerial risk taking. Some theorists state that the convex payoff of stock options give an incentive to managers to take more risk, because CEOs do not incur losses but obtain gains from the investments (e.g. Jensen & Meckling (1976), Smith & Watts (1992), Smith and Stulz (1985)). Other author argue that stock options contain a leveraged position in the equity of the company and because of that stock options can reduce the manager's incentive to take risks (Lambert et al. (1991)).

The importance of this study is that the research contributes to the literature by providing an evidence of equity based compensation influence on managerial behavior. Taking into consideration that the most of the previous studies concentrate on short term activities (for example acquisition or repurchase of stock Sanders (2001)) this study pays attention to the long-term investments such as R&D spending. Moreover, the study attempts to add the tenure into the relationship. While reviewing previous studies this kind of relationship was not observed.

1.4 Research method

The study which is done in this thesis is an archival study. The sample includes firms listed on the Standard and Poor's 500; Mid-Cap and Small-Cap stock exchange. Two samples of firms over the period from 2009 to 2014 are selected in order to test hypotheses. The first sample includes all industries and contains 4561 observations. Second sample includes industries which are research intensive, which means that they invest a lot more in research and development than other industries. Second sample includes 561 observations. Relying on the successful experience of Sanders and Hambrick (2007) and Wu and Tu (2007) the lagged model structure is used. More detailed reasons for using lagged model are described later in the thesis. The findings of their research are described in more details later in the Theoretical Framework. CEO stock options are measured a one-year value of option awards. The proxy for risk which is taken in this study is research and development expenses per employee. Financial data is collected from the COMPUSTAT database and the information regarding compensation comes from ExecuComp.

Further, the test on whether tenure affects riskiness is done. The definition of tenure is also stated above in Paragraph 1.1 is defined as number of years the CEO has been occupying managerial position in the company. The OLS regression is run where dependent variable is risk and independent variable is tenure.

1.5 Thesis outline

In the chapter 2 which contains the theoretical framework for the study I elaborate on the concept of tenure and explain how the riskiness is defined in the context of this thesis. Hypotheses on which the research is based are provided in chapter 3. In order to provide a theoretical foundation for this study, a literature review concerning the effects of tenure which are related to the riskiness of CEOs, riskiness and convexity in payments of similar studies is provided in chapter 2. In the chapter 3 Paragraph 3.3 "Data and Methodology" describes the sample selection of the research. The "Methodology" part describes the model and research method which is used in order to answer the hypothesis and the research question. In chapter 4 which contains the results and conclusion for the study the findings this study are presented.

In order to answer the research question, firstly the relation between executive stock options and riskiness of CEO investments is examined. Secondly, tenure is added to the regression to see whether tenure has a positive or negative effect on risk-taking.

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Chapter 2 Theoretical Framework

2.1 Introduction

This chapter discusses the previous findings and the contents of the studies which were performed. In order to obtain an understanding of the background theory which is used in the thesis, I provide definition and general assumptions of the agency theory in Paragraph 2.2.1. Moreover, I elaborate on the agency theory in the context manager-shareholder relationship and on how the agency problem is expected to be mitigated.

Taking into account that the thesis uses agency theory as a background theory the thesis also includes findings from another theory, power theory. In paragraph 2.2.2 I provide findings of previous studies that tested the effect of tenure on CEO power. The two theories are used for hypotheses development. The decision of inclusion of the findings which use a different background theory, not agency theory, is taken for two reasons. One reason is that while reviewing literature which elaborated on the relationship between tenure and riskiness of CEO in the context of the agency theory, not many studies were found. Most of the studies which were found were testing the effect of tenure on CEO power and used power theory. Inclusion of the findings of the effect of tenure on CEO power, which in turn may influences policies chosen by a manager, may contribute to the general understanding and expectations regarding tenure. The other reason is that the review of literature which elaborates on the effect of tenure on CEO power helps to understand how tenure is measured and to see the argumentation for the use of a specific tenure measure. The paragraph overall discusses the effect of tenure on CEO power, the influence of CEO power on compensation packages and firm policies chosen by managers.

Paragraph 2.2.3 discusses the effect of CEO compensation package on the CEO risk taking. Since the research question of the thesis tries to investigate whether tenure affects the CEO risk taking in the context of agency theory and the main suggestion of theorist on the solving the agency problem is granting stock options, the first part of the Paragraph talks about stock options and the convexity in the payoff. After defining and explaining CEO stock options and

convexity in the payoff which is obtained by granting the stock options the paragraph does an overview of the previous studies regarding the effect of convexity in payment on riskiness of CEO.

The papers that are reviewed in this section are collected from the most influential journals: Journal of Accountancy, Journal of Accounting and Economics, Academy of management, Journal of Management. The reason for selecting the most influential journals is because they provide the highest quality of the research.

The aim of writing a literature review is to provide background knowledge to the reader regarding the studies which have already been performed and present previous findings. A literature review is beneficial because by reading and analyzing previous studies, it allows for an understanding of how previous authors have studied the topic and allows for the development of a theoretical framework. It aids in hypotheses development and constructing the research design.

2.2 Literature overview

2.2.1 Agency theory

Agency theory is one of the most often used theories which concern a cooperative relationship. Agency theory provides an understanding of behavior of two or more parties when one party, the agent, acts in the interests of other party designated the principal (Arrow, 1985; Barney & Ouchi, 1986; Jensen & Meckling, 1976). In the context of a company or corporation this theory assumes that the agent will not always act in the best interest of the principal. The agent will not always maximize the welfare of principal, because agent and principal may have different goals and different tendencies toward risk (Wright, Ferris, Sarin, & Awasthi, 1996). According to the agency theory, principals are risk neutral in their preferences since they can diversify their shareholdings by buying stock from different companies (Wiseman & Gomez-Mejia, 1998). On the other hand, agents are considered to be risk averse. The reason for that is that most of their wealth and the reputation is inextricably tied to the company which they manage. If company fails the reputation of CEO is damaged (Donaldson, 1961; Williamson, 1963). So,

agents are concerned to be risk averse in their decision in order to decrease the risk to their wealth. The focus of agency theory is on creating a contract which would minimize the costs associated with agency relationship and aligning the goals of agents with the goals of principals.

Amihud and Lev (1981) suggest that one of the main problems is that CEOs are worried about the losses and this prevents them from taking. In order to solve the problem of not taking enough risk the use of stock options is proposed. This solution is seen as the most direct solution of agency problem. The reason for that is because grant of stock options align interests of managers with interest of shareholders (e.g., Jensen and Meckling, 1976; Hall and Liebman, 1998). It has become a widely used practice to use stock options based compensation for managers over the past 30 years. Moreover, it is believed that stock option based compensation incentivize managers to take risks. A number of researchers suggest that executive stock options provide incentives to a manager to become riskier and to invest in a high risk projects (e.g. Jensen and Meckling (1976), Hemmer et al. (2000), Lambert (1986)). The reason why stock options incentivize managers to take risks is because these options provide convexity in the payment of CEOs. Convexity in the payoff, provided by stock options, allows managers to share gains of the firm and not share losses of the firm. Moreover, convexity provided by stock options is helps managers to overcome risk-aversion by letting them to enjoy gains and floor to avoid losses (Sanders & Hambrick, 2007). Also, Wu and Tu (2007). By making granting stock options, shareholders align interests of CEOs with interest of shareholders which want their agents to be more risky.

2.2.2 Effect of Tenure on CEO Power

For a long time CEOs were the ones who dominated in the process of selection of board directors. Despite the fact that shareholders became more active and reduced the influence of CEOs in the director selection process, CEOs are still dominating in taking important decision (Lorsch & Maciver, 1989). There are several reasons which make researchers think about the fact that the longer CEO works for the company, the more entrenched they become. Moreover, with the longer tenure, CEOs gain more power and start acting in their own interests rather than in the interests of stakeholders. In particular CEOs may be able to control boards of

directors within some period of time and therefore start demanding compensation packages that would reflect their own preferences (Hill & Phan, 1991; Shen, 2003).

The reasons for expecting influence of CEOs over boards to increase with the tenure are discussed below. Normally CEOs are the ones who nominate new board members. Therefore, they can add new directors and remove troublesome board members. By taking these kinds of actions their influence over board becomes stronger, because they are able to control board composition Finkelstein and (1989). Initially, when the new CEO is appointed, he or she has a little influence over their boards, because existing board members were most likely nominated by the previous CEO. Therefore, the board members have a little loyalty to the newly appointed CEO. However, over time the new CEO is able to fill in the board with their own nominees. Since these new directors were positioned by the new CEO and they owe their position to the CEO, their loyalty may be to the CEOs and not to the shareholders (Fredrickson, Hambrick, & Baumrin, 1988).

2.2.2.1 Effect of powerful CEO on Compensation

Usually the board committee executes the function of compensation committee; consequently a board composition of a company influences the compensation. Compensation consultants brought in to advise the committee are often hired by the CEO or by the human resources department of the firm. It is widely speculated that consultants and board members are often friends of the CEO who are more likely to approve of high CEO pay. If the CEO of the firm also occupies the position of the chairman of the board, the CEO's influence over the board would be even greater. As result of this influence, such a CEO would likely enjoy a larger compensation package (Sridharan, 1996).

The paper developed by Bebchuk, Fried, and Walker (2002) show the importance of managerial power in executive compensation. Authors mention that under optimal contracting approach payment arrangements which are set by the board of directors aim to maximize shareholder value. However, under managerial power approach “boards do not operate at arm's length” in developing executive compensation plans. Moreover, CEOs have power to effect their own pay

by altering the compensation plan in the way they prefer. The authors show evidence that managers are left with a significant power to shape their own payment agreements.

Boyd (1994) identified directors as a key mechanism which sets the compensation of a CEO. In his paper he tests the theory that managers try to circumvent board of directors in order to maximize their pay and he finds a support that CEO salaries and compensation were higher in firms where board control was lower, which means that CEO could influence the board in order to get the higher pay.

Sridharan (1996) in his paper also proposed evidence which suggest that CEO influence over board is positively related to CEO pay. The results of the study suggest that CEO salary levels are function of CEO influence over the board of directors. A CEO who has power over a board gets more compensation than CEO with less power.

Ueng, Wells and Lilly (2000) made a similar research on the topic of CEO influence and CEO compensation as Sridharan. However, study of Sridharan was limited to only large firms and Ueng, Wells and Lilly wanted to see if CEOs in small firms can have same kind of influence on their pay as in large firms. The results were consistent in large firms. For small firms same evidence was not found. The possible explanation for that can be that owners of small firms are also CEOs. In this situation CEO influence might be unimportant in determining compensation.

Hill and Phan in their study have found that the tenure influences the strength of the relationship between absolute pay and firm size, absolute pay and firm risk and changes in pay and stock returns. In all cases, the idea that tenure helps CEOs to build influence in the firms and therefore to adapt compensation packages to their own preferences still exists.

Consequently, link between pay and firm size and link between pay and firm risk gets stronger with the tenure and the relationship between pay and stock returns starts to become weaker as tenure increases (Hill & Phan, 1991). The findings are also consistent with the ones which were done earlier by Gomez-Mejia, Tosi and Hinkin (1987), where they explored a moderation effect that concentration of stock ownership has on the relationship between CEO pay and size of the company (Gomez-Mejia et al., 1987).

2.2.2.2 Effect of powerful CEO on Risk taking

Zeki Simsek (2007) in his study found that CEO tenure had influence on performance and risk taking through its ability to affect the top management team and stakeholders. He found that CEO tenure had a positive effect on risk taking. Therefore, the image of a risk-taking CEO that arises from the study is a well-seasoned person with a good knowledge of the company and the environment. According to the study, it appears that as the CEOs acquired firm and job specific knowledge, the more competent and confident in the risk taking activities they became.

CEO risk taking is defined as making decisions which have outcomes that are not predictable and not certain (Palmer & Wiseman, 1999). A big variety of proxies have been used to measure CEO risk taking such as acquisitions (Pablo, Sitkin, & Jemison, 1996), R&D expenditure (Palmer & Wiseman, 1999), spending for innovations (Greve, 2003).

Dewellyn and Muller-Kahle (2012) examine managerial risk taking and use a proxy for a risk taking which is a decision to follow a strategy of specializing in subprime lending. It is generally accepted that subprime loans have pose a high threat of default for a company. Researchers take a sample of 74 firms and 344 firm years and find an evidence of positive relation between CEO power and excessive risk taking.

Two other authors Aanderson and Galinsky (2006) in their work run five studies in order to find out if power is related to risk. In their first study authors tested if people with higher sense of power are more likely to have more optimistic perception of risk compared to individuals with lower sense of power. In second study researchers examined if power makes people to think more about positive aspects and think less about negative aspects of environment. The aim second study was to find out if optimism in risk perception of powerful people can extend to outcomes beyond their lives. Findings from Study 1 suggest that people with high overall sense of power are more optimistic in their risk perception regarding future events such as post-graduation job or avoiding diseases. In Study 2 higher sense of power and people who are primed with a higher-power mind-set show an optimistic estemitates of danger and are optimistic in their perception of risk. In study 4, individuals with higher-power mindset show

more willingness to engage in risky behavior. In study 5, people with a higher sense of power perceived less risk in disclosing information in face-to-face negotiations (Anderson & Galinsky, 2006).

The overall finding of Anderson and Galinsky (2006) states that there is a positive association between power and risk taking.

2.2.3 CEO compensation and Risk taking under agency theory

The literature concerning the managerial risk taking is ambiguous to some extent which makes it difficult for the researchers to understand what does being risky for the CEO means. The definitions are not specific. Some authors define risk taking as the process of selecting projects that have uncertainties with the expectations of outcome (Wright, Ferris, Sarin, & Awasthi, 1996: 442). Other authors define risk as uncertainty of some event (Bloom and Milkovich (1998: 285). However, the fact that any action or decision made by CEO has some uncertainty makes it hard to understand and answer the question what risk-taking is. Because of these ambiguities in defining the riskiness of CEO the proxies which are chosen to measure the risk also vary. Most of the existing literature which tests the impact of CEO compensation on the behavior of CEO focus on short-term variables such as acquisitions (Sanders, 2001), repurchase of stocks (Sanders, 2001) and not many studies focus on risky investments such as R&D spending (e.g., Ryan and Wiggins, 2002).

It is widely used practice to incentivize CEOs to become more risky through compensation schemes. Most of the empirical work which is done on the topic of relation between compensation structure and risk taking of CEO uses agency theory as a background theory.

Taking into account that the purpose of thesis is to broaden the current literature and check whether adding tenure affects riskiness of CEOs the same theory is to be used in this study. The review of previous literature which uses agency theory is introduced in the following paragraphs. After reviewing and presenting the common strategies which motivate CEOs to become riskier, the hypothesis will be build.

The way by which executive stock options motivate CEOs to become more risk seeking is by letting them to share earnings through the stock options and providing a floor to evade losses. This means that stock options provide convexity in payoff. Convex payment can be defined as a method of payment where a person shares the gains of the firm in case if a firm makes profit, and does not share losses of the company. One of the methods which make payment convex is a grant of stock options. If a manager has enough stock options he or she can become very rich by taking projects which are risky. If the project fails CEO is not losing anything; however if the project succeeds CEO is sharing the profit. This feature of executive stock options (ESO) is the one which induces managers to become more risky (Sanders & Hambrick, 2007).

The majority of existing empirical researches on compensation plans are indirectly related to how these compensation schemes influence actions of CEOs. For instance, one branch of authors examine how various firm features such as asset nature, legal rules, presence of incentive mechanisms are related to the structure of CEO compensation plans (Yermack, 1995; Smith & Watts, 1992; Deli, 2002). Other researchers link the compensation plans to firm performance. The idea is that if a specific compensation plan makes a CEO to act in a way which is beneficial for a shareholder, then the link between a compensation scheme and firm performance should be observed (McConnell & Servaes, 1990).

The following studies present different approaches to the question of whether convexity in payment such as stock options for example influence riskiness of CEOs.

Coles, Daniel and Naveen (2006) show a strong casual relationship between managerial compensation and investment policy and firm risk. The findings state that when controlling for CEO pay-performance, feedback effects of firm policy and risk on the managerial compensation schemes, higher sensitivity of CEO wealth to stock volatility (vega) implies riskier policy choices such as more R&D investment. Authors also find that risky policy choices lead to compensation structures with higher vega.

The paper by Cohen, Hall and Viceira (2000) in their paper examine the effect of executive stock option on risk taking incentives of CEOs and the way CEOs respond to those incentives. The

finding of the paper is that executive stock options do increase the risk taking by managers. The authors conclude that one of the outcomes of granting ESO is that managers will start taking on projects that have negative net present value but which increase stock price volatility.

Guay (1999) in his study finds that stock options are positively related to the sensitivity of managers' wealth to the equity risk. Author says that if incentive scheme has a convexity then manager's wealth will be positively related to firm risk; and stock options is an incentive with convex payoff which encourages CEOs to become more risky. Moreover, the stock return volatility of a company has a positive relation with convexity provided to CEOs which means that convex incentives affect investing and financing decisions.

Rajgopal and Shevlin (1999) examined if executive stock options granted to CEOs gives them a motivation to invest in risky projects. The study is done in an oil and gas sector and the coefficient of variation of future cash flows from activities associated with exploration is used as a proxy for exploration risk. Researchers state that exploration risks increase with the sensitivity of options granted to CEO to stock return volatility. Authors present evidence of a direct relationship between the level of incentives provided to managers by granting them executive stock options to increase a firm risk and further CEO actions which increased firm risk. Furthermore, the coefficient of variation of future cash flows generated from exploration activities shows a positive relation with the sensitivity of executive stock options to stock return volatility.

Low (2009) in his paper provides an evidence of an impact of equity based compensation on risk taking behavior of CEOs. Low in his work states that risk aversion is a serious problem which results in a loss of wealth of shareholders because of the firm risk reduction. Author also finds that risk reduction are associated with a reduction of share price. One of the most important findings of the paper is that firms are able to overcome the risk aversion problem of managers by increasing the CEO vega. On the other hand, the results on impact of delta on managerial risk taking are not clear. All in all, the empirical evidence suggest that vega is an efficient mechanism for motivating CEOs to take risks.

Dong, Wang and Xie (2010) in their study tested if ESO encourage CEOs to risk taking in security issue decisions. The study suggests that managers are more sensitive to stock return volatile because of ESO are more induced to choose debt financing over equity. Authors state that this finding holds for both unlevered and over levered entities. The evidence supports the theory that executive stock options induce CEOs to be riskier.

Sanders and Hambrick (2007) differentiated among three main elements of risk taking. The first element is size of outlay or the amount at stake. Second element is the variance of probable outcomes. The third element is likelihood of extreme loss (the loss of most of the investment).

The findings of the study regarding the first element of risk taking (the size of outlay) state that ESO which are granted to CEOs provoke high investment outlays through R&D investment, CAPEX and acquisitions. Testing on the second element of risk taking, stock options engender extreme corporate performance which means that CEOs tend to make high variance bets. Lastly, authors present evidence that CEOs with high level of stock options had more big losses than big wins. The overall finding of the study suggest that stock options induce CEOs to become more risky (Sanders & Hambrick, 2007).

Other study which also investigate effect of stock option pay on research and development spending, which can be treated as a proxy for a risk, is done by Wu and Tu (2007). Using panel data from R&D intensive industries authors showed the positive impact of CEO stock option pay on research and development spending. Authors go further in their study and provide an state that the positive relation is stronger when the firm performance is higher.

Hirshleifer and Suh (1992) found that shareholders in order to decrease risk aversion of managers offer them greater option compensation. This evidence is consistent with previous findings which suggest that firms which grant options or option like compensation packages have growth in research and development spending and growth in capital expenditures.

In practice the compensation packages for CEOs include numerous features. Some of them which induce convexity in the payment shift managers risk preference higher and one of the features which offers convexity to managers is stock options.

In the paper authors also derive predictions and suggest that when there is a need to motivate CEO choice toward more risky one, greater option based package should be used. Moreover, the paper predicts that if there are risky growth opportunities, then greater option-based compensation is used (Hirshleifer & Suh, 1992).

In the paper of Gormley, Matsa and Milbourn (2013) the two-way relationship between managerial compensation and corporate risk is done. Authors find that CEOs with less convex payoffs have a tendency to cut leverage and research and development spendings and diversify acquisitions, which means that CEOs who have less stock options are more risk-averse.

Smith and Stulz (1985) discuss managerial compensation and hedging in their paper. Authors argue that compensation of a manager often has a payment which depends on the accounting earnings. From which it follows that expected utility of a CEO consist from both: market value of a firm and an accounting earnings. Consequently, if managers pay is dependent mostly on accounting earnings and utility is concave then the use of hedge accounting is anticipated even if doing so would increase the variance of firm's value. If managers compensation plan has more convexity the use of hedge accounting is less probable. So, the more convex is the pay (the more stock options are in the compensation plan) the less is the probability of hedging.

Chen and Ma (2011) in their study discuss how stock options affect firm value. Their research takes into consideration risk aversion of CEO when examining the influence of stock options on firm performance. The findings state that executive stock options make managers more risky, however such risk taking is constrained by risk aversion of managers. Findings suggest that both long-term and short-term stock returns increase when the risk taking is induced by ESOs. Despite the fact that the risk taking effect of stock options in short-term return on invested capital is negative, the effect on long-term return on invested capital is positive. This means that the risk-taking effect of stock options needs some time in order to become observable.

Therefore, the risk taking relationship on invested capital may be observed in long-term, but not short-term.

However, on the other side Lambert, Larcker and Verrecchia (1991) show that if the probability that options finish in the money is high enough, then stock options increase risk-aversion of CEOs.

There are a number of theories which propose the idea that the bigger strategic risk taking experiences the person has, the less doubtful the person is likely to assess the result of taking these risks. Moreover, these risks will appear more reasonable to the person. Both the ideas of ‘reasoned risk-taking’ (Carpenter, Pollock, & Leary, 2003) and ‘problem domain familiarity’ (Sitkin & Pablo, 1992) confirm the theory which is stated above. More specific, experience may reduce the scale of actual or perceived probable loss and the likelihood of loss linked with expected risk taking. This can happen by 1) making improvement in the selection procedure whereby the person would identify those actions associated with risk within a set of potential actions that have the highest likelihood of success; 2) motivate people to make more comprehensive assessment of the actions they take, which they might consider too risky without the experience they already have; and 3) making improvements in the performance of executions made by individual. CEOs that have low tenure may not have enough awareness to notice and assess strategic risks in a best way. They are also unknown, untested, and lacking legitimacy, which might limit their performance in execution. On the other hand, CEOs who have long tenure have better and deeper knowledge of the firm’s environment and specific skills related to the company. Furthermore, a CEO with a long tenure has already been integrated in a greater extent into the network of main stakeholders and established the resources and informal partnerships. These kinds of partnerships enable CEO to support risky initiatives and influence stakeholders. Moreover, long-tenured CEOs are likely to have more experience in strategic risk situations and can therefore be expected to manipulate the risk taking activities (Simsek, 2007).

2.2.4 Tenure and Risk-taking under agency theory

Compared to the number of studies which elaborate on the effect of compensation package on CEO risk taking the number of papers who try to add tenure to their regression is small. The following three papers are using agency theory as a background theory and have included the tenure variable in their regression.

One of the interesting studies which is done by Chen & Zheng (2014) conduct the analysis of the effect of tenure on the risk taking. During the study, authors find a positive relation between tenure and managerial risk-taking. According to authors, the results are more consistent with interpreting tenure as a career concern of a manager. Authors present couple of hypothesis regarding the effect of tenure on risk-taking. One of the hypothesis is a power hypothesis which is more noticeable if the CEO is powerful. The other hypothesis is experience hypothesis which suggests that the effect of tenure on CEO risk taking is more obvious if CEO is abler. Also they provide career concern hypothesis which suggests that the effect of tenure on risk taking is less positive if there is a high information asymmetry.

The measurements which are used in the paper for risk-taking is the volatility of stock return. The choice of volatility stock return is favored by the authors because according to them volatility of stock return is less ambiguous compared to leverage ration or R&D spending. CEO tenure is defined as the length of time between the date when person took a position of a CEO and the current fiscal year.

The other study done by Bloom and Milkovich (1998) in their work has run a regression analysis where they wanted to check the effect of past performance of the firm on the firm risk. The main purpose of the study is to examine the role of the risk in the structure of managerial compensation. One of the hypothesis which authors are testing is as follows: “For firms with higher business risk, the use of incentive pay is negatively related to firm performance”. The effect of tenure in the regression where dependent variable was a firm risk was positive. The tenure is measured as the length of time between the date when person took a position of a CEO and the current fiscal year.

The study done by Coles et al. (2006), which was described earlier in the Paragraph 2.2.3 also includes tenure in their main regression and turns out that the effect of CEO tenure on firm risk is significant and negative. The tenure is also measured as a number of years CEO has been occupying the position of a manager in the current company.

2.2.5 Analysis of previous findings

In this Paragraph I will attempt to make an analysis of previous findings which are presented in previous Chapter 2. Mainly the elaboration of the measurements which are chosen for the previous papers is done.

Paragraph 2.2.3 summarized 12 papers which studied the effect of compensation of CEOs on risk taking (Table 1). All the papers found a positive relation between the convexity in the payment of CEOs compensation package and risk taken by the CEO. The dependent variables in all the studies are risk. However, the way by which risk is measured is different in papers. Most of the papers used R&D spending as a measure of riskiness (e.g., Coles et al., 2006; Sanders & Hambrick, 2007; Wu & Tu, 2007), some papers used CAPEX (Coles et al., 2006; Hirshleifer & Suh, 1992), some choose to use variance of stock returns as a proxy for risk (e.g., Low, 2009; Guay, 1999) and some choose the market leverage ratio (Dong et al. 2010). In this section the paper elaborates why different papers use different methods for measuring the variables.

The main reason for having such a big diversity in measurement choice is, as stated in Paragraph 2.2.2, the ambiguity in the measuring of risk. However, there should be argumentation in making a choice for a measurement. Paragraph 2.2.3 presented an overview of previous studies which investigate the relation between compensation package and risk-taking. Some of the papers investigate the relation between compensation package and investment policies chosen by managers. Current study distinguishes two main ways to measure CEO riskiness in the reviewed studies. The first group which uses long-term invested capital as a measure of risk such as R&D and CAPEX spending and the second group uses stock return volatility for measuring the riskiness.

Coming back to the remark which is stated above, that not all of the studies had a purpose to find an association between compensation package and risk taking, firstly I would like to give an example of the work done by Coles et al. (2006). Authors had a purpose of investigating the effect of convexity in payment on firm policies regarding the investment. Later on they differentiated between investment in R&D and investment in CAPEX. Authors argued that R&D investment is typically viewed as a high risk investment compared to CAPEX or PP&E investment. When authors found that convexity in payment encourages to make more investments to R&D, authors made a conclusion that convexity in payment also makes investment policies riskier, which in turn has an effect on firm risk.

On the other hand one of the purposes of Sanders and Hambrick (2007) was to find the relation between stock options, which provide convexity in payoff, and firm risk. Authors defined risk as “as the degree to which potential outcomes associated with a decision are consequential, vary widely, and include the possibility of extreme loss” (Sanders & Hambrick, 2007). Authors made a choice to choose three measurements which would be in line with this definition. One measurement for the risk is R&D, the second is CAPEX and the third one is PP&E.

The other study which chooses R&D as a measurement of risk is the study done by Wu and Tu (2007). The main goal of the study which can be understood from the headline of the study is about CEO stock option pay and R&D investment. The purpose of the study is to find out if there is an association between stock payment and R&D expenditure. The study motivates the choice of R&D by the fact that most of the studies which examine the impact of compensation schemes on the managerial risk taking use short term activities such as acquisitions (Sanders, 2001) and stock repurchases.

The second group of the papers which are overviewed in this study include papers which use variance of stock returns as a proxy for a firm risk. Low (2009) in his study want to find a relation between equity based compensation, specifically with the compensation which provides convexity in payoff, and the riskiness of the firm. The measure which he chooses for the risk is the variance of stock returns, which is not similar to the previously described studies.

The reasons for using such a measurement are provided in the study and are the following: first of all, according to author, there are a number of problems which arise when one wants to estimate firm risk such as calculating the risk of the firm's debt. The author also states that because of this problem most of the studies use equity risk as a proxy of firm risk. Secondly, Low states that in the context of his study stock options are written on the firm's equity and because of that the use of equity risk of proxy is more appropriate in the context of the study. Third of all, author states that he controls for the effect of leverage on the equity risk.

Guay (1993) uses equity risk in his study because the main purpose of his study was to show the effect of stock options, which increase the sensitivity of CEOs' wealth, on the equity risk.

Also differences arise in the choice of independent variable, the measure of the convexity in payoff. There are two main measures which are used in the papers which are overview: dollar value of stock options granted and CEO Vega. Convexity in payments is measured as the dollar value of stock options granted in the majority of listed studies in the Chapter 2, the use of CEO Vega is less common among the papers which are reviewed in this thesis. Coles et al. (2006) use CEO Vega instead of stock options value and motivated it by stating that using CEO Vega has an advantage compared to the use of the dollar value of stock options. That is when vega is estimated for the entire portfolio of a CEO (stocks and options) we get a more precise measure of incentives faced by managers compared to the use of the dollar value of stock options granted. Low (2009) states the same as Coles et al. (2006) and says that the value of stock options held is a noisy measurement. On the other hand, other researches argue that the use of stock options is more appropriate because the ideal instrument for aligning the interests of shareholders with interests of managers is to grant more stock options. Grant of stock options is expected to help managers to overcome risk-aversion by letting them to enjoy gains and floor to avoid losses (Sanders & Hambrick, 2007). Also, Wu and Tu (2007) state that CEO stock motivate CEOs to become riskier because first of all the value of stock options granted will not become an actual wealth until the price of stock is higher than the exercise price. In order to realize the stocks CEOs have to increase price of stocks by increasing the firm performance and one of the ways to do it is take more risks. Moreover, CEOs need to wait some period of time to

vest the options which were granted to them. The need to wait motivates them to think about future performance of the firm and focus on long-term investments such as R&D.

Regarding the measurement of tenure, most of the studies measure tenure as the length of time between the date when person took a position of a CEO and the current fiscal year. In some cases the natural logarithm of tenure is taken, but that is due to the skewness.

The Table 1 provides the list of authors whose studies are described in the literature review. The reason for including the table is to have a quick summary of the papers reviewed. In the table you can see the measures of the independent variable and dependent variable which is chosen. Also the object of the study is stated.

The reason for doing this analysis is because it aids the thesis in choosing the measures which are used in the previous studies and helps to analyze and provide the argumentation for the use of specific measure. The argumentations and references which explain the choice of a specific variable are explained in more details in Chapter 3 in Paragraph 3.3

2.2.6 Aid of literature review

The main aid of literature review in this thesis is that while studying the previous studies the writer is able to avoid making mistakes and choose correct set of variables as controls and proxies. Mainly literature review helps in choosing the measures which are used in the thesis and providing the argumentation for the use of specific measure. The argumentations and references which explain the choice of a specific variable are explained in more details in Chapter 3 in Paragraph 3.3. Also reading previous literature helps in choosing statistical models which suits the study the best. As an example, if one takes a look at Table 1 he/she can see that the most of studies used R&D spending as a measure for riskiness of CEO.

2.2.7 Link between theory and hypothesis development

As stated in the previous sections the background theory of this study is agency theory. One of the reasons why agency theory is used as a background theory is because agency theory arises

when there is a conflict in interests between agent and principal. In this case the study is concerned about the risk taking attitude of CEO and shareholders and one of the main questions of the study is whether CEOs become riskier with tenure. So, answering the question of whether CEO become riskier in their investments with tenure is in line with the agency theory, because the answering the research question would aid in solving the agency problem, shareholders will have a new tool, in addition to the grant of stock options, which would help shareholders to align interest of CEOs with their own interests regarding the risk taking.. As an example, if the answer turns out to be positive, then CEOs would not favor appointing new CEOs.

However, one could ask why the findings of previous studies which were using power theory as a background theory is included to this thesis. The reason for including previous studies is mainly for the purpose of studying of how previous studies measured tenure. The other reason is that not many papers which used agency theory as a background theory tried to investigated whether tenure affect risk taking behavior of CEO and this study is making an attempt to go further and investigate whether tenure affects the riskiness of CEO (e.g., Wu and Tu, 2007; Sanders and Hambrick, 2007; Dong et al., 2010; Gormley et al., 2013). The other reason of including power theory is because it can contribute to the general understanding of how tenure affects CEO power and the power of a manager in future may affect investment policies taken by CEO.

So summarizing what was said previously, the main link between these two theories is that the power theory is used as a supporting theory which adds value to the thesis by aiding in how to measure the tenure of a CEO.

2.3 Summary and conclusions from prior research

Overall the purpose of the chapter was to introduce theory which is a background theory for the study and to elaborate on the previous studies which are done on the topic. The definitions and explanations of main theory and terminology are provided in previous paragraphs.

Paragraph 2.2.1 introduced the agency theory. The paragraph gives a definition and explanation of the agency theory, the background theory of the thesis. Moreover, the paragraph provides an understanding of how agency theory is applied in the current thesis and provides general solution suggested by theorists, which is granting stock options (e.g., Jensen and Meckling, 1976; Hall and Liebman, 1998).

Later in the Chapter 2, the thesis provides findings of the supporting theory (power theory). The Paragraph 2.2.2 discusses the effect of tenure on CEO power and provides summaries of previous researches concerning the relationship of power and tenure. The conclusion tenured manager influence board of directors and select own nominees for a position of director. These directors in return help CEOs to be reelected. The Paragraph 2.2.2 is included in order to get an understanding of how to measure tenure.

Paragraph 2.2.2.1 discusses the influence of power and powerful managers on the compensation packages. Several studies suggest that powerful CEO is able to affect their own salaries and structure of compensation. The conclusion of Paragraph 2.2.2.1 is that managers indeed can affect the compensation packages and can shift the components of compensation towards preferred ones.

In Paragraph 2.2.2.2 of the thesis the overview of studies regarding the relationship between power of CEO and CEO risk-taking is done. The relationship turns out to be positive and the conclusion that can be drawn from this section is that the more powerful CEO gets, the riskier he or she becomes.

Paragraph 2.2.3 of the thesis discusses following aspects. First of all, section presents executive stock options and gives an understanding of what it is. The definition of convex payoff and the effect of stock options which provides convexity in payoff are presented. However, the main aspect of this section is to present previous findings and studies which are done on the topic of how stock options affect risk-taking behavior of managers. In Paragraph 2.2.3 I reviewed 13 studies and wrote summaries on the findings of the papers. 12 out of 13 papers suggested that

Table 1. Summary of relevant empirical research

Author	Object of study	Theory	Ind variable	Dep variable	Relation
1) Sanders and Hambrick, 2007	The effects of CEO stock options on company risk taking	Agency	CEO stock option	R&D spending , CAPEX	Positive
2) Coles et al. (2006)	Relation between managerial compensation and investment policy, debt policy, and firm risk	Agency	CEO Vega	R&D spending , CAPEX	Positive
3) Cohen et al (2000)	The effect of stock options on managerial risk-taking	Agency	ESO	Volatility of the firms	Positive
4) Guay (1999)	The sensitivity of CEO wealth to equity risk	Agency	CEO stock options	Stock-return volatility	Positive
5) Rajgopal and Shevlin (1999)	Relation between stock option compensation and risk taking	Agency	Executive stock options (ESO)	Coefficient of variation of future cash	Positive
6) Low (2009)	Effect of equity based compensation on managerial risk-taking	Agency	CEO Vega	Stock-return volatility	Positive
7) Dong, Wang and Xie (2010)	Effect of stock options on excessive risk taking	Agency	ESO	market leverage ratio	Positive

8) Wu and Tu (2007)	Effect of stock options on R&D spending	Agency	CEO stock options	R&D spending	Positive
9) Hirshleifer and Suh (1992)	CEO motivation and project choice	Agency	ESO	R&D spending, CAPEX	Positive
10) Gormley et al. 2013	CEO compensation and corporate risk	Agency	Convex payoff	R&D spending, leverage	Positive
11) Smith and Stulz (1985)	The hedging behavior of value-maximizing corporations	Agency	ESO	Hedging	Positive
12) Chen and Ma (2011)	The risk-taking effect of executive stock options on firm performance	Agency	ESO	Long-term invested capital	Positive

13) Chen & Zheng (2014)	Analysis of the effect of CEO tenure on risk-taking.	Agency	Tenure	Stock-return volatility	Positive
14) Bloom and Milkovich (1998)	the role of risk in the managerial compensation and its effect to organization performance	Agency	Tenure	Stock-return volatility	Positive
14) Shen (2003)	CEO power and CEO-board relations	Power	Tenure	CEO power	Positive
15) Zeki Simsek (2007)	CEO tenure and organization al performance	Power	CEO power	Risk-taking	Positive
16) Lewellyn and Muller-Kahle (2012)	CEO Power and Risk Taking	Power	CEO power	Risk-taking	Positive
17) Aanderson and Galinsky (2006)	The effect of Power on risk perception	Power	CEO power	Risk-taking	Positive

because of the fact that stock options provide convexity in payments for CEOs these stock options motivate managers to become riskier in their investments (e.g., Wu and Tu, 2007; Sanders and Hambrick, 2007; Dong et al., 2010; Gormley et al., 2013). However, a paper written by Lambert et al. (1991) suggest that if the probability of stock options being in the money is high, then stock options would increase risk-averseness of the managers.

The review mainly includes papers which present a positive relationship between stock options and riskiness of CEOs. However one paper written by Lambert et al. (1991) argues about the relationship found by other authors.

Paragraph 2.2.4 includes studies which used agency theory as a background theory and

included the tenure in their regression. Chen and Zheng (2014) as well as Bloom and Milkovich (1998) find that tenure has a positive effect on risk taking.

In the following paragraph the hypotheses and research methods are presented.

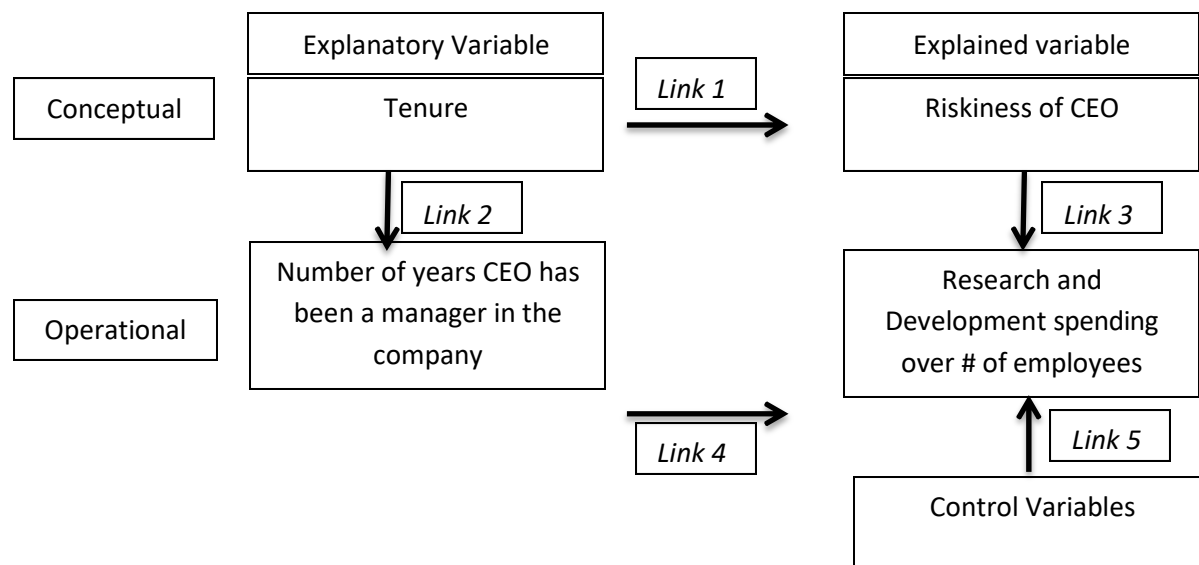
Chapter 3 Hypothesis Development

3.1 Introduction

Previous findings concerning the effect of stock options on power of CEOs which induces managers to become riskier tested the effect of stock options (independent variable) on riskiness of CEO (dependent variable) (e.g., Wu and Tu, 2007; Sanders and Hambrick, 2007; Dong et al., 2010; Gormley et al., 2013). This study wants to test whether adding tenure to the regressions would be positively related to the CEO riskiness.

Presented below are Libby Boxes, which were introduced by Libby, Bloomfield, and Nelson, (2002) present my dependent and independent variables

Figure 1. Libby Boxes



The predictive validity framework of Libby which are also known as Libby boxes, are extremely helpful in setting up a research study and are widely used in experimental accounting research. The framework consists of 4 boxes and 5 links. Link 1 captures the hypothesized causal relation of concepts. Link 2 and link 3 reflect operationalization of these concepts which means that the appropriate measurements are chosen to reflect concepts. Link 4 reflects the relation that the thesis is empirically testing. Link 5 reflects the effects of other factors.

So the goal of the thesis is to test whether tenure has an effect on the riskiness of CEOs. Which means that the conceptual explanatory variable is tenure and explained conceptual variable is the riskiness of CEOs. After defining conceptual variables I need to make a choice of how to measure these concepts. For measuring the tenure I took the length of time between the date when person took a position of a CEO and the current fiscal year. For measuring explained variable I chose the R&D spendings divided by the number of employees.

The reasons for choosing such operational variables are described in details in Data and Methodology part.

3.2 Hypotheses

In order to answer the research question: “Do managers become riskier with tenure?” I first of all test whether stock options have a positive effect on risk taking by CEOs. Previous findings suggest that stock options do increase risk taking behavior of CEOs (e.g., Wu and Tu, 2007; Sanders and Hambrick, 2007; Dong et al., 2010; Gormley et al., 2013). The proxy that I use for risk is the magnitude of research and development investments per employee (Wu and Tu, 2007). So the first hypothesis is as follow:

H1: Stock options are positively related with risk.

The hypotheses are directly linked to the agency theory, which is a background theory of the study. Shareholders are expected to be risk-neutral and managers are expected to be risk averse. Theorists suggested that in order to solve the problem with risk adverse CEOs, shareholders should grant stock options to CEOs (e.g., Jensen and Meckling, 1976; Hall and Liebman, 1998). By answering the first hypothesis the study will see if the stock options positively affect riskiness of CEOs.

After testing first hypothesis, I will test my second hypothesis which is directly linked to my research question. I will test whether the tenure positively affects CEO behavior and makes them to invest more in research and development. If the answer turns out to positive and significant that would mean that CEOs indeed become riskier with tenure.

H2: Tenure positively affects research and development spending.

The link between second hypotheses with the agency theory is that answering this question may add value in solving the agency problem or at least reducing the costs associated with the principal agent problem. The way by which answering this hypothesis may help in solving agency problem is that shareholders will know whether CEOs become riskier with tenure and if the answers turns out to be positive, then shareholders would favor tenured CEOs.

3.3 Data and Methodology

Sample

There are two samples for this study. Both of the samples include firms which listed on the Standard & Poor's 500, Mid-Cap and Small-Cap indexes. The annual financial data for both samples are taken from S&P's 500 COMPUSTAT database and the compensation information is taken from S&P's ExecuComp database.

The difference for the samples is that first sample is a random sample of firms over the years 2009 to 2014. First sample includes 4561 observations. The second sample includes firms over the years 2009 to 2014 in which research and development expenses are great of importance. Number of observations in second sample is 561 of which 372 observations are from pharmaceutical industry, 115 are from electronics, 67 observations from aerospace and 27 from chemical industry.

The reason for choosing two samples is to have a more detailed study.

Measures

Dependent variables

This thesis firstly examines whether executive stock options influence risk taking by managers. In order to measure the risk I will use research and development investment divided by the number of employees. The reason for using R&D spending as a measure for riskiness is because

existing literature mainly uses short-term variables such as acquisitions (Sanders, 2001), repurchase of stocks (Sanders, 2001) and not many studies focus on risky investments such as R&D spendings (e.g., Ryan and Wiggins, 2002). Moreover, Chen and Ma (2011) stated that risk-taking effect of stock options needs some time in order to become observable and risk-taking effect on invested capital can be observed in long-term. The reason for dividing R&D over the number of employees is better than R&D expenditures over sales because it is less sensitive to the influence of accounting methods and business cycles. The use of R&D spending as a measure of riskiness is in line with previous studies (e.g., Barker and Mueller, 2002; Baysinger et al., 1991).

Independent variable

The measure for the independent variable (convexity in payment) for the first hypothesis is a stock option. The reason for using stock option is because according to agency theorists it is the best way to bring into line the interests of shareholders with interests of managers. Also grant of stock options is expected to help managers to overcome risk-aversion by letting them to enjoy gains and floor to avoid losses (Sanders & Hambrick, 2007). According to previous works the CEO stock option is measured as dollar value of options granted every year (Sanders, 2001). The thesis used a one-year option value as a dependent variable. The reason for using one-year value is because no differences are observed while using the ratio of stock options over total compensation or using average value of stock options granted over three preceding years or using one-year value of stock options (Wu & Tu, 2007).

After testing first hypothesis which test whether stock options affects riskiness of CEOs, the second hypothesis is tested. The test investigates whether managers become riskier with tenure. For the second hypothesis the independent variable is tenure which will be calculated as a number of years a person has been working as a CEO for the current company. In order to calculate tenure the data when CEO starts working as a manager is subtracted from the fiscal year. The tenure is measured as the number of years CEO has been in the position for the current company. The same measure of tenure used in the most of the studies (e.g., Chen &

Zheng, 2014; Bloom and Milkovich, 1998; Coles et al., 2006; Simsek, 2007; Lewellyn and Muller-Kahle, 2012).

Control variables

The study includes return on assets (ROA) as a measure to control for firm's financial performance. ROA is measured as net income divided over by the assets at the end of the year). The reason for including the firm performance is because it affects the levels of investment spending. The use of ROA is common among a lot of studies (e.g., Ahuja, 2000; Wu and Tu, 2007; Sanders & Hambrick, 2007). Previous year research and development spending is included as a control variable because it has a causal effect on the next year's R&D expenses. Moreover, according to Wu and Tu (2007), there is a tendency for managers to choose the options of firms which are innovative in a technological way. In order to control for such a possibility the research and development spending of previous year is included to the regression.

Because a stock option is only one of the methods to incentivize CEO I control for the compensation package by including stock ownership, total compensation, restricted stock holdings and long term-incentives. Stock ownership is measured as the natural log of the value of CEO's stock ownership. Total current compensation which is calculated as a sum annual salary and bonus is also included as a control variable. Restricted stock holdings are calculated by multiplying the market value of a stock by the number of restricted shares held by CEO. Long-term incentives are a long-term award to the CEOs who meet specific performance criteria. The compensatory data was gained from Standard and Poor's ExecuComp database.

The Tobin's Q is used in the study as proxy for growth opportunity. Tobin's Q is calculated as the ratio of market value of firm to the book value (Montgomery and Wernerfelt, 1988).

Tenure of CEO is measured by the sum of years the person worked as the CEO of the specific company (e.g., Simsek, 2007; Lewellyn and Muller-Kahle, 2012).

All independent and control variables are lagged one year behind the dependent variable.

Table 2. Variable Description

Variable name	Definition variable
RD_over_people	Ratio variable; R&D spending/number of employees
Opt_reward	Continuous variable; dollar value of stock options granted
Shares	Continuous variable; dollar value of shares
Curr_comp	Continuous variable; salary+bonus
Restr_stocks	Continuous variable; dollar value of restricted stocks granted
Long_term_inc	Continuous variable;
Tobin_s_q	Ratio variable; (market value/book value)
RD	Continuous variable; R&D spending
ROA	Ratio variable; Return on assets (net income/total assets)
Tenure	Continuous variable; length of time between the date when person took a position of a CEO and the current fiscal year
Bin_var13	Dummy variable; value 1 for the firm in Pharmaceutical industry, value 0 otherwise
Bin_var21	Dummy variable; value 1 for the firm in Electronics industry, value 0 otherwise
Bin_var24	Dummy variable; value 1 for the firm in Aerospace industry, value 0 otherwise
Bin_var41	Dummy variable; value 1 for the firm in Chemical industry, value 0 otherwise

Model

The data sample which includes several years of observation for a specific firm may have a serial correlation problem. There are three approaches in order to test hypothesis 1 which is a panel data. First one is random-effects model, second one is fixed-effects model and third one is inclusion lagged dependent variables as predictors. The random-effect model was applied firstly. However after running the Hausman test which suggested that estimates of random- effect model were significantly different from fixed-effects model (Chi-squared is equal to 27.44 which is significant at the 0.0006 level) the use of random-effect model was not appropriate

and would not fit for the present panel dataset anymore. Despite the fact that fixed-effect model is more suitable than the random-effects model, the big number of firms and the small number of observations in the panel dataset makes the use of fixed-effects model problematic. Referring to Maddala (1987) consistent estimation of a fixed-effects model with this type of dataset is not possible. Therefore the method which is used in this thesis for a panel data is inclusion of lagged dependent variables as predictor variables in the OLS regressions.

For the second hypothesis tenure variable is included in the OLS regression.

In order to test the first hypothesis the model for the second sample, the sample which includes only four industries) is as follows:

$$\text{RD_over_people} = \beta_0 + \beta_1 \text{OPT_Reward} + \beta_2 \text{Shares} + \beta_3 \text{Curr_Comp} + \beta_4 \text{Long_term_inc} + \beta_5 \text{Tobin_s_q} + \beta_6 \text{RD} + \beta_7 \text{ROA} + \beta_8 \text{Bin_var13} + \beta_9 \text{Bin_var13} + \beta_{10} \text{Bin_var21} + \beta_{11} \text{Bin_var24} + \beta_{12} \text{Bin_var41}$$

Testing first hypothesis for Sample 1 which includes whole industry looks the same but without including industry dummies.

In order to test second hypothesis, which tries to find the relation between tenure and riskiness of CEO, the model for the second sample is as follows:

$$\text{RD_over_people} = \beta_0 + \beta_1 \text{OPT_Reward} + \beta_2 \text{Shares} + \beta_3 \text{Curr_Comp} + \beta_4 \text{Long_term_inc} + \beta_5 \text{Tobin_s_q} + \beta_6 \text{RD} + \beta_7 \text{ROA} + \beta_8 \text{Bin_var13} + \beta_9 \text{Bin_var13} + \beta_{10} \text{Bin_var21} + \beta_{11} \text{Bin_var24} + \beta_{12} \text{Bin_var41} + \beta_{13} \text{Tenure}$$

In order to test the effect of tenure for the whole industry, industry dummies are taken away from the equation.

3.4 Summary and conclusion

Two samples are used for testing my hypotheses. The aim is to get a more detailed study. Years of observations are from 2009 till 2014. In order to test the first hypothesis the ordinary least

regression with lagged dependent variables is used. For testing the second hypothesis the same kind of regression is used and tenure variable is added to the regression. Inclusion of control variables helps to avoid bias and endogeneity.

Chapter 4 Results

4.1 First Hypothesis Results

In this part of the thesis the results regarding the first hypothesis are provided. The first hypothesis stated that stock options positively affect riskiness of CEO. First of all, the results of the first sample are provided and after the results of Sample 2 are presented. The results are elaborated and explained.

Table 1 presents the descriptive statistics and correlations for the variables included in this study. The mean of R&D spending is positive which suggest that on average sample firms were spending money on research and development.

Table 3. Mean, standard deviation, and correlation

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
R&D	37.9	78.9	1													
CEO St Option	1437	3670	.08*	1												
CEO Shares	1386 51	159 4 793	.05*	.49*	1											
CEO total compensati on	940	830	-.05*	.15*	.05*	1										
CEO restricted stocks	4097	165 06	-.05	.03	-.02	.17 *	1									
CEO long term incentives	3930	7504	-.04*	.07*	-.02	.23*	.20*	1								
Growth opportunity R&D	8.01	1.20	.25*	.09*	.01*	.06*	.03*	0.03	1							
previous year Firm performanc e	338	1051	.14*	.20*	0.3*	.23*	.12*	.34*	.14	1						
	0.04	0.28	-.08*	.27	.18	.05*	.04*	.07*	.04*	.04	1					
CEO tenure	8.01	9.32	.002	.06*	.09*	.01*	.04*	.07*	.05*	-.03	.01	1				
Pharmaceuti cal	0.08	0.27	.46*	.06*	-.02	.001	-.03	.03*	.22*	.18*	-.02	.04*	1			
Electronics	0.03	0.16	.08*	-.02	-.02	.001	-.001	.002	.06*	.06*	.02	.02	.09*	1		
Aerospace	0.01	0.12	-.03*	.05*	-.01	.14*	-.001	.04*	-.04*	.06*	.01	.01	-.04*	-.03	1	

Chemical	0.01	0.08	-.03*	0.01	-.01	0.06	.07*	.03	-.04*	-.01	.002	-.003	-.02	-.02	-.01	1
*P<0.5																

Table 2 presents the results for the first sample which contained 4561 observations. Model 1 includes only control variables; the independent variable is not included. The dependent variable is R&D spending per employee. As Model 1 presents, the past year research and development spending coefficient is highly significant and positively affect the dependent variable. Firm's growth opportunity coefficient is also highly significant and is positively related to the risk. These results suggest that firm's past spending on R&D and future opportunities in development influence on future R&D spending. Model 2 presents the results of the regression where the independent variable is included. As it can be seen the CEO stock option coefficient is positive and significant which means that stock options influence future spending of research and development. The F-statistic was equal to 38.28 in Model 1 and 36.71 in Model 2.

In order to test the same hypothesis for the second sample, industry dummies are included. As stated in the Paragraph 3.3 the second sample has 561 observations. 372 observations are from pharmaceutical industry, 115 are from electronics, 67 observations are from aerospace and 27 from chemical industry. Table 3 presents two models for the second sample. Model 1 presents results of the regression where only control variables are included. The coefficient of previous research and development spending is highly significant and positive. The coefficient of future growth opportunity is also positive and highly significant. The F value of Model 1 is equal to 87.52. After including the dependent variable which is CEO stock option, the previous year R&D spending and future growth opportunity coefficients are still positive and significant. As it can be seen from the table CEO stock option coefficient is positive and significant at 5% level. This means that stock options positively influence R&D spending. The F value of Model 2 is equal to 82.85.

Table 4. Results of OLS regression analysis of R&D spending

	1	2
Constant	10.99	10.79

CEO stock ownership	-1.83E-06** (7.51E-07)	-3.46E-06*** (8.52E-07)
CEO total current compensation	-0.0048*** (0.0014)	-0.005939*** (0.001458)
CEO restricted holdings	-7.62E-05 (7.00E-05)	-8.06E-05 (6.98E-05)
CEO long-term incentives	-0.001*** (0.0002)	-0.001*** (0.0002)
Firm growth opportunity	15.67*** (0.95)	15.43401*** (0.95)
R&D spending in previous year	0.014*** (0.001)	0.014045*** (0.0012)
Firm performance	-25.44*** (4.05)	-25.62*** (4.04)
CEO stock options		0.001431*** (0.000357)
Overall R ²	0.108	0.112
Adj. R ²	0.105	0.109
F value	38.28	36.71
* p<0.10; ** p<0.05, Standard errors are shown *** p<0.01 in the parenthesis Number of observations=4561		

4.2 Second Hypothesis Results

In this part of the thesis the elaboration on the second hypothesis results is done. As in previous paragraphs the test on whether tenure positively affects riskiness is done separately for two samples. Table 4 presents the results of the test.

Model 1 of Table 4 presents the results for the whole industry (Sample 1). After including “Tenure” variable explanatory value of the model increased by 1.5%. The coefficient of Tenure has a negative effect on the research and development spending; however the result is insignificant. Coefficients of previous R&D spending, growth opportunity and CEO stock options still remain positive and significant.

Table 5. Results of OLS regression analysis of R&D spending

	1	2
Constant	14.9 9	14.86
CEO stock ownership	5.08E-07 (6.85E-07)	-4.19E-07 (7.80E-07)
CEO total current compensation	-0.004*** (0.0013)	-0.0045*** (0.0013)

CEO restricted holdings	2.75E-05 (6.36E-05)	2.46E-05 (6.35E-05)
CEO long-term incentives	-0.0008*** (0.0001)	-0.0008*** (0.002)
Firm growth opportunity	9.35*** (0.8895)	9.2533*** (0.8898)
R&D spending in previous year	0.0068*** (0.0012)	0.0068*** (0.0011)
Firm performance	-21.3*** (3.67)	-21.42*** (3.67)
Pharmaceutical	113.47 (3.95)	112.8 (3.952432)
Electronics	-11.38 (6.41)	-11.21 (6.41)
Aerospace	-7.00 (8.45)	-7.52 (8.44)
Chemicals	-16.37 (14.05)	-17.04 (14.04)
CEO stock options		0.0008** (0.0003)
Overall R ²	0.27	0.272
Adj. R ²	0.26	0.269
F value	87.5 2	82.85
* p<0.10; ** p<0.05, *** p<0.01 Standard errors are shown in the parenthesis		
Number of Observations=561		

The results of this part suggest that tenure has a negative insignificant effect on research and development spending in the research intensive industry.

Model 2 of Table 4 presents the results for the second sample. The coefficient of Tenure variable is negative and significant at 10% level, which means that the higher the tenure the less risky investment, like spending on R&D, the CEO is willing to take.

After running all regression the decision of running one more test with inclusion of interaction term is taken. The interaction which is done is between the tenure of the CEO and CEO stock options. The reason for including the interaction is because one can think that tenure includes the effect of increasing stock options, because CEOs may get option grants every year. In order to separate that effect, interaction variable is included. The explanatory power of the regressions did not increase a lot however the significance of Tenure variable changed. Table 5 represents the results of the regression where interaction variable is included. Model 1 includes

the Sample 1 results and Model 2 represents the result of the second sample which included research intensive industries.

If the comparison of Model 2 between Table 4 and Table 5 is done, it can be observed that the tenure which was significant at 10% level in Table 4 became insignificant in Table 5 after inclusion the interaction term. The coefficient of interaction term is insignificant and too small to have an effect.

Table 6. Results of OLS regression analysis of R&D spending

	1	2
Constant	11.34	16.26
CEO stock ownership	-3.43E-06*** (8.52E- 07)	-4.23E-07 (7.87E-07)
CEO total current compensation	-0.006*** (0.0015)	-0.0045*** (0.0013)
CEO restricted holdings	-7.68E-05 (6.96E-05)	1.97E-05 (6.95E-05)
CEO long-term incentives	-0.001*** (0.0002)	-0.0008*** (0.002)
Firm growth opportunity	15.22*** (0.95)	9.2533*** (0.8898)
R&D spending in previous year	0.014*** (0.0012)	0.007*** (0.0012)
Firm performance	-24.52*** (4.02)	-20.77*** (3.68)
Pharmaceutical		112.8 (3.952432)
Electronics		-11.21 (6.41)
Aerospace		-7.52 (8.44)
Chemicals		-17.04 (14.04)
CEO stock options	0.015*** (0.0004)	0.0008** (0.0003)
Tenure	-0.08 (0.12)	-0.2* (0.11)
Overall R ²	0.113	0.259
Adj. R ²	0.109	0.256
F value	33.55	71.71
* p<0.10; ** p<0.05, *** p<0.01		Standard errors
Number of Observations=3697		are shown in the parenthesis

4.3 Summary and conclusion

In this paragraph the summary of the results part is given. Overall the effect of CEO stock option is positive on research and development spending. Both Sample 1 and Sample 2 provided positive and most importantly significant coefficients for CEO stock options. Previous year R&D and future growth opportunity both have positive and highly significant coefficients. All in all result provided in this part of the thesis are in line with previous findings which are described in Chapter 2.

Table 7. Results of OLS regression analysis of R&D spending

	1	2
Constant	11.17	15.87378
CEO stock ownership	-3.27E-06*** (9.11E- 07)	-4.37E-08 (8.41E-07)
CEO total current compensation	-0.006*** (0.0015)	-0.0047*** (0.0014)
CEO restricted holdings	-7.68E-05 (6.96E-05)	2.05E-05 (6.39E-05)
CEO long-term incentives	-0.001*** (0.0002)	-0.0008*** (0.002)
Firm growth opportunity	15.22*** (0.95)	9.3*** (0.9)
R&D spending in previous year	0.014*** (0.0012)	0.007*** (0.0012)
Firm performance	-24.53*** (4.02)	-20.8*** (3.68)
Pharmaceutical		107.98 (3.68)
Electronics		-11.45 (6.44)
Aerospace		-7.47 (6.44)
Chemicals		-17.35 (14.03)
CEO stock options	0.017*** (0.0006)	0.0013** (0.0005)
Tenure	-0.07 (0.13)	-0.16 (0.11)
Tenure*CEO stock options	-1.01E-05 (2.02E-05)	-2.36E-05 (1.85E-05)
Overall R ²	0.113	0.26

Adj. R ²	0.109	0.256
F value	33.55	68.04
* p<0.10; ** p<0.05, *** p<0.01		
Number of Observations=3697	Standard errors are shown in the parenthesis	

The conclusion for second hypothesis is that tenure negatively affects the riskiness taken by the CEO for the Sample 2, but after inclusion interaction variable Tenure does not affect the spending made on research and development. For Sample 2 the tenure has no significant effect on R&D.

Chapter 5 Conclusion and Discussion

5.1 Conclusion

The study applies agency theory to examine the relationship between CEO tenure and the riskiness of CEO investments choices. The purpose of using agency theory instead of any other theory is because the literature which would test the effect of tenure on the riskiness is lacking and few studies attempted to examine this relationship.

The thesis tries to investigate whether CEOs become riskier in investments when they obtain more tenure. As it is stated in the previous Chapters, the agency conflict appears because of the fact that CEOs are not as risky as shareholders would want them to be. Answering this question would assist shareholders in solving the agency problem. Literature overview in Chapter 2 provides the relevant theories and studies which have been done regarding the topic of riskiness of CEOs. As it is stated in previous chapters, not many studies paid enough attention the question of whether managers become riskier with tenure, most of the studies focus on the topic of how compensation packages affect the riskiness of CEOs.

To answer the research questions I first of all run the test where my independent variable is convexity in payment and checked if convexity in payment which is mostly discussed in other

studies affects the riskiness of the investments. The measure which is chosen for dependent and independent variable are discussed in Chapter 3. Moreover, the motivation for making the choice of specific measurement is provided. The results state that the convexity in payment positively affects riskiness of the investments. These results are consistent with the previous studies.

After that, the regression which is directly linked to the research question is run. The effect of tenure on the riskiness of the investments is tested and the agency theory is used as a background theory. The results for the research intensive industries are negative, which means that the longer tenure CEO has, less risky he becomes. However, decision of running one more regression with adding interaction of CEO stock option award with CEO tenure was made. The reason for adding the interaction variable is because one could think that the stock options award increase every year and that tenure includes that effect of yearly stock awards. After inclusion the tenure variable the effect of tenure is still negative but not significant. One of the reasons for the results being insignificant may be that are some other factors which should be taken into account. This thesis does not control for CEO age, which can one of the factors which influence the riskiness of the investments made by a CEO, because the perception of risk for younger people is different from older people. Also the overall experience can play a crucial role when making a decision to take a risk. Also CEO duality and director ownership are not included in the regression, which also can have an effect on the way how CEO would make investments.

The conclusion of the thesis is that after controlling for the yearly option stock grant the tenure has no significant effect on the riskiness of investments made by a CEO. However, taking into account that other variables also can change with the time, inclusion of more interaction terms is needed in the future research.

The outcome of the thesis is comparable to the studies which are described in Chapter 2. More specifically to the studies which described the effect of convexity in payment to the riskiness of CEO investments. This thesis finds that the convexity in payment, defined as the dollar value

stock options granted, have a positive effect on the riskiness of CEO investments, which is defined as R&D spending over number of employees in the thesis. This results is in line with previous studies (e.g., Wu and Tu, 2007; Sanders and Hambrick, 2007; Dong et al., 2010; Gormley et al., 2013; Smith and Stulz, 1985; Chen and Ma, 2011; Guay, 1999)

5.2 Limitations and further research

First of all, the data is drawn from the COMPSTAT and ExecuComp which includes large public firms. So applying the results of this thesis to small firms can be problematic.

Secondly, this thesis focuses on whether CEO tenure affects R&D spending. However, the thesis does not take into account such factors as CEO duality or director ownership. So, the lack of the information regarding the board information is another limitation of the study because board control can play a crucial role in making the strategic decisions. Moreover, the thesis did not take into account how CEOs who own a big number of stock options are able to practice their risky behavior and convince others to agree for the risks. Future research can extend the study and take into account the interaction between governance structures.

Thirdly, there are a lot of effects which can influence the results of how tenure affects the R&D spending. For example, CEOs receive option awards yearly, so the more tenure CEO has the more stock options a manager would own. Therefore adding more control variables which would interact with tenure and separate the effects carried by the tenure is advisable for the future research.

One more limitation which can be mentioned is a small sample size for the second sample, which includes only research intensive firms. It is believed that the archival studies have a greater external validity, which means that archival studies can be generalized to the whole population in a greater extent. However, due to the fact that the second sample of the thesis includes only 561 observations which make it problematic to apply for all firms which heavily invest in R&D spending. Taking into account that the primary goal is to generalize from a sample to population, large samples approximate whole population better.

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