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ANTON DE KOM UNIVERSITY OF SURINAME

FACULTY OF SOCIAL SCIENCES

Inefficient investment and CEO compensation

The effect of inefficient investment on CEO compensation

In partial fulfillment of the requirements for the degree of Master of Science in Accountancy

Field of study: Accountancy

Name: Isrie, Devinderkumar R. BSc.

Supervisor: Mr. Chandrikasingh, Sharda MBA

Paramaribo, February 2022

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Acknowledgment

This master thesis marks the end of my master's study of Accountancy at the Anton de Kom University of Suriname. During the course Seminar Financial Research, I came across inefficient investment and CEO compensation. This subject caught my attention and I decided to choose it as a research topic for my master thesis.

For the successful completion of this thesis, I would like to take the opportunity to thank a few people whose help was invaluable to me. First, I would like to express my gratitude to my supervisor Mr. Chandrikasingh, Sh. MBA for the professional support and guidance on my thesis. Furthermore, I would like to thank Gangapershad, W. MSc., the co-supervisor of my thesis, Ramdin, V. MSc., Head of the Department of Economics, and Drs. Sheoratan, A. RA, coordinator of the Master in Accountancy program.

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Isrie, Devinderkumar R. BSc.

Paramaribo, February 2022

Abstract

In this thesis, the relationship between inefficient investment and CEO compensation is examined. The relationship between inefficient investment and CEO compensation is used to indicate the extent of the agency problems in overinvestment and underinvestment within the U.S.A. listed manufacturing and retail companies from the U.S. Securities and Exchange Commission (SEC) between the years 2015-2018. The purpose of this thesis is to investigate the effect of inefficient investment on CEO compensation.

To investigate whether inefficient investment divided into overinvestment and underinvestment affects CEO compensation; a multivariate linear regression analysis is executed. The variables inefficient investment and CEO compensation are measured respectively by sales growth and salary. Two hypotheses are developed for this thesis. After testing both hypotheses, the results show that overinvestment has a negative and insignificant effect on salary. This indicates that there is no relationship between overinvestment and salary. Furthermore, that underinvestment has a positive significant effect on salary. This indicates that there is a relationship between underinvestment and salary.

Keywords: inefficient investment, CEO compensation, overinvestment, underinvestment, sales growth, salary.

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List of abbreviations

CEO = Chief Executive Officer

SEC = Securities and Exchange Commission

U.S.A. = United States of America

EDGAR = Electronic Data Gathering, Analysis, and Retrieval

FHP model = Frisch, Hasslacher & Pomeau model

SAL = Salary

LEV = Leverage

ROA = Return on Assets

NPV = Net Present Value

SPSS = Statistical Package for Social Sciences

R^2 = R Square

1 Introduction

1.1 Background

The purpose of this research is to investigate the effect of inefficient investment on CEO compensation. In past decades, efficient investment has obtained increased attention among firms and stakeholders. Efficient investment seems to be the driving force of the economic growth of a firm. However, in the real world, a firm's investment decisions often deviate from the efficient levels because of the capital market frictions, resulting in overinvestment or underinvestment (Xiao, Bai, Qin, Xiong, & Yang, 2021). Typical inefficient investment behavior includes overinvestment and underinvestment. Overinvestment will lead to a large amount of capital being waste in areas of overcapacity. At the same time, it will increase the debt of the company and bring more financial risk and operational risks. Underinvestment will hinder the realization of the maximum value of the company, which not only slows down the expansion of the company but also damages the interest of the investors. Therefore, how to control effectively inefficient investment has become a hotspot to academia and practitioners (Qiu & Wu, 2018). Inefficient investment refers to management that does not rely on the decision criteria of the shareholder value maximization in their selection of investment projects. The goal of inefficient investment is to maximize the private benefit of managers. Inefficient investment refers to the inconsistent behavior between the actual investment expenditure and the level of the optimal investment (Li & Teng, 2019).

CEO compensation is a controversial topic. In theory, to maximize value on behalf of shareholders, the boards should draft the pay packages. Contracts should therefore attract talented CEOs and incentivize them to exert effort, exploit growth opportunities, and reject wasteful projects while minimizing the cost of doing so (Edmans & Gabaix, 2009).

1.2 Problem definition

According to Boshkoska (2015), 'Agency problems' means conflict of interest between managers and shareholders. Having more indebt information on the data of the company, managers may use this in making decisions for their own benefit that might not be equal or more beneficial for the shareholders. Agency problems are among the corporate governance a major problem that many big companies face. Agency problems between managers and shareholders can cause many

problems, one of which is a decision to choose for an inefficient investment that binds the company. Managers may invest in projects for their interest, not for shareholders' interest. Under a rational and perfect information market assumption, firms invest efficiently in projects with positive Net Present Value (NPV). However, in practice, efficiency is different for each investment. Investments with low efficiency, for example where the costs are higher than the earnings, are called inefficient investment (Shan & An, 2018).

Various empirical studies have focused on inefficient investment. Some of these studies are relate to investigating the effect of inefficient investment on CEO turnover, financial constraints or agency costs, and investment transparency (Masoud, 2020); (Chen, Smith, & Wirth, 2017); (Yang & Guariglia, 2012).

The study of Masoud (2020) indicates that cash holding, which means cash held by the company as cash in hand or available for investment in assets and distributes them to investors (Gill & Shah, 2012), has led to negative changes in a performance like under surplus cash, managers are capable to opportunistic use of resources. Opportunistic behavior is believed to be the main drive that leads to inefficient investment. This problem is due to managers' misuse of resources and overinvestment in negative current value projects for personal gain. Overinvestment is use as a signaling factor and internal mechanism concerning different circumstances and environments to influence manager decisions.

Furthermore, the study of Chen, Smith, and Wirth (2017) reports that firms that are investing efficiently in positive NPV projects wish to avoid problems on information asymmetry and agency costs, and therefore communicate more comprehensive corporate disclosures to the financial markets. However, when firms are investing inefficiently due to agency problems, financial constraints, or other difficulties, managers may have a strong motivation to hype the desirability of the new investment projects to external resources providers by undertaking greater investment transparency or improved in formativeness of investment disclosures.

To contribute to the existing literature, this study will explore whether inefficient investment affects CEO compensation. This study will only focus on manufacturing and retail companies.

1.3 Research question

Based on the information presented above the following research question is developed:

Does inefficient investment affect CEO compensation?

Sub questions:

In order to answer the main research question, the following sub-questions will be answered:

1. What is inefficient investment?
2. What does overinvestment and underinvestment mean?
3. What is CEO compensation?
4. What are the components of CEO compensation?
5. Is CEO compensation affected by inefficient investment?

1.4 Purpose of the thesis

The purpose of this thesis is to investigate the effect of inefficient investment on CEO compensation during the period from 2015 to 2018. To accomplish this, the final sample will contain 97 U.S.A listed companies from the U.S. Securities and Exchange Commission (SEC) in the manufacturing and retail sector. Moreover, the data of these companies will be used to conduct research in this thesis.

1.5 Relevance and contribution

This study will contribute to the literature on the relation between inefficient investment and CEO compensation. The study of Masoud (2020) examined the effectiveness of investment inefficiency and cash holding on CEO turnover in Iran. The results indicate that managers' opportunism increases investment inefficiency and cash holdings of the company because inappropriate managerial decisions lead to an increased risk of wrong selection for investors. Furthermore, the study of Biddle, Hilary, and Verdi (2009) examined the relationship between financial reporting quality and the level of capital investment in the USA and Japan. Consistent with this study inefficient investment is measure as a deviation from the expected investment using models that predict the investment as a function of sales growth. Sales growth is considered a measure of the growth opportunities of the firm. A company's investments deviating from the expected level

measured by its error term represents an inefficient investment. Companies investing at a higher rate than the expected levels according to sales growth have positive residuals thus representing overinvestment, while companies investing at a lower rate than expected have negative residuals representing underinvestment.

The study of Yang, and Guariglia (2012) focuses on examining the environment of financial constraints and agency problems associated with listed firms in China. The findings support the fact that higher sensitivities of abnormal investment to free cash flow can be caused by financial constraints or agency costs. The evidence suggests that firms with free cash flow below the optimal levels tend to under invest due to financial constraints. Moreover, firms whose free cash flow exceeds the optimal level are more likely to overinvest due to agency costs.

As described above, other than these studies there has been very limited research done on the subject of inefficient investment and CEO compensation in the U.S.A. Furthermore, this thesis could be a good foundation for those who want to investigate the effect of inefficient investment on CEO compensation in the Suriname Stock Exchange listed companies. Suriname also deals with international investors in the short or long term. Finally, this thesis can be used as a source to collect information for future research.

1.6 Methodology

This research is a desk study and consists of two phases, literature review and quantitative analysis. The first phase "literature review" includes the theoretical aspects of inefficient investment, CEO compensation, and findings of prior studies.

The second phase of this research is based on empirical evidence that is collected from a database. The original sample size data for this research contains 100 U.S.A listed companies in the manufacturing and retail sector from the period 2015 to 2018. While conducting this research, the financial statement data from 3 companies were not available. The final sample size data used for analysis are 97 companies. The financial statements for these companies are retrieved from the Electronic Data Gathering, Analysis, and Retrieval (EDGAR). The information for these companies is downloaded from the sub-data source Fortune, which is a market data provider (Fortune 500, 2021). Further, in this research, two hypotheses are developed to test the expectations in this study. The effect of inefficient investment on CEO compensation is examined by the multivariate regressions by the Statistical Package for Social Science (SPSS). Depending

on the outcome of the study, the hypotheses might be supported. To test the hypotheses the following research model will be use:

SAL= β0 + β1 Sales Growth + β2 ROA + β3 Lev + E

1.7 Structure of the thesis

This thesis contains seven chapters, including the introduction chapter. The remainder of this thesis starts with chapter two, which describes the theoretical aspects of inefficient investment and CEO compensation. Further, chapter three will discuss the prior research. Chapter four present the hypotheses development. Chapter five provides information about the research methodology. Furthermore, Chapter six present the empirical results with the multivariate regression model developed in this study. Finally, chapter seven provides the conclusion, discussion, and further research.

2 Literature review

2.1 Introduction

This chapter presents a theoretical background on inefficient investment, overinvestment, underinvestment, CEO compensation, and the components of CEO compensation.

2.2 Inefficient investment

Investment is related to the rational allocation of corporate resources, which has an important influence on a company's business risks, profitability, growth opportunities, and other factors, and is the source of value creation and sustainable development for companies. However, because of many unfavorable factors, such as agency conflicts and information asymmetry, corporate investment will present inefficient investment (Mao, Li, & Lui, 2019). According to Richardson (2006), inefficient investment means undertaking projects with negative NPV or giving up projects with positive NPV.

Inefficient investment refers to managers who do not choose investment projects according to the decision criteria of maximizing shareholder value but aim at maximizing the private benefits of managers. This leads to inconsistency between the actual investment expenditure and the optimal investment level. The theoretical basis of inefficient investment is principal-agent problem (agency problem), and information asymmetry (Glover & Levine, 2015). A description of the principal-agent problem (agency problem) and information asymmetry is given below.

The agency relationship is defined as a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf, which involves delegating some decision-making authority to the agent (Jensen & Meckling, 1976). This relationship can occur in different form of situation. For instance, there can be a principal-agent relationship between shareholder and manager, an employee, and an employer, or between the state and the government (Ross, 1973).

There are two agency problems usually arise through incomplete and or insufficient information as well as uncertainty, which characterize most business settings. The agency problems are adverse selection and moral hazard (Shane, 1998). Adverse selection happens when the principal cannot determine whether the agent is acting on behalf of the interest of the principal. Moral hazard occurs

when the principal is unable to verify if the agent is putting forth any effort (Shane, 1998); (Mole, 2002). An agency problem occurs when the goals, interests, or risk preferences of the principal and agent are misaligned. Costs that are incurred by the firm due to this problem are called agency costs. Although agency costs are hard to quantify, it usually manifests in various forms, for example, costs of contracting and monitoring, a drop in productivity, or loss of firm value (Bebchuk, Fried, & Walker, 2002).

The principal-agent relationship between shareholders and managers may bring about inefficient investments. CEOs can receive private benefits through investment; therefore, some CEOs tend to overinvest in negative NPV projects (Jensen & Meckling, 1976). Although some CEOs own stocks of the firms, inefficient investments would still happen. In the research of Broussard, Buchenroth, and Pilotte (2004), the researchers concluded that investment increases along with the increase of management's shareholding ratio, but when the ratio exceeds the defense effect of management, the investment will then decrease as management's shareholding ratio goes up. In contrast to agency problems causing overinvestment, investment performance is a direct indicator of a manager's ability and competence, some managers' care about their reputations more than gaining short-term benefits from investments. Under these conditions, some firms will experience underinvestment rather than their optimal investment plans (Campbell, Chan, & Marino, 1989).

The principal-agent relationship between shareholders and creditors may bring about inefficient investments too. In the environment of the modern market, shareholders carry limited liability to the company operating risks. In this case, the shareholders tend to choose to invest in higher-risk projects for higher returns. The returns will be shared among the shareholders, rather than the creditors. Nevertheless, if once there happens to be a loss, all these losses will be shared among both the shareholders and the creditors, and thus managers can pass risks to creditors. Under this circumstance, creditors will increase the interest rate of debt to prevent potential losses, and this restriction may lead to underinvestment (Jensen & Meckling, 1976).

Furthermore, under information asymmetry, the agent and the principal have access to different information. In general, the agent (for example CEO) has more access to the information than the principal (for example shareholder). For instance, the CEO has more information about the firm and knows which decisions to take, while the shareholder is unable to monitor or control the decision-making. As a result, the agent can use this information asymmetry to his advantage, instead of pursuing the objectives of the principal (Jensen & Meckling, 1976).

According to the literature, there are three main measurement models for inefficient investment developed by different researchers. The three main measurement models by various researchers are described as followed:

1. Frisch, Hasslacher and Pomeau (FHP) model, which is based on the sensitivity of investment and cash sensitivity. This model is used to measure the degree of financial constraints faced by enterprises through the sensitivity of the investment of fixed assets and their free cash flow. From the sensitive point of view, the investment behavior of enterprises with many free cash flows is measured through this model (Frisch, Hasslacher, & Pomeau, 1986). Although the FHP model is widely used in academia, the model is not accurate enough to test the efficiency of investment. First, it cannot measure the efficiency of investment directly. This is because, in practice, it is impossible to distinguish whether the sensitivity of investment expenditure and free cash flow is caused by overinvestment or underinvestment. Secondly, only financing constraints are considered in the model. The model ignores some other factors, such as the nature of the firm, the firm size of the company, the industry, and so on (Frisch, Hasslacher, & Pomeau, 1986).
2. Vogt published the Vogt model, which is based on the intersection of cash flow and investment opportunity, in 1994. This model tests the cash sensitivity of investment with an investment opportunity, cash flow, and the interaction term, to judge whether the enterprise is overinvestment of underinvestment. The Tobin Q value is the ratio between the market value of the firm's assets and the replacement of those assets (Chung & Pruitt, 1994). Tobin Q value is used to measure the investment opportunity. When the investment opportunity is low, the interaction between investment, cash flow, and investment opportunity is a negative correlation, which means excessive investment. But when the investment opportunity is high, the interaction of investment, cash flow, and investment opportunity is a positive correlation, which means the investment is insufficient. The disadvantage of this model is that it can only judge whether the enterprise is overinvestment or insufficient investment, but it cannot detect the degree of overinvestment or underinvestment (Glover & Levine, 2015).
3. Richardson published the Richardson model, which is based on the residual of the investment of the enterprises, in 2006. The model uses residual to measure the degree of inefficient investment and makes up for the inadequacy of the above two models which cannot quantify the degree of inefficient investment. Richardson uses the accounting method to construct an

optimal investment model, including investment opportunities, asset-liability ratio, cash flow, company size, company operating years, stock returns, previous year's new investment, and other explanatory variables. If the residual term of the model is greater than 0, it indicates that the enterprise is over invested. If the residual is less than 0, it means that the enterprise is an insufficient investment. Its value indicates the extent of overinvestment or underinvestment. However, this model does not consider the influence of other factors such as agency conflict and information asymmetry on investment behavior. Moreover, the introduction of the new investment base in the previous year is insufficient, so if the test sample is overinvestment or insufficient investment, the model will have systematic errors and other problems. Nevertheless, the model is widely used in academic circles because it can make people more intuitive to measure the degree of inefficient investment (Richardson, 2006).

In a perfect and complete capital market, firms are expected to efficiently invest in projects with positive NPV, while it has been long recognized that firms make inefficient decisions. Inefficient decisions can fall into two categories: overinvestment and underinvestment (Modigliani & Miler, 1958). The next sub-paragraphs describe what overinvestment and underinvestment mean.

2.2.1 Overinvestment

Overinvestment is the condition in which there is a lot of investment with negative NPV (Cherkasova & Zakharova, 2016). When a firm holds a large amount of free cash flow, it may invest in negative NPV. If overinvestment exists in a firm, this means that the firm pursues substantial risk and high return investment at the cost of the interests of shareholders and creditors (Lang & Lizenberger, 1989).

Problems in overinvestment have to do with the possibility that management can abuse its decision-making power by adopting unprofitable or overly risky projects that could damage the interests of the shareholders as well as those of the debtholders (Jensen & Meckling, 1976). Problems with managerial overinvestment and with overinvestment in risky projects can arise when applying resource management policies considered being optimal (Stulz, 1990). A description of managerial overinvestment and overinvestment in risky projects is given below.

Managerial overinvestment

When considering the hypothesis where ownership and control are separated, the problem of managerial overinvestment consist of a conflict of interest that primarily influences the relationship between the managers, who have control over the firm, and the stockholders and owners of the firm. Instead, in a context where property and control substantially coincide (owner-managed firms), the conflict of interest has to do with the relationship between internal shareholders, the group in control or managers and entrepreneurs, and external shareholders who do not participate in firm management. Moreover, it is believed that this problem, which involves a reduction of resources and firm value decided by the governing board, can also influence relations between management and debtholders (Jensen & Meckling, 1976).

The problem of managerial overinvestment is based on the hypothesis that managers emphasize the importance of their role, different from that of the shareholders, which gives rise to a conflict of interest that will produce opportunistic behavior that can lead to a decrease in the firm's total value when the chance arises (Jensen & Meckling, 1976). Beyond their goal of maximizing stock value, managers consider the firm as a source of economic profit, of self-esteem, and, more generally, to increase their human capital. For this reason, managers sometimes end up making inefficient decisions whose only objective lies in increasing their private profits, with no regard for the eventual consequences that can damage the shareholders (Zingales, 1998).

Overinvestment problems can take on various forms. Jensen (1986) connects overinvestment to how managers use the financial resources that the firm produces. When profitable investment projects and growth opportunities are lacking, managers prefer to use the free-cash-flow (available cash flow that is more than the resources that are necessary to handle the firm's investments at a positive NPV for opportunistic purposes, instead of giving it back to the shareholders through dividends. As Jensen (1986) and Stulz (1990) point out, firm expansion beyond what may be considered an optimal level and the increase of resources directly under managerial control would create higher salaries and would offer greater power and prestige to those who run the firm. However, if the firm has few growth opportunities, an excessive increase in firm size is in direct contrast to shareholder interests. The propensity towards empire-building tends to stimulate managers to invest all available resources (the free-cash-flow) in projects that increase the firm's size but not its value. Essentially, managers tend to invest even in negative present value projects

so long as they can increase the firm's size and thus their private benefits (Degryse & De Jong, 2006).

Managerial overinvestment can also take on other forms. For example, managers prefer investing in projects that are even of negative NPV but that increase their human capital, making firm activity inseparable from their personal skills (entrenchment). Managerial entrenchment is defined as a set of self-defense mechanisms that management creates by deciding on firm development strategies to emphasize their competencies and skills, rather than choosing strategies that are in the firm's interest. In this way a dependent type of relationship is created, that attributes importance to the managers' skills independently of whether they can maintain the firm's competitive edge (Shleifer & Vishny, 1989).

Another source of overinvestment could be generated by managerial overconfidence; managers, while acting in good faith and to maximize value for shareholders well in mind, could nevertheless overestimate available competencies and abilities, or else could be overly optimistic about the potential of the firm's activities by investing in projects that do not have a positive NPV (Stein, 2001). By placing too much confidence in their abilities, managers can end up perceiving less risk than there really is and thus not evaluate carefully all the uncertainties that characterize an investment project. For example, the payment of exorbitant prices in buyouts and fusions can be caused by overconfidence concerning the benefits and synergies that can be obtained (Stein, 2001).

These types of situations debt, as pointed out by Jensen (1986) can help reduce overinvestment problems by limiting managerial discretion in using agency resources. Putting limits on managerial decision-making power can be particularly effective when dealing with the conflict of interest between ownership and management that arises with how free cash flow is allocated. In fact, making recourse to debt represents an indirect means of control and discipline of managerial behavior by limiting their tendency to use agency cash flow inefficiently, since it must be used first for interest reimbursement and loan capital. A high level of recourse to debt capital, while assuring a fixed recurring outflow of financial resources that are thus no longer available to managers, stimulates management's commitment to avoid situations of economic distress and bankruptcy. This means that company management is more exposed to capital market evaluations and represents a positive sign for the capital market, which results in share appreciation (Jensen, 1986).

Overinvestment in risky projects

Overinvestment in risky projects produces a conflict of interest between shareholders and debtholders. This increases the possibility that managers, after having contracted debt and while acting in ownership interest, transfer the value from debtholders to shareholders through another rise in leverage. Thus, increasing the risk of distress and bankruptcy, or else undertake new investment projects that are riskier than the firm's average ones (Jensen & Meckling, 1976). Different levels of risk connected to investment decisions made by managers influence the conflict of interest between debtholders and shareholders since riskier investment and financing policies that increase share value and decrease debt value, transfer wealth from debtholders to shareholders (Jensen & Meckling, 1976).

Jensen and Meckling (1976) show how, due to equity's limited liability, shareholders, and the managers that act in their interests, are encouraged to approve projects that are riskier than the ones initially proposed before the debt was underwritten. Once the financing has been obtained from investors, the manager could use these financial resources for various investments that are riskier; if the debt's price is set based on the risk level of already existing projects, riskier projects would end up causing a devaluation of the debt. The debt's market value would decrease, and the debtholders' loss would be the shareholders' gain.

In this case, the firm would be stimulated to issue debt to engage in even riskier investment projects. It would then be able to obtain financial resources at a lower interest rate than the one that corresponds to the risk category of the investment that was engaged in and would have a lower total debt cost. On the other hand, the debtholders would be damaged by such a situation, in that they would receive a lower yield than the one they would have been able to get with other types of investments. Consequently, the debt's market value would decrease, while the shares' market value would increase if the firm remained the same due to higher yield possibilities. Thus, the value would be transferred from the debtholders to the shareholders (Barnea, Haugen, & Senbet, 1980).

This mechanism is based on the fundamental difference between equity and debt, which can be found in the different types of sensitivity shown concerning the firm's level of risk, while equity value grows when there is higher risk, debt value decreases when the volatility of the firm's activities increases (Barnea, Haugen, & Senbet, 1980).

Shareholders of indebted firms can obtain most of the benefits inherent in a risky project when it is successful and can avoid sharing the costs of unsuccessful projects with debtholders thanks to their limited liability (Jensen & Meckling, 1976). High-risk investment projects show a broader distribution of the yields probability than the one usually applied by the firm. The shareholders hope to be able to take advantage of the positive side of a probability distribution since their responsibilities and thus the total of their losses is limited to the firm's capital, no matter what type of investments have been made. At the same time, though, shareholders are residual claimants or subjects that have the right to receive everything that is left other once the debtholders have been paid (Fluck, 1998).

Listed corporations often face overinvestment problem because firms are not obliged to pay dividends. Dividend payment substantially decreases the free cash flows, which restrict managers to invest in wasteful projects. Overinvestment is an indication of agency problem because it is totally against the manager's interests of shareholders' interests of investment in positive NPV projects. Debt has an overall benefit of reducing this agency problem arising due to overinvestment (Stulz, 1990). The overinvestment problem is much worse than the underinvestment problem because there are higher chances for the overinvesting firms to fail in the future than under investing firms (Degryse & De Jong, 2006).

2.2.2 Underinvestment

Underinvestment is the rejection of projects with a positive NPV (Cherkasova & Zakharova, 2016). If a firm cannot achieve enough free cash flow, meanwhile, it might have higher leverage which usually makes the firm face heavy financing restraints; the firm must give up positive NPV projects. There is also another possibility that managers could reject some positive NPV projects because these projects may need massive amounts of investment expenditure and have a longer payback period (Myers, 1977).

Underinvestment problems have to do with the agency relationship between shareholders and debt holders, following the hypothesis that managers act in shareholder interest, or else between new and old shareholders when managers act in the interest of the old ones. The study of Myers (1977) was the first to point out the possibility that high debt relationships can stimulate managers to reject positive NPV projects, which ends up decreasing firm value.

Myers' (1977) analysis is based on the concept that firm value is made up of assets in place and growth opportunities based on the future ability to make profitable investments. Growth opportunities are compared to options, whose present value is a result of not only the expected cash flow but also the probability that the firm takes advantage of them. In other words, the value of growth opportunities depends on investments made at the manager's (decision-makers) discretion, who have the power to exercise these options. The way that the assets in place are financed, and thus the way the firm's capital is structured, influences the ability to create and take advantage of growth opportunities, since in this manner the pressure is put on the quality of the firm's decision making (Myers, 1977).

When trying to maximize firm value, managers should use all investment options that have a positive NPV. Instead, Myers (1977) shows that when there are risky debt managers who act in shareholder interest tend to follow a completely different decision-making process, which leads them to reject profitable investments that could offer positive net worth to the firm's value. In other words, shareholders of firms who have risky debt are not willing to finance projects, thus taking on the cost that would exclusively or benefit mostly the firm's debtholders. In these cases, the NPV of the project, while positive, would allow the debt's market value to rise to the corresponding nominal value, without producing other benefits for the shareholders. Risky debt would act as a sort of tax on the profits derived from the new investments since most of the value created would only serve to allow debtholders to recover their loan (Stein, 2001). In such a situation, the investment would be made only when the NPV is positive and higher than the debt's nominal value. In fact, managers, as a rule, would tend to choose investments whose NPV offers a residual payoff to shareholders, while it is also positive and thus can cover the debt value (Stein, 2001). The presence of risky debt creates ex-post, potential situations where management can serve shareholders' interests only by making suboptimal decisions. Therefore, indebted firms could not be able to finance positive NPV investment projects, thus losing growth opportunities.

Besides the above-mentioned situations of ex-post underinvestment, that cause a problem of moral hazard, underinvestment conditions can be caused also by agency problems and by ex-ante information asymmetry, which set off adverse selection. Debtholders prevent the possibility that managers and shareholders can adopt opportunistic behavior by raising interest rates or by limiting credit. Since it is difficult to ascertain the quality of firm management behavior in investment

choices due to a lack of information, the debt becomes riskier, as does the premium that should be paid to obtain financial resources. Having thus to turn to external capital, a profitable investment could end up not being undertaken due to the high cost of the debt therefore, it is the shareholder who carries the cost of the conflict of interest (Stiglitz & Weiss, 1981).

Firms could choose to issue new equity rather than debt; in this way, a conflict of interest between senior and new shareholders would arise for the same reasons. The new shareholders, in fact, not knowing the actual quality of the proposed firm investments, end up asking for a high premium in exchange for their financial resources to protect themselves from eventual opportunistic behavior. In other words, the firm would be financed by issuing equity at a price that is lower than the market price. Such actions could annul the benefits of a positive NPV investment and thus cause a loss of value while spurring the decision not to undertake the project (Myers, 1977).
Therefore, these problems cause unavailability of those financial resources necessary to allow the firm to take advantage of all investment opportunities that could potentially create value; the only projects that will be undertaken are those that show returns capable of canceling the difference between market value and nominal debt value and of paying off shareholders (Myers, 1977).

Underinvestment in risky projects

The traditional contraposition between problems of under and overinvestment is more complex than it seems, in that it points out a much greater variety of deviations from optimal investment policies. Problems regarding risk shifting, which is particularly favored by firms that are financially stressed, are not found in the investment policies of highly indebted firms (Myers, 1977). Brito, and John (2002) show how the presence of risky debt does not always create risk shifting, but that in some contexts it can generate situations, that are opposite to those, of risk avoidance (or rather underinvestment in risky projects).

Based on these considerations, Brito, and John (2002) re-examine incentives for risk-shifting in a model where during the final period the firm still shows growth opportunities that have not yet been realized and show how these have a very strong impact on agency costs determined by risky debt. These growth opportunities can eliminate the underinvestment problem described by Myers (1977) and reduce the problem of risk shifting, by sometimes converting it into opposite situations of risk avoidance (underinvestment in risky projects).

Although risk-shifting problems seem to be particularly relevant, it can be observed in economic reality that often these types of indebted firms adopt a conservative and prudent investment policy, where they try to focus on the core business by selling extra assets and reducing, instead of increasing, the firm's risk. While incentives for risk-shifting are generated by the shareholders' awareness that they are in any case protected by the principle of limited liability (put options on firm activity), risk avoidance attitudes are produced by the fear that growth opportunities may be lost if the firm were to be put up for sale (Brito & John, 2002).

The impact of risky debt on firm decision-making depends on whether or not there are future opportunities for investment of value; excessively risky investment policies could damage the firm's possibility to survive at least up until the time when such growth opportunities can be taken advantage of. Entrepreneurs can take advantage of such growth opportunities only if they manage to keep control of the firm, for example, keep it from going bankrupt; in fact, distress and eventual bankruptcy would give debtholders firm ownership. The entrepreneurs' commitment is thus towards saving the firm's future ability to obtain those financial resources necessary to be able to take advantage of growth opportunities. The main conclusion reached by Brito, and John (2002) is that the presence of growth opportunities has not been taken advantage yet of has a notable impact on agency costs of risky debt. Firms with low growth prospects that operate in mature sectors and with high leverage are stimulated to over-invest in risky projects (risk shifting), whereas to the contrary, firms with good economic prospects are stimulated to under-invest and to avoid overly risky investments (risk avoidance).

Incentives for risk avoidance, which are generally the result of information asymmetries, allow us to understand why firms with high levels of risky debt and growth opportunities have not yet taken advantage of adopting quite conservative investment policies. For example, after the operation, the shareholders avoid making highly risky investments because they are afraid of losing control of the firm before they have taken advantage of those growth opportunities that in many cases spurred them towards a buy-out operation. Risk avoidance incentives also help understand why young firms with high growth potential show, ceteris paribus, a debt level that is much lower than in firms whose growth opportunities are limited. These second types of firms would benefit from innovative strategies, but when they are financed through debt, they would end up having to face a trade-off between conservative investment policies, that could compromise growth opportunities

and a more aggressive policy that could cause bankruptcy. Brito, and John (2002) thus observe that these types of firms avoid going into debt since debt creates risk avoidance incentives, that is the managers, being worried about losing control of the firm, could decide to not undertake riskier projects that would be necessary for the firm's development.

As described above, building on the assumption of information asymmetries and the consequent inability of shareholders to effectively monitor and control management action in widely held organizations, the study of Agrawal, and Mandelkar (1990) have argued that the concentration of ownership consolidates ownership interest and improves monitoring efficiency. This greater efficiency is thought to influence CEO compensation. In the next paragraph, the theoretical aspects of CEO compensation are described.

2.3 CEO compensation

CEO compensation is defined as the sum of base salary, cash bonuses, stocks, stock options, and other forms of compensation and benefits (Bognanno, 2010). The compensation is usually calculated as follows: the CEO has a fixed base salary, an annual cash bonus if a financial target is reached, and a long-term investment plan in which the CEO receives stocks or stock options, which is related mostly to a non-financial target (Bognanno, 2010).

The level of executive compensation has been up for public debate for a long time now, especially in periods of economic distress. Academic researchers positioned themselves on both sides of the debate over whether the level of executive compensation is justified. The main argument of the researchers that are in favor of the current level of CEO compensation is in accordance with the agency theory, optimal contracting theory, and managerial theory, which is described in detail in sub-paragraphs 2.3.1, 2.3.2 and 2.3.3. The agency theory explains how to organize relationships where one determines the work, and another undertakes it (Mole, 2002). Under the optimal contracting theory, CEO compensation can be seen as a remedy to the agency problem (Gray & Cannella, 1997). The researchers believe that the interests of the manager and shareholder can be aligned by using incentives for the manager. The increase in components of compensation that are linked to firm performance, for example, stock options, is viewed to be the best choice to align the interests. Furthermore, another argument is that there is a competitive market for executive talent,

in which the level of CEO compensation reflects the intensive bidding by firms. The main argument of the researchers against the current level of CEO compensation uses the managerial power theory as an explanation. They argue that under the managerial power theory, CEOs have power over the board's decision-making processes in determining the CEO compensation. Hence, the CEO can influence the board to decide on a higher level of compensation or less performance-sensitive compensation (Bebchuk, Fried, & Walker, 2002).

CEO compensation, among other top revenues, has risen since the 1980s in most industrialized countries and specifically in the U.S.A (Hall & Liebman, 1998). This rise may stem from an increase in the size of the companies (Gabaix & Landier, 2008). In addition to the size effect, governance practices inspired by the agency theory may also have an explanatory power to explain the evolution of CEO compensation. The agency-principal relationship theorized the discrepancy of interest that lies between shareholders and managers (Jensen & Meckling, 1976).

Most companies are characterized by the separation of ownership and control where diverse shareholders hold the ownership, and the control is in the hands of top executives. As a result, shareholders are not able to monitor managers' actions directly. According to the agency theory, these companies are likely to suffer from agency problems. That is, managers as the agent may not always act in the interest of the shareholders, thereby giving rise to conflicts of interest (Dan, Hsien-Chang, & Lie-Huey, 2013). One important control mechanism to align the interests of shareholders and managers and to mitigate the agency problems is to structure CEO compensation so that changes in executive wealth are linked to changes in stock price. By creating a pay-performance linkage in compensation contracts, executives have more incentives to maximize shareholder wealth (Core, Guay, & Larcker, 2003).

In the next sub-paragraphs, the agency theory, optimal contracting theory, and manager power theory are described.

2.3.1 Agency theory

The relation between the owners of a firm and the executive is a pure real-life principal-agent problem, where the owners are the principal, and the executive is the agent. A principal-agent relationship is a contract between two parties, where decision-making authority is passed, at least partially, from the principal to the agent, who provides a service to act on behalf of the principal. If both parties are assumed to act to maximize their utility, probably, the agent will not act

invariably in the best interest of the principal (Jensen & Meckling, 1976). Agency theory is the primary framework used to explain the complicated relationship between those who manage a firm and its owners. The fundamental purpose of the theory is to identify and address the agency issues to which agents and principal relationships are subject to (Eisenhardt, 1989).

The agency problem arises due to information asymmetry, misaligned interests, and high monitoring costs (Eisenhardt, 1989). These factors are fundamental precursors to a myriad of complications that agency theory attempts to resolve. Stiglitz (2002) defines information asymmetry plainly, as different people know different things. Executives may actively seek to grow the information gap between themselves and the owners, thereby entrenching themselves and increasing their bargaining power. The misalignment of interests between the parties, arising from factors including interests and objectives, can produce further agency conflicts. High monitoring costs are incurred when it is difficult to monitor and verify whether the executive is acting duly. Furthermore, the problem of risk sharing arises when the owners and the executive have different risk preferences, resulting in a conflict regarding actions taken within the firm (Eisenhardt, 1989).

Although agency costs can be reduced significantly through incentives and optimal contracting, the problems will always generate costs for both the principal and the agent. Agency costs is defined as the sum of the principal's monitoring costs, the agent's bonding costs, and the residual loss (Jensen & Meckling, 1976). Expenditures related to the board of directors are an example of the principal's monitoring costs. The board of directors oversees the monitoring, evaluation, and compensation of the executive manager. Other monitoring costs include the cost of issuing financial statements as well as recruitment and training of executive managers (Panda & Leepsa, 2017). Bonding costs are the agent‘s costs of operating in accordance with the defined structure of the firm. These costs are incurred when the agent commits to various contractual obligations when the firm, such as renouncing the right to other employment opportunities, hires him. Lastly, the residual loss is any additional loss in welfare that the principal may suffer because of these conflicts (Jensen & Meckling, 1976).

Theoretically, incentives influence motivation, which sequentially affects effort and eventually performance. The three primary elements; performance measurement, monetary incentives, and career concerns, link the performance of the employee to their rewards. Motivation can be either

intrinsic or extrinsic. Motivation is intrinsic to achieve a certain goal for its own sake rather than from the want for monetary- or other externally influenced rewards. Extrinsic motivation, on the other hand, is gained by the expectation to get something in return or to avoid punishment. Monetary incentives are, therefore, the ultimate extrinsic motivator (Herpen, Praag, & Cools, 2005). In the agency theory, extrinsic motivation is relied upon to estimate the effort an agent will make. When relying primarily on extrinsic motivation, the potential negative influence on intrinsic motivation is ignored. According to crowding-out theory, the use of monetary incentives and other external interventions may diminish intrinsic motivation when the agent regards the external interference as controlling, and this is referred to as crowding-out (Frey & Osterloh, 2016). The crowding out of intrinsic motivation occurs when the agent‘s interest is shifted from the activity itself to the reward. If, however, the agent perceives the external motivation to be supportive and informative, intrinsic motivation can be heightened, and this is referred to as crowding-in. Crowding-in can, however, be hampered by extrinsic rewards when they signal that carrying out one ‘s duties is not socially acceptable without additional compensation. Whether the extrinsic interventions put in place by the principal causes, crowding out of intrinsic motivation depends on the perception of the employee, which may be connected to various economic determinants (Frey & Osterloh, 2016).

2.3.2 Optimal contracting theory

Under the optimal contracting view, an efficient compensation contract can, eliminate agency problems largely. This approach explains executive compensation as an instrument to alleviate agency problems, to align the interests between shareholders and management. Principals are assumed to design efficient compensation agreements that incentivize the agent to act in the best interest of the principal. Such contracts can be obtained from either arm‘s length bargaining between the principal and the agent or from market constraints that drive the adoption of such contracts. Arm‘s length bargaining involves two parties who act independently in their interest, with balanced bargaining power and without pressure from the counterparty (Bebchuk, Fried, & Walker, 2002).

Empirical work has been done from the perspective of the optimal contracting approach. Jensen and Meckling (1976) argue that a CEO who is compensated without regard to performance will not act in a way that maximizes value but rather as a bureaucrat. Therefore, the structure of

compensation should be in such a way, that it rewards managers generously for outstanding performance and penalizes performance that is below expectations. Although, a contract by which the interests of shareholders and managers are aligned perfectly is not obtainable because of agency problems, the optimal contract is the contract that minimizes the costs associated with these problems. At least three criteria must be met to obtain an efficient compensation contract. Firstly, it should attract and retain talented executives. Secondly, it should provide proper incentives that encourage the CEO to make decisions that are in the best interest of the shareholders. Thirdly, it should minimize agency costs (Jensen & Meckling, 1976).

Critics of the optimal contracting theory argue that its insistence on tying executive compensation as tightly as possible to firm performance leads to an excessive focus on short-term performance. The adverse effects of exorbitant compensation packages include an increased likelihood of accounting fraud and an excessive focus on inflating short-term performance at the expense of long-term opportunities (Frey & Osterloh, 2016).

2.3.3 Managerial power theory

Bebchuk, Fried, and Walker (2002) question the ability of the optimal contracting approach to fully explain compensation practices. While much of the previous work in the field focuses on how optimal contracting of executive compensation reduces agency problems. Bebchuk, Fried, and Walker (2002) shift the focus to view executive compensation as an agency issue in and of itself. The central premise of their view referred to as the managerial power approach, is that the executives themselves fundamentally control executive compensation. According to this view, executives can set their pay, given certain constraints. They challenge the idea that CEOs' compensation arrangements are bargained at arm's length and argue that high performance-related pay is used as a rationalization for lavish compensation, whilst causing the least public outrage possible (Weisbach, 2007).

Under the optimal contracting view, the assumption is that the board of directors, elected by shareholders, acts entirely in accordance with the best interests of shareholders. The board of directors is, however, likely to be well disposed towards the CEO for numerous reasons, thus creating a new agency problem. These include the directors' desire to keep their place on the board and gaining the CEOs' support in obtaining additional directorships at other firms (Weisbach,

2007). In firms where the CEO is assumed to have a significant influence on the process of pay setting, levels of total compensation are notably higher than in situations where the CEO has less power. The relative power of the CEO is influenced by factors including the level of board independence, CEO duality, and the ratio of outside shareholders. Where the board of directors has more power, relative to the CEO, CEO compensation is lower, both in terms of cash compensation and other compensation (Van Essen, Otten, & Carberry, 2015).

Two fundamental elements of the managerial power approach are outrage and camouflage. Firstly, the level of potential outrage caused by a compensation package can affect the board of directors' readiness to approve or propose the arrangement. Outrage can cause the reputation of the CEO and board of directors to suffer harm, resulting in a lack of shareholder support for incumbents. The outrage constraint serves as an upper bound on CEO compensation, determined by public perception (Weisbach, 2007). This matter of perception then relates to the second element, camouflage. Managers could be inclined to attempt to limit the potential outrage caused by a compensation arrangement by obscuring their level of compensation. This obscuration can lead to the adoption of compensation arrangements that do not provide the right incentives for managers and may ultimately hurt corporate performance (Bebchuk, Fried, & Walker, 2002).

2.4 Components of CEO compensation

CEO compensation typically consists of a short-term and a long-term component. The short-term component usually includes base salary and the annual cash bonus, and other benefits paid for by the company. The long-term component consists mostly of performance share grants and share option grants. The terms used to describe these compensation components varies from study to study, but all the components of total compensation can be classified under either short-term cash compensation or long-term incentive compensation (Steyn, 2015). The value of cash compensation is readily available since it is disclosed in the remuneration reports and poses no valuation difficulties. Other benefits include perquisites that are not paid directly to the CEO, but on behalf of the CEO (for example pension fund contributions and membership fees). (Lambert, Larcker, & Weigelt, 1993).

Shareholders rely on CEOs to adopt policies that maximize the value of their shares. Nevertheless, CEOs favor activities that increase their well-being. One of the most critical roles of the board of

directors is to motivate the CEO that makes to do what is in the best interest of the shareholders. A few policies are in place that create the right motivation for the CEO to maximize the value of the shares of the shareholders. One of them is that salaries, bonuses, and stock options are designed to provide rewards for the CEO; on the other hand, there are penalties if there is poor firm performance (Murphy, 1999). As mentioned above the component base salary, annual bonus, and other benefits will be discussed respectively in sub-paragraphs 2.4.1, 2.4.2, and 2.4.3.

2.4.1 Base salary

Base salary is the most common part of CEO compensation. The base salary is a monthly payment that does not depend on the company's results (Jeppson, Smith, & Stone, 2009). Most of the time it is benchmarked primarily on general salary surveys. Moreover, the base salary is a critical component of CEO compensation, adding to those base salaries does represent the fixed component in the CEOs contract. Because managers are risk-averse, CEOs would like to have a more substantial base salary compared to their variable component; this is in line with the agency theory (Murphy, 1999). The base salary only consists of one part, which is the annual pay towards the CEO (Basu, Hwang, Mitsudome, & Weintrop, 2007).

2.4.2 Annual Bonus

The annual bonus is based on performance, which is in addition to the base salary of the CEO (Jeppson, Smith, & Stone, 2009). Moreover, according to Murphy (1999), roughly every profit company has an annual bonus plan, which covers the CEOs. Most of the time, the bonus is paid annually and paid in the form of cash. Firms traditionally use financial metrics such as return on equity or return on assets. However, some firms use non-financial (such as market share, product quality, customer satisfaction) measures in performance. Other words for an annual bonus are short-term incentive pay. Usually, the short-term incentive pay/annual bonus is paid out annually, that means that financial and non-financial measures are mainly focused on short-term performance. This means that the CEO will most likely look at the short-term performance instead of the long-term performance of the company. Those performance components are for the short-term can be influenced by the CEO to ensure the bonus. This can mean that the CEO can steer for a change in the denominator or nominator, just to ensure the bonus (Ittner, Larcker, & Rajan, 1997); (Murphy, 1999); (Jackson, Lopez, & Reitenga, 2008).

2.4.3 Other benefits

Furthermore, after the base salary, short-term incentive/annual bonus, the CEO can enjoy other benefits during their time as an executive at a certain company. There are many other benefits, which can be a part of the CEO compensation. This can be, for example, a retirement plan, golden parachute, life insurance, health insurance, car allowance, travel reimbursements, and company cell phone (Sigler, 2011); (Frydman & Jenter, 2010). Moreover, eventually adding to this, according to Larcker, and Tayan (2015) the CEO can use, for example, private company jets, pay for club memberships, company car, and company cell phones. The thinking behind this is that the CEO improves their managerial productivity and can increase the value for the shareholders (Rajan & Wulf, 2006).

Long-term incentive signals commitment to the shareholders' interest. Typically, the long-term incentives are comprised of two major compensation arrangements, which are stock options and restricted stock. Also, is that the LTIP can substantively change the agency problem between top managers and the owners (Westphal & Zajac, 1993). The difference with the short-term incentive is that a long-term incentive is most likely for a period between three and five years. In addition, the long-term incentive offers a minimum (mostly zero) and a defined maximum positive value, which is included in the contract of the CEO (Buck, Bruce, Main, & Udueni, 2003). A brief description of stock options and restricted stock are discussed in sub-paragraphs 2.4.4 and 2.4.5.

2.4.4 Stock options

The right to buy a share of stock at a pre-specified exercise or strike price for a pre-specified price are called stock options (Murphy, 1999). Stock options are an incentive by many firms as types of equity compensation to motivate the CEOs to work in the shareholders' best interest. Moreover, a disadvantage of stock options for the CEO is that there is no income to report at the time, unless the stock is sold at the same time it is exercised (Sigler, 2011). Agreeing with Sigler (2011); Frydman, and Jenter (2010) examined that the purpose of a stock option is to tie the compensation directly towards share prices and by this giving the CEO an extra incentive to increase the shareholders' wealth. However, there is a limitation towards stock options, meaning that when the stock price fall, the managers will not lose money.

2.4.5 Restricted stock plans

Just as stock options, restricted stock is a form of equity-performance-based pay and is also linked at the stock price. Restricted stock is another form of stock ownership that allows the interest of the CEOs and shareholders to come together. A restriction of this type of stock is that it requires a period to achieve a specific goal before the CEO sells the stock on the market (Sigler, 2011). Nevertheless, according to Frydman, and Jenter (2010), the restricted stock grants have replaced stock options as the most popular form of equity compensation.

The next chapter will discuss previous research regarding the main topics of this research. It will report the findings of prior research concerning inefficient investment and CEO compensation.

3 Prior research

3.1 Introduction

This chapter presents the previous studies regarding the main topic of this research. A description of the previous studies and their findings is given in the next paragraph below.

3.2 Previous studies and their findings

1. Liu, and Bredin (2010) studied overinvestment in Chinese firms, furthermore, checked the impact of institutional shareholdings on the extent of overinvestment, and finally analyzed the impact of overinvestment on firm corporate performance. It is interesting to check the impact of institutional shareholdings on overinvestment because the widely acknowledged theories of corporate finance argue that institutional shareholdings provide a powerful monitoring mechanism on managerial investment decisions. Hence, it may act to decrease the firm's overinvestment level and improve performance. Results of this study showed that overinvestment is not so high, and its mean value is equivalent to 0,0002. Therefore, the overinvestment problem is not so serious. In addition to that, 36,9% of Chinese firms were found to be suffering from overinvestment and 63,1% with underinvestment (Liu & Bredin, 2010). In contrast to theoretical evidence, it was found that institutional shareholdings could not reduce the overinvestment problem (Liu & Bredin, 2010).
2. Chen, and Lin (2012) investigated the influences of the different levels of managerial optimism on improving the investment efficiency when firms tend to under invest or over invest. This study is based on firms in the U.S.A. from 1992 to 2009. The results indicate that an underinvested firm with a CEO that has a high level of managerial optimism can improve the firm's investment efficiency by reducing the degree of underinvestment, further increasing the value of a firm (Chen & Lin, 2012).
3. Huang, and Huang (2012) have used Richardson's investment model to research real estate listed companies in China from 2006 to 2010 and have concluded that the phenomenon of excessive investment is common because of the existence of free cash flow in the domestic real property market. Overall, debt financing could have an inhibitory effect on excessive investment in real estate industries (Huang & Huang, 2012).
4. Zeng, and Yang (2012) have taken financial data of 300 Chinese manufacturing listed companies from 1999 to 2005 as a sample and researched the relationship among investment

opportunity, financial leverage, and investment behaviors of enterprises. The results have shown that financial leverage has effects on the decisions of enterprises. The effects may be restraining excessive investment or leading to insufficient investment. The negative correlation of companies in high growth between financial leverage and investment expenditure is weaker than those in low growth (Zeng & Yang, 2012).

5. The study done by Farooq, Ahmed, and Saleem (2015) researches the extend of overinvestment, underinvestment problems and measures its impact on corporate performance. The sample of this study consists of 7 years of data (2005 to 2011) from 360 non-financial companies listed in the Singapore Stock Market. The result shows that 52% of firms in the sample are engaged in proper investment projects, 29% of firms are overinvesting, while 19% of firms are under investing. Maximum overinvestment is taking place in the Basic Material sector while maximum underinvestment happening in the healthcare sector. Further tests show that both overinvestment and underinvestment show a severe negative impact on firm performance. However, proper investment has a positive impact on firm performance (Gill & Shah, 2012).
6. Abbas, Ahmed, Malik, and Waheed (2018) investigated the impact of investment efficiency on the cost of equity-based on a sample of 235 Pakistani listed non-financial firms' period from 2005 to 2015. The results of this study revealed that there is a negative significant influence of investment efficiency on the cost of equity. This indicates that investors required rate of return increases with the increase in the level of investment inefficiency. The results of this study also provided evidence that overinvestment is positively associated with the cost of equity. However, the authors are unable to find a significant impact of underinvestment on the cost of equity, this pointed that overinvestment is considered a more serious problem for investors as compared to underinvestment (Abbas, Ahmed, Malik, & Waheed, 2018).
7. The study of Shan, and An (2018), analyzes the effect of stock option incentives on inefficient investment specifically, based on the motive of design, stock option incentives are divided into incentives-driven and welfare-driven incentives. This study is based on the panel data of 511 Chinese listed companies that declared stock option incentives from 2010 to 2014, including both incentive-driven and welfare-driven incentives. The result of this study shows that diverse types of stock option incentives have different effects on inefficient investment. Incentive-

driven stock option incentives reduce inefficient investment, whereas welfare-driven stock option incentives do not reduce inefficient investment but increase it (Shan & An, 2018).

8. The study of Huiqi (2019) examines whether increased career concerns induce investment inefficiency during the early years of a CEO's tenure, based on listed companies in the U.S.A. The result shows that underinvestment is more likely to happen in the early years than in the later years, and that the underinvestment problem is most evident when the CEO is externally appointed, holds an interim position, has the low managerial ability, when the firm has a higher level of information asymmetry and lower financial reporting quality. The result also shows that firms are less to issue debts during those early years, which suggests that a reduced supply of capital can contribute to the underinvestment phenomenon in the early years of a CEO's tenure. Together, these results indicate that during the early years of a CEO's service, especially in contexts where career concerns are high and the information environment is more asymmetric, investment inefficiency is more likely to occur (Huiqi, 2019).
9. The study done by Mao, Li, and Liu (2019), examines the influence of internal control on inefficient investment, based on 2009-2017 port-listed companies in China's Shanghai and Shenzhen stock markets. The study revealed that internal control can effectively inhibit the overall level of inefficient investment and overinvestment of port-listed companies but is not significant for underinvestment (Mao, Li, & Lui, 2019).
10. Sualihu, Rankin, and Haman (2021) examined whether and how the components of equity compensation, stock option, and restricted stock affect overinvestment and underinvestment in labor. This study is based on the New York Stock Exchange listed companies. The result of this study indicates that stock options mitigate overinvestment (underinvestment) in labor, while suggesting that giving stock options to managers encourages (discourages) them to over (under) invest in labor. In contrast, restricted stock mitigates both overinvestment and underinvestment in labor, so granting restricted stock to managers discourages them from over and underinvestment. The results are consistent after controlling for managerial ability and corporate governance. Overall, this study demonstrated stock options and restricted stock matter in managers' labor investment decisions (Sualihu, Rankin, & Haman, 2021).

4 Hypotheses development

4.1 Introduction

In this chapter the hypotheses have been formulated in order to conduct the multivariate linear regression analysis.

4.2 Hypotheses development

According to Babbie (2013) a hypothesis is a specified testable expectation about empirical reality that follows from a more general proposition. The focus of the hypotheses for the multivariate linear regression analysis is to test whether inefficient investment divided into overinvestment and underinvestment, which is operationalized in sales growth, affected CEO compensation. The main research question will be answer by testing two hypotheses. The development of these hypotheses will be present in the sub-paragraphs below.

4.2.1 Overinvestment and CEO compensation

Titman, Wei, and Xie (2004) documented the impact of overinvestment and stock returns and found that there is a negative impact of overinvestment on stock returns of the firm and this negative relation between stock returns and overinvestment gets stronger when firms have high cash flows and low leverage.

The study of Masoud done in 2020 in Iran shows that opportunistic behavior is believed to lead to inefficient investment. This problem is caused by managers' misuse of resources and overinvestment in negative current value projects for personal gain. Overinvestment is used as a signaling factor and internal mechanism regarding different circumstances and environments to influence manager decisions. The managers concluded that by the development of inappropriate investing behaviors in companies, overinvestment increases negative information transmission and increases agency costs. Proper overinvestments reduce the quality of accounting information and investment decisions, change the interests of investors, and disable optimal sharing of resources in capital markets (Masoud, 2020).

Investors are more likely to invest in firms that have information transparency. If overinvestment increases, the firm's credibility decreases, and the costs of processing company-specific public information are increased, hence overinvestment leads to more CEO turnover. Investors need clear

and uniform information to identify optimal investment opportunities. Increased investment efficiency facilitates the analysis and identification of financial information to avoid adverse selection and avoids the imposition of surplus costs (Masoud, 2020). Based on the information in this sub-paragraph the first hypothesis is developed:

H1: Overinvestment has a negative effect on CEO compensation.

4.2.2 Underinvestment and CEO compensation

Prior research by Richardson (2006) found a positive relationship between firms with the negative free cash flow and the experience of underinvestment. The study of Titman, Wei, and Xie (2004) revealed that firms which do underinvestment does not have any impact on firm stock returns

The study of Masoud (2020) indicates that opportunistic behavior can manifest itself in the form of underinvestment and a slowdown in corporate growth due to the lack of sufficient capital and excessive cost of financing and high agency costs are effective on investment efficiency.

Underinvestment problem may be caused by interest conflicts between shareholders and bondholders. Jensen & Meckling (1976) states that riskier projects are expected to give larger benefits that shareholders enjoy, whereas if large losses occur, these are passed on to bondholders Myers (1977) proposed another reason for the underinvestment problem resulting from the conflict between shareholders and bondholders. Shareholders may not undertake positive NPV projects whenever the NPV is lower than the amount of debt issued. The information asymmetries induce a moral hazard problem. The underinvestment problem may also be because of adverse selection. Bondholders may require a higher premium on a firm that has sound investment project quality just because they do not have sufficient information on the firm (Myers, 1977). Based on the information in this sub-paragraph, the second hypothesis is developed:

H2: Underinvestment has a positive effect on CEO compensation.

To test these two hypotheses, the next chapter describes the research methodology used for this research and the research model to test the developed hypotheses.

5 Research methodology

5.1 Introduction

In this chapter, the research methodology is discussed. To test the hypotheses, the research model and control variables are discussed in detail. Further the conceptualization of the dependent and independent variables is discussed. The population and sample size, data collection, data analysis, a test of significance, and research ethics are also described. Finally, the last paragraph explains the Libby boxes, which illustrates the conceptual framework of this research.

5.2 Research model

To answer the main research question of the study and to conduct the hypothesis, a multivariate regression analysis is applied. Inefficient investment as a result of overinvestment and underinvestment is the key independent variable. This study employs sales growth as proxy of overinvestment and underinvestment estimated from the inefficient investment model developed by Biddle, Hilary, and Verdi (2009); Richardson (2006). This model predicts the expected investments as a function of sales growth. Sales growth is considered a measure of the growth opportunities of the firm. Firms with a positive sales growth represent overinvestment, while firms with a negative sales growth represent underinvestment. Based on these criteria, this study created the interaction terms of overinvesting firms and underinvesting firms to separately investigate the effect of overinvestment and underinvestment on CEO compensation. Further this study used the amount of the salary (SAL) as proxy for CEO compensation.

According to the study of Richardson (2006), control variables are also added for this research. The control variables are held constant in this research by including them as an explanatory variable in the multivariate regression models. The control variables are included because it is potentially correlated with both the independent and dependent variable of interest and not including it could lead to correlated omitted variable bias. The control variables that are used are ROA and LEV.

To test both hypotheses as mentioned in chapter 4 paragraph 4.2, the following multivariate regression model is developed:

SAL= β0 + β1 Sales Growth + β2 ROA + β3 Lev + E

Where:

The dependent variable is:

SAL = The amount of the annual salary of the CEO.

The independent variable is:

Sales growth = a proxy for overinvestment and underinvestment. The data of sales growth is collected manually from the annual reports presented on the profit and loss statement and measured as (net sales current period – net sales prior period)/ net sales prior period *100.

The control variables are:

ROA = Return on Assets. The data of ROA is collected manually from the annual reports presented on the balance sheet and calculated as (net income / average total assets). This variable is used to control the firm's performance.
Lev = Leverage. The data of Leverage is collected manually from the annual reports presented on the balance sheet and measured as (total liabilities / total assets).
$\beta 0$ = the intercept
$\beta 1$, $\beta 2$ and $\beta 3$ = the regression coefficient
E = Error term

In the next paragraph, the dependent, and the independent variables are described

5.3 Dependent and independent variable

A dependent variable is a variable assumed to depend on or be caused by another (called the independent variable) (Babbie, 2013). The dependent variable in this research is CEO compensation. CEO compensation in this research is measured by the amount of the annual salary of the CEO. This research will focus on the CEO compensation component salary. Salary simply measures the component of compensation that is fixed at the beginning of the year. This variable is included to test whether inefficient investment actually affects the CEO compensation. Furthermore, the component salary is added as a variable as well to check for robustness.

An independent variable is a variable with values that are not problematic in analysis but are taken as simply given. An independent variable is presumed to cause or determine a dependent variable

(Babbie, 2013). The independent variable in this research is inefficient investment. Inefficient investment is measured by sales growth. Sales growth represents a change in sales revenue in the current financial year and previous financial year. This variable is included because it represents a change in demand for the firm's products and services and is the fundamental determinant of profitability and the level of investment a firm should make (Pinnuck & Lillis, 2007).

5.4 Population size and sample size

The starting point for the sample for this research is the population of the top 500 listed companies in the U.S.A. The information for these companies is downloaded from the Fortune website, which is a market data provider (Fortune 500, 2021). The company name is used as a search tool to manually download and examine the data for the study sample in this research. The study will only focus on the top listed companies in the U.S.A. operating in the manufacturing and retail sector. The study sample consists of 97 listed companies (n= 97), divided by 48 manufacturing companies and 49 retail companies. Appendix A presents a list with the names and sector groups of the companies included in the sample. Furthermore, financial companies such as banks and insurance companies are excluded due to their debt structure and the difference in operational, investment, and financing activities.

To obtain the data for the study sample, the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) dashboard is used to obtain interactive data 10-K (annual report) and Proxy (annual meeting) submissions. The EDGAR dashboard is a free-to-use online service.

The next paragraph describes the data collection.

5.5 Data collection

Data collection is the process of collecting evidence to gain new insights about a certain topic to answer the main research question (Orodho, 2003). The data of the independent variable such as sales growth is collected manually from annual reports of the U.S.A. listed companies from the period 2015 to 2018. Moreover, the sales growth for this research is calculated with the information presented on the profit and loss statement of the annual report. The data of the dependent variable; salary is collected from the proxy (annual meeting) and information statements. The data of the control variables; ROA and LEV are collected manually from the annual reports and is calculated

with the information presented on the balance sheet. The annual reports and the proxy (annual meeting) and information statements are available on the EDGAR dashboard database.

The next paragraph describes the data analysis.

5.6 Data analysis

The focus of this study is analyzing the data of the 97 listed companies in the U.S.A. divided by 48 manufacturing and 49 retail companies. The data examination period is 2015-2018. Thereby the annual reports, proxy, and information statements of the U.S.A. listed companies will be analyzed. To determine the explanatory variable, sales growth, it is necessary to go through the annual reports of the sample companies. This means that content analysis will be used to analyze the variable. Furthermore, the study used multivariate linear regressions to test whether inefficient investment affected CEO compensation, by testing the hypotheses development. To analyze the information of the annual reports and the proxy statements, the data will be stored in a Microsoft Excel file and then transferred to the data editor of Statistical Package for the Social Sciences (SPSS).

As mentioned in paragraph 5.2, firms with a positive and negative sales growth represent respectively overinvestment and underinvestment. Based on these criteria this study classifies the data analysis of the 97 listed companies with a positive sales growth as overinvestment and negative sales growth as underinvestment, to separately investigate the effect of overinvestment and underinvestment on CEO compensation. From this analysis there are 80 companies with a positive sales growth that represent overinvestment and 17 companies with a negative sales growth that represent underinvestment. The data analysis for overinvestment and underinvestment are respectively presented in appendix B and C.

The next paragraph describes the test of significance.

5.7 Test of significance

The test of significance used in this research is the multiple linear regression analysis in which tests with an expected adjusted Coefficient of Determination (adjusted R^2) and the Analysis of Variance along with relevant P-values are performed. Statistical techniques are done at 95%

Confidence Level (α=0.05) meaning that all the p-values under 5% will be identified as statistically significant (Babbie, 2013).

The next paragraph describes the research ethics.

5.8 Research ethics

For this research, the annual reports of the U.S. Securities and Exchange Commission listed companies are analyzed. The information obtained from the annual reports of these companies will not be used in a way that can bring harm or damage to these companies. The information will strictly be used for research purposes only. Since the information used for this research is publicly disclosed on the website of these companies, the names of these companies are displayed in this master thesis.

The purpose of presenting Libby boxes is to illustrate the research concept to simply understand the relationship between all the research variables used in this research. In the next paragraph, the Libby boxes are discussed.

5.9 Libby boxes

The Libby boxes for this research are presented in appendix D. The Libby boxes include the conceptual, operational, independent (explanatory), dependent (explained), and control variables. The relation between these variables is explained with five arrows that also explain the construct validity, the internal validity, and the external validity (Deegan & Unerman, 2011).

First, the purpose of construct validity is to operationalize the theoretical idea (Deegan & Unerman, 2011). Arrows 2 and 3 in the Libby boxes represent the construct validity. Arrow 2 operationalizes the inefficient investment as a conceptual independent variable to an operational independent variable, which is sales growth. Arrow 3 operationalizes the conceptual dependent variable CEO compensation into salary.

Second, internal validity is concerned with how well the research captures the relation between the operationalized dependent and independent variables (Deegan & Unerman, 2011). Arrow 4 in appendix D illustrates the internal validity of this research. The control variables presented in arrow 5 can increase the internal validity.

Third, external validity refers to how well the outcome of a study can be expected to apply to other settings or populations (Deegan & Unerman, 2011). Arrows 1 and 4 in appendix D illustrate this.

To test the developed hypothesis in chapter 4 paragraph 4.2, this study will use the multivariate regression model as stated in paragraph 5.2. The next chapter will describe the results of this test.

6 Results

6.1 Introduction

This chapter presents the results of this research generated with the use of the IBM software SPSS version 26. The second paragraph describes the descriptive statistics of this research. The third paragraph describes the correlation analysis. Furthermore, the multivariate regression output is analyzed thoroughly and discussed with the hypotheses. The results are tested with a significance level of 5%.

6.2 Descriptive statistics

Descriptive statistics are used to explain the characters of the research variables used. They provide summaries about samples and variables. The descriptive statistics of the research are presented in table 1 below.

Table 1: Panel A Descriptive Statistics for overinvestment

Descriptive Statistics for overinvestment						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
SAL.	80	15485385.0	.0	15485385.0	4573770.213	1735803.679
Sales Growth	80	133.225	.712	133.937	21.891	24.319
ROA	80	102.102	-7.158	94.944	32.564	20.193
LEV	80	5.754	1.309	7.063	2.692	.847
Valid N (listwise)	80					

(Source: SPSS v. 26)

Table 1 panel A presents the descriptive statistics for the sample for overinvestment. It summarizes the descriptive statistics of the dependent variable (SAL), the independent variable (sales growth), and control variables (ROA and LEV) used in the multivariate regression analyses. The results from panel A show the range with the minimum salary identified at $ 0 and the maximum at $ 15,485,385. On average, the base salary of the CEOs is measured at $ 4,573,770.213 per year. The range for the minimum sales growth is measured at 0.712% and the maximum at 133.937%. On average, the sales growth identified is 21.891%. Regarding the control variables used in this

research, the minimum firm's performance known in economic terms, as Return on Assets (ROA) is -7.158% and the maximum firm's performance is 94.944%. On average, the firm's performance is 32.564%. The minimum financial leverage (LEV) measured is 1.309 and maximum 7.063, this value is out of range because the total liabilities of the firms between the years 2015-2018 are higher than total assets. On average, the financial leverage (LEV) is 2.692.

Table 1: Panel B descriptive statistics for underinvestment

Descriptive Statistics for underinvestment						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
SAL.	17	6074381.0	.0	6074381.0	3580293.176	1543401.421
Sales Growth	17	118.878	-119.451	-.573	-20.376	29.288
ROA	17	75.811	-35.268	40.543	5.427	20.073
LEV	17	5.806	1.190	6.996	2.801	1.221
Valid N (listwise)	17					

(Source: SPSS v. 26)

Table 1 panel B presents the descriptive statistics for the sample for underinvestment. The results from panel B show the range with the minimum salary identified at $ 0 and the maximum at $ 6,074,381. On average, the base salary of the CEOs is measured at $ 3,580,293.176 per year. The range for the minimum sales growth is measured at -119.451% and the maximum at -0.573%. On average the sales growth identified is -20.376%. Regarding the control variables used in this research, the minimum firm's performance (ROA) is -35.268% and the maximum firm's performance is 40.543%. On average, the firm's performance is 5.427%. The minimum financial leverage (LEV) measured is 1.190 and maximum 6.996, this value is out of range because the total liabilities of the firms between the years 2015-2018 are higher than total assets. On average, the financial leverage (LEV) is 2.801.

In the next paragraph, correlation analyses are conducted to determine the strength of the (linear) relationship between inefficient investment and CEO compensation.

6.3 Correlation analysis

Correlation analysis is a method of statistical evaluation used to study the strength of a relationship between two, numerically measured, continuous variables. This analysis is useful when a researcher wants to establish if there are possible relationship between variables. It is often misunderstood that correlation analysis determines cause and effect. However, this is not the case because other variables that are not present in the research may have affected the results. If correlation is found between two variables, it means that when there is a systematic change in one variable, also a systematic change is in the other variable. If there is correlation found depending upon the numerical values measured, this can be either positive or negative. Positive correlation exists if one variable increases simultaneously with the other. Negative correlation exists if one variable decrease when the other increases (Farooq, Ahmed, & Saleem, 2015).

Pearson's coefficient is the measurement of correlation and ranges between +1 and -1. The +1 indicates the strongest positive correlation possible, and the -1 indicates the strongest negative correlation possible. Therefore, the closer the coefficient to either of these numbers the stronger the correlation of the data it presents. On this scale 0 indicates no correlation, hence values closer to zero imply weaker correlation than those closer to +1/-1. The independent variable used in this research is sales growth and the dependent variable is SAL. In table 2 the results of the Pearson correlation coefficient are presented.

Table 2: Panel A Pearson correlation coefficient for overinvestment

Correlations					
		SAL.	Sales Growth	ROA	LEV
SAL.	Pearson Correlation	1	-.120	-.053	.055
	Sig. (2-tailed)		.290	.640	.630
	N	80	80	80	80
Sales Growth	Pearson Correlation	-.120	1	.009	-.061
	Sig. (2-tailed)	.290		.940	.588
	N	80	80	80	80
ROA	Pearson Correlation	-.053	.009	1	-.031
	Sig. (2-tailed)	.640	.940		.783
	N	80	80	80	80
LEV	Pearson Correlation	.055	-.061	-.031	1

	Sig. (2-tailed)	.630	.588	.783	
	N	80	80	80	80

(Source: SPSS v. 26)

Table 2 Panel A presents the Pearson correlation coefficient for the sample for overinvestment. The Pearson correlation coefficient for the variable SAL and sales growth is -0.120, which is not significant ($p > 0.05$, for a two tailed test). Regarding the control variables (ROA and LEV), the Pearson correlation coefficient for the variable SAL and ROA is -0.053, which is also not significant ($p > 0.05$, for a two tailed test). The Pearson correlation coefficient for the variable SAL and LEV is 0.055, which is also not significant ($p > 0.05$, for a two tailed test). The result in table 2 panel A indicate insignificant correlations for the Pearson test. Based on the result, the following can be state:

1. SAL and sales growth have a statistically insignificant linear relationship ($p > 0.05$)
2. The direction of the relationship is negative. SAL and sales growth are correlated negatively. That means a high SAL is associated with a low sales growth.

Table 2: Panel B Pearson correlation coefficient for underinvestment

Correlations					
		SAL.	Sales Growth	ROA	LEV
SAL.	Pearson Correlation	1	.685**	.638**	-.055
	Sig. (2-tailed)		.002	.006	.833
	N	17	17	17	17
Sales Growth	Pearson Correlation	.685**	1	.539*	-.009
	Sig. (2-tailed)	.002		.025	.972
	N	17	17	17	17
ROA	Pearson Correlation	.638**	.539*	1	-.225
	Sig. (2-tailed)	.006	.025		.385
	N	17	17	17	17
LEV	Pearson Correlation	-.055	-.009	-.225	1
	Sig. (2-tailed)	.833	.972	.385	
	N	17	17	17	17
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

(Source: SPSS v. 26)

Table 2 panel B presents the Pearson correlation coefficient for the sample for underinvestment. The Pearson correlation coefficient for the variable SAL and sales growth is 0.685, which is significant ($p < 0.01$ for a two tailed test). The Pearson correlation coefficient for the variable SAL and ROA is 0.638, which is also significant ($p < 0.01$). The Pearson correlation coefficient for the variable sales growth and ROA is 0.539, which is also significant ($p < 0.05$). The result in table 2 panel B indicate three significant correlations for the Pearson test. Based on the result, the following can be state:

1. Sales growth and ROA have a statistically significant linear relationship ($p < 0.05$).
2. The direction of the relationship is positive. Sales growth and ROA are correlated positively. This means that a higher sales growth is associated with a higher ROA.

In the next paragraph, the multivariate regressions results are discussed.

6.4 Multivariate regressions analysis

In this paragraph, the multivariate regression is conducted to test the effect of inefficient investment on CEO compensation. As discussed in chapter three, there is one regression model related to sales growth. This model is explained by CEO compensation. The control variables as discussed in paragraph 3.6 are also included in the multivariate regression model. Below, the relevant measures for the model evaluation are described.

6.4.1 Model evaluation

When evaluating whether the model, in which all constructs were added, is successful for prediction, the Model Summary has been assessed. The R Square (R^2) is an important measure that indicates how much of the variance in the dependent variable is accounted for by the different predictors in the model. The adjusted R square (R^2) indicates how well the model can be generalized in a population (Field, 2009).

Another important useful measure when assessing the model's predictive power is the F-value measures whether the model has a statistically significant predictive capability. F-value of overall significance indicates whether the linear regression model provides a better fit to the data.

The Durban – Watson Test is a measure of autocorrelation in residuals from regression analysis. Autocorrelation is the similarity of time series over successive time intervals. This ensures that the standard errors are underestimated, resulting in a picture where the predictors are portrayed significantly when this is not the case. The Durban - Watson test provides a specific type or serial correlation. The assumptions hereby are that the errors are normally distributed with a mean of zero and the errors are stationary.

The Durban – Watson test reports a test statistic, with a value from 0 to 4, whereby the value 2 means no autocorrelation, the value between 0 to < 2 is a positive autocorrelation (common in time series data), and the value > 2 to 4 is a negative autocorrelation (less common in time series data). Field (2009) suggests that values under 1 or more than 3 are a definite cause for concern. The test statistic value in the range of 1.5 to 2.5 is relatively normal. Values outside of this range could be causing concern.

Statistical significance of each of the independent variable's tests whether the unstandardized of standardized coefficients are equal to 0 (zero) in the population (i.e., for each of the coefficients, Ho: $\beta = 0$ versus Ha: $\beta \neq 0$ is conducted). If $p < 0.05$, the coefficients are statistically significantly different to 0 (zero). The usefulness of these tests of significance is to investigate if each explanatory variable needs to be in the model, given that the others are already there (Dhakal, 2018).

6.4.2 Model Summary

This subparagraph explains the model summary of the multivariate regressions analysis.

Table 3: panel A model summary for overinvestment

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.138[a]	.019	-.020	1752684.8215	.019	.495	3	76	.687	2.018

a. Predictors: (Constant), LEV, ROA, Sales Growth

b. Dependent Variable: SAL.

(Source: SPSS v. 26)

Table 3, panel A presents the model summary output for overinvestment. R is the correlation coefficient, which is 0.138. To measure what extend the independent variables can explain the dependent variable, the adjusted R-Square (R^2) is used. The R^2 in the model summary table is 0.019, which means that 1.9% of the variance in SAL can be explained by the independent variables Sales Growth, ROA, and Leverage. The adjusted R^2 is -0.02 or -2%, which indicates that SAL has an insignificant predictive value. The F-value is 0.495 with a significance level of 0.687, which indicates that SAL does not have a significant predictive value with an adjusted R^2 of -2%. This indicated that the regression model is not good fit of the data. The Durbin-Watson test is 2.018, which indicates no autocorrelation between the residuals.

Table 3: panel B model summary for underinvestment

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.757[a]	.573	.474	1119507.5579	.573	5.804	3	13	.010	2.822

a. Predictors: (Constant), LEV, Sales Growth, ROA

b. Dependent Variable: SAL.

(Source: SPSS v. 26)

Table 3, panel B presents the model summary output for underinvestment. R is the correlation coefficient, which is 0.757. To measure what extend the independent variables can explain the dependent variable, the adjusted R-Square (R^2) is used. The R^2 in the model summary table is 0.573, which means that 57.3% of the variance in SAL can be explained by the independent variables Sales Growth, ROA, and Leverage. The adjusted R^2 is 0.474 or 47.4%, which indicates that SAL can be explained for 47.4% by the independent variables and 52.6% cannot be explained. The F-value is 5.804 with a significance level of 0.010 ($p < 0.05$), which indicates that SAL does have a significant predictive value with an adjusted R^2 of 47.4%. This indicated that the regression model is a good fit of the data. The Durbin-Watson test is 2.822, which indicates a negative autocorrelation (less common in time series data) between the residuals.

The next subparagraph will explain the coefficient of the multivariate linear regression for hypotheses 1 and 2.

6.4.3 Coefficients

Table 4: panel A Coefficients output for overinvestment

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4643878.438	768589.942		6.042	.000	3113098.902	6174657.975
	Sales Growth	-8321.499	8123.931	-.117	-1.024	.309	-24501.711	7858.712
	ROA	-4347.410	9770.526	-.051	-.445	.658	-23807.098	15112.278
	LEV	94206.052	233227.769	.046	.404	.687	-370307.306	558719.411
a. Dependent Variable: SAL.								

(Source: SPSS v. 26)

Table 4 panel A presents the coefficients output for overinvestment. The output shows that Sales Growth p-value (0.309) > 0.05 has an insignificant negative association with SAL, this indicates that overinvestment cannot influence the salary of the CEO. ROA p-value (0.658) > 0.05 has an insignificant negative association with SAL, this means that ROA cannot influence the salary of the CEO. LEV p-value (0.687) > 0.05 has an insignificant positive association with SAL. This means that LEV cannot influence the salary of the CEO.

The first hypothesis of this research is:

H1: Overinvestment has a negative effect on CEO compensation

Below, the general form of the multivariate regression for this hypothesis is presented:

$SAL = \beta 0 + \beta 1$ Sales Growth $+ \beta 2$ ROA $+ \beta 3$ Lev $+ E$

Predicted SAL = 4643878.44 – 8321.50* Sales Growth – 4347.41* ROA + 94206.05* Lev + E

The first hypothesis predicts that overinvestment has a negative effect on CEO compensation. When examining this hypothesis, the correlation coefficient on sales growth for the sample for overinvestment is negative and not significant at the 5% level. The null hypothesis (Ho) of the study cannot be rejected with a confidence level of 5%, and thus the H1 is rejected. The H1 showed

the results of statistical tests, where the significant value of overinvestment is measured. The significant value of sales growth of 0.309 > 0.05, where it is concluded that the H1 is rejected. This result is consistent with the finding of Titman, Wei, and Xie (2004) who documented the impact of overinvestment and stock returns and found that there is a negative impact of overinvestment on stock returns of the firm and this negative relation between stock returns and overinvestment gets stronger when firms have high cash flows and low leverage. The result shows that sales growth for the sample for overinvestment is insignificant. This indicate that firms that do overinvestment will not affect the salary of the CEOs, which means that there is no association between overinvestment and salary.

The complete regression output for overinvestment is presented in Appendix E1.

Table 4: panel B coefficient output for underinvestment

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	3795804.394	823600.464		4.609	.000	2016523.766	5575085.021
	Sales Growth	25028.321	11456.863	.475	2.185	.048	277.272	49779.369
	ROA	30015.160	17156.164	.390	1.750	.104	-7048.480	67078.800
	LEV	46971.561	237527.317	.037	.198	.846	-466175.010	560118.133
a. Dependent Variable: SAL.								

(Source: SPSS v. 26)

Table 4 panel B presents the coefficients output for underinvestment. The output shows that Sales Growth p-value (0.048) < 0.05 has a significant positive association with SAL, this indicates that underinvestment can influence the salary of the CEO. ROA p-value (0.104) > 0.05 has an insignificant positive association with SAL, this means that ROA cannot influence the salary of the CEO. LEV p-value (0.846) > 0.05 has an insignificant positive association with SAL. This means that LEV cannot influence the salary of the CEO.

The second hypothesis of this research is:

H2: Underinvestment has a positive effect on CEO compensation

Below, the general form of the multivariate regression for this hypothesis is presented:

SAL = β0 + β1 Sales Growth + β2 ROA + β3 Lev + E

Predicted SAL = 3795804.39 + 25028.32* Sales Growth + 30015.16* ROA + 46971.56* Lev + E

The second hypothesis predicts that underinvestment has a positive effect on CEO compensation. When examining this hypothesis, the correlation coefficient on sales growth for the sample for underinvestment is positive and significant at the 5% level. This means H2 is accepted. H2 showed the results of statistical tests, where the significant value of underinvestment is measured. The significant value of sales growth of 0.048 < 0.05, where it is concluded that H2 is accepted. This result is consistent with the findings of Richardson (2006), who found a positive relationship between firms with the negative free cash flow and the experience to underinvestment. The result shows that sales growth for the sample for underinvestment is significant. This indicate that firms that do underinvestment affect the salary of the CEOs, which means that there is an association between underinvestment and salary.

The complete regression output for underinvestment is presented in Appendix E2.

7 Discussion, conclusion, and further research

7.1 Introduction

This final chapter presents the discussion and conclusion based on the outcome of the multivariate regressions. The limitation and possibilities for future research are also described in this chapter.

7.2 Discussion and conclusion

Using a sample of U.S.A. listed companies from the period 2015 to 2018; this study analyzes the effect of inefficient investment on CEO compensation executed by a multivariate linear regression analysis. The objective of this study was to indicate empirically the association between inefficient investment and CEO compensation.

As mentioned in the introduction, the main research question of this thesis is:

Does inefficient investment affect CEO compensation?

Based on the two hypotheses in this study the following conclusions have been reached:
Regarding the first hypothesis, sales growth that represent the sample for overinvestment has an insignificant negative effect on SAL. The alternative hypothesis of this variable is rejected, and the null hypotheses is accepted with a confidence level of 5%. This hypothesis predicted a decrease in sales growth. The results of this research indicate that firms that do overinvestment will not affect the salary of the CEOs, which means that there is no association between overinvestment and salary. This result is consistent with the finding of Titman, Wei, and Xie (2004) who documented the impact of overinvestment and stock returns and found that there is a negative impact of overinvestment on stock returns of the firm. They state further that this negative relation between stock returns and overinvestment gets stronger when firms have high cash flows and low leverage.
Regarding the second hypothesis, sales growth that represent the sample for underinvestment has a significant positive effect on SAL. The alternative hypothesis of this variable is accepted, and the null hypotheses is rejected with a confidence level of 5%. This hypothesis predicted an increase in sales growth. The results of this research indicate that firms that do underinvestment affect the salary of the CEOs, which means that there is an association between underinvestment and salary.

This result is consistent with the findings of Richardson (2006), who found a positive relationship between firms with the negative free cash flow and the experience to underinvestment.

7.3 Limitations

This study has the following limitations. This study only focuses on the manufacturing and retail sectors. The Banking sectors are excluded from this research due to their debt structure and the difference in operational, investment, and financing activities. The components of CEO compensation are limited to the annual salary of the CEO.

Another limitation of this research is the availability of data. This research is conducted in Suriname. Because of the limited availability of CEO compensation data in the annual reports from listed companies in Suriname the researcher had few opportunities to conduct extensive and comprehensive research in Suriname to study the effect of inefficient investment on CEO compensation. The choice went therefore to publicly listed companies in the U.S.A.

Final limitation is the availability of online indebt company data, especially from the USA, which seems to be restricted by their cyber policies.

7.4 Further research

This research is performed to investigate whether inefficient investment affected CEO compensation. For additional research, it will be interesting to extend the research with the association between inefficient investment and CEO compensation for companies not listed on the U.S. Securities and Exchange Commission but registered on the US Chamber of Commerce. This might explore a common denominator beyond the current U.S.A. market. Another aspect for future research is to investigate the effect of inefficient investment on the total CEO compensation (salary, bonus, stock awards, option awards, non-equity incentive plan compensation, and change in pension value and nonqualified deferred compensation earnings). This research focused on the CEO its compensation component salary. To investigate what could be the results, further research can apply the methodology to examine the relationship between inefficient investment and total CEO compensation. Further, it is suggested to perform future research for companies in the financial sectors (banks) because the debt structure, operational, investment and financing

activities from these companies are different relative to the non-financial sectors. To investigate what could be the results, it will be interesting to examine the relationship between inefficient investment and CEO compensation in the financial sector (banks).

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Appendix A: Companies in the sample by sector group

No.	Company name	Sector Group
1	Caterpillar	Industrial
2	Honeywell International	Industrial
3	Deere	Industrial
4	Emerson Electric	Industrial
5	Whirlpool	Industrial
6	Cummins	Industrial
7	Illinois Tool Works	Industrial
8	Parker Hannifin	Industrial
9	AGCO	Industrial
10	Dover Corporation	Industrial
11	Terex	Industrial
12	Rockwell Automation	Industrial
13	Costco	Retail
14	Home Depot	Retail
15	Target Corporation	Retail
16	Lowe's Companies Inc.	Retail
17	Best Buy	Retail
18	Sears Holdings	Retail
19	TJX Companies Inc.	Retail
20	Macy’s	Retail
21	Group 1 Automotive	Retail
22	AutoNation	Retail
23	Kohl’s	Retail
24	Dollar General	Retail
25	General Electric	Industrial
26	Flowserve	Industrial
27	General Cable	Industrial
28	Colfax	Industrial
29	Xylem	Industrial
30	Zebra Technologies	Industrial
31	Snap-on	Industrial
32	Lennox International	Industrial
33	Manitowoc	Industrial
34	Hubbell	Industrial
35	Penske Automotive Group	Retail
36	The Gap Inc.	Retail
37	Dollar Tree	Retail
38	CarMax	Retail

39	Tiffany	Retail
40	Nordstrom	Retail
41	American Eagle Outfitters	Retail
42	Sally Beauty Holdings	Retail
43	Ross Stores	Retail
44	Bed Bath & Beyond	Retail
45	Caleres	Retail
46	Murphy USA	Retail
47	Corning	Industrial
48	Navistar International	Industrial
49	Paccar	Industrial
50	Oshkosh	Industrial
51	AutoZone	Retail
52	Burlington Stores	Retail
53	Sonic Automotive	Retail
54	Advance Auto Parts	Retail
55	Asbury Automotive Group	Retail
56	Hertz Global Holdings	Retail
57	GameStop	Retail
58	Travel Centers of America	Retail
59	Big Lots	Retail
60	CST Brands	Retail
61	Casey’s General Stores	Retail
62	Lithia Motors	Retail
63	Dillard's	Retail
64	Avis Budget Group	Retail
65	Westinghouse Air Brake	Industrial
66	Fortive	Industrial
67	Acuity Brands	Industrial
68	Timken	Industrial
69	Crane	Industrial
70	A.O. Smith	Industrial
71	Hyster-Yale Materials Handling	Industrial
72	Lincoln Electric Holdings	Industrial
73	ITT	Industrial
74	Donaldson	Industrial
75	Middleby	Industrial
76	Toro	Industrial
77	Belden	Industrial
78	EnerSys	Industrial
79	Mueller Industries	Industrial
80	IDEX	Industrial
81	Itron	Industrial

82	Kennametal	Industrial
83	Nordson	Industrial
84	SPX Flow	Industrial
85	Rexnord	Industrial
86	Generac Holdings	Industrial
87	Qurate Retail	Retail
88	Sysco	Retail
89	Expedia Group	Retail
90	O’ Reilly Automotive	Retail
91	Foot Locker	Retail
92	Tractor Supply	Retail
93	Ulta Beauty	Retail
94	PC Connection	Retail
95	Williams-Sonoma	Retail
96	Rush Enterprises	Retail
97	Michaels Companies	Retail

Appendix B: Data analysis for overinvestment in Microsoft Excel

Company name	Sector Group	SAL 2015	SAL 2016	SAL 2017	SAL 2018	SAL.	Sales growth 2015	Sales growth 2016	Sales growth 2017	Sales growth 2018	Sales Growth	ROA 2015	ROA 2016	ROA 2017	ROA 2018	ROA	LEV 2015	LEV 2016	LEV 2017	LEV 2018	LEV
AGCO	Industrial	1,345,575	1,345,575	1,345,575	1,375,851	5,412,576	(23.21)	(0.76)	12.09	12.59	0.71	3.81	2.34	2.50	3.64	12.29	0.56	0.60	0.61	0.61	2.38
Hertz Global Holdings	Retail	1,450,000	1,450,000	1,416,539	1,450,000	5,766,539	(4.83)	(2.37)	-	7.96	0.76		(2.30)	1.67	(1.10)	(1.73)	0.91	0.94	0.92	0.95	3.73
The Gap Inc.	Retail	1,300,000	1,330,288	1,396,058	1,526,442	5,552,788	(3.88)	(1.78)	2.18	4.57	1.10	12.13	8.96	10.87	12.51	44.48	0.66	0.62	0.61	0.56	2.44
Kohl's	Retail	1,378,075	1,400,441	1,421,483	1,400,000	5,599,999	0.95	(2.70)	2.19	0.69	1.13	4.82	4.09	6.38	6.20	21.49	0.60	0.62	0.59	0.56	2.37
Bed Bath & Beyond	Retail	3,967,500	3,967,500	3,967,500	3,582,885	15,485,385	1.87	0.92	1.09	(2.60)	1.30	12.69	10.27	6.13	(2.02)	27.08	0.61	0.60	0.59	0.61	2.41
Big Lots	Retail	1,034,656	1,092,308	1,142,308	359,615	3,628,887	0.26	0.19	1.36	(0.50)	1.31	8.72	9.41	11.65	8.54	38.32	0.56	0.60	0.59	0.66	2.41
Rockwell Automation	Industrial	1,216,115	689,504	950,000	1,065,385	3,921,004	(4.76)	(6.79)	7.34	5.62	1.41	13.11	10.81	11.58	7.98	43.47	0.65	0.72	0.63	0.74	2.74
Rexnord	Industrial	750,000	750,000	876,923	929,615	3,306,538	0.78	(6.17)	(0.29)	7.71	2.03	2.47	2.00	2.15	2.18	8.79	0.84	0.82	0.70	0.65	3.01
Illinois Tool Works	Industrial	1,155,379	1,205,313	1,253,684	1,306,747	4,921,123	(7.45)	1.45	5.26	3.17	2.43	11.44	13.16	10.55	16.20	51.35	0.67	0.72	0.73	0.78	2.89
Target Corporation	Retail	1,300,000	1,300,000	1,300,000	1,384,615	5,284,615	1.61	(5.81)	3.43	3.69	2.91	8.26	7.05	7.68	7.20	30.18	0.68	0.71	0.70	0.73	2.81
Honeywell International	Industrial	1,890,000	1,890,000	1,414,615	1,571,154	6,765,769	(4.28)	1.87	3.13	3.13	3.85	10.23	9.37	2.99	11.65	34.24	0.63	0.64	0.71	0.68	2.65
ITT	Industrial	992,308	1,000,000	1,000,000	1,000,000	3,992,308	(6.37)	(3.23)	7.48	6.18	4.07	9.56	5.09	3.10	8.87	26.63	0.63	0.60	0.57	0.53	2.33
Sally Beauty Holdings	Retail	844,038	1,013,942	998,346	1,000,000	3,856,326	2.15	3.08	(0.36)	(0.15)	4.73	11.47	10.55	10.11	12.30	44.43	1.14	1.13	1.17	1.13	4.57
Tiffany	Retail	1,239,931	1,246,644	956,307	1,346,375	4,789,257	(3.41)	(2.51)	4.20	6.53	4.80	9.00	8.73	7.01	10.86	35.59	0.43	0.41	0.41	0.41	1.65
EnerSys	Industrial	990,000	1,000,000	800,000	850,000	3,640,000	1.26	(7.55)	2.20	9.07	4.97	8.09	6.06	7.02	5.01	26.19	0.51	0.54	0.52	0.52	2.08
Dover Corporation	Industrial	1,000,000	1,030,000	1,060,000	776,924	3,866,924	(10.27)	(2.33)	15.25	2.51	5.16	9.86	5.44	7.81	6.00	29.10	0.58	0.62	0.59	0.67	2.46
Caterpillar	Industrial	1,600,008	1,600,008	1,200,000	1,425,000	5,825,016	(14.81)	(18.03)	17.97	20.37	5.50	2.59	(0.08)	1.00	7.91	11.42	0.81	0.82	0.82	0.82	3.28
Whirlpool	Industrial	1,475,000	1,480,000	1,480,000	1,250,000	5,685,000	5.13	(0.83)	2.58	(1.02)	5.87	4.21	4.86	1.72	(0.83)	9.97	0.70	0.70	0.74	0.83	2.97
Best Buy	Retail	1,175,000	1,175,000	1,175,000	1,286,058	4,811,058	(2.01)	(0.32)	6.97	1.73	6.37	6.24	8.97	7.43	11.28	33.93	0.68	0.66	0.72	0.74	2.80
General Electric	Industrial	3,800,000	3,800,000	1,737,500	625,000	9,962,500	0.17	5.37	(1.29)	2.85	7.10	(1.07)	2.06	(1.56)	(6.59)	(7.16)	0.79	0.78	0.77	0.83	3.18
Avis Budget Group	Retail	748,836	1,000,000	1,095,068	1,100,000	3,943,904	0.20	1.85	2.18	3.12	7.35	1.82	0.92	2.04	0.90	5.68	0.98	0.99	0.97	0.98	3.91
Mueller Industries	Industrial	934,615	1,100,000	1,100,000	1,117,308	4,251,923	(11.18)	(2.11)	10.24	10.67	7.62	6.63	7.16	6.29	7.94	28.02	0.36	0.35	0.59	0.59	1.89
Casey's General Stores	Retail	1,050,000	1,125,000	900,000	925,000	4,000,000	(0.93)	(8.31)	5.40	11.78	7.94	7.57	8.70	6.18	9.80	32.24	0.65	0.60	0.61	0.63	2.49
Sonic Automotive	Retail	1,055,503	1,085,438	1,090,733	1,051,670	4,283,344	4.64	1.12	1.39	0.86	8.01	2.56	2.59	2.49	1.36	9.00	0.80	0.80	0.79	0.78	3.17
Deere	Industrial	1,500,000	1,500,000	1,500,000	1,500,000	6,000,000	(19.97)	(7.69)	11.61	25.62	9.57	3.25	2.62	3.49	3.49	12.86	0.88	0.89	0.85	0.84	3.46
PC Connection	Retail	900,000	943,442	945,000	945,000	3,733,442	4.49	4.61	8.14	(7.29)	9.95	7.94	7.26	7.65	8.32	31.17	0.39	0.37	0.36	0.35	1.46
Caleres	Retail	1,030,000	1,030,000	1,110,000	1,150,000	4,320,000	0.22	0.08	7.99	1.77	10.06	6.50	4.76	5.88	(0.33)	16.81	0.54	0.58	0.52	0.65	2.29
Parker Hannifin	Industrial	857,667	1,000,000	1,125,000	1,200,000	4,182,667	(3.82)	(10.63)	5.88	18.90	10.34	7.92	6.63	7.15	6.89	28.59	0.58	0.62	0.66	0.62	2.48
Lincoln Electric Holdings	Industrial	903,221	865,429	935,000	965,000	3,668,650	(9.86)	(10.30)	15.38	15.40	10.62	6.84	10.64	11.38	12.07	40.93	0.48	0.63	0.61	0.62	2.35
Foot Locker	Retail	1,037,500	1,087,500	1,100,000	1,100,000	4,325,000	3.65	4.78	0.21	2.02	10.65	14.72	17.44	7.28	13.91	53.34	0.32	0.29	0.36	0.34	1.33
Michaels Companies	Retail	1,160,462	1,195,269	1,202,000	1,202,000	4,759,731	3.69	5.79	3.17	(1.68)	10.97	18.22	18.10	17.56	14.43	68.31	1.85	1.79	1.66	1.76	7.06
Donaldson	Industrial	580,865	742,116	844,712	942,308	3,110,001	(4.13)	(6.36)	6.83	15.27	11.60	11.09	10.61	12.36	9.11	43.17	0.57	0.57	0.57	0.57	2.27
Belden	Industrial	850,000	868,750	875,000	893,750	3,487,500	0.04	2.05	1.36	8.24	11.69	2.01	3.60	2.43	4.22	12.26	0.75	0.62	0.63	0.63	2.63
AutoNation	Retail	1,250,000	1,250,000	1,250,000	1,293,750	5,043,750	9.17	3.58	(0.34)	(0.57)	11.85	4.93	4.39	4.28	3.78	17.38	0.75	0.77	0.77	0.75	3.04
Snap-on	Industrial	1,042,875	1,071,951	1,098,750	1,126,219	4,339,795	2.29	2.31	7.48	1.46	13.54	11.15	12.36	11.48	13.11	48.10	0.46	0.44	0.43	0.42	1.75
Oshkosh	Industrial					-	(10.43)	2.97	8.77	12.83	14.13	4.99	4.77	5.94	9.08	24.79	0.59	0.56	0.55	0.53	2.22
Lennox International	Industrial	1,052,500	1,084,000	1,116,750	1,151,250	4,404,500	2.97	5.02	5.44	1.15	14.58	10.83	16.16	16.74	19.36	63.10	0.94	0.98	0.97	1.08	3.97
Hyster-Yale Materials Handling	Industrial			902,674	954,965	1,857,639	(6.83)	(0.33)	12.28	10.02	15.14	6.78	3.55	3.33	2.02	15.68	0.58	0.63	0.65	0.68	2.54
Crane	Industrial	925,096	915,000	970,385	1,002,000	3,812,481	(6.29)	0.26	1.38	20.10	15.45	6.77	3.67	4.93	8.80	24.16	0.66	0.67	0.62	0.62	2.57
IDEX	Industrial	921,808	949,347	977,900	996,808	3,845,863	(5.92)	4.57	8.25	8.58	15.49	9.91	9.10	10.29	11.95	41.24	0.49	0.51	0.45	0.43	1.87
Group 1 Automotive	Retail	1,100,000	1,100,000	1,100,000	1,150,000	4,450,000	6.99	2.40	2.17	4.29	15.85	2.20	3.32	4.57	3.20	13.29	0.79	0.79	0.77	0.78	3.13
Corning	Industrial	1,353,096	1,337,740	1,370,971	1,412,769	5,474,576	(6.22)	3.06	7.73	11.61	16.18	4.57	13.10	(1.79)	3.88	19.75	0.34	0.36	0.43	0.50	1.62
Nordstrom	Retail	735,445	751,152	771,142	756,393	3,014,132	6.89	2.22	4.89	2.47	16.46	7.08	4.55	5.47	7.05	24.16	0.89	0.89	0.88	0.89	3.55
Asbury Automotive Group	Retail	950,000	996,552	1,750,000	1,000,000	4,696,552	12.27	(0.91)	(1.09)	6.46	16.73	7.53	7.21	5.92	6.65	27.32	0.86	0.88	0.83	0.82	3.40
Fortive	Industrial	701,200	919,834	1,036,542	1,050,000	3,707,576	(2.49)	0.73	6.94	12.11	17.28		11.32	11.18	7.84	30.35	0.28	0.67	0.64	0.49	2.08
AutoZone	Retail	1,000,000	1,000,000	1,000,000	1,000,000	4,000,000	7.51	4.40	2.38	3.05	17.35	14.88	14.86	14.34	14.38	58.46	1.21	1.21	1.15	1.16	4.73
Timken	Industrial	900,000	900,000	900,000	941,667	3,641,667	(6.63)	(7.03)	12.51	19.21	18.05	(2.35)	5.52	6.55	7.80	17.52	0.52	0.53	0.57	0.63	2.24
Rush Enterprises	Retail	1,337,000	1,437,000	1,474,649	1,549,948	5,798,597	5.34	(15.36)	11.85	16.81	18.63	2.39	1.49	6.27	4.57	14.71	0.70	0.67	0.64	0.67	2.68
Williams-Sonoma	Retail	1,373,077	1,400,000	1,400,000	1,473,077	5,646,154	5.90	2.16	4.10	7.17	19.34	13.06	12.48	9.86	11.92	47.33	0.50	0.50	0.57	0.59	2.16
Toro	Industrial	960,000	990,000	775,000	875,000	3,600,000	10.04	0.05	4.72	4.53	19.35	16.15	17.17	18.60	17.75	69.67	0.65	0.60	0.59	0.57	2.41
American Eagle Outfitters	Retail	1,500,000	1,500,000	1,500,000	1,500,000	6,000,000	7.28	2.50	5.14	6.33	21.25	12.89	12.52	11.35	14.08	50.83	0.35	0.32	0.31	0.32	1.31
Itron	Industrial	830,769	800,000	800,000	821,154	3,251,923	(3.29)	6.88	0.25	17.73	21.58	0.87	2.15	3.27	(4.10)	2.20	0.63	0.59	0.62	0.72	2.55
Costco	Retail	699,810	700,000	713,462	800,000	2,913,272	3.16	2.17	8.68	9.73	23.74	7.25	7.18	7.81	8.24	30.48	0.68	0.63	0.70	0.68	2.68
Cummins	Industrial	1,337,500	1,375,000	1,375,000	1,442,500	5,530,000	(0.58)	(8.38)	16.67	16.36	24.08	9.52	9.66	6.01	11.78	36.96	0.49	0.52	0.55	0.57	2.13
Sysco	Retail	1,220,583	1,245,833	1,250,000	1,000,000	4,716,416	4.65	3.46	9.94	6.06	24.11	4.41	5.47	6.63	7.99	24.50	0.71	0.79	0.86	0.86	3.21
Lowe's Companies Inc.	Retail	1,300,000	1,300,000	1,300,000	864,423	4,764,423	5.07	10.06	5.54	3.92	24.59	8.08	9.42	9.89	6.63	34.03	0.76	0.81	0.83	0.89	3.30
Paccar	Industrial	1,186,730	1,210,000	1,347,308	1,373,077	5,117,115	0.62	(10.89)	14.23	20.76	24.72	7.69	2.50	7.60	8.97	26.76	0.67	0.67	0.66	0.66	2.66
Home Depot	Retail	1,300,000	1,300,000	1,300,000	1,325,000	5,225,000	6.42	6.86	6.67	7.23	27.19	16.99	18.74	19.73	25.12	80.58	0.85	0.90	0.97	1.04	3.76
O' Reilly Automotive	Retail	1,205,769	1,238,461	1,313,462	803,846	4,561,538	10.40	7.86	4.48	6.22	28.96	14.10	14.95	15.35	17.03	61.43	0.71	0.77	0.91	0.96	3.35
Penske Automotive Group	Retail	1,200,000	1,200,000	1,375,000	1,400,000	5,175,000	11.91	4.32	6.30	6.54	29.08	4.33	4.11	6.33	4.39	19.15	0.77	0.80	0.77	0.76	3.10
Nordson	Industrial	825,000	850,000	875,000	925,000	3,475,000	(0.90)	7.13	14.26	9.08	29.57	9.10	11.37	10.14	11.04	41.65	0.72	0.65	0.66	0.58	2.61
TJX Companies Inc.	Retail	1,575,002	1,575,002	1,525,001	1,619,232	6,294,237	6.42	7.23	8.08	8.67	30.40	20.26	18.86	19.36	21.56	80.03	0.63	0.65	0.63	0.65	2.56
Hubbell	Industrial	968,700	1,000,000	1,030,000	1,050,500	4,049,200	0.92	3.39	4.67	22.16	31.13	8.64	8.85	6.90	8.52	32.91	0.45	0.55	0.56	0.63	2.19
A.O. Smith	Industrial	980,000	1,000,000	1,030,000	900,000	3,910,000	7.66	5.89	11.57	6.38	31.50	10.96	11.83	9.74	14.17	46.70	0.46	0.48	0.48	0.44	1.86
Dollar General	Retail	926,605	1,083,375	1,127,543	1,188,879	4,326,402	7.72	7.94	6.75	9.18	31.59	10.37	10.91	12.72	12.36	46.37	0.52	0.54	0.51	0.51	2.08
Ross Stores	Retail	1,276,250	1,301,875	1,322,500	1,342,500	5,243,125	8.14	7.76	9.85	6.01	31.76	21.36	21.96	24.71	26.92	94.94	0.49	0.48	0.47	0.46	1.90
Xylem	Industrial	981,731	975,384	996,923	1,025,385	3,979,423	(6.72)	3.23	24.82	10.62	31.96	7.17	4.67	4.95	7.80	24.58	0.55	0.66	0.63	0.61	2.46
CarMax	Retail	1,191,062	1,257,747	902,308	1,031,721	4,382,838	13.48	6.17	4.79	7.84	32.28	4.80	4.50	4.08	3.93	17.31	0.76	0.80	0.81	0.81	3.18
Burlington Stores	Retail	1,109,102	1,164,257	1,300,000	1,329,250	4,902,609	5.78	8.99	9.28	9.14	33.19	5.78	8.39	14.29	14.08	42.54	1.04	1.02	0.97	0.90	3.92
Tractor Supply	Retail	992,308	1,033,846	1,040,000	1,090,769	4,156,923	9.01	8.88	7.03	9.02	33.95	18.63	17.33	15.25	17.88	69.09	0.41	0.46	0.51	0.49	1.87
Qurate Retail	Retail	1,125,509	1,254,788	1,250,000	1,250,000	4,880,297	(4.86)	6.59	(2.28)	35.24	34.68	4.58	6.13	11.18	4.59	26.49	0.68	0.66	0.58	0.68	2.60
Generac Holdings	Industrial	750,000	794,932	824,658	862,986	3,232,576	(9.83)	9.65	15.78	20.49	36.10	4.23	5.43	8.30	10.84	28.80	0.74	0.77	0.70	0.66	2.87
Westinghouse Air Brake	Industrial	750,000	825,000	1,000,000	1,250,000	3,825,000	8.66	(11.39)	32.43	12.41	42.11	12.07	6.39	3.99	3.83	26.28	0.48	0.55	0.57	0.67	2.27
Acuity Brands	Industrial	600,000	600,000	600,000	600,000	2,400,000	13.07	21.57	6.50	4.99	46.14	9.66	10.87	11.01	11.89	43.43	0.44	0.44	0.43	0.43	1.73
Middleby	Industrial	1,000,000	1,000,000	1,000,000	1,500,000	4,500,000	11.61	24.16	2.98	16.59	55.34	7.94	10.01	9.53	8.04	35.52	0.58	0.57	0.59	0.63	2.37
Expedia Group	Retail	1,000,000	1,000,000	824,039	1,000,000	3,824,039	15.77	31.49	14.66	11.56	73.48	5.89	1.67	2.17	2.18	11.91	0.68	0.64	0.67	0.69	2.68
Ulta Beauty	Retail	1,000,000	1,000,000	1,117,000	1,150,510	4,267,510	21.06	23.72	21.21	14.14	80.13	15.19	17.13	20.34	21.59	74.25	0.35	0.39	0.39	0.43	1.57
Lithia Motors	Retail	882,000	950,000	1,000,000	1,020,000	3,852,000	45.90	10.35	16.23	17.19	89.66	5.99	5.58	5.75	5.28	22.60	0.74	0.76	0.77	0.78	3.05
Dollar Tree	Retail	1,585,577	1,680,769	1,290,384	1,400,000	5,956,730	80.17	33.69	7.37	2.60	123.82	2.91	5.67	10.70	(10.66)	8.62	0.72	0.66	0.56	0.58	2.52
Zebra Technologies	Industrial	889,041	900,000	938,462	988,462	3,715,965	118.55	(2.08)	4.14	13.33	133.94	(2.59)	(2.83)	0.38	9.77	4.73	0.82	0.83	0.80	0.69	3.14

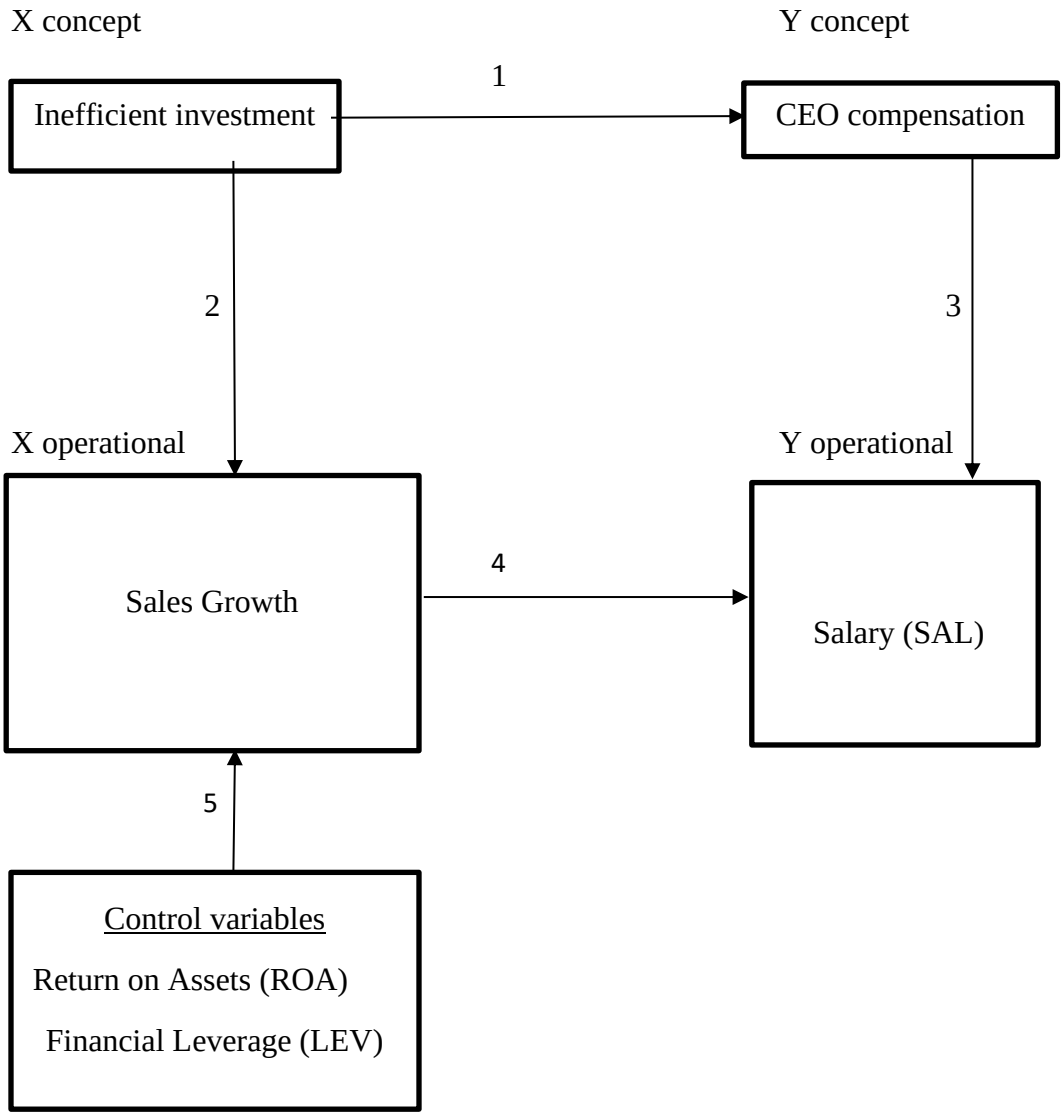
(Source: own research)

Appendix C: Data analysis for underinvestment in Microsoft Excel

Company name	Sector Group	SAL 2015	SAL 2016	SAL 2017	SAL 2018	SAL.	Sales growth 2015	Sales growth 2016	Sales growth 2017	Sales growth 2018	Sales Growth	ROA 2015	ROA 2016	ROA 2017	ROA 2018	ROA	LEV 2015	LEV 2016	LEV 2017	LEV 2018	LEV
Travel Centers of America	Retail	300,000	300,000	300,000	300,000	1,200,000	(24.79)	(5.80)	11.02	(99.88)	(119.45)	1.82	(0.12)	0.57	(16.68)	(14.40)	0.66	0.67	0.65	0.69	2.67
Sears Holdings	Retail					-	(19.40)	(11.96)	(24.56)		(55.92)	(9.20)	(21.46)	(4.61)		(35.27)	1.17	1.41	1.51		4.09
General Cable	Industrial	462,500	945,192	950,000		2,357,692	(21.60)	(14.53)	(0.55)		(36.68)	(4.66)	(3.98)	(2.44)		(11.08)	0.89	0.92	0.94		2.76
SPX Flow	Industrial	1,224,800	825,000	841,262	868,221	3,759,283	(13.76)	(16.43)	(2.23)	7.10	(25.32)	2.38	(12.90)	1.77	1.71	(7.04)	0.62	0.71	0.64	0.61	2.58
Flowserve	Industrial	1,090,372	1,049,988	825,000	1,126,654	4,092,014	(6.50)	(12.49)	(8.26)	4.69	(22.55)	5.43	3.05	0.09	2.63	11.19	0.67	0.65	0.66	0.64	2.62
Kennametal	Industrial	562,500	405,303	1,000,000	779,167	2,746,970	(6.70)	(20.73)	(1.91)	15.04	(14.30)	(11.04)	(8.58)	2.18	7.68	(9.77)	0.52	0.58	0.56	0.58	2.24
CST Brands	Retail	1,000,690	1,030,000			2,030,690	(10.27)	(3.05)			(13.32)	3.73	7.41			11.15	0.60	0.59			1.19
Macy's	Retail	1,600,000	1,600,000	1,208,333	1,291,667	5,700,000	(3.65)	(4.80)	(3.65)	0.13	(11.98)	5.11	3.02	7.83	5.66	21.62	0.79	0.78	0.71	0.66	2.95
Murphy USA	Retail	898,245	991,667	1,027,500	1,057,500	3,974,912	(25.24)	(8.70)	10.63	11.98	(11.33)	9.19	11.14	11.10	9.11	40.54	0.58	0.67	0.68	0.66	2.59
Manitowoc	Industrial	1,173,652	931,731	973,019	995,865	4,074,267	(11.60)	(13.54)	(1.97)	16.79	(10.32)	1.75	(14.79)	(0.60)	(4.26)	(17.91)	0.76	0.61	0.58	0.61	2.56
Colfax	Industrial	426,923	1,000,000	1,021,932	1,049,000	3,497,855	(14.22)	(8.07)	3.59	11.11	(7.58)	2.68	2.21	2.60	2.32	9.82	0.52	0.52	0.44	0.47	1.95
Terex	Industrial	1,438,462	882,692	900,000	935,577	4,156,731	(10.48)	(11.52)	(1.79)	17.45	(6.34)	2.58	(3.30)	3.04	3.27	5.58	0.66	0.70	0.65	0.75	2.76
Dillard's	Retail	1,000,000	1,000,000	1,000,000	1,035,000	4,035,000	(0.38)	(5.13)	0.07	1.51	(3.93)	6.70	4.37	5.85	4.79	21.71	0.54	0.56	0.53	0.51	2.14
GameStop	Retail	1,246,923	1,285,077	1,733,586	1,808,795	6,074,381	0.73	(8.07)	7.17	(3.07)	(3.24)	9.39	7.59	0.70	(14.81)	2.86	0.52	0.55	0.56	0.96	2.59
Advance Auto Parts	Retail	1,034,138	803,852	1,100,008	1,100,008	4,038,006	(1.09)	(1.74)	(2.03)	2.21	(2.65)	5.88	5.59	5.66	4.84	21.97	0.70	0.65	0.60	0.61	2.55
Navistar International	Industrial	900,000	950,000	1,000,000	1,027,183	3,877,183	(6.16)	(20.01)	5.66	19.60	(0.91)	(2.14)	(1.06)	0.93	5.51	3.25	1.77	1.94	1.75	1.54	7.00
Emerson Electric	Industrial	1,300,000	1,300,000	1,300,000	1,350,000	5,250,000	(9.10)	(10.63)	5.11	14.05	(0.57)	11.81	7.59	7.50	11.13	38.04	0.63	0.65	0.55	0.56	2.39

(Source: own research)

Appendix D: Libby boxes



Appendix E: Multivariate regressions output

E1): Regression output for overinvestment

Variables Entered/Removed[a]			
Model	Variables Entered	Variables Removed	Method
1	LEV, ROA, Sales Growth[b]	.	Enter
a. Dependent Variable: SAL.			
b. All requested variables entered.			

Model Summary[b]										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.138[a]	.019	-.020	1752684.8215	.019	.495	3	76	.687	2.018
a. Predictors: (Constant), LEV, ROA, Sales Growth										
b. Dependent Variable: SAL.										

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4563428293652.031	3	1521142764550.677	.495	.687[b]
	Residual	233464710353105.030	76	3071904083593.487		
	Total	238028138646757.060	79			
a. Dependent Variable: SAL.						
b. Predictors: (Constant), LEV, ROA, Sales Growth						

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4643878.438	768589.942		6.042	.000	3113098.902	6174657.975
	Sales Growth	-8321.499	8123.931	-.117	-1.024	.309	-24501.711	7858.712
	ROA	-4347.410	9770.526	-.051	-.445	.658	-23807.098	15112.278
	LEV	94206.052	233227.769	.046	.404	.687	-370307.306	558719.411
a. Dependent Variable: SAL.								

(Source: SPSS v. 26)

SAL = β0 + β1 Sales Growth + β2 ROA + β3 Lev + E

SAL = 4643878.44 – 8321.50* Sales Growth – 4347.41* ROA + 94206.05* Lev + E

E2) Regression output for underinvestment

Variables Entered/Removed[a]			
Model	Variables Entered	Variables Removed	Method
1	LEV, Sales Growth, ROA[b]	.	Enter
a. Dependent Variable: SAL.			
b. All requested variables entered.			

Model Summary[b]										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.757[a]	.573	.474	1119507.5579	.573	5.804	3	13	.010	2.822
a. Predictors: (Constant), LEV, Sales Growth, ROA										
b. Dependent Variable: SAL.										

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21820543942348.750	3	7273514647449.583	5.804	.010[b]
	Residual	16292863237713.725	13	1253297172131.825		
	Total	38113407180062.480	16			
a. Dependent Variable: SAL.						
b. Predictors: (Constant), LEV, Sales Growth, ROA						

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	3795804.394	823600.464		4.609	.000	2016523.766	5575085.021
	Sales Growth	25028.321	11456.863	.475	2.185	.048	277.272	49779.369
	ROA	30015.160	17156.164	.390	1.750	.104	-7048.480	67078.800
	LEV	46971.561	237527.317	.037	.198	.846	-466175.010	560118.133
a. Dependent Variable: SAL.								

(Source: SPSS v. 26)

$$SAL = \beta 0 + \beta 1 \text{ Sales Growth} + \beta 2 \text{ ROA} + \beta 3 \text{ Lev} + E$$

$$SAL = 3795804.39 + 25028.32^{*} \text{ Sales Growth} + 30015.16^{*} \text{ ROA} + 46971.56^{*} \text{ Lev} + E$$