

CEO compensation and incentives: Is there a relationship between the level of CEO compensation and the company performance?

Bachelor Thesis Finance

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Abstract

In this paper I investigated if there is a significant positive relation between the level of CEO compensation and a firms performance. Firstly, I intend to prove that high level managerial compensation has a positive effect on the company performance. Also, I want to investigate the sensitivity of the CEO compensation on the company performance. In order to conduct this research, I emphasized the theoretical background of the CEO compensation and the influence the level of CEO compensation has on a firm's performance.

In order to conduct this research I divided the company performance into both return on stocks and return on assets. The CEO compensation is measured as base salary, bonus, stock awards, long term incentive payments and the total CEO compensation. I dropped the interest a CEO has in a firm from my research because the data in relation to the total shares a CEO owes is not available for the time range in which my research will take place. In my investigation I processed data of 9.581 firms in the time range from 2000 till 2006.

Introduction

Since the financial crisis appeared the discussion about the high CEO compensation shifted more and more from a corporate issue to a social issue. Political figures, union leaders and consumer activists discuss whether it is fair to compensate the board of directors, and especially the CEOs, on such high levels. The social question arises whether CEOs actually have a vast influence on the company performance to compensate them on such high level. In addition the question arises if the term "CEO overcompensation" is righteous? Or does the CEO compensation in fact affect the company performance?

In this research I intend to prove that the level of CEO compensation has a large positive influence on a firms performance by investigating the total CEO compensation in relation with the company performance. Besides the total CEO compensation, the different components of the CEO compensation and their effects on the company performance will be distinguished. Also, the sensitivity of the different components of the managerial compensation on the company performance will be highlighted.

Therefore, this research consists of two main parts. Firstly I will conduct a brief literature review on this subject where the level of managerial performance is emphasized and the different matters and

motivations of CEO compensation (incentives) are distinguished to create a general overview on the topic. Also, some theoretical contracting theories and models will be empathized. Secondly I will perform an empirical research where on the basis of data of 9.581 US firms the research questions and the hypothesis will be confirmed or rejected. In the literature review I will mainly focus on information from both the United States and Europe, for the empirical part of the investigation I will focus on just the United States. Strictly because of the fact that the collected data is based on US firms only.

Theoretical framework

In this research, my intention is to find out whether the level of the CEO compensation has a positive influence on the company performance. First, I will create a general overview of the important components according to this subject. Therefore I will describe the general agency problem that occurs in a company when a CEO has to look after different interests. Furthermore, I will summarize the different components and facets of executive compensation and the motivation for high level executive compensation and the development of executive compensation packages will be empathized. In addition, the level of executive compensation and the managerial incentives will be highlighted and I will elaborate on some theoretical models for CEO compensation contracting design. Finally, I will refer to earlier research on this subject in relation to my investigation.

The relationship between company owners and management can be described as a principal-agent relationship (Grinblatt & Titman, 2004). The stockholders are considered the principals and the managers considered the agents. Managers are hired by the owners to make decisions on their behalf. Although, managers are representatives of the shareholders, they also see themselves as representatives of customers, employees, suppliers, etc. Thus, besides maximizing shareholders wealth managers have to take other interests into account. This conflict of interests can be defined as the agency problem. Consequently, the incentive package should be designed in a way that motivates managers to make decisions in advantage of the shareholders without neglecting other interests.

Summarized, the conflict of interest between CEOs and shareholders can be defined as the principal-agent problem or the agency problem. According to Bebchuck & Fried (2003) there are two different views on how the agency problem and the managerial compensation can be linked. Firstly, the “optimal contracting approach” can be a partial solution to the agency problem, which means that boards are assumed to design compensation packages that maximizes the shareholders wealth. Secondly, the “managerial power approach” focuses much more on another link between managerial compensation and the agency problem. The main assumption of the managerial power approach is that

executive compensation is not only a remedy for the agency problem, but also a part of the agency problem itself because earlier research has concluded that in some cases of executive compensation payments, managerial rent seeking is preferred above provision of efficient incentives. In addition, Tosi, Werner, Katz and Gomez-Mejia (2000) mentioned that managers are more interested in increasing a firm's size than maximizing profits because this will lead to more prestige, power and eventually more pay. Even though this may result in lower returns to the shareholders. There is a chance that managers prefer more salary in the future rather than lower short-term payments.

In another research Jensen & Murphy (2010) argue that, according to company performance, the structure of CEO payment is more important than the level of payment. They mention that almost 50% of CEO salaries exists of bonuses while there are three essential components which have to be included into the CEO incentive package to motivate CEOs to maximize the company value. Firstly, boards can require that the CEO owns a substantial amount of stocks, consequentially the CEO becomes more dependent of shareholders wealth. Secondly, CEOs should be more dependent from company performance. Thus, superior performance should be rewarded well and there should be a big penalty for poor performance. Finally, CEOs should be threatened by dismissal for poor performance, and the threat has to be executed. (Note that in this investigation the company performance is measured as maximization of the company value, in this case, the value of equity).

According to the aforementioned researches, the executive compensation packages should be designed in a way that it motivates executives to act in the owners advantage without neglecting the other firm interest. How is the optimal contract, which harmonizes both of these interests as well as possible, designed? A lot of economists have argued about this subject. In a leading research Holmström and Tirole (1989) empathized the different compensation schemes and found that compensation contracts should be designed in a way that it supports both the strategic objectives of the firm and motivate the executives to excel. To achieve that purpose it is nowadays not uncommon that more than half of the yearly executive income exists of stock and stock options. In order to design an optimal contract the independence of directors has to be taken into account. Firstly, the compensation has to contain incentives to exert supervisory effort. Secondly, the directors must not collude with the managers and let them divert funds for their own benefits. The role of directors can be described as a control layer between shareholders and managers. These considerations have to be taken into account when designing an optimal contract because the interests of both the managers and the shareholders have to be taken into consideration.

Also, to design an optimal contract it is important to consider why an executive would not want to pursue the objectives of the owners. Beside the reasons mentioned before, Holmström and Tirole considered that the manager may want to divert company funds for his own benefit; he may want to

expand the business for reasons of prestige; he may cater to the tastes of other stakeholders like employees in order to make his work easier within the organization; he may prefer free time above work and so forth. In order to make an optimal contract model some basic assumptions are formulated, a lot of extant agency models are based on the assumption that executives are risk and work averse. Holmström and Tirole found that not very plausible because in most cases managers are workaholics, and they are driven by concerns for their careers and their income.

Also, Holmström and Tirole distinguish some agency models. For example, with the assumption that managers are both risk and work averse, the technology is of the form $x = x(a, \Theta)$. In this case x is the output, a the managers effort and Θ the stochastic term. Both the a and the Θ cannot be observed, or else the effort could be inferred from the knowledge of Θ and x , assuming x is increasing in a . An incentive scheme is a sharing rule $s(x)$. The owner's design problem can be viewed as one of instructing the manager to take a particular action, a . The Pareto optimal design which maximizes the principals wealth can be seen as $(a, s(x))$, assuming that the wealth subject that the manager gets a minimum level of utility induces the manager to choose a .

In another research, Roberts and Milgrom (1992) found the four principles of contract design which eventually lead to a linear optimal contracting model. The first principle is the informativeness principle, which states that the level of the executive's effort and the performance measure should be included into a compensation contract. The second principle is the incentive-intensity principle, which states that the intensity of a certain incentive is depending on four elements: the incremental profits in relation to the effort; the risk tolerance of the agent; the influence incentives have on the agent and the precision of the monitoring of the agents activities. The third principle is the monitoring intensity principle, this principle states that when the level of incentive intensity is high, the level of monitoring intensity is (in most cases) also high. The last principle is the equal compensation principle, this principle states that activities that are considered equal valuable by the agents should be compensated on equal basis. In this case the value of an activity is not only measured financially but also in non-financial aspects (for example flexibility). These four principles can be combined in the linear model $w = a + b(e + x + gy)$, where w stands for wage, e for effort, b for the intensity of incentives, a stands for the base salary, x for unobserved exogenous effects and y for observed exogenous effects.

For the most important reason, compensation packages are designed to motivate the managers to improve company performance or company value. Besides these performance motives there are financial motives, a company can take advantages by compensating managers in certain ways. For example, an important advantage for firms is that so called agency costs can be mitigated. Agency costs are costs which occur when management and shareholders objectives are divergent because of separate control and information asymmetry. According to Jensen & Meckling (1976) agency costs are the sum of the monitoring expenditures by the principal, the bonding expenditures by the agent and the

residual loss. Compensating managers with stocks and stock options can mitigate agency costs. K. Tzioumis (2008) considered that besides the agency problem also the agency costs are mitigated when the CEO owns a substantial amount of shares. Also, a CEO who already owns a certain amount of shares would become further undiversified by accepting stocks. Both these arguments are motivations for firms to use granting stocks and stock options for compensating CEOs. On the other hand there are some investigations that empathize the disadvantages of compensating CEOs with a large amount of shares of stock options. For instance, Burns and Simi (2006) argue that the possibility of financial misreporting increases when executives have a strong interest in a firm. For example, General Electric and Microsoft have already announced that they will no longer use stock options to compensate their CEOs.

Now is clarified how the structure of executive compensation is used to motivate CEOs in certain ways. I will elaborate the level of executive compensation and narrow the scope to several researches that investigated the relationship between managerial compensation and company performance.

During the last decades executive pay became more and more tied to company performance. The question arises if it is fair to compensate CEOs based on firm performance because CEOs do not control every component that influences the firm performance. Many financial economists have argued about this topic. For example, Jensen & Murphy (1990) concluded that executive compensation is not as sensitive to firm performance as assumed. They say that CEO compensation packages are not enough designed to give sufficient monetary incentives to create more shareholders value. Hall and Liebman (1998) are contradicting this conclusion, they criticized the fact that company performance is measured by the change in firm value because the dominator (change in firm value) is subsequently large, which can create a misleading picture of the performance based pay relationships. Due to this comment they want to provide a broader perspective on the relationship between company performance and managerial compensation. Thus besides the change in firm value, they added a variety of other measures for company performance. Hall and Liebman conclude that the CEO compensation has become much more sensitive to company performance. This is mainly due to the fact that CEOs are more paid in stock and options over the years, which almost entirely drive the relationship between company performance and managerial compensation. Which concludes that they provided strong evidence to suggest that equity-based incentives have significantly increased the sensitivity of CEO compensation to firm performance.

Jensen & Murphy (1990) also argue about a managerial incentive program that motivates the executives to maximize shareholders wealth. They concluded that most of the CEO compensation structures are designed in such way that it does not provide CEOs enough to primarily work for shareholders benefits. However, Boschen & Smith (1995) suggest that Jensen & Murphy may have

underestimated the sensitivity of performance based compensation. Also they suggest that the sensitivity of performance based compensation has increased over time and that the performance-based compensation became a lot more dynamical. Also, Boschen and Smith found evidence that compensation cumulated over many years has about 10 times larger effect on the cumulative response of pay per performance than performance based compensation in individual years.

Hypothesis development

The general question which I intend to solve during this research is: Is it fair to compensate managers on high level compared to the influence they have on company performance? The aforementioned researches mainly emphasize the effect of the company performance on the managerial compensation. In my research I investigate the effect of the CEO compensation on the company performance. Therefore, based on the aforementioned articles, papers and theory, I derived the following hypotheses:

H1: The level of the CEO compensation has a positive influence on a firm's performance.

In order to solve this hypothesis the firms' performance will be split into two measures to cover both the income aspect and the company value aspect. Therefore I will investigate both the effect of the level of CEO compensation on the operating performance and the influence of the level of CEO compensation on the stock returns. Besides the research on the influence of the level of the total CEO compensation has on a firms operating performance and stock returns, my intention is to investigate if a certain component of CEO compensation has a bigger influence on a firms operating performance and return on stocks than other components.

To investigate the effect of the CEO compensation on the operating performance I have to find measures that are presenting a firms performance. Therefore I have to find measures that are presenting both the company's operating performance and a firms stock return. In earlier research different measures presented the company performance. For example, Chakraborty, Sheikh and Subramanian (2009) used the return on assets to calculate the CEO turnover, Husis, Parrino and Starks (2001) used the return on assets, the one-year change of return on assets and the return on stocks. Bulan, Sanyal and Yan (2010) determined a productivity-index which measures a firms performance and, as I mentioned before, Jensen and Murphy used the change in firm value to measure the company performance. Besides these papers there are variant examples of papers that cover the small contents of company performance, I rather overview of the global companies performance. Therefore my opinion is similar to Huson, Parrino and Starks (2001), who state that return on assets (ROA) is a

reliable measure to determine the company performance, because the ROA provides an indication of the recent accounting performance. Furthermore, Huson et al. found that the stock return is a reliable measure because the return on stocks indicates how well a firm's stock performs. Also, to show the effect of managerial compensation on a firm's performance and to clarify the discrepancy between operating performance and return on equity, according to the aforementioned articles, the return on shares seems to be a good measure.

Besides the company performance, I need a measure for the CEO compensation. A lot of earlier investigations (included the before mentioned articles from Chakraborty et al. & Bulan et al.) measured the firm performance influenced by the amount of shares a CEO possesses. However this method seems to be reliable, I want to look at the parts of CEO compensation that are expressible in dollars. For example, if a CEO receives a certain amount of stocks, I will determine the value of the stock. Also, to cover all the facets of executive compensation, the interest a CEO has in a firm will be included in my research. This is mainly because I intend to clarify both that the effect of a reward in year one will be visible in year two and that the CEO's interests in a firm give incentives. Therefore, the components I use for the research are comparable with the components of CEO compensation table from Ozkan (2011) (table 1 part 1). This table contains base salary, bonus, stock option, long term incentive program (LTIP) and total compensation. I use these variables to visualize the effect a reward has in year $t-1$ on the company performance of year t . Besides these components I will add the total value of shares a CEO has of the firm, especially because according to Hall and Liebmann (1998) the CEO's interest in a firm should give the best incentives to clarify the effect an executive's interest in a firm in year $t-1$ has on the company performance in year t . Based on the aforementioned articles, I find that these components of compensation are covering the biggest part of the total compensation.

As mentioned before, the company performance is measured by both return on assets and return on stocks. In this particular study, both these measures are used as the dependent variables and the components of the CEO compensation are used as the independent variables. This method is similar to the method Core, Guay and Rusticus used in 2006 to investigate whether the G-index has an influence on the return on assets. In combination with the control variables market value of equity and book to market equity this seems a good approach to conduct this investigation. In the chapter empirical analysis the research method is further emphasized.

Data and descriptive statistics

In this chapter additional information about the data is provided. Firstly, I describe which data I used and how I achieved the data. Secondly, I emphasize the database in relation with the investigation and hypotheses.

In my study I investigate whether the height of CEO compensation has a positive effect on a firms operating performance and a firms stock returns. I acquired all the data from CompuStat North America. The CompuStat database is a database of U.S. and Canadian fundamental and market information on active and inactive publicly held companies. For example, CompuStat contains a lot of data on aggregates industry segments, banks, market prices, dividends, earnings and so forth. In connection with the data collection there are some important subjects I have taken into account. Firstly, the financial crisis had a big influence on the financial and CEO compensation characteristics, due to this fact I decided to gather the data from the period before the financial crisis. Since the crisis appeared in 2008, I choose to achieve data from the period before 2008. Mainly because I intend to exclude the financial crisis from my investigation. In order to make a solid analysis I used data from at least seven years, consequently, the time range I use is 2000 till 2006.

According to my investigation the data can be split in two main types. On the one hand I collected the financial data and on the other hand I collect data about managerial compensation. The main reason that I chose to acquire my research data from CompuStat North America is the fact that it provides a lot of data about both these types. The company performance is measured by both the return on assets and the return on stocks. Therefore, I collected data from the financial database about total assets, total equity, operating income before depreciation, operating income after depreciation, deferred taxes and stock price. To conduct the empirical research I created the dependent variables return on assets (ROA) before and after depreciation and the return on stocks. The ROA variables are obtained by dividing the operating income before, respectively, after depreciation by the total assets. The total stock returns are determined by dividing the stock price at time 1 minus the stock price at time 0 plus dividends by the stock price at time 0 (Berk and DeMarzo, 2011). Represented as a formula : $(P1 - P0 + \text{div}) / P0$. Also, according to Core et al. (2006), I added two control variables. The control variables that I add to conduct the empirical part of the investigation are both the natural logarithms of book-to-market value of equity and market value of equity. In addition, Fama and French (1995) proved that these control variables are correlated with profitability. The market value of equity is calculated by multiplying the number of common shares with the share price at the end of the fiscal year. The book-to-market equity is calculated by dividing the book value of equity by the market value of equity.

In addition, according to Ozkan (2011) I acquired the following variables from the managerial compensation database: CEO salary, bonuses, Stock option awards, payments for long term incentive plans (LTIP), and total CEO compensation. Similar to Ozkan, values of the granted options are calculated based on the Black-Scholes formula (Black & Scholes, 1973). The total compensation contains the total of salary, bonus, other annual, total value of restricted stock granted, Total value of stock options granted (using Black-Scholes) and long-term incentive payouts. Long-term incentive plans are plans especially designed to motivate managers to achieve good results over a long term. Unfortunately, the CompuStat database did not provide additional data regarding the number of shares and the value of shares a CEO has in a firm for the time range in which my investigation will take place. These variables are barely available for the time range 2000 – 2005 (each year between 22 and 35 observations). However, in contrast with the earlier years, the CompuStat database provides more information about the amount of shares a CEO owns from 2006 and the years after (1.361 observations in 2006). Nevertheless, there are too less observations to conduct a solid analysis on this subject. Therefore, I exclude the value of interest that a CEO has in a firm from my research.

I derived the research method from Core et al. (2006) and the used variables from Ozkan (2011). Therefore I used both this papers to create a schematic representation of the data I use for my research. To create a general overview of the different variables I use the same tables as Core at al.. Since Core et al. regressed the variables per year I choose to create an overview of the compensation data per year also. This table I use from Ozkan. After merging the financial database and the CEO compensation database dropping the empty observations and dropping the outliers of the compensation characteristics (values less than 0 or above 200) I obtained a database with a total of 9581 observations of US firms.

Table I
Descriptive statistics total: Firm and CEO compensation characteristics

	Mean	Median	S.D.	Min	Max	Observations
Firm characteristics						
Total assets (million)	12149,69	1.611,40	57.477,22	1,91	1.459.737,00	9561
Market value of equity (million)	7.217,53	1.484,85	24.130,89	0,09	476.115,50	9496
Log(market value of equity t-1)	7,34	7,23	1,67	0,00	13,14	8452
Log(book-to-market equity t-1)	-0,80	-0,75	0,78	-7,53	7,75	8222
Return on assets (before depreciation)	0,11	0,12	0,16	-9,57	0,90	9246
Return on assets (after depreciation)	0,08	0,08	0,18	-12,38	0,86	9559
Return on stocks (%)	0,36	0,15	3,97	-0,99	216,14	9371
CEO characteristics						
Salary (\$000's)	566,90	500,00	335,98	0,00	5.773,08	9579
Bonus (\$000's)	650,07	275,00	1.456,47	0,00	30.402,45	9579
Stock awards (Black-Scholes) (\$000's)	1.867,65	532,48	5370,31	0,00	151.099,30	9149
LTIP (\$000's)	157,85	0,00	1.294,63	0,00	84.799,99	8173
Total compensation (\$000's)	4.308,81	2.197,20	7148,60	0,00	151.221,10	9053

Table I represents the mean, median, standard deviation, minimum, maximum and number of observations of both the total of the firm characteristics and the CEO compensation characteristics. The financial firm characteristics are represented in millions, the other values are represented as ratios or percentages. The CEO compensation characteristics are all represented in units of thousand dollars each. The stock awards are measured as the value of rewarded stock options determined by the Black-Scholes method.

Table II
Descriptive statistics: CEO compensation characteristics per year

	2000	2001	2002	2003	2004	2005	2006
Base salary (\$000's)							
Mean	468,19	492,07	519,44	550,42	594,43	641,07	657,35
Median	408,24	433,31	450,00	493,34	532,46	580,00	600,00
S.D.	265,06	286,55	296,39	311,71	357,73	377,44	366,71
Observations	1155	1210	1313	1421	1440	1401	1638
Bonus (\$000's)							
Mean	531,31	446,71	563,26	680,03	866,77	1.013,73	426,49
Median	250,00	203,85	281,33	325,00	474,65	544,25	0,00
S.D.	1.054,65	777,89	945,10	1.351,66	1.650,02	1.941,71	1.734,53
Observations	1155	1210	1313	1421	1440	1401	1638
Stock option (\$000's)							
Mean	3.065,64	2.674,45	2.063,57	1.469,61	1.575,21	1.676,09	1.133,31
Median	630,45	773,98	584,03	477,55	566,71	544,67	364,71
S.D.	10.202,09	6.941,97	5.306,40	2.875,72	3.137,98	4.382,04	2.478,77
Observations	1076	1103	1197	1334	1399	1386	1634
LTIP (\$000's)							
Mean	87,22	80,41	112,23	185,68	148,05	295,84	229,13
Median	0,00	0,00	0,00	0,00	0,00	0,00	0,00
S.D.	444,98	472,46	687,35	2.329,49	672,85	1.677,36	1.014,49
Observations	1155	1210	1313	1421	1440	1301	232
Total compensation (\$000's)							
Mean	4.696,56	4.191,76	3.901,50	3.648,36	4.092,20	4.776,09	4.795,84
Median	1.799,45	1.953,86	1.885,73	1.885,61	2.345,30	2.686,32	2.769,27
S.D.	10.914,23	7.776,85	6.937,48	5.767,24	5.328,13	6.849,73	6.192,68
Observations	1076	1103	1197	1354	1399	1386	1538

Table II represents the mean, median, standard deviation and number of observations of the CEO compensation characteristics. These characteristics are represented in units of thousand dollars per year. I divided these characteristics by year because the empirical analysis and the results are interpreted per year. Notable of table II is the fact that the CEOs base salary increases almost each year. Also, the bonus is increasing almost every year, except the last year. This can be a sign of the beginning deterioration of the economy. Furthermore, the median in 2006 is zero, which shows that there are less CEOs who earned a bonus over 2006 then it was the case in 2005. In addition, table II shows that the total of stock option awards is decreasing over the years while the total CEO compensation is fluctuating. This might be a sign that the structure of the CEO compensation packages is changing over the years. The stock option variable is the value of the awarded stock options, determined by the Black-Scholes method, in a certain year.

Empirical analysis

To interpret the effect of the level of CEO compensation on both the stock returns and the operating performance I regress the different components of CEO compensation and the total CEO compensation with the stock returns and the return on assets. This regression is performed per year. In this chapter I show a general overview and interpretation of the empirical results.

Analysis operating performance

To test the effect of the level of CEO compensation on a firm's operating performance, I regress the future measure of the operating performance (dependent variable measured at time t) on the different components of the CEO compensation and the total of CEO compensation. In addition, control variables are added (independent variables measured at time t-1). The return on assets (ROA) is used as the measure of operating performance and is regressed on the CEO's base salary, bonus, option awards, LTIP and total CEO compensation. As control variables both the natural logarithms of book-to-market equity and market value of equity are added. Represented as a formula it gives us:

Return on assets_{i,t}

$$= \alpha + \beta_1 \text{Salary}_{i,t-1} + \beta_2 \text{Bonus}_{i,t-1} + \beta_3 \text{Stock option awards}_{i,t-1} + \beta_4 \text{LTIP}_{i,t-1} \\ + \beta_5 \text{Log(BME)}_{i,t-1} + \beta_6 \text{Log(MVE)}_{i,t-1}$$

This model takes the different components of CEO compensation into account. However, in addition the regression of the total CEO compensation on the return on assets is performed to show the total effect. Below the model of the total CEO compensation is shown:

Return on assets_{i,t}

$$= \alpha + \beta_1 \text{Total CEO compensation}_{i,t-1} + \beta_2 \text{Log(BME)}_{i,t-1} + \beta_3 \text{Log(MVE)}_{i,t-1}$$

These models are derived from Core et al.. In their investigation they regressed shareholder rights in relation to the return on assets, these shareholder rights are measured in the form of a G-index. In my model I replace the G-index with the components of CEO compensation and the total of CEO compensation. Similar to Core et al. I add the control variables log(BME) and log(MVE). Barber & Lyon (1996) find that the ROA is a good way to measure the operating performance because it is not affected by leverage, extraordinary items and other discretionary items. Furthermore, Barber & Lyon prefer to use the operating income before depreciation because the measurement is not affected by managerial discretion in depreciation policy. Although, Core et al. found that governance affects the firm performance through capital expenditure programs, and therefore executives have influence on the depreciation. I took these statements into consideration and chose to use both the return on assets

before, respectively, after depreciation in my model. Finally, to show the effect which the different components of CEO compensation and the total CEO compensation have on the return on assets and to eliminate the reversed causality, I measure the independent variables at $t-1$. Also, similar to Core, Guay and Rusticus I follow Fama and MacBeth (1973), and estimate the coefficients and mean differences by year because the measures of operating performance are influenced by external economic events, which can result into the fluctuation of these variables over time. Also, I perform the regression per year to ensure that the results are unaffected by cross-sectional dependence and serial correlation. Cross-sectional investigations measure the coefficients on a single moment. Serial correlation arises when residuals (ε) influence each other over time. For example: residual ε_t includes information about ε_{t-1} . Serial correlations can result into higher or lower standard deviations of the regression, which on his turn influences the significance of the coefficient.

Table III

Influence of CEO compensation on operating performance

In the table below the coefficients of the separate components of CEO compensation and the total CEO compensation in regression on the return on assets is presented. In panel A1 this regression is presented on the ROA calculated based on the operating income after depreciation. In column A the coefficients are based on the components alone. In column B the coefficients are also based on the separate components of CEO compensation and the total CEO compensation, except the control variable log(book-to-market-equity) is added. In subpanel C both log(book-to-market-equity) and log(market value of equity) are used as control variables. Panel A2 presents the same numerical data except the data in panel A2 is based on the ROA calculated with the operating income before depreciation instead of the operating income after depreciation. The significant coefficients are at 1%, 5% and 10% level. At the bottom of the table the time-series mean and standard deviation are presented. In addition, the mean T statistics are presented at the bottom of the table, the mean T statistics determines the significance of the time series mean.

*Return on assets*_{*i,t*} =

$$\alpha + \beta_1 \text{Salary}_{i,t-1} + \beta_2 \text{Bonus}_{i,t-1} + \beta_3 \text{Stock option awards}_{i,t-1} + \beta_4 \text{LTIP}_{i,t-1} + \beta_5 \text{Log(BME)}_{i,t-1} + \beta_6 \text{Log(MVE)}_{i,t-1}$$

$$\text{Return on assets}_{i,t} = \alpha + \beta_1 \text{Total CEO compensation}_{i,t-1} + \beta_2 \text{Log(BME)}_{i,t-1} + \beta_3 \text{Log(MVE)}_{i,t-1}$$

A1 Operating income after depreciation	Salary			Bonus			Option award		
	A	B	C	A	B	C	A	B	C
2000	0,0317**	0,0320**	0,0235	0,0165***	0,0142***	0,0123**	0,0008*	0,0004	0,0002
2001	0,0523***	0,0395***	0,0205	0,0101**	0,0080**	0,0039	-0,0003	-0,0013**	-0,0005***
2002	0,0344***	0,0227**	0,0201*	0,0006	0,0002	-0,0004	-0,0001	-0,0014***	-0,0018***
2003	0,0336	0,0142*	-0,0027	0,0153	0,0065**	0,0026	0,0014	-0,0003	-0,0011**
2004	0,0160	0,0159	-0,0071	0,0042*	0,0038*	0,0004	0,0029**	0,0012	-0,0005
2005	0,0147	0,0131*	-0,0162*	0,0058***	0,0055***	0,0018	0,0042***	0,0018**	0,0001
2006	0,0237***	0,0157**	-0,0111	0,0036**	0,0029**	-0,001	0,0019***	0,0009	-0,0003
Control variables	None	BME	BME, MVE	None	BME	BME, MVE	None	BME	BME, MVE
Time series mean	0,0295**	0,0219**	0,0040	0,0080**	0,0059**	0,0028	0,0015	0,0002	-0,0005
Time series std	0,0129	0,0104	0,0167	0,0061	0,0045	0,0045	0,0016	0,0012	0,0006
T-statistic	2,0671	2,0257	0,0371	1,9671	1,9943	0,6514	1,4443	-0,2057	-1,2871

A1 Operating income after depreciation	LTIP			Total Compensation		
	A	B	C	A	B	C
2000	0,0069	0,0046	0,0016	0,0009**	0,0004	0,0002
2001	0,0086	0,0075	-0,0004	-0,0002	-0,0010**	-0,0015***
2002	0,01330*	0,0097*	0,0085	0,0001	-0,0010***	-0,0014***
2003	0,0056	0,0039	0,0006	0,0015	0,0001	-0,0006*
2004	-0,0001	0,0001	-0,0003	0,0010*	0,0006	-0,0005
2005	0,0041	0,0058	-0,001	0,0026***	0,0017***	0,0001
2006	0,0013	0,0015	-0,0006	0,0016***	0,0010***	-0,0005
Control variables	None	BME	BME, MVE	None	BME	BME, MVE
Time series mean	0,0057	0,0047	0,0012	0,0011	0,0003	-0,0006
Time series std	0,0045	0,0033	0,0033	0,0010	0,0010	0,0007
T-statistic	0,7214	0,9043	0,1243	1,6429	0,4300	-1,4429

*Significant at 0,1 level; **Significant at 0,05 level; ***Significant at 0,01 level.

A2 Operating income before depreciation	Salary			Bonus			Option awards		
	A	B	C	A	B	C	A	B	C
2000	0,0171	0,0191	0,0139	0,0101*	0,0081*	0,0069	0,0010**	0,0005	0,0004
2001	0,0384**	0,0276*	0,0120	0,0053	0,0033	0,0001	-0,0002	-0,0009**	-0,0012***
2002	0,0263**	0,0156	0,0197*	-0,0016	-0,0019	-0,0190	-0,0003	-0,0015***	-0,0016***
2003	0,0263	0,0071	-0,0034	0,0091	0,0011	-0,0015	0,0011	-0,0005	-0,0010*
2004	0,0090	0,0086	-0,0108	0,0014	0,0010	-0,0019	0,0025	0,0009	-0,0004
2005	0,0075	0,0067	-0,0191**	0,0034*	0,0031*	-0,0002	0,0041***	0,0016*	0,0001
2006	0,0203**	0,0117*	-0,0128*	0,0018	0,0011	-0,0027*	0,0017**	0,0007	-0,0005
Control variables	None	BME	BME, MVE	None	BME	BME, MVE	None	BME	BME, MVE
Time series mean	0,0207	0,0136	0,0001	0,0042	0,0023	-0,0026	0,0014	0,0001	-0,0006
Time series std	0,0108	0,0074	0,0152	0,0042	0,0031	0,0079	0,0015	0,0011	0,0007
T-statistic	1,4586	1,2343	-0,2300	0,9500	0,7057	-0,4057	1,3529	-0,2886	-1,1971

A2 Operating income before depreciation	LTIP			Total Compensation		
	A	B	C	A	B	C
2000	0,0045	0,0033	0,0016	0,0009**	0,0004	0,0004
2001	0,0054	0,0042	-0,0015	-0,0001	-0,0008**	-0,0011***
2002	0,0130*	0,0095	0,0099	-0,0002	0,0012***	-0,0014***
2003	0,0045	0,0028	0,0009	0,0011	-0,0002	-0,0007*
2004	0,0011	0,0024	-0,0012	0,0007	0,0002	-0,0009
2005	0,0029	0,005	0,0007	0,0021***	0,0012**	-0,0001
2006	0,0030	0,0043**	0,0012	0,0014***	0,0008**	-0,0006
Control variables	None	BME	BME, MVE	None	BME	BME, MVE
Time series mean	0,0049	0,0045	0,0017	0,0008	0,0001	-0,0006
Time series std	0,0038	0,0024	0,0038	0,0008	0,0008	0,0006
T-statistic	0,9843	0,9543	0,3000	1,3371	0,0000	-1,5514

*Significant at 0,1 level; **Significant at 0,05 level; ***Significant at 0,01 level.

I interpret a significant positive or negative coefficient as a relationship between the components of the CEO compensation and the total CEO compensation with the return on assets. The CEO compensation variables are represented as units of thousand dollars. However the coefficients I determine with these variables are extremely small. To clarify the effect the CEO compensation variables have on the return on assets I decided to divide them by thousand, so the effect will be represented as millions of dollars. The coefficient, which is represented in table III is the effect of a million dollar change in a certain component of CEO compensation on the return on assets.

As can be seen in table III the individual components of CEO compensation have a predominantly positive effect on the return on assets. However, my interest goes especially out to the effect that the total CEO compensation has on the ROA and the mean effect of the time series. Panel A1 shows the effect the CEO compensation has on the return on assets after depreciation. Notable from this panel is

the fact that both the CEOs base salary and the CEOs bonuses are significant for the most individual time series (both individual and adjusted with book-to-market equity), and significant for the time series mean (both individual and adjusted with book-to-market equity). Therefore, the reasonable assumption can be made that these components have a slightly positive effect on the ROA after depreciation. Also, based on the significance of the last three time series, the option awards give a small positive effect on the operating performance after depreciation. Unfortunately, the most time individual series and the time series mean are not significant which suggests that there is no statistical relationship between the awarded stock options and the ROA after depreciation. In comparison to the low T-statistic, this could be a result of the regression which is performed by year. If the regression is performed as a total, there are more observations that are taken into account, which on his turn has a positive effect on the significance. Also, the last two time series of the total CEO compensation give a significant positive relationship, which implies that there is a positive relationship between the total CEO compensation and the ROA after depreciation. Unfortunately, the lack of significance applies also for the total CEO compensation and, therefore, there cannot be concluded that there is a certain relationship. The final remark on panel A1 is the fact that the coefficient of long term incentive plan payments (LTIP) give no significant relationship with the ROA after depreciation.

Panel A2 shows the relationship between the CEO compensation and the return on assets before depreciation. Similar to panel A1 the most of the coefficients are slightly positive, however, almost none of the coefficients are significant. Therefore I cannot conclude that there is a certain relationship between the ROA before depreciation and the level of CEO compensation. Nevertheless, in both the variables salary and total compensation I find some significant coefficients, which indicate a positive relationship between the ROA before depreciation and the level of CEO compensation.

In table III the regression is performed per year. As can be seen there is not really an effect of the CEO compensation in relation to the operating performance over time. It fluctuates much, but there is no relationship between the deferent coefficients over the years.

Now the relationship between the components of CEO compensation, the total CEO compensation and the return on assets is clarified I emphasize on the level of influence of these variables on the ROA. The most remarkable finding is the fact that the CEOs base salary has a bigger influence on the return on assets per dollar than the bonus, stock option awards and the total CEO compensation. This could imply that cash based payment result into bigger incentives than other payments. However, if I take a look at the descriptive statistics, the salaries are after LTIP the less awarded component of CEO compensation (mean 566,90). Therefore the impact of the CEOs base salary becomes less in comparison to the other components of CEO compensation. In addition, the total compensation and the option award doesn't seem to have a lot of influence compared to the other components, but when the descriptive are taken into account there can be seen that the mean and median are a lot bigger than

the other components. Therefore, I can conclude that they have a big impact. Furthermore, table III shows that the influence of the level of CEO compensation on the operating performance is bigger after depreciation than before depreciation. This could imply that CEOs take depreciation policy into account and use it into their advantage.

Analysis return on stocks

In the previous section I found that there was a small positive significant relation between the CEO compensation and the return on assets. In the second part of the analysis I intend to provide evidence that there is a relationship between the returns on stocks and the level of CEO compensation. To investigate whether this is the case I use a model similar to the model that is used to find a relationship between the level of CEO compensation and the return on assets, except the return on assets is replaced by the return on stocks:

Return on stocks

$$= \alpha + \beta_1 \text{Salary}_{i,t-1} + \beta_2 \text{Bonus}_{i,t-1} + \beta_3 \text{Stock option awards}_{i,t-1} + \beta_4 \text{LTIP}_{i,t-1} + \beta_5 \text{Log}(BME)_{i,t-1} + \beta_6 \text{Log}(MVE)_{i,t-1}$$

This model takes the different components of CEO compensation into account. However, since the effect of the total compensation has to be taken into consideration also, I apply a model that takes the total of the CEO compensation into consideration. This model is similar to the model that I used earlier to find an influence between the total return on assets and the total CEO compensation, except the return on assets is replaced by the return on stocks. This model merges the different components into a single coefficient.

Return on stocks_{i,t}

$$= \alpha + \beta_1 \text{Total CEO compensation}_{i,t-1} + \beta_2 \text{Log}(BME)_{i,t-1} + \beta_3 \text{Log}(MVE)_{i,t-1}$$

As mentioned before, the return on stocks is determined as follows: the stock price in year P1 minus the stock price in year P0 plus dividends in year P1, finally this sum is divided by the stock price in year P0. The CEO compensation variables are similar to the variables as used in the analysis of the return on assets. By performing this regression I intend to prove that there is a positive significant relation between the level of CEO compensation and the return on stocks. Similar to the analysis of the return on assets, I interpret a significant positive or negative coefficient as a relationship between the components of the CEO compensation and the total CEO compensation with the return on stocks. The CEO compensation variables are represented as units of thousand dollars. However the coefficients I determined with these variables were extremely small. To clarify the effect the CEO compensation

variables have on the return on stocks I divide them by thousand, so the effect will be represented as millions of dollars. The coefficients, which are represented in table IV, are the effect of a million dollar change in a certain component of CEO compensation on the return on stocks.

Table IV
Influence of CEO compensation on the return on stocks

In the table below the coefficients of the separate components of CEO compensation and the total CEO compensation in regression on the return on stocks is presented. In column A the coefficients are based on the components alone. In column B the coefficients are also based on the separate components of CEO compensation and the total CEO compensation, except the control variable log(book-to-market-equity) is added. In subpanel C both log(book-to-market-equity) and log(market value of equity) are used as control variables. The significant coefficients are at 1%, 5% and 10% level. At the bottom of the table the time-series mean and standard deviation are presented. Also, the mean T statistics are presented at the bottom of the table, the mean T statistics determines the significance of the time series mean.

$$\text{Return on stocks} = \alpha + \beta_1 \text{Salary}_{i,t-1} + \beta_2 \text{Bonus}_{i,t-1} + \beta_3 \text{Stock option awards}_{i,t-1} + \beta_4 \text{LTIP}_{i,t-1} \\ + \beta_5 \text{Log(BME)}_{i,t-1} + \beta_6 \text{Log(MVE)}_{i,t-1}$$

$$\text{Return on stocks}_{i,t} = \alpha + \beta_1 \text{Total CEO compensation}_{i,t-1} + \beta_2 \text{Log(BME)}_{i,t-1} + \beta_3 \text{Log(MVE)}_{i,t-1}$$

A1 Return on stocks	Salary			Bonus			Option award		
	A	B	C	A	B	C	A	B	C
2000	-0,0039	-0,0482	0,1803	0,0049	0,0019	0,0588	-0,0049	-0,0041	-0,0007
2001	-0,1506*	-0,1285*	0,0473	-0,0226	-0,0149	0,0205	-0,0068***	-0,0050**	-0,0023
2002	-0,4203	-0,3584	-0,1658	-0,0231	-0,0148	0,0048	-0,0195	-0,0123	-0,0065
2003	-0,0521	-0,4064***	0,0132	0,1770	-0,0515*	0,0624**	-0,0335	-0,0026	0,0107**
2004	-0,0722	-0,0993	0,0976	-0,0075	-0,0109	0,0197	-0,0168*	-0,0041	0,0105
2005	-0,0673	-0,0626*	-0,0133	0,0024	0,0019	0,0114	-0,0020	0,0006	0,0044
2006	-0,0974	-0,1108**	-0,0991*	-0,0168	-0,0136	-0,0101	-0,0120	-0,0036	-0,0021
Control variables	None	BME	BME, MVE	None	BME	BME, MVE	None	BME	BME, MVE
Time series mean	1,3765	1,3164*	2,2963	0,0779	0,0440	0,1384	-0,0072	0,1428	0,1853
Time series std	3,9933	3,9769	6,0930	0,1680	0,1576	0,3022	0,0190	0,3897	0,4887
T-statistic	-0,833	-1,851	0,136	-0,199	-0,670	0,929	-1,359	-0,791	0,367

A1 Return on stocks	LTIP			Total Compensation		
	A	B	C	A	B	C
2000	-0,0204	-0,0247	0,0291	-0,0048	-0,0040	0,0001
2001	-0,0608	-0,0586	0,0025	-0,0065***	-0,0050***	-0,0016
2002	-0,0661	-0,0396	0,0139	-0,0180	-0,0121	-0,0062
2003	-0,1401	-0,0592	0,0263	-0,0120	-0,0055	0,0086**
2004	0,0031	0,0001	0,0034	-0,0039	-0,0018	0,0072*
2005	-0,0145	-0,0065	0,0078	-0,0003	0,0007	0,0047*
2006	0,0149	0,0019	0,0047	-0,0084	-0,0041	-0,0030
Control variables	None	BME	BME, MVE	None	BME	BME, MVE
Time series mean	-0,0476	-0,0480	-0,0039	-0,0042	0,0341	0,0593
Time series std	0,0497	0,0506	0,0486	0,0122	0,1035	0,1557
T-statistic	-0,239	-0,479	0,347	-1,170	-1,066	0,566

*Significant at 0,1 level; **Significant at 0,05 level; ***Significant at 0,01 level.

Conclusion according to table IV is that, the coefficients that are presenting the influence of CEO compensation on the return on stocks are mostly negative. However, in some cases the coefficients are positive. Also, the coefficients vary from size. These variation in combination with a lack of significance regarding the individual coefficients and the time series mean, make these coefficients difficult to interpret. This could be a result from the regression per year, when the regression is performed as a total the probability of higher T-statistics increases, which on his turn influences the significance. In the table can be seen that the coefficients on long term incentive payments and the CEO bonuses show a barely significant effect on the stock returns. Therefore cannot be confirmed nor rejected that these variables have a positive relationship with the stock returns. However, the significant coefficients both show a slightly positive effect and a slightly negative effect of the CEO salary, option awards and total compensation on the stock returns. Unfortunately, due to the lack of significance, there cannot be concluded that the CEO compensation has a significant positive or negative linear effect on the return on stocks.

Further analysis

The analysis regarding the influence of the CEO compensation on the return on assets provided evidence that there is a positive significant effect between the level of CEO compensation and operating performance. However, the analysis of the return on stocks does not provide enough evidence to prove that there is an actual positive significant influence between the return on stocks and the level of CEO compensation. Therefore, I add a final component to my investigation in which the total of the time range will be taken into account. Consequently, I perform the same regression as in the analysis of the operating performance and the analysis of the stock return, except, this regression is not split up by year but processes the total observations of 2000 – 2006. In addition, I add both one lagged and two lagged independent variables (CEO compensation) to create an overview of both the one year and the two year influence of the level of CEO compensation on the operating performance and return on stocks.

Table V

Table V shows the regression of the total CEO compensation and the single components on both the return on assets before depreciation, the return on assets after depreciation and the stock returns. In addition, the regression is performed on one lagged variables and two lagged variables to show both the one year and the two year effect of the level of CEO compensation on the firms performance.

	ROA before depreciation	ROA after depreciation	Return on stocks
Salary t-1	0,0201***	0,0297***	-0,1246
Salary t-2	0,0189***	0,0287***	-0,1524
Bonus t-1	0,0030**	0,0061***	-0,0043
Bonus t-2	0,0017	0,0050***	-0,0001
Option award t-1	0,0005*	0,0003*	-0,0121*
Option award t-2	0,0003	0,0003	-0,0068
LTIP t-1	0,0041*	0,0015	-0,0045
LTIP t-2	0,0064*	0,0016	-0,0102
Total Compensation t-1	0,0006*	0,0008***	-0,0088
Total Compensation t-2	0,0004	0,0006***	-0,0068

***Significant at 0,1 level; **Significant at 0,05 level; ***Significant at 0,01 level.**

Table V shows the coefficients of CEO compensation on both the return on assets and the return on stocks. These coefficients represent the respond of the firm performance on a million dollar change of the CEO compensation. However, these coefficients represent a one year change, when x goes up the coefficient becomes less also. This table shows that there is a positive significant influence between the cash based components of the CEO compensation (salary and bonus) the total compensation and the ROA before and after depreciation. Also, the option awards and the long term incentive plan payments show a positive influence. However, these coefficients show a positive relation, compared to the aforementioned coefficients it shows a significance on a lower level. There can be concluded that there is a positive significant influence between the level of CEO compensation and the return on assets before and after depreciation. Still, the coefficients of the CEO compensation on the return on stocks don't give a significant effect. Therefore, I cannot conclude that there is an actual influence between the level of CEO compensation and the stock returns.

Also, table V shows that there is an effect on the operating performance after one year, remarkable is the fact that there also is an effect on the operating performance after two years. Although this effect is smaller than the effect after one year, it implies that high level CEO performance influences the operating performance multiple years. Furthermore, in table V is shown that in most cases the influence of the CEO compensation on the ROA before depreciation is bigger than the influence on the ROA after depreciation, this could imply that CEOs use depreciation policy in their advantage. Also, in table V is shown that the CEOs base salary has the biggest influence on the operating

performance, this could imply that CEOs who receive a high salary are more motivated to achieve good results. Therefore, I can conclude that it is fair to reward CEOs on such high level because the CEO compensation influences the operating performance.

Summery and conclusion

In this paper I studied on the effect of the level of CEO compensation on the company performance. I divided the company performance into operating performance (return on assets) on the one hand and the return on stocks on the other hand. I investigated the influence of the different components of CEO compensation and the influence of the total CEO compensation on these variables. For this investigation I used a similar approach as Core, Guay and Rusticus (2006), who used this method to investigate whether the G-index has an influence on the company's operating performance and analysts' forecasts. My research provides evidence that the level of the different components of CEO compensation and the total CEO compensation have a small positive significant influence on the operating performance (return on assets). Therefore I can conclude that it is fair to compensate CEOs on high level because that influences the operating performance in a positive way. Due to the lack of significance and the divergent results according to the influence of the level of CEO compensation on stock returns, I cannot conclude that the level of CEO compensation has a significant effect on a firms return on stocks.

Shortcomings of the investigation

For some components of my research, the outcome was not very satisfying. If I should do this investigation again I would make some adjustments concerning the research method. Firstly, I estimated the coefficients of the CEO compensation on both the analysis of the operating performance and the stock returns per year, because I assumed that these coefficients fluctuated over time. In retrospect this assumption was unnecessary. Secondly, because of the reversed causality it is difficult to interpret if the firm performance is better because of the level of CEO compensation, or that the level of CEO performance is higher because the company performance is better. Thirdly, the coefficients I determined show the effect of the level of CEO compensation on company performance, but this effect doesn't apply when x becomes infinity. In order to interpret the result it is better to follow the coefficients over time to develop some kind of model which shows till which level of CEO compensation these coefficients apply. Finally, to broaden the scope I should have included more components of both CEO compensation and company performance to create a better overview. For example, I investigated that there is a positive significant effect between the stock option that are awarded and the operating performance. However, the shares owned by a CEO should give incentives also.

Future research

In my opinion, if a company really wants to take advantage of an investigation on this topic, it is important that the scope to narrow the scope to a certain branch. Because I think that these coefficients are varying per sector. For example, in the dataset I used to conduct the empirical analysis the top 10 of highest salaries existed almost entirely of software and hardware companies. I think this could influence the results. Furthermore, I excluded the financial crisis from my investigation. In my opinion it is very interesting to look at the effect of CEO compensation on the company performance before and after the crisis. Are well-paid CEO achieving better results than others during and after the crisis? And, how do companies deal with bad results in relation with the level of CEO compensation? Especially in relation to interest of CEOs in the company and stock based compensation.

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