Are CEOs rewarded for luck?

A study in the light of the financial crisis

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Introduction

Executives are given incentives by their compensation package to align the interest of the manager with those of the shareholders. This is done to tackle the classical agency problem, where the principal, the CEO of a firm, has different incentives than his agents, the shareholders. The shareholders cannot control all the actions of the manager and this leads to asymmetric information, where the manager can act in his personal interest and not in those of his principles. Special compensation packages are designed to make the manager act in the interests of the shareholders. There is much discussion about this way of payment throughout the years; are the right incentives given to the manager? Does it improve firm performance? Are the CEOs overpaid? Are they rewarded for their own performance or for factors outside their control?

The discussion still continues in recent years, during and after the credit crunch special attention has been drawn to the compensation of managers and in particular compensation of managers at financial institutions. A recent example is found in the financial times of April 2nd 2011, it stated that the CEO of Goldman was rewarded a bonus, which was twice as much as the year before. Goldman argued it was because the CEO led the company during one of the most difficult periods in history. Another explanation was that the bank had a strong past 3 year performance and especially compared to their core competitors. An interesting remark is that last year, the bank was still under severe regulatory and political scrutiny, while over the year this has tempered and now the executive compensation has risen significantly. Questions arising from this article could be why the bonus payout has doubled in the last year, is this increase in compensation related to the weakening of control? Is the strong performance of the last 3 years related to the market recovery during that period? Is the compensation related to general firm performance or to performance relative to competitors?

This research will investigate if CEOs are rewarded for firm performance and whether this compensation is based on market factors outside the control of the CEO or on the personal performance of the company, where market factors should be filtered out. Said otherwise, this paper investigates if CEOs are rewarded for luck or for skill.

Furthermore the phenomenon called asymmetric benchmarking will be tested in this research and the impact of stronger corporate governance after the credit crisis on the pay for luck relation will be investigated. These subjects will become clear in the academic literature.

Academic Literature

Pay-performance relation and optimal contracting

The origin of the management compensation issue lies in the agency problem. First the agency problem will be explained and later several papers about management compensation contracts will be reviewed.

Jensen and Meckling (1976) define the concept of agency costs and they show the relation with separation of ownership and control and the conflict of interests arising from this. The agency costs are the difference in firm value when the firm was managed by its owners or when the firm was managed by an agent. The agent is assumed to act in his self interest and not in that of the owners, also he is assumed to be more risk-averse than the owners, because they could diversify their portfolio. Therefore the manager could reject positive NPV projects, because he finds them too risky, while the owners would accept it. Part of the agency costs are the costs of monitoring the agent, if he indeed acts in the interest of the owners. To minimize these costs it is necessary to introduce contracts that motivate and discipline managers by giving them incentives and monitoring them. Executive compensation is an important instrument to motivate and discipline the managers. The firm can reward the manager by giving him a higher base salary or they can give the manager equity-based compensation, because his own compensation depends on the firm performance. Now his interest is aligned with the interest of the shareholders.

Holmström (1979) has studied effective contractual agreements in principle-agent relationships. It appears that due to moral hazard, an optimal contract using payoff alone is second-best. By adding information about the agent's actions or the state of nature the contract can be improved. Even though these actions cannot be monitored perfectly, there can be performance measures which estimate these actions. These estimates of the actions will still improve the managerial contract. This is because additional information allows a more accurate judgment of the performance of the agent. It also provides the same incentives for effort with less loss of risk-sharing benefits. Furthermore this paper implies that optimal contracts should not be tied to factors outside the executive's control, because the contract cannot provide better incentives and will only make the contract riskier.

Kevin J. Murphy is an academic who shows great interest in management remuneration. The following papers reviewed are several researches from Murphy over the years about optimal contracting and the pay for performance relationship. In Murphy (1985), he is showing there is a positive relationship between firm performance and management compensation. In earlier research their appeared to be only a relation between firm size (or sales) and compensation but not with performance; measured by return on equity or profits. Earlier research only concentrated on base salary and bonus payment, while Murphy was the first to include other compensation as stock options, stock awards and deferred compensation. Also earlier research used cross-sectional analysis, which omitted important factors like entrepreneurial ability and managerial responsibility. Murphy analyzes time-series regressions on individual executives, where these variables are constant over time. The conclusion of this research is that performance is strongly and positively related to firm performance. It appears that controlling for firm and individual-specific variables leads to an important difference between cross sectional and time-series regressions when analyzing the effect of performance on remuneration. Furthermore this paper shows that using only salary and bonus in this analysis omits significant performance-sensitive components of remuneration.

In Murphy (1986), managerial contracts are analyzed based on incentives and learning. This is a forerunner of the contracting view which is later argued against in the Bertrand and Mullainathan (2001) paper on which this research is based. The contracting view states that it is optimal when management is paid based on performance. In Murphy's research he tests different management compensation contracts in multi-period environments. Incentives contracts are based on productivity, which depends on unobservable managerial effort. The level of managerial effort depends on the executive's incentive contract, which determines the extent to which his productivity affects his current and future compensation. In learning contracts productivity is based on managerial ability, which is unknown, but revealed over time. He illustrates two types of learning contracts, the marginal product contract and the insurance contract. In the marginal product contract, executives are paid for their predicted managerial ability; the contract is adapted afterwards to the past performance of the executive, which represents a new estimate of his managerial ability. In insurance contracts the managers smoothens their payment over the years compared to marginal product contract, by paying an insurance premium when their realization of ability is higher and receiving extra payment when their realization of ability is lower. He concludes that all the contracts predict upward-sloping experience-earnings profiles and show a positive relation between performance and

compensation. This performance-compensation relation is significantly stronger for CEO's in their initial years than in their later years. He furthermore concludes that the marginal product contract in general is the best, but due to mixed results he states that both incentives and learning are important in compensation contracts.

Jensen and Murphy (1990) investigate the pay for performance relation and they find that the typical CEO's wealth rises by $3.25 for each $1,000 increase in the value of the corporation. They find that this relation between CEO wealth and shareholder wealth is small and they show that this relation has decreased over time. They conclude that this pay-performance sensitivity is too low to be consistent with principal-agent theory. They also find that this relation is higher for small firms than for large firms. Despite bonuses count for almost 50% of the compensation, they do not appear to be very sensitive to market or accounting performance. The year to year change in bonuses shows a low variability, which also indicates a low relation between compensation and performance. Even though the relation is small they believe that awarding the managers with an equity-based compensation is the way to align the interest of the managers with those of the shareholders and it does improve firm performance. They argue that public and private political forces impose a constraint on the pay for performance relation and this is the reason for the low sensitivity, while it should be the way to determine management compensation.

Gibbons and Murphy (1992) also study incentive contracts. In their research they take into account the factor career concerns. They argue that when an executive is of younger age, he has more career concerns than an executive who is almost ready to retire. Therefore an older executive should be incentivized with more compensation, because he is not worried anymore about career concerns, which do incentivize younger managers. They give prove to this idea by showing that the relation between firm performance and management compensation is stronger in years close to retirement of the manager. This was the last paper reviewed by Murphy, as can be seen he was an important academic in the field of management contracts.

Garen (1994) uses a principal-agent model to estimate the determinants of management compensation. He further investigates the paper of Jensen and Murphy (1990) and he does conclude that optimal incentives contracts are consistent with principal-agent models. In the principal-agent theory, the compensation contract is a trade-off between incentives and insurance. As the productivity of the agent becomes riskier, the insurance component of pay is

increased and the incentive component is reduced and vice versa. His research investigates several determinants of pay-performance sensitivity, determinants of salary and determinants of pay-related stock and stock option incentives. He finds that the greater the variability of firm and CEO income associated with these determinants, the lower the firm-performance sensitivity and the higher the salary. Which again is in line with principle-agent theory, because greater variability means more risk, which increases salary and reduces the incentive component. However the variables have low statistical significance and therefore they conclude that principle-agent theory has an important effect on management compensation, the exact determinants remain unresolved.

Hall and Liebman (1998) also go against the conclusion of Jensen and Murphy (1990), but in this research it is not about the principle-agent theory but about the pay-performance relation. They argue that the pay-performance relation is high and significant, based on a large sample of data containing broad information about stock and option grants in CEO compensation. They show that both the level of CEO compensation and the responsiveness of CEO compensation to firm performance have risen dramatically over the period investigated, which contains the years between 1990 and 1994. They explain their different results than other research papers, because other researches ignored the change in value of stock and stock options, which account for most of the sensitivity between management compensation and firm performance. The wealth change of stock and stock options for a given wealth change in firm performance is about 50 times higher than the wealth change in salary and bonus. Therefore they contradict the statement that incentive contracts are inefficient, because of low sensitivity between pay and performance. They show that total wealth of CEO's is strongly related to the company's total wealth.

Aggarwal and Samwick (1999a, 1999b) have written two relevant papers about management compensation contracts in the same year. Both the researches try to find evidence for relative performance relations with management compensation, but they both fail to find evidence for it. The first research investigates the pay-performance relation taking the riskiness of the company into account. They find that the pay-performance sensitivity is significantly lower for executives of companies with volatile stock returns, than those with less volatile stock returns. This is the same finding as in Garen (1994). They also test in this paper the existence of relative performance measures with rival firms, but they find not enough support for this. Therefore management compensation contracts do incorporate risk sharing benefits, but do

not use relative performance measures. In their other paper, Aggarwal and Samwick provide a theoretical explanation for the exclusion of relative performance measures from management compensation contracts. The main reason is because of strategic interactions between managers of the rival firms. They find contradicting conclusions, depending on which theoretical background is used. Using the Bertrand competition model, compensation is positively related to rival firm performance, because of the need to soften competition. Compensation is more strongly related to rival firm performance when the market operated in, faces stronger competition. This contract leads to lower returns for shareholders. With the Cournot competition model, management compensation is negatively related with rival firm performance. Here the contract leads to stronger competition and lower returns for both the firms. Both the contradicting theories lead to lower returns and therefore relative performance measurements should be excluded from management compensation contracts.

Oyer (2004) finds reasons for companies to award managers remuneration based on exogenous factors. He does not argue for relative performance measurements, but does argue for relative management compensation. He acknowledges that management compensation should be corrected for market- and industry-wide shocks, but that firms lack to index the compensation. The main reason for this is the participation constraint, which implies that the manager's outside possibilities determines his stay in the company. If the market is growing, there will be more demand for good managers and if the firm does not adapt its compensation to the market, they will risk the chance of losing their manager. A second reason is that in his model adjusting compensation contracts is costly. In this model, management compensation based on market factors appears optimal.

Managerial power view

While the previous studies all find optimal contracts based on the pay for performance relation to tackle the classical agency problem The next papers hold a different perspective on management compensation.

Bertrand and Mullainathan (2001) conclude in their research about management compensation that managers are rewarded just as much for luck than for their performance. By luck they mean factors outside the control of the manager, like market or industry movements. They show that the compensation for luck is larger in poorly governed firms. The main reason for this is that CEOs can use their power to bargain for higher compensation and for compensation which is less tied to their personal performance. This idea is referred to as the skimming view on management compensation; this name indicates that managers only skim off the gains from good luck and use their power to benchmark their compensation with bad luck. In previous research, the contracting view was the norm, where optimal contracts are designed to align the interest of the manager with those of the shareholders, therefore this paper is important in academic literature, because it develops a new view on the subject. Corporate governance plays an important role in the skimming view, because it can only exist in firms where corporate governance is not optimal. Firms who have, for example, large shareholders in the board will control the manager better and pay him more based on his performance, which is in line with the contractual view. In firms where half of the board is appointed by the current CEO, it is easier for the executive to bargain for better compensation, because the board members might feel they owe something to the CEO. This paper argues that performance contributed to exogenous factors should be filtered out when considering management compensation and the contracting view should be optimal, but finds in practice that it does not happen in almost half of the cases.

Bebchuk and Fried (2003) continue arguing for the skimming view, which in their paper they refer to as the managerial power approach. Also they wrote a book in 2004, about the same subject. They point out that management compensation should be a solution to the agency problem, but is also part of the agency problem itself. In the contracting view approach, managers are incentivized by their contracts to act on the behalf of the shareholders, because they have a tendency to act in their own interest. But directors, who determine the incentive contracts, face agency problems themselves. A director's personal interest is that he remains in the board. While the CEO plays an important role in this decision, the director has an

incentive to favor the CEO. Here comes the managerial power approach into play. The manager can use his power to influence the board of directors on his compensation. This results in higher compensation, compensation which is less tied to performance and gratuitous goodbye payments in case the CEO is replaced, even though his performance was bad. Still, there are limits to what directors will accept and what markets will allow, but these constraints do not prevent managers from obtaining arrangements that are substantially more favorable than those they could obtain by bargaining at arm's length. These limits depend on the expected 'outrage' of public opinion about the height of the compensation. Other factors which determine the power of the CEO depend on the corporate governance of the firm. Managers would tend to have more power when the board is relatively weak or ineffectual. This depends, among other factors, on the size of the board and number of directors appointed by the CEO. Managers also have more power, when there is no large outside shareholder or few institutional shareholders, who could control the board of directors sharply. They conclude that managerial power has an important role in management compensation and this has significant implications for corporate governance; In their book they provide recommendations on improving transparency, pay arrangements and board accountability.

Garvey and Milbourn (2006) investigate in their research the existence of asymmetric benchmarking in compensation. This is also based on the theory of Bertrand and Mullainathan (2001) that managers in poorly governed firms can use their power to influence their remuneration. They find that the pay for luck is significantly lower in case of bad luck than for good luck. This is consistent with the view that important aspects of management compensation are not chosen as part of an ex ante contract agreement, but rather as a way to transfer wealth from shareholders to executives ex post. This can be explained by the managerial power theory, because executives can use their power over the board to relate their compensation less to industry performance in case the industry performed poorly. With good luck they do not worry about this and also less about overpayment, therefore in good economic periods the compensation is more tied to luck. They also conclude that firms with more influential shareholders are more consistent in benchmarking management compensation in up and down markets.

A more recent study about the relation between executive compensation and firm performance by Weill (2009) argues again that greater CEO payment causes greater managerial performance. He supports the optimal contract approach where manager incentives improve firm performance and he disagrees with the view that management power determines his remuneration. He finds an optimum for executive payment, but this is still significantly higher than the current average payment, therefore he suggests that the management compensation could be enhanced. This illustrates that there is still much discussion on how management compensation should be determined.

Gopalan (2010) tries to explain in another recent study why firms do not use benchmarks which remove effects of sector performance, when setting management payment. It gives reasons why firms do not use relative performance evaluation and also argues against the managerial power approach. They argue that managers can do something about their exposure to market and industry movements through the choice of the firm's strategy. Therefore sector performance is not just a random portion of firm performance; the relative performance of the firm depends on how the manager's strategy fits with the changing environment. This explains the positive sensitivity of management compensation with industry performance, because it incentivizes CEOs to select a strategy by managing exposure to external factors relevant to their own firm. This paper goes against the managerial power hypothesis, because it explains the payment for luck as bargaining power of the manager, whereas this paper explains this phenomenon as optimal contracting incentivizing the manager to respond correctly to the market.

This review of the academic literature shows that over the years many researches are conducted on the way managers should be optimally compensated. The main discussion is whether management compensation should be based on general firm performance or on relative firm performance to for example other core competitors or as some papers, including this one, refer to it as compensation based on luck or on skill. The remainder of this research will examine the existence of several phenomena mentioned in this research, mainly the pay for luck relation and the asymmetric pay for luck relation. More detail about this follows next in the research method.

Research method

This paper will investigate how CEOs where paid during the recent decade; it will compare the remuneration of managers before and after the credit crisis. Interest is in if these payments where based on performance or on luck. Relying on the academic literature stated above, it is expected that the payment for luck is higher before the crisis than during the crisis. This is expected because of two main reasons. First, because of asymmetric benchmarking it is expected that manager's compensation is more tied to luck in good times than in bad times. Second, because of the credit crunch, a lot of negative attention was on the executives, who received enormous amounts of compensation and therefore, they were monitored more strictly by the public and by sharpened corporate governance. Stricter corporate governance leads according to the academic literature to less pay for luck. The main research question in this research will be:

Is the payment for luck in management compensation lower during the financial crisis than in prosperous times?

Before the main research question can be answered, a few other hypotheses need to be tested in a logical order to lead the way to answering the main research question. First this research will investigate if there exists a positive relation between pay and performance, which is heavily tested in academic literature over the years and it will be tested again in this research over a different period with a different sample. Therefore the first hypothesis is as stated below.

Hypothesis 1*: The management compensation is positively related with firm performance.*

This hypothesis can be answered by running an ordinary least squares (OLS) regression to estimate the following equation:

$$ln\ (compensation_{it}) = \beta_0 + \beta_1 * stock\ return_{it} + \beta_2 * ln\ (age_{it}) + \beta_3 * ln\ (tenure_{it}) + \varepsilon_{it} \quad (1)$$

Where for compensation the following dependent variables are used in this and all the forthcoming regressions in this research; total compensation, bonus and options grants. The natural logarithm of the compensations items is used, because of outliers in the distribution of the compensation. The stock return is the yearly return on the firms' stock including dividends and is the variable of interest in this equation. The natural logarithm of age and tenure are

used as control variables in this equation as in Garvey and Milbourn (2006), because they could explain differences in management compensation based on CEO characteristics.
The total compensation is defined as salary, bonus, other annual compensation, total value of restricted stock granted, total value of stock options granted (using Black-Scholes), long-term incentive payouts, and all other total compensation. The bonus is defined as the dollar value of a bonus, cash and non-cash. The options are defined as the total value of stock options granted calculated according to the Black-Scholes model. Tenure is calculated as the current year minus the year the CEO was appointed. In this research we use, besides total compensation, also bonuses and option grants as dependent variable, because as Garvey and Milbourn (2006) say, they are the main sources of incentive pay.
The next step is to test whether managers are paid for luck during this period.

***Hypothesis 2**: Managers are paid for luck.*

This can be tested, using the 2-step method used by Bertrand and Mullainathan (2001). The first step contains running an OLS regression with the company returns on the market and/or the industry return.

$$stock\ return_{it} = \beta_0 + \beta_1 * market\ return_t\ and/or\ industry\ return_{it} + \varepsilon_{it} \qquad (2)$$

In this equation, the market return is the value-weighted return including dividends according to the CRSP database. The industry returns are calculated by taking the average return of the two-digit standard industrial classification (SIC) code of all the companies per year. The market and industry returns are proxies for luck, because they represent factors outside the control of the managers. The error term is a proxy for skill, because this is the part of the stock return which is not influenced by market or industry factors.
The second step is to predict the luck and skill variable from this regression. This means the predicted performance based on luck is calculated using the β_0 and β_1 estimates from regression (2) and the market $return_t$ and/or industry $return_{it}$ to estimate the predicted stock $return_{it}$. This resulting predicted stock variable will be called luck, because it is the predicted stock return based on exogenous factors. Because three different proxies for luck are used, (industry, market and industry & market) there will be three different estimates for the luck variable. The skill variable is calculated as the difference between this predicted performance based on luck with the actual performance, this also results in three different estimates for

skill, which can be seen as the residuals of equation (2). In order to test if managers are paid for luck the following equation needs to be estimated:

$$ln\ (compensation_{it}) = \beta_0 + \beta_1 * luck_{it} + \beta_2 * skill_{it} + \beta_3 * ln\ (age_{it}) + \beta_4 * ln\ (tenure_{it}) + \varepsilon_{it} \quad (3)$$

With this equation the sensitivity of compensation with performance is separated in performance based on luck and performance based on skill. If β_1 is positive and significant it implies that managers are paid for luck. Bertrand and Mullainathan (2001) show in their research that compensation is related as much to luck as to skill. They also imply that compensation is less tied to bad luck, but don't provide a test for this. Garvey and Milbourn (2006) do find a method to test for asymmetric benchmarking in management compensation. From their research, the method is used to test the following hypothesis.

Hypothesis 3*: Managers are less penalized for negative luck than rewarded for positive luck.*

From Garvey and Milbourn (2006) it is not only expected that managers are rewarded for luck, but also because of asymmetric benchmarking that they are more rewarded for luck, than penalized for bad luck. They explain this with the managerial power view in which managers have the power to bargain ex post to what extent their compensation should be benchmarked to exogenous factors. The hypothesis can be tested by estimating the following equation:

(4)

$$ln\ (compensation_{it}) = \beta_0 + \beta_1 * luck_{it} + \beta_2 * skill_{it} + \beta_3 * negative\ luck + \beta_4 * (luck_{it} * negative\ luck) + \beta_5 * negative\ skill + \beta_6 * (skill_{it} * negative\ skill) + \beta_7 * ln\ (age_{it}) + \beta_8 * ln\ (tenure_{it}) + \varepsilon_{it}$$

In this equation the variables negative luck and negative skill are dummy variables taking the value 1 if the luck- or skill variable is negative and 0 otherwise. If β_4 is negative and significant it implies that managers are punished less for negative luck than rewarded for positive luck. This value may be expected according to Garvey and Milbourn (2006).

The research continues with comparing two subsamples; the period before the credit crunch (2000-2006) and the period during and after the crisis (2007-2010). The paper investigates if the pay for luck is lower after the crisis than before the crisis. This part of the research will be new and therefore relevant in academic literature, because it relates the assumed changes in

corporate governance during or after a crisis to management compensation relations with performance and luck. I expect the pay for luck relation to be lower during the crisis, because of the 'outrage' on management compensation, where Bebchuk and Fried (2003) explain about in their book, which arose after the start of the credit crunch, the corporate governance related to the management compensation should have gone much stronger. Stronger corporate governance should lead to less pay for luck according to several different academic papers. Therefore the next hypothesis is as follows:

Hypothesis 4*: The payment for luck in management compensation is lower during and after the crisis than before.*

Besides the pay for luck relation, we also test the pay-performance relation, to remain more complete and to see if this relation differs in the second period. These hypotheses are tested first by including a 'crisisdummy' and the accompanying interaction term with luck to the formulas used before in equations (1) and (3). The crisisdummy is one for the data from the period 2007 till 2010 and zero otherwise. The resulting equations are presented below, equation (5) tests the pay to performance relation and equation (6) the pay for luck relation:

(5)

$$ln\ (compensation_{it}) = \beta_0 + \beta_1 * stock\ return_{it} + \beta_2 * crisisdummy + \beta_3 * (stock\ return_{it} * crisisdummy) + \beta_4 * ln\ (age_{it}) + \beta_5 * ln\ (tenure_{it}) + \varepsilon_{it}$$

(6)

$$ln\ (compensation_{it}) = \beta_0 + \beta_1 * luck_{it} + \beta_2 * skill_{it} + \beta_3 * crisis\ dummy + \beta_4 * (luck_{it} * crisisdummy) + \beta_5 * ln\ (age_{it}) + \beta_6 * ln\ (tenure_{it}) + \varepsilon_{it}$$

The luck and skill variables are again the same predicted values used in equation (3). For the dependent variable in this test and the remaining tests of this paper, the variable option grants is omitted, because there was no data available from 2007 till 2010 as can be seen in the descriptive statistics later on. If β_3 has a significant negative value it means that the pay to performance relation is lower in the second period and if β_4 has a negative value and is significant it implies that the pay for luck is lower after the crisis.

The second way this hypothesis can be tested is by estimating equation (3) on both the subsamples. The higher or the lower the coefficients, if significant, will show how the relation has changed between the two periods.

The last hypothesis will be if the asymmetric payment for luck is also lower during the crisis. It shows if the expected stronger corporate governance leads to less asymmetry in management compensation.

Hypothesis 5: *There is less asymmetric pay for luck during and after the crisis than before.*

Since I expect the credit crunch to lead to stronger corporate governance, I also expect the asymmetry in management compensation to be lower. The managerial power view suggests that with stronger corporate governance, managers are less likely to adjust the benchmarking in their favor, therefore less asymmetric benchmarking is expected. This hypothesis will be tested by regressing formula (4) on both the subsamples and view if the coefficients show a weaker relation after the crisis. This hypothesis is not tested by means of the crisis dummy, because this would require an interaction term containing three variables (negative luck * $luck_{it}$ * crisis dummy), which makes it difficult to interpret.

Data

The data used will be yearly data from the US market between 2000 and 2010. In this research, the period from 2000 to 2006 is considered as the period before the credit crunch and the period from 2007 to 2010 is considered as the period during the crisis. According to BBC News, the start of the crisis has been pinpointed as 9 August 2007, when French bank BNP Paribas questioned rating agencies, because there was a complete absence of liquidity in certain market segments of the U.S. securitization market, which made it impossible to value certain assets fairly, regardless of their quality or credit rating. This triggered sharp rise in the cost of credit, and made the financial world realize how serious the situation was. Since the data used in this research is yearly, the year 2007 is considered as a year during the crisis, because the impact of the start of the crisis can be seen in the overall numbers of the year. All the data is gathered from the Wharton Research Data Services website. The data about company returns and market returns comes from the CRSP database. The data about the CEO compensation and CEO characteristics are from the Compustat ExecuComp database.

Before the dataset is ready for use, there are a few alterations made to the data. Since the data about the CEO compensation is in a yearly format and the data about the company and market returns is monthly, this data needs to be converted into yearly data too. The industry returns are calculated by taking the average return of the two-digit standard industrial classification (SIC) code of all the companies per year. After this, the data can be merged into one database.

Next, all years in which a CEO has left the company and a new one is appointed are dropped out, because the compensation needs to be compared over full year periods. And years are dropped in which the CEO served the firm for less than 2 years, because we need to analyze firm year-to-year changes. Also the used data contains only information about firms with fiscal year endings in December, also for reliable comparison of similar peer groups, therefore other items are also dropped out.

The remaining dataset consist of 7340 observations of the compensation of 1802 unique CEOs, during the period from 2000 to 2010, at 1289 unique companies with the corresponding yearly returns of the companies as well as the market return and the industry returns, which are based on the firm’s two-digit SIC code.

Descriptive statistics

In table 1 the descriptive statistics of the full dataset are given; all variables used in this research are present.

Table 1: Descriptive statistics (2000-2010)

variable	number of observations	mean	standard deviation	median
salary	7340	706,3	376,9	650
bonus	7340	581,1	1.947,3	75
option grants	4000	2.669,2	9.266,8	7.798,5
total compensation	7294	5.138,5	9.175,4	2.795,4
age	7093	55,9	7,4	56
tenure	7152	8,6	7,1	6
stock return	7340	0,134	0,504	0,131
market return	7340	0,024	0,230	0,076
industry return	7340	0,147	0,304	0,163

This table summarizes the full sample (2000-2010). Compensation data are in thousands of Dollars, age and tenure are in years.

From table 1, it appears that the average CEO during this period is 56 years, has an average tenure of 8,6 years and receives a total compensation of $ 5,1 million a year. The tenure of this sample could be misleading, because of the data which is dropped out. Another interesting fact is that the option grants on average count for about 50% of the total compensation. Also the standard deviations are high in magnitude, which indicates there is a big spread in the sample especially with option grants and total compensation. The mean of salary and bonus is higher than the median, which indicates a positive skewness of the variables. This can also imply extreme outliers in this dataset, therefore in the further research the natural logarithm of the CEO characteristics is used to correct for this. This is not the case with option grants and total compensation, even though this may be expected. An explanation for this could be, while many companies do not award option grants, which makes the average lower than the median, despite the outliers. The observations of option grants are also much lower, because there was no information available for the period of 2007 and onwards.

The stock return has an average yearly return of 13,4% with a standard deviation of 0,50. As may be expected the market return has a lower average return of 2,4% with a standard deviation of 0,23. The low average return on the market could be declared because of the bad periods during the credit crunch. An interesting feature is that the industry return has a higher average return, with a lower standard deviation.

Later on in this research some comparisons will be made between two periods; the subsamples of these two periods are presented in table 2 and 3.

Table 2: Descriptive statistics (2000-2006)

variable	number of observations	mean	standard deviation	median
salary	4728	672,4	351,6	623,9
bonus	4728	749,2	1.599,7	321,8
option grants	4000	2.669,2	9.266,8	779,8
total compensation	4682	5.245,4	10.273,6	2.675,5
age	4502	56,1	7,5	56
tenure	4585	8,6	7,2	6
stock return	4728	0,176	0,430	0,159
market return	4728	0,051	0,162	0,074
industry return	4728	0,196	0,212	0,189

This table summarizes the sample before the crisis (2000-2006). Compensation data are in thousands of Dollars, age and tenure are in years.

The first subsample is the period before the credit crunch. Interesting facts to point out are that the average returns are all higher, with a lower standard deviation. This indicates the impact of the crisis on the average results of the full sample returns. Furthermore the average salary is lower, while the bonus and total compensation are higher. This could indicate that incentive based compensation is more used in prosperous times than in times of crisis, while the base salary is increased during the economic bad times. This could imply asymmetric pay for luck, because less performance related compensation is used during bad times. It could also imply that the variable compensation is just lower because of the worse performance. The descriptive statistics on the option grants remain the same, while there is no information about it in the other subsample.

Table 3: Descriptive statistics (2007-2010)

variable	number of observations	mean	standard deviation	median
salary	2612	767,7	411,8	715
bonus	2612	276,8	2.425,3	0
option grants	0			
total compensation	2612	4.946,9	6.772,8	2.990,1
age	2591	55,5	7,0	55
tenure	2567	8,6	6,9	7
stock return	2612	0,059	0,608	0,056
market return	2612	-0,024	0,313	0,076
industry return	2612	0,058	0,408	0,058

This table summarizes the sample during and after the crisis (2007-2010). Compensation data are in thousands of Dollars. Age and tenure are in years.

In the subsample representing the years during and after the credit crunch the returns are much lower and the standard deviations are higher as is expected in times of recession. The market return is on average even negative by 2,4%. The base salary is higher than before the crisis and the bonus is lower as is mentioned before. The total compensation is lower than in the period before the crisis, which could imply that there exists a pay for performance relation to some extent, while the returns are also lower. On the other hand, the total compensation is not that big of a difference, while the returns are.

Next in table 4 the Pearson correlations are presented of the main variables used in this research. The natural logarithms of the executive characteristic variables are already taken here, because it better represents the relation between the variables, because of the outliers in compensation. Another reason is because in the remainder of the research these natural logarithms are also used.

Table 4: Pearson correlations

	ln bonus	ln options	ln total compensation	ln age	ln tenure	stock return	market return
ln bonus	1,000						
ln options	0,401*	1,000					
ln total compensation	0,612*	0,861*	1,000				
ln age	0,081*	-0,041**	0,037*	1,000			
ln tenure	-0,046*	-0,018	-0,089*	0,353*	1,000		
stock return	0,060*	-0,035***	0,004	-0,004	0,017	1,000	
market return	0,055*	-0,057*	0,002	0,020***	-0,008	0,462*	1,000
industry return	0,057*	-0,033***	-0,003	0,019	-0,003	0,591*	0,754*

This table shows the Pearson correlations of the full sample. * Correlation is significant at the 1% level. ** Correlation is significant at the 5% level. *** Correlation is significant at the 10% level.

From this table it appears that the compensation variables correlate positively with each other and these values are significantly different from zero at the 1% level. The compensation variables correlate positively with age and negatively with tenure, except for options, which correlates negatively with age and does not have a significant correlation with tenure. This could be due to the lack of observations from 2007 onwards. The other correlations indicate that the older the CEO, the more compensation he receives, but the longer he stays at a firm, the lower his remuneration will be. The value of the age variable could be explained by career concerns issued by Gibbons and Murphy (1992).

The compensation data shows mixed results with the returns. The bonuses correlate significantly positive with the returns as should be expected, while the option grants correlate negatively and the total compensation shows no significant relation. This implies that total compensation does not depend on firm, industry or market performance, which is a somewhat strange result. The lack of observations about option grants could be a reason for the negative correlation with the returns. Left to mention is that age and tenure show in general no relation with the returns and the firm, industry and market returns do correlate significantly positive with each other, which both seems logical.

Results

Pay performance relation and pay for luck

After collecting and investigating the data, the research can begin with testing the proposed hypotheses. The first two hypotheses are both tested in this first section. They include testing the pay-performance relation and the pay for luck relation. To test the pay for luck relation, first the performance based on luck and on skill need to be estimated. This is done according to the 2-stage method introduced by Bertrand and Mulainathan (2001) as explained in the research method. The first stage is presented in table 5 and includes regressing the industry return, market return and both the returns on the firms' stock return.

Table 5: stage 1 regression

	stock return		
	1	2	3
intercept	-0,009***	0,110*	-0,004
	(0,005)	(0,005)	(0,006)
industry return	0,978*		0,930*
	(0,016)		(0,024)
market return		1,010*	0,083*
		(0,023)	(0,031)
R2	0,349	0,213	0,349

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level.
Standard errors are in parentheses.

All the returns are positively related and significant; the intercepts are significant too, except for the third regression. Now three proxies of performance based on luck are predicted using the coefficients from this regression multiplied by the industry and/or market return. For example the predicted stock return based on luck using the industry return as a proxy is calculated using the numbers from table 5 as follows:

$$luck\ (industry)_{it} = -0{,}009 + 0{,}978 * industry\ return_{it}$$

Than the skill variable using the industry proxy is the difference between the actual performance and the predicted performance based on luck.

$$skill\ (industry)_{it} = stock\ return_{it} - luck\ (industry)_{it}$$

The predicted stock return variable represents the part of performance, which is outside the control of the manager and is therefore referred to as luck. The difference between the actual performance and the performance based on luck is called skill, because than this is the part of performance which is based on the manager's actions. The descriptive statistics of the predicted luck and skill variables are given in table 6.

Table 6: Descriptive statistics of luck and skill variables

variable	number of observations	mean	standard deviation	median
luck (industry)	7340	0,134	0,297	0,150
skill	7340	0,000	0,406	-0,015
luck (market)	7340	0,134	0,233	0,187
skill	7340	0,000	0,447	-0,033
luck (industry & market)	7340	0,134	0,298	0,151
skill	7340	0,000	0,406	-0,018

This table presents the descriptive statistics of the calculated luck and skill variables.

Because of OLS regression the mean of the different luck variables is the same as the mean stock return in table 1. The skill variables have a mean of zero, because they are based on the standard errors of the first stage regression. The standard deviations do differ slightly. In this research all three proxies for luck and skill are used in order to minimize estimation errors.

After estimating the luck and skill variables, we can start testing the hypotheses by estimating equations (1) and (2). In table 7 these regression are shown, including the three different proxies for luck and skill and using the three different measurements of compensation.

Table 7: Pay performance relation and pay for luck

	Ln total compensation							
variable	1		2		3		4	
intercept	5,172*	(0,445)	5,161*	(0,445)	5,167*	(0,445)	5,161*	(0,445)
stock return	0,006	(0,027)						
luck (industry)			-0,033	(0,046)				
skill			0,027	(0,034)				
luck (market)					-0,028	(0,059)		
skill					0,015	(0,031)		
luck (industry & market)							-0,032	(0,046)
skill							0,027	(0,034)
ln age	0,782*	(0,114)	0,786*	(0,114)	0,784*	(0,114)	0,786*	(0,114)
ln tenure	-0,192*	(0,020)	-0,193*	(0,020)	-0,193*	(0,020)	-0,193*	(0,020)
R2	0,016		0,016		0,016		0,016	
	Ln bonus							
variable	1		2		3		4	
intercept	1,507**	(0,707)	1,530**	(0,707)	1,532**	(0,707)	1,532**	(0,707)
stock return	0,169*	(0,051)						
luck (industry)			0,255*	(0,089)				
skill			0,132**	(0,059)				
luck (market)					0,349*	(0,114)		
skill					0,136**	(0,054)		
luck (industry & market)							0,261*	(0,089)
skill							0,130**	(0,059)
ln age	1,242*	(0,181)	1,232*	(0,181)	1,229*	(0,181)	1,231*	(0,181)
ln tenure	-0,174*	(0,031)	-0,172*	(0,031)	-0,172*	(0,031)	-0,172*	(0,031)
R2	0,018		0,018		0,019		0,018	
	Ln options							
variable	1		2		3		4	
intercept	8,605*	(0,837)	8,601*	(0,836)	8,620*	(0,836)	8,601*	(0,836)
stock return	-0,114***	(0,059)						
luck (industry)			-0,251**	(0,117)				
skill			-0,068	(0,068)				
luck (market)					-0,465*	(0,152)		
skill					-0,068	(0,062)		
luck (industry & market)							-0,266**	(0,118)
skill							-0,064	(0,068)
ln age	-0,314	(0,213)	-0,306	(0,213)	-0,306	(0,213)	-0,305	(0,213)
ln tenure	-0,021	(0,037)	-0,022	(0,037)	-0,022	(0,037)	-0,022	(0,037)
R2	0,003		0,003		0,005		0,003	

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level. Standard errors are in parentheses.

The results of the regressions using total compensation as dependent variable do not show significant relations between pay and performance or pay for luck. The intercept and control variables age and tenure do show significant relations, but this just implies that there are other factors influencing total compensation and higher age results in higher total compensation, while a greater tenure leads to lower total compensation. These results seem in order with the outcome of the Pearson correlation, that returns have no influence on total compensation and therefore total compensation is also not based on luck.
By using bonus as independent variable the results show a significant relation as was expected from the hypotheses. The height of the bonus is positively related to the stock return, although it even stronger related to the age of the CEO. From these regressions it also appears that the bonus is related positive and significant to both luck and skill. The compensation in the form of bonus is even more related to performance based on luck than on the skill of the CEO, which means the bonus reward is based more on the exogenous factors market and industry return than on the individual performance of the CEO if these factors where corrected for. Even though these results are significant and in line with the hypothesis the R^2 is low, which indicates that these variables do not explain a great part of the variation in bonus payments.

The last dependent variable analyzed in table 7 is options. It appears that the value of options granted to CEOs is negatively related to the firms' stock returns, which is significant at the 10% level. This means that a greater value of option grants is rewarded when firm performance is bad and a lower value when performance is good. Options show a significantly negative value with performance for luck, but performance based on skill does not show a significant relation. A reason could be that options are more used in bad times, because of less transparency of options, which will reduce 'outrage', as argued by Bebchuk and Fried (2003). Another reason could be that these results arise because options are issued when the stock price is undervalued and not when the stock price is already on a peak. This could also explain why it only relates to luck and not to skill, because these are compensation decisions based on market factors and not on personal CEO actions. The R^2 shows again a very low value, which indicates that this equation does not declare much of the variation in option grants.

The hypotheses are tested with mixed results; by using bonus as a dependent variable both the hypotheses are validated, which means that bonus compensation relates positively with firm performance and that managers are rewarded for luck. Total compensation does not show a

significant relation between pay and performance or between luck and performance. Options grants show a negative relation with performance and performance based on luck. These last two results were not expected up front, but could already be seen in the Pearson correlation matrix.

Asymmetric pay for luck

The next step in this research is to test whether there exists asymmetric pay for luck during the period of 2000 till 2010. This means that managers are rewarded more for luck when performance is good than they are punished when performance is bad. This implies that compensation is benchmarked for market or industry factors when these factors are down and is less benchmarked when these factors are up. As explained in academic literature, a reason for this is that managers use their power two bargain for benchmarking only when this is in their own interest, namely when markets are down. In table 8, equation (4) is estimated by using the different compensation, luck and skill variables.

Table 8: Asymmetric pay for luck

	Ln total compensation					
variable	1		2		3	
intercept	5,549*	(0,448)	5,560*	(0,446)	5,554*	(0,448)
luck (industry)	0,064	(0,080)				
skill	-0,287*	(0,060)				
luck (market)			-0,066	(0,114)		
skill			-0,216*	(0,054)		
luck (industry & market)					0,050	(0,081)
skill					-0,284*	(0,060)
negativeluckd	-0,115**	(0,054)	-0,227*	(0,076)	-0,139**	(0,054)
nld*luck	-0,604*	(0,177)	-0,842*	(0,277)	-0,633*	(0,176)
negativeskilld	0,000	(0,038)	0,100**	(0,039)	0,006	(0,038)
nsd*skill	0,744*	(0,099)	0,766*	(0,090)	0,752*	(0,099)
ln age	0,706*	(0,114)	0,702*	(0,114)	0,706*	(0,114)
ln tenure	-0,186*	(0,020)	-0,186*	(0,020)	-0,186*	(0,020)
R2	0,025		0,028		0,026	

	Ln bonus					
variable	1		2		3	
intercept	2,547*	(0,711)	2,520*	(0,709)	2,573*	(0,710)
luck (industry)	0,074	(0,136)				
skill	-0,392*	(0,097)				
luck (market)			0,046	(0,178)		
skill			-0,304*	(0,086)		
luck (industry & market)					0,032	(0,137)
skill					-0,406*	(0,096)
negativeluckd	-0,068	(0,090)	0,016	(0,108)	-0,130	(0,092)
nld*luck	0,470	(0,363)	0,742	(0,501)	0,366	(0,363)
negativeskilld	-0,002	(0,062)	0,126***	(0,064)	-0,015	(0,062)
nsd*skill	1,428*	(0,178)	1,602*	(0,172)	1,445*	(0,178)
ln age	1,031*	(0,181)	1,027*	(0,180)	1,031*	(0,180)
ln tenure	-0,156*	(0,031)	-0,152*	(0,031)	-0,157*	(0,031)
R2	0,038		0,042		0,039	
	Ln options					
variable	1		2		3	
intercept	8,152*	(0,846)	8,637*	(0,847)	8,120*	(0,846)
luck (industry)	-0,198	(0,163)				
Skill	0,105	(0,118)				
luck (market)			-0,768*	(0,200)		
skill			0,046	(0,102)		
luck (industry & market)					-0,235	(0,165)
skill					0,113	(0,117)
negativeluckd	-0,347*	(0,120)	0,323	(0,346)	-0,414*	(0,129)
nld*luck	-2,612*	(0,726)	4,961	(3,240)	-2,873*	(0,776)
negativeskilld	0,029	(0,073)	0,113	(0,075)	0,037	(0,073)
nsd*skill	-0,361***	(0,198)	-0,105	(0,194)	-0,350***	(0,198)
ln age	-0,205	(0,215)	-0,307	(0,215)	-0,195	(0,215)
ln tenure	-0,037	(0,037)	-0,028	(0,037)	-0,038	(0,037)
R2	0,01		0,009		0,011	

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level. Standard errors are in parentheses.

As said before, hypothesis 3 is validated when the coefficient of the interaction term between the negative luck dummy and the luck variable shows a significantly and negative result. Starting by looking at total compensation, β_4 shows for all the proxies of luck a significant and negative value. This would imply that there is less payment for luck when luck is negative than when luck is positive. Said otherwise, when market returns or industry returns are bad, management compensation is less related to these exogenous factors than when market and industry returns are positive. However just as in table 7, total compensation does not show a significant relation with luck, therefore it cannot be assumed there exists asymmetric pay for luck if there is not any pay for luck relation. Besides this another surprising outcome is that the skill variable appears significantly negative, which indicates that total compensation is

negatively related to skill. Nevertheless, the interaction term between skill and the negative skill dummy shows a significant and positive value. This means that manager remuneration is more related to their performance based on skill, when skill appears negative. This is in line with the findings from Garvey and Milbourn (2006) and is a comprehensive finding with asymmetric pay for luck. Normally this means that the manager is punished more for bad skill than rewarded for good skill, but since skill appears to be significantly negative, this implies managers are rewarded more for bad skill than punished for showing good skill. This result is as it sounds a strange outcome.

The variables which test for asymmetric pay for luck show a relation as expected, but these results are not supported by the pay for luck relation; the same holds for the relation with skill.

For bonus payments, the same pay for luck relations appear as with total compensation; insignificant pay for luck relation and a significant negative pay for skill relation. This result is not as expected, especially because prior to this, regressions on bonus payouts were the only ones resulting in a completely significant outcome as expected. There also appears no evidence for asymmetric pay for luck. Again there does appear strong evidence for asymmetric pay for skill, as indicated by the significant and positive coefficients at the interaction term between skill and the negative skill dummy.

Option grants show only a significant relation with luck if using the market proxy for luck, but this shows a negative relation, which is not expected up front, but is consistent with previous results. The variables which test asymmetric payment for luck do not show a significant relation in case if using the market proxy for luck, but do show significant numbers for the other estimates of luck. B_4 shows a significant negative value, which again argues for asymmetric pay for luck, but again, without evidence of a significant relation between payment and luck this hypothesis cannot be validated.

Influence of the financial crisis on pay for luck

Before testing hypothesis 4, first the influence of the credit crunch on the pay for performance relationship, which is done by regressing equation (5). The results are shown in table 9. Option grants are not used in this section, because of the missing data for the period during and after the credit crunch.

Table 9: Pay for performance including crisis dummy

variable	ln totalcomp		ln bonus	
intercept	5,065*	(0,446)	1,816*	(0,703)
return	0,057	(0,041)	0,183*	(0,058)
crisis dummy	0,098*	(0,030)	-0,452*	(0,065)
crisis dummy*return	-0,074	(0,056)	-0,209***	(0,119)
ln age	0,799*	(0,114)	1,171*	(0,179)
ln tenure	-0,194*	(0,020)	-0,151*	(0,031)
R2	0,017		0,034	

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level. Standard errors are in parentheses.

Total compensation does not show significant results for the interaction term and the return. This means no relation between compensation and stock return and also no significant difference in relation between the two periods. The crisis dummy is positively and significantly related with total compensation, which implies that managers were paid more total compensation during and after the crisis than before. This does not correspond with the findings from the descriptive statistics, because the average compensation was lower in the second period. However this difference was relatively small especially compared with the change in return, so this might explain that there still appears to be a positive relation. Bonus payment shows a negative and significant relation, on the 10% level, with the interaction term. This indicates that the sensitivity of payment to performance is lower during the crisis, which could be explained by a theory suggested by Bertrand and Mulainathan (2001), which says that due to stronger corporate governance and therefore stricter monitoring, there is less need to relate pay to performance.

Next, the research continuous with testing hypothesis 4. This is done by estimating formula (6) and the results are shown in table 10. Here is examined if there is less payment for luck in the period during and after the crisis than before. This is tested by the same regressions used in testing pay for luck, only now including a crisis dummy and the interaction term with luck. I expect that because of the crisis, the corporate governance at firms becomes stronger and

this should result in less pay for luck, which will be indicated by a significant and negative value of β_4.

Table 10: Pay for luck including crisis dummy

	Ln total compensation					
variable	1		2		3	
intercept	5,068*	(0,446)	5,056*	(0,446)	5,067*	(0,446)
luck (industry)	0,024	(0,084)				
skill	0,026	(0,034)				
luck (market)			0,149	(0,107)		
skill			0,025	(0,031)		
luck (industry & market)					0,030	(0,085)
skill					0,026	(0,034)
crisis dummy	0,092*	(0,033)	0,118*	(0,034)	0,093*	(0,033)
crisis dummy*luck	-0,039	(0,101)	-0,217***	(0,129)	-0,048	(0,102)
ln age	0,800*	(0,114)	0,798*	(0,114)	0,800*	(0,114)
ln tenure	-0,195*	(0,020)	-0,194*	(0,020)	-0,195*	(0,020)
R2	0,017		0,018		0,017	
	Ln bonus					
variable	1		2		3	
intercept	1,794*	(0,703)	1,782*	(0,702)	1,794*	(0,703)
luck (industry)	0,278**	(0,113)				
skill	0,142**	(0,059)				
luck (market)			0,525*	(0,146)		
skill			0,130**	(0,054)		
luck (industry & market)					0,293*	(0,114)
skill					0,139**	(0,059)
crisis dummy	-0,443*	(0,066)	-0,391*	(0,068)	-0,440*	(0,066)
crisis dummy*luck	-0,451**	(0,187)	-0,749*	(0,233)	-0,466**	(0,186)
ln age	1,172*	(0,180)	1,167*	(0,179)	1,172*	(0,180)
ln tenure	-0,150*	(0,031)	-0,151*	(0,031)	-0,150*	(0,031)
R2	0,035		0,036		0,035	

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level. Standard errors are in parentheses.

Total compensation shows again no significant relation with luck or skill as is seen before in table 7. The crisis dummy shows a significant and positive value, which implies more total compensation in the second period. The interaction term only gives a significant value at the 10%-level by using the market proxy. This implies that there is less pay for luck in the period of the crisis, but because the pay for luck relation itself is not significant hypothesis 4 cannot be validated.

Bonus payment shows a result as expected; both the luck and skill variables show a positive and significant relation with the bonus payment. This is consistent with the findings in table 7 and raises questions about the inconsistency of table 8. Furthermore the crisis dummy shows a significantly negative relation, which seems more logical than the positive relation seen with total compensation, because when payment is related to performance due to luck or skill it should be expected that it is lower in times of crisis. Also the interaction term between the crisis dummy and luck gives a significantly negative value for the different estimates of luck. This indicates that there is less payment for performance based on luck during the crisis. This could be explained by the managerial power theory, because of stronger corporate governance, which results in less compensation setting power of the executive. Therefore hypothesis 4 is validated by the bonus payments, managers are paid less bonuses related to luck during and after the crisis than before.

Comparing the relations in two subsamples

Finally the pay-performance relation, the pay for luck relation and the asymmetric pay for luck relation are compared for the two different periods. In table 11 the first two relations are tested by estimating the same equations as in table 7, using the two different subsamples of both the periods. If results appear significant in both the periods, the values of the coefficients can be compared to investigate in which period the relation is stronger or weaker.

Table 11: comparing 2 periods pay performance relation and pay for luck

	Ln total compensation				ln bonus			
variable	2000-2006		2007-2010		2000-2006		2007-2010	
intercept	5,486*	(0,548)	4,309*	(0,762)	1,126	(0,707)	5,254**	(2,380)
stock return	0,056	(0,041)	-0,016	(0,037)	0,186*	(0,053)	-0,031	(0,142)
ln age	0,686*	(0,140)	1,029*	(0,196)	1,354*	(0,180)	0,118	(0,618)
ln tenure	-0,177*	(0,024)	-0,230*	(0,033)	-0,175*	(0,031)	0,014	(0,115)
R2	0,014		0,022		0,024		0,000	
intercept	5,486*	(0,548)	4,310*	(0,762)	1,131	(0,707)	5,125**	(2,385)
luck (industry)	0,026	(0,084)	-0,015	(0,057)	0,278*	(0,104)	-0,171	(0,204)
skill	0,065	(0,047)	-0,017	(0,050)	0,157*	(0,060)	0,081	(0,183)
ln age	0,688*	(0,140)	1,029*	(0,196)	1,349*	(0,180)	0,150	(0,619)
ln tenure	-0,177*	(0,024)	-0,230*	(0,033)	-0,175*	(0,031)	0,012	(0,115)
R2	0,014		0,022		0,024		0,002	

intercept	5,487*	(0,548)	4,296*	(0,762)	1,127	(0,706)	5,126**	(2,386)
luck (market)	0,157	(0,108)	-0,067	(0,072)	0,529*	(0,135)	-0,205	(0,249)
skill	0,044	(0,043)	0,005	(0,046)	0,147*	(0,055)	0,051	(0,172)
ln age	0,682*	(0,140)	1,034*	(0,196)	1,341*	(0,180)	0,156	(0,620)
ln tenure	-0,176*	(0,024)	-0,231*	(0,033)	-0,174*	(0,031)	0,009	(0,115)
R2	0,014		0,022		0,026		0,002	
intercept	5,486*	(0,548)	4,308*	(0,762)	1,132	(0,707)	5,120**	(2,385)
luck (industry & market)	0,032	(0,085)	-0,018	(0,056)	0,294*	(0,105)	-0,170	(0,202)
skill	0,063	(0,047)	-0,015	(0,050)	0,152**	(0,060)	0,082	(0,184)
ln age	0,687*	(0,140)	1,029*	(0,196)	1,348*	(0,180)	0,152	(0,619)
ln tenure	-0,177*	(0,024)	-0,230*	(0,033)	-0,175*	(0,031)	0,012	(0,115)
R2	0,014		0,022		0,024		0,002	

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level. Standard errors are in parentheses.

In the first part of this table the pay for performance relation is tested for both the periods. In line with earlier findings the total compensation does not give significant values for both the periods. More surprisingly is that bonus payments only show a positive significant relation before the crisis, which indicates that during and after the crisis bonus payments were not related anymore to firm performance. This could make sense, because managers were still rewarded with bonuses even though performance was bad. Also age and tenure are not related anymore to bonuses in the second period.

Further in this table the pay for luck relation is tested for the three different estimates of luck. They all show somewhat the same relation, which is in line with the findings on pay for performance. Total compensation shows no relation with luck or skill in both the periods and for all proxies of luck. This might be expected because it is consistent with previous findings. The bonus variable shows a positive and significant value in all cases concerning the period before the crisis, which is expected and in line with the pay for luck results from table 7. But in the second period there again appears no relation with performance based on luck or on skill and also no relation with CEO characteristics, which in general relate significant to compensation in all the regressions used in this research.

Therefore I cannot conclude that there exists less pay for performance or less pay for luck by comparing the two periods. But it is an interesting result, that the bonus payment, which seemed like the variable relating as expected throughout this research, only relates this way before the crisis and does not relate to any variable in the period during and after the credit crunch.

The last hypothesis tested in this research investigates if there exists less asymmetric payment for luck in the period during and after the crisis than before the crisis. The same equations as in table 8 are estimated for both the periods and they are presented in table 12.

Table 12: comparing asymmetric pay for luck for 2 periods

	Ln total compensation				ln bonus			
variable	2000-2006		2007-2010		2000-2006		2007-2010	
intercept	6,064*	(0,556)	4,661*	(0,762)	2,276*	(0,707)	4,853**	(2,415)
luck (industry)	-0,134	(0,114)	0,179	(0,116)	0,148	(0,138)	0,365	(0,428)
skill	-0,207**	(0,083)	-0,384*	(0,087)	-0,464*	(0,097)	0,156	(0,311)
negativeluckd	-0,095	(0,085)	-0,096	(0,086)	0,091	(0,105)	0,087	(0,305)
nld*luck	0,312	(0,515)	-0,655*	(0,230)	1,739*	(0,658)	-1,108	(0,833)
negativeskilld	0,033	(0,048)	-0,041	(0,064)	-0,077	(0,061)	0,355	(0,236)
nsd*skill	0,713*	(0,135)	0,805*	(0,147)	1,514*	(0,178)	0,621	(0,592)
ln age	0,569*	(0,141)	0,964*	(0,195)	1,121*	(0,179)	0,142	(0,622)
ln tenure	-0,166*	(0,024)	-0,231*	(0,033)	-0,155*	(0,031)	0,017	(0,115)
R2	0,022		0,035		0,054		0,011	
intercept	6,036*	(0,553)	4,607*	(0,761)	2,118*	(0,706)	5,035**	(2,412)
luck (market)	-0,173	(0,143)	-0,090	(0,240)	0,387**	(0,176)	-0,011	(0,809)
skill	-0,135***	(0,073)	-0,336*	(0,080)	-0,327*	(0,085)	0,034	(0,313)
negativeluckd	0,430	(0,270)	-0,075	(0,400)	0,302	(0,309)	-0,562	(0,916)
nld*luck	5,571**	(2,518)	-0,184	(1,169)	3,043	(2,865)	-2,094	(2,618)
negativeskilld	0,145*	(0,050)	0,044	(0,064)	0,047	(0,063)	0,472**	(0,239)
nsd*skill	0,761*	(0,129)	0,868*	(0,129)	1,604*	(0,176)	0,993***	(0,545)
ln age	0,565*	(0,140)	0,990*	(0,194)	1,136*	(0,179)	0,155	(0,620)
ln tenure	-0,165*	(0,024)	-0,232*	(0,033)	-0,153*	(0,031)	-0,019	(0,115)
R2	0,025		0,039		0,052		0,013	
intercept	6,077*	(0,556)	4,650*	(0,762)	2,306*	(0,707)	4,896**	(2,418)
luck (industry & market)	-0,168	(0,116)	0,181	(0,119)	0,111	(0,140)	0,380	(0,436)
skill	-0,206**	(0,082)	-0,381*	(0,087)	-0,472*	(0,097)	0,103	(0,313)
negativeluckd	-0,140	(0,091)	-0,097	(0,086)	0,041	(0,113)	0,101	(0,303)
nld*luck	0,204	(0,548)	-0,663*	(0,227)	1,638**	(0,703)	-1,079	(0,813)
negativeskilld	0,036	(0,048)	-0,031	(0,064)	-0,082	(0,061)	0,301	(0,236)
nsd*skill	0,720*	(0,135)	0,822*	(0,147)	1,530*	(0,178)	0,644	(0,594)
ln age	0,569*	(0,141)	0,965*	(0,195)	1,119*	(0,179)	0,139	(0,623)
ln tenure	-0,167*	(0,024)	-0,231*	(0,033)	-0,156*	(0,031)	0,013	(0,115)
R2	0,023		0,036		0,054		0,010	

*Significant at 1% level ** Significant at 5% level *** Significant at 10% level. Standard errors are in parentheses.

Total compensation shows mixed results for the three proxies of luck and skill. By using the industry estimate and the market & industry estimate, the coefficient of the interaction term with the negative luck dummy and luck show a negative significant value in the second period and no significant in the period before the crisis. This implies asymmetric pay for luck during and after the crisis, while this does not appear to exist before the crisis. But because there is no significant relation with luck, this is not validated. What is validated is that skill shows a significantly negative value in both the periods and a stronger relation in the second period. This shows that total compensation is more negatively related to skill after the crisis has started. Also the interaction term of skill and the negative skill dummy show significance in both periods, in this case a positive relation. This implies that managers are punished more for bad skill than rewarded for good skill and this asymmetry is even larger in the second period. This can be seen as the comprehensive result of asymmetric pay for luck, only this appears to be significant while payment for luck is not. But because skill has a negative value this result implies the contra expecting outcome that managers are rewarded more for bad luck, than they are punished for good luck. But anyways the negative outcome of skill is an unexpected outcome. The CEO characteristics show a stronger relation during and after the crisis than before, but this has no further implications concerning this hypothesis.

Bonus also shows mixed results; again both the industry proxy and the industry & market proxy show similar results, but the market proxy shows different results. Also as seen before the bonus payments do not relate to any variable during the second period, only with some, using the market proxy. By using the industry estimate of luck and skill, this results in a significant negative value for skill in the first period and no significant value for luck. The coefficient, which implies asymmetric payment for luck, shows a positive value in the first period, which is not as expected. It would imply that managers are punished more for luck, when luck is down than they are rewarded for luck, when luck is up. However, again, this result is not validated, because there appears no relation between payment and luck. The relation that is validated is the positive asymmetric relation for skill, which implies again, together with the negative value of skill, the illogical outcome that managers are rewarded more for bad luck, than they are punished for good luck. The market proxy shows a significant positive value for luck in the first period, which is seen before, but no relation indicating asymmetric pay for luck. It again does show a positive value for skill asymmetry. The second period here shows some significant values for negative skill and the interaction term with skill, but they have no meaning since the skill variable is not significant.

To conclude this part, there is no evidence for more or less asymmetric pay for luck between the two periods. This could also not be found for the pay for performance relation or the pay for luck relation. However by using the crisis dummy it appeared that bonus payments were less related to luck after the beginning of the crisis than before.

Conclusion

This paper has tried to investigate if earlier findings in the area of management compensation still hold in the recent decade, containing a financial crisis. First, this paper tests the relation between management compensation and firm performance, which has previously been tested by, among others, Jensen and Murphy (1990). In this research it appears that there is no significant relation between the total compensation of the CEO and the firm performance measured by the firm's stock return. Bonus payments do relate significant and positive to performance and option grants relate negatively and significant.

Second, the relation between management compensation and firm performance based on luck it tested. This phenomenon is introduced by Bertrand and Mullainathan (2001) and is reinvestigated in this research. Total compensation shows no relation to performance based on luck, which is consistent with the pay for performance relation. Bonus payments show a significantly positive relation to performance based on both luck and skill. This means that managers are both rewarded for personal performance as for performance based on factors outside their control, which is the same conclusion as Bertrand and Mullainathan (2001). Option grants only show a significantly negative relation to luck. The hypothesis that managers are paid for luck is only validated by bonus payments.

Third, the sample is tested for asymmetric compensation, which was first tested by Garvey and Milbourn (2006). This did not give results as expected, because if there was a significant relation found with the asymmetric compensation variable, there was no relation to luck. Therefore this paper cannot support the hypothesis that managers are rewarded more in case of good luck than penalized in case of bad luck.

Fourth, the influence of the credit crunch is tested on the different relations. This is done in two ways; by means of a crisis dummy and by a comparison of regressions on two subsamples. This step in this research is new in academic literature and therefore could be of

great relevance. From the test with the crisis dummy it appears that the relation between bonus payments and firm performance is lower during the crisis. Besides this, also the bonus payment relation with performance based on luck is lower during the crisis. Total compensation again yielded no significant results.

Finally, the comparison of the two subsamples show no significant results in any of the relations. Total compensation shows no relevant significant relation as seen before in this research. Bonus payments show significant results on the pay for performance relation and the pay for luck relation before the crisis, but show no relation during and after the crisis. For asymmetric compensation there appears to be no relevant outcome as well.

Therefore, based on the test using the crisis dummy, bonus payment supports the fourth hypothesis, that there is a lower pay for luck relation in the second period. This could imply that due to stricter corporate governance there is less pay for luck. There appears to be no evidence for the fifth hypothesis, that there is also lower asymmetric compensation in the second period.

Limitations

Limitations of this research are, for example, the lack of data on option grants in the second subsample, which is the period during and after the credit crunch. This withholds results about the influence of the credit crunch on the different relations with option grants.

Another limitation is that this research only uses stock return as a proxy for firm performance. Other estimates of firm performance could be used to investigate the different relations.

Also the method estimating the luck and skill variable have some limitations. In this research, luck and skill are based on the relation between a firm's stock return and the market or industry return. The same discussion as in the academic literature holds here, whether the exogenous factors are indeed the market or industry returns, or should research only focus on core competitors? Garvey and Milbourn (2006) argue that these proxies for skill and luck might be imperfect, so the determination of what part of performance is due to skill and what is due to luck might be incorrect.

The assumption that corporate governance will become stronger and monitoring will be stricter due to the financial crisis is just an assumption and there is no scientific proof for it besides that Bebchuk and Fried (2003) mention that this should happen.

Further research

This research is the first in academic literature that relates the management compensation issues to the recent financial crisis. It relates the role of corporate governance in management compensation to the change in governance during and after a crisis. Future research could be done on the influence of the credit crunch on corporate governance. Also further research is possible on the influence of the financial crisis on management compensation as is done in this paper. Future research could tackle the limitations from this research and generate more reliable results.

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