

SECTION 2

MANAGEMENT IN FIRMS AND ORGANIZATIONS

A Significant Interrelation between Balance Sheet Manipulation and Stock Option Remuneration. An Empirical Study of US Companies

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Abstract

The extent of stock option remuneration for executives has been strongly criticized due to numerous cases of balance sheet manipulation in the USA. The (complete) incentive compatibility of executive remuneration using stock options to the market value of the company is still a controversy. This paper contributes to the criticism with a comparison between executive remuneration in companies that have manipulated their balance sheets and a control group. As a result, CEOs of companies manipulating their balance sheets in the sample received (in absolute and relative terms) significantly more stock options than in the selected control group. When controlling for age, size, and risk as potentially confounding factors, a strong interrelation with absolute amount of stock option remuneration remains, while the interrelation to the relative amount can largely be explained by the confounding factors. Furthermore, fixed salaries tended to be lower in manipulating companies.

Key words: Balance sheet manipulation, stock options, executive remuneration, incentive systems, corporate governance.

JEL classification: G34, M52.

Introduction

“Rather than aligning the interests of executives and investors as promised, CEO pay packages – bloated by stock options – led to ever more aggressive accounting techniques, making many company’s earnings statements works of fiction masquerading as fact. [...] The single most powerful link between excessive CEO pay, inflated corporate earnings and the current crisis in corporate governance is the skyrocketing rise in stock option grants given to CEOs” (Klinger et al., 2002, p. 3 and 7).

This quote summarises the strong criticism of executive stock options for their potential to create incentives for balance sheet manipulation, excessive risk taking and a (short-term) fixation on stock prices (Hall and Murphy, 2003). The recent accounting scandals such as Enron, WorldCom, Qwest among others seem to legitimate this criticism.

Despite this strongly and frequently criticised link between executive stock options and earnings manipulation, few empirical research has been undertaken to provide evidence to this assumption. Thus, in this paper we contribute to the first steps in this direction. As such, we compare CEO compensation of companies that strongly manipulated their balance sheets with companies that did not.

The results largely confirm our hypothesis: CEO’s of manipulating companies receive a significantly higher amount of stock option (in US\$ and percentage of total compensation) than CEO’s in non-manipulating companies. When conducting a discriminant analysis and a logistic regression including confounding factors (industry, age, size and beta of company), we find that

stock options in US\$ in combination with company age explain most of the variance whereas stock options in percent of total compensation do not contribute strongly to the explained variance.

Literature Review

In this study we examine the relationship between CEO compensation (in particular, stock options) and manipulation of earnings. The literature does not provide a clear definition on balance sheet or earnings management / manipulation. While earnings *management* is concerned with accounting procedures within the generally accepted accounting principles (GAAP), *manipulation* involves illegal measures. In this study we follow Dechow et al. (1996) and define both accounting procedures within and outside GAAP as a necessary condition for manipulation. Hence, firms that have been selected for the sample of manipulating companies used both legal and illegal reporting practices in order to deceive the shareholders and stakeholders.

The basic assumption for this paper is the underlying principal-agent problem between managers and shareholders (Jensen and Meckling 1976). Although stock options are intended to address this problem by aligning the interests of managers and shareholders, an unintended effect of stock options might motivate managers to manipulate balance sheets in order to influence the stock price. Stock option possesses a convex and asymmetrical compensation structure in which the value of the option can never be negative regardless the share price. In the following section both managers' motivation for manipulation triggered by stock options and their ability to manipulate are examined with regards to the relevant literature.

Motivation to manipulate earnings

The literature on earnings manipulation and executive compensation largely examines the hypothesis if bonus contracts based on earnings motivate managers to manipulate. As such Healy (1985) provides evidence that managers adjust accruals in a way that maximises their bonus payments and that changes in accounting procedures are linked to changes of executive bonus plans. Similarly, Holthausen et al. (1995b) investigate the extent to which executives manipulate earnings to maximize the present value of their bonus payments and find (partly) evidence consistent with Healy's (1985) outcomes. Dechow and Sloan (1991) show that executives tend to reduce R&D expenditure as they near retirement in order to maximize their bonus based on accounting earnings. Finally, DeFusco et al. (1990) provide evidence that executive stock option plans set asymmetric payoffs that motivate managers to opt for more risky decisions. Further studies research and enhance the evidence between executive compensation and earnings management or manipulation. (e.g., Barber et al., 1998; Bushman and Indejejkian, 1993; Dechow and Sloan, 1991; Dechow et al., 1996; Holthausen et al., 1995a). Hence, a large body of literature suggests that executive compensation sets incentives for earnings manipulation (both within and outside the boundaries of GAAP).

However, the link between executive stock options and manipulation seems not to have been examined in depth hitherto. On the contrary, stock-based compensation for executives has been suggested by both scholars and practitioners as a means to solve the problem of earnings manipulation. Healy (1985), for example, concludes his study with the following question: "Why do bonus contracts reward managers on the basis of earnings, rather than stock price?" (p. 106). The basic idea is that stock-based compensation seems to be more immune to manipulation because the stock price – in theory – is based on all publicly available information and represents the market's estimate of the firm's current and future cash flow. Thus, it is assumed that the stock price is less susceptible to manipulation than accounting earnings as managers should not be able to take advantage of private information (Hall and Murphy, 2003). Therefore, executive stock options have been suggested to reduce the agency conflict between managers and shareholders.

However, as Hall and Murphy (2003) assert, the incentives provided by stock options have been strongly criticised in the light of the recent accounting scandals such as Enron, World-Com etc. From 1992 to 2000 the value of average real pay for S&P 500 CEOs increased from \$3.5 million to \$14.7 million largely due to stock options which rose from an average of \$800,000 to \$7.2 in the same time frame (Hall and Murphy, 2003).

The authors state that “in recent accounting scandals, some executives allegedly boosted stock prices by reporting fraudulently higher earnings” (p. 50). Thus, executives seemed to have used the private information that the actual accounting data were misleading in order to exploit the incentives provided by stock options (Hall and Murphy, 2003).

To conclude, executives could in general possess a motivation to manipulate accounting earnings in order to increase their compensation. In addition, this does not only hold for earnings-based compensation plans but an equally strong if not a stronger motivation might stem from stock-price compensation, especially given their increasing popularity in the recent decade.

However, the question might be posed if executives have the ability to influence the stock price and extract the payments accordingly from their compensation plans.

Ability to manipulate earnings and stock price

Multiple studies show that managers have an influence on the reporting procedures of accounting earnings (Baber et al., 1998; Bushman and Indejikian, 1993; Carpenter and Remmers, 2001; Dechow and Sloan, 1991; Dechow et al., 1996; Holthausen et al., 1995a; Jensen and Murphy, 1990; Kim and Schroeder, 1990; Lewellen et al., 1995; Sloan, 1993; Sloan, 2001; Yermack, 1997). Although executives are not able to influence the stock price directly, they seem to have influence on the signals their company is sending out to the financial community, in particular accounting earnings. Fuller and Jensen (2002) state that CEOs have been driven more and more by analysts' earnings forecasts and “as stock options became an increasing part of executive compensation [...] the preservation or enhancement of short-term stock prices became a personal (and damaging) priority for many CEOs and CFOs” (p. 42).

In addition, executives seem to possess timing ability regarding the exercise of their stock options so that managers actually are able to take advantage of a short-term increase in stock price (Carpenter and Remmers, 2001; Nofsinger and Kenneth, 2003). In particular the study of Carpenter and Remmers (2001) shows that executives exercised stock options in times of favourable price performance. Although stock options have been suggested as a long-term incentive, the majority of option plans in practice have some “puzzling” features such as non-indexed options, at the money options and “managers' broad freedom to unwind incentives and to choose the time of such unwinding” (p. 795) etc. that actually allow the executive to exploit their compensation contract (Bebchuk et al., 2002). Labelled as the “managerial power approach”, Bebchuk, Fried and Walker (2002) argue that executives have a significant power to influence their own pay package in a way that is advantageous for them but provides suboptimal incentives regarding shareholder value.

In the studies mentioned above evidence is provided that executive potentially possesses both the motivation and the ability to manipulate some aspects of the firm's reporting procedures in order to increase stock-based compensation. As such, the incentive to manipulate earnings grows with the amount of stock options awarded to the CEO. Therefore, we hypothesise that:

Hypothesis 1: The mean, absolute value (in US\$) of CEO remuneration through stock options is greater for companies that have manipulated their balance sheet than in a control group.

In addition, the incentive to manipulate might be moderated by the other remuneration components such as fixed salary, restricted stock awards and bonus payments. Thus, we hypothesise that:

Hypothesis 2: The mean (relative) part (in %) of stock options in overall CEO remuneration is greater for companies that have manipulated their balance sheet than in a control group.

Discussion of potentially confounding factors in the literature

The incentives for earnings manipulations, in particular in the recent accounting scandals, seem to be a complex combination of factors. In this paper we aim at researching the contribution of stock options to this phenomenon. However, in order to test for the most common confounding factors, we include size, age, risk and industry of the firm into the latter part of the analysis.

As such, CEO compensation is higher in larger firms than in small or medium-sized ones (e.g., Garen, 1994; Zhou, 2000). Therefore firm size might have an effect on the amount of stock

options awarded to CEOs. Habib and Ljungqvist (2003) find that in particular medium sized companies award too many stock options in terms of incentive efficiency. Similarly, Carpenter and Remmers (2001) control for firm size effects. In general, the impact of firm size on the results is expected to be small because all firms in both samples are large US companies¹.

In order to include the risk of the company we also control for the effects of the companies' beta (Garen, 1994). Finally, the sample is adjusted in order to control for industry biases. For example, certain industries classified as New Economy might be in general more favourable in terms of awarding executive stock option than more conservative industries (Garen, 1994; Hall and Murphy, 2003).

In addition, we also control for the effects of company age, because from appearance one might expect that the recent scandals tend to involve companies that are comparatively young or have been at the stock market for a shorter period of time.

Empirical Examination

Sample Selection

To test our hypotheses, we compare two samples. The first sample was built according to the concentration method and consists of US S&P 500 companies that strongly manipulated their earnings (in the following referred to as U_B). Initially this sample consisted of 27 companies suspected of various degrees of balance sheet tampering that were selected from press reports between 2000 and 2002. From this larger sample, those firms were selected for U_B which fulfilled the following four criteria to assure sufficient evidence for a manipulation of a considerable scope (Appendix 1).

Criteria for the existence of balance sheet manipulation:

1. Official investigations of the company have been conducted by the US stock exchange regulator SEC, public prosecutors, or the FBI
2. Management admitted to the manipulation or it was proved in official investigations.

Criteria for the existence of severe degree of manipulation:

1. The market value of the stock dropped at least 30% after the publication of the suspicion of manipulation.
2. The manipulated amount equals at least 30% of the company's published revenues.

From the initial sample eight companies fulfil these criteria. U_B consists of: the pharmaceuticals corporation Bristol-Myers Squibb, energy traders Enron und Dynegy, communications corporations WorldCom and Qwest, fibre-optic networker Global Crossing, the conglomerate Tyco and office equipment company Xerox. Hence, it can be assured that all companies in these sample conducted severe earnings manipulations. The four criteria are a comparatively strict measures for acceptance into group U_B : The legitimacy of extending the random sample by means of loosening up the criteria is basically a matter of choice.

The control group (in the following referred to U_K) consists of comparable companies, namely those listed in the Dow Jones Industrial Average. The group was adjusted by three companies suspected of manipulation (Nofsinger and Kenneth, 2003, p. 113; Schiessl, 2002)^{2, 3}. The intention of using all non-suspicious values from S&P 500-Index was not implementable and would have possibly induced difficulties with strongly deviating company sizes between the two groups.

¹ We decided to use number of employees instead of assets or sales like often employed in other studies to better account for structural biases of different industries in both groups.

² These companies are Citigroup, J.P. Morgan Chase, and Merck.

³ We cannot know with certainty that none of the remaining companies in U_K has manipulated earnings so far undetected. However, this fact is not a statistical difficulty: such control groups with censored group indicators are often used for statistic assertions on one randomly observable characteristic that appears in a rather small part of the population. U_B having a known group indicators is compared to control group U_K in which the characteristic of manipulation can be expected in the (maximum) same frequency as in the general population. The main effect is a lower theoretical significances than in cases in which the characteristics are observable.

The evaluation of remuneration components

For reasons of comparability, for instance differing sizes of executive boards, this investigation is restricted to the earnings of CEOs. Remuneration data for US CEOs and board members must be published in its entirety according to "Regulation S-K- (Item402) Executive Compensation" as a proxy to balance sheet ("DEF 14A - Proxy").

Six remuneration components are shown for every year: fixed salary, bonuses, restricted stock awards, options / SARs, other annual compensation and all other compensation (Herz et al., 1997, p. 1172)¹. This investigation neglects the last two components because their composition is unclear and partly heterogeneous. In addition, both components are by far the smallest in terms of value. Both samples will be compared regarding the four main components regarding US\$ and as a percentage of total remuneration for the years 1998 and 2001 so that 32 observations for U_B and 108 for U_K are available for each component. Fixed salary, bonuses and restricted stock awards are already stated in US\$ in the proxy statements. The evaluation of stock options, however, is more complicated because only the number of options and the strike price are shown which usually corresponds to the share price on the day of granting (e.g., Murphy, 1999). In general, the option has a ten-year term of validity and it entitles to the purchase of one stock. In the observed companies this was the case in principle.

Evaluating the stock option component from the CEOs' perspective is not an easy task, since "there is no accepted methodology, and little research, on estimating the value of a stock option to an executive-recipient" (Murphy, 1999, p. 2513). This holds true for the Black/Scholes-model that is close to standard when evaluating from a corporate finance perspective: First, the literature discusses systematic problems regarding the evaluation of long-term executive stock options using Black/Scholes, i.e., payment of dividends is not included, and options are not transferable (e.g., Lewellen et al., 1987; Lewellen et al., 1995; Murphy, 1999; Noreen and Wolfson, 1981). Second, when it comes to evaluating the stock options from an individual agent's perspective as in this paper, a large number of factors such as individual risk aversion, wealth, finance portfolio's diversification, the share price and the likelihood that he or she will stay with the company do in principle matter (Murphy 1999, p. 2509). Neither Black/Scholes nor any other method can take these factors into account, hence there is no compelling standard for our task to rely on (Lewellen et al., 1995, p. 636).

Besides these principal issues, Black/Scholes has high degrees of freedom due to the many parameters used, especially when it comes to risk and volatility, and its dependency on these parameters is delicate. And of course, high degrees of freedom are susceptible to criticism in the context of statistical testing.

The majority of companies use a simpler method for reporting the option values in their proxy statements: the price appreciation method (Elloumi and Gueyie, 2001; Gaver and Gaver, 1995; Kramarsch, 2000, p. 86)². While sharing imprecisions of the Black/Scholes-model, it has two advantages in direct comparison for evaluating CEO stock options: First, it serves as a natural anchor for the CEOs' personal evaluation by the mere fact that it is used in the companies' proxy statements. Second, its simplicity and the few parameters involved lead to low degrees of freedom in evaluation. In addition, recent results indicate that there will not be much of a difference in the average evaluation of stock options between price appreciation and Black/Scholes: Price appreciation and similar models using intrinsic value of stock options in a proper way explain about 92% of variance from empirical data while Black/Scholes achieves about 98% (Figlewski, 2002). Thus, we would on average only gain a little theoretical precision using Black/Scholes, at the same time loosing significantly due to more degrees of freedom and less robustness. Both the works of Elloumi and Gueyie (2001) and Gaver and Gaver (1995) opt for. The main downside remaining is

¹ The annual reports are not quoted in further detail. They can be looked up on the Internet "SEC-Filings", for instance, at www.hoovers.com. SARs ("stock appreciation rights") certify the right of stock purchase, as "virtual stock options" without diluting the stock price.

² Until 1995 price appreciation also was the most commonly used method among stock market listed US-companies even in corporate finance settings, see also Kramarsch (2000, p. 86) for a portrayal of the model. Elloumi and Gueyie (2001) as well as Gaver and Gaver (1995) opt also for this simpler version to calculate the value of the stock options drawing on the consulting company Mercer, which justifies and uses this approach.

that risk considerations are not specific to the single company. Looking at the evaluation of an option on a riskier stock compared to that of a safer (less volatile) one, Black/Scholes will make the riskier option look more favourable than does the price appreciation method, since the Black/Scholes formula is well known to appreciate risk of an underlying (volatility) (Hull, 2003)¹. Thus, using price appreciation instead of Black/Scholes will make options on riskier stocks look less attractive in comparison to safer ones. As we will see and might already expect, the average risk is higher in sample U_B (manipulation) than in the control group U_K (no manipulation)², leaving us on the safer side with price appreciation for our statistical purpose.

The method calculates the inner value (W_n) of the option for the purchase of X shares for the basic price (B) at the end of the duration (n years), under the assumption of an average, annual share price increase (s) of the share value at the time of issuance (K_0):

$$W_n = X \cdot (K_0 (1 + s)^n - B). \quad (1)$$

For $B = K_0$ as for the stock options in question, this equals the exact appreciation value of the share in the duration if the average stock price increases with s every year. The inner value W_n will then be discounted by the average capital cost k of the company, the investors' required rate of return as a risk-adequate interest rate. Consequently, the value of option W_0 at issue date is generally obtained as:

$$W_0 = W_n / (1 + k)^n = [X \cdot (K_0 (1 + s)^n - B)] / (1 + k)^n \quad (2)$$

In our case, (2) with $B = K_0$, $n = 10$, and $X = 1$ (see above) reduces to

$$W_0 = K_0 \cdot [(1+s)^{10} - 1] / [(1+k)^{10}]. \quad (3)$$

It becomes clear that the selection of the same pair ($s;k$) of average annual price increase and average capital costs for all companies results in the same, common multiple of the stock price at the issue date as value per option. In other words: *If one changes factors s and k , then all the (absolute) option evaluations for all companies change by the same factor respectively.* As long as one abides by the identical, i.e. homogeneous, values for s and k in all the companies, then meaningful statistical methods for the examination of mean value localisation of absolute remuneration through stock options lead to the exact same result (to identical p-values and significances). This is especially true for the two-sample t-Test and the Mann-Whitney U-Test (or the Wilcoxon Rank Sum Test), that are used in the following. For the amount of absolute remuneration according to hypothesis 1, the concrete selection of s and k is thus irrelevant for the statistical assertion³.

Regardless of the evaluation method, a difficulty is the fact that the option value is also dependent on the dividend payments since the stock option programmes (all) are not dividend-adjusted. Basically higher dividend payout leads to a lower appreciation of the stocks and as a consequence lower option values⁴. A differentiated consideration of dividends per company is difficult as past dividend policy is not a reliable indicator for future dividend behaviour.

If the options are evaluated by means of the price appreciation model, then the result for the tests of absolute remunerations (hypothesis 1) would only have an impact in the case of different dividend payments in U_B and U_K (see the above specifications on the irrelevance of the peculiarities of s and k). A two-sample t-test shows that there is no systematic difference of the mean dividend yield between both samples during the years in question. On the contrary, the p-value of 0.54 under the null hypothesis of same mean values indicates no clear and systematic tendencies in the

¹ See Hull (2003, p. 316). It is well known that Vega, the partial derivative of the Black/Scholes price for the option with respect to the underlyings volatility, is strictly greater than 0, i.e., the option price is strictly increasing in volatility according to the Black/Scholes formula all other things being equal.

² For U_B the average volatility is between 0.56 and 0.60 even when excluding Enron, depending on the year under analysis. Similarly, the average volatility for the control group U_K is between 0.35 and 0.40, and including Enron increases this difference. In the years of interest, average Beta in U_B is 1.48 compared to 0.96 in U_K .

³ For the relative remuneration according to hypothesis 2, an (although, as it proves, very small) influence of the concrete values results from the fact that in the change of s and k the share of the overall remuneration varies slightly between the companies because the other remuneration components remain constant. In the following the two scenarios ($s = 0.10$; $k = 0.07$) and ($s = k = 0.07$) will be tested to aim for a certain robustness when it comes to relative remuneration.

⁴ s is interpreted as an average stock price increase after dividend payment.

mean dividend behaviour between the samples¹.

Results of the investigation

First, hypotheses 1 and 2 will be examined statistically for significant differences. To assure that the results are no artefacts of interrelations with other factors, we then control for four possible confounding factors: industry sector, age, and size of the respective companies as well as the (systematic) risk of their market capitalization. Finally, we conduct further analysis of the remaining remuneration components to explore other potential interesting interrelations.

Results for the hypotheses on interrelation using single factors

In order to test our hypotheses, we first conduct a one-sided, two-sample t-test on assuming (at least approximate) normal distribution without identical variations of the random variables "stock options in US\$" and "stock options in % of total compensation". The results of the often very robust two-sample t-test are an interesting indication even in the case of a possible violation of the normal distribution assumption. Secondly, the distribution-free, one-sided Mann-Whitney U-Test (or the equivalent Wilcoxon Rank Sum Test) is used. This test merely uses the ranking order of the test sizes in the groups². We define p-values of 1% as "*highly significant*" and 5% as "*simply significant*" in the following.

On hypothesis 1 – value of the absolute stock option remuneration:

Null hypothesis H_1 states that the mean value of stock option in the manipulation sample at most equals amount of the control group ($SO_B^S \leq SO_K^S$). Our results in both tests show that H_1 can be rejected with high significance in favour of the alternative hypothesis K_1 (p-values: 0.006 for the t-Test and 0.001 for the U-Test). Table 1 shows the test results for the exemplary scenario $s = 0.10$ and $k = 0.07$.

Table 1

Test values for hypothesis 1

Hyp.	Null hypothesis H	Alternative hypothesis K	Mean (in mill. US\$)		p-values		Result
			U_B	U_K	t-Test	U-Test	
1	$SO_B^S \leq SO_K^S$	$SO_B^S > SO_K^S$	55.9	22.3	0.006	0.001	<i>highly significant</i>

From the results for the sample under the stated conditions, one can assume that the mean stock option remuneration in the group of companies tampering with balance sheets exceeds that of the control group in terms of value.

On hypothesis 2 – (relative) share of stock options in remuneration:

Since p-values and significances can depend on parameters s and k when assessing the relative remuneration, tests are conducted for a more conservative second scenario 2: $s = k = 0.07$. Our results show that for both scenarios the null hypothesis H_2 ($SO_B^{\%} \leq SO_K^{\%}$) can be rejected in favour of the alternative hypothesis K_2 that postulates a reverse interrelation ($SO_B^{\%} > SO_K^{\%}$).

Hence, the variation of parameters within reasonable limits has only a slight impact on the p-values and significances. The results seem to be robust also when acknowledging the potential

¹ The mean dividend yield is 1.3% in U_B and 1.6% in U_K , and without assumption of identical variants, a two-sided, two-sample t-test results in the mentioned p-value that does not even indicate a tendency. In terms of systematic considerations, this cannot of course be proof of the equality of both mean values. All statistical evaluations in this paper were carried out with SPSS. Consideration of validity for the relative remuneration (hypothesis 2) follows in the discussion of the results.

² Systematic violations of the independence assumption cannot be identified or recognized within the data, so stochastic independence of the samples is assumed.

impact of dividend yield in both samples¹. Table 2 shows the test results for both scenarios ($s = 0.10$; $k = 0.07$) and ($s = k = 0.07$).

As a result, one can assume for the existing sample under the named conditions that on average a higher percentage of CEO remuneration is paid in the form of stock options in those companies manipulating balance sheets.

Table 2

Test results for hypothesis 2
Scenarios 1 ($s = 0.10$; $k = 0.07$) and 2 ($s = k = 0.07$)²

Hyp.	Null hypothesis H	Alternative hypothesis K	Mean (in %)		p-Values		Result
			U _B	U _K	t-Test	U-Test	
Scenario 1: $s = 0.10$; $k = 0.07$							
2	$SO^{\%}_B \leq SO^{\%}_K$	$SO^{\%}_B > SO^{\%}_K$	76.1	63.2	0.009	0.037	simply significant
Scenario 2: $s = k = 0.07$							
2	$SO^{\%}_B \leq SO^{\%}_K$	$SO^{\%}_B > SO^{\%}_K$	69.1	56.7	0.012	0.037	simply significant

Controlling the hypotheses' results for confounding factors

Controlling for the industry sector as a confounding factor

One could argue that stock option remuneration is more popular in those industries in which accounting scandals are more prevalent. Consequently, the statistical results of the previous tests could be an artefact of the industry sector.

To control for this possible bias, we restrict the control group U_K to companies from those sectors that build U_B. Companies in U_B can be assigned to five industries while U_K firms stem from nine different sectors. Hence, we adjust the control group for the industry sector. The new control group is called U_{K*} and the corresponding hypotheses are referred to as hypothesis 1* (absolute amount in US\$, U_B vs. U_{K*}) and hypothesis 2* (relative amount in %, U_B vs. U_{K*}). Hypothesis 2* is again tested for the exemplary scenario $s = 0.10$ and $k = 0.07$ and for $s = k = 0.07$.

Table 3

Test results for sector bias
Hypothesis 1* (scenario 1, $s=0.10$; $k=0.07$) and
hypothesis 2* (scenarios 1, $s=0.10$; $k = 0.07$, and 2, $s=k=0.07$)

Hyp.	Null hypothesis H*	Alternative hypothesis K*	Mean (in %)		p-Values		Result
			U _B	U _K	t-Test	U-Test	
<i>value of absolute stock option remuneration</i>							
1*	$SO^{\$}_B \leq SO^{\$}_K$	$SO^{\$}_B > SO^{\$}_K$	55.9	22.7	0.007	0.002	highly significant
<i>(relative) share of stock options in remuneration</i>							
Scenario 1: $s = 0.10$; $k = 0.07$							
2*	$SO^{\%}_B \leq SO^{\%}_K$	$SO^{\%}_B > SO^{\%}_K$	76.1	57.1	0.002	0.008	highly significant
Scenario 2: $s = k = 0.07$							
2*	$SO^{\%}_B \leq SO^{\%}_K$	$SO^{\%}_B > SO^{\%}_K$	69.1	50.8	0.002	0.008	highly significant

¹ The alleged robustness is found in the evaluation according to the price appreciation model compared with a uniform change of the mean dividend yield for the overall sample, which affects the average stock price increase s after dividend payment. There are no indications for a systematic difference of dividend yields between both groups during the time periods in question.

² The means of absolute values and relative shares only seem to be inconsistent. This results from the fact that they deal with a four-year average referring to different bases.

Again, the modified null hypothesis H_{1*} can be rejected with high significance (p-values: 0.007 for the t-Test and 0.002 for the U-Test) with both test methods. Similarly H_{2*} can be rejected highly significantly in both tests (see Table 3). *In consequence, there is no indication that the previous results are attributable to the industry sector.*

Controlling for age, size, and risk as confounding factors

It is natural to expect interrelations between balance sheet manipulation and other factors. As stated above, especially size and market capitalization risk of a company have been named in the literature and will be taken into account. Additionally, we control for company age. One might suspect that the statistical results seen so far might be an artefact of common interrelations with these confounding factors. In that case, most of the direct interrelation between stock option remuneration and balance sheet manipulation could be explained by taking these potentially confounding factors into account¹.

Analysing correlations between the amount of stock option remuneration and these factors gives some indication towards a connection, although with only rare cases of statistical significance. Table 4 shows the correlations of the average absolute and relative stock option remuneration (1998 to 2001) with the companies' (systematic) risk, measured as the average annual beta of their market capitalization in the years under analysis, their size in average thousand employees during that same period, and their age in years from IPO until 2001. The strongest correlations that at the same time do not equal zero with some statistical significance occur first between option value in % and company size and second between option value in US\$ and risk.

Table 4

Pearson's correlation between stock option remuneration (scenario 1) and risk, size and age in U_B and U_K (two-tailed)

	risk (avg. beta)		size (in 1000 empl.)		age (IPO until 2001)	
	corr.	sign \neq 0 (p)	corr.	sign \neq 0 (p)	corr.	sign \neq 0 (p)
Option value in US\$	0.30	0.083	-0.20	0.250	-0.24	0.171
Option value in %	0,05	0.757	-0.48	0.004	0.14	0.436

When controlling for multiple confounding factors, a common tool is a multivariate (linear) regression. However, because our dependent variable (manipulation; no manipulation), is dichotomous, standard regression is not applicable. Instead we use two approaches of multivariate analysis that allow for the dependent variable to be binary (0/1): discriminant analysis and binary logit regression².

Discriminant analysis looks for a linear function of the dependent variables that classifies the set of all data records into two groups (manipulation, no manipulation) depending on whether the function exceeds a certain threshold. In a perfect match, it would divide the data records exactly into U_B and U_K . The analysis is conducted using five independent variables: absolute and relative value of stock option remuneration, risk, size and age as defined previously. It is standard to measure the goodness of the classification by two related parameters, Wilk's λ and the canonical correlation (similar to R^2 in regression). A lower value for Wilk's λ corresponds to higher goodness.

At first, we look for the goodness of classification for every single factor. We find that the value of stock options in US\$ has the best goodness, followed by age, risk, size, and finally value

¹ All analyses on age, risk, and size rely on the usual assumptions of distributions, although these assumptions are not in all cases easily justified. For Pearson's correlation and discriminant analysis, these are the assumptions that allow for applying ordinary least squares-analyses (e.g. normal distribution is sufficient). For the binary logit regression, estimation is as usual done by maximising log-likelihoods, the SPSS standard procedure.

² A third possibility is to do a multiple regression with stock option remuneration as independent variable that uses balance sheet manipulation as a dichotomous dummy variable. This is not pursued further because explaining the amount of stock option remuneration is not the research question we focus on here.

of options in % (Table 5). Remarkably, if we do a stepwise discriminant analysis, only allowing for those variables to be included that add most to the overall goodness (similar to stepwise regression analysis), the solution of that optimization procedure is a set of two variables: value of options in US\$ and age¹.

Table 5

Goodness of classification from discriminant analysis for single factors and stepwise, measured in Wilk's lambda and canonical correlation

	Option value in US\$	Option value in %	risk	size	age	Stepwise: option value in US\$ & age
Wilk's λ	0.77	0.96	0.84	0.94	0.79	0.65
Canonical correlation	0.48	0.21	0.40	0.26	0.46	0.59

Altogether discriminant analysis shows that all five variables do have a certain classifying power for balance sheet manipulation like we expected. When testing the significant interrelation between stock option remuneration and balance sheet manipulation, we arrive at three important conclusions: First, the classifying power of the absolute option value in US\$ is the highest among all factors under analysis, second the classifying power of its relative share in % is the lowest among them. Third and most important, the best linear classification by stepwise discriminant analysis is achieved using absolute option value in US\$ and age. Notably these two variables are not strongly correlated (see Table 5), thus together they explain different parts of balance sheet manipulation as the dependent variable's variety.

Besides discriminant analysis, we conduct precisely the same set of analyses using binary logit regression with the five factors above and the logit of balance sheet manipulation as the dependent variable. Again we use a regression for the five isolated factors first and then stepwise including all five factors². In binary logit regression the goodness is as usually measured by Cox & Snell R^2 and by Nagelkerke R^2 .

In conclusion, the results support the findings from discriminant analysis. As a single factor, the absolute value of options in US\$ is relatively important, although for the logit analysis the age is a little more instructive, and size stays about the same. Similarly, the relative value of options in % reaches the least goodness among the factors. Most important again, stepwise logit regression takes absolute value of options in US\$ and the age of the company as independent variables to explain the logit of balance sheet manipulation (Table 6).

Table 6

Goodness of binary logit regression for single factors and stepwise, measured in Cox & Snell R^2 and Nagelkerke R^2

	Option value in US\$	Option value in %	risk	size	age	Stepwise: option value in US\$ & age
Cox & Snell R^2	0.20	0.05	0.14	0.20	0.23	0.32
Nagelkerke R^2	0.30	0.08	0.21	0.31	0.35	0.49

The analyses of risk, size, and age as potentially confounding factors lead to a clear result: Of course, stock option remuneration is not the only factor that interrelates with balance sheet manipulation. When assessing risk, size, and age as potentially confounding, there remains a notably strong interrelation between balance sheet manipulation and absolute value of stock option remuneration.

¹ The criterion for the stepwise procedure is improvement in Wilk's λ .

² Stepwise analysis is done forward. Conditional procedure and likelihood ratio have both been tested using SPSS and lead to precisely the same result.

neration in US\$ that otherwise cannot be explained directly. *Thus the interrelation is supported for the absolute amount of executive stock options.* For stock options in % of total remuneration the interrelation we found earlier is put into perspective by the three other factors: its goodness and classifying power is inferior, and it does not seem to add significantly to our understanding when combined with potentially confounding factors.

Results of the explorative analysis of other remuneration components

In the following we summarise the results of an explorative examination of the absolute and relative values of the remaining remuneration. The t-test indicates that there is no statistic significance for bonus payments and restricted stock awards.

However, there are several interesting and significant assertions for the fixed salary component, so that again, t-tests and U-tests are conducted and once again both scenarios are calculated for the (relative) remuneration components. The two-sided null hypothesis $H_3 (F_B^S = F_K^S)$ that the absolute value of the fixed remuneration is equal in both groups can be rejected highly significantly with the t-test in favour of the alternative $K_3 (F_B^S \neq F_K^S)$, which postulates a difference between both values. For the U-test there is no significance, but instead only a confirmation of the general tendency. Both methods thus reach a qualitatively different result. The corresponding hypothesis for the (relative) share of fixed salary, $H_4: F_B^{\%} = F_K^{\%}$, can be rejected in favour of $K_4: F_B^{\%} \neq F_K^{\%}$ with at least simple significance. In reverse, the significances here in the U-test are higher than the t-test. Table 7 illustrates the results.

In the sample there is thus a tendency under the stated conditions towards lower fixed salaries in companies manipulating balance sheets compared to the control group on average. For the relative share of remuneration, this result is simply significant, while for the absolute remuneration there is no clear significance.

Table 7

Test results for hypotheses 3 and 4
Scenarios 1 ($s = 0.10$; $k = 0.07$) and 2 ($s = k = 0.07$)

Hyp.	Null hypothesis H	Alternative hypothesis K	Mean Value		p-values		Result
			U_B	U_K	t-Test	U-Test	
3	$F_B^S = F_K^S$	$F_B^S \neq F_K^S$	\$ 1.07 million	\$ 1.30 million	0.006	0.132	<i>not significant (tendency)</i>
<i>Scenario 1: $s = 0.10$; $k = 0.07$</i>			7.2%	13.9%	0.017	0.001	<i>simply significant</i>
4	$F_B^{\%} = F_K^{\%}$	$F_B^{\%} \neq F_K^{\%}$					
<i>Scenario 2: $s = k = 0.07$</i>			9.0%	16.1%	0.014	0.001	<i>simply significant</i>
4	$F_B^{\%} = F_K^{\%}$	$F_B^{\%} \neq F_K^{\%}$					

The result is only partially an outcome of the reciprocal assertion for remuneration components in stock options, since the other remuneration components, bonuses and restricted stock awards, also contribute to the compensation of the higher ratio of stock options. The resulting pattern of a lower fixed salary in U_B compared to U_K is not easily explained with standard arguments from risk aversion and the managers' utility functions¹. The attempt to clarify the matter more precisely, perhaps when also drawing on non-financial aspects as well, is not adequately supported by the available information. It would therefore have to be referred to as speculative.

¹ In consequence and all other things being equal, one would have to make the unusual assumption of increasing absolute risk aversion of the average manager to explain this result, since the act of manipulating is a risky one.

Interpretation of the results and résumé

The investigation confirms a positive, statistically significant interrelation between balance sheet manipulation and stock option remuneration for CEOs: Overall, for manipulating companies, there are significantly higher absolute values and (relative) parts of stock option remuneration than in the control group. This result is not an artefact of the varying business sectors in both groups. Controlling for age, size, and risk as potentially confounding factors shows that there is indeed a strong interrelation between manipulation and absolute stock option remuneration (in US\$) that cannot otherwise be explained. For the relative amount (in % of total compensation), the interrelation is weaker when testing for confounding factors.

Furthermore, results reveal that the fixed salary for CEOs tends to be lower in manipulating companies. This result is significant when comparing fixed salary as a percentage of total compensation: For the absolute fixed component, the statistical significance of these explorative assertions depends on the selected test method and, more precisely, on the assumption of normal distribution.

Delimiting factors to the generalisability of this study are the selection of samples, the selected time window and further potentially confounding aspects that were not controlled for. Further investigation in this area is needed to substantiate our results.

However, our results indicate what is already frequently asked for and strongly sought after: The need to create adequate incentive systems so that companies and shareholders are more strongly protected from the illegal and damaging threats of balance sheet manipulation by management. A re-examination of current executive stock option plans is necessary, even if tax aspects could be quite upsetting for managers in some countries.

One point should be kept in mind, however. Whatever assessment basis is chosen for performance based remuneration, the implicit threat of manipulation will probably always exist, if ethical or moral standards prove not to be sufficient.

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Appendix 1

Selection criteria for the companies manipulating balance sheets in U_B

Companies	Criteria			
	Investigations	Manipulation Proven	Stock price losses after publication (in %)	Profit manipulation (in %)
Bristol-Myers Squibb	✓	✓	66%	42%
Dynegy	✓	✓	96%	169%
Enron	✓	✓	100%	43%
Global Crossing	✓	✓	100%	79%
Qwest	✓	✓	95%	323%
Tyco	✓	✓	70%	94%
Worldcom	✓	✓	100%	520%
Xerox	✓	✓	51%	94%
Adelphia	✓	✓	100%	N. A.
<i>Citigroup</i>	✓	---	41%	N. A.
CMS Energy	✓	---	56%	N. A.
Computer Associates	✓	✓	23%	30%
ABB	---	---	65%	N. A.
Cendant	✓	---	14%	N. A.
Cisco	---	---	38%	N. A.
Halliburton	✓	---	41%	25%
Imclone	✓	---	88%	N. A.
JDS Uniphase	---	✓	76%	61%
<i>J. P. Morgan Chase</i>	✓	---	42%	N. A.
Kmart	✓	✓	100%	N. A.
McLeod USA	---	---	90%	N. A.
Metromedia Fiber Network	---	✓	N. A.	N. A.
<i>Merck</i>	✓	---	5%	62%
Mirant	✓	---	91%	N. A.
Peregrine	✓	✓	100%	11%
Reliant	✓	✓	87%	10%
Sunbeam	---	---	N. A.	N. A.

The companies in cursive letters (*Citigroup*, *J.P. Morgan Chase* und *Merck*) are companies of the Dow Jones Industrial Average. These three companies were under suspicion of balance sheet manipulation and thus excluded from U_K .