Macroeconomic Fluctuations as a Source of Luck in CEO Compensation

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PRELIMINARY

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Abstract:
Incentive effects of performance-based compensation schemes for management may be weakened or biased by macroeconomic influences on remuneration. We analyze the impact of macroeconomic, industry and firm-specific factors on the compensation of US CEOs 1993-2007. We find that compensation is explained to a substantial extent by macroeconomic factors; less so by unanticipated factors alone. In comparison with an existing study of CEO compensation in Sweden the results indicate that US CEOs' compensation is more sensitive to macroeconomic fluctuations. US CEOs' compensation has a much greater variable component than Swedish CEO compensation. Total compensation of US CEOs is measured both including options awarded and options exercised. The latter measure is less sensitive to macroeconomic fluctuations than the former and the variation in the unanticipated macroeconomic component of compensation including options exercised appears to be smaller. Finally, distinguishing between favorable and unfavorable macroeconomic developments, we ask whether remuneration is more responsive to favorable than to unfavorable developments in performance and macroeconomic variables.

Key words: executive compensation, macroeconomic uncertainty, macroeconomic factors, performance, luck

JEL: L14, L16, M14, M21, M52

1. Introduction

Executive compensation is under scrutiny and there are calls for regulation and "codes of conduct" with respect to levels as well as forms of compensation. Although the level of compensation in Europe remains below that in the US, the level in most European countries have increased rapidly in the new millenium. According to Bång and Waldenström, (2009) the difference between Europe and the US can be explained to a large extent by the larger variable component of executive compensation in the US. The higher variability in the US seems to be associated with a risk-premium. This observation implies that levels and forms of compensation are not independent.

One common view in the current debate is that CEO compensation should be linked to "sustainable" profits that presumably are the result of skill and effort. Regulation seems to be emerging in many countries stating that the reward for improved performance should not be fully realized unless the improved performance is observed for a period of 3-5 years. Increased compensation would be linked to performance surpassing some benchmark for some duration. The argument behind such proposals would be that improved performance is likely to be caused by other factors than executive skill and effort if it does not exceed a benchmark for a minimum duration. The other factors could be earnings management by the executives and some sort of luck.

There are a number of difficulties associated with proposals of the type discussed if they are to provide appropriate incentives for managers. The concern with earnings management can be partly resolved by linking compensation to less manageable variables and by improved accounting standards. The issue of luck is more complicated. One problem is to define a benchmark for performance representing a minimum level that would be achieved without particular skill and effort. A second problem is to determine when and how performance above (below) the benchmark should be rewarded (penalized) for being the result of skill and effort rather than luck. More fundamentally, what changes in performance are caused by luck or bad luck in an environment characterized by a variety of shocks? Even with the benefit of hindsight this question could be hard to answer.

The contracting literature indicates that optimal incentive contracts are achieved by means of some kind of benchmarking for "normal" performance and the linking of

compensation to a performance measure reflecting skill and effort with as little noise as possible.[1]

Analyzing the impact of luck on CEO compensation Bertrand and Mullainathan (2000, 2001) define luck as performance beyond CEO's control. As examples, they consider performance effects of fluctuations in oil prices in the energy sector, the impact of exchange rates in traded goods sectors and changes in performance around year to year changes in mean industry performance. Garvey and Milbourn (2006) use a market index and an industry index as proxies for stock price performance based on luck. In all cases the empirical results indicate that compensation depends strongly on luck. Garvey and Milbourn also find that executives are rewarded (penalized) more for good luck than for bad luck and that this asymmetry can be linked to corporate governance variables.

Accepting the premise from the contracting literature that lucky performance should not be rewarded there is an additional difficulty associated with the measurement of performance outside the control of management. As pointed out by Gopalan, Milbourn and Song (2009) the effect on performance of external shocks beyond management's control can be influenced by management's strategic choices as well as operational decisions in response to external shocks. If so, the incentives of management to take advantage of lucky external events and to dampen the effects of unlucky external events would be removed if compensation is not related to performance effects of lucky circumstances.

The implication of this discussion is that the appropriate definition of lucky performance depends on the nature of shocks and the technological ability to adjust strategy and operations to shocks within a certain time frame. The adjustment of strategy and operations can take the form of investment in flexibility or real options in an environment characterized by high uncertainty about external shocks or adjustment may take the form of switching production and marketing efforts in response to anticipated and even current events. A restaurant business may be able to respond very quickly to lucky events by adding tables while a capital intensive firm may need years to adjust production capacity.

Lack of sustainability of performance also not a good indication of luck in all industries. Macroeconomic fluctuations may be short lived or last several years. The performance of a firm that can respond rapidly to macroeconomic fluctuations depends on skill and effort even in the short run.

[1] Milgrom and Roberts (1992) reviews the contracting literature on incentive effects of compensation schemes.

In this paper we focus on the macroeconomic environment as a major source of changes in performance beyond management's control. Macroeconomic fluctuations affect almost all aspects of corporate performance but they cannot be influenced by management. However, as noted, the effect of macroeconomic fluctuations on corporate performance can be influenced by management if macroeconomic conditions can be forecast and operations can be adjusted within the period it is possible to obtain macroeconomic forecast. For this reason we distinguish between anticipated and unanticipated macroeconomic conditions. Depending on firm-specific conditions, performance beyond management control may be explained either by all macroeconomic fluctuations or only by unanticipated fluctuations.

Oxelheim, Wihlborg and Zhang (2008) show that 60 percent of the increase in CEO compensation in Sweden during the period 2001-2007 can be explained by changes in macroeconomic factors represented by interest rates, exchange rate changes and inflation. Changes in these variables are viewed as indicators of underlying macroeconomic events. The variation in CEO compensation from year to year is also dominated by macroeconomic developments. Unanticipated macroeconomic events play a less dominating role in explaining changes in CEO compensation in Sweden but they are far from unimportant. The impact of unanticipated macro-factors on Swedish CEOs' year to year changes in compensation range from and -4 percent to +10 percent during the period. These changes represent a large share of changes in bonus payments. There are also indications that the impact of macro-factors is asymmetric through their impact on performance in the sense that compensation is affected more strongly by positive developments than by negative developments.

The objective of this paper is to analyze the role of macroeconomic factors in CEO compensation in the US furing the period 1992-2008. As Figure 1 shows a very large share of executive compensation in the US is performance based. Cash compensation in the form of salary plus bonus constitutes 15-20 percent of total CEO compensation. In Sweden the proportions are reversed with 75-80 percent of the compensation in the form of salary plus bonus, and more than 50 percent as salary. We ask whether these differences in compensation structure are associated with different sensitivities to macroeconomic events.

After estimating elasticities of compensation to macroeconomic factors we ask how CEO compensation would have developed had macroeconomic influences on compensation been filtered out each year. We also distinguish between anticipated and unanticipated macroeconomic fluctuations to see how CEO compensation had developed if only unanticipated macroeconomic influences were filtered out from compensation. Third, we ask whether there is an asymmetric impact on remuneration any particular year in the sense that

remuneration is particularly sensitive to favorable developments in variables affecting performance. The interest in asymmetry arises because it may be reflect "skimming" of shareholders in the words of Bertrand and Mullainathan (2001) and because asymmetry affects incentives for risk management with respect to variables affecting compensation.

Compensation is typically not linked in a simple way to one well-defined performance measure. Macroeconomic effects on compensation can occur through a number of channels depending on what aspects of performance affect salaries, bonus and other forms of CEO compensation. Therefore, we focus on the decomposition of compensation into "intrinsic" and macroeconomic components rather than of any one performance measure. Presumably, changes in compensation net of changes linked to macroeconomic factors represent compensation for changes in firms' "intrinsic" competitiveness. We control for industry factors as well.

In Oxelheim and Wihlborg (2003) the case of Electrolux was used to illustrate how changes in performance can be decomposed into one "intrinsic" component and one component caused by macroeconomic developments. A set of domestic and foreign macroeconomic price variables (exchange rates, interest rates, price levels) were used to filter out the macroeconomic component from total changes in performance from quarter to quarter. One reason for using price variables is that they can be observed without a long lag. Therefore, they can be used in practice to decompose very recent changes in performance and, thereby, to adjust compensation.

In this paper, macroeconomic price variables are also used as indicators of macroeconomic fluctuation. We focus on the impact of macroeconomic fluctuations on changes in CEO compensation in US firms during the period 1992-2008. The data set for compensation in the form of salary, bonus, option awards and pension payments is described in Section 2. Relevant performance variables explaining compensation are identified in Section 3. The contribution of macroeconomic factors to compensation and performance measures is estimated in Section 4 using cross-section and panel analyses. In Section 5 we decompose compensation each year into an "intrinsic" component and a component caused by macroeconomic factors distinguishing between the total impact of the macro economy and the unanticipated impact. In section 6 we test whether remuneration is asymmetric in response to macroeconomic factors, in particular. The total compensation each year is divided into symmetric and asymmetric components. Concluding comments follow in Section 7.

2. **Data Sources and Stylized Facts**

Our sample consists of U.S. firms from 1992 to 2008. Compensation data is obtained from Standard and Poor's Execucomp through COMPUSTAT North America. The database covers about 3000 companies, both active and inactive. Executive compensation data is collected directly from each company's annual proxy (DEF 14A SEC form).

This paper examines executive compensation in response to macroeconomic factors fluctuations. Macroeconomic factors of interest include an annual interest rate, inflation and exchange rate changes. The interest rate is the one year Treasury rate. Inflation is the change in the level of consumer prices (CPI) which is obtained from the Bureau of Economic Analysis[2]. The exchange rate is defined as Euro per Dollar.

There are several compensation variables available in the database for up to 10 executives in each firm. We focus on CEO's compensation packages for comparability with the analysis of Swedish CEO compensation. Other variables related to CEO age and tenure in the firm are also obtained from Execucomp. The following compensation variables for CEOs are used in the empirical analysis below:

1. ***TOTALCURR***: Total current compensation which includes salary and bonus.
2. ***TDC1:*** Total compensation as calculated under the 1992 reporting format. Total compensation is comprised of the following: Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted (using Black-Scholes), Long-Term Incentive Payouts, and All Other Total (in thousands $).
3. ***TDC2:*** Total compensation as calculated under the 1992 reporting format. Total Compensation is comprised of the following: Salary, Bonus, Other Annual, Restricted Stock Grants, Long-Term Incentive Payments, All Other, and Value of Options Exercised (in thousands $).

The difference between TDC1 and TDC2 is that TDC1 includes the value of options at the time the options are awarded while TDC2 includes the value of options at the time they are exercised. Thus, TDC1 is what is usually known as compensation while TDC2 represents realized payments to the executive. The cash payments on these options may differ substantially from options awarded. The correlation in cross-section between the two variables representing total compensation in a particular year (2007) is .58. From the point of view of risk management incentives the pattern of realized compensation should be of particular interest.

[2] CPI is extracted from U.S. department of labor website http://www.bls.gov.

In 2006 the FAS123R changed the reporting requirements for executive compensation. Under the new reporting regime the cost of all employee stock options, as well as other equity-based compensation arrangements have to be reflected in the financial statements based on the estimated fair value of the awards (TOTAL_ALT1 and TOTAL_ALT2). However, we only have very short time series for each reporting firm of these two variables[3].

It is a source of worry to use the older data when data based on updated definitions exist if only for two years. This worry seems to be unfounded, however, since the correlation between TDC1 and TOTAL_ALT1 in cross-section for 2007 is .99 while the correlation between TDC2 and TOTAL_ALT2is .81.

We begin by investigating the statistical properties of the three compensation series for 3046 firms in the dataset covering the period 1992-2008. The panel is unbalanced. After excluding some firms with less than five years of data, there are 2,158 firms remaining in the dataset. Table 1 displays annual means and standard deviations for the levels (thousands US Dollar and index) of TOTALCURR, TDC1 and TDC2 for each year.

Table 1 shows that the variations across firms are larger each year in TDC1 than in TOTALCURR as one would expect in the US where variable compensation constitute a large share of total compensation. The variations across firms are even larger in TDC2. The means for each year are plotted in Figure 1 along with the S&P 500 index during this period.

Figure 1 shows that the peaks for TDC1 and TDC2 appear to occur at approximately the same time. TDC1 had its highest peak in 2000 the year after the peak in the stock market index. It peaked in 2007 as well during a peak year for the stock market. The peaks for TDC2 occurred the same years although the highest peak for TDC2 (with options exercised) occurred in 2007. It is no surprise that options are exercised when the stock market is high but the incentives to grant options should be relatively high when the stock market is low. On the other hand, compensation based on performance is high during the same years and options represent a large part of compensation.

Oxelheim, Wihlborg and Zhang (2008) examine Swedish CEO compensation in response to macroeconomic fluctuations. As a comparison to the U.S. data in most recent years, Swedish firms commonly compensate their CEOs in following four forms: Salary, Bonus,

[3] ***TOTAL_ALT1*** substitutes for TDC1 except that stock and option awards are valued using the grant date fair value of the award instead of the amount charged to the income statement under FAS 123R. ***TOTAL_ALT2*** substitutes for TDC2 except that stock and option awards are valued using the value realized from option exercise or stock vesting instead of the amount charged to the income statement under FAS 123R.

Options and Pension. The cash component constitute 72 percent of Swedish executive pay. In the US only about 14 percent of total pay is based on salary and bonus in 2007.

Turning to skewness to analyze asymmetry of compensation we use growth rates of compensation from year to year for individual firms. The test for skewness requires a sufficient number of observations for each firm. A sub-sample consisting of 620 firms with at least 15 observations is created. For skewness tests, the null hypothesis is that skewness equals zero (not skewed). For normality tests, the null hypothesis is that the series is normally distributed. The cutoff p-value that is used here is 0.05, i.e. if the p-value is less than 0.05, then we reject the null hypothesis of no skewness.

In Table 2, we see that 45 percent of the firms' Cash Compensation (including bonus) is (significantly) skewed, while 56 percent of the firms' TDC1 is skewed. 65 percent of the firms have skewed TDC2. This observation makes sense since TDC2 includes the value of options at the time of exercise. Consistent with this observation column 4 of Table 3 shows that TDC2 is more skewed than TDC1 in 59 percent of the 347 firms wherein both TDC1 and TDC2 are skewed. We return to an analysis of asymmetric effects of macroeconomic fluctuations and performance in Section 6.

Table 3 describes micro (Sales, Q, age and tenure) and macro variables (interest rate, inflation and exchange rate changes) for the full period and year by year. Average CEO age is 56 year old and tenure at the firm averages about 7 years. Annual averages of sales revenue and Tobin's Q are also provided in Table 4. Annual averages for the 1-year Treasury bond yield, the exchange rate and inflation rates are described in Table 5. We return to criteria for choosing the specific micro and macro variables below.

In the following we analyze first what performance measures are most strongly linked to CEO compensation before turning to analysis of the impact of macroeconomic fluctuations.

3. Explaining compensation without macroeconomic factors

Early US studies of executive compensation across firms focused on the relation between CEO compensation and measures of firm performance (Coughlan and Schmidt, 1985; Murphy, 1985, 1986; Jensen and Murphy, 1990; Abowd, 1990; Leonard, 1990), while other studies analyzed whether CEOs are rewarded for performance relative to a market or industry benchmark (Antle and Smith, 1986; Gibbons and Murphy, 1990; Bebchuk and Grinstein 2005). The US evidence indicates that benchmarking is not practiced much.

In order to first identify the most important firm-specific factors explaining CEO-compensation, the compensation data (TOTALCURR, TDC1 and TDC2) is matched with

firm performance variables. The sample of firms is limited to 620 firms with a minimum of 15 years of observations.

The following regression is estimated using a random effects model.[4] The dependent variable (Compensation) will be defined as TOTALCURR, TDC1 and TDC2 since the sensitivities to these compensation measures cannot be expected to be the same.

$$Log(Compensation_{i,t}) = \alpha_0 + \alpha_1 Log(Sales_{i,t}) + \alpha_2 Log(Performance_{i,t}) + \sum_{i=3}^{8} \alpha_i Industry\ dummies_i + \varepsilon_{i,t}$$

…….Equation (1)

We use the same firm performance measures to explain CEO compensation across the US sample of firms as those used by Oxelheim, Wihlborg and Zhang to explain CEO compensation in Swedish firms. 17 industry dummies and 14 time dummies are included in the random effects model.

The firm's total sale is used as a proxy for firm size. A number of performance variables are tested in equation (1) to find which one(s) explains compensation the best. Tobin's Q is adopted as the performance measure in our specifications.[5]

All the variables in the regressions in this study are in logarithms. Therefore, the regression coefficients are interpreted as "compensation-performance elasticities" rather than "compensation-performance sensitivities". One of the advantages of the elasticity approach is that it produces a better "fit" in terms of marginal effects. Another advantage is that the elasticity is relatively invariant to firm size while sensitivities vary monotonically with firm size (larger firms having smaller betas) (Gibbons and Murphy, 1992; Murphy 1999).

Based on Table 6, firm specific variables including sales revenue, CEO age, tenure and firm performance all contribute positively to executive compensation. The cash component of compensation is the least sensitive to firm sales and performance as expected. Compensation including options awarded and exercised (TDC1 and TDC2) are more sensitive

[4] The random effects model is compared to pooled linear regressions and the fixed effect model in the next section where macro variables are introduced. See footnote 7 below.

[5] The return on assets (ROA), market to book value of equity, return on equity (ROE), and Tobin's Q are alternative performance measures tested in Oxelheim, Wihlborg and Zhang (2008), Tobin's Q (measured as market value relative to book value) had the most explanatory power and the least correlation with non-performance variables.

to these firm level variables. TDC 2 is also considerably more sensitive to Tobin's Q than TDC 1 indicating that CEO's are able to exercise options at favorable Q's. CEO age and tenure both contribute positively to cash- and total compensation to similar degrees.

In comparison to the results for Sweden reported in Oxelheim, Wihlborg and Zhang (2008) the compensation-sales elasticity for cash compensation is similar in the two countries while the total compensation performance elasticities are substantially higher in the US than in Sweden.

The results in Table 6 also show that there are substantial industry differences as well as time differences. The time dummies for TDC 1 and TDC 2 in particular seem to be much larger after 2000 than before. Equation 1 was also tested in cross-section for each individual year. The results are not included here for reasons of space. The compensation elasticities with respect to sales and performance were quite stable over time for TDC 2 and to a lesser degree for TDC 1. The greatest variation over time was observed for cash compensation.

4. CEO-compensation and macroeconomic factors

In this section we turn to an analysis of the macroeconomic influences on CEO-compensation. These influences can occur through the performance variables in equation (1) or through other variables influencing compensation. We investigate whether macroeconomic variables affect compensation independently of variation in Performance and Sales, and we analyze macroeconomic influences on Performance and Sales. The total macroeconomic influence on compensation to be analyzed in Section 5 is the sum of these effects.

Macroeconomic conditions can be identified using either quantity variables like GDP, GDP growth, investments and employment, or using price variables like interest rates, inflation, exchange rates and the stock market index. Although the former group of variables describes macroeconomic conditions, they are typically observed with a substantial lag. As Oxelheim and Wihlborg (2008) note, price variables are easily observable signals of underlying macroeconomic shocks and developments. A shock would have a certain effect on a group of price variables as well as on GDP, employment, etc. but only the former would be observable at the time a shock occurs. Therefore, these signals can be useful tools for a firm wishing to decompose compensation and performance into "intrinsic factors" and macroeconomic factors. Another advantage of using price variables like interest rates and exchange rates in the decomposition is that they adjust rapidly to both domestic and foreign conditions affecting a firm's performance. For these reason we prefer to use only price

variables as proxies for macroeconomic conditions in the following. Specifically, we use exchange rates, interest rates, inflation and the market return in the stock market.

It is likely that each firm's performance is sensitive to its specific set of variables but here we employ one set to explain changes in compensation across firms and time. Thus, we obtain estimates for the macroeconomic impact on compensation for the average firm. We restrict the use of dummies to identification of industry effects on levels of compensation.

The first step in the analysis of macroeconomic influences on compensation is to determine effects of macroeconomic influences controlling for variation in the performance variable, Q, Sales and industry dummies. These variables will explain only a part of changes in compensation if corporate boards use varying criteria to determine compensation. The analysis is conducted for the three compensation variables TOTALCURR, TDC1 and TDC2. The following model is estimated on the firm level as well as in a panel using the random effects model:[6]

$$
\begin{aligned}
&Log(Compensati\,on_{i,t}) = \alpha_0 + \alpha_1 Log(Sales_{i,t}) + \alpha_2 Log(Tobin's\ Q_{i,t}) \\
&+ \alpha_3 Log(1 + Anticipate\,d\ interest\ rate_{i,t}) \\
&+ \alpha_4 Log(1 + Unticipate\,d\ interest\ rate_{i,t}) \\
&+ \alpha_5 Log(1 + \Delta Anticipate\,d\ exchange\ rate_{i,t}) \\
&+ \alpha_6 Log(1 + \Delta Unticipate\,d\ exchange\ rate_{i,t}) \\
&+ \alpha_7 Log(1 + Anticipate\,d\ \Delta CPI_{i,t}) + \alpha_8 Log(1 + Unanticipa\,ted\ \Delta CPI_{i,t}) \\
&+ \alpha_9 Log(exchange\ rate_{i,t-1}) \\
&+ \sum_{i=10}^{15} \alpha_i Industry\ dummies_i + u_i + \varepsilon_{i,t}
\end{aligned}
$$

…….*Equation (2)*

[6] The robustness of the random effects model is further tested by using two alternative specifications, i.e. pooled linear regression model or fixed effects model. The random effects exist based on the Breusch and Pagan Lagrangian Multiplier test ($\chi^2(1)$ =1049.11, Prob > χ^2 = 0.000). Furthermore, based on the Hausman test ($\chi^2(5)$ =11.57, Prob > χ^2 = 0.024), the random effects model is rejected at 5% level of significance, but it cannot be rejected at 1% level of significance. In addition, in order to detect multicollinearity among all the factors, the variance inflation factors (VIF) are estimated by using the pooled regression. The average VIF is 2.67, and the individual VIF is within the range 1.36-4.74. Therefore, multicollinearity does not seem to be a problem in the final model.

All variables are defined in log levels. The macro variables are the US 1-year Treasury interest rate, the exchange rate (Euro/$) and the consumer price index (CPI). The stock market index has been removed from the equation. It does not add explanatory value to the interest rate. Since compensation may be affected to different degrees by anticipated and unanticipated levels and changes in the macro-variables, we distinguish between the anticipated levels of the interest rate and the exchange rate, and the unanticipated changes in these variables from the previous year.

The anticipated exchange rate level in period *t* is further divided into the level last period and the anticipated change from last year. Thereby, the exchange rate can influence compensation in three ways; the level from the previous period, the anticipated change from previous period and the unanticipated change.

We assume that compensation is potentially influenced by inflation rather than the price level after controlling for sales. This variable is expected to increase with the price level. At a constant inflation rate we expect sales and compensation to increase at the rate of inflation. Macroeconomic fluctuations will be reflected in the difference between the actual inflation and the average inflation during the period. Furthermore, the impact of inflation may depend on whether it is anticipated or unanticipated.

All proxies for anticipated vs unanticipated changes in macro-variables are subject to uncertainty and potential criticism. Nevertheless, we make assumptions about expectations formation since incentive effects of compensation sensitivities to these components of macroeconomic fluctuations can be quite different and since one objective is to estimate how compensation would have developed over time if CEO-compensation had been made insensitive to total macroeconomic fluctuations and unanticipated macroeconomic fluctuations, respectively.

The expected interest rate in the next period is assumed to be equal to the current interest rate. Thus, all interest rate changes from year to year are assumed to be unanticipated.

$$Anticipated\ interest\ rate_t = i_{t-1}$$

$$Unanticipated\ interest\ rate_t = i_t - i_{t-1}$$

The expected exchange rate change (between the US and Euro) over the next year is reflected in the current one-year interest rate differential (uncovered interest rate parity). Thus,

$$Anticipated\ \Delta exchange\ rate_t = i^{Euro}{}_{t-1} - i^{USD}{}_{t-1}$$

$$Unanticipated\ \Delta exchange\ rate_t = \left[(Euro/USD)_t - (Euro/USD)_{t-1}\right] - \left[i^{Euro}{}_{t-1} - i^{USD}{}_{t-1}\right]$$

The expected inflation over the next year is equal to the inflation last year. In other words, a change in the inflation rate from one year to another is considered unanticipated. Thus,

$Anticipated\ \Delta CPI = cpi_{t-1} - cpi_{t-2}$

$Unanticipated\ \Delta CPI = (cpi_t - cpi_{t-1}) - (cpi_{t-1} - cpi_{t-2})$.

Table 7 shows the compensation elasticities with respect to Sales, Tobin's Q and the macroeconomic variables. Age, tenure and sector dummies are included as above. The compensation variables are Cash (Current Compensation), TDC 1 and TDC 2. Model 1 for TDC 1 and TDC 2 include all the macroeconomic variables while insignificant variables in Model 1 have been removed in Model 2.

Sales and Tobin's Q are significant in all the models in Table 7. Coefficients are very similar to the coefficients in Table 6 except that the elasticity of TDC2 with respect to Tobin's Q has increased.

Looking at the Model 2 results for macroeconomic variables the conventional measure of total compensation awarded (TDC1) depends negatively on both anticipated and unanticipated interest rates, negatively on unanticipated inflation and negatively on all three exchange rate factors indicating that an appreciation of the dollar leads to a decline in compensation. The magnitude of several coefficients is large. For example, the coefficient of -7 for the unanticipated interest rate implies that a one percentage point increase in the interest rate leads to a 7 percent decline in compensation. The smallest effects of macro-variables are associated with anticipated inflation (zero) and unanticipated exchange rate changes (-0.150). These effects are obtained when controlling for sales and performance in terms of Q. The zero effect of anticipated inflation implies therefore that there is no effect of anticipated inflation above what is accounted for in increased sales and market value in dollars.

The orders of magnitude of macroeconomic effects are similar to the results obtained for Swedish CEO compensation in Oxelheim, Wihlborg and Zhang (2008).

The results for compensation including options exercised each period (TDC 2) are different in some respects. As noted above the performance (Q) sensitivity has increased relative to results without macro variables. Furthermore, the effects of unanticipated interest rates and inflation are insignificant. Thus, all unanticipated macroeconomic changes have relatively little effect on compensation actually paid out while anticipated effects are as strong as for TDC1. One interpretation of these results is that executives are able to protect themselves against unanticipated macroeconomic events by means of timing of exercising options.

We turn now to the impact of macroeconomic factors on the performance measures, Sales and Q, which systematically affect compensation. We regress these two performance variables on the set of macroeconomic and dummy variables used in Models 1 in Table 7. In addition, Log (Tobin's Q) is an independent variable in the regression for log Sales and vice versa.

Table 8 shows that Sales has a small but significant negative effect on Q when controlling for macroeconomic factors and Q has a small significant negative effect on Sales. These results indicate that sales generally are higher than what value maximization would call for. As expected Tobin's Q does not affect Sales.

All the macroeconomic variables have a significant effect on both Q and Sales. Anticipated and unanticipated interest rates have a negative impact on both variables while inflation has a positive impact. Anticipated and unanticipated appreciations of the dollar are associated with negative effects on Q and sales. Thus, the macroeconomic effects of interest rate increases and dollar appreciations on compensation are negative through the direct channels captured in Table 7 as well as the indirect channels captured in Table 8. The effect of increased inflation on TDC1 is negative through the direct channel in Table 7 but positive through the impact on Q and Sales in Table 8. The effect of anticipated inflation on TDC2 in Tables 7 and 8 reinforce each other, however.

In the next section the above estimates of macroeconomic influences on Sales, Q-values, and on compensation at constant levels of Sales and Q will be used to decompose compensation changes during the period 1992-2008 into one component explained by macroeconomic factors and one component explained by "intrinsic" factors.

5. Filtering out macroeconomic influences on compensation

How would compensation have developed if the impact on compensation of macro-economic factors would have been filtered out? Table 9 shows the impact on the three measures of compensation of the total change in the macro variables for the period 1993-2007, while Table 10 displays the impact of unanticipated changes in macro variables.

In each of the tables 9 and10 column (1) shows the percent of salary plus bonus caused by macroeconomic variables each year at constant levels of Q and Sales. In table 9 the column shows the effects of total changes in macroeconomic variables while in table 10 the effects of unanticipated changes are presented. Columns (2) and (3) show the corresponding effects of macroeconomic variables on total compensation awarded (TDC1) and total compensation realized (TDC2). Columns (4) and (5) show the percent of changes in Q and Sales explained by the same variables. Column (6) presents the sum of the effects in columns (1), (4) and (5) using the coefficients in Table 8 as weights. Thus, column (6) shows the percent change in salary plus bonus each year explained by macroeconomic factors. Columns (7) and (8) shows the macroeconomic effects on compensation awarded (TDC1) and realized (TDC2), respectively.

The macroeconomic effects in Table 9, columns (1)-(3) are calculated based on deviations from mean levels of the macro variables each year times the appropriate coefficients in Tables 7. The procedure for calculating macroeconomic effects on Q and Sales is the same, but the coefficients are obtained from Table 8. The mean levels of unanticipated changes are zero. The effects of changes in the exchange rate do not include effects of the lagged level of the exchange rate.

Macroeconomic effects of unanticipated changes in macro variables in Table 10 are calculated the same way as in Table 9 with the difference that only unanticipated effects of macro variables and corresponding coefficients are included.

The total macroeconomic impact on compensation in Table 9 varies from year to year and differs among the compensation measures. The impact on cash compensation varies from a negative 16 percent to a positive 31 percent. The corresponding figures for TDC1 (TDC2) are negative 16 (15.5) percent to positive 30 (40) percent. On average for the whole period the macroeconomic impact is close to zero. Comparing macroeconomic effects on cash compensation in Column (6) with total compensation awarded (TDC1) in column (7) it can be observed that the time pattern is very different although the variation is similar. Comparing effects on awarded compensation (TDC1) and realized compensation (TDC2) in column (8) the time pattern is once again different.

The effects of unanticipated macroeconomic fluctuations in Table 10 are large as well. The largest negative effect on cash compensation in column (6) is -27.6 while the largest positive effect is +27.7. The corresponding figures for TDC1 (TDC2) are -21.6 (-13.6) and +26.4 (+38.7). Thus, it seems that realized compensation (TDC2) is subject to smaller extreme negative effects of unanticipated macroeconomic fluctuations as well as larger extreme positive effects.

In comparison to the results for Sweden for the years 2001-2007 the effects of macroeconomic fluctuations are much larger in the USA. The range for macroeconomic effects on total compensation awarded ranged from -11 to +12 percent while the range for unanticipated macroeconomic effects in Sweden was from -4 percent to +11 percent. During the same period the range for unanticipated macroeconomic effects in the USA in Table 10 is from -21.6 to +26.4. The large difference between the two countries can be explained by the much higher variable share of compensation in the USA making it more sensitive to unanticipated macroeconomic fluctuations in particular.

6. Asymmetric macroeconomic effects

As noted in Section 2 the distribution of compensation in a large share of US firms is asymmetric. The model including macroeconomic effects in equation 2 is therefore re-estimated by including interaction terms capturing up or down periods. We define one dummy with the value of one in periods when Q is increasing. The hypothesis is that sensitivity of compensation to all variables is more positive or less negative in periods when there is an increase in Q.

Taking the formulations for cash compensation, TDC1(model 2) and TDC2 (model 2) in Table 7 as the starting point we interact the 0/1 dummy with Sales, Tobin's Q and all the macroeconomic variables in Table 11. The coefficient for each variable in periods when Q is increasing is the coefficient for the variable itself plus the coefficient for the interactive term with the same variable.[7]

In the regression for cash compensation (Current compensation) in Table 11 the interactive term is significant and positive for unanticipated inflation but significant and negative for Sales and the unanticipated exchange rate change. For total awarded

[7] An alternative way to test for asymmetry is to use one 0/1 dummy for each variable taking the value of one in periods when the particular variable has a positive effect on performance.

compensation (TDC1) the interactive term is significant and positive for unanticipated inflation but negative for the unanticipated interest rate. The interactive terms for the anticipated interest rate and the unanticipated exchange rate are positive and significant in the regression for realized compensation (TDC2) while the interactive term for sales is negative.

Since there are both positive and negative interactive coefficients we calculate the total effect of asymmetry on total compensation awarded (TDC 1) for each year in Table 12. The figure for each year is the predicted percentage difference between the macroeconomic effect on TDC 1 if Q were increasing and the macroeconomic effect if Q were decreasing. The result for each particular year depends on what macroeconomic variable was changing that year. The table indicates that in most years the macroeconomic effects on compensation would be greater if Q was increasing than if Q were decreasing. This asymmetry would tend to reduce incentives for risk management with respect to macroeconomic risk.

7. Conclusions

The "optimal" CEO compensation contract in terms of sensitivity and asymmetry to macroeconomic factors from shareholders point of view depends on a number of firm-specific factors in addition to ability to forecast macroeconomic developments and risk-aversion of managers. Firms differ with respect to adjustability of structure, capacity and operations, and they differ in terms of their sensitivity to macroeconomic fluctuations. Thus, although macroeconomic fluctuations are beyond management's control their impact on performance may not be the result of luck alone. If management cannot do much to benefit from positive macroeconomic developments or to dampen the effects of negative developments, contract theory suggest that management should not be rewarded (penalized) for performance it cannot influence. This argument presumes that it does not lie in the shareholders interest to induce management to reduce exposure to macroeconomic fluctuations.

No matter how the optimal incentive contract looks there is little doubt that macroeconomic fluctuations have a powerful impact on CEOs' compensation in the US as well as in Sweden as shown in Oxelheim, Wihlborg and Zhang (2008). The sensitivity of compensation seems larger in the US than in Sweden where the variable part of compensation is much lower than in the US (Fernandes et al., 2008).

Analysis of the dependence of a particular firm's performance and CEO-compensation on macroeconomic conditions requires data for performance, compensation, and relevant macroeconomic data for a substantial period. The relevant macroeconomic factors and their

impact may vary across firms. In this paper the analysis was restricted to macroeconomic influences on CEO compensation in a panel of 620 forms for the period 1993-2007 using the same set of macroeconomic factors for all firms. Using pooled data we identified the average impact of macroeconomic factors on cash compensation (salary plus bonus), total compensation awarded and total realized compensation taking into account exercised options.

Three channels of macroeconomic influences on compensation were identified. Macroeconomic factors affect sales and Q-values, and they affect compensation through other variables that affect compensation in a less systematic way than sales and Q. The macroeconomic factors we identified as important for the aggregate performance and compensation in the firms were the exchange rate, the interest rate and the inflation rate. These macroeconomic price variables can be viewed as signals of underlying macroeconomic shocks. As such, they are easily observable and useful for decomposing performance and compensation into an "intrinsic" component and a macroeconomic component.

The estimation of compensation elasticities with respect to anticipated and unanticipated macroeconomic factors for different measures of compensation indicated that all unanticipated macroeconomic factors have relatively small effects on realized compensation while anticipated effects are as strong for realized compensation as for awarded compensation. One interpretation of these results is that executives are able to protect themselves against unanticipated macroeconomic events by means of timing of exercising options.

After estimation of the sensitivities of performance variables and compensation to the anticipated and unanticipated macroeconomic factors we used the coefficients in combination with macroeconomic developments each year to calculate how the different measures of compensation would have developed had macroeconomic influences been filtered out each of the years 1993 through 2007. The calculations showed that macroeconomic factors increased total compensation awarded as much as 30 percent in one period and reduced compensation 16 percent in another period. The effect on realized compensation ranged from around negative 16 percent to positive 40 percent. This range is substantially wider than what was observed for Sweden.

The impact of unanticipated macroeconomic factors on US CEO compensation is almost as large as the impact of total macroeconomic factors although the time pattern is different. Furthermore, the most negative impact on realized compensation is smaller than the most negative impact on awarded compensation while the most positive impact on realized compensation is larger than the most positive impact awarded compensation.

The distribution of compensation for a large share of US firms appears to be skewed and more skewed for realized compensation than for awarded compensation. We analyzed whether the impact of macroeconomic factors on awarded compensation is larger in periods when Q is increasing than when Q is decreasing. The results were ambiguous but analysis of the asymmetric impact each year indicated that in most periods macroeconomic effects on compensation are larger in years when Q is increasing.

It is a complicated task beyond the scope of this paper to analyze incentive effects of the observed sensitivity of both performance and compensation to macroeconomic fluctuations. Even if performance effects are considered the result of luck it seems that compensation in the form of options allow CEOs' to time the exercising of options to their advantage. If so, the incentive to manage uncertainty with respect to macroeconomic factors is reduced relative to a situation when both performance effects and compensation effects are the result of luck.

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Table 1 Annual Compensation Levels

This table displays annual mean, standard deviation for three CEO-compensation levels (thousands US Dollar), Cash Compensation, Total Compensation including Option Granted, and Total Compensation including Option Exercised, as well as the index for each variable with 1992 value=100. The data set includes 2158 firms.

Year	# of Firms	Cash Compensation (TOTALCURR)			Total Compensation including Option Granted (TDC1)			Total Compensation including Option Exercised (TDC2)		
		Mean	Std	Index	Mean	Std	Index	Mean	std	Index
1992	341	1128.08	753.56	100.00	2311.47	2237.64	100.00	2968.28	5919.96	100.00
1993	1002	991.50	947.68	87.89	2060.19	2785.52	89.13	2246.33	7100.73	75.68
1994	1307	961.50	825.03	85.23	2158.44	2818.32	93.38	1674.21	2240.06	56.40
1995	1386	1017.17	877.32	90.17	2313.67	3368.73	100.10	2062.86	3343.67	69.50
1996	1456	1118.40	1083.73	99.14	3145.05	6961.12	136.06	2634.70	5345.99	88.76
1997	1534	1217.46	1298.16	107.92	3902.26	7759.24	168.82	3697.28	9846.04	124.56
1998	1612	1206.54	1232.38	106.95	4550.20	18327.76	196.85	4628.58	23451.62	155.93
1999	1688	1298.75	1451.42	115.13	5079.43	11232.50	219.75	4227.30	11373.14	142.42
2000	1709	1358.96	1636.57	120.47	6722.32	21505.91	290.82	6194.79	23011.75	208.70
2001	1620	1315.13	1784.21	116.58	6350.07	16410.67	274.72	4503.23	11835.08	151.71
2002	1629	1390.60	1374.71	123.27	4918.76	7358.69	212.80	3797.93	8234.69	127.95
2003	1686	1567.82	1869.16	138.98	4549.01	6092.59	196.80	4536.37	9232.79	152.83
2004	1642	1762.80	2008.10	156.26	5216.06	7192.90	225.66	5909.10	11498.16	199.07
2005	1578	1898.22	2302.86	168.27	5553.92	7406.41	240.28	7169.01	16502.57	241.52
2006	1498	1247.18	1927.01	110.56	5742.93	7817.98	248.45	7680.47	15222.72	258.75
2007	1418	1086.38	1737.21	96.30	5909.39	8125.76	255.65	7806.26	14084.72	262.99
2008	294	1015.60	860.35	90.03	5238.12	5645.65	226.61	6023.59	8079.45	202.93

Table 2 Skewness Tests on the Percentage Changes of Cash Compensation, Total Compensation with Option Granted and Total Compensation with Option Exercised

This table reports the skewness tests on the percentage changes of three compensation series: Cash Compensation, Total Compensation including Option Granted, and Total Compensation including Option Exercised. The sample contents 620 firms in the period 1992-2008.

	Cash Compensation	TDC1: Total Compensation with Option Granted	TDC2; Total Compensation with Option Exercised	TDC1 (incl Option Granted) is less skewed than TDC2 (incl. options exercised)
	(i)	(ii)	(iii)	(iv)
# of firms	620	620	620	347
Skewed firms %	44.68	55.97	65.32	59.08

Table 3. Descriptive Statistics for the Micro and Macroeconomic Factors

This table reports the means and standard deviations for the micro and macro economic factors in our sample during the period 1993-2007. Sales refer to million dollars of firm sales revenue. Tobin's Q is defined as the Market to Book value of a firm. Age refers to CEO age. Tenure refers to CEO years on the job.

	Observations	Mean	Standard Deviation
Panel A: Micro Economic Factors			
Sales (million $)	10 222	5.222	13.353
Tobin's Q	10 222	1.868	1.390
Age (year)	10 222	56.356	7.242
Tenure (year)	10 222	7.152	7.759
Panel B: Macro Economic Factors			
Anticipated interest rate	10 222	0.047	0.016
Unanticipated interest rate	10 222	-0.002	0.014
Anticipated ΔCPI	10 222	0.028	0.007
Unanticipated ΔCPI	10 222	0.000	0.007
Anticipated ΔExchange rate	10 222	-0.003	0.021
Unanticipated ΔExchange rate	10 222	-0.033	0.156

Table 4. Year by Year Descriptive Statistics for the Macroeconomic Factors

This table displays mean, standard deviation for the macroeconomic factors: interest rate, exchange rate, and inflation by using monthly average.

Year	US 1 year rate		Exchange rate (Euro/Dollar)		US inflation rate	
	Mean	Std.	Mean	Std.	Mean	Std.
1992	0.062	0.009	1.663	0.105	0.030	0.021
1993	0.043	0.005	1.560	0.087	0.029	0.018
1994	0.037	0.001	1.661	0.057	0.027	0.018
1995	0.057	0.012	1.612	0.071	0.026	0.017
1996	0.062	0.005	1.426	0.044	0.025	0.021
1997	0.058	0.003	1.508	0.029	0.033	0.023
1998	0.061	0.001	1.739	0.058	0.017	0.016
1999	0.055	0.004	1.692	0.272	0.016	0.013
2000	0.058	0.005	0.946	0.033	0.027	0.026
2001	0.069	0.004	1.088	0.049	0.033	0.035
2002	0.037	0.010	1.123	0.033	0.016	0.042
2003	0.022	0.005	1.056	0.070	0.023	0.030
2004	0.014	0.001	0.878	0.042	0.019	0.040
2005	0.022	0.006	0.803	0.031	0.031	0.040
2006	0.041	0.005	0.808	0.033	0.035	0.065
2007	0.053	0.002	0.791	0.026	0.025	0.053
2008	0.051	0.004	0.726	0.030	0.040	0.041

Table 5. Descriptive Statistics for the Microeconomic Factors

This table displays mean, standard deviation for the microeconomic factors: Sales and Q by using cross sectional data.

Year	Sales		Tobin's Q	
	Mean	Std.	Mean	Std.
1993	5360.023	11959.260	1.785	1.029
1994	3999.859	8884.899	1.651	0.946
1995	4352.513	10395.820	1.782	1.011
1996	4184.282	10213.640	1.840	1.152
1997	4473.973	10104.050	2.099	2.122
1998	4566.647	10791.060	2.089	1.758
1999	4986.122	12314.050	2.113	1.929
2000	5291.154	13470.800	1.924	1.743
2001	5276.750	11538.610	1.896	1.264
2002	4565.261	11579.030	1.592	0.956
2003	4912.149	12810.350	1.868	1.131
2004	5880.201	16508.380	1.846	1.134
2005	6118.876	14881.240	1.867	1.458
2006	7211.917	20144.580	1.812	0.903
2007	7088.995	18115.400	1.764	1.120

Table 6. Random Effects Model with Sector and Time Dummy Variables

This table reports the parameter estimations from three random effects models for the period 1993-2007. The dependent variables are Log (Current Compensation), Log (Tdc1), and Log (Tdc2).

	Log (Current Compensation)	**Log (Tdc1)**	**Log (Tdc2)**
Log (Sales)	0.303***	0.434***	0.431***
	(53.71)	(70.81)	(66.24)
Log (Tobin's Q)	0.133***	0.329***	0.514***
	(6.70)	(15.19)	(22.36)
Age	0.047***	0.046***	0.048***
	(3.80)	(3.48)	(3.37)
Age^2/100	-0.037***	-0.043***	-0.037***
	(-3.45)	(-3.68)	(-2.97)
Tenure	0.015***	0.017***	0.041***
	(5.26)	(5.46)	(12.68)
Tenure^2/100	-0.033***	-0.053***	-0.107***
	(-3.66)	(-5.47)	(-10.35)
Sector 1	-0.014	0.128**	0.040
	(-0.30)	(2.45)	(0.72)
Sector 2	0.002	-0.116**	-0.194***
	(0.04)	(-2.09)	(-3.31)
Sector 3	-0.160***	-0.132***	-0.188***
	(-3.85)	(-2.91)	(-3.91)
Sector 4	0.043	0.219***	0.032
	(1.10)	(5.12)	(0.69)
Sector 5	-0.050	-0.107**	-0.054
	(-1.19)	(-2.31)	(-1.10)
Sector 6	-0.197***	-0.052	-0.144***
	(-5.62)	(-1.37)	(-3.56)
Sector 7	-0.071*	0.137***	-0.018

	(-1.71)	(3.05)	(-0.38)
Sector 8	-0.188***	-0.141***	-0.140***
	(-4.85)	(-3.36)	(-3.13)
Sector 9	-0.021	0.154***	0.075
	(-0.45)	(2.99)	(1.37)
Sector 10	0.163***	0.335***	0.231***
	(2.63)	(4.98)	(3.24)
Sector 11	-0.326***	-0.478***	-0.326***
	(-8.74)	(-11.81)	(-7.57)
Sector 12	-0.182***	-0.267***	-0.260***
	(-3.10)	(-4.18)	(-3.82)
Sector 13	-0.204***	-0.208***	-0.233***
	(-4.32)	(-4.05)	(-4.27)
Sector 14	-0.228***	-0.330***	-0.338***
	(-3.83)	(-5.10)	(-4.91)
Sector 15	0.336***	0.434***	0.523***
	(8.69)	(10.34)	(11.73)
Sector 16	0.379***	0.343***	0.268**
	(4.01)	(3.40)	(2.49)
Sector 17	0.119	0.400***	0.239**
	(1.39)	(4.31)	(2.42)
Year 93	0.024	0.180***	0.002
	(0.45)	(3.06)	(0.03)
Year 94	0.060	0.159***	0.043
	(1.12)	(2.73)	(0.70)
Year 95	0.082	0.310***	0.180***
	(1.55)	(5.40)	(2.95)
Year 96	0.103**	0.398***	0.261***
	(1.97)	(6.99)	(4.31)
Year 97	0.093*	0.426***	0.244***
	(1.79)	(7.53)	(4.06)
Year 98	0.156***	0.551***	0.293***

	(3.04)	(9.83)	(4.92)
Year 99	0.154***	0.594***	0.397***
	(3.00)	(10.65)	(6.70)
Year 00	0.085	0.584***	0.267***
	(1.64)	(10.39)	(4.47)
Year 01	0.184***	0.643***	0.369***
	(3.55)	(11.40)	(6.16)
Year 02	0.246***	0.576***	0.427***
	(4.80)	(10.34)	(7.22)
Year 03	0.288***	0.610***	0.576***
	(5.59)	(10.88)	(9.68)
Year 04	0.286***	0.589***	0.635***
	(5.53)	(10.46)	(10.61)
Year 05	-0.179***	0.616***	0.747***
	(-3.40)	(10.76)	(12.29)
Year 06	-0.275***	0.652***	0.814***
	(-5.18)	(11.29)	(13.28)
Constant	2.971***	2.598***	2.102***
	(8.59)	(6.93)	(5.27)
Observations	10,185	10,222	10,213
R-squared	0.28	0.40	0.40

1. *t*-values are in round parentheses, and *p*-values are in square parentheses.
2. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better

Table 7. Random Effects Model with Symmetric Firm Specific Factors and Interest Rate, Exchange Rate and Inflation as Macroeconomic Factors.

This table reports the parameter estimations from three random effects models. The dependent variables are Log (Current Compensation), Log (Tdc1), and Log (Tdc2). The time period is 1993-2007.

	Log (Current Compensation)	Log (Tdc1)		Log (Tdc2)	
		Model 1	Model 2	Model 1	Model 2
Log (Sales)	0.299***	0.418***	0.417***	0.434***	0.434***
	(35.07)	(37.28)	(37.24)	(39.47)	(39.52)
Log (Tobin's Q)	0.149***	0.301***	0.300***	0.617***	0.617***
	(5.24)	(7.59)	(7.56)	(16.04)	(16.11)
Age	0.047***	0.052***	0.052***	0.052***	0.052***
	(3.19)	(3.03)	(3.01)	(2.76)	(2.77)
Age^2/100	-0.041***	-0.051***	-0.051***	-0.042**	-0.043***
	(-3.07)	(-3.37)	(-3.34)	(-2.57)	(-2.58)
Tenure	0.015***	0.012***	0.012***	0.043***	0.043***
	(5.43)	(3.72)	(3.73)	(11.98)	(11.93)
Tenure^2/100	-0.027***	-0.034***	-0.033***	-0.107***	-0.106***
	(-3.29)	(-3.39)	(-3.39)	(-9.27)	(-9.23)
Log (1+Anti. interest rate)	-10.591***	-3.529***	-4.161***	-4.505***	-3.141***
	(-11.00)	(-3.38)	(-4.43)	(-3.96)	(-4.38)
Log (1+UnAnti. interest rate)	-9.798***	-6.165***	-6.972***	-1.712	-
	(-9.11)	(-5.50)	(-7.23)	(-1.44)	-
Log (1+Ananti. ΔCPI)	-8.745***	-3.402	-	13.741***	14.095***

	(-4.07)	(-1.49)	-	(5.52)	(8.26)
Log (1+UnAnti. ΔCPI)	5.736***	-7.622***	-5.332***	-1.402	-
	(2.66)	(-3.63)	(-3.62)	(-0.62)	-
Log (1+Anti. ΔExchange rate)	-6.683***	-5.336***	-5.895***	-4.636***	-3.221***
	(-7.57)	(-5.68)	(-6.81)	(-4.63)	(-4.95)
Log (1+UnAnti. ΔExchange rate)	0.224***	-0.126***	-0.150***	-0.368***	-0.404***
	(4.41)	(-2.74)	(-3.50)	(-7.39)	(-8.97)
Log (Exchange rate (t-1))	0.283***	-0.607***	-0.589***	-0.752***	-0.766***
	(7.79)	(-15.68)	(-15.95)	(-19.08)	(-22.87)
Sector 1	-0.062	0.102	0.103	0.039	0.040
	(-0.76)	(1.30)	(1.32)	(0.50)	(0.51)
Sector 2	-0.012	-0.092	-0.090	-0.230***	-0.231***
	(-0.23)	(-1.15)	(-1.12)	(-2.76)	(-2.78)
Sector 3	-0.153**	-0.145**	-0.144**	-0.210***	-0.210***
	(-2.17)	(-2.38)	(-2.36)	(-3.31)	(-3.32)
Sector 4	0.043	0.247***	0.248***	0.012	0.013
	(0.90)	(4.11)	(4.13)	(0.18)	(0.20)
Sector 5	-0.049	-0.125**	-0.124**	-0.051	-0.050
	(-1.14)	(-2.16)	(-2.14)	(-0.82)	(-0.80)
Sector 6	-0.181***	-0.003	-0.002	-0.153**	-0.152**
	(-3.50)	(-0.04)	(-0.03)	(-2.10)	(-2.08)
Sector 7	-0.107**	0.119*	0.119*	-0.074	-0.073
	(-2.38)	(1.70)	(1.70)	(-0.97)	(-0.95)
Sector 8	-0.185***	-0.180***	-0.179***	-0.173**	-0.173**
	(-3.03)	(-2.72)	(-2.70)	(-2.57)	(-2.57)
Sector 9	-0.072	0.142**	0.142**	-0.023	-0.022
	(-1.47)	(1.98)	(1.98)	(-0.30)	(-0.28)
Sector 10	0.139*	0.248**	0.250**	0.129	0.127

	(1.94)	(2.01)	(2.03)	(1.02)	(1.01)
Sector 11	-0.334***	-0.481***	-0.480***	-0.288***	-0.288***
	(-5.50)	(-5.93)	(-5.91)	(-3.69)	(-3.70)
Sector 12	--0.178***	-0.289***	-0.288***	-0.260***	-0.259***
	(-3.35)	(-3.51)	(-3.50)	(-2.83)	(-2.82)
Sector 13	-0.272***	-0.281***	-0.279***	-0.323***	-0.323***
	(-4.71)	(-3.59)	(-3.57)	(-4.02)	(-4.02)
Sector 14	-0.248***	-0.349***	-0.348***	-0.376***	-0.375***
	(-4.09)	(-3.67)	(-3.66)	(-3.66)	(-3.64)
Sector 15	0.322***	0.400***	0.401***	0.504***	0.505***
	(7.15)	(7.03)	(7.05)	(8.26)	(8.26)
Sector 16	0.409***	0.338*	0.341**	0.302	0.305
	(4.79)	(1.95)	(1.97)	(1.47)	(1.49)
Sector 17	0.089	0.384***	0.383***	0.223	0.225
	(1.18)	(3.04)	(3.03)	(1.52)	(1.53)
Constant	3.808***	3.403***	3.349***	2.215***	2.151***
	(9.10)	(6.82)	(6.80)	(4.19)	(4.08)
Observations	10,185	10,222	10,222	10,213	10,213
R-squared	0.28	0.39	0.39	0.39	0.39

1. *t*-values are in round parentheses, and *p*-values are in square parentheses.
2. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better.

Table 8. Random Effects Model with Tobin's Q and Sales as Dependent Variables

This table reports the parameter estimations from two random effects models. The time period is 1993-2007.

	Q Equation	**Sales Equation**
Log (Sales)	-0.027***	-
	(-4.21)	-
Log (Tobin's Q)	-	-0.075***
	-	(-3.24)
Log (1+Anti. interest rate)	-1.236***	-2.845***
	(-3.33)	(-4.99)
Log (1+UnAnti. interest rate)	-1.726***	-4.202***
	(-4.33)	(-6.38)
Log (1+Ananti. ΔCPI)	2.152**	9.950***
	(2.52)	(8.52)
Log (1+UnAnti. ΔCPI)	3.855***	1.623*
	(5.21)	(1.50)
Log (1+Anti. Δ Exchange rate)	-3.341***	-4.706***
	(-9.55)	(-8.00)
Log (1+UnAnti. Δ Exchange rate)	-0.052***	-0.369***
	(-2.88)	(-15.42)
Log (Exchange rate (t-1))	0.081***	-0.669***
	(5.51)	(-28.37)
Sector 1	0.091**	0.018
	(2.05)	(0.07)
Sector 2	0.348***	0.891***
	(6.07)	(4.56)
Sector 3	0.098**	0.140
	(2.21)	(0.85)
Sector 4	0.477***	-0.565**
	(9.09)	(-2.57)

Sector 5	-0.006	-0.196
	(-0.13)	(-1.27)
Sector 6	0.369***	-0.595***
	(8.67)	(-3.82)
Sector 7	0.369***	-0.885***
	(6.72)	(-5.09)
Sector 8	0.086**	0.308*
	(2.06)	(1.91)
Sector 9	0.355***	-1.105***
	(5.99)	(-6.12)
Sector 10	0.222**	0.713**
	(2.56)	(2.17)
Sector 11	-0.171***	0.310*
	(-5.88)	(1.86)
Sector 12	-0.040	0.067
	(-0.72)	(0.23)
Sector 13	0.165***	0.421**
	(3.06)	(2.52)
Sector 14	0.248***	0.199
	(3.55)	(0.93)
Sector 15	-0.127***	0.166
	(-4.06)	(1.05)
Sector 16	0.060	-0.031
	(0.72)	(-0.08)
Sector 17	0.280***	-0.381
	(3.32)	(-1.64)
	0.495***	7.070***
Constant	(8.45)	(59.18)
	-0.027***	
Observations	10,222	10,222
R-squared	0.18	0.06

1. *t*-values are in round parentheses, and *p*-values are in square parentheses. 2. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better.

Table 9. Contribution of the Anticipated plus Unanticipated Symmetric Macroeconomic Factors to Compensation

This table reports the predicted anticipated and unanticipated symmetric macro effects in different years as well as the whole period 1993-2007 using coefficients in Table 7 (Models 2 for TDC1 and TDC2). In the column (6), (7) and (8), w_q and w_s are the coefficients for the variables Log (Tobin's Q), and Log (Sales) in Table 8.

Year	Macro Effects in the Current Compensation Equation given Q and Sales	Macro Effects in the Tdc1 Equation given Q and Sales	Macro Effects in the Tdc2 Equation given Q and Sales	Q Equation	Sales Equation	Total Macro Effects to the Current Compensation (1)+w_q×(4)+w_s×(5)	Total Macro Effects to the Tdc1 (1)+w_q×(4)+w_s×(5)	Total Macro Effects to the Tdc2 (1)+w_q×(4)+w_s×(5)
	%	%	%	%	%	%	%	%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1993	-12.95	-10.91	-3.51	-7.41	-6.88	-16.20	-16.06	-10.97
1994	-15.18	-7.22	8.79	-1.85	-1.13	-15.90	-8.33	7.29
1995	-7.71	2.40	6.07	4.17	6.55	-5.49	6.10	11.92
1996	4.81	8.49	2.23	7.12	7.42	8.05	13.69	9.90
1997	-0.38	8.41	1.87	3.95	3.23	1.29	11.03	5.58
1998	-15.66	20.48	22.12	5.20	24.34	-10.48	29.95	39.39
1999	18.43	4.64	-14.98	6.36	-5.39	19.53	5.67	-15.54
2000	4.88	-9.24	-9.87	6.18	-6.55	5.75	-8.63	-11.23
2001	-2.50	12.90	1.23	1.18	10.47	-0.59	16.53	8.20
2002	4.44	13.57	4.32	-4.75	5.49	3.84	13.24	5.65
2003	29.29	8.54	-2.14	2.57	3.70	30.61	10.72	1.26
2004	23.91	5.83	8.18	3.32	5.48	25.72	8.86	13.00
2005	19.67	2.42	11.77	7.92	7.32	23.13	7.92	19.72
2006	-2.70	5.17	16.70	5.42	11.51	0.63	10.88	26.15
2007	-10.57	5.24	10.45	1.81	9.48	-8.61	8.84	17.08
03-07	4.78	0.06	0.05	0.03	0.06	4.80	0.09	0.09

Table 10. Contribution of the Unanticipated Symmetric Macroeconomic Factors to Compensation

This table reports the predicted unanticipated symmetric macro effects in different years as well as the whole period 1993-2007 using coefficients in Table 7 (Models 2 for TDC1 and TDC2). In the column (6), (7) and (8), w_q and w_s are the coefficients for the variables Log (Tobin's Q), and Log (Sales) in Table 8.

Year	Macro Effects in the Current Compensation Equation given Q and Sales	Macro Effects in the Tdc1 Equation given Q and Sales	Macro Effects in the Tdc2 Equation given Q and Sales	Q Equation	Sales Equation	Total Macro Effects to the Current Compensation (1)+w_q×(4)+w_s×(5)	Total Macro Effects to the Tdc1 (2)+w_q×(4)+w_s×(5)	Total Macro Effects to the Tdc2 (3)+w_q×(4)+w_s×(5)
	%	%	%	%	%	%	%	%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1993	6.06	4.06	-1.52	0.50	1.02	6.36	4.58	-0.67
1994	-24.94	-12.99	1.08	-4.62	-8.38	-27.57	-17.43	-6.09
1995	-6.04	-2.24	4.16	0.32	2.23	-5.61	-1.44	5.68
1996	6.02	0.77	-3.23	0.74	-1.11	6.07	0.75	-3.59
1997	-2.24	-1.17	-6.85	-3.61	-8.42	-4.57	-5.20	-13.61
1998	-15.40	16.37	23.93	1.49	22.86	-11.55	23.84	38.69
1999	3.81	-7.00	-5.29	1.20	-4.88	3.45	-7.96	-7.78
2000	-0.30	-17.56	-6.57	1.84	-8.80	-1.06	-19.43	-11.20
2001	25.07	21.81	-1.17	3.27	10.85	27.66	26.43	6.94
2002	6.30	17.19	3.00	-1.77	7.10	6.83	18.58	6.61
2003	7.20	4.71	7.62	4.96	11.08	10.33	10.10	16.61
2004	-8.30	-6.69	3.58	0.50	0.45	-8.09	-6.35	4.07
2005	-14.65	-19.01	-0.95	-0.52	-7.86	-15.98	-21.59	-6.02
2006	-14.05	-7.80	0.11	-2.87	-5.51	-15.73	-10.65	-4.53
2007	-1.15	4.83	3.16	-0.48	3.43	-0.78	5.66	5.07
93-07	-0.01	0.00	0.02	0.00	0.02	-0.01	0.01	0.03

Table 11. Random Effects Model with Asymmetric Firm Specific Factors and Macroeconomic Factors.

This table reports the parameter estimations from three random effects models. The dependent variables are Log (Current Compensation), Log (Tdc1), and Log (Tdc2). The time period is 1993-2007. The Q dummy takes the value one when the variable Tobin's is increasing relative to the previous year.

	Log (Current Compensation)	**Log (Tdc1)**	**Log (Tdc2)**
Log (Sales)	0.303***	0.416***	0.430***
	(32.06)	(37.19)	(37.18)
Log (Tobin's Q)	0.215***	0.325***	0.681***
	(4.81)	(6.15)	(12.45)
Age	0.046***	0.052***	0.051***
	(3.11)	(2.98)	(2.73)
Age^2/100	-0.040***	-0.051***	-0.042**
	(-3.00)	(-3.32)	(-2.55)
Tenure	0.015***	0.012***	0.043***
	(5.54)	(3.73)	(11.96)
Tenure^2/100	-0.027***	-0.033***	-0.107***
	(-3.41)	(-3.38)	(-9.25)
Log (1+Anti. interest rate)	-11.319***	-4.625***	-4.347***
	(-9.01)	(-4.04)	(-4.79)
Log (1+UnAnti. interest rate)	-10.127***	-5.741***	-
	(-7.39)	(-4.51)	-
Log (1+Anti. ΔCPI)	-10.429***	-	15.651***
	(-4.01)	-	(7.11)
Log (1+UnAnti. ΔCPI)	1.518	-7.973***	-
	(0.61)	(-4.09)	-
Log (1+Anti. ΔExchange rate)	-7.131***	-6.358***	-3.880***
	(-6.34)	(-5.60)	(-4.52)
Log (1+UnAnti. ΔExchange rate)	0.308***	-0.177***	-0.483***
	(4.31)	(-3.50)	(-8.91)

Log (Exchange rate (t-1))	0.279***	-0.591***	-0.769***
	(7.70)	(16.06)	(22.97)
Q Dummy × Log (Sales)□	-0.124**	-0.051	-0.106*
	(-2.50)	(-0.91)	(-1.77)
Q Dummy × Log (Tobin's Q)□	-0.009	0.001	0.007
	(-1.03)	(0.13)	(0.79)
Q Dummy × Log (1+Anti. interest rate)□	1.649	1.051	2.713**
	(1.07)	(0.75)	(1.98)
Q Dummy × Log (1+UnAnti. interest rate)□	0.701	-2.722*	-
	(0.37)	(-1.65)	-
Q Dummy × Log (1+Anti. ΔCPI)□	3.107	-	-3.441
	(1.09)	-	(-1.18)
Q Dummy × Log (1+UnAnti. ΔCPI)□	8.588**	5.694**	-
	(2.37)	(1.99)	-
Q Dummy ×Log (1+Anti. ΔExchange rate)□	0.978	0.954	1.483
	(0.66)	(0.64)	(1.14)
Q Dummy ×Log (1+UnAnti. ΔExchange rate)	-0.178*	0.053	0.159*
	(-1.93)	(0.65)	(1.83)
Sector 1	-0.072	0.099	0.030
	(-0.87)	(1.27)	(0.39)
Sector 2	-0.017	-0.093	-0.239***
	(-0.33)	(-1.16)	(-2.87)
Sector 3	-0.159**	-0.148**	-0.216***
	(-2.26)	(-2.42)	(-3.42)
Sector 4	0.041	0.246***	0.010
	(0.85)	(4.10)	(0.16)
Sector 5	-0.057	-0.125**	-0.052
	(-1.31)	(-2.16)	(-0.85)
Sector 6	-0.188***	-0.004	-0.158**
	(-3.64)	(-0.06)	(-2.16)
Sector 7	-0.117***	0.117*	-0.076
	(-2.60)	(1.67)	(-1.00)

Sector 8	-0.191***	-0.181***	-0.179***
	(-3.14)	(-2.73)	(-2.65)
Sector 9	-0.079	0.140*	-0.026
	(-1.62)	(1.96)	(-0.33)
Sector 10	0.131*	0.247**	0.119
	(1.83)	(2.00)	(0.94)
Sector 11	-0.337***	-0.481***	-0.289***
	(-5.57)	(-5.94)	(-3.71)
Sector 12	-0.178***	-0.286***	-0.257***
	(-3.35)	(-3.47)	(-2.81)
Sector 13	-0.276***	-0.282***	-0.326***
	(-4.77)	(-3.59)	(-4.06)
Sector 14	-0.260***	-0.349***	-0.379***
	(-4.31)	(-3.67)	(-3.68)
Sector 15	0.326***	0.403***	0.508***
	(7.28)	(7.08)	(8.31)
Sector 16	0.403***	0.344**	0.308
	(4.75)	(1.97)	(1.51)
Sector 17	-0.124**	-0.051	-0.106*
	(1.08)	(2.98)	(1.50)
Constant	3.872***	3.370***	2.191***
	(9.24)	(6.80)	(4.16)
Observations	10,185	10,222	10,213
R-squared	0.28	0.40	0.40
p–value from the F-test for joint significance of the interaction macro factors	0.118	0.079	0.244

1. *t*-values are in round parentheses, and *p*-values are in square parentheses.
2. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better.

Table 12. Asymmetric Effects of the Macro Factors to Total Compensation with Option Granted

This table reports the predicted percentage differences between Q up and down periods for Total Compensation with Option Granted (TDC1) based on coefficients in Table 11.

Year	Percentage Difference of the predations from up and down period in the Tdc1 Equation, given Q and Sales (Up-Down)/(Down)
	%
	(1)
1993	7.94
1994	-3.93
1995	3.34
1996	5.96
1997	0.38
1998	-2.08
1999	6.37
2000	8.19
2001	12.27
2002	1.76
2003	7.93
2004	0.92
2005	-0.17
2006	-1.99
2007	3.16

Figure 1 Compensation Index

This figure plots the mean levels of Cash Compensation, Total Compensation including Option Total Compensation including Option Granted, and Total Compensation including Option Exercised for the CEOs in 2158 US firms during the period 1992-2008. The S&P 500 index is also shown.