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Macroeconomic Fluctuations as Sources of Luck in CEO Compensation

Abstract

Macroeconomic fluctuations such as interest rate and exchange rate can be considered sources of good or bad "luck" for corporate performance. Incentive effects of performance-based compensation for management may be weakened or biased by macroeconomic influences depending on the ability of management to adjust for operations. We decompose the impacts on CEO compensation to distinguish between macroeconomic (anticipated and unanticipated) and "intrinsic" sources. Total CEO compensation is measured by including options awarded or options exercised. Both measures depend strongly on variations in macro factors but the time patterns differ. The macroeconomic factors increased total awarded compensation as much as 30 percent in one period and reduced awarded compensation 14 percent in another period. The effect on realized compensation ranges from positive 44 percent to negative 16 percent. The average annual absolute effect lies within the range of 11 to 16 percent.

1. Introduction

CEO compensation has increased sharply during the last few decades and has drawn significant attention from the general public, politicians and regulators in the US as well as in Europe; especially during the recent financial crisis.[1] 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 millennium.[2] According to Fernandes et al. (2008), the difference between Europe and the US compensation can be explained to a large extent by performance-based component of executive compensation in the US compensation which seems to be associated with a higher risk premium. This observation implies that levels and forms of compensation are not independent.

In this paper we analyze the impact of macroeconomic fluctuations on CEO compensation in the US. We distinguish between anticipated and unanticipated fluctuations because incentive effects of macroeconomic fluctuations could depend on the degree to which they are anticipated as explained below. To our knowledge, US is the only country where data allows analysis for several dimensions of compensation for a long period but we are able to compare some results with a more limited study of CEO compensation in Sweden (Oxelheim et al, 2008) where variable compensation represents a much smaller share of total compensation.

Changes in macroeconomic conditions can be considered an important source of good or bad "luck" in corporate performance and in compensation based on performance. Although management lacks influence over macroeconomic conditions, compensation may be able to influence performance to the extent operations can be adjusted in response to contemporaneous or anticipated macroeconomic conditions. Thus, "purely" lucky or unlucky performance and compensation occurs in

[1] In Gabaix and Landier (2008) it is argued that the six fold increase of CEO compensation in the US between 1980-2003 can be attributed to the sixfold increase of market capitalization of large companies during the same period. In a long time series analysis of CEO compensation Frydman and Saks (2010) show that prior to the 70s there was little dispersion across managers and low correlation between pay and firm size prior. After the 70s, incentive pay has grown significantly, correlation between pay and firm size has strengthened and pay dispersion across executives has widened.

[2] See, for example, Oxelheim and Randöy (2005).

response to macroeconomic events if management is unable to respond to these events for lack of anticipation or inability to adjust.

Analyzing the impact of luck on CEO compensation, Bertrand and Mullainathan (2000, 2001) define luck as performance beyond CEO's control. 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 from year to year around 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. Benchmarking can be viewed as an attempt to adjust for luck. Aggarwal and Samwyck (1999) and more recently Bizjak, Lemmon, and Naveen (2008) document widespread use of benchmarking.

Accepting the premise from the contracting literature that optimal incentive contracts do not include rewards (penalties) for observable lucky (unlucky) performance, there is an additional difficulty associated with the measurement of luck or performance outside the control of management.[3] 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 the above discussion is that the appropriate definition of lucky performance depends both on the nature of shocks and the technological, as well as managerial, 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 (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 such as exchange

[3] 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, Milgrom and Roberts (1992) and Rosen (1992 Contracts and the Market for Executives) review the contracting literature on incentive effects of compensation schemes.

rate changes. For instance, 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. In general, we would expect the service industry including the financial sector to have the technological capability to adjust operations rapidly to take advantage of macroeconomic fluctuations. In this case, skill and effort contribute to performance effects of short lived macroeconomic shocks.

In this paper we focus on the macroeconomic environment as a major external source of changes in CEO compensation as well as in corporate performance in the US during the period 1993-2007. We distinguish between anticipated and unanticipated macroeconomic effects. If compensation responds to, for example, anticipated events but not to unanticipated events, managers have incentives to adjust operations in response to forecast macroeconomic developments.

Three research questions will be investigated in this paper. First, we ask to what extent do macroeconomic fluctuations contribute to the level and variability of compensation. Second, we analyze whether there are substantial differences between compensation effects of anticipated and unanticipated macroeconomic fluctuations. Third, we ask whether differences between awarded and realized compensation reveal an ability of CEOs to exercise options with timing expertise with respect to macroeconomic events.

Macroeconomic developments during a period are captured by exchange rate changes, interest rates, and inflation rates. These macroeconomic price variables respond rapidly to underlying unobservable macroeconomic shocks and provide information about the extent of macroeconomic influences on compensation and performance.[4]

The dataset for CEO compensation in the US covering the period 1992-2008 includes salary, bonus, option awards and pension payments. We exclude data after 2008 due to years of financial crisis. Year 1992 shows that a very large share of executive compensation in the US is performance

[4] Oxelheim and Wihlborg (2003, 2008) use these variables to identify corporate exposure to macroeconomic uncertainty and to assess a firm's "intrinsic" competitiveness. In Section 3 below we show that adding changes in GDP to changes in the macroeconomic price variables does not add information about macroeconomic developments.

based. Cash compensation in the form of salary plus bonus constitutes 15-20 percent of total CEO compensation. The data is described in more details in the next section.

The paper is organized as follows. In section 2, the data sources and stylized facts are presented. Section 3 presents estimations of pay-for-performance elasticities with respect to macroeconomic factors, industry factors and firm specific factors. 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. Then follows the section 4 in which we analyze and calculate the contributions of the macroeconomic factors to compensation and performance year by year. Since incentive effects of macroeconomic influences on compensation may depend on whether they are anticipated we make specific assumptions about expectations formation to illustrate the importance of identifying the contribution of luck correctly. The final section 5 provides concluding comments and policy implications.

2. Data Sources and Stylized Facts

Compensation data is obtained from Standard and Poor's Execucomp through COMPUSTAT North America. The database covers about 3,000 companies, both active and inactive. Our sample consists of U.S. firms from 1992 to 2007 but the estimation period is limited to 1993-2007. Year 1992 data is used to calculate the rate of the return on compensation. All the variables are calculated in 1992 values.

The following 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 incentives 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 2007 is 0.58 while the correlation for our overall sample period is 0.47. From the point of view of risk management incentives the pattern of realized compensation should be of particular interest.

In 2006 the FAS 123R 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 while TDC1 and TDC2 exist for the period before as well as after 2006.[5] Since the correlations between TDC1 and TOTAL_ALT1, and between TDC2 and TOTAL_ALT2 in cross-section for 2007 are as high as 0.99 and 0.81, we are comfortable using TDC1 and TDC2 as compensation measures.

We begin by investigating the statistical properties of the three compensation series for 3,046 firms in the dataset covering the period 1992-2007. The panel is unbalanced. After excluding some firms with incomplete data, there are 2,158 firms remaining in the compensation dataset. Table 1 displays annual means and standard deviations for the levels (in thousands $) and index (year 1992=100) of TOTALCURR, TDC1 and TDC2 for each year.

(Insert Table 1 here)

[5] 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.

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 such as options granted constitute a large share of total compensation. The variations across firms are even larger in TDC2.

The peaks for TDC1 and TDC2 appear to occur at approximately the same time. Stock market peaked in 1999 and 2007. TDC1 including awarded incentives had its highest peak in 2000, the year after the peak in the stock market index. The peaks for TDC2 including options exercised peaked the same year as stock market index. It is no surprise that options are awarded when the stock market is high but the timing of exercising options depends on managers' ability to predict market movements.

Table 2, Panel A describes the means and standard deviations for the macroeconomic variables, interest rate, inflation rate relative to the previous year, and annual exchange rate changes[6], while Panel B shows the main firm specific accounting variables, Sales and Tobin's Q. The interest rates are the annual average one year Treasury rates. Inflation rates are the year to year changes in the level of consumer prices (CPI). The exchange rates are the annual average Euro per Dollar rates after 1998. Before 1998, the German Mark per Dollar is used. All the macroeconomic factors are obtained from DataStream.

In the Table we can see that the average 1-year T-bill rate is 4.6% and the average annual inflation rate is 2.6%. The average annual exchange rate change is -0.006 with a standard deviation of 0.093. The dollar's depreciation over the whole period is expected to favor exporting firms. Average sales of our firms are 4.3 million dollars and Tobin's Q is 1.989. The latter is defined as (Market value of equity + Book value of debt) / (Book value of equity + Book value of debt). The average CEO age is 56 years while the average CEO tenure is about 7 years. These data are not included in the table to save space.

(Insert Table 2 here)

[6] The changes in real US GDP relative to the previous year were tested as well.

3. Explaining Compensation with and without Macroeconomic Factors

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

3.1 Identifying performance variables and industry effects

Early studies of executive compensation across firms focus 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 analyze whether CEOs are rewarded for performance relative to a market or industry benchmark (Antle and Smith, 1986; Gibbons and Murphy, 1990; Bertrand and Mullainathan, 2001; Bebchuk and Grinstein 2005; Garvey and Milbourn, 2006). 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 following pooled regression (1) is estimated for the period 1993-2007 including 17 industry dummies and 14 year dummies but no macroeconomic variables. Fixed effects and random effects models are compared below when macroeconomic factors are included instead of year dummies.[7] The dependent variable (real compensation) is defined as TOTALCURR, TDC1 and TDC2, respectively, since the sensitivities to these compensation measures cannot be expected to be the same.

$$Log(Compensation_{i,t}) = \alpha_0 + \alpha_1 Log(Sales_{i,t}) + \alpha_2 Log(Performance_{i,t}) + \sum_{i=1}^{4} \beta_i Control\ variables_i + \sum_{i=1}^{17} \gamma_i Industry\ dummies_i + \sum_{i=1}^{14} \theta_i Year\ dummies_i + \varepsilon_{i,t} \quad (1)$$

The firm's total (real) 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

[7] Equation (1) was also tested in cross-section for each individual year. The results are not included here for reasons of space.

adopted as the performance measure in our specifications. Variations in this variable are dominated by variations in the market value of equity.

All variables in the regressions in this study are in logarithms. Therefore, the regression coefficients are interpreted as "pay-for-performance elasticities." One advantage of using the elasticity approach is that it produces a better "fit" in terms of marginal effects. The other advantage is that the elasticity is relatively invariant to firm size (Gibbons and Murphy, 1992; Murphy 1999).

Table 3 reports the parameter estimations from three pooled regression models for the period 1993-2007 by using equation (1). The table shows that 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 measured by sales and performance measured by Tobin's Q. Compensation including options awarded and exercised (TDC1 and TDC2) is more sensitive to these firm level variables. TDC2 is also considerably more sensitive to Tobin's Q than TDC1. CEO age and tenure both contribute positively to cash and total compensation. Industry dummies indicate that compensation levels vary substantially across industries.[8] The time dummies for TDC1 and TDC2 in particular seem to be much larger after 2000 than before. We do not report industry and year dummies throughout the paper for reason of brevity.

Equation (1) was also tested cross-sectionally 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 TDC2 and to a lesser degree for TDC1. The greatest variation over time in elasticities was observed for cash compensation. Thus, it seems that the composition of compensation varies over time.

(Insert Table 3 here)

[8] The sectors in Table 4 are the following with the number of firms in parenthesis: 1=Oil and Gas (22); 2=Food Tobacco Products (28); 3=Paper and Paper Products (48); 4=Chemical Products (64); 5=Manufacturing (35); 6=Computer Hardware & Software (66); 7=Electronic equipment (35); 8=Transportation (51); 9=Scientific Instruments (38); 10=Communications (10); 11=Electric and Gas Services (58); 12=Durable Goods (8); 13=Retail (32); 14=Eating and Drinking Establishments (20); 15=Financial Services (38); 16=Entertainment Services (4); 17=Health (5); 18=All Others (72).

3.2 Macroeconomic influences on compensation and performance

Macroeconomic influences on compensation can occur through performance variables in equation (1) or through other variables influencing compensation. We investigate whether macroeconomic variables affect compensation independent of variation in Q and Sales, and we analyze macroeconomic influences on Q and Sales. The total macroeconomic influence on compensation is calculated as sum of all effects.

Macroeconomic conditions can be identified by either quantity variables like GDP, GDP growth, investments and employment, or by price variables such as interest rates, inflation rates, exchange rates and 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 (i.e. interest rate) as well as on quantity variables (i.e. GDP growth). Only the former would be observable at the time a shock occurs. Therefore, price-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 quickly to both domestic and foreign conditions affecting a firm's performance.

The macro price variables used in this paper are the 1-year US Treasury interest rate, the consumer price index (CPI), the exchange rate (Euro/Dollar). Other dollar-exchange rates are not included because they are highly correlated.[9] The stock market index is not included because this variable does not add explanatory power when interest rate is included.

The following random effects model is then estimated with firm specific variables, macro-variables (anticipated and unanticipated), as well as some control variables.

[9] It seems that most of the variation in most $-exchange rates are dominated by events originating in the US.

$$
\begin{aligned}
&Log\left(Compensati\ on_{i,t}\right) = \alpha_0 + \alpha_1 Log\left(Sales_{i,t}\right) + \alpha_2 Log\left(Tobin's\ Q_{i,t}\right) \\
&+ \sum_{i=1}^{4} \beta_i Control\ \ variables_i \\
&+ \theta_1 Log\left(1 + Anticipate\ d\ interest\ \ rate_{i,t}\right) \\
&+ \theta_2 Log\left(1 + Unanticipa\ ted\ interest\ \ rate_{i,t}\right) \\
&+ \theta_3 Log\left(1 + Anticipate\ d\ \Delta CPI_{i,t}\right) \\
&+ \theta_4 Log\left(1 + Unanticipa\ ted\ \Delta CPI_{i,t}\right) \\
&+ \theta_5 Log\left(1 + \Delta Anticipate\ d\ exchange\ \ rate_{i,t}\right) \\
&+ \theta_6 Log\left(1 + \Delta Unticipate\ d\ exchange\ \ rate_{i,t}\right) \\
&+ \theta_7 Log\left(exchange\ \ rate_{i,t-1}\right) \\
&+ \sum_{i=1}^{17} \gamma_i Industry\ \ dummies_i + u_i + \varepsilon_{i,t}
\end{aligned}
\qquad (2)
$$

The macro-variables expressed in terms of anticipated and unanticipated changes are formulated in the following way. The anticipated interest rate in the next period is assumed to be equal to current interest rate. Thus, we define unanticipated interest rate as the interest rate changes from year to year.

$$
\begin{aligned}
&Anticipated\ interest\ rate_t = i_{t-1} \\
&Unanticipated\ interest\ rate_t = i_t - i_{t-1}
\end{aligned}
$$

The anticipated exchange rate change (euro/$) over the next year is reflected in the current one-year interest rate differential (uncovered interest rate parity). Thus,

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

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

All proxies for anticipated and 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.

Table 4 shows the compensation elasticities with respect to Sales, Tobin's Q, and the macroeconomic variables using equation (2). Age, tenure and industry dummies are included as above. The compensation variables are TOTALCURR, TDC1 and TDC2 as above. In Table 5, Model 1 for TDC1 and TDC2 include all the macroeconomic variables while insignificant variables in Model 1 have been removed in Model 2.

We can see that Sales and Tobin's Q are significant in all the models in Table 4. Looking at 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 is associated with a decline in compensation. The magnitude of several coefficients is large. For example, the coefficient of the unanticipated interest rate implies that a one percentage point increase in the interest rate is associated with a 7 percent decline in compensation. The smallest effects of macro-variables are associated with anticipated inflation (zero) and unanticipated exchange rate changes (-0.141). The zero effect of anticipated inflation implies that there is no effect of anticipated inflation on real compensation.

The results for compensation including options exercised each period (TDC2) are different in some respects. As noted above the performance (Q) sensitivity has increased relative to results without macro variables in Table 3. Furthermore, the effects of unanticipated inflation are insignificant. This observation is an indication that managers are not able to exercise option based on timing expertise with respect to changes in this macroeconomic variable. We return to this issue below.

We also add a term (Export sales/Total sales), as well as this ratio interacting with all exchange rate variables, to possibly capture firm-specific effects of exchange rate changes. The export-sales ratio was obtained for 523 firms out of the total sample of 2,091. The results are not presented because neither the export/sales ratio itself, nor the interaction terms were significant. Thus, we are not able to identify a higher sensitivity of compensation to exchange rate changes in firms with high export dependence.

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 equation (2) and Table 4. In addition, Log (Tobin's Q) is an independent variable in the regression for log Sales and vice versa.

Table 5 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.[10]

(Insert Table 5 here)

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 4 as well as the indirect channels captured in Table 5. The effect of increased inflation on TDC1 is negative through the direct channel in Table 4 but positive through the impact on Q and Sales in Table 5.

4. The Impact of Macroeconomic Fluctuations on CEO Compensation

In this section we combine the elasticities estimated in the previous section with actual changes in macroeconomic factors each year to "filter out" the share of compensation explained by

[10] These results indicate that sales generally are higher than what value maximization would call for.

macroeconomic conditions. First, we ask how much macroeconomic fluctuations contribute to the level and variability in compensation. Second, we analyze whether there are substantial differences between compensation effects of anticipated and unanticipated macroeconomic fluctuations. Third, we ask whether differences between awarded and realized compensation reveal an ability of CEOs to exercise options with timing expertise with respect to macroeconomic events.

Table 6 shows the total effect of macroeconomic variables while Table 7 shows the effects of unanticipated changes. In each of the tables column (1) shows the percent of salary plus bonus (TOTALCURR) resulted from macroeconomic factors each year at constant levels of Q and Sales. 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 5 as weights. Thus, column (6) shows the percentage of current compensation each year explained by macroeconomic factors. Columns (7) and (8) show the macroeconomic effects on compensation awarded (TDC1) and realized (TDC2), respectively.

The macroeconomic effects in Table 6, columns (1) through (3) are calculated based on deviations from mean levels of the macro variables each year times the appropriate coefficients in Tables 4. The procedure for calculating macroeconomic effects on Q and Sales is the same, but the coefficients are obtained from Table 5.

The total macroeconomic impact on compensation in Table 6 varies from year to year and differs among the compensation measures. Comparing macroeconomic effects on cash compensation (TOTALCURR) in column (6) with total compensation awarded (TDC1) in column (7) and total realized compensation (TDC2) in column (8), it can be observed that the time patterns are different. The impact on cash compensation varies from a negative 16 percent to a positive 29 percent. The corresponding figures for TDC1 (TDC2) are negative 14 (negative 16) percent to positive 30 (44) percent. Thus, the variation in realized compensation (TDC2) appears to be the largest. These figures do not indicate that managers have exercised options with systematic forecasting expertise. However,

there is weak evidence of forecasting expertise in the difference between macroeconomic impact on realized compensation over our sample period (11.88 percent) and the macroeconomic impact on awarded compensation (8.79 percent).

Macroeconomic effects of unanticipated changes in macro variables in Table 7 are calculated the same way as in Table 6 with the difference that only unanticipated effects of macro variables and corresponding coefficients are included. The mean levels of unanticipated changes in macro variables are zero.[11]

(Insert Table 7 here)

The effects of unanticipated macroeconomic fluctuations in Table 7 are large as well. The largest negative effect on cash compensation in column (6) is -25 percent in 1994 while the largest positive effect is +26 percent in 2001. The corresponding figures for TDC1 are -23 percent in 2000 and +21 percent in 2001 while for TDC2 they are -15 percent in 2000 and +42 percent in 1998. 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. Thus, managers have been able to avoid exercising options in periods when unanticipated macroeconomic conditions are at the most disadvantageous and able to take advantage of the most advantageous conditions. This is evidence of occasional forecasting expertise. There is weak evidence in Table 7 that this expertise might be systematic in that the unanticipated macroeconomic impact on TDC2 (3.31 percent) is greater than the corresponding impact on TDC1 (1.36 percent). [12]

[11] The effects of the lagged exchange rate levels are neglected since calculation of this effect requires an assumption about what the exchange rate would be under "neutral" macroeconomic conditions.

[12] There are substantial differences between the impact of macroeconomic conditions on CEO compensation in the US and in Sweden where the variable part of compensation is much lower. According to Oxelheim et al (2008), the sensitivity of compensation to macroeconomic factors seems larger in the US than in Sweden for the period 2001-2007. The range for unanticipated macroeconomic effects on total compensation awarded ranged from -11 to +12 percent in Sweden during the period. The corresponding range for the US during the same period was between -13 and +21 percent in Table 9.

Table 8 presents the Average Absolute Macro Effects on the different compensation measures based on Table 6 for total macro effects and Table 7 for unanticipated macro effects under the assumption of symmetry. The Average Absolute Macro Effects shows the average share of compensation explained by macroeconomic conditions. Total macroeconomic conditions explain approximately equal shares of TDC1 and current compensation in column (1). Macroeconomic conditions explain a larger average share of realized compensation (TDC2). Unanticipated macro effects explain a relatively large share of awarded compensation (TDC1) during the period 1993-2007 in column (3).

(Insert Table 8 here)

5. Concluding Remarks

We analyze macroeconomic influences on CEO compensation in a panel of 2,091 US firms for the period 1993-2007 using exchange rate changes, interest rates and inflation rates as indicators of macroeconomic fluctuations. The same set of macroeconomic factors was applied for all firms. 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. We estimate the impact of the macroeconomic factors on current compensation, total compensation awarded and total realized compensation taking into account exercised options.

Three channels of macroeconomic influences on compensation are 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. After estimating the elasticities of performance variables and compensation to anticipated and unanticipated macroeconomic factors, we use the coefficients in combination with macroeconomic developments each year to calculate how three different measures of compensation would have developed had macroeconomic influences been filtered out. The results indicate that a large share of the annual changes in CEO compensation in the

US is explained by macroeconomic factors. The effect on compensation over our sample period ranges between 7 percent in current compensation and 12 percent in realized compensation.

Specifically three research questions have been investigated in this paper. First, we ask how much macroeconomic fluctuations contribute to the level and variability of compensation. The empirical evidence shows that the macroeconomic impact on cash compensation varies from a negative 16 percent to a positive 29 percent. These fluctuations in compensation can be considered the result of luck in firms with little flexibility to adjust operations in response to changes in macroeconomic conditions. In comparison with a study of awarded compensation in Sweden for the period 2001-2007 we find that the sensitivity to macroeconomic conditions is greater in the US than in Sweden where the variable share of compensation is much smaller.

The second research question investigates whether there are substantial differences between compensation variations due to anticipated and unanticipated macroeconomic fluctuations. The results show that the range for anticipated average absolute effects was 11 to 16 percent, while for unanticipated average absolute effects was 9 to 12 percent. The effects from unanticipated macroeconomic fluctuations can be considered the result of luck in firms requiring a year or more to adjust operations to take advantage of positive macroeconomic effects or reducing the impact of negative macroeconomic conditions. The very wide fluctuations in compensation would provide appropriate incentives only in the presumably small share of the economy with sufficient flexibility to adjust operations very rapidly. In most firms we expect that the sensitivity of compensation to macroeconomic fluctuations distort or weaken incentives of management to focus effort and skill where they can be applied most effectively.

Finally, we ask whether differences between awarded and realized compensation reveal an ability of CEOs to exercise options with timing expertise with respect to macroeconomic events. Based on the regression results, it seems that the managers are able to occasionally time the exercising of options with expertise but this expertise may not be systematic.

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 a benchmark for some duration. The argument behind such proposals would be that improved performance is likely to be caused by other factors than manager skill and effort, i.e. luck, if performance does not exceed a benchmark for duration of time.

A serious problem associated with the proposals to reward only "sustainable" performance 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. In the presence of macroeconomic fluctuations sustainability of good performance need not be a good indicator of skill and effort as opposed to luck for two reasons. First, "lucky" macroeconomic conditions can last for several years and, second, the short term impact of macroeconomic conditions could depend on skill and effort in firms with a great deal of flexibility.

The analysis in this paper can be refined further in future research. We can further detangle incentive effects of macroeconomic fluctuations for individual firms with different degrees of technological adjustability for operations. Through firm level analysis, we could analyze firm specific elasticities of different measures of compensation with respect to macroeconomic variables over time. Incentive effects are a subject for future research.

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Table 1 Annual Compensation Levels

This table displays annual mean, standard deviation for three CEO-compensation levels (Million US Dollar): Cash Compensation(TOTALCURR), Total Compensation including Option Awarded (TDC1), and Total Compensation including Option Exercised (TDC2), as well as the index for each variable with 1992 value=100. The dataset includes 2,158 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	1.128	0.754	100.00	2.311	2.238	100.00	2.968	5.920	100.00
1993	1,002	0.992	0.948	87.89	2.060	2.786	89.13	2.246	7.101	75.68
1994	1,307	0.962	0.825	85.23	2.158	2.818	93.38	1.674	2.240	56.40
1995	1,386	1.017	0.877	90.17	2.314	3.369	100.10	2.063	3.344	69.50
1996	1,456	1.118	1.084	99.14	3.145	6.961	136.06	2.635	5.346	88.76
1997	1,534	1.217	1.298	107.92	3.902	7.759	168.82	3.697	9.846	124.56
1998	1,612	1.207	1.232	106.95	4.550	18.328	196.85	4.629	23.452	155.93
1999	1,688	1.299	1.451	115.13	5.079	11.233	219.75	4.227	11.373	142.42
2000	1,709	1.359	1.637	120.47	6.722	21.506	290.82	6.195	23.012	208.70
2001	1,620	1.315	1.784	116.58	6.350	16.411	274.72	4.503	11.835	151.71
2002	1,629	1.391	1.375	123.27	4.919	7.359	212.80	3.798	8.235	127.95
2003	1,686	1.568	1.869	138.98	4.549	6.093	196.80	4.536	9.233	152.83
2004	1,642	1.763	2.008	156.26	5.216	7.193	225.66	5.909	11.498	199.07
2005	1,578	1.898	2.303	168.27	5.554	7.406	240.28	7.169	16.503	241.52
2006	1,498	1.247	1.927	110.56	5.743	7.818	248.45	7.680	15.223	258.75
2007	1,418	1.086	1.737	96.30	5.909	8.126	255.65	7.806	14.085	262.99

Table 2 Year by Year Descriptive Statistics for the Macroeconomic and Microeconomic Factors

Panel A: Macroeconomic Factors

Year	US 1 year rate		Exchange rate change		US inflation rate	
	Mean	Std.	Mean	Std.	Mean	Std.
1993	0.037	0.001	0.006	0.030	0.027	0.018
1994	0.057	0.012	-0.010	0.020	0.026	0.017
1995	0.062	0.005	-0.006	0.032	0.025	0.021
1996	0.058	0.003	0.007	0.021	0.033	0.023
1997	0.061	0.001	0.012	0.029	0.017	0.016
1998	0.055	0.004	-0.062	0.199	0.016	0.013
1999	0.058	0.005	0.013	0.021	0.027	0.026
2000	0.069	0.004	0.005	0.037	0.033	0.035
2001	0.037	0.010	0.004	0.024	0.016	0.042
2002	0.022	0.005	-0.014	0.026	0.023	0.030
2003	0.014	0.001	-0.015	0.030	0.019	0.040
2004	0.022	0.006	-0.006	0.020	0.031	0.040
2005	0.041	0.005	0.012	0.019	0.035	0.065
2006	0.053	0.002	-0.009	0.019	0.025	0.053
2007	0.051	0.004	-0.009	0.017	0.040	0.041
1993-2007	0.046	0.017	-0.006	0.093	0.026	0.005

Panel B: Microeconomic Factors

Year	Sales		Tobin's Q	
	Mean	Std.	Mean	Std.
1993	6.767	11.485	1.749	1.087
1994	4.077	8.670	1.682	0.976
1995	3.703	9.419	1.871	1.300
1996	3.757	9.472	1.902	1.242
1997	3.910	9.732	2.042	1.365
1998	3.919	9.539	2.194	2.215
1999	4.127	10.721	2.443	3.596
2000	4.275	11.912	2.214	2.263
2001	4.082	10.876	2.047	1.526
2002	3.926	10.942	1.649	1.058
2003	4.134	11.511	1.987	1.377
2004	4.384	12.557	2.018	1.495
2005	4.687	12.726	1.955	1.436
2006	5.346	15.437	1.916	1.078
2007	5.892	16.788	1.871	1.245
1993-2007	4.350	11.759	1.989	1.735

Table 3 Pooled Regression Model with Sector and Time Dummy Variables

This table reports the parameter estimations from three pooled regression models for the period 1993-2007. The dependent variables are Log (TOTALCURR), Log (TDC1), and Log (TDC2). The industries are identified in footnote 10 in the text.

	Log (TOTALCURR)	Log (TDC1)	Log (TDC2)
Log (Sales)	0.289***	0.409***	0.415***
	(71.79)	(91.01)	(86.26)
Log (Tobin's Q)	0.116***	0.366***	0.505***
	(8.90)	(25.13)	(32.29)
Age	0.067***	0.047***	0.055***
	(7.60)	(4.83)	(5.19)
Age^2/100	-0.054***	-0.044***	-0.043***
	(-6.88)	(-5.02)	(-4.56)
Tenure	0.011***	0.008***	0.035***
	(5.44)	(3.59)	(14.29)
Tenure^2/100	-0.028***	-0.042***	-0.102***
	(-4.09)	(-5.63)	(-12.67)
Constant	2.482***	2.776***	1.983***
	(9.94)	(9.98)	(6.64)
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Observations	18,665	18,665	18,665
R-squared	0.28	0.40	0.40

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

Table 4 Random Effects Model with 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 (TOTALCURR), Log (TDC1), and Log (TDC2). The time period is 1993-2007. T-values are in round parentheses. *, **, *** denotes significance at the 0.10, 0.05 and 0.01 level or better. Industry dummies are included in all models.

	Log	Log (TDC1)		Log (TDC2)	
	(TOTALCURR)	Model 1	Model 2	Model 1	Model 2
Log (Sales)	0.278***	0.398***	0.398***	0.419***	0.419***
	(24.19)	(32.59)	(32.67)	(34.81)	(34.83)
Log (Tobin's Q)	0.185***	0.368***	0.368***	0.652***	0.651***
	(6.30)	(7.62)	(7.62)	(18.42)	(18.46)
Age	0.067***	0.046**	0.046**	0.052**	0.052**
	(3.41)	(2.10)	(2.08)	(2.35)	(2.35)
Age^2/100	-0.057***	-0.044**	-0.044**	-0.043**	-0.043**
	(-3.26)	(-2.28)	(-2.27)	(-2.18)	(-2.18)
Tenure	0.010***	0.004	0.004	0.040***	0.040***
	(2.98)	(0.94)	(0.94)	(9.85)	(9.85)
Tenure^2/100	-0.015	-0.019	-0.019	-0.106***	-0.106***
	(-1.19)	(-1.54)	(-1.53)	(-6.68)	(-6.69)
Log (1+Anti. interest rate)	-10.622***	-2.949***	-3.364***	-4.818***	-4.924***
	(-18.92)	(-4.39)	(-5.50)	(-5.98)	(-6.14)
Log (1+UnAnti. interest rate)	-8.745***	-6.485***	-7.002***	-1.979**	-2.255***
	(-13.80)	(-8.74)	(-10.09)	(-2.34)	(-2.77)
Log (1+Ananti. ΔCPI)	-6.966***	-2.254	-	14.765***	15.677***
	(-4.98)	(-1.60)	-	(8.93)	(12.71)
Log (1+UnAnti. ΔCPI)	5.159***	-5.840***	-4.333***	-1.240	-
	(4.77)	(-4.12)	(-3.95)	(-0.90)	-
Log (1+Anti. ΔExchange rate)	-6.472***	-4.547***	-4.884***	-5.050***	-5.106***
	(-9.20)	(-6.53)	(-7.08)	(-6.47)	(-6.50)
Log (1+UnAnti. ΔExchange rate)	0.217***	-0.125***	-0.141***	-0.416***	-0.426***
	(8.99)	(-3.82)	(-4.54)	(-12.85)	(-13.57)
Log (Exchange rate (t-1))	0.277***	-0.591***	-0.579***	-0.771***	-0.763***
	(7.11)	(-14.68)	(-14.44)	(-20.08)	(-20.24)
Constant	3.325***	3.702***	3.671***	2.330***	2.309***
	(6.16)	(6.25)	(6.19)	(3.85)	(3.83)
Observations	18,665	18,665	18,665	18,665	18,665
Number of firms	2,091	2,091	2,091	2,091	2,091
R-squared	0.27	0.37	0.37	0.37	0.37

Table 5 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)	-0.031***	-
	(-3.89)	-
Log (Tobin's Q)	-	-0.088***
	-	(-3.18)
Log (1+Anti. interest rate)	-1.432***	-2.107***
	(-4.25)	(-4.94)
Log (1+UnAnti. interest rate)	-2.629***	-3.326***
	(-8.73)	(-7.17)
Log (1+Ananti. ΔCPI)	1.134	10.322***
	(1.52)	(10.18)
Log (1+UnAnti. ΔCPI)	4.873***	0.813
	(10.10)	(1.33)
Log (1+Anti. Δ Exchange rate)	-4.701***	-3.364***
	(-15.93)	(-7.23)
Log (1+UnAnti. Δ Exchange rate)	-0.041***	-0.403***
	(-3.41)	(-22.44)
Log (Exchange rate (t-1))	0.089***	-0.764***
	(5.32)	(-24.12)
Constant	0.582***	6.947***
	(9.06)	(78.13)
Industry dummies	Yes	Yes
Observations	18,665	18,665
Number of firms	2,091	2,091
R-squared	0.16	0.07

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

Table 6 Contribution of the Anticipated plus Unanticipated 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 4 (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 5.

Year	Macro Effects in Current Compensation given Q and Sales	Macro Effects in TDC1 given Q and Sales	Macro Effects in TDC2 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	-12.48	-8.33	-6.25	-11.22	-3.76	-16.30	-14.15	-13.40
1994	-12.22	-8.76	6.94	-3.85	0.13	-13.26	-10.24	5.42
1995	-7.84	1.66	6.28	5.61	5.97	-5.18	6.04	12.52
1996	3.80	7.45	4.94	10.24	4.82	7.54	13.26	12.37
1997	-0.19	6.44	3.95	6.06	1.05	1.69	9.23	7.17
1998	-16.65	18.73	24.54	6.63	25.03	-10.18	30.36	43.61
1999	16.10	3.41	-14.06	10.84	-9.53	17.35	4.31	-15.72
2000	3.78	-9.19	-11.72	9.30	-9.33	4.64	-8.84	-13.90
2001	-4.63	14.24	4.91	1.96	10.33	-2.17	18.73	12.46
2002	3.99	12.97	7.17	-6.62	6.58	3.37	12.70	8.68
2003	27.20	8.15	0.83	3.95	2.35	28.73	10.56	4.02
2004	23.89	3.74	11.04	3.67	4.00	25.65	6.64	15.18
2005	20.51	-0.52	14.49	9.61	4.48	24.01	4.92	21.43
2006	-0.55	2.73	18.93	5.91	10.38	3.01	8.81	28.17
2007	-9.91	4.77	11.76	1.66	9.76	-7.64	8.93	18.81
93-07	5.01	5.16	6.69	4.60	5.01	7.21	8.79	11.88

Table 7 Contribution of the Unanticipated Macroeconomic Factors to Compensation

This table reports the predicted unanticipated macro effects in different years as well as the whole period 1993-2007 using coefficients in Table 4 (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 5.

Year	Unanticipated Macro Effects in Current Compensation given Q and Sales	UnanticipatedMacro Effects in TDC1 given Q and Sales	Unanaticipated Macro Effects in TDC2 given Q and Sales	Q Equation	Sales Equation	Total Unanticipated Macro Effects to Current Compensation (1)+w_q×(4)+w_s×(5)	Total Unanticipated Macro Effects to TDC1 (2)+w_q×(4)+w_s×(5)	Total Unanticipated Macro Effects to TDC2 (3)+w_q×(4)+w_s×(5)
	%	%	%	%	%	%	%	%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1993	5.48	4.82	-0.22	0.99	0.44	5.84	5.37	0.48
1994	-22.06	-10.31	-3.51	-6.92	-6.11	-25.11	-15.26	-10.38
1995	-5.56	-6.20	3.43	-0.05	2.84	-5.04	-5.20	5.26
1996	5.52	-4.33	-2.52	1.29	-1.82	5.54	-4.47	-3.17
1997	-1.73	-5.80	-7.86	-4.29	-8.26	-4.45	-10.47	-15.03
1998	-15.01	11.02	25.92	0.50	24.71	-10.30	20.09	42.22
1999	3.65	-9.69	-6.16	1.71	-5.61	3.08	-11.02	-9.10
2000	0.05	-20.73	-9.57	2.22	-9.39	-1.07	-23.22	-14.75
2001	22.73	15.47	5.79	5.54	8.62	25.87	20.77	13.72
2002	5.48	18.30	6.55	-1.71	7.00	6.29	20.13	10.38
2003	6.16	12.29	9.66	6.12	10.54	9.81	18.51	19.09
2004	-7.53	4.10	1.95	0.05	1.17	-7.30	4.54	2.72
2005	-12.90	-9.50	-5.38	-1.45	-6.82	-14.56	-12.52	-10.42
2006	-12.47	-6.50	-2.69	-4.21	-4.21	-14.42	-9.69	-7.20
2007	-1.18	1.99	3.91	-0.68	3.74	-0.68	3.06	6.06
93-07	-1.09	0.60	2.00	0.20	1.88	-0.69	1.36	3.31

Table 8 Summary of Results: Average Absolute Total Macro Effects and Unanticipated Macro Effects

	Average Absolute Total Macro Effect (Table 6)		Average Absolute Unanticipated Macro Effect (Table 7)	
	Including effects through Q and Sales %	At constant Q and Sales %	Including effects through Q and Sales %	At constant Q and Sales %
	(1)	(2)	(3)	(4)
TOTALCURR	11.38	10.92	9.29	8.50
TDC1	11.81	6.80	12.29	9.34
TDC2	15.52	9.85	11.33	6.34