

Preliminary

Why do CEOs increase their equity-based compensation?

Because they have to.

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Abstract

We study whether the pay-setting process is controlled by managers or boards. To identify who controls it, we rely on the findings of the market timing literature. Since managers are more likely to believe their firm is overvalued when the market-to-book ratio has increased, it should be that if managers are in control they would try to reduce their pay-for-performance sensitivity. We analyze CEO compensation during the sample period 1992–2003 and show that an increase in relative firm-value leads to an increase in the manager's pay-for-performance sensitivity. Firms also significantly increase the option part of total compensation after increases in market-to-book. This rejects the hypothesis that the average CEO is "self-dealing" and skims the company by setting her own compensation in a way consistent with the market timing theory. However, our findings are consistent with effective boards timing the market or increasing the pay sensitivity because they are uncertain whether the high valuation is due to luck or skill. In addition, firms which increase the compensation after increases in value experience poorer returns in the subsequent months, suggesting that the board is successfully timing the market or rightfully doubted that the high valuation was due to skill.

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1 Introduction

The last decade has witnessed an extraordinary rise in compensation for top executives, with the pay of an average CEO more than quadrupling¹. Most of this increase has taken the form of options- and equity-based compensation. The amount of options and equity granted to CEOs has grown by about 250% (Bebchuk and Grinstein, 2005). This rate has far outstripped the increase in the fixed portion of their compensation.

In this paper we ask whether the increase in compensation is driven by managers setting their own pay or whether effective boards are responsible for the pay we observe. Bebchuk and Fried (2004) argue that the level of pay is too high and is caused by executives taking control of the pay-setting process. On the other hand, Hall and Murphy (2003) find that the pay increase is higher in firms with independent board, concluding that the level of pay might be board determined. Bebchuk and Grinstein (2005) argue that independent boards are not necessarily more inclined to oppose pay packages by top executives. Kaplan and Minton (2006) find an increased performance sensitivity for CEO dismissals after 1998 which can be evidence that boards react to CEO excesses or that board monitoring has become better and the higher compensation is thus more likely to be board determined. Hence the question to what extent managers are setting their own pay is still an open question.

Our tests are based on the following arguments: If managers determine their own pay, the “skimming” hypothesis (Bertrand and Mullainathan, 2001; Bebchuk and Fried, 2004) predicts that managers are able to impose their requests upon weak boards. In particular, executives have an easier time to extract higher pay if the market value is high or has recently appreciated a lot. In those situations, board control would be less stringent and managers can get excessive pay.

This provides a clear cross-sectional restriction for a test of the skimming hypothesis: if high market valuation represents the time when it is easier for managers to extract surplus from the shareholders, it should also affect *how* the surplus is extracted. Whether or not more equity-based compensation is the right strategy at times of high

¹ Bebchuk and Fried (2004) report that “between 1992 and 2000, the average real (inflation-adjusted) pay of chief executive officers of S&P 500 firms more than quadrupled, climbing from \$3.5 million to \$14.7 million”. Bebchuk and Grinstein (2005) find that the pay of an average CEO in the S&P 500 companies has increased from \$3.7m to \$9.1m.

market valuation would depend on what “high market valuation” means to the managers and to the board.

Recent literature has shown that managers interpret high market valuation (or high stock returns over the recent past) as overvaluation (due to expected mean-reversion), and act accordingly. For example, Baker and Wurgler (2002) show that during periods of high market valuations, managers tend to tilt the capital structure towards equity. Jenter (2005) finds that managers time the sale of their company’s shares out of their personal portfolio – more shares are sold in periods of high stock valuation (measured as high market-to-book ratio). Tests of Stein’s (1996) market timing theory (Polk and Sapienza, 2003; Gilchrist, Himmelberg, and Huberman, 2003) as well as the evidence on the positive correlation between stock market valuation and equity issues (Marsh, 1982; Loughran, Ritter, and Rydqvist, 1994; Jung, Kim, and Stulz, 1996; Pagano, Panetta, and Zingales, 1998; and Graham and Harvey, 2001) further suggest that managers interpret high market valuations as an opportunity of overvaluation to be quickly exploited.

The above characterization of skimming and market-timing by managers leads us to our first hypothesis: if, indeed, executives control the pay-setting process, we would expect the executives in firms with recent increases in market value (or market-to-book ratio) to make their compensation *less* performance-sensitive in anticipation of a future stock price correction.

However, we show that for the *average* firm, an increase in the market-to-book ratio instead leads to an *increase* in equity-based compensation. That is, after a period of good performance, managerial compensation at an average firm becomes *more* sensitive to performance. This is not a statistical artifact, but appears to be the result of a deliberate effort to time executive compensation: in periods of high market-to-book, firms rely more on equity-based compensation and even increase the fraction of compensation in the form of options, effectively tying compensation to the future performance of the stock. We also compute future abnormal returns of firms with recent increases in the market-to-book ratio as well as increases in the pay-for-performance sensitivity, and find these abnormal returns to be negative.

In order to explain the above findings, we explore two alternatives: either the firm’s board is effective and sets the managers’ pay or else managers control the board

and effectively determine their own remuneration but they are biased. For instance, managers of firms experiencing a positive performance could be overconfident and might extrapolate past performance to the future. Thus, following an increase in the market-to-book ratio, overconfident managers would like to tie their compensation even closer to the stock performance. The board, being weak, is unable to intervene in this pay-setting process and allows the managers to set their own pay.

An effective board might increase the pay sensitivity after increases in the valuation either to time the market or to use it as a way to distinguish between high valuation that is due to luck versus skill. Thus, the board would increase the pay sensitivity to incentivize skilled executives to repeat the good performance or to reduce the share of surplus appropriated by “lucky” executives.

We use a proxy for the degree of uncertainty about firm’s valuation being due to skill versus luck to distinguish between these hypotheses. Holmstrom (1979) shows that it is optimal to reduce the equity sensitivity of the pay if stock prices are more noisy signals about managerial performance. Aggarwal and Samwick (1999) find evidence for this hypothesis by showing that boards take into account the stock’s volatility when setting the pay-for-performance sensitivity (PPS). If compensation is mainly determined by a rational board, we expect to see cross-sectional correlations between firms’ pay sensitivity changes and the degree of uncertainty about firm value. Instead, if compensation is mainly determined by biased managers who grant themselves more performance-sensitive compensation when valuation is high, we do not expect to see any systematic cross-sectional differences among firms.

We find that firms that display a higher degree of uncertainty about its valuation, measured as the firm’s idiosyncratic risk, increase the pay sensitivity less after increases in the market-to-book ratio. This finding suggests that, on average, boards are controlling the pay setting process, not CEOs. This is important as it contradicts the popular believe that the average manager extracts rents through excessive options and stock compensation.

However, this conclusion is based on results valid for the *average* firm in our sample. The question remains: how would managers choose if they were to determine their own pay? It is very well possible that if CEOs were in control, they would reduce the PPS, as suggested by the *skimming hypothesis*. Alternatively, as described above,

CEOs might act as if they were overconfident and might thus increase their PPS while expecting past good returns to repeat in the future. In order to answer the above question, we use proxies for the quality of corporate governance while assuming that “worse” corporate governance is associated with a less powerful board. If boards are weak, then managers would control the pay-setting process and we would expect rational managers to reduce their PPS after increases in firm value while biased managers would increase this sensitivity. On the other hand, in firms with good governance the board would be more powerful and it would increase the pay-for-performance sensitivity after increases in the market-to-book.

We provide two sets of findings. First, unlike what recent studies and the popular press seem to suggest, it is firms with *good* corporate governance, measured using the Gompers et al. (2003) index, that increase compensation more – in particular incentives-based compensation – after the market-to-book ratio has increased. This is consistent with the interpretation that boards purposefully grant executives with more incentive-based compensation after improved market value. This may happen because the board too is aware of the stock’s potential overvaluation and/or wants to induce the managers to exert the effort required to reproduce the good performance. Our findings complement Hall and Murphy (2003) who use board independence as a proxy for board control. Second, even firms with poorer governance display an increase in the PPS after increases in the market-to-book ratio. This finding is consistent with the interpretation that CEOs, even when they are more likely to be in control of the pay-setting process, behave as if they were biased when determining their own compensation structure.

How does the market react to all of this? In line with the argument that the stock is overvalued, we find that firms that increase executive compensation – particularly compensation that increases the pay-for-performance sensitivity – under-perform in the following year. The fact that stock prices drop after an increase in managerial compensation can be interpreted in two ways. One interpretation is that the market realizes that an increase in incentives-based compensation either signals an overconfident manager being governed by a weak board or else an effective board that is doubtful about the future prospects of the firms; in either case, it’s a worrisome scenario for the market. Alternatively, it may be the case that firms’ prices were due to revert back toward the long-term mean and that compensation was changed just before the mean reversion occurred.

What are the implications? Our findings suggest that, on average, the compensation policy of the top 1,500 US companies is determined by boards, and not so much by the CEO as argued by the skimming hypothesis and the popular press. This suggests a perspective very different from the conventional one. It seems to be the case that the ever increasing adoption of stock-option plans and the growing link between compensation and performance may have actually been imposed upon the managers by the board, presumably to either increase the incentives of the managers or to time the market.

Why did managers accept such compensation contracts? One possibility is that they have been forced to accept this compensation by strong boards. A CEO who says no to a more performance based compensation package might also reveal that he thinks firm value is high because of luck, not his skill. Alternatively, the CEOs themselves may have been subject to hubris or overconfidence. The higher the performance of the firm, the more overconfident managers might have grown and therefore the higher the incentive to get a performance-based compensation. As we argued, the data supports the former as opposed to the latter hypothesis. However, in either case, the findings paint a rosier picture of executive compensation in the 90s than the skimming hypothesis implies.

Our research links to different strands of literature. The first is the literature on executive compensation. The separation of ownership and control in modern corporations increases the interest in studying the relation between CEO pay and company performance (Coughlan and Schmidt, 1985; Murphy, 1985, 1986; Jensen and Murphy, 1990; Abowd, 1990; Leonard, 1990; Aggarwal and Samwick, 1999a, 2003). Many of these studies focus on quantifying the fraction of increase in firm-value that is appropriated by the manager. Particular focus has been given to the question of whether CEOs are remunerated for performance measured relative to the market or industry (Antle and Smith, 1986; Gibbons and Murphy, 1990; Aggarwal and Samwick, 1999b). In all these cases, the objective has been to see whether the remuneration was in line with what contract theory prescribes. Other research has studied whether CEO contracts are terminated following poor performance (Weisbach, 1988; Warner, Watts, and Wruck, 1988). The principal tenet of this literature is that executive compensation is used to reduce agency problems between managers and shareholders.

More recently, Bertrand and Mullanaithan (2001) argue that CEOs are able to “capture the pay-setting process” and therefore set the compensation not in line with what contract theory would require, but in line with their ability to skim the profits of the company they manage. They find evidence that pay is related to luck and CEO pay in fact responds as much to a lucky dollar as to a general dollar increase in share price. Bolton, Scheinkman and Xiong (2003) provide a model where the stock price can deviate from fundamentals and show that optimal compensation contracts then should be structured such that managers have incentives to increase the stock price in the short term even at the expense of the long term value. Their model provides a rationale for boards to increase (decrease) pay sensitivity after price runups (drops).

The second piece of literature that we relate to is the one on insider trading. Seyhun (1986) shows that insiders at small firms are on average net purchasers while insiders at large firms are net sellers. More recently, Jenter (2005) shows that top managers have contrarian views on firm value. He shows that low market-to-book (“value”) firms are regarded as undervalued by their own managers relative to high market-to-book (“growth”) firms. Managers in value firms actively purchase additional equity on the open market despite substantial prior exposure to firm risk through stock and option holdings, equity-based compensation and firm-specific human capital. This finding is robust to controlling for non-information motivated trading.

A third body of literature that we contribute to is the one on market timing. Building on the seminal paper of Stein (1996), many have shown that corporate decisions are correlated with stock valuations. For example, Baker and Wurgler (2002) provide evidence on market timing, i.e., managers deliberately time the market by issuing equity (buying back shares) during periods of high (low) valuation. This opportunistic behavior of managers has long-lasting effects on the firm’s capital structure and helps in explaining cross-sectional variation in firms’ capital structure. Shleifer and Vishny (2002) show that managers take advantage of market misvaluations through merger decisions, especially when they use their own equity as acquisition currency. Similar evidence is available for IPOs (e.g., Ritter, 1991 and Loughran and Ritter, 1995) as well as in the case of stock repurchases (e.g., Ikenberry, Lakonishok, and Vermaelen, 1995).

The remainder of the paper is structured as follows. In the next section, we consider our hypotheses and lay out the testable restrictions. In section 3, we describe the data. In section 4, we describe the main empirical findings on the determinants of compensation. In section 5, we study the effect of compensation on stock prices. A brief conclusion follows.

2 Main hypotheses

Bebchuk and Fried (2004) argue that skimming is consistent with the observed changes in compensation in the 1990s because higher market values seem to correlate with higher executive compensation. The skimming hypothesis predicts that managers control the pay-setting process and would take as much as they can. This is however an unconditional statement. A proper test of the skimming hypothesis would look at how exactly a manager would want to set his pay in specific circumstances. An ideal testing conditioning is provided by the degree of stock overvaluation.

If we start from the well established fact that rational managers interpret high stock price valuation as overvaluation and react to exploit such perceived temporary misvaluations in all aspects of their decision processes – e.g., the choice of capital structure, debt and equity issuance or repurchases, investment policy, M&A activity – then we can predict that also in their choice of compensation they should condition on it. That is, after increases in the market-to-book ratio, rational managers timing the market through the pay process would want to reduce the performance sensitivity of their compensation (holding the level of pay fixed) in anticipation of future declines in the share price.

Hypothesis 1: Rational managers that control the pay setting process are more likely to reduce (increase) the pay-for-performance sensitivity after increases (decreases) in the stock price.

Alternatively, managers may be biased. A biased manager might want to increase the pay-for-performance sensitivity after an increase in the stock price. Two specific biases that would induce such behavior are overconfidence and extrapolation bias. Managers that have become more overconfident as a result of the company's price appreciation would ask for more equity-linked pay. Also, managers that extrapolate

recent increases (decreases) in the stock price would view it to be beneficial to increase (decrease) the performance sensitivity of their pay.

Hypothesis 2: Biased managers that control the pay setting process are more likely to increase (decrease) the pay-for-performance sensitivity after increases (decreases) in the stock price.

What should we expect to see, if, on average, managers do not dominate the pay-setting process? First, the board might time the market by increasing the pay sensitivity when the firm is overvalued. Second, the board may use compensation as a tool to deal with the uncertainty related to the ability of the manager. Indeed, a serious problem facing a shareholder is to determine how much of the firm performance is due to luck or misvaluation and how much is due to skill (e.g., Bertrand and Mullainathan, 2001). Only the latter is persistent and can be replicated. One way of overcoming the informational asymmetry between managers and shareholders about managerial ability is to tie their compensation more closely to performance. Therefore, equity-based compensation would be used by the board to induce successful managers to repeat themselves or to reduce the fraction of surplus appropriated by the managers. Oyer (2004) presents a model in which it is optimal to increase the compensation even when high valuation is due to luck. Similarly, Bolton, Scheinkman and Xiong (2003) provide a model where the stock price can deviate from fundamentals and show that optimal compensation contracts then should be structured such that managers have incentives to increase the stock price in the short term even at the expense of the long term value. Their model provides a rationale for boards to increase (decrease) pay sensitivity after price runups (drops).

Hypothesis 3: If boards control the pay setting process, a rational board timing the market would increase (decrease) the pay-for-performance sensitivity after increases (decreases) in the stock price. In addition, an increase in the pay-for-performance sensitivity is predicted in the presence of uncertainty whether recent stock price increases are due to luck or managerial skill.

While rational managers might not like this, our assumption for hypothesis 3 is that the board has control of the pay-setting process and would do what helps them to reward skilled managers.

3 Data and variables

3.1 Sample Selection

We obtain data on CEO compensation from COMPUSTAT's Executive Compensation (*ExecuComp*) database and company data from the CRSP-COMPUSTAT Merged database (CCM) and stock returns from CRSP. Our sample period spans 1992-2003 and the unit of analysis in our study is the unique manager-firm combination, as identified by the variable CO_PER_R in ExecuComp. The governance index as constructed by Gompers, Ishii, and Metrick (2003) is taken from the Investor Responsibility Research Center (IRRC) Governance database. We also construct an anti-takeover index, which is the sum of five anti-takeover provisions identified in the same IRRC data; this index is similar to the one created by Cremers and Nair (2005).

We exclude observations if the firm does not have a PERMNO or has no executive identified in a particular year (i.e., no CO_PER_R). We also restrict our analysis to only CEOs for two reasons. First, CEOs are arguably the most important and influential decision makers in corporations. Second, since compensation is reported for the five highest paid executives, the identity of those individuals will vary year-by-year. Furthermore, we exclude all firms in the utilities (SIC Codes 4900–4999) or financial services industry (SIC Codes 6000–6411, 6500–6553, and 6700–6799).

This results in a sample of 14,752 CEO-year observations. Additional data requirements, as described below, will further limit the sample size.

3.2 Variable Description

We construct five different measures of compensation. First, we compute the change in market value of equity and options held by the CEO at the beginning of the fiscal year; we denote this change by $(\Delta E + \Delta O)$. This variable is defined as $(\Delta E + \Delta O) = (SOWN_{t-1} + 0.6 \times UNEXO_{t-1}) \times P_{t-1} \times R_{i,t}$, where the variables SOWN (shares owned by the manager) and UNEXO (exercisable unexercized options owned by the manager) as well as the constant 2003 dollars stock price, P, are measured at the prior fiscal year end. We multiply UNEXO by 0.6, assuming that the average delta of these options is 0.6, i.e., roughly the delta of an at the money option (e.g., Core and Guay, 2002).² $R_{i,t}$ denotes the *real* return on the company's stock in the current fiscal year. This measure

² We use this rough approximation since we do not know the exact delta of all the CEO's options. Since we are interested in how compensation in year t changes for firms with a high market-to-book ratio (measured at t-1), it is likely that we underestimate the delta since the market price is relatively higher than in the past when those options were granted. This biases the results against what we find.

abstracts from stock and option grants during the current fiscal year as well as exercising of stock options and trading of shares.

The second measure called “EBW1” (a proxy for CEO’s equity-based wealth) is the sum of $(\Delta E + \Delta O)$ and VOG as well as VRSG; VOG is the value of options granted and VRSG is the value of restricted stock granted to the CEO. As an alternative, a second proxy for CEO’s equity-based wealth – “EBW2” – is computed by adding the value of all equity obtained by the CEO during the fiscal year to $(\Delta E + \Delta O)$. This equity is obtained either from shares directly granted as part of the compensation or from trades by the CEO or else from exercising stock options.

The fourth compensation variable is called “FCBW”, or flow-compensation–based wealth. To $(\Delta E + \Delta O)$, it adds “flow-compensation”, where flow-compensation includes the following components of compensation: salary, bonus, other annual payments (such as perquisites, tax reimbursements, etc.), long-term incentive plan, options and restricted stock grants, and all other total payments (such as severance payments, 401K, signing bonus, etc.) This is similar to the “flow compensation” variable defined by Aggarwal and Samwick (1999).

The fifth measure, the CEO’s firm-specific wealth or “FSW”, is computed as the sum of $(\Delta E + \Delta O)$ and the total compensation granted to the CEO in a given fiscal year.

The market-to-book ratio (MB) is defined as the ratio of market equity to book equity, where market equity is the product of common stock price at fiscal year-end (DATA 199) and number of shares outstanding (DATA 25), and the value of common equity (DATA 60) is taken as book equity. We also use industry-standardized market-to-book (ISMB) in several tests of robustness; this is the ratio of the firm’s MB to the average MB in the corresponding industry group. Firm size (SIZE) is the logarithm of total assets (DATA 6); leverage (BLEV) is the ratio of total long-term debt (DATA 9) to total assets (DATA 6); sales (SALES) and capital expenditure (CAPEX) are logarithms of net sales (DATA 12) and capital expenditures (DATA 128), respectively; finally, return on assets (ROA) is taken from ExecuComp and earnings are logarithm of (DATA237 + DATA50 + DATA51). The definitions of all variables used in our analyses are provided in Appendix A.

We follow Aggarwal and Samwick (1999) and adjust variables denominated in dollars to represent constant 2003 dollars and convert all gross returns to real returns by subtracting the growth in the consumer price index. Data on

consumer price index and inflation are obtained from Department of Labor's Bureau of Labor Statistics.

Firms are categorized into 48 industry groups, which are defined according to Fama and French (1997).

4 Timing of equity-based compensation

We test whether equity-based compensation is related to stock over-valuation. We consider two types of tests. The first relates the pay-for-performance sensitivity to the level of equity values in the previous periods. The second is a formal test of market timing (following Baker and Wurgler, 2002) applied to compensation.

4.1 Pay-for-performance sensitivity and firm value

We start with a test linking the pay-for-performance sensitivity to the degree of over-valuation of the stock. In particular, we follow Aggarwal and Samwick (1999) and estimate the following specification:

$$\begin{aligned} Comp_{i,t} = & \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \\ & + \beta_4 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + Controls + \varepsilon \end{aligned} \quad (1)$$

where for the *i*th firm in period *t*, $Comp_{it}$ is the executives' compensation, $R_{i,t}$ and $R_{ind,t}$ are the return of the stock of the firm and the return on the market, respectively. MB_t is the market-to-book ratio of the firm in period *t* and $CDF(.)$ represents the empirical cumulative density function of the ratio $(MB_{t-1}/MB_{t-2,t-11})$ which is last year's market-to-book ratio of the company standardized by its average MB over the previous ten years.³ We estimate fixed-effect coefficients for the above specification, where we control for manager-firm fixed-effects (i.e., for the "Co_Per_R"). It is important to stress that our measure of potential overvaluation is based on information in the years prior to the fiscal year over which compensation is measured. Thus, there is no mechanical relation between compensation that is mostly driven by stock price changes in that fiscal year and our measure of potential overvaluation.

³ The CDF implies that a value of 0 (1) is given to the firm with the lowest (highest) $MB_{t-1}/MB_{t-2,t-11}$ ratio. The measure is computed every year.

Recall that Hypothesis 1 posits that the pay-for-performance sensitivity decreases after periods of high value of the firm, while Hypotheses 2 and 3 posit the opposite. Thus, according to hypotheses 2 and 3, we should expect $\beta_3 > 0$. That is, the sensitivity to the performance of the firm increases after periods of high market-to-book. The sign on β_4 is ambiguous since it is not clear whether an executive timing the market by controlling his own pay-setting process in a certain way would also want to change the pay-for-performance sensitivity to the industry or the broader market. Similarly, an overconfident manager nor the board might want to change that sensitivity.

We report the results in Panel A of Table 1. We find that $\beta_3 > 0$. That is, the sensitivity to own firm performance is higher *after* periods of high market-to-book. In particular, when we use the change in the value of equity and options held at the beginning of the current year t as a proxy for compensation $[\Delta E + \Delta O]$ (as shown in Column (1)), then the sensitivity to performance of a firm with the highest $CDF(MB_{t-1}/MB_{t-2,t-11})$ is 32% higher than that of a median firm (i.e., one with $CDF(MB_{t-1}/MB_{t-2,t-11})=0.5$). Given that the coefficient β_1 is 0.15, a change in the market-to-book ratio has an economically meaningful impact on the pay-for-performance sensitivity.

A first potential concern with our test is that managers grant themselves more compensation in the year of the high market-to-book valuation. This might result in high E and O at the beginning of the year. Therefore, we have as a control variable total compensation granted in $t-1$.

An additional question is whether managers increase the equity or the option component of compensation in states of high valuation. Hypothesis 1 suggests that managers would try to reduce pay-for-performance sensitivity. However, if they cannot do this, they might try to at least shift return sensitive compensation from options to equity. One way of doing so might be to reduce the fraction of option compensation relative to total compensation. We test this by comparing the ratio of option to total compensation (OBC) in year t between two subgroups of firms, namely firms where $CDF(MB_{t-1}/MB_{t-2,t-11}) > 0.5$ to $CDF(MB_{t-1}/MB_{t-2,t-11}) \leq 0.5$. We find that firms with high (low) valuation display an average OBC of 33.6% (30.5%). This difference is statistically significant at the 1% level and also rejects the prediction of hypothesis 1.

Finally, if CEOs follow a ‘take-all-you-can’ compensation strategy, even if it is in the form of options, then we should observe that CEOs at least exercise their

exercisable options and potentially sell shares that can be sold. However, when we look at EBW2 as a proxy for compensation that adjusts $[\Delta E + \Delta O]$ for shares traded and received from options exercises (Column (3)), we find that the β_3 coefficient is even more positive with a value of 0.21 as opposed to 0.14. This suggests that to the extent that CEOs take all they can in any form they can, they do not adjust their overall exposure to equity price changes in a way that CEOs following hypothesis 1 would do.

In Column (2), we also add the restricted stocks and options granted during the current year t to $(\Delta E + \Delta O)$. The question is whether current grants are significantly adding to the pay-for-performance sensitivity in year t . The coefficient β_3 is in fact higher at 0.15 compared to 0.14 using $(\Delta E + \Delta O)$. We get similar results if we use “FCBW” or the broader measure “FSW”. The latter one is especially informative since it could well be that CEOs grant themselves more compensation in the form of cash or bonuses – means that are independent of the current stock performance. However, the higher coefficient on β_3 suggests that the main effect of the pay-for-performance sensitivity originates in the stock of shares and options that the CEO holds at the beginning of the period. Adjustments during the year rather increase that pay-for-performance sensitivity in high market-to-book states.

As a robustness check, we re-estimate equation 1 by standardizing the market-to-book ratio by its average industry level. This measure assumes that managers and/or the board also take into account their firm’s valuation relative to the industry. That is, we estimate:

$$\begin{aligned}
 Comp_{i,t} = & \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \\
 & + \beta_4 R_{ind,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) + Controls + \varepsilon
 \end{aligned} \tag{2}$$

The variables are defined as in the previous specifications and the restrictions are the same as before. We report the results in Panel B of Table 1. As in the previous case, the sensitivity to performance is higher after periods of high industry-adjusted market-to-book ratios. In particular, using $[\Delta E + \Delta O]$ as a proxy for compensation, the difference in pay-for-performance of a median firm and a firm with the highest industry-adjusted market-to-book ratio is 29%. The result is again robust to changes in the proxies for compensation as reported in columns 2-4.

It is interesting to note that the estimates of the β_4 coefficients are mostly insignificant. The two regressions in Panel A of Table 1 where β_4 is significant, the sign is once negative (Column (1)) and once positive (Column (3)). This is consistent with prior research on relative performance evaluation (e.g., Aggarwal and Samwick, 1999) finding little support for such a concept in US data.

This first set of tests clearly rejects the first hypothesis, which states that managers are in control of the pay setting process and time the market using the pay sensitivity of their compensation.

4.2 *The market-timing of equity-based compensation*

We now proceed with a standard test of market timing. We rely on the methodology devised by Baker and Wurgler (2002) and we estimate:

$$CTRL = \alpha + \beta_1 MarketTiming + Controls + \varepsilon \quad (3)$$

where the dependent variable is either

$$CTRL1 = \frac{\sum_{n=1992}^T VOG_n}{ME_T} \quad \text{or} \quad CTRL2 = \frac{\sum_{n=1992}^T (VOG + VRSG)_n}{ME_T},$$

i.e., it is either the ratio of (dollar value of) all the options the CEO has been granted since 1992 so far (i.e., until year T) to the company's market value of equity (ME) in the current fiscal year, T , or it is the ratio of (dollar value of) all options and restricted stock the CEO has been granted since 1992 so far (i.e., until year T) to the company's market value of equity in the current fiscal year, T .⁴

The market-timing variables are similar to the "external finance weighted-average market-to-book ratio" of Baker and Wurgler (2002). These are defined as follows:

$$OMT = \sum_{t=1992}^T \frac{VOG_t}{\sum_{n=1992}^T VOG_n} \times MB_t \quad \text{or} \quad EOMT = \sum_{t=1992}^T \frac{(VOG + VRSG)_t}{\sum_{n=1992}^T (VOG + VRSG)_n} \times MB_t$$

⁴ Due to the limitation of data, we start the cumulative summation of options and restricted stock granted only from 1992 onward; ideally, one would include all options and stock granted to the executive from the start of her tenure at the company. (Recall that our unit of analysis is CO_PER_R, which represents every unique manager-firm combination.)

The variables are a weighted average of the yearly option value (or options plus restricted stock value) granted to the CEO relative to the sum of all options granted up to time T (where the weight is the contemporaneous market-to-book ratio); this variable takes high values if the CEO was granted more options (or options plus restricted stock value) *just when* the market-to-book was high.

Equation 3 relates the (percentage) managerial ownership of the firm to the process that has generated it. According to hypothesis 1, i.e., in the case of market timing by managers, we expect $\beta_1 < 0$. That is, managers should have acquired a bigger stake in the periods following stock *undervaluation*. However, when managers are biased (hypothesis 2) and when a rational board is controlling the pay setting process (hypothesis 3), we expect $\beta_1 > 0$.

The results of manager-firm fixed-effects regressions are reported in Table 2. We find that the estimate of β_1 is positive and significant. For example, in Column (1) when we use the options-based definition of CEO-control (“CTRL1”), we find a coefficient of 0.0837, with a t-statistic of 9.83. Economically, this means that a one standard deviation increase in OMT^{MB} results in a 29% increase in CTRL1, the options-based measure of CEO-control. When we use the options- and stock-based measure (“CTRL2”) in Column (3), the coefficient is 0.0875, significant with a t-statistic of 9.57. Similar results obtain when we use ISMB, the market-to-book measure that is standardized by the industry MB, as shown in Column (2) and (4).

The finding that more options are awarded in years of high market-to-book is particularly interesting. Hypothesis 1 would imply that market-timing CEOs would shift compensation towards equity or cash. However, comparing results in Column (1) and (3) suggests that options and stock grants are not awarded differentially in high market-to-book states.

Our results clearly reject hypothesis 1 but they are in line with hypotheses 2 and 3. Thus, since we find that, on average, the pay-for-performance sensitivity increases with an increase in the market-to-book ratio, we conclude that the pay-setting process in the average firm in our sample is captured by either biased managers who determine their own pay or by rational boards setting the pay to either time the market themselves

or to try and distinguish between the stock price being high due to luck or skill of the managers.

The question thus is how can we differentiate between hypotheses 2 and 3 as representing the average US firm's pay setting process?

4.3 *Biased managers or powerful board?*

Holmstrom (1979) shows that it is optimal to reduce the equity sensitivity of the pay if stock prices are more noisy signals about managerial performance. Aggarwal and Samwick (1999) find evidence for this hypothesis by showing that boards take into account the stock's volatility when setting the pay-for-performance sensitivity (PPS). In particular, they show that firms with higher stock return volatility display lower PPS. The reason is that higher volatility corresponds to a situation where the stock price is less informative about the manager's effort and ability. Consequently, boards are expected to provide lower PPS for firms with higher volatility. If managers are biased, however, there should not be a difference between high and low volatility firms. For example, the extrapolation bias purely relies on the past stock price trend. Whether that trend is with high or low volatility is irrelevant.

Therefore, we can exploit the cross-sectional variation in the level of volatility to distinguish between hypotheses 2 and 3. That is, if we hold constant the level of valuation, firms with higher volatility should display a lower pay-for-performance sensitivity relative to firms with low volatility if the board controls the pay setting process. If biased managers control the pay setting process, the level of volatility should not make a difference for the pay for performance sensitivity. We therefore re-estimate equation 1 including an additional interaction variable as follows:

$$\begin{aligned}
 Comp_{i,t} = & \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \\
 & + \beta_5 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times UFP + \beta_6 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times UFP \\
 & + Controls + \varepsilon
 \end{aligned}
 \tag{4}$$

where we use stock idiosyncratic volatility defined as the residual from the market-model regression during the year prior to the current fiscal year end as a proxy for volatility.

UFP is equal to 1 if the company's idiosyncratic volatility is above the median volatility within that year and equal to 0 if its idiosyncratic volatility is below the median value.

The results are reported in Table 3. We find that $\beta_5 < 0$, suggesting that firms with higher idiosyncratic volatility have a lower pay-for-performance sensitivity holding constant the level of market-to-book ratio. This finding is robust across the different specifications, shown in Panels A and B. Thus, the data is consistent with the interpretation that the average firm in our sample has a board-determined pay-setting process. Interestingly, we find that the β_3 -coefficient is positive and significant. Adding β_3 and β_5 , the coefficient is still positive (e.g., in Column (3) of Table 3, Panel A: $0.3567 - 0.2042 = 0.1525$). This means that boards increase the pay-for-performance sensitivity when the market-to-book ratio increases, even in firms with above median volatility. We thus conclude that the pay-setting process is less sensitive to potential overvaluation if volatility is high – but, importantly, it is still sensitive.

Our tests have revealed that the average firm in our sample has a pay-setting process that is determined by the board. The board of our average sample firm thus increases pay sensitivity after increases in valuation. Such an increase is rational if increases in the market-to-book ratio are associated with increased uncertainty whether the higher valuation is due to luck or skill. However, it is also consistent with the notion that the board is timing the market with the CEO compensation. The question is why does the CEO accept such a compensation package? There are two possible answers: First, it might be that CEOs are overconfident or have an extrapolation bias. In that case, they would increase pay sensitivity even if they were in control. Second, even if they are rational, the signal they would send to the board by rejecting an increased pay sensitive compensation might reveal to the board that managers believe the stock is overvalued (i.e., luck), versus highly valued due to skills. In the following we try to get an assessment of the importance of the two possible reasons by investigating how managers change their compensation if they are more likely to be in control.

The question is whether the managers are timing the market or whether managers behave as if they had a bias *in cases where they have power* over the pay setting process. In order to test this we use the quality of corporate governance to proxy for the relative power of the CEO versus the board. We assume that well governed firms

are more likely to have a board that sets the pay. Firms with weaker governance should be more likely to have managers determine their own pay.

Thus, if we study how the pay-for-performance sensitivity changes with the cross-sectional variation in the quality of governance we should find either one of two possible relations: First, if biased managers set their own pay (as they do in badly governed firms) and if a rational board sets the pay (as is done in well governed firms), either way we expect a positive correlation between pay-for-performance sensitivity changes and changes in the market-to-book ratio. Therefore, the cross-sectional variation in the quality of corporate governance should result in little difference between changes in the pay-for-performance sensitivity and changes in the market-to-book ratio. However, if rational managers timing the market set their own pay (as they do in badly governed firms) and if a rational board sets the pay (as is done in well governed firms) we should expect a significant difference depending on the quality of corporate governance. The reason is that market-timing managers would *reduce* the pay-for-performance sensitivity according to hypothesis 1, if they controlled the pay-setting process, which is more likely observable in badly governed firms.

Therefore, the relation between the pay-for-performance sensitivity and changes in the market-to-book ratio should vary with the cross-sectional variation in the quality of corporate governance from increasing (in well governed firms) to decreasing (in badly governed firms). In particular, in the case of rational managers, the pay-for-performance sensitivity should increase (decrease) with an increase in the market-to-book ratio in firms with better (worse) quality of corporate governance. In the case of biased managers, a change in the quality of governance would leave the correlation positive. To test it, we re-estimate equation 1 including additional interaction variables as follows:

$$\begin{aligned}
 Comp_{i,t} = & \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \\
 & + \beta_5 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times ATI / GI + \beta_6 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times ATI / GI \\
 & + Controls + \varepsilon
 \end{aligned}
 \tag{5}$$

where ATI/GI are dummies that control for the quality of corporate governance. The Governance Index (GI) is equal to 1 if the company has a Governance Index (as defined by Gompers, Ishii, and Metrick, 2003) of 10 or higher, and equal to 0 if it has a

Governance Index of 9 or lower. ATI is a component of GI and is constructed by adding 1 point for each one of the following five provisions adopted: poison pill, blank check, a classified board, limits to call special meetings, and limits for written consent (as defined in Gompers, Ishii, and Metrick, 2003). Similar to Cremers and Nair (2005), we define this sum as the "Anti-takeover Index" (ATI).⁵

The results are reported in Table 4. We find that β_5 is negative, suggesting that the relation between changes in market-to-book and changes in pay-for-performance sensitivity is stronger for firms characterized by better corporate governance. This holds for both definitions of the quality of governance. In particular, a *increase* in the quality of governance increases the sensitivity to performance by 38% for a firm with median MB (relative to its past) in the case of GI, and by 18% for the same median firm in the case where one more anti-takeover provision is added (i.e., ATI increases by 1). More importantly, the overall pay-for-performance sensitivity is still positive even for badly governed firms where we expect that CEOs are more likely to control the pay-setting process. For example, firms with bad governance and a higher current market-to-book ratio still display a positive pay-for-performance sensitivity. This can be seen by adding the coefficients of β_3 and β_5 . For both proxies of governance quality, the sum is significantly positive. Thus, the data is consistent with the interpretation that managers of badly governed firms are more likely to behave as if they were biased rather than rationally timing the market since they still increase their pay-for-performance sensitivity even if their market-to-book ratio is high.

5 Equity based compensation and stock performance

5.1 How does the market react to changes in the compensation?

We argue that in both cases where biased managers exert control over the pay-setting process, and when the board has control over the process – the stock price should drop after an increase in equity-based compensation. Indeed, in the case of biased managers, the market may be able to read through the manager's behavior. That is, the market knows that managers are overconfident and that they are more likely

⁵ Hall and Murphy (2003) use board independence as a proxy for governance quality. They find that firms with more independent boards increase the equity pay more and conclude that the recent increases in the level of compensation is not driven by managers but by boards.

to increase their pay-for-performance sensitivity at the very moment in which the firm performance has reached its peak. This induces them to use compensation to assess a firm's future value. However, also in the case where a rational board determines the pay, it would be the same. The market would infer from the decision to increase equity-based compensation that the board is uneasy about the ability of the managers to repeat themselves. Moreover, just like in other cases of market timing (e.g., IPOs), given that an increase in compensation takes place at the peak of the market, a negative correlation between changes in compensation and ensuing stock prices may be simply a contemporaneous rather than a causal relation. That is, firms' prices are due to mean revert and compensation is changed just before the mean reversion occurs.

However, if rational managers have control over the pay-setting process and time the market by changing the composition of the pay, the market should drop if managers reduce the pay-for-performance sensitivity and vice versa. We should therefore expect that unless the average firm's pay-setting process is controlled by rational managers that time the market, stock prices should drop after the link of compensation to performance becomes stronger.

5.2 Effect of changes in compensation on future market-to-book ratios

Therefore, both in the case of biased managers as well as when the board determines the pay, the stock price should drop after an increase in equity-based compensation. We estimate the following regression:

$$MB_{t+1} = \alpha + \beta_1 \Delta Comp_t + \beta_2 Comp_{t-1,t} + \beta_3 MB_t + Controls + \varepsilon \quad (6)$$

where we use four different proxies for compensation (*Comp*). The first (OBC) is calculated as the ratio of the Black-Scholes value of options granted (VOG) relative to total compensation (TC). A second proxy is the ratio of the sum of VOG and the value of stocks granted (VRSG) to TC; we denote this by EBC1.

Given our findings thus far, we expect $\beta_1 < 0$, i.e., that increases in equity-based compensation affect future stock prices negatively. We report regression results of equation (6) in Table 5 using both a Fama-MacBeth methodology (Panel A) and Fixed-Effects (Panel B). We find that an increase in equity-based compensation reduces the market-to-book value of the firm the following period. The sign and significance of the coefficient is robust across the different specifications and is in line with the inferences

drawn from the data so far. Notice that this relation exists even after controlling for the market-to-book ratio in year t . Thus, it seems that the negative effect of increases in the equity-based compensation is not merely due to a contemporaneous correlation between increases in equity based compensation and the market-to-book ratio.

5.3 *Future abnormal stock returns depending on changes in compensation*

In a second test we relate stock returns to the change in the executive compensation in the previous year. We consider market-adjusted abnormal returns from a buy-and-hold portfolio strategy that holds a long position in companies that increase their CEO's compensation (relative to that in the previous fiscal year) and a short position in those that decrease their CEO's compensation (again, relative to that in the previous fiscal year). We follow a methodology analogous to the one adopted by Jenter (2005). This allows us to compare our findings to his.

We use several different measures of compensation, most of which measure some type of equity-based incentives. Options-based compensation (OBC) is the ratio of the dollar value of options granted to the total compensation that the CEO receives. Another measure of equity-based compensation (EBC1) is the ratio of options as well as restricted stock grants to the total compensation of the CEO. The second such measure (EBC2) is the ratio of the (dollar value of) shares obtained by the CEO during the fiscal year (either from trading stock or exercising options or those granted as part of compensation) and of options granted, to the total compensation. Dollar value of options granted (VOG) and the dollar value of options plus restricted stock (VOG + VRSG) are two other measures of compensation that are equity-based. In order to avoid any price-effects, we also look at the number of options granted (NOG) as well as the number of equity shares obtained by the CEO (SOBT). Finally, we move away from equity-based compensation and look at the total compensation that the CEO receives in the fiscal year (TC).

Every fiscal year, we divide all the unique manager-firm pairs (or CO_PER_Rs) into two groups after sorting by the *change* in the above-described compensation variables. The "CompUp" group includes Co_Per_Rs whose compensation increased relative to that received in the previous fiscal year, and "CompDown" refers to the group that includes Co_Per_Rs that suffer a decrease in the above-described compensation variables with respect to the last fiscal year. We then create a portfolio strategy that

holds a long position in the “CompUp” companies and a short position in “CompDown” companies, and determine the market-adjusted abnormal returns for such a buy-and-hold strategy. We consider both, equally-weighted as well as value-weighted portfolio returns. The returns are calculated for several different horizons starting after the end of the fiscal year (during which the changes in executive compensation are observed); the column headings of the relevant table indicate the months over which these returns are calculated. We calculate returns over 3-months, 6-months, 9-months, and 12-months periods. For instance, [1, 3] indicates that the return is calculated for the three-month period immediately after the fiscal year ends, and likewise, [7, 12] implies that returns are calculated for the 6-month period six months after the fiscal year-ends.

We report the results in Panel A of Table 6. The first four columns report the results for equally-weighted portfolio returns, while the remaining four columns report the results for value-weighted returns. For both cases, we calculate returns over the following periods: [1, 3], [1, 12], [4, 12], and [7, 12].

The results show a strong negative relation between change in compensation and subsequent returns. Using equally- as well as value-weighted portfolios, the results hold for all the different intervals within 1 year and are robust to the different definitions of change in compensation. For example, we find that the equally-weighted portfolio based on OBC results in a negative abnormal return of 2.53% (11.62%) over the period [1,3] ([1,12]). Both abnormal returns are significant at the 1% level. Abnormal return estimates using other proxies for compensation are similar.

We conduct a further robustness test using as a benchmark the Fama-French three factor model (as well including the momentum factor in addition) and investigating the abnormal returns of long-only portfolios that hold companies that increase their compensation (defined as above) and display an above median market-to-book ratio.⁶

The results are displayed in Panel B of Table 6. We find significant negative abnormal returns for the period [1,12] for all proxies of compensation other than total compensation. The size of the abnormal return is between –5% and –6%, thus about half the magnitude of the long-short strategy shown earlier. This finding is consistent with the interpretation that the market reacts to the decision to increase compensation negatively in the case of high market-to-book firms. Interestingly, most of the abnormal

⁶ Similar results obtain if we use as a cut-off the industry-adjusted median market to book ratio.

return is accounted for in the first three months after the fiscal year end. In that sense our abnormal return findings can also be interpreted as an event study with a long event window. The reason is that the information about executive compensation is at the latest revealed in the proxy filings, which can be up to three months after the fiscal year end. There is also some evidence of negative, albeit not significant abnormal returns in the months [4,12]. These findings suggest that the market reacts to the information of compensation changes, but it takes time to adjust to the long-run value, maybe due to some uncertainty about the actual reason compensation has been changed or the fact that the information only is revealed in the proxy statements weeks after the fiscal year end. The initial negative abnormal returns are consistent with the estimates of equation 6 and shows that, on average, the market interprets the decision to increase compensation negatively.

These findings provide support for market rationality to the extent that the market adjusts to the information about compensation changes, once the information is provided. Nevertheless, the reporting lag allows the board to time the market. Our findings are also consistent with Jenter's (2005) results. Indeed, as the stock price is high, managers are induced to tie their compensation more closely to the performance of the firm. The natural reaction to this constrained behavior is the manager's decision to sell shares held in their own account. This, taken on its own, appears as market timing on the side of the managers. However, if this is analyzed jointly with the increase in the performance-based compensation, we find that managers do not actually try to outsmart the market, but merely to adjust their exposure to their firm. But again, not as much as predicted by hypothesis 1.

6 Conclusion

We ask whether in the average US firm the pay-setting process is controlled by managers or by the board. We find that an increase in firm value leads to an increase in the pay-for-performance sensitivity, rejecting the hypothesis that rational managers time the market by reducing performance sensitivity of their pay when the firm is more likely to be overvalued. We explain the finding in terms of two alternative hypotheses: rational managers with effective boards or overconfident managers. According to the former hypothesis, effective boards doubtful about the ability of the managers to repeat themselves tie their compensation to the performance of the firm to incentivize them.

According to the latter hypothesis, overconfident managers that have experienced an increase in the stock price, believe this will persist and will go for an even bigger slice of the pie by tying their compensation to the firm's stock price.

Since the pay-for-performance sensitivity increase is smaller if firm volatility is higher, we conclude that the board is determining the pay since a biased manager would not take into account volatility, but only the price level when setting the pay. We also find that firms with better governance are more likely to make their managers' compensation more sensitive to performance if valuation is high. Finally, firms that increase compensation of their managers experience a price drop in the following months, suggesting that the board was timing the market or correctly doubtful about the sustainability of the performance of the company's CEO.

These findings suggest that the disproportionate usage of executive-based compensation during the bubble-period, far from being a way of the managers to skim the company, turned out to be a way used by the board to enforce discipline upon potentially too complacent managers prone to rest on their laurels. This sheds new light on the debate about executive compensation.

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Appendix A: Variable Definitions

Variable	Definition	Description
Compensation variables		
VOG	Value of options granted to the CEO	ExecuComp variable "BLK_VALU" adjusted to thousands of 2003 constant dollars
NOG	Number of options granted to the CEO	ExecuComp variable "SOPTGRNT"
VRSG [†]	Value of restricted stock granted to the CEO	ExecuComp variable "RSTKGRNT" adjusted to thousands of 2003 constant dollars
TC	CEO's total compensation	ExecuComp variable "TDC1" adjusted to millions of 2003 constant dollars
SOBT	Shares obtained during current fiscal year, t , either from stock grants or exercising options or personal trading	The difference ($SOWN_t - SOWN_{t-1}$) for every fiscal year t , where SOWN is millions of equity shares owned by the CEO
$\Delta E + \Delta O$	Change <i>during</i> this fiscal year in the value of options and stock held by the CEO at the end of last fiscal year.	$(SOWN_{t-1} + 0.6 \times UNEXO_{t-1}) \times P_{t-1} \times R_{i,t}$. t refers to the current fiscal year, and thus SOWN (millions of shares owned by the CEO) and UNEXO (CEO's unexercized exercisable options, measured in millions) as well as P (stock price in constant 2003 dollars) are all measured at the end of last fiscal year. $R_{i,t}$ denotes the real return on the company's stock in the current fiscal year. (As a result, $[\Delta E + \Delta O]$ is in millions of constant 2003 dollars.)
EBW1	First measure of CEO's "equity based wealth" is the wealth due to option and restricted stock grants	$[\Delta E + \Delta O + VOG + VRSG]$ adjusted to millions of constant 2003 dollars
EBW2	Second measure of CEO's "equity-based wealth" is the wealth tied to all equity obtained and options granted	$[\Delta E + \Delta O + (SOBT) \times (\text{Current fiscal year's closing stock price in constant 2003 dollars}) + VOG]$ adjusted to millions of constant 2003 dollars
FCBW	"Flow-compensation based wealth" is CEO's wealth obtained from flow compensation	$[\Delta E + \Delta O + (\text{Flow Compensation})]$ adjusted to millions of constant 2003 dollars. "Flow compensation" here is defined in the same manner as in Aggarwal and Samwick (1999), i.e. it is the sum of salary, bonus, other annual payments (e.g., perquisites, tax reimbursements, etc.), long-term incentive plan, options and restricted stock grants, and all other total payments (e.g., severance payments, 401K, signing bonus, etc.)
FSW	"Firm-specific wealth" is CEO's wealth obtained from <i>total</i> compensation awarded by the firm	$[\Delta E + \Delta O + TC]$ adjusted to millions of constant 2003 dollars
CTRL1	First proxy for CEO's control on the firm based on options granted, measured with respect to market value of firm's equity	$CTRL1_T = \frac{\sum_{n=1992}^T VOG_n}{ME_T}$, where ME is as defined below

CTRL2	Second proxy for CEO's control on the firm based on options and restricted stock granted, also measured with respect to market value of firm's equity	$CTRL2_T = \frac{\sum_{n=1992}^T (VOG + VRSG)_n}{ME_T}$, where ME is as defined below
OBC	Options-based compensation	VOG/TC
EBC1	First measure of equity-based compensation	(VOG + VRSG)/TC
EBC2	Second measure of equity-based compensation	[VOG + (SOBT)x(Current fiscal year's closing stock price in constant 2003 dollars)]/TC
ΔOBC	Change in options-based compensation	OBC _t - OBC _{t-1}
ΔEBC1	Change in the first measure of equity-based compensation	EBC1 _t - EBC1 _{t-1}
ΔSOBT	Shares obtained this year as compared with those obtained last year	SOBT _t - SOBT _{t-1}
ΔTC	Change in total compensation	TC _t - TC _{t-1}
Market-timing variables		
OMT ^{MB}	Options-based market-timing variable constructed using market-to-book ratio	$OMT_T^{MB} = \left(\frac{\sum_{t=1992}^T \frac{VOG_t}{\sum_{n=1992}^T VOG_n} \times MB_t \right)$
OMT ^{ISMB}	Options-based market-timing variable constructed using industry-standardized market-to-book ratio	$OMT_T^{ISMB} = \left(\frac{\sum_{t=1992}^T \frac{VOG_t}{\sum_{n=1992}^T VOG_n} \times ISMB_t \right)$
EOMT ^{MB}	Equity and options based market-timing variable constructed using market-to-book ratio	$EOMT_T^{MB} = \left(\frac{\sum_{t=1992}^T \frac{(VOG + VRSG)_t}{\sum_{n=1992}^T (VOG + VRSG)_n} \times MB_t \right)$
EOMT ^{ISMB}	Equity and options based market-timing variable constructed using industry-standardized market-to-book ratio	$EOMT_T^{ISMB} = \left(\frac{\sum_{t=1992}^T \frac{(VOG + VRSG)_t}{\sum_{n=1992}^T (VOG + VRSG)_n} \times ISMB_t \right)$
Firm characteristics		
R _{i,t}	Company returns net of growth	ExecuComp variable "TRS1YR" adjusted for the growth in CPI to obtained real returns
R _{ind,t}	Industry returns net of growth	Value-weighted average of company returns within each of 48 industry groups, which are defined as per Fama and French (1997)

MB	Market-to-book ratio	(DATA25 x DATA199)/DATA60, using Compustat data items
ISMB	Industry-standardized MB	MB/(Average MB in the corresponding industry group)
SIZE	Logarithm of deflated assets	ln(DATA6 in constant 2003 dollars), using Compustat data items
BLEV	Book leverage	(DATA9/DATA6), using Compustat data items
SALES	Logarithm of deflated sales	ln(DATA12 in constant 2003 dollars), using Compustat data items
CAPEX	Logarithm of deflated capital expenditure	ln(DATA128 in constant 2003 dollars), using Compustat data items
ROA	Return on assets net of growth	ExecuComp variable "ROA" adjusted for the growth in CPI to obtained real returns
EARNINGS	Logarithm of deflated earnings	ln(DATA237 + DATA50 + DATA51 in constant 2003 dollars), using Compustat data items
ME [†]	Market Equity	(DATA25 x DATA199) in thousands of constant 2003 dollars, using Compustat data items
Other independent variables		
CDF(MB _{t-1} /MB _{t-2,t-11})	A control for the firm's past MB	For each year, a cumulative distribution function of the firms' MB in the previous fiscal year standardized by the average MB over the ten years before that
CDF(ISMB _{t-1} /ISMB _{t-2,t-11})	Another control for the firm's past MB	For each year, a cumulative distribution function of the firms' ISMB in the previous fiscal year normalized by the ISMB averaged over the ten years before that.
UFP	A measure of uncertainty about firm's performance	This dummy variable is equal to 1 if the company's idiosyncratic volatility is above the median volatility within that year and equal to 0 if its idiosyncratic volatility is below the median value.
ATI	A measure of takeover defenses employed by the firm	This variable is a component of "GI" (defined below) and is constructed by adding 1 point for each one of the following five provisions adopted: poison pill, blank check, a classified board, limits to call special meetings, and limits for written consent (as defined in Gompers, Ishii, and Metrick, 2003). Similar to Cremers and Nair (2005), we define this sum as the "Anti-takeover Index".
GI	A measure of the quality of corporate governance	For each year, this dummy variable is equal to 1 for firms that have a governance index of 10 or higher and equal to 0 if the firm has a governance index of 9 and lower. Governance Index is the measure of corporate governance that Gompers, Ishii, and Metrick (2003) construct and it is assumed constant until next reported.
Identifying variable		
CO_PER_R	An ID for each unique manager-firm combination	CO_PER_R variable reported in ExecuComp

[†]VRSG and ME are not used *directly* in the analyses but since these appear as components of several other compensation and market-timing variables that are analyzed, these are described separately in this appendix.

Appendix B: Summary Statistics

The table below presents summary statistics of the variables used in our analyses. The number of Co_Per_R–Years observations are reported in column “N” of the table and the number of unique Co_Per_R’s in our sample is approximately 1,900 (the exact number varies by specification).

All dollar variables (executive compensation as well as firm-characteristics) are adjusted to figures in constant 2003 dollars; figures in thousands of constant 2003 dollars are denoted by M03\$ and those in millions are denoted by MM03\$. All nominal rates of return are deflated by the growth in consumer price index (CPI) to present real returns. CPI and growth data are obtained from US Department of Labor’s Bureau of Labor Statistics. Firm-characteristic control variables are logarithms of dollar values of the corresponding variables. In order to avoid a negative logarithm, observations with earnings between \$0 and +\$1 are ignored. If earnings are reported as less than -\$1, then the logarithm of the absolute value of earnings is multiplied by -1.

Variables	Units	N	Mean	Median	Std. Dev.
Compensation variables					
VOG	M03\$	6610	1,795.97	507.02	5921.44
NOG	M	6901	141.78	50	324.90
TC	MM03\$	6733	3.53	1.80	7.02
SOBT	M	6023	134.99	3	2486.81
$\Delta E + \Delta O$	MM03\$	5659	5.94	0.24	135.34
EBW1	MM03\$	5659	8.07	1.24	135.86
EBW2	MM03\$	5558	14.13	1.44	195.86
FCBW	MM03\$	5659	9.55	2.43	135.98
FSW	MM03\$	5639	9.69	2.47	136.17
CTRL1	%	6634	0.50	0.16	1.27
CTRL2	%	6775	0.55	0.18	1.33
OBC	fraction	6728	0.33	0.31	0.28
EBC1	fraction	6728	0.37	0.37	0.29
EBC2	fraction	6728	2.85	0.49	58.98
ΔOBC	fraction	5700	-0.0029	0	0.2981
$\Delta EBC1$	fraction	5700	0.0002	0	0.3025
$\Delta SOBT$	M	4854	-2.97	0	3256.26
ΔTC	MM03\$	5704	0.61	0.09	6.68
Market-timing variables					
OMT^{MB}		5954	3.33	2.48	3.50
OMT^{ISMB}		5954	1.01	0.84	2.38
$EOMT^{MB}$		6113	3.31	2.47	3.51
$EOMT^{ISMB}$		6113	1.00	0.83	2.36
Firm characteristics					
$R_{i,t}$	%	6901	15.46	8.71	48.75
$R_{ind,t}$	%	6901	22.77	18.44	33.20
MB	fraction	6901	3.10	2.27	2.71
SIZE	ln	6901	20.94	20.75	1.43
BLEV	fraction	6901	0.53	0.54	0.19
SALES	ln	6901	20.90	20.79	1.38
CAPEX	ln	6901	17.84	17.75	1.61
ROA	%	6901	2.45	2.61	7.34
EARNINGS	ln	6901	13.01	17.69	12.51
Other independent variables					
UFP	0/1	5370	0.48	-	-
ATI	0-5	5226	2.80	3	1.39
GI	0/1	5133	0.47	-	-
Dummy =1 if CEO is also Chairman	0/1	6901	0.60	-	-

TABLE 1

Panel A presents the fixed-effect estimates from the following regression:

$$Comp_t = \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + Controls + \varepsilon$$

The unit of analysis in these fixed-effects regressions is every unique manager-firm combination (as identified by the variable CO_PER_R) and the dependent variable is some measure of the CEO's compensation. The results presented here use the following five compensation variables: $\Delta E + \Delta O$, EBW1, EBW2, FCBW, and FSW. Column (1) uses $\Delta E + \Delta O$, which is the change during the current fiscal year in value of all equity shares and options held by the CEO at the beginning of this fiscal year. Columns (2) and (3) use a measure (each) of "Equity-based Wealth", which represents the CEO's wealth that is tied to the company's equity. Columns (4) and (5) show results for "Flow-compensation based Wealth" and "Firm-specific Wealth", which are two measures for how much of CEO's wealth is derived from compensation awarded by the firm. (Details on exact definition of these variables can be found in Appendix A.) $R_{i,t}$ is the return of company i in year t and $R_{ind,t}$ is the return of the corresponding industry group in the same year; industry groups are defined in the same manner as the 48 groups identified in Fama and French (1997). $R_{i,t} \cdot CDF(MB_{t-1}/MB_{t-2,t-11})$ represents the weighting of company i 's returns by its position on the cumulative distribution (calculated every year) of $MB_{t-1}/MB_{t-2,t-11}$, which is last year's market-to-book ratio of the company standardized by its average MB over the previous ten years. $R_{ind,t} \cdot CDF(MB_{t-1}/MB_{t-2,t-11})$ represents returns of the industry (to which company i belongs) weighted by the same cumulative distribution as described above. In addition to these independent variables, we also control for the contemporaneous market-to-book ratio (MB), total compensation of the manager in the previous year (TC_{t-1}), firm size calculated as the logarithm of its assets (SIZE), the firm's book leverage (BLEV), and a dummy which equals 1 if the CEO is also the Chairman of the Board.

Panel B reports fixed-effect (controlling for manager-firm fixed-effects) regression estimates of the following relation:

$$Comp_t = \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) + Controls + \varepsilon$$

All dependent and independent variables are the same as those described above except the cumulative distribution function $CDF(ISMB_{t-1}/ISMB_{t-2,t-11})$ that is now used instead of $CDF(MB_{t-1}/MB_{t-2,t-11})$ used in Panel A. This is the cumulative distribution (also calculated every year) of $ISMB_{t-1}/ISMB_{t-2,t-11}$, which is last year's industry-standardized market-to-book ratio of the company normalized by its industry-standardized-MB averaged over the previous ten years. All nominal values are converted to real values; as a result, all dollar figures are adjusted to constant 2003 dollars and all percentage returns are deflated by subtracting the growth in consumer price index from nominal returns (see Aggarwal and Samwick, 1999.) Finally, firms in the "Utilities" (SIC Codes 4900-4999) and "Financial Firms" (SIC Codes 6000-6411, 6500-6553, and 6700-6799) industry groups are excluded from the analyses.

Table 1 (continued)

Panel A: Firm-level market-to-book ratio

	Dependent variables:				
	$\Delta E + \Delta O$	EBW1	EBW2	FCBW	FSW
	(1)	(2)	(3)	(4)	(5)
Independent variables:					
$R_{i,t}$	0.1539*** (14.18)	0.1482*** (12.77)	0.1453*** (9.25)	0.1482*** (13.02)	0.1502*** (13.03)
$R_{ind,t}$	0.0474*** (2.87)	0.0379** (2.03)	-0.0318 (-1.25)	0.0286 (1.56)	0.0280 (1.51)
$R_{i,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11})$	0.1444*** (7.34)	0.1541*** (7.32)	0.2190*** (7.66)	0.1551*** (7.50)	0.1543*** (7.37)
$R_{ind,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11})$	-0.0510* (-1.84)	-0.0346 (-1.09)	0.0948** (2.19)	-0.0220 (-0.71)	-0.0181 (-0.58)
MB	-0.0035 (-1.19)	-0.0033 (-1.07)	-0.0056 (-1.35)	-0.0032 (-1.08)	-0.0033 (-1.09)
TC_{t-1}	0.1785* (1.80)	0.2970*** (2.82)	1.0885*** (7.67)	0.2519** (2.43)	0.3367*** (3.22)
SIZE	3.0655*** (3.75)	5.3763*** (6.25)	4.7851*** (4.12)	5.9395*** (7.03)	6.1625*** (7.22)
BLEV	-1.7976 (-0.54)	-6.4789* (-1.85)	2.5615 (0.54)	-7.2936** (-2.12)	-7.1490** (-2.06)
Dummy=1 if CEO is also Chairman	-6.1740* (-1.72)	-2.9963 (-0.79)	-12.6232** (-2.30)	-2.6150 (-0.70)	-2.5332 (-0.67)
Intercept	-60.3613*** (-3.57)	-106.4794*** (-5.99)	-93.0957*** (-3.88)	-116.4461*** (-6.67)	-121.4384*** (-6.89)
Sample Size	8118	8032	7891	8030	8001
Number of individual-specific intercepts	1975	1965	1952	1966	1962
R-squared	21.27%	19.61%	15.23%	20.19%	20.12%

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Table 1 (continued)

Panel B: Industry-adjusted market-to-book ratio

	Dependent variables:				
	$\Delta E + \Delta O$	EBW1	EBW2	FCBW	FSW
	(1)	(2)	(3)	(4)	(5)
Independent variables:					
$R_{i,t}$	0.1578*** (13.36)	0.1591*** (12.7)	0.1581*** (9.30)	0.1607*** (12.95)	0.1625*** (12.94)
$R_{ind,t}$	0.0463*** (2.73)	0.0307 (1.63)	-0.0182 (-0.71)	0.0208 (1.11)	0.0208 (1.10)
$R_{i,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11})$	0.1273*** (5.97)	0.1209*** (5.32)	0.1666*** (5.39)	0.1184*** (5.27)	0.1179*** (5.18)
$R_{ind,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11})$	-0.0450 (-1.54)	-0.0169 (-0.52)	0.0765* (1.69)	-0.0016 (-0.05)	0.0006 (0.02)
MB	-0.0029 (-1.01)	-0.0026 (-0.85)	-0.0045 (-1.10)	-0.0025 (-0.84)	-0.0026 (-0.85)
TC_{t-1}	0.1576 (1.54)	0.2425** (2.25)	0.9664*** (6.62)	0.2633** (2.46)	0.3546*** (3.28)
SIZE	3.1330*** (3.75)	5.5407*** (6.35)	4.6087*** (3.90)	5.9106*** (6.84)	6.1409*** (7.03)
BLEV	-3.2053 (-0.95)	-8.4182** (-2.38)	1.6291 (0.34)	-9.0812*** (-2.62)	-9.0009*** (-2.57)
Dummy=1 if CEO is also Chairman	-3.6133 (-0.98)	-2.9368 (-0.77)	-1.0943 (-0.20)	-2.5755 (-0.68)	-2.5076 (-0.66)
Intercept	-62.6160*** (-3.63)	-108.8319*** (-6.04)	-95.9203*** (-3.92)	-115.0098*** (-6.44)	-120.1305*** (-6.66)
Sample Size	7834	7748	7609	7758	7728
Number of individual-specific intercepts	1952	1942	1930	1940	1935
R-squared	21.15%	19.62%	14.39%	17.68%	17.63%

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

TABLE 2

Column (1) of Table 2 presents the estimated coefficients for the following test of market-timing of options granted to the executives:

$$CTRL1_T = \alpha + \beta_1 OMT_T^{MB} + Controls + \varepsilon$$

This is a fixed-effects regression controlling for manager-firm fixed effects (where manager-firm combination is identified by CO_PER_R.) The dependent variable is a measure of control that the CEO is capable of wielding on the firm, and is measured by the ratio of (dollar value of) all the options the CEO has been granted since 1992 so far (i.e., till year T) to the company's market equity in the current fiscal year, T .

The explanatory variable of interest – OMT_T^{MB} – is the “market-timing” variable (following Baker and Wurgler, 2002.) Being a weighted average of the fraction of CEO's total options that were granted in a given year (weighted by the contemporaneous MB), this variable takes high values if the CEO was granted more options *just when* the market-to-book was high.

Results from the following alternative specification (again controlling for manager-firm fixed effects) are presented in Column (2) of Table 2 and serve as a check for robustness of the results in Column (1):

$$CTRL1_T = \alpha + \beta_1 OMT_T^{ISMB} + Controls + \varepsilon$$

In the specification shown in column (3), estimated coefficients for a different test of market-timing are reported. This specification tests for the market-timing of restricted stock grants and option grants to the executives, and is written as:

$$CTRL2_T = \alpha + \beta_1 EOMT_T^{MB} + Controls + \varepsilon$$

This is also a fixed-effects regression controlling for manager-firm fixed effects (where manager-firm combination is identified by CO_PER_R.) However, now the dependent variable, which is a measure of control that the CEO is capable of wielding on the firm, is measured by the ratio of (dollar value of) all the restricted stock and options the CEO has been granted since 1992 so far (i.e., till year T) to the company's market equity in the current fiscal year, T . The explanatory variable of interest – $EOMT_T^{MB}$ – is the “market-timing” variable (following Baker and Wurgler, 2002.) Being a weighted average of the fraction of CEO's total restricted stock and options that were granted in a given year (weighted by the contemporaneous MB), this variable takes high values if the CEO was granted more stock and options *just when* the market-to-book was high.

Results from the following alternative specification are presented in Column (4) of Table 2 and serve as a check for robustness of the results in Column (3):

$$CTRL2_T = \alpha + \beta_1 EOMT_T^{ISMB} + Controls + \varepsilon$$

Following firm-characteristic controls are also included in the four regressions described above: the level of market-to-book ratio (MB) in the current fiscal year T , logarithm of the firm's assets measured in constant 2003 dollars (SIZE), book leverage (BLEV), logarithm of net sales measured in constant 2003 dollars (SALES), logarithm of capital expenditure measured in constant 2003 dollars (CAPEX), and return-on-assets deflated by the growth in consumer price index (ROA).

In all specifications, firms in the “Utilities” (SIC Codes 4900-4999) and “Financial Firms” (SIC Codes 6000-6411, 6500-6553, and 6700-6799) industry groups are excluded.

Table 2 (continued)

Dependent variable:	CTRL1		CTRL2	
	(1)	(2)	(3)	(4)
Independent variables:				
OMT ^{MB}	0.0837*** (9.83)			
OMT ^{ISMB}		0.0579*** (3.02)		
EOMT ^{MB}			0.0875*** (9.57)	
EOMT ^{ISMB}				0.0602*** (2.85)
MB	-0.1213*** (-22.94)	-0.0956*** (-22.54)	-0.1288*** (-22.58)	-0.1009*** (-22.06)
SIZE	0.0481 (1.39)	0.0823** (2.36)	0.0759** (2.09)	0.1045*** (2.84)
BLEV	1.0705*** (12.66)	1.0820*** (12.61)	1.0492*** (11.67)	1.0423*** (11.44)
SALES	0.2947*** (7.88)	0.2962*** (7.85)	0.2979*** (7.65)	0.3036*** (7.66)
CAPEX	-0.1700*** (-11.21)	-0.1701*** (-11.08)	-0.1815*** (-11.27)	-0.1808*** (-11.07)
ROA	-0.0236*** (-20.08)	-0.0222*** (-18.78)	-0.0245*** (-19.42)	-0.0233*** (-18.36)
Intercept	-4.0119*** (-10.49)	-4.6177*** (-12.08)	-4.3843*** (-10.79)	-7.4619*** (-15.86)
Sample Size	9385	9264	9673	9534
Number of individual-specific intercepts	1956	1950	1985	1981
R-squared	21.66%	21.16%	20.30%	19.96%

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

TABLE 3

Panel A of Table 3 reports fixed-effect estimate for the following relationship:

$$Comp_t = \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \\ + \beta_5 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times UFP + \beta_6 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times UFP + Controls + \varepsilon$$

Only certain coefficients of interest (β_1 , β_3 and β_5) are reported in the tables; the remaining are similar to those in Table 1. The unit of analysis for fixed-effect estimates is every unique manager-firm combination (as identified by the variable CO_PER_R). In these regressions, the dependent variables used are the same five compensation variables that were used in Table 1 above: $\Delta E + \Delta O$, EBW1, EBW2, FCBW, and FSW. Column (1) uses $\Delta E + \Delta O$, which is the change during the current fiscal year in value of all equity shares and options held by the CEO at the beginning of this fiscal year. Columns (2) and (3) use a measure (each) of “Equity-based Wealth”, which represents the CEO’s wealth that is tied to the company’s equity. Columns (4) and (5) show results for “Flow-compensation based Wealth” and “Firm-specific Wealth”, which are two measures for how much of CEO’s wealth is derived from compensation awarded by the firm. (Details on exact definition of these variables can be found in Appendix A.)

$R_{i,t}$ is the return of company i in year t and $R_{ind,t}$ is the return of the corresponding industry group in the same year; industry groups are defined in the same manner as the 48 groups identified in Fama and French (1997). $R_{i,t}.CDF(MB_{t-1}/MB_{t-2,t-11})$ represents the weighting of company i ’s returns by its position on the cumulative distribution (calculated every year) of $MB_{t-1}/MB_{t-2,t-11}$, which is last year’s market-to-book ratio of the company standardized by its average MB over the previous ten years. $R_{ind,t}.CDF(MB_{t-1}/MB_{t-2,t-11})$ represents returns of the industry (to which company i belongs) weighted by the same cumulative distribution as described above. $R_{i,t}.CDF(MB_{t-1}/MB_{t-2,t-11}).UFP$ and $R_{ind,t}.CDF(MB_{t-1}/MB_{t-2,t-11}).UFP$ capture the interaction of the two terms (described above) with uncertainty about the firm’s performance. UFP is a dummy variable equal to 1 for firms in the top two quintiles, when sorted by the level of uncertainty (measured by the regression residual from the market model), and equal to 0 if the firm is in the bottom two quintiles. In addition to these independent variables, we also control for the contemporaneous market-to-book ratio (MB), total compensation of the manager in the previous year (TC_{t-1}), firm size calculated as the logarithm of its assets (SIZE), the firm’s book leverage (BLEV), and a dummy which equals 1 if the CEO is also the Chairman of the Board. (See Appendix A for detailed definitions of all variables involved.)

As a test of robustness for the results in Panel A, fixed-effect estimate of β_5 in the following alternative specification is also determined and reported in Panel B:

$$Comp_t = \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \\ + \beta_5 R_{i,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \times UFP + \beta_6 R_{ind,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \times UFP + Controls + \varepsilon$$

All dependent and independent variables are the same as those described above except the cumulative distribution function $CDF(ISMB_{t-1}/ISMB_{t-2,t-11})$ that is now used instead of $CDF(MB_{t-1}/MB_{t-2,t-11})$ used in Panel A. This is the cumulative distribution (also calculated every year) of $ISMB_{t-1}/ISMB_{t-2,t-11}$, which is last year’s industry-standardized market-to-book ratio of the company normalized by its industry-standardized-MB averaged over the previous ten years.

All nominal values are converted to real values; as a result, all dollar figures are adjusted to constant 2003 dollars and all percentage returns are deflated by subtracting the growth in consumer price index from nominal returns (see Aggarwal and Samwick, 1999.) Finally, firms in the “Utilities” (SIC Codes 4900-4999) and “Financial Firms” (SIC Codes 6000-6411, 6500-6553, and 6700-6799) industry groups are excluded from the analyses.

Table 3 (continued)

Panel A: Firm-level market-to-book ratio

	Dependent variables:				
	$\Delta E + \Delta O$	EBW1	EBW2	FCBW	FSW
	(1)	(2)	(3)	(4)	(5)
Additional independent variables:					
$R_{i,t}$	0.1564*** (13.99)	0.1497*** (12.80)	0.1468*** (9.25)	0.1497*** (13.04)	0.1517*** (13.06)
$R_{i,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11})$	0.2433*** (8.91)	0.2564*** (8.97)	0.3468*** (8.94)	0.2610*** (9.30)	0.2590*** (9.13)
$R_{i,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11}) \times \text{UFP}$	-0.1446*** (-5.84)	-0.1419*** (-5.48)	-0.1757*** (-4.97)	-0.1466*** (-5.77)	-0.1454*** (-5.65)
Sample Size	7966	7965	7827	7963	7934
Number of individual-specific intercepts	1957	1957	1943	1958	1954
R-squared	22.18%	20.65%	15.85%	21.27%	21.17%

Panel B: Industry-adjusted market-to-book ratio

	Dependent variables:				
	$\Delta E + \Delta O$	EBW1	EBW2	FCBW	FSW
	(1)	(2)	(3)	(4)	(5)
Additional independent variables:					
$R_{i,t}$	0.1643*** (13.49)	0.1634*** (12.94)	0.1628*** (9.46)	0.1639*** (13.08)	0.1657*** (13.07)
$R_{i,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11})$	0.1876*** (6.59)	0.1940*** (6.58)	0.2539*** (6.31)	0.1986*** (6.78)	0.1967*** (6.64)
$R_{i,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11}) \times \text{UFP}$	-0.1008*** (-4.04)	-0.1090*** (-4.21)	-0.1283*** (-3.62)	-0.1147*** (-4.47)	-0.1134*** (-4.36)
Sample Size	7682	7682	7546	7681	7653
Number of individual-specific intercepts	1933	1933	1921	1934	1929
R-squared	21.87%	20.57%	14.84%	20.87%	20.78%

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

TABLE 4

Panel A of Table 4 reports fixed-effect estimate for the following relationship:

$$\begin{aligned} Comp_t = & \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \\ & + \beta_5 R_{i,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times ATI / GI + \beta_6 R_{ind,t} CDF\left(\frac{MB_{t-1}}{MB_{t-2,t-11}}\right) \times ATI / GI + Controls + \varepsilon \end{aligned}$$

Only estimates of β_1 , β_3 and β_5 are reported in the tables; the remaining variables are the same as those in Table 1 and are not reported for brevity. The unit of analysis for fixed-effect estimates is every unique manager-firm combination (as identified by the variable CO_PER_R). In these regressions, the dependent variables used are the same five compensation variables that were used in Table 3 above: $\Delta E + \Delta O$, EBW1, EBW2, FCBW, and FSW. Column (1) uses $\Delta E + \Delta O$, which is the change during the current fiscal year in value of all equity shares and options held by the CEO at the beginning of this fiscal year. Columns (2) and (3) use a measure (each) of “Equity-based Wealth”, which represents the CEO’s wealth that is tied to the company’s equity. Columns (4) and (5) show results for “Flow-compensation based Wealth” and “Firm-specific Wealth”, which are two measures for how much of CEO’s wealth is derived from compensation awarded by the firm. (Details on exact definition of these variables can be found in Appendix A.)

$R_{i,t}$ is the return of company i in year t and $R_{ind,t}$ is the return of the corresponding industry group in the same year; industry groups are defined in the same manner as the 48 groups identified in Fama and French (1997). $R_{i,t}.CDF(MB_{t-1}/MB_{t-2,t-11})$ represents the weighting of company i ’s returns by its position on the cumulative distribution (calculated every year) of $MB_{t-1}/MB_{t-2,t-11}$, which is last year’s market-to-book ratio of the company standardized by its average MB over the previous ten years. $R_{ind,t}.CDF(MB_{t-1}/MB_{t-2,t-11})$ represents returns of the industry (to which company i belongs) weighted by the same cumulative distribution as described above. $R_{i,t}.CDF(MB_{t-1}/MB_{t-2,t-11}).ATI/GI$ and $R_{ind,t}.CDF(MB_{t-1}/MB_{t-2,t-11}).ATI/GI$ capture the interaction of the two terms (described above) with the quality of corporate governance – proxied *either* by ATI *or* by GI. ATI is an index that takes integer values in the range 0-5 and measures the anti-takeover provisions employed by the firm. GI is a dummy variable equal to 1 for firms that have a governance index (as constructed by Gompers, Ishii, and Metrick, 2003) of 10 or higher and equal to 0 if the firm has a governance index of 9 and lower. In addition to these independent variables, we also control for the contemporaneous market-to-book ratio (MB), total compensation of the manager in the previous year (TC_{t-1}), firm size calculated as the logarithm of its assets (SIZE), the firm’s book leverage (BLEV), and a dummy which equals 1 if the CEO is also the Chairman of the Board. (See Appendix A for detailed definitions of all variables involved.)

Panel B reports fixed-effect estimates of β_1 , β_3 and β_5 in the following alternative specification (other coefficients are omitted for brevity):

$$\begin{aligned} Comp_t = & \alpha + \beta_1 R_{i,t} + \beta_2 R_{ind,t} + \beta_3 R_{i,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) + \beta_4 R_{ind,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \\ & + \beta_5 R_{i,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \times ATI / GI + \beta_6 R_{ind,t} CDF\left(\frac{ISMB_{t-1}}{ISMB_{t-2,t-11}}\right) \times ATI / GI + Controls + \varepsilon \end{aligned}$$

All dependent and independent variables are the same as those described above except the cumulative distribution function $CDF(ISMB_{t-1}/ISMB_{t-2,t-11})$ that is now used instead of $CDF(MB_{t-1}/MB_{t-2,t-11})$ used in Panel A. This is the cumulative distribution (also calculated every year) of $ISMB_{t-1}/ISMB_{t-2,t-11}$, which is last year’s industry-standardized market-to-book ratio of the company normalized by its industry-standardized-MB averaged over the previous ten years. All nominal values are converted to real values; as a result, all dollar figures are adjusted to constant 2003 dollars and all percentage returns are deflated by subtracting the growth in consumer price index from nominal returns (see Aggarwal and Samwick, 1999.) Finally, firms in the “Utilities” (SIC Codes 4900-4999) and “Financial Firms” (SIC Codes 6000-6411, 6500-6553, and 6700-6799) industry groups are excluded from the analyses.

Table 4 (continued)

Panel A: Firm-level market-to-book ratio

	Dependent variables:									
	$\Delta E + \Delta O$		EBW1		EBW2		FCBW		FSW	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Additional independent variables:										
$R_{i,t}$	0.1415*** (10.53)	0.1374*** (10.16)	0.1379*** (9.76)	0.1333*** (9.48)	0.1454*** (7.54)	0.1430*** (7.35)	0.1381*** (9.98)	0.1341*** (9.61)	0.1403*** (10.03)	0.1364*** (9.68)
$R_{i,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11})$	0.3579*** (9.34)	0.2600*** (9.07)	0.3793*** (9.41)	0.2765*** (9.28)	0.4646*** (8.44)	0.3391*** (8.17)	0.3721*** (9.43)	0.2740*** (9.27)	0.3669*** (9.19)	0.2675*** (8.95)
$R_{i,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11}) \times \text{ATI}$	-0.0553*** (-5.17)		-0.0582*** (-5.19)		-0.0672*** (-4.38)		-0.0548*** (-4.98)		-0.0543*** (-4.88)	
$R_{i,t} \times \text{CDF}(\text{MB}_{t-1}/\text{MB}_{t-2,t-11}) \times \text{GI}$		-0.1006*** (-3.52)		-0.1063*** (-3.58)		-0.1205*** (-2.92)		-0.0961*** (-3.26)		-0.0913*** (-3.06)
Sample Size	6373	6234	6371	6232	6260	6121	6368	6230	6348	6211
Number of individual-specific intercepts	1669	1644	1669	1644	1657	1632	1669	1644	1666	1641
R-squared	21.58%	21.60%	20.19%	20.50%	16.09%	15.95%	20.83%	20.84%	20.64%	20.64%

Panel B: Industry-adjusted market-to-book ratio

	Dependent variables:									
	$\Delta E + \Delta O$		EBW1		EBW2		FCBW		FSW	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Additional independent variables:										
$R_{i,t}$	0.1566*** (10.53)	0.1497*** (10.01)	0.1569*** (10.14)	0.1501*** (9.64)	0.1732*** (8.24)	0.1695*** (7.98)	0.1575*** (10.26)	0.1518*** (9.84)	0.1599*** (10.30)	0.1543*** (9.89)
$R_{i,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11})$	0.3009*** (7.68)	0.2190*** (7.17)	0.3077*** (7.54)	0.2214*** (6.96)	0.3487*** (6.25)	0.2364*** (5.41)	0.2980*** (7.35)	0.2159*** (6.86)	0.2909*** (7.08)	0.2102*** (6.59)
$R_{i,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11}) \times \text{ATI}$	-0.0538*** (-5.19)		-0.0552*** (-5.12)		-0.0617*** (-4.19)		-0.0511*** (-4.77)		-0.0500*** (-4.61)	
$R_{i,t} \times \text{CDF}(\text{ISMB}_{t-1}/\text{ISMB}_{t-2,t-11}) \times \text{GI}$		-0.1164*** (-4.11)		-0.1157*** (-3.92)		-0.1141*** (-2.82)		-0.1062*** (-3.65)		-0.1028*** (-3.49)
Sample Size	6153	6026	6152	6025	6041	5920	6150	6032	6130	6012
Number of individual-specific intercepts	1644	1619	1644	1619	1631	1604	1644	1617	1640	1613
R-squared	21.14%	21.13%	20.04%	19.93%	15.17%	10.66%	20.32%	16.92%	20.13%	16.96%

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

TABLE 5

Table 5 presents coefficient estimates for the following relation:

$$MB_{t+1} = \alpha + \beta_1 MB_t + \beta_2 \Delta Comp_{t-1,t} + \beta_3 Comp_t + Controls + \varepsilon$$

In Panel A of Table 5, these coefficients are estimated using a Fama-MacBeth type methodology, i.e., first the coefficients are estimated in a cross-sectional regression for each year, and then the variation in the time-series of coefficients is used to test for significance. These *t*-statistics are reported in parentheses. In Panel B, the same relation is tested using a fixed-effect regression (controlling for manager-firm fixed-effects, where each manager-firm combination is identified by CO_PER_R.) The dependent variable is the market-to-book ratio of the company in the subsequent year (MB_{t+1}) and the explanatory variables of interest are the change in and level of the CEO's compensation during the current fiscal year (i.e., $\Delta Comp_{t-1,t}$ and $Comp_t$). For $\Delta Comp_{t-1,t}$ and $Comp_t$, four different measures of compensation are used and the results are reported separately in the two columns. Column (1) uses the ratio of options granted to total compensation (OBC); in column (2), results using a measure of equity-based compensation (EBC1) are reported. Other control variables include: the level of market-to-book ratio (MB) in the current fiscal year t , the logarithm of the firm's assets measured in constant 2003 dollars (SIZE), book leverage (BLEV), the logarithm of net sales measured in constant 2003 dollars (SALES), the logarithm of capital expenditure measured in constant 2003 dollars (CAPEX), and return-on-assets deflated by growth in the consumer price index (ROA). In all specifications, we exclude firms in the "Utilities" (SIC Codes 4900-4999) and "Financial Firms" (SIC Codes 6000-6411, 6500-6553, and 6700-6799) industry groups.

Table 5 (continued)
Panel A: Fama-MacBeth regressions

	Dependent variable:	
	MB_{t+1}	
	(1)	(2)
"Comp" used:	OBC	EBC1
Independent variables:		
ΔComp	-0.2296** (-2.69)	-0.2159*** (-3.69)
Comp	0.4069** (2.83)	0.3893*** (3.31)
MB	0.7729*** (17.03)	0.7772*** (17.63)
SIZE	0.0556 (0.86)	0.0515 (0.78)
BLEV	-0.3099 (-1.18)	-0.3497 (-1.33)
SALES	0.0217 (0.35)	0.0218 (0.34)
CAPEX	-0.0184 (-0.43)	-0.0183 (-0.42)
ROA	0.0061 (0.99)	0.0044 (0.75)
Intercept	-0.6300 (-0.86)	-0.5420 (-0.72)
Number of estimates	10	10

Panel B: Fixed-effect regressions

	Dependent variable:	
	MB_{t+1}	
	(1)	(2)
"Comp" used:	OBC	EBC1
Independent variables:		
ΔComp	-0.2045** (-2.05)	-0.1884** (-1.96)
Comp	0.3308** (2.25)	0.3325** (2.34)
MB	0.2683*** (20.38)	0.2799*** (21.02)
SIZE	-1.1922*** (-10.15)	-1.1859*** (-10.15)
BLEV	1.9045*** (6.75)	1.7858*** (6.36)
SALES	0.4591*** (3.69)	0.4549*** (3.68)
CAPEX	-0.1101** (-2.24)	-0.1061** (-2.17)
ROA	0.0162*** (4.17)	0.0117*** (2.97)
Intercept	18.3503*** (14.01)	18.25718*** (14.08)
Sample Size	7334	7329
Number of individual-specific intercepts	1849	1847
R-squared	14.64%	14.80%

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

TABLE 6

Table 6, Panel A presents market-adjusted abnormal returns from a buy-and-hold portfolio strategy that holds a long position in companies that increase their CEO's compensation (relative to that in the previous fiscal year) and a short position in those that decrease their CEO's compensation (again, relative to that in the previous fiscal year). Several different measures of compensation, most of which measure some type of equity-based incentives, are used to divide firms into the two groups: increase in compensation (denoted as "CompUp") and decrease in compensation (denoted as "CompDown"). Of these compensation variables, those that are equity-based include: Options-based compensation (OBC), two measures of equity-based compensation (EBC1 and EBC2), value of options granted (VOG), value of options plus restricted stock granted (VOG + VRSG). In order to avoid any price-effects, number of equity shares obtained by the CEO (SOBT) as well as the number of options granted to the CEO (NOG) are also used. Finally, moving away from equity-based compensation variables, the total compensation that the CEO receives in the fiscal year (TC) is used to categorize firms as "CompUp" or "CompDown". (Detailed descriptions of all these variables can be found in Appendix A.) Every fiscal year, all the unique manager-firm combinations (or CO_PER_Rs) are categorized into "CompUp" and "CompDown" groups. For each fiscal year t , if $\text{Comp}_t - \text{Comp}_{t-1} > 0$, then the observation belongs in the "CompUp" group, and if $\text{Comp}_t - \text{Comp}_{t-1} < 0$, then it belongs to the "CompDown" group. Both groups are then formed into equally-weighted or value-weighted portfolios. The first four columns of the table below present results using equally weighted portfolio returns and the remaining four columns present those using value-weighted portfolio returns. Returns are calculated over several different horizons; the column headings indicate the months over which these are calculated. For instance, [1, 3] implies that returns are calculated for the 3-month period immediately after the fiscal year-end, and likewise [7, 12] represents returns over a 6-month period starting 6 months after the fiscal year-end. In all specifications, we exclude firms in the "Utilities" (SIC Codes 4900-4999) and "Financial Firms" (SIC Codes 6000-6411, 6500-6553, and 6700-6799) industry groups

Panel B of Table 6 presents abnormal returns of calendar-time portfolio strategies where the portfolio consists of all firms increasing their CEO's compensation and belong to the high market-to-book group in our sample. These abnormal returns are first calculated in excess of the Fama-French three-factors and then including the momentum factor in addition. The compensation variables used are the same as defined above.

Table 6, Panel A

	Period over which the equally-weighted returns are calculated				Period over which the value-weighted returns are calculated			
	[1, 3]	[1, 12]	[4, 12]	[7, 12]	[1, 3]	[1, 12]	[4, 12]	[7, 12]
Compensation variable used:								
OBC	-2.53%*** (-3.87)	-11.62%*** (-8.89)	-8.67%*** (-7.66)	-5.66%*** (-6.12)	-2.40%*** (-3.31)	-8.95%*** (-6.16)	-6.38%*** (-5.07)	-3.92%*** (-3.82)
EBC1	-2.34%*** (-3.67)	-11.58%*** (-9.08)	-8.78%*** (-7.96)	-5.60%*** (-6.21)	-1.76%** (-2.29)	-8.61%*** (-5.60)	-6.49%*** (-4.87)	-3.54%*** (-3.25)
EBC2	-2.03%*** (-3.46)	-10.92%*** (-9.29)	-8.49%*** (-8.35)	-5.44%*** (-6.55)	-1.37%* (-1.67)	-11.16%*** (-6.83)	-9.56%*** (-6.76)	-5.62%*** (-4.86)
VOG	-1.53%** (-2.10)	-9.33%*** (-6.39)	-7.39%*** (-5.84)	-5.03%*** (-4.87)	-2.06%** (-2.55)	-8.51%*** (-5.27)	-6.19%*** (-4.42)	-4.19%*** (-3.67)
VOG + VRSG	-1.78%** (-2.44)	-9.40%*** (-6.47)	-7.24%*** (-5.75)	-5.04%*** (-4.91)	-1.55%* (-1.87)	-8.34%*** (-5.04)	-6.41%*** (-4.47)	-4.37%*** (-3.73)
SOBT	-3.48%*** (-4.64)	-12.97%*** (-8.64)	-9.12%*** (-7.01)	-5.42%*** (-5.10)	-2.21%** (-2.43)	-10.13%*** (-5.56)	-7.64%*** (-4.84)	-4.07%*** (-3.16)
NOG	-2.77%*** (-4.74)	-11.58%*** (-9.89)	-8.33%*** (-8.22)	-5.35%*** (-6.47)	-2.60%*** (-2.93)	-11.14%*** (-6.28)	-8.10%*** (-5.27)	-5.21%*** (-4.15)
TC	-0.63% (-0.92)	-6.87%*** (-4.97)	-5.89%*** (-4.92)	-4.28%*** (-4.38)	-0.23% (-0.28)	-4.82%*** (-3.01)	-4.24%*** (-3.05)	-3.37%*** (-2.98)

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.

Table 6, Panel B

Compensation variable used:	Fama-French 3-factors based abnormal returns of calendar-time portfolio strategies				Fama-French 3-factors and momentum based abnormal returns of calendar-time portfolio strategies			
	[1, 3]	[1, 12]	[4, 12]	[7, 12]	[1, 3]	[1, 12]	[4, 12]	[7, 12]
	OBC	-3.08%** (-2.23)	-6.09%** (-2.21)	-3.02% (-1.27)	-3.75%* (-1.93)	-2.72%** (-1.99)	-5.81%** (-2.13)	-3.10% (-1.31)
EBC1	-2.98%** (-2.19)	-5.90%** (-2.16)	-2.92% (-1.24)	-3.74%* (-1.94)	-2.64%* (-1.95)	-5.38%** (-1.98)	-2.74% (-1.17)	-3.79%** (-1.98)
EBC2	-2.61%* (-1.85)	-4.98%* (-1.76)	-2.37% (-0.97)	-2.98% (-1.49)	-2.45%* (-1.75)	-4.54% (-1.62)	-2.10% (-0.87)	-2.76% (-1.39)
VOG	-2.88%** (-2.07)	-4.96%* (-1.78)	-2.09% (-0.87)	-3.20% (-1.63)	-2.52%* (-1.83)	-4.40% (-1.60)	-1.89% (-0.79)	-3.21%* (-1.65)
VOG + VRSG	-2.61%* (-1.93)	-4.81%* (-1.78)	-2.21% (-0.94)	-3.24%* (-1.69)	-2.26%* (-1.69)	-4.58%* (-1.71)	-2.32% (-1.00)	-3.45%* (-1.82)
SOBT	-3.14%** (-2.08)	-5.87%* (-1.95)	-2.74% (-1.05)	-2.87% (-1.34)	-2.98%** (-2.00)	-5.77%* (-1.94)	-2.80% (-1.08)	-2.88% (-1.37)
NOG	-2.99%** (-2.20)	-5.19%* (-1.91)	-2.21% (-0.94)	-3.32%* (-1.73)	-2.73%** (-2.04)	-5.08%* (-1.90)	-2.35% (-1.01)	-3.67%* (-1.94)
TC	-2.56%* (-1.86)	-4.07% (-1.48)	-1.52% (-0.64)	-2.59% (-1.33)	-2.27%* (-1.67)	-3.82% (-1.41)	-1.55% (-0.66)	-2.74% (-1.42)

t-statistics are reported in parentheses.

*, **, and *** indicate significance at 10%, 5%, and 1% level, respectively.