MISVALUATION, CEO EQUITY-BASED COMPENSATION, AND CORPORATE GOVERNANCE

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Abstract

We investigate empirically whether mispricing of a firm's stock affects CEO equity-based compensation, controlling for industry and year effects, economic determinants, board characteristics, and institutional ownership. We hypothesize that an overvalued firm may award higher grants to meet the manager's reservation utility from another job, to maintain performance incentives, to acquiesce to greater rent extraction, or to reduce the likelihood of paying for luck. Among firms that award stock options, we find that CEOs of overvalued firms receive higher stock option compensation, lower cash compensation and higher overall total compensation. Furthermore, we find that when a firm awards higher option grants in response to overvaluation or because of a weak board, it subsequently underperforms more. However, the firm subsequently overperforms when it awards more option grants because it has high growth prospects or a high fraction of institutional shareholders.

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I. Introduction

In this study, we examine empirically whether stock market misvaluation influences CEO equity-based compensation. The premise of our research departs from the typical perspective of the literature on executive compensation, where both the principal (shareholders) and the manager (agent) are assumed to be fully rational, and the stock price of the firm reflects its fundamental value accurately. Instead, we allow for the possibility that stock prices can deviate from fundamental value, and consider its effect on the contracted compensation outcome. Therefore, our approach reflects research in behavioral corporate finance which has provided evidence suggesting that managers behave strategically to exploit stock market inefficiencies.[1]

If CEOs or board of directors perceive the stock market to be inefficient, they have an incentive to take mispricing into account when bargaining over the level of equity compensation. We therefore investigate how the magnitude and structure of CEO compensation and firm subsequent performance are related to firm misvaluation. Specifically, we test empirically whether CEOs of overvalued firms are awarded a greater amount of equity-based, cash, and total compensation when the firm is overvalued. We then examine how the compensation induced by misvaluation affects subsequent firm accounting and stock return performance.

These tests are motivated by three lines of reasoning which are developed in Section 2. The first reasoning is based on a rational principal-agent paradigm with exogenous shocks to the firm's stock price and with options assumed to be granted at-the-money (for accounting reporting reasons). All else equal, the fundamental value of stock options to managers fall when the firm's stock price is overvalued. Consequently, to maintain the fundamental value of the

[1] Daniel, Hirshleifer, and Teoh (2002) review the empirical literature on market inefficiency. There is evidence of strategic behavior by managers in response to firm mispricing. For example, firm managers issue new equity when the stock is overvalued (Loughran and Ritter 1995), and repurchase shares when the firm is undervalued (Ikenberry, Lakonishok, and Vermaelen 1995). There is also evidence that insider trades are forecasters of future stock returns even after the public disclosue of these trades (Lakonishok and Lee 2001).

compensation, firms have to pay a higher measured compensation when the firm is overvalued to meet the manager's participation constraint and for the firm to maintain appropriate incentives.

The second reasoning uses the insight in Core and Guay (1999) that firms set target ownership levels for managers to ensure appropriate incentives. A manager is likely to exercise options and sell his holdings of the firm's stock when the stock is overvalued. To maintain ownership levels to at least the critical level, an overvalued firm therefore has to pay higher equity compensation.

The third reasoning uses the finding in the literature that managers are paid for luck, not performance, (Bertrand and Mullainathan, 2001, and Garvey and Milbourn, 2006), that managers are able to extract rents (Bebchuk and Fried, 2002) and that severe agency problems exist in firms with overvalued equity (Jensen, 2004). When the firm is overvalued, managers extract higher compensation by appealing to the improved firm stock price. In Section 2, we describe several ways in which this can occur (involving board misperceptions, board vulnerability to pressure, and misperceptions from the labor market) and in which compensation variables, equity, cash or total compensation, are affected.

To test these predictions, we require an empirical proxy for misvaluation. We consider two measures, the book-to-price and fundamental value-to-price ratios. Both of these are suggested by prior literature. Jenter (2005) uses book-to-price (B/P) and closely related variables such as proxies for Tobin's Q. However, these variables have also been interpreted as a proxy for financial distress, growth opportunities, and agency problems. The value-to-price ratio (V/P) has been applied in several corporate finance studies as a proxy for misvaluation, see D'Mello and Shrof (2000), and Dong, Hirshleifer, Richardson, and Teoh (2006). The latter paper also argues that the V/P ratio offers a more purified measure of misvaluation in that growth factors are refined away by considering fundamental values that incorporate analysts' forecasts of growth.

The basic idea of both B/P and V/P measures is that misvaluation can be measured as the deviation between a fundamental measure of value and market price. B/P uses a crude measure of fundamental value, the book value of equity B, which does not reflect the firm's future earnings prospects, and varies with the degree of accounting reporting conservatism and growth opportunities. A potentially better measure of the firm's fundamental value would take into account the firm's prospects for future growth and would be less sensitive to accounting reporting choice.

Ohlson (1995) provides a model which appropriately combines book value with future earnings forecasts to obtain a fundamental valuation (V) of the firm's equity. This V/P ratio thereby filters out growth effects to provide a purer measure of misvaluation. V/P has been found to be a robust predictor of both aggregate stock market returns (Lee, Myers, and Swaminathan 1999), and of the cross-section of stock returns after controlling for other known return predictors (Frankel and Lee 1998, and Ali, Hwang, and Trombley 2004).

Our tests of the relation between CEO compensation and misvaluation control for other known determinants that the past literature has shown to affect CEO compensation. We include economic determinants of compensation to control for firm performance, firm risk, and business complexity, as well as year and industry indicator variables. The board governance proxies relate to the degree of independence of the board and other shareholders, and their ability to monitor the CEO.[2] For example, past evidence suggest that companies with strong governance, as measured inversely by the size of the board, provide stronger CEO pay-for-performance incentives (Yermack 1996). Core, Holthausen and Larcker (1999) find that firms that are poorly governed (as measured by board and ownership structure variables) pay their CEOs more, after controlling for other determinants of compensation. Because we also include economic

[2] See Hermalin and Weisback (2003) for a review of the board governance literature, as well as a discussion of the problem of board endogeneity.

determinants and board variables in our regressions on compensation, our findings also contribute to prior research relating compensation to governance and economic variables.

In the empirical tests, we first consider separate OLS regressions of stock option grants, cash compensation, and total compensation on the economic determinants, board governance proxies, and the misvaluation variables. We report clustered T-statistics to allow for correlation of errors within clusters by firm (see Petersen (2007), and we perform further robustness checks by considering rank variables instead of continuous variables where applicable. Finally, we examine the decision to award stock options, and whether this self-selection affects the relation between option compensation and misvaluation using the Heckman 2SLS method. In the first stage, we consider a probit analysis on the probability of option grants, and in the second stage, we include the inverse Mill's ratio as an additional explanatory variable in the regression of option compensation on economic determinants, board governance variables, and misvaluation.

We find that our measures of overvaluation are positive predictors of the amount of option compensation, after controlling for other known determinants of compensation based on standard economic and board governance variables. In other words, greater overvaluation is associated with greater option compensation. This is consistent with managers 'seeing through' the overvaluation and, to the extent that pay takes the form of options, demanding a correspondingly greater amount of option compensation. The board will correspondingly want to award stock options to maintain incentives. It is also consistent with the possibility that managers are selling on personal account the shares of overvalued firms, and that directors observe this and offer greater option compensation to maintain managerial incentives. Finally, it is consistent with greater ease of rent extraction, and with the firm attempting to reduce the likelihood that it is paying for luck when the firm's stock has risen suddenly by switching towards longer-term equity compensation away from immediate cash compensation.

The empirical results are robust across all alternative empirical methods employed (clustered T-statistics, rank variables, and 2SLS method). The results are also economically significant. A 10% drop in V/P (i.e. increased overvaluation) increases stock option compensation by 3.9%. In dollar terms, a one standard deviation drop in V/P increases stock option grant compensation by about $532,000, which is 19.5% of the mean stock option grant value in the sample. The economic effects of B/P on stock option grants are even larger. A 10% drop in B/P increases stock option compensation by 9.7%.

For the Heckman 2SLS procedure, the probit analysis in the first stage indicates that V/P does not significantly affect the probability of a grant option being awarded whereas B/P is highly significant. This is consistent with B/P acting as a proxy for growth opportunities, and therefore significantly affecting the decision of whether to pay stock option grants. V/P, on the other hand, is behaving more similarly to a pure misvaluation measure. Since misvaluations are temporary, it plays a more minor role, if at all, in the decision to shift policy to granting stock options.

In the second stage Heckman regression, the inverse Mill's ratio is not statistically significant. This finding suggests that the self-selection bias from ignoring the decision on whether to pay grants does not severely bias the coefficients in a one-pass OLS regression of positive stock option grants on misvaluation. Importantly, the second stage Heckman regressions also indicate that misvaluation significantly affects the amount of stock option compensation for the CEO among firms that do pay stock options. Higher overvaluation leads to higher stock option grants.

We also revisit past literature relating CEO compensation to subsequent accounting performance and its components, and stock return performance. For example, Core, Holthausen, and Larcker (1999) find that higher compensation related to board governance predicts worse

performance, whereas Hanlon, Rajgopal, and Shevlin (2003) do not. Instead, Hanlon et al. suggest that economic determinants exert a more important effect on subsequent performance than governance. We examine whether grant compensation amounts predicted from five sets of variables (economic determinants, board variables, institutional ownership, B/P, and V/P) are related to future performance. The incremental predicted compensation amounts are measured using the estimated coefficients from a regression of grant compensation on these five sets of variables.

We find that grant compensation amounts predicted from board variables and misvaluation (V/P) predict poor subsequent performance. Compensation amounts estimated from institutional ownership and growth opportunities, on the other hand, predict better future accounting performance and institutional ownership compensation predicts better stock return performance. Compensation that is predicted from economic variables has no influence on future performance. These findings suggest that misvaluation, governance, and growth opportunities have an important influence on compensation, and consequently on managerial behavior that is reflected in future performance.

The remainder of the paper is structured as follows. Section II discusses the motivation for the basic predictions, and Section III describes the sample and data. Section IV examines the misvaluation effects on CEO compensation and robustness tests are in Section V. Section VI examines the effects of compensation on future performance and Section VII concludes.

II. Motivation for test prediction

When the firm's stock price becomes overvalued, the manager's wealth increases from his prior stockholdings and the existing options that he is able to trade or exercise. We go beyond

this windfall wealth to focus on the new period compensation. In other words, we consider the effects of overvalution on new option grants, cash compensation, and total compensation.

In this section, we examine the forces that affect the level of compensation and form of compensation that is paid by the overvalued firm. In developing the test predictions on the relation between misvaluation and compensation, we consider several possible scenarios below.

Participation and Incentive Compatibility Constraints For Given Real Mix When Strike Price Equals Current Stock Price

This first scenario consists of a principal-agent model in which both the CEO and the board of directors are rational, but in which the stock market is inefficient so that there are exogenous deviations of price from underlying fundamentals. Suppose that the board's compensation committee shares the same view as the manager about the firm's true underlying value. If so, then when the stock is overvalued, the manager places a low value on an option, but the board correspondingly views that option as having low a cost to the firm (as a claim on underlying cash flows). The overvaluation *per se* has no effect on the firm's relative cost (in terms of rational fundamental value) of alternative forms of compensation, either cash compensation or stock option grants.

However, for given contractual terms with regard to cash compensation (i.e. salary and bonus), when the firm is overvalued a greater *market* value of equity-based compensation (valued at market prices) is needed to meet the manager's reservation utility that he could obtain from another job. This is because (based on accounting rules during the sample period) firms generally set the option grant strike price at the current stock price to avoid reporting an expense on the income statement. So, option grants made at-the-money when the stock price is overvalued are essentially underwater in fundamental terms at the time of grant, and so worth relatively less. Therefore, the firm has to increase the measured CEO compensation, either via

cash or more options grants to ensure that the CEO participation constraint is met in the principal-agent program. Additionally, the firm also has to increase the measured CEO option compensation, specifically to maintain the appropriate incentives for the manager. In summary, this scenario predicts that equity-based compensation and total compensation should increase with overvaluation.

Target ownership level to maintain CEO incentives

The second scenario allows for the possibility that the manager has a better understanding of whether the firm is overvalued than the board. Core and Guay (1999) provide evidence that firms set target stock ownership levels for managers for incentive reasons, and that the amount of stock option compensation is used to manage actual ownership levels. When a firm is overvalued, its manager will tend to exercise options and sell shares on his personal account (Jenter 2005, and Jiang and Zhang 2007). The board understands that insider selling weakens the manager's pay-for-performance sensitivity even if it is unaware that the firm's stock price is overvalued. Therefore, when the board observes the manager selling his stocks and options, it offsets this shift to strengthen the manager's performance incentives by offering the manager more equity-based compensation such as options.

Psychological Influences, Pay for Luck, Rent Extraction of Naïve or Weak Boards, and Agency Problems with Overvalued Equity,

The third scenario takes a psychological perspective. When a firm is overvalued, it is likely psychologically easier for managers to extract higher compensation by appealing to the improved firm stock price as proof of the manager's high ability. This effect can operate regardless of whether the CEO understands that the market misvalues his firm. Suppose that the

board of directors misperceives improved stock price performance as reflecting improved fundamentals. Then, it will acquiesce by awarding the manager higher pay. It could be that the CEO is unaware of the overvaluation, and suffers from biased self-attribution.[3] When a firm's stock price becomes overvalued, a CEO who is subject to such bias would attribute the stock performance to his own ability, would believe that others also view his performance as superior, and therefore would demand higher pay. Graham, Harvey, and Rajgopal's (2005) survey of CFOs find that managers think that the labor market assesses their skill level based on short-run stock prices.

Bertrand and Mullainathan (2001) and Garvey and Milbourn (2006) find that managers are paid for luck, and not just for performance; These papers measure luck using systematic factors that are exogenous to the firm (e.g. oil shocks, exchange rate movements, market wide indices, mean industry performance) whereas skill is proxied using the firm's idiosyncratic component. In this paper, we offer a different measure of luck — mispricing relative to firm fundamentals.[4] The mispricing may be idiosyncratic to the firm or is experienced across the industry or even be market-wide, as for example when investors were exuberant about the high tech sector and the NASDAQ market in general in the late nineties and early 2000s.

Following the argument for pay for luck in previous papers, the manager of an overvalued firm succeeds in strategically extracting higher pay when stock price performance is high. This can happen in two ways. The board is cognizant of the overvaluation but is too weak to resist the CEO's request for higher pay. This reflects the rent extraction or skimming hypothesis of Bebchuk and Fried (2002) when CEOs have control over weak boards.

[3] Biased self-attribution is the documented tendency for people to interpret information in ways that promote their own self esteem. As such, it is closely related to overconfidence, and has been used as the basis for models of securities trading and pricing (Daniel, Hirshleifer, and Subrahmanyam 1998; Gervais and Odean 2001).

[4] Measuring mispricing is obviously difficult and any measure will likely have errors. Because of this, we cannot assume that a firm is overvalued if $V/P < 1$ or that it is undervalued when $V/P > 1$. Therefore, we do not attempt to investigate whether there is asymmetry in pay for luck for overvalued versus undervalued firms.

A similar prediction can be obtained even when the board is neither naïve nor weak. Competition in the labor market may force a rational board to pay higher compensation when the firm's stock price is overvalued. This is because the CEO of the overvalued firm may be incorrectly perceived as better than he is. This increases his opportunity cost of remaining in the same firm as rival firms bid for his services. To avoid transition costs with a new CEO, the firm may be forced to increase the CEO's pay in order to retain him.

Similarly, when shareholders are irrationally exuberant about the firm's stock, a rational board of directors and CEO may be reluctant to do anything that may prick the bubble, either because doing so is costly to the firm or to directors and the CEO personally. A precipitous drop in the stock price may subject the firm to costly lawsuits, increased contracting and renegotiation costs, and increased discontent among lower level employees with unexercised options or firm stockholdings. Therefore, the temptation may be to maintain the market exuberance. This is suggested by Jensen (2004), who argues that equity-based compensation exacerbates managerial agency problems when there is overvaluation. He writes that equity-based compensation, far from solving the agency problem, "*in the context of overvalued equity such equity-based incentives are like throwing gasoline on a fire — they make the problem worse, not better.*" (page 7)[5]. Higher CEO compensation signals to the market that the firm is rewarding the manager for improved performance. Thus, a rational board may be forced to pay the CEO higher compensation to continue to mislead the market.

Equity Compensation versus Cash Compensation

The pay for luck argument can be extended to predict how overvaluation affects the form of executive compensation. If the board of directors is unsure whether a sudden rise in stock

[5] Jensen (2004), however, does not discuss the direct effect of overvaluation on executive compensation.

price is a result of improved fundamentals or from overvaluation, it may prefer to have the CEO share in the burden of overvaluation, especially since the CEO is more likely to be informed. Even though the board acquiesces to a higher total compensation package, a tilt towards equity-based compensation and away from cash compensation reduces its likelihood of paying for luck. By deferring pay to a future period, any lucky draw on the current stock price has to be sustainable until the option vests before the firm actually incurs a cost. Therefore, beyond the prediction for total compensation, this reasoning further predicts that cash compensation declines whereas stock option grants increase when there is overvaluation.

In summary, for several reasons, we predict that overvaluation should be positively related to higher CEO compensation. Some of the scenarios we examine further imply that overvaluation affects the form of compensation, with cash compensation declining and equity-based compensation increasing as the firms becomes more overvalued.

III. Sample and Data

The sample contains CEO compensation data for 1996-2002 from ExecuComp. The sample period ends in 2002 to permit analysis of the effect of compensation on subsequent performance over the next three years. The control variables based on accounting and stock returns data are measured as of the end of the fiscal year before the compensation year. Accounting data are from Compustat, and stock returns data are from CRSP. Board governance variables are from IRRC (Investor Responsibility Research Center) and measured in the same year as the compensation year to proxy for characteristics of the board that set the compensation for the year. For inclusion in the final sample, the firm must have sufficient data to calculate accounting and stock return performance and other known economic determinants of compensation, and a measure of misvaluation following Dong et al. (2005) described below.

Firms must also have positive sales. The misvaluation measure was also required to be greater than zero (to be discussed), and to be available at the fiscal year end before the compensation year. Observations are excluded if the annual meeting fails to occur within five months of the fiscal year end, or the adjacent fiscal year ends are less than ten months apart to remove firms that changed fiscal year ends.

Measures of CEO Compensation

Three measures of CEO compensation are used as dependent variables. These are the value of option grants, cash compensation, and total compensation. The value of option grants is the S&P Black Scholes value of total options awarded during the year to the CEO (BLK_VALUE). Cash compensation (TCC) is the current year's compensation comprised of salary and bonus. Total compensation (TDC1) includes Salary, Bonus, Other Annual, Total Value of Restricted Stock Granted, Total Value of Stock Options Granted, Long-Term Incentive Payouts, and All Other Total. If Total compensation was zero and compensation components were missing, the components were set to zero.

The empirical measures of the sets of explanatory variables for compensation considered in this study are described next. The first set considers economic determinants of compensation drawn from incentive based optimal contracting theories. The second set is drawn from board characteristics to proxy for governance based factors that may influence the non-optimality of compensation that is actually paid. We also examine monitoring effects by outside shareholders using the fraction of institutional ownership. Finally, the third set that we introduce in this paper to the compensation literature is two misvaluation measures, proxied by B/P and V/P. We explain the empirical proxies for these variables below.

Economic Determinants of CEO Compensation

Economic theory suggests that the determinants of CEO compensation depend upon the complexity of the CEO job (or skill level), firm risk, firm investment opportunities, contemporaneous firm performance, and the firm's information and operating risk. Optimal contracting theory suggests that firms that are larger, have greater growth opportunities, and have more complex operations demand higher-quality managers and pay higher equilibrium wages (e.g. Rosen, 1982). Following Core, et al. (1999), we use firm sales to proxy for firm size and complexity. The natural log of sales is measured in the year prior to the compensation year. We also include firm age to capture differences in firm complexity and growth opportunities over time. Several other measures are also used to proxy for business complexity or growth opportunities. We include capital expenditures divided by total sales, and research and development divided by total assets as additional proxies for investment opportunities and/or business complexity. In addition, we include a binary variable that is equal to one if a firm has no research and development and zero otherwise, to allow non-research and development firms to have a separate compensation relation with firm fundamentals.

Standard agency contracting theory also suggests that pay is increasing in firm performance, and prior literature (Cyert et al. 1997) has documented that CEO pay is increasing in firm risk. The mean annual stock return and ROA for the past year are used to measure recent firm performance. ROA is measured as net income before extraordinary items divided by total assets. The standard deviation of the annual stock return (ROA) is calculated from the most recent five years of stock returns (ROA), with a minimum of three years to capture firm risk. Other things equal, we expect managers to demand higher compensation to work in firms that are more risky. Year indicator variables and Fama-French 48 industry indicator variables are

included in all regressions to control for time and industry differences in the demand for managerial talent, but not reported.

Misvaluation Measure, the V/P Ratio

Following past literature, we use two standard measures of misvaluation, book-to-price ratio (B/P) and fundamental-value-to-price ratio (V/P), as in Dong et al. (2005). The empirical tests do not require that either book value or residual income value is a better proxy for rational fundamental value than market price. All that is required for a valid misvaluation measure is that either book value or residual income value contains substantial incremental information about fundamentals above and beyond market price. We would expect this to be the case if a significant portion of variation in market price derives from misvaluation.

As pointed out in Dong et al. (2004), the B/P measure contains elements of growth as well as misvaluation whereas V/P is more likely to be purged of growth effects, especially when B/P is also included as an explanatory variable. We therefore consider regressions of compensation with V/P separately from regressions including both B/P and V/P as misvaluation proxies. When B/P and V/P are entered jointly in the regressions, the coefficient on B/P would more likely pick up growth effects whereas the coefficient on V/P would more likely represent the result of misvaluation effects.

In the V/P measure, the fundamental value V is calculated using the residual income model of Ohlson (1995), and P is the firm's stock price. Lee et al. (1999) and Dong et al. (2005) argue that the residual income value may be superior to the book value of equity as a measure of fundamental value. The residual income value is designed to be invariant to accounting choice as long as the "clean surplus" accounting identity obtains (i.e. earnings net of comprehensive dividends captures all of the change in book equity). If so, the V/P ratio is less sensitive to

differences in accounting choices across firms. Furthermore, book value contains backward-looking information, whereas the residual income value incorporates forecasts of future earnings and therefore filters out growth expectations from price. V/P, therefore, is more likely to pick out mispricing than the book to price ratio.

In the residual income model of Ohlson (1995), the intrinsic value, V, per share of a firm is equal to the book value per share of equity plus the net present value of the firm's forecasted excess income earned on equity (beyond what would be expected based upon the firm's book value) discounted at the firm's cost of capital,

$$V_t = B_t + \sum_{i=1}^{\infty} \frac{E_t\,[ROE_{t+i} - r_t]B_{t+i-1}}{[1+r_t]^i} \ ,$$

where E_t is the expectations operator, B_t (t) is the book value of equity per share at time t (negative B_t observations are deleted), ROE_{t+i} is the return on equity for period t+i, and r_t is the firm's annualized cost of equity capital. The infinite sum of excess income requires a finite approximation for practical implementation. We use analysts' forecasts of earnings for three future years and estimate a terminal perpetuity value beyond the three future year horizon based on the analysts' earnings forecast for the third year out, so the model value becomes

$$V_t = B_t + \frac{[FROE_{t+1} - r_t]B_t}{[1+r_t]} + \frac{[FROE_{t+2} - r_t]B_{t+1}}{[1+r_t]^2} + \frac{[FROE_{t+3} - r_t]B_{t+2}}{[1+r_t]^2 r_t} \ ,$$

where $FROE_{t+i}$ is the forecasted return on equity for period t+i, the length of a period is one year, and the last term discounts the period t+3 residual income as a perpetuity.

Lee, Myers, and Swaminathan (1999) report that the quality of the V estimate is insensitive to using longer forecast horizons. A further advantage of the residual income valuation is that estimates of V are less sensitive to errors in terminal value estimates than in alternative fundamental value models such as a dividend discount model. Pre-terminal values

include book value, so terminal values depend on a shorter forecast horizon of residual earnings and not the full stream of earnings (or dividends).

Forecasted ROEs are computed as $FROE_{t+i} = \frac{FEPS_{t+i}}{\overline{B}_{t+i-1}}$, where $\overline{B}_{t+i-1} = \frac{B_{t+i-1} + B_{t+i-2}}{2}$ is the average book value per share and $FEPS_{t+i}$ is the forecasted earnings per share (EPS) for period t+i. V/P is calculated at the end of the fiscal year prior to the compensation year. Therefore, book values and analysts' forecasts of future earnings prospects at the end of the fiscal year prior to the compensation year are used. We require that each of the $FROE_{t+i}$ be less than one. Future book values of equity are computed as $B_{t+i} = B_{t+i-1} + (1-k) FEPS_{t+i}$, where k is the dividend payout ratio determined by $k = \frac{D_t}{EPS_t}$, and D_t and EPS_t are, respectively, the dividend and EPS for period t. Following Lee, Myers, and Swaminathan (1999), if $k < 0$ (owing to negative EPS), we divide dividends by (0.06 * total assets) to derive an estimate of the payout ratio, that is, we assume that earnings are on average 6% of total assets. Following past literature, we delete from this study observations for which the computed k is greater than one.

The annualized cost of equity, r_t is determined as a firm-specific rate using the Capital Asset Pricing Model (CAPM), where the time t beta is estimated using the trailing five years (or, if there is not enough data, at least two years) of monthly return data. The market risk premium assumed in the CAPM is the average annual premium over the risk-free rate for the CRSP value-weighted index over the preceding 30 years. Any estimate of the CAPM cost of capital that is outside the range of 3% to 30% (less than 1% of our estimates) is winsorized to lie at the border of the range. Previous studies report that the predictive ability of V/P is robust to the cost of capital model used (Lee et al. 1999) and to whether the discount rate is allowed to vary across

firms (D'Mello and Shroff 2000). The results are similar to those reported here. Finally, V/P is winsorized at the 1% and 99% tails.

Board Governance Proxies

Board composition and ownership variables are selected to proxy for the degree of managerial agency problems. A binary variable equal to one if the CEO is board chair, and zero otherwise is included, because a CEO who is also the chairman of the board has a better opportunity to control the board agenda and the information seen by other board members. Board size is measured as the number of board members. Larger boards require more coordination efforts, and past evidence indicates that they are less effective (Jensen 1993, Yermack 1996).

We include the fraction of corporate insiders on the board as an explanatory governance variable even though past evidence is mixed on whether the CEO can exert greater influence over the board if the fraction of insiders on the board is higher. Thus, no prediction is made about the sign of relation with compensation. Insiders are expected to be less independent of the CEO but they also have better access to information about the company. An insider is defined as a current or former officer of the corporation.

A gray outside director is a service provider or supplier or customer, receives charity, may have interlocking relations with other board directors, or is a family member of a director or executive. Gray board members are more subject to the influence of the CEO and therefore are less likely to behave independently of the CEO. The Gray directors variable is divided by the number of outside directors.

Outside directors appointed by the CEO are expected to be subject to more influence by the CEO. We divide the measure by the number of outside directors. Similarly, the fraction of outside directors over 69 is expected to indicate reduced monitoring by the board. The number of

outside directors who are serving on three or more boards divided by the number of outside directors is also expected to indicate reduced board monitoring.

CEO stock ownership as a percent of shares outstanding is included as an explanatory variable. The relation between stock ownership by the CEO and board members with firm value is found to be mixed in the literature (Holderness and Sheehan (1988), Allen (1981), Lambert et al. (1993), Morck et al. (1988), and Yermack (1996)). Morck, Shleifer, and Vishny (1988) find a non-linear relation between insider ownership and firm value. Firm value first rises with an increase in inside ownership as the incentive alignment effect of share value dominates, then falls as the entrenchment effect of insider voting control becomes stronger. Therefore, we do not make predictions regarding the sign of the relation between compensation and CEO ownership.

We include the institutional share ownership as a percent of shares outstanding to capture the effect of institutional monitoring on compensation. Almazan et al. (2005) find that the presence of institutional investors increases the sensitivity of CEO compensation to the stock price, while lowering the level of salary and direct compensation, and therefore option grants (and the sensitivity of CEO wealth to the stock price) are expected to increase with the level of institutional ownership.[6]

Descriptive Statistics of Sample

Table 1 presents the descriptive statistics of the sample. The final sample consists of 6613 observations with available accounting, returns, analyst forecasts, and compensation data from CRSP, Compustat, IBES, and Execucomp. These are relatively larger firms because of the requirement that analyst forecasts be available to compute the misvaluation measure (V/P).

[6] Our results are robust to including a binary indicator for the presence of at least one non-board member that holds at least 5% of the stock (Dlugosz, et al. 2006). This variable is not available for a large part of our sample, and so we do not include it.

The mean dollar value of grants awarded is $2.7m and is about 55% of total CEO compensation for the full sample of 6,613 observations. The median value of grants is smaller at $743,000, and comprises about 31% of median total compensation. The distribution is highly variable and skewed, because some firms have huge option grants while others do not award any at all. There are 1,535 observations (23.2% of sample) with zero grants. Of the 5,078 observations with non-zero stock option grants, the mean (median) dollar value of grants awarded is $3.5m ($1.3m), which is 61% (43%) of total CEO compensation. These numbers indicate that stock option compensation is a very major component of compensation during our sample period from 1996-2002.

The mean (median) cash compensation is $1.35m ($0.97m) and the mean (median) total compensation is $5m ($2.4m) in the full sample. Among firms that grant stock options, the mean (median) cash compensation is $1.4m ($1.0m) and the mean (median) total compensation is $5.8m ($3.0m). These findings indicate that CEOs are more highly compensated in firms that grant stock options than those that don't. Given the skewness in the distributions of option, cash, and total compensation, we use the natural logarithms of these variables in the regressions.

Turning to the control variables for economic determinants of CEO compensation, the mean (median) sales value is $4.6 billion ($1.4 billion). We measure capital intensity by capital expenditures to sales ratio. The mean (median) level of capital expenditures is 47% (24%) of sales. The relatively high capital investment to sales may reflect that some firms in the sample are relatively new firms that may not yet have generated significant sales.[7] To measure relative intangible to tangible assets, we use the research and development to total asset ratio. The mean of this variable is only 3%, and the median rounds to zero%. However, only 54% of observations in the sample have positive research and development.

[7] We checked capital expenditure as a fraction of total assets, and find that the mean is 7% and median is 5%, which is more in line with the rate at which assets are renewed to maintain firm operations for a stable firm or to expand operations for a growing firm.

The mean firm age is about 20 years (median 22). The average firm has positive performance during this period, with a mean (median) ROA of 5% (5%). The annual stock return has a mean of 18% and median of 12%; this may be because the period covered the run-up years as well as crash years 2000-2001. This is reflected by the high mean standard deviation of annual stock returns of 45% (median 32%). The accounting performance varied less dramatically, with a mean standard deviation of ROA of only 5% and median 3%.

Turning to the next set of control variables that are governance-related, the CEO is also chairman of the board in 69% of the observations, and the mean board size is 9.62. Inside directors on average comprise 28% of the board, and grey directors are 10% of outside directors. The median statistics for these variables are similar in magnitude. The CEO appoints a mean 20% of outside directors, whereas the median fraction is only 10%. The fraction of old outside directors (over age 69) is only 7%, so the majority of board members are relatively young. Busy outside directors are infrequent in that only 3% of outside directors are on 3 or more boards. The mean (median) CEO stock ownership is 2.58% (.30%) of the shares outstanding, so generally the CEO holds a very small fraction of the firm's shares. This does not necessarily mean that the dollar value of the CEO share ownership is insubstantial, because the firms in our sample have high market capitalization. The mean (median) institutional share ownership percentage is 52% (58%), indicating that institutions are an important majority investor group for the firms in our sample.

Turning to our two key variables of interest in measuring misvaluation, the mean (median) B/P ratio is 0.47 (0.41) and the mean (median) V/P ratio is 0.74 (0.64). In past studies using V/P as a proxy for misvaluation, V/P is not required to be one for appropriately valued firms because of errors in measuring fundamental value. In other words, a V/P ratio of greater

than one can still reflect overvaluation. As in previous studies, we exploit the cross-sectional variation in both B/P and V/P to proxy for variations in firm misvaluation.

IV. Misvaluation Effects on CEO Compensation

Using the regression model of Core et al. (1999), we run a pooled OLS regression of compensation on the set of economic determinants, board governance variables, and our test variable V/P as a measure of misvaluation. Time dummy variables and the 48 Fama-French (1997) industry dummy variables are included to control for firm fixed effects and industry variations.

$$\begin{aligned}\text{CEO Compensation}_{\text{i}} = \alpha_0 &+ \sum \beta_k \text{Economic Determinants}_{\text{i}} \\ &+ \sum \chi_j \text{Board Governance Variables}_i \\ &+ \mu(\text{IO})_i + \sum \delta_t \text{Time} + \sum \phi_s \text{Industry}_i \\ &+ \gamma(\text{B/P})_i + \lambda(\text{V/P})_i + \varepsilon_i\end{aligned} \tag{1}$$

We expect the residuals of firm-year observations to be correlated across years for a given firm, which would lead to inflated t-statistics. To correct for this problem, we use standard errors calculated using the Huber-White estimator, where we cluster by firm. Petersen (2007) demonstrates the superiority of the Huber-White estimator over other correction methods.

Table 2 reports results from an OLS regression of the natural logarithm of the dollar value of new option grants.[8] We first interpret the results for the regression with just the control variables in column 1. Stock option grant values increase with job complexity as proxied by firm sales and R&D to asset ratio, but not by capital intensity. Younger firms also pay significantly more option compensation. To the extent that new economy firms have higher R&D intensity

[8] Hanlon et al. (2003) suggests that the relation between compensation and economic variables is non-linear. We observe that compensation amounts and firm size related variables have skewed distributions. Instead of fitting a regression with squared terms, we chose the more common and simpler empirical specification using natural logarithms of compensation and sales in the regressions. We also winsorize the independent and dependent variables at 1%. We also consider the rank variable regression specification as a robustness check on the results in the next section.

and are younger, these results are also consistent with past findings that new economy firms pay higher options than old economy firms (Ittner, Lambert, and Larcker 2003, and Murphy 2003). Consistent with the predictions of principal agent models, stock option grant values increase significantly with firm performance as measured by stock returns. ROA. is not significant, possibly because it is subsumed by stock returns. Higher compensation is also paid for managing riskier firms as measured by the standard deviation of ROA and stock returns.[9]

For the association of option compensation with board characteristics, we find that lower option compensation is paid when the CEO has higher stock ownership. When the CEO already owns a lot of the firm's stock, she is less willing to accept further risk from holding securities that are related to own firm's stock and incur further lack of diversification of her wealth portfolio. Furthermore, when there is higher CEO stock ownership, her interest is better aligned with shareholders, and so there is less need to provide further incentives to reduce managerial agency problems using stock options.

For the other board variables, the first column of Table 2 reports that firms pay higher option compensation when the CEO is chairman of the board, marginally when the boards are larger, when there is lower fraction of inside directors and gray outside directors, marginally when there is a lower fraction of outside directors appointed by the CEO, and lower fraction of outside directors over 69. If the CEO is more entrenched when the position is combined with being chairman of the board and when board size is larger, the higher option compensation is consistent with the predictions of the entrenchment hypothesis of the past literature. As Core, Holthausen, Larcker (1999) points out, the fraction of inside directors have ambiguous predictions for the entrenchment hypothesis. The negative sign we find here is consistent with

[9] Since option grants are contingent payments, when firm risk goes up, managers may prefer to switch the mix of compensation to a less risky component such as cash. However, the standard deviation of stock returns and ROA are likely correlated with growth opportunities, and for incentive reasons, options may still be preferred over cash. When we include B/P ratio in the regression in column 3, the relation between option compensation and standard deviation measures becomes weaker.

their result. The result for gray outside directors is inconsistent with the entrenchment hypothesis. The lower option compensation for firms with older board members may reflect the lack of familiarity of these board members with derivative securities.

Finally, CEO option compensation is higher when institutional share ownership is higher. This may seem inconsistent with better monitoring of the CEO. However, our finding of a positive relation between institutional ownership and stock option compensation confirms the evidence in Almazan et.al. (2005). Institutional owners are more likely to be active shareholders, so there is a greater need for the CEO to be responsive to stock price movements. The CEO's compensation is therefore weighted towards equity-based incentives through the higher grant of stock options when institutional ownership is high.

Turning to the test variable of primary interest in this study, we find that the misvaluation measure V/P has incremental explanatory power for stock option compensation beyond the economic determinants and board governance variables. Consistent with our prediction, the findings in column 2 of Table 2 indicate that higher misvaluation is associated with greater option compensation. The misvaluation effect is incremental to the economic determinants variables of option compensation and the board governance variables. V/P is strongly and negatively associated with stock option grant compensation at the 1% significance level, without affecting the significance of the previous significant control variables. Therefore, holding constant economic determinants and board governance variables, more overvalued firms tend to pay higher dollar value of stock option compensation to their CEOs. The effect is also economically significant: If V/P declines by 10%, stock option grant values increase by 3.9%.[10]

[10] An alternate calculation for the economic significance shows that a one-standard deviation decline in V/P from the mean is associated with approximately a 23% increase in stock option compensation relative to the mean. Let y = ln (option compensation + 1). The estimated coefficient on V/P in column 2 of Table 2 is -0.42, one standard deviation of V/P is 0.50, and the mean (y) = 5.51. The change in ln(option compensation +1) from a decline of V/P by one standard deviation is (-0.42)*(-0.5) = 0.21. The dollar change in option compensation is exp(mean of y+0.21) - exp(mean of y) = $57,750 which is 23% of exp(mean y).

This is consistent with CEOs demanding more options to compensate for the lower likelihood of the options being in the money in the future, assuming that the firm follows the common practice of setting the exercise price at the current market price.

We include B/P ratio as a further measure of misvaluation in column 3 of Table 2. Most of the other variables remain qualitatively similar, but slightly lower statistical significance. Similar to the V/P ratio, the incremental B/P ratio is significantly negatively related to option compensation suggesting that overvaluation as measured by B/P results in higher option compensation. A 10% decline in B/P increases stock option compensation by almost as large a percentage increase of 9.7%[11]. As previously discussed, B/P may also be picking up performance and growth opportunities. To the extent that it does, the negative coefficient of B/P indicates that growth firms experiencing better performance pay higher options. If so, the V/P measure will be more likely than B/P to pick up the pure misvaluation effect that is incremental to growth opportunities. The significant incremental V/P effect confirms the results in column 2 that overvaluation results in higher option compensation.

Turning towards cash compensation in the first column in Table 3, we find significant relations with size, stock returns, and firm age. These findings are consistent with the prior literature; larger, more successful firms and older (or likely old economy) firms pay higher cash compensation. Firms with CEOs who are also chairmen, firms with larger boards, and firms with greater fraction of outside directors that are appointed by the CEO pay more cash compensation to the CEO. Thus weaker boards pay CEOs higher cash compensation, consistent with the entrenchment hypothesis. Furthermore, CEOs with high stock ownership are also paid less cash compensation, suggesting that these CEOs are not exerting their ownership influence with the

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[11] Using the same method of calculating economic significance as in the previous footnote for V/P, a one standard deviation decrease in B/P results in a large 39% increase in option compensation relative to the mean.

board of directors to strike a more favorable bargain on their cash compensation. Alternatively, these CEOs may prefer stock based compensation which is more tax efficient over cash compensation. Finally CEOs with high stock ownership gets rewards from the share appreciation and dividends directly, and so the participation constraint may not be binding.

Regarding the main test variables, the B/P and V/P, Table 3 indicates that these measures have opposite signs in their relation with cash compensation, and are highly significant at the 1% level. To the extent that B/P represents misvaluation, higher misvaluation results in more cash compensation. On the other hand, if B/P represents growth opportunities, the negative relation is consistent with firms paying more to the higher skilled employees needed to manage firms with higher growth opportunities (Ittner et al. 2003).

The incremental effect of V/P over B/P is more likely to be associated with misvaluation than growth. The results suggest that more overvalued firms incrementally pay less cash compensation.[12] This is consistent with the retention hypothesis in Ittner et al. (2003) and Murphy (2003). When the firm is overvalued, outside firms incorrectly perceive the CEO as having higher skill, and consequently are more likely to bid away the CEO. This improved outside opportunity for the CEO results in his participation constraint becoming more binding. Consequently, if switching costs are high, the overvalued firm has to pay the CEO more to retain him in the firm. The overvalued firm will prefer to choose option grants or other forms of long-term compensation that require time to be vested over cash compensation to meet the retention objective. Additionally, the longer-term horizon for option compensation relative to cash compensation also reduces accidental pay for luck when the board is unsure whether the good performance is the result of overvaluation or true improved performance.

[12] It is interesting that cash compensation increases with stock returns but decreases incrementally with overvaluation.

Table 3 column 2 shows the results for total compensation, which includes both cash and equity-based compensation. The results are generally in line with those of option grant compensation The economic determinants and board governance variables generally have similar signs as in Table 2, again confirming consistency with the business complexity hypothesis and the entrenchment hypothesis. The institutional ownership variable, however, is not statistically signficiant for either cash compensation or total compensation. Most relevantly, both misvaluation variables are again statistically and significantly negative. Higher misvaluation results in higher total CEO compensation.

In sum, the results in Tables 2 and 3 generally support the findings in previous literature on the economic determinants and board governance effects of the levels of equity-based, cash, and total compensation. Most specifically for our misvaluation hypothesis, we find that misvaluation has incremental significant explanatory power for compensation beyond the economic determinants and board governance variables. Firms that are overvalued pay the CEOs significantly higher option and total compensation and less cash compensation.

V. Robustness

We perform various robustness checks on the results in this section. We examine whether our results are robust using rank variable regressions. Next, we consider the possibility that measurement error in V/P may induce a spurious relation between compensation and misvaluation. Measurement error in V/P may be related to firm age; younger firms may be more likely to be overvalued, and younger firms are more likely to grant option awards. To control further for this potential measurement error, we include a further interaction term between misvaluation and firm age in the compensation regression on misvaluation.

The decision of whether to use stock options as a form of compensation may itself be

affected by misvaluation. We allow for this possibility and perform a Heckman 2SLS to examine whether previous results are robust to controlling for this endogeneity. Finally, we also investigate robustness of our results with respect to further industry adjustments for compensation as well as misvaluation. [13]

Rank Regressions

If extreme values exist for some of the continuous variables, they could exert undue influence on the regression estimates. Therefore, we first check the robustness of the qualitative relation between compensation and misvaluation by using a rank specification for the continuous variables in the regression. These results are reported in Table 4.

The results in Table 4 using rank variables generally provide similar results for the control variables. Column 1 in Table 4 indicates that all of the qualitative results for option compensation in Table 2 are robust, except that the first three board variables associated with outside directors are not statistically significant (or marginally significant) whereas the fourth variable representing busy boards is now marginally significant at the 10% level. For cash compensation in column 2 of Table 4, all of the qualitative results for economic determinants are robust. For the board variables, the signs for the variables are the same as in Table 3. However, the fraction of inside directors and institutional ownership are now statistically significant, whereas CEO stock ownership is not. For total compensation in column 3, Table 4 indicates generally similar significance levels, but with increased significance at the 1% level for the standard deviation of ROA and institutional ownership.

For our variables of interest, rank variables for misvaluation are robust for all forms of compensation. Both the ranks of B/P and V/P are statistically significant negative for option

[13] When we include CEO tenure and age in our OLS regressions, V/P remains statistically significant (results not reported). We exclude these additional variables because neither variable achieved significance above 10% when included, and their inclusion reduced our sample size significantly.

compensation and total compensation as in the previous regressions with continuous variables consistent with firms paying more compensation when there are more overvalued.V/P and B/P continue to have opposite signs for cash compensation as before. We conclude from these findings that the regression results in the earlier tables are not driven by extreme values.

Measurement errors in misvaluation variables that relate to firm age

The misvaluation measures may have errors that are systematically related to firm age. The fundamental value, V, is in theory invariant to accounting choice. However, our practical implementation assumes that the analyst forecast of earnings three years out is a perpetuity in order to estimate the terminal value beyond three years. Therefore, if analyst forecast of earnings for young firms three years out underestimates the long horizon earnings, V will be systematically downward biased for young firms. These effects may induce a spurious relation between V/P and compensation if young firms (e.g. more are new economy firms) generally pay more option compensation. Similarly, younger firms may have lower book values than older firms because younger firms are more likely to incur start-up losses.

In Table 5, we extend Table 4 regressions to include the interaction of firm age with misvaluation to allow for the possibility of measurement error in misvaluation that may be correlated with firm age. We find that the misvaluation rank variables are qualitatively similar to Table 4. Option compensation and total compensation increases and cash compensation decreases with overvaluation, even when allowing for measurement errors in misvaluation that varies with firm age. The interaction variable V/P*firm age shows that the negative relation between V/P and option compensation is weaker as firm age increases. While B/P becomes insignificantly negative in the cash compensation regression, the interaction term is statistically significant and negative. The interaction term is also significant at the 5% level for total compensation.

Heckman two stage analysis

The results from the Heckman two stage regressions are reported in Table 6. The system of equations in the Heckman analysis contain a probit model for the grant decision in column 1, and a log linear regression model for the magnitude of options grants in column 2.

In the probit regression, the misvaluation variables have distinctly different effects on the probability of a stock option grant. V/P has no effect on the decision to grant options. B/P on the other hand has a negative and highly significant effect (at the 1% level) on the likelihood that stock options are granted. High growth firms are much more likely to grant options. To the extent that B/P is a better proxy for growth opportunities and V/P is a purer measure of misvaluation, the results suggest that temporary misvaluation is less likely to trigger a policy change of the firm to begin granting options.

Interestingly, the economic variables are relatively weak in affecting the decision to grant options, whereas the board variables have a strong influence on the payment of option grants. All board variables are statistically significant at the 1% level, except CEO is board chair and the fraction of busy directors. Firms that grant options tend to have larger boards, a higher fraction of outside directors, a lower fraction of gray outside directors, a lower fraction of outside directors appointed by the CEO, a younger board of directors, lower CEO stock ownership and higher institutional ownership. With the exception of larger boards, the board characteristics and institutional ownership results are consistent with stronger monitoring being associated with greater incentive-based compensation. When CEO stock ownership is already high, there is less need to provide incentive-based compensation that is tied to the firm's stock.

The stage two regression estimates the relation of the magnitude of CEO grant compensation with misvaluation, after controlling for the potential self-selection bias that stock options grants are paid. The results indicate that the economic determinants are more important

in the decision on the magnitude of the option grants than board variables, whereas the opposite was the case for stage 1 regression in the choice of whether to grant options. Capital intensity, stock return, and standard deviation of stock returns now become significant relative to previous simple OLS regression results in Table 2. Many of the board variables now lose statistical significance, except CEO is board chair is now highly statistically significant. It is interesting to note that CEO is board chair does not affect the decision to grant options, but affects strongly the magnitude of the grant.

Previous results on our key variable, misvaluation, strengthen. More overvaluation leads to a significantly higher stock option compensation. The results are also economically significant. A 10% drop in V/P results in a 3.1% increase in stock option compensation, and a 10% drop in B/P results in 8.5% increase in stock option compensation.

The differences in estimated coefficients and statistical significance of the variables in the two separate stages of the Heckman analysis indicate that the determinants of the grant decision are very different from the determinants of the magnitude of option grants.[14] Additionally, the insignificant inverse mills ratio in stage 2 of the Heckman analysis indicates that the estimates for the magnitude of option grants would be similar in a simple OLS regression on firms with positive grant values only.

Industry Adjustments

Within an industry, compensation can be similar because of similar managerial skill requirements. This industry effect can be reinforced by peer benchmarking (as documented by Bizjak, Lemmon, and Naveen 2007). Therefore, we control for fixed industry effects on compensation using industry indicator variables in our regressions in the previous sections.

[14] A Tobit analysis that constraints these determinants to have the same effects on the grant decision as on the decision about the magnitude of the grant is therefore inappropriate.

As a robustness check, we consider whether the misvaluation effects on compensation are largely driven by high tech industries. Firms in high tech industries as defined by Ljungarist and Wilhelm's (2003) were removed from the sample. V/P remains highly significant in the Heckman second stage regression, despite the reduced sample size (results not reported). Finally, we also regress industry-adjusted option grants on industry-adjusted V/P and industry-adjusted B/P and the results remain robust. Since entire industries can be misvalued, and peer benchmarking can induce a compensation response to industry misvaluation, the industry-adjusted specification is less appropriate for our purpose.

VI. Predicted compensation and future performance

Past literature has tested for whether there is a relation between executive compensation and future accounting and stock price performance. Core et al. (1999) suggest that poorly governed firms pay managers beyond the optimal amount that is dictated by the underlying economics of the firm. This overpayment is proxied by the amount of compensation that is incrementally implied by board variables from a regression of compensation on economic determinants and board characteristics. Consistent with their hypothesis, the board-related compensation measure negatively predicts subsequent accounting and return performance.[15]

On the other hand, Hanlon et al. (2003) find that compensation predicted from governance variables do not result in poorer future performance. Instead, they report that compensation that is predicted from economic variables have a strong influence on future performance. Ittner, Lambert, and Larcker (2003) focus on residual compensation and find that lower than predicted grant compensation results in lower future performance, but higher than predicted grant compensation is unrelated to future performance.

[15] The finding that board-related compensation results in weak subsequent stock returns indicates that the market fails to discount appropriately for managerial rent extraction from a weak board.

Given the mixed evidence in the past literature, we revisit whether future performance is associated with compensation that is economically-related (proxies as noted above for firm performance, firm risk, and business complexity) and compensation that is monitoring-related. We separate compensation that is related to board variables from compensation that is related to institutional ownership. Extending the past literature in this area, we also consider whether future performance is associated with compensation that is related to our misvaluation variables, B/P and V/P.

We compute predicted compensation for each firm-year using the estimated coefficients from the cross-sectional regression on grant compensation as in (1) above. We only include observations with positive grants in the regression. The set of five predicted compensation measures from each type of variables are:

$$\text{Economics Pred Comp}_{\text{i}} = \sum \hat{\beta}_k \, \text{Economic Determinants}_{\text{i}}$$

$$\text{Board Pred Comp}_{\text{i}} = \sum \hat{\chi}_j \, \text{Board Variables}_{\text{i}}$$

$$\text{IO Pred Comp}_{\text{i}} = \hat{\mu} \, \text{IO}_{\text{i}}$$

$$\text{B/P Pred Comp}_{\text{i}} = \hat{\gamma} \, \text{B/P}_{\text{i}}$$

$$\text{V/P Pred Comp}_{\text{i}} = \hat{\lambda} \, \text{V/P}_{\text{i}}$$

For example, predicted board compensation is calculated as a linear combination of the board governance variables weighted by the estimated coefficients ($\hat{\chi}_j$'s). This expression differs somewhat from the calculation in Core et al. (1999) because the set of board variables are slightly different, and institutional ownership, B/P and V/P are additional explanatory variables in estimating regression (1). Therefore, the board predicted compensation is the incremental CEO compensation that is implied by board governance and beyond the amount dictated by underlying economics of the firm, institutional ownership, the amount of investor misvaluation

that is assumed to be known to the manager, and the remaining control variables. Following Core, et al. (1999), we interpret the weights on the board variables in regression (1) as reflecting the effectiveness of board monitoring, so the cross-sectional variation in predicted grant compensation from the board variables is reflecting differences in unresolved agency problems in the firm. An analogous interpretation is used for predicted incremental compensation from the other sets of determinants, For example, the cross-sectional variation in predicted compensation from V/P represents cross-sectional differences in misvaluation of the firm.

We regress future performance on the five predicted incremental compensation variables and year and industry indicator variables as further controls.[16] The accounting measure of future performance is return on assets (ROA), and is calculated as described earlier. In addition, measured ROA can result from both cash flows and accruals. We therefore include as dependent variables cash flow from operations scaled by total assets, and accruals scaled by total assets to further refine how predicted compensation affects subsequent ROA, either through cash flow or accruals. The market performance is measured by the natural log of stock returns.

Table 7 reports the results from the regression of future performance on the five predicted compensation variables. Predicted compensation from economic determinants has no predictive power for future performance. None of the coefficients for future ROA (and its component cash flows from operations and accruals) and for future stock returns are statistically significant at the 5% level. These findings are inconsistent with the findings in Hanlon, et al. (2003). However, the findings provide support for Demsetz and Lehn's (1985) view that there should be no statistical incremental association between performance and an endogenous choice, which in this case is

[16] Since we include predicted compensation from economic determinants, we do not enter the economic determinants of future performance separately. When economic determinants are entered directly into the regression instead of the compensation that is predicted from economic determinants, the results on the other predicted compensation variables are generally robust.

the optimal amount of compensation that is a reward to managers based on underlying firm characteristics.

Consistent with Core et al. (1999) and inconsistent with Hanlon et al. (2003), the predicted compensation from board variables is negatively associated with future ROA in each of the three subsequent years at the 1% level.[17] Interestingly, the effects on ROA from board-related compensation come primarily from the effects on cash flows from operations rather than from accruals. These findings suggest that board monitoring reflected in compensation influences managerial actions that have a direct effect on real firm operations, and not on accounting reporting decisions. Predicted compensation from board variables affects future stock returns significantly negatively at the 1% level for the first year, then fades to 5% and 10% significance respectively in years 2 and 3. This suggests that investors do not discount adequately for poor monitoring by weak boards.

Predicted compensation from institutional ownership has a highly statistically significant positive effect on all three future years of ROA and stock returns (with year 2 significant at the 5% level). Most of the ROA effects are primarily from cash flows from operations. These findings are consistent with the literature that suggests that institutions exert a positive monitoring influence on managers; see Shu (2007). On average, institutional shareholders are successful in motivating managerial effort to increase firm performance.

Predicted compensation from our misvaluation measures, B/P and V/P, have opposite effects on ROA. Predicted compensation from B/P has a highly significant positive effect on ROA in each of the three subsequent years. The ROA effect is derived from both cash flows

[17] In the regression of grant compensation on economic determinants and governance variables, Hanlon et al. include lag grant compensation as an economic determinant. To the extent that governance variables are sticky, lag compensation will contain board monitoring effects as well. Thus, their predicted compensation from economic determinants will likely reflect board monitoring effects, and reduce the relative importance of their predicted compensation from governance variables.

from operations as well as accounting accruals.[18] If B/P is interpreted as a growth measure, these findings indicate that option compensation rewarding growth-related incentives leads to positive outcomes. Most of these growth-related effects are, however, anticipated appropriately by the stock market, so that the predicted compensation from B/P is not statistically significantly related to future stock returns.

Predicted compensation from V/P, on the other hand, has distinctly opposite effects on future performance. In contrast to B/P-related compensation, V/P-related compensation has a highly significantly negative effect on future ROA in each of the subsequent three years at the 1% level. Interestingly, the ROA effect is primarily from the accruals component of net income (significant at the 1% level), and the effect is present in cash flows from operations only in the first year (significant at the 5% level). The findings on accruals are consistent with Bergstresser and Philippon (2006) who report that CEOs of firms with relatively higher stock-sensitive compensation are more likely to manage accruals. Both Burns and Kedia (2006) and Effendi, Srivasta, and Swanson (2006) report higher accounting restatements in firms whose manager has higher exposure to equity-based compensation. Predicted compensation from V/P also has a significantly negative effect on all three future stock returns. These findings are consistent with firms using accounting accruals to excite investor optimism about the firm's stock, and then subsequently when these accruals are reversed, the overvaluation gets corrected.

VII. Conclusion

We examine the relation between market misvaluation and CEO compensation, controlling for board governance characteristics, institutional ownership, and economic determinants of compensation. We hypothesize that CEOs of overvalued firms are given a greater amount of option compensation when the granted options are overpriced based upon

[18] Accruals reflecting growth need not be undertaken by the manager for strategic reporting reasons.

three alternative lines of reasoning. The first line of reasoning extends the principal-agent paradigm to allow for investor misvaluation. Grant compensation and total compensation is predicted to increase when the firm is overvalued in order to satisfy the participation and incentive compatibility constraints. The second line of reasoning predicts that the firm increases option compensation to restore CEO sensitivity to equity incentives when the manage sells stock on personal account when the firm is overvalued. The third line of reasoning incorporates a behavioral perspective that overvalued equity fuels agency problems, and the managers can exert power over the board to extract rents and be rewarded for luck.

Empirically, we find that misvaluation, as measured by V/P, has no influence on the decision whether or not to award stock options whereas growth opportunities (as reflected by incremental B/P variable to V/P) increases the likelihood of an option grant. Consistent with this line of reasoning, we also find that CEOs of overvalued firms are paid higher option compensation and total compensation. B/P and V/P however have opposite influences on cash compensation. While growth firms pay more total compensation (either grants or cash), misvalued firms pay more grant compensation but less cash compensation. The redirection of compensation away from cash towards option compensation is consistent with the firm's reluctance to pay for luck.

We find that grant compensation predicted from board variables predicts poor subsequent performance. This implies that weak boards that overpay CEOs underperform. Board governance variables therefore have an important influence on managerial compensation and firm performance. Compensation derived from institutional ownership, on the other hand, predicts future over-performance. Institutional shareholders, on average, are able to influence managerial incentives and result in improved performance.

Compensation reflecting incremental growth opportunities (B/P related) predicts improved future accounting performance, but these effects appear to be appropriately priced by the market. On the other hand, compensation that is incrementally derived from misvaluation (V/P related) predicts worse accounting performance, primarily in accruals. These effects are not appropriately discounted by investors so that predicted compensation from misvaluation predicts poor future stock returns. Investors are overly optimistic when earnings are high because of accruals, and subsequently when these are reversed, the accounting performance drops leading investors to revise down their valuation of the firm.

In summary, our evidence indicates that managers receive more option compensation and total compensation during periods of stock overvaluation, consistent with the following scenarios. Overvalued firms pay the CEOs more to meet the participation and incentive compatibility constraints, to meet the critical level of equity ownership to maintain incentives, because the CEO is able to extract rents, and to reduce the likelihood of paying for luck. In addition, higher compensation associated with governance variables and overvaluation lead to poorer subsequent performance.

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Appendix A: Variable Description

The sample contains firm-year observations between 1996-2002 with available compensation data from ExecuComp, governance data from the IRRC, accounting data from Compustat, stock returns data from CRSP, and V/P data calculated using IBES analyst forecasts.

Compensation Variables	
Ln (Option Grants + 1)	The natural log of the dollar value of 1+ CEO options at grant ($000) using the S&P Black-Scholes option pricing formula (ExecuComp item BLK_VALUE.)
Ln (Cash Compensation + 1)	The natural log of 1 + current compensation salary plus bonus (ExecuComp item TCC) in $000s.
Ln (Total Compensation + 1)	The natural log of the dollar value of 1 + total compensation in $000s (ExecuComp item TDC1 includes salary, bonus, other annual total, restricted stock grants, options granted, long-term incentive payouts, and all other total.)
Economic Determinants	
Ln of Sales	The natural log of sales (Compustat item 12) in $mil for the fiscal year before the compensation year.
Capital Expenditures/Sales	Compustat item 8/item 12 for the fiscal year before compensation year, winsorized at 1%.
Research & Development / Total Assets	Compustat item 45/item 6 for the fiscal year before compensation year, winsorized at 1%.
No Research & Development Indicator	Equal to 1 if Compustat item 45 is missing for the year before compensation year.
Firm Age	The number of years the company is listed on CRSP before compensation year.
Return on Assets	Compustat item 18/compustat item 6 for the fiscal year before compensation year, winsorized at 1%.
Standard Deviation of Return on Assets	The standard deviation of return on assets from five to one year before compensation year, winsorized at 1%. A minimum of three years was required.
Stock Return	Annual stock return (from CRSP) before compensation year, winsorized at 1% .
Standard Deviation of Stock Returns	The standard deviation of annual stock returns (from CRSP) from five to one year before compensation year, winsorized at 1%. A minimum of three years was required.

Misvaluation	
V/P Ratio	An intrinsic value-price ratio, calculated at the end of the fiscal year before the compensation year. The intrinsic value is estimated using a residual income model (RIM) where the discount rate is based on firm-specific CAPM. It is winsorized at 1%.
B/P ratio	The fiscal year end book value of equity, divided by stock price before the compensation year times the number of shares outstanding. It is winsorized at 1%.
Board Structure and Oversight	
CEO is Chairman of the Board	A binary indicator from IRRC.
Board Size	The number of directors on the board (from IRRC).
Fraction Inside Directors	DIRTYPE='E" or FORMEREMP=1 from IRRC. It includes employees and former employees, and is divided by the number of directors.
Fraction Gray Outside Directors	DIRTYPE="L" or "linked" from IRRC, but excluding former employees. It is divided by the number of directors.
Fraction Outside Directors Appointed by CEO	From IRRC, divided by the number of outside directors.
Fraction Outside Directors Over 69	The number of outside directors over age 69 divided by the number of outside directors. (From IRRC).
Fraction Outside Directors on 3 or More Boards	From IRCC and indicates that PROXYBSC>2. It is divided by the number of outside directors.
CEO Stock Ownership (%)	From ExecuComp (SHROWNPC) and is the percent of shares outstanding held by the CEO.
Institutional Share Ownership (%)	The percentage of common shares held by institutions (IRRC INSTHOLD).
Other Variables	
Economics Pred Comp	Predicted compensation due to the economic determinant variables, which is the defined as the sum of the products of economic determinant variables and the associated coefficients from an equation (1) regression on positive grant observations only.
Board Pred Comp	Predicted excessive compensation due to the board and the ownership structure variables, which is the defined as the sum of the products of board and the ownership structure variable and the associated coefficients from an equation (1) regression on positive grant observations only.

IO Pred Comp	Predicted excessive compensation due to the institutional ownership, which is the defined as the product of the institutional ownership variable and the associated coefficient from an equation (1) regression on positive grant observations only.
V/P Pred Comp	Predicted excessive compensation due to the V/P, which is the defined as the product of the V/P variable and the associated coefficient from an equation (1) regression on positive grant observations only.
B/P Pred Comp	Predicted excessive compensation due to the B/P, which is the defined as the product of the B/P variable and the associated coefficient from an equation (1) regression on positive grant observations only.

Table 1
Descriptive Statistics for CEO Compensation, Misvaluation, Economic, Board Governance and External Monitoring Variables

There are 6613 observations. See Appendix A for variable descriptions.

	Mean	Median	Std. Dev.
Compensation Variables			
Option Grants	2726	743	7859
Cash Compensation	1352	971	1838
Total Compensation	4987	2360	12301
Economic Determinants			
Ln(Sales)	7.34	7.23	1.42
Capital Expenditures/Sales	0.47	0.24	0.61
Research & Development/Total Assets	0.03	0.00	0.05
No Research & Development Indicator	0.46	0.00	0.50
Firm Age	20.34	22.00	12.07
ROA	0.05	0.05	0.06
Stock Return	0.18	0.12	0.50
Standard Deviation of ROA	0.05	0.03	0.05
Standard Deviation of Stock Return	0.45	0.32	0.50
Misvaluation			
V/P Ratio	0.74	0.64	0.50
B/P Ratio	0.47	0.41	0.33
Board Structure and Oversight			
CEO is Chairman of the Board	0.69	1.00	0.46
Board Size	9.62	9.00	2.75
Fraction Inside Directors	0.28	0.25	0.14
Fraction Gray Outside Directors	0.10	0.08	0.12
Fraction Outside Directors Appointed by CEO	0.20	0.10	0.24
Fraction Outside Directors Over 69	0.07	0.00	0.10
Fraction Outside Directors on 3 or More Boards	0.03	0.00	0.07
CEO Stock Ownership (%)	2.58	0.30	6.14
Institutional Share Ownership	0.52	0.58	0.26

Table 2
Least Squares Regressions Explaining CEO Grant Values

The dependent variable Ln (Option Grants + 1) is the natural log of the value of CEO options at grant using the S&P Black-Scholes option pricing formula (ExecuComp BLK_VALUE plus one). Grant values are in $000. See Appendix A for the description of the independent variables. Year, and Fama-French 48 industry indicators were included but not reported. Cluster T statistics are in parentheses. "***", "**", and "*" indicate significance at the 1%, 5%, and 10% level respectively.

	Ln (Option Grants + 1)		
Intercept	0.70	1.05	1.72
	(0.86)	(1.27)	(2.09)**
Economic Determinants			
Ln Sales	0.51	0.50	0.47
	(8.83)***	(8.71)***	(8.30)***
Capital Expenditures/Sales	0.14	0.09	0.11
	(1.03)	(0.68)	(0.83)
Research & Development/Total Assets	4.60	4.16	3.42
	(2.95)***	(2.67)***	(2.17)**
No Research & Development Indicator	-0.08	-0.06	-0.05
	(-0.49)	(-0.41)	(-0.29)
Firm Age/10	-0.15	-0.14	-0.13
	(-2.72)***	(-2.53)**	(-2.46)**
ROA	1.08	1.17	-0.62
	(1.32)	(1.42)	(-0.72)
Standard Deviation of ROA	2.50	2.30	1.93
	(2.23)**	(2.09)**	(1.77)*
Mean Stock Return	0.32	0.29	0.16
	(4.11)***	(3.71)***	(1.97)**
Standard Deviation of Stock Return	0.32	0.29	0.26
	(2.16)**	(1.94)*	(1.76)*
Board Structure and Oversight			
CEO is Chairman of the Board	0.21	0.22	0.21
	(1.98)**	(2.07)**	(1.96)**
Board Size	0.04	0.04	0.04
	(1.71)*	(1.73)*	(1.59)
Fraction Inside Directors	-2.29	-2.38	-2.43
	(-4.98)***	(-5.22)***	(-5.41)***
Fraction Gray Outside Directors	-0.90	-0.91	-0.89
	(-2.08)**	(-2.11)**	(-2.08)**
Fraction Outside Directors Appointed by CEO	-0.42	-0.44	-0.44
	(-1.79)*	(-1.90)*	(-1.91)*
Fraction Outside Directors Over 69	-1.49	-1.45	-1.31
	(-2.76)***	(-2.70)***	(-2.44)*
Fraction Outside Directors on 3 or More Boards	0.61	0.58	0.55
	(0.93)	(0.89)	(0.85)
CEO Stock Ownership (%)	-0.09	-0.09	-0.09
	(-7.75)***	(-7.68)***	(-7.61)***
Institutional Share Ownership	0.68	0.68	0.63
	(3.17)***	(3.16)***	(2.96)***
Misvaluation			
V/P Ratio		-0.39	-0.22
		(-3.54)***	(-1.97)**
B/P Ratio			-0.97
			(-5.45)***
Adjusted R^2	.1790	.1812	.1869

Table 3
Least Squares Regressions Explaining CEO Salary Plus Bonus, and Total Compensation

The dependent variable Ln (Cash Compensation + 1) is the natural log of ExecuComp current compensation salary plus bonus (TCC) plus one. Ln (Total Compensation + 1) is the natural log of ExecuComp total compensation (TDC1) plus one. Cash compensation and total compensation are in $000. See Appendix A for the description of the independent variables. Year, and Fama-French 48 industry indicators were included but not reported. Cluster T statistics are in parentheses. "***", "**", and "*" indicate significance at the 1%, 5%, and 10% level respectively.

	Ln (Compensation Measure + 1)	
	Cash Compensation	**Total Compensation**
Intercept	4.47	4.57
	(12.18)***	(13.83)***
Economic Determinants		
Ln Sales	0.24	0.41
	(11.90)***	(20.37)***
Capital Expenditures/Sales	-0.01	0.11
	(-0.08)	(1.82)*
Research & Development/Total Assets	-0.01	1.42
	(-0.04)	(2.46)**
No Research & Development Indicator	0.00	-0.03
	(0.00)	(-0.52)
Firm Age/100	0.45	-0.35
	(2.70)***	(-2.05)**
ROA	0.08	0.41
	(0.28)	(1.27)
Standard Deviation of ROA	-0.23	0.72
	(-0.70)	(1.54)
Mean Stock Return	0.25	0.23
	(11.26)***	(8.16)***
Standard Deviation of Stock Return	-0.02	0.13
	(-0.57)	(2.47)**
Board Structure and Oversight		
CEO is Chairman of the Board	0.09	0.14
	(2.52)**	(3.87)***
Board Size	0.03	0.01
	(2.97)***	(1.45)
Fraction Inside Directors	-0.14	-0.60
	(-1.05)	(-4.04)***
Fraction Gray Outside Directors	0.05	0.07
	(0.36)	(0.44)
Fraction Outside Directors Appointed by CEO	0.26	0.08
	(3.45)***	(1.16)
Fraction Outside Directors Over 69	0.16	0.02
	(1.03)	(0.09)
Fraction Outside Directors on 3 or More Boards	0.11	0.17
	(0.45)	(0.73)
CEO Stock Ownership (%)	-0.02	-0.03
	(-3.89)***	(-6.54)***
Institutional Share Ownership	0.13	0.14
	(1.57)	(1.50)
Misvaluation		
V/P Ratio	0.13	-0.07
	(3.91)***	(-2.02)**
B/P Ratio	-0.16	-0.40
	(-2.67)***	(-7.01)***
Adjusted R^2	.2811	.4119

Table 4
Least Squares Rank Regressions Explaining CEO Grant Values, Salary Plus Bonus, and Total Compensation

The dependent variable Ln (Option Grants + 1) is the natural log of the value of CEO options at grant using the S&P Black-Scholes option pricing formula (ExecuComp BLK_VALUE plus one). Ln (Cash Compensation + 1) is the natural log of ExecuComp current compensation salary plus bonus (TCC) plus one. Ln (Total Compensation + 1) is the natural log of ExecuComp total compensation (TDC1) plus one. See Appendix A for the description of the independent variables. All variables are ranked. Year, and Fama-French 48 industry indicators were included but not reported. Cluster T statistics are in parentheses. "***", "**", and "*" indicate significance at the 1%, 5%, and 10% level respectively.

	Ln (Compensation Measure + 1)		
	Option Compensation	**Cash Compensation**	**Total Compensation**
Intercept	25.06	-5.06	4.89
	(3.41)***	(-0.82)	(0.77)
Economic Determinants			
Ln Sales	0.30	0.54	0.50
	(12.31)***	(24.05)***	(21.47)***
Capital Expenditures/Sales	0.01	-0.02	-0.01
	(0.53)	(-0.90)	(-0.37)
Research & Development/Total Assets	0.15	0.07	0.16
	(3.20)***	(1.71)*	(3.40)***
No Research & Development Indicator	0.07	0.06	0.07
	(1.68)*	(1.52)	(1.84)*
Firm Age (Rank/10)	-0.63	0.44	-0.30
	(-3.34)***	(2.49)**	(-1.70)*
ROA	-0.01	-.01	-0.01
	(-0.86)	(-0.48)	(-0.89)
Standard Deviation of ROA	0.04	0.01	0.04
	(2.43)**	(0.69)	(2.75)***
Mean Stock Return	0.03	0.18	0.09
	(2.42)**	(18.82)***	(8.58)***
Standard Deviation of Stock Return	0.06	-0.02	0.05
	(3.52)***	(-1.11)	(3.27)***
Board Structure and Oversight			
CEO is Chairman of the Board	0.05	0.08	0.08
	(2.99)***	(4.51)***	(4.81)***
Board Size	0.03	0.05	0.03
	(1.32)	(2.06)**	(1.53)
Fraction Inside Directors	-0.09	-0.04	-0.09
	(-5.06)***	(-2.24)**	(-5.45)***
Fraction Gray Outside Directors	-0.00	0.02	0.02
	(-0.17)	(1.16)	(1.03)
Fraction Outside Directors Appointed by CEO	-0.01	0.06	0.02
	(-0.51)	(3.56)***	(0.95)
Fraction Outside Directors Over 69	-0.03	0.02	0.00
	(-1.69)*	(1.57)	(0.26)
Fraction Outside Directors on 3 or More Boards	0.04	0.03	0.03
	(1.91)*	(1.49)	(1.68)*
CEO Stock Ownership (%)	-0.11	-0.01	-0.06
	(-5.52)***	(-0.66)	(-3.23)***
Institutional Share Ownership	0.08	0.08	0.09
	(4.78)***	(4.90)***	(5.78)***
Misvaluation			
V/P Ratio	-0.09	0.04	-0.06
	(-5.36)***	(2.67)***	(-3.70)***
B/P Ratio	-0.13	-0.08	-0.14
	(-6.66)***	(-4.57)***	(-7.81)***
Adjusted R^2	0.2888	0.5033	0.4637

Table 5
Least Squares Rank Regressions Explaining CEO Grant Values, Salary Plus Bonus, and Total Compensation including Firm Age Interaction with V/P and B/P Ratios as Explanatory Variables

The dependent variable Ln (Option Grants + 1) is the natural log of the value of CEO options at grant using the S&P Black-Scholes option pricing formula (ExecuComp BLK_VALUE plus one). Ln (Cash Compensation + 1) is the natural log of ExecuComp current compensation salary plus bonus (TCC) plus one. Ln (Total Compensation + 1) is the natural log of ExecuComp total compensation (TDC1) plus one. See Appendix A for the description of the independent variables. All variables are ranked. Year, and Fama-French 48 industry indicators were included but not reported. Cluster T statistics are in parentheses. "***", "**", and "*" indicate significance at the 1%, 5%, and 10% level respectively.

	Ln (Compensation Measure + 1)		
	Option Compensation	**Cash Compensation**	**Total Compensation**
Intercept	26.24	-10.94	3.53
	(3.50)***	(-1.76)*	(0.55)
Economic Determinants			
Ln Sales	0.30	0.53	0.50
	(12.39)***	(23.81)***	(21.36)***
Capital Expenditures/Sales	0.01	-0.02	-0.01
	(0.51)	(-1.00)	(-0.43)
Research & Development/Total Assets	0.15	0.08	0.16
	(3.13)***	(1.76)*	(3.36)***
No Research & Development Indicator	0.07	0.06	0.07
	(1.71)*	(1.57)	(1.89)*
Firm Age	-0.11	0.18	-0.01
	(-2.68)***	(5.24)***	(-0.31)
ROA	-0.01	-0.01	-0.01
	(-0.69)	(-0.76)	(-0.86)
Standard Deviation of ROA	0.04	0.01	0.04
	(2.52)**	(0.79)	(2.85)***
Mean Stock Return	0.03	0.18	0.09
	(2.55)**	(19.00)***	(8.73)***
Standard Deviation of Stock Return	0.06	-0.02	0.05
	(3.45)***	(-1.11)	(3.22)***
Board Structure and Oversight			
CEO is Chairman of the Board	0.05	0.08	0.08
	(2.93)***	(4.66)***	(4.83)***
Board Size	0.03	0.04	0.03
	(1.45)	(1.98)**	(1.59)
Fraction Inside Directors	-0.09	-0.03	-0.09
	(-5.03)***	(-2.19)**	(-5.41)***
Fraction Gray Outside Directors	0.00	0.02	0.02
	(-0.12)	(1.22)	(1.10)
Fraction Outside Directors Appointed by CEO	-0.01	0.06	0.02
	(-0.49)	(3.54)***	(0.95)
Fraction Outside Directors Over 69	-0.02	0.02	0.01
	(-1.54)	(1.54)	(0.36)
Fraction Outside Directors on 3 or More Boards	0.04	0.03	0.03
	(1.87)*	(1.45)	(1.64)*
CEO Stock Ownership (%)	-0.11	-0.01	-0.06
	(-5.47)***	(-0.55)	(-3.15)***
Institutional Share Ownership	0.08	0.08	0.10
	(4.97)***	(5.02)***	(5.93)***

Misvaluation			
V/P Ratio	-0.17	0.09	-0.10
	(-5.69)***	(3.39)***	(-3.59)***
B/P Ratio	-0.08	-0.02	-0.09
	(-2.63)***	(-0.56)	(-2.91)***
V/P Ratio * Firm Age /100	0.17	-0.10	0.08
	(3.35)***	(-2.20)**	(1.76)*
B/P Ratio * Firm Age/100	-0.09	-0.16	-0.12
	(-1.67)*	(-3.22)***	(-2.56)**
Adjusted R^2	0.2904	0.5068	0.4645

Table 6
Two Stage Heckman Regressions Explaining CEO Grant Values

The two stage regressions are censored at zero grants. Ln (Option Grants + 1) is the natural log of the value of CEO options at grant using the S&P Black-Scholes option pricing formula (ExecuComp BLK_VALUE plus one). Grant Values are in $000. See Appendix A for the description of the independent variables. Year, and Fama-French 48 industry indicators were included but not reported. In the first stage probit regression Wald Chi-Square values are in parentheses. For the second stage OLS regressions Cluster T statistics are in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level respectively. Marginal effects are reported.

	Ln (Option Grants + 1)		
	Probit	**OLS**	**Marginal**
Intercept	0.19	2.88	1.79
	(0.55)	(5.18)***	
Economic Determinants			
Ln Sales	0.05	0.54	0.40
	(6.91)***	(20.87)***	
Capital Expenditures/Sales	-0.02	0.22	-0.03
	(0.17)	(3.97)***	
Research & Development/Total Assets	0.41	3.61	3.12
	(0.46)	(5.74)***	
No Research & Development Indicator	-0.01	-0.05	-0.07
	(0.04)	(-0.67)	
Firm Age/100	-0.12	-1.44	-1.01
	(0.37)	(-5.78)***	
ROA	-0.68	0.37	-3.33
	(3.64)*	(0.97)	
Standard Deviation of ROA	0.73	1.12	4.00
	(2.39)	(1.44)	
Mean Stock Return	-0.01	0.23	0.01
	(0.10)	(6.28)***	
Standard Deviation of Stock Return	0.02	0.29	0.18
	(0.18)	(6.64)***	
Board Structure and Oversight			
CEO is Chairman of the Board	0.02	0.21	0.18
	(0.31)	(4.60)***	
Board Size	0.03	-0.01	0.14
	(10.32)***	(-0.91)	
Fraction Inside Directors	-1.05	-0.88	-5.56
	(51.63)***	(-2.44)**	
Fraction Gray Outside Directors	-0.54	0.01	-2.73
	(11.92)***	(0.02)	
Fraction Outside Directors Appointed by CEO	-0.25	-0.10	-1.29
	(7.47)***	(-0.94)	
Fraction Outside Directors Over 69	-0.75	-0.12	-3.79
	(15.73)***	(-0.41)	
Fraction Outside Directors on 3 or More Boards	0.23	0.20	1.21
	(0.52)	(0.80)	
CEO Stock Ownership (%)	-0.03	-0.03	-0.17
	(109.69)***	(-2.13)**	
Institutional Share Ownership	0.27	0.22	1.42
	(13.59)***	(1.84)*	
Inverse Mills Ratio		0.97	
		(1.33)	

Misvaluation			
V/P Ratio	0.02	-0.31	0.01
	(0.19)	(-6.16)***	
B/P Ratio	-0.24	-0.85	-1.47
	(12.84)***	(-8.16)***	
Pseudo R^2	14.37%		
Adjusted R^2		48.29%	
Number of Observations	6613	5078	

Table 7
Least Squares Regressions of Future Performance on Compensation-Associated Variables with Board Governance, Institutional Ownership, and Misvaluation

Dependent variables are ROA, Asset-Scaled Cash Flow from Operations, Asset-Scaled Accruals, and Ln Stock Returns for one year, two years, and three years after the compensation year. The compensation-associated variables are calculated using coefficients estimated as in equation (1) for positive grant observations, multiplied by the values for the variables. Control variables include industry and year indicator variables. Coefficients on control variables are not reported. All other variable definitions are in the Appendix. Clustered (by firm) T statistics are in parentheses. ***, **, and *indicate significance at the 1%, 5% and 10% level respectively.

Panel A: ROA

	Year 1	Year 2	Year 3
Economics Pred Comp	.00	.00	.00
	(0.05)	(0.42)	(0.47)
Board Pred Comp	-.07	-.07	-.06
	(-5.32)***	(-5.08)***	(-4.44)***
IO Pred Comp	.24	0.24	0.20
	(3.46)***	(3.06)***	(2.67)***
V/P Pred Comp	-.05	-.04	-.04
	(-4.81)***	(-3.92)***	(-3.39)***
B/P Pred Comp	.14	.13	.12
	(17.08)***	(14.19)***	(12.40)***
Adjusted R^2	.17	.17	.16

Panel B: SCFO

	Year 1	Year 2	Year 3
Economics Pred Comp	-.00	.00	.00
	(-0.17)	(0.81)	(0.54)
Board Pred Comp	-.06	-.06	-.06
	(-4.36)***	(-4.14)***	(-3.61)***
IO Pred Comp	0.15	0.21	0.17
	(2.21)**	(2.71)***	(2.31)**
V/P Pred Comp	-.02	-.01	-.01
	(-2.07)**	(-1.25)	(-0.60)
B/P Pred Comp	.11	.10	.10
	(12.79)***	(12.27)***	(12.17)***
Adjusted R^2	.14	.13	.15

Panel C: SAccrual

	Year 1	Year 2	Year 3
Economics Pred Comp	.00	-.00	-.00
	(0.36)	(-0.77)	(-.07)
Board Pred Comp	-.01	-.01	-.00
	(-0.92)	(-0.68)	(-0.33)
IO Pred Comp	.09	.03	.04
	(1.80)*	(.72)	(0.94)
V/P Pred Comp	-.03	-.03	-.03
	(-3.86)***	(-3.59)***	(-4.03)***
B/P Pred Comp	.03	.03	.0.02
	(5.21)***	(4.95)***	(3.21)***
Adjusted R^2	.15	.16	.16

Panel D: LnReturn

	Year 1	Year 2	Year 3
Economics Pred Comp	-.01	-.01	-.02
	(-1.33)	(-.61)	(-1.77)*
Board Pred Comp	-.15	-.11	-.07
	(-3.17)***	(-2.41)**	(-1.67)*
IO Pred Comp	0.99	0.59	1.01
	(4.17)***	(2.43)**	(4.15)***
V/P Pred Comp	-.12	-.20	-.12
	(-2.89)***	(-4.76)***	(-2.86)***
B/P Pred Comp	-.01	0.01	.02
	(-0.28)	(0.33)	(0.53)
Adjusted R^2	.15	.13	.15