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Richard A. Lord and Yoshie Saito*

Abstract: Are CEO compensation packages designed to alleviate some of the personal risks that they bear? We employ a unified framework to test the relationship between the four major components of executive pay; salary, bonuses, option grants and restricted stock grants, and four factors that increase CEOs' personal risks; the real value of their pay, the riskiness of firm equity, the value of their equity portfolios, and the delta of these equity holdings. We show that personal risks that CEOs face have significant effects on the design of their compensation contracts. Our results suggest that the portion of salary compensation decreases many of the personal risks that they face. There are intriguing differences between salary and bonuses on one hand, and option and restricted stock grants on the other. As predicted, we find that the delta of CEOs' equity portfolios have strong nonlinear relationships with the different forms of compensation; especially with option grants.

Keywords: CEO compensation structure, personal CEO risk bearing, executive stock holdings, delta of executive equity portfolios

1. INTRODUCTION

There are numerous reasons for the recent growth of executive stock-based compensation. However, the risk exposure these payments create for managers, and how this affects the composition of their pay plans, is still not well understood. The design of the annual compensation package can be used to counterbalance some of the risks associated with the poorly diversified portfolio held by the CEO, and could encourage managerial actions more beneficial to the diversified outside shareholders.

Most prior studies of managerial compensation focus on stock options alone (Rajgopal and Shevlin, 2002; Ittner et al., 2003; Coles et al., 2006; and Kroumova and Sesil, 2006). These approaches can make it difficult to see the subtlety in contract structure. We examine all of the components of CEO compensation plans in a unified setting, because the risk exposure created for the CEO by one element can be offset by another.

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We use the ratios of the four major components of managerial compensation, salary, bonuses, option grants and restricted stock grants, to the total value of compensation. Using the portion of each form of compensation is an integral part of our research design; the proportional measures capture the interactions among the components. A change in the proportional use of any one of the components affects the portions used of the other three. This approach actually embodies the character of the trade-offs involved in the design of CEO compensation packages. Previous empirical studies (Lewellen et al., 1987; Holthausen et al., 1995; Ryan and Wiggins, 2001 and 2002; and Ittner et al., 2003) have used proportional measures of some of the components of compensation.

Our objective is to test whether annual CEO pay is structured to mitigate important personal risks faced by managers. We focus on the effect of four interrelated factors that contribute to the personal risks that CEOs bear: the amount of risky stock-based pay**,** the riskiness of the firm's stock, the total value of the manager's equity portfolio, and the delta, or the sensitivity of their portfolio to changes in stock value.

We test five hypotheses in order to assess the effect of CEO risk exposure on the design of compensation packages. First, we argue that as more risky stock-based elements are included in annual compensation, the total size of the pay package must be larger. This hypothesis follows from a standard utility-based argument, where more risky compensation must also have a larger expected certainty equivalent value. Second, we hypothesize that when managers own a larger equity stake in the firm, some of the risks of these poorly-diversified holdings can be offset by paying them a higher portion of cash-based compensation.

Our third area of interest is the effect of the risk of the firm's stock on the design of compensation contracts. The standard utility argument suggests that a manager holding stock in a riskier firm must be granted a higher portion of the certainty equivalent cash compensation to provide the same total utility as for a manager holding stock in a less risky firm. However, there are several competing arguments that firm equity risk should be positively correlated with the amount of stock-based compensation to align managerial interests with those of shareholders. In addition, the standard deviation of a firm's stock returns is mechanically related to the value of stock option grants, which creates a problem in model specification. To mitigate this problem, we use the cumulative density function of the standard deviations as our proxy for volatility.

Tests of the two final hypotheses are our most novel contribution. We examine the relationship between the delta of the CEO's equity portfolio and the proportional elements of CEO compensation. Lambert et al. (1991) imply that the delta of the manager's equity portfolio has an inverted U-shaped relationship with option grants. We assume there will be a U-shaped relationship with the portions of salary, bonuses and restricted stock grants to the managers.

The results generally support our hypotheses. As expected, the portion of salary paid to the manager is negatively correlated with the real dollar value of their annual compensation, and positively related to the real dollar value of their equity-holdings in the firm. The opposite is true for the portions of option and restricted grants. The portion of bonus compensation is negatively correlated with the size of the CEO compensation package, but we cannot confirm that it is positively related with CEO equity holdings. We also find that Section 162 (m) of the IRS code, disallowing the deduction of executive salary compensation over one million dollars, has an

appreciable impact on the relationship of total CEO compensation with the portion of salary.

While our results concerning the effect of firm equity risk on the design of CEO compensation are mixed, they provide several new insights. We find some evidence of a positive relationship between option grants and firm risk, which is contrary to the standard utility argument, but is not an uncommon empirical result. On the other hand, restricted stock grants are negatively correlated with risk. In accordance with standard utility theory, the portion of salary is positively related with firm risk. But, the correlation between risk and bonuses is negative.

In our most unique contribution to the existing literature, we confirm that the delta of managers' equity portfolios have nonlinear relationships with the portions of the various classes of CEO compensation. As expected, there is an inverted U-shaped relationship between delta and option grants. This supports Lambert et al.'s (1991) contention that at some point decreasing utility caused by the concavity of managers' utility functions begins to dominate increases in utility created by the convexity of their option holdings. We also confirm the anticipated U-shaped relationships of delta with the portions of salary, bonuses, and restricted stock grants. From the magnitude of the estimated coefficients, we can infer that the portion of option grants to the manager is more sensitive to the value of delta than the other three forms of compensation. Clearly, the sensitivity of the manager's equity portfolio to changes in share price partially determines the structure of the annual compensation package.

The remainder of the paper is organized as follows. In the next section, we outline the hypotheses concerning the portions of the four widely used components of managerial compensation contracts. We then discuss the sources for the data used in the study. Next, we describe our models and econometric methodologies. In the fifth section, we discuss the empirical results. Then, we present results for some sensitivity tests of our methodologies. In the final section we summarize and draw conclusions.

2. DEVELOPMENT OF THE HYPOTHESES

In developing testable hypotheses about managerial risk-bearing it is important to be mindful that executives face a set of risks significantly different from those borne by the well-diversified outside shareholders. Jensen and Meckling (1976) note that managers are unduly risk-averse, prone to hoard cash, and engage in empire building. Fama (1980) and Amihud and Lev (1981) stress that the failure of their firms can be ruinous for managers who have their careers (human capital) invested in the enterprise, again confirming that they will avoid large risks. The shareholders must bear the costs of all of the disincentives that undiversifiable risks create for the managers.

Demsetz and Lehn (1985), Lambert and Larcker (1987), Lambert et al. (1991), Smith and Watts (1992), Bushman and Indjejikian (1993), Aggarwal and Samwick (1999), Lambert (2001), Datar et al. (2001) and Hall and Murphy (2002) devise theoretical models of how to compensate poorly diversified managers to best align their interests with those of diversified outside shareholders. Many of their hypotheses are based on standard microeconomic models of risk-averse behavior where a principal and agent collectively design a compensation package that clears the managers' reservation wage and that the participants consider efficient based on their *a priori* expectations of the risks and expected outcomes.

We test five inter-related hypotheses that present a unified picture of how the design of annual CEO compensation packages may help to control the personal risks managers face from their poorly diversified portfolios. We examine how the portions of the four major elements of CEO compensation; (1) salary, (2) bonuses, (3) option grants and (4) restricted stock grants, are affected by four firm or manager-specific characteristics; (1) the real dollar value of annual CEO compensation, (2) the risk of the firm's equity, (3) the real dollar value of CEO equity holdings, and (4) the delta or sensitivity of the managerial equity portfolio to a change in share value.

It is important to consider the relative personal risks that the common forms of annual compensation create for managers. In their standard utility model, Lambert et al. (1991) assume that a manager's compensation consists of a risk-free and a risky component. Most empirical studies concentrate on the 'cash-based' or 'stock-based' compensation. There is a widely-held presumption that stock-based compensation is more risky because its ultimate realization depends upon longer-term firm performance, as well as macroeconomic factors not under the manager's control. On the other hand, cash-based compensation is assumed to be relatively secure. Once cash has been paid, it has a sure value, or can be invested in a diversified portfolio. In developing our hypotheses we will maintain this presumption that cash-based compensation is relatively safe for managers, while stock-based compensation exposes them to greater risk.

The personal risks that options create for CEOs differ in important ways from restricted stock. Traditionally, options grants were much more widely-used. But, Carter et al. (2007), Lord and Saito (2010) and Irving et al. (2011) show that the popularity of restricted stock grants have increased in recent years. Both options and restricted shares typically have lengthy vesting periods. But, because of their convexity, options shield the manager more from down-side risk. With options, the manager must make a payment to the firm to exercise, but not for restricted stocks. The value of options also increases with the risk of the underlying shares. Still, the fundamental risks to managers of holding shares or options are fairly easy to understand. They depend upon future firm performance.

It is more difficult to comprehend the personal risks that bonus schemes produce for CEOs. They differ sharply from those created by either salary (which are minimal), or stock-based compensation. There is a well-established tradition where bonuses are lumped with salary in estimating cash-based compensation. However, for managers, bonuses seem intuitively more risky than salary.

Bonuses are presumably based on an explicit or implicit contract between the CEO and the Board of Directors with respect to some elements of firm performance. The risk to managers is whether or not they meet these targets. Outsiders can only see the *ex post* bonus payments, not the underlying contracts. Therefore, both bonuses and stock-based compensation depend upon firm performance; though bonuses are based on recent past performance while the ultimate payoff from stocks or options depend upon the more distant future.

What signals do the levels of *ex post* bonuses send about the personal risks that CEOs bear from the structure of their compensation contract? Three arguments suggest that higher bonuses indicate lower personal risks for managers. First, after-the-fact a bonus is merely a cash grant, similar to salary. In this sense, managers face no risk associated with future firm performance once the bonus is paid.

The second argument concerns managerial ability. If all executives operate similar firms and have similar bonus contracts, on average, very able managers who receive high current bonuses, will probably repeat their superior performance and receive greater bonuses in the future.

Third, some managers may be given targets that are easier to achieve than others. If the nature of the contracts is relatively constant into the future, managers that receive higher current bonuses might have had lower targets. Therefore, they are probably more likely to achieve these easy targets again and receive higher bonuses in the future.

These three arguments seem to be plausible explanations of the relationship between bonus compensation and managerial risk-bearing. Therefore, we feel reasonably confident that greater current bonus payments signal a lower personal risk to a CEO than an equal stream of option or restricted grants. However, because of the lingering uncertainty about the *ex post* realization of bonus targets, they certainly create higher personal risks than an equal amount of salary compensation.

In deriving our hypotheses we will follow the established tradition that the relationships of bonuses with the proxies of undiversiable managerial risk exposure are similar to those for salary. But, it should not be a total surprise if the portion of bonus compensation occasionally has a relationship with a variable that differs from our hypotheses.

(i) Effect of Size of the Compensation Package on the Design of Compensation

Lambert et al. (1991) maintain that the portion of risk-free (cash-based) managerial compensation should be negatively related to the total dollar amount of annual pay. Using a standard microeconomic model of risk-averse behavior they argue that salary may balance the effects of some of the risks managers face from the stock-based portion of their pay.

Assume the stocks of two firms are equally risky and also that their managers have similar utility functions, are equally skilled, and hold similar equity portfolios. Any contracts offered must provide both managers with equal total utility. Assume that cash-based compensation is relatively risk-free while the stock-based compensation is risky. Further, assume that one of the managers is remunerated with a combination of cash and equity grants, while the other's entire pay package consists of stock-based compensation. According to standard utility theory, the manager given some risk-free cash would accept a package with a lower expected value than the one who receives all risky stock compensation. The relative weights assigned to the components of the compensation contract alter the risk faced by the manager.

Thus, our first set of hypotheses in alternative form is:

H_1: The portions of salary and bonuses (option and restricted stock grants) paid to the CEO are negatively (positively) related to the real total dollar value of annual managerial compensation.

Simply testing for a positive relationship between the portions of option grants paid to managers and the total real dollar value of annual compensation may not be sufficient because of two potential problems. First, the tax code prohibits the deduction of compensation over one million dollars that is not linked to firm

performance. This might discourage firms from increasing salaries beyond this ceiling. Second, much of the rise in CEO pay in recent decades came as option grants. We must try to avoid simply confirming this well-known historic trend. Below, we will explain these difficulties and how we address these problems in a series of sensitivity tests.

(ii) Effect of the Risk of Firm Equity on the Design of Compensation

The volatility of the firm's stock is obviously an important element of the personal risk borne by the manager. According to the standard utility argument, managers of more risky firms must be granted a higher portion of the certainty equivalent cash to produce the same total utility as for managers granted stock in less risky ventures.[1] This implies a positive relationship between firm equity risk and the portion of cash-based compensation, and a corresponding negative correlation between stock-based compensation and risk.

However, there are several reasonable theoretical arguments suggesting that option grants should be positively related to firm equity risk. Smith and Watts (1982) note that managers can increase the value of their options by increasing equity risk. Demsetz and Lehn (1985) maintain that it is necessary to grant the managers of more risky ventures options to properly align their incentives with those of the outside stockholders. Ittner et al. (2003) argue that high-risk firms can use options to attract less risk-averse employees.

Previous empirical findings on the relationship between the risk of firm stock and managerial compensation have also been mixed. There is considerable anecdotal evidence that young firms with more volatile equity employ more option grants in their CEO's compensation packages than larger, more stable firms. Aggarwal and Samwick (1999), Palia (2001), Ittner et al. (2003), Williams and Rao (2006) and Belkhir and Chazi (2010), all provide empirical support for a positive relationship between the risk of firm equity and option grants to the CEO. On the other hand, Beatty and Zajac (1994) and Zajac and Westphal (1994) find a negative relationship, which conforms to the standard utility story.

Because of the ambiguous nature of the theoretical arguments and previous empirical findings, we present the second set of hypotheses in null form:

H_2: The portions of the four elements of managerial compensation (salary, bonuses, option grants and restricted stock grants) are not related to the risk of firm equity.

Testing these propositions may be problematic because there is a mechanical relationship between firm risk and the portion of option grants. Call option values are positively correlated with the standard deviation of the returns of the underlying shares. If two firms issue the same number of employee stock options, the grant by the riskier firm would have a higher value. Thus, the portion of option grants must be higher for this firm, and the portions of all the other components of compensation would be lower (Smith and Watts, 1982). This mechanical relationship means that the standard deviation of the firm's stock return is probably an inappropriate measure of

1 Lambert and Larcker (1985) and Bloom and Milkovich (1998) propose such hypotheses.

firm equity risk. Therefore, as a proxy, we use the cumulative density function of the standard deviations suggested by Aggrawal and Samwick (1999).

(iii) Effect of CEO Equity Holdings on the Design of Compensation

Lambert and Larcker (1987), Smith and Watts (1992) and Core and Guay (1999), all argue that the design of the annual CEO compensation package will depend on the value of managerial equity holdings. In a recent study in an international setting, Conyon et al. (2011) present evidence that higher annual compensation for managers in America results from their higher risk exposure associated with greater equity holdings. We push this argument a step further, and examine whether the mix of components in executive compensation contracts might also ameliorate some of this risk. The standard utility argument suggests that a higher portion of cash compensation will balance some of the personal risk executives bear. CEOs with large equity stakes will require a higher certainty equivalent. Therefore, our third set of hypotheses in alternative form is:

H_3: The portions of salary and bonuses (option and restricted stock grants) paid to the CEO are positively (negatively) related to the real total dollar value of managerial equity and option holdings.

(iv) Effect of CEO Equity Portfolio Sensitivity on the Design of Compensation

One of the most unique elements of our study is to examine how the delta, or the sensitivity of a manager's holdings to change in firm value, is related to the design of annual CEO compensation. Above, we note that the convexity of options contracts causes their value to increase with the risk of the firm's stock. Therefore, the utility that managers derive from their option holdings should rise in a strict linear fashion as the delta of their portfolio rises (Smith and Watts, 1982). However, Lambert et al. (1991) argue that the delta of an undiversified portfolio will eventually reach a point where the concavity of managers' utility functions will cause the relationship to reverse and further grants of options will decrease their utility. If this is the case, there should be a concave (inverted U-shape) relationship of the delta of the manager's equity portfolio with the portions of option grants.

Delta is a measure of the change in option value for a one-dollar change in the price of the underlying stock. For example, consider a typical option issued to a CEO for the firms in our sample. Most employee stock options are granted at-the-money, so assume that the exercise price is near the current market price of the stock. Also assume that the standard deviation of annual returns of the shares is typical for our sample, and the options have a long vesting period. In this case, the value of delta derived from the Black-Scholes-Merton model is about 0.84.[2] This means that if the stock price rises (or falls) by $1 the option value will rise (or fall) by about 84 cents.

As the stock price rises further above the exercise price, the option is said to be in-the-money (a higher chance it will be exercised). As the stock goes deeper in-the-money, the delta of the underlying option increases toward one. If a stock price is

2 This is based upon typical observations from our sample. We assume both the current share price and strike price are $32, the standard deviation of annual returns (sigma) is 0.40, the time-to-exercise is nine years, the risk-free rate is 5% and there are no dividends. The resulting value of delta is 0.835.

very-deep-in-the-money the delta will be practically one, which means that the option has become essentially the same thing as holding stock itself. Finally, if share value falls below the exercise price, the option is out-of-the-money, it is less likely to be exercised. As the option falls further out-of-the-money the delta approaches zero.

In estimating the delta of a manager's portfolio of firm equity, we will also include their stock and restricted stock holdings. By definition stocks have a delta equal to one.

The relationship of portfolio delta with restricted stock grants should differ from that for options. The inverted U-shaped relationship between options and portfolio delta suggested by Lambert et al. depends upon the fact that option values rise with increases in stock volatility. However, this is not the case for restricted shares, whose value should decline with increasing risk.

Therefore, our fourth and fifth hypotheses in alternative form are:

H_4: The portions of salary, bonuses and restricted stock grants (option grants) paid to the CEO are negatively (positively) related to the delta of the manager's equity and option holdings.

H_5: The portions of salary, bonuses and restricted stock grants (option grants) paid to the CEO are positively (negatively) related to the square of the delta of the manager's equity and option holdings.

3. VARIABLE DEFINITIONS AND DATA SOURCES

(i) Data Sources

We collect data for the fourteen year period from 1992 to 2005 from three sources. Information on managerial compensation and equity holdings are taken from the EXECUCOMP database, which contains comprehensive information for a sample corresponding roughly to the S&P1,500. Other necessary data are culled from the COMPUSTAT and CRSP datasets.

(ii) Managerial Compensation and Equity Holdings

The real total dollar value of CEO equity holdings (CEOEQ), taken from EXECUCOMP, is the sum of the market value of all restricted and non-restricted stock holdings plus the Black-Scholes-Merton value of the executive's option holdings, estimated using the Core and Guay (2002) approximation described below. These values are then deflated by the Consumer Price Index (CPI-U) for the end-of-fiscal-year month.[3]

Total annual CEO compensation (CEOCOMP) is the sum of salary, bonuses, payments from long-term incentive plans, the Black-Scholes-Merton value of option grants, restricted stock grants, and all other compensation taken from the EXECUCOMP database. These values are also deflated by the CPI-U.

We compute the proportion of each element of CEO compensation by taking the ratio of the annual dollar value of that form of compensation to total annual CEO compensation. For instance, the percentage of salary paid to the CEO (SALRYPC) is the ratio of salary divided by the total compensation figure. The portions of option

3 Consumer Price Index for all urban consumers, with the year 1994 set to one.

grants (OPTGRPC) and restricted stock grants (RSGRPC) are computed in a similar fashion. The percentage of bonus compensation (BONUSPC) is the sum of bonuses and payments under long-term incentive plans divided by total compensation.[4]

(iii) Equity Risk Measure

To estimate the volatility of firm shares, we first calculate the annualized standard deviation of daily stock returns.[5] These figures are then transformed using an approach suggested by Aggarwal and Samwick (1999), because there will be a mechanical relationship between the portion of CEO option grants in total compensation and the raw measure of firm risk. We calculate the mean and variance for all of the observations of the annual standard deviation of stock returns in our sample, and then estimate the cumulative density function of these measures of standard deviation (CDFSD). These transformed values are used as an instrumental variable to represent the riskiness of firm stock.

(iv) Estimation of Delta

To estimate the delta of a manager's option portfolio we use the adaptation of the Black and Scholes (1973) model suggested by Core and Guay (2002). This can be approximated using data from EXECUCOMP and CRSP. For the calculation we need estimates of six parameters: share price, the strike price of the options, the time-to-maturity of the contracts, the volatility of the underlying shares, the risk-free rate, and the firm's dividend-payout-ratio. The strike price of the CEO's option portfolio is approximated as the difference between the end-of-fiscal-year share price and the EXECUCOMP estimate of the intrinsic value of in-the-money options held by the CEO divided by the number of options he holds. Following Core and Guay (2002), we presume that all unexercisable options have a time-to-exercise of nine-years, and exercisable options[6] have a time-horizon of six-years. The annualized standard deviations of daily stock returns for the fiscal year are used as the estimate of volatility in the model. The yield on seven-year Treasury Bonds in the month of the fiscal-year end is used as the risk-free rate. Finally, we incorporate the dividend-payout-ratio for the fiscal year using Merton's (1973) extension of the Black-Scholes model.

To estimate the delta of the manager's entire equity portfolio, DELTA, we include both option and stock holdings. We multiply the number of options the CEO holds by the option portfolio delta described above and add the total number of restricted and non-restricted shares held by the manager, and divide this total by the sum of the number of options, restricted and non-restricted shares held. The CEOs' portfolio deltas will have a value between zero and one.

Because Lambert et al. (1991) imply that compensation should be non-linear in delta, we also included the squared value, DELTA2. This allows us to test whether

4 Richardson and Waegelein (2003) explain the differences between long-term performance plans and traditional bonus contracts, and also characteristics of firms that tend to employ long-term plans.

5 This is estimated using stock returns taken from the CRSP database. We carefully match the daily stock returns to correspond to each firm's fiscal year. All Firms that are missing more than ten daily returns for a year are eliminated from the sample.

6 Exercisable options have vested and unexercisable options have not.

compensation plans differ between firms where the equity portfolio of the manager is very sensitive to changes in share value and those where the portfolio is less sensitive.

(v) Control Variables

We also employ five control variables to account for factors that should affect the design of managerial compensation contracts. These are (1) CEO tenure, (2) market-to-book ratio, (3) firm size, (4) return-on-assets, and (5) annual stock return.

We obtain estimates of CEO tenure (TENURE) from EXECUCOMP. Dechow and Sloan (1991) and Gibbons and Murphy (1992) argue that CEO tenure should be negatively correlated with equity grants. Yermack (1995), Ryan and Wiggins (2002) and Palia (2001) also find that CEO tenure has vital explanatory power even in regression models that control for firm-specific effects.

The market-to-book ratio of long-term capital (M/B) is our proxy for unrecorded intangible assets or growth opportunities. This is the ratio of total assets minus the book value of equity plus the market value of equity to total assets. Gaver and Gaver (1995), Mehran (1995), Himmelberg et al. (1999) and Palia (2001) all find a positive relationship between measures of growth opportunities and equity grants to managers.

Firm size should have important effects on managerial compensation and equity holdings (Smith and Watts, 1992; Himmelberg et al., 1999; Hall and Murphy, 2003; Baker and Hall, 2004; and Gabaix and Landier, 2008). Therefore, we include the logarithm of the market value of firm equity (LEQMARK) as a proxy in our models.

Our measure of normalized earnings (ROA) is earnings before extraordinary items divided by the value of total assets, taken from the COMPUSTAT annual industrial file. There is considerable evidence that earnings are the principal determinant of bonus packages, so we expect to find a strong positive relationship between bonus compensation and ROA. There is little empirical evidence concerning the impact of earnings on option compensation.

We estimate annual stock returns (RET) using daily stock returns from the CRSP database. Healy (1985) and Murphy (1999) note that earnings are the primary determinant of bonuses. Still, Murphy (1985), Gibbons and Murphy (1990), Boschen and Smith (1995), Baber et al. (1996), Hall and Liebman (1998), Anderson et al. (2000) and Chen (2003) have found a positive relationship between bonuses and stock returns.

Evidence on the relationship between the firm performance measures and option grants is mixed. In a seminal study Jensen and Murphy (1990) argue that the relationship is surprisingly weak. Core et al. (2003) continue to argue that there is little clear evidence of a solid relationship between firm performance and managerial equity grants. On the other hand, Hall and Liebman (1998) and Aggarwal and Samwick (2003) provide evidence of a robust positive relationship.

(vi) Final Sample Characteristics

After, collecting the preliminary data, we eliminate all observations for any firm-year that are missing values for any of the variables. As is common, we delete all observations

Table 1
Univariate Sample Statistics 12,597 Observations

Variable	*Median*	*Mean*	*St. Dev.*	*Minimum*	*Maximum*
SALRYPC	0.2729	0.3366	0.2425	0.0000	1.0000
BONUSPC	0.1722	0.1960	0.1719	0.0000	1.0000
OPTGRPC	0.3314	0.3491	0.2900	0.0000	1.0000
RSGRPC	0.0000	0.0561	0.1351	0.0000	1.0000
TENURE	6.0000	8.3162	7.4324	1.0000	54.7500
LEQMARK	0.2184	0.3792	1.5948	−4.9601	6.2311
M/B	1.6822	2.2446	2.0987	0.4040	78.5648
ROA	0.0545	0.0436	0.1266	−3.2466	0.5783
RET	0.1176	0.1161	0.4085	−0.9984	2.9299
CEOCOMP	1.7362	3.4568	9.7317	0.0000*	558.3984
CDFSD	0.4066	0.4699	0.2727	0.0370	1.0000
CEOEQ	0.0161	0.0995	0.9633	0.0000*	60.0067
DELTA	0.9442	0.9293	0.0641	0.5289	1.0000
DELTA2	0.8916	0.8677	0.1147	0.2797	1.0000

Notes:
SALRYPC – Salary as a Percentage of Total Annual CEO Compensation,
BONUSPC – Bonuses as a Percentage of Total Annual CEO Compensation,
OPTGRPC – Option Grants as a Percentage of Total Annual CEO Compensation,
RSGRPC – Restricted Stock Grants as a Percentage of Total Annual CEO Compensation,
TENURE – CEO Tenure (Years),
LEQMARK – Natural Logarithm of the Market Value of Equity,
M/B – Market-to-Book Ratio of Firm Assets,
ROA – Return on Assets (Ratio of Net Earnings to Total Assets),
RET – Annual Geometric Return on the Market Value of Equity,
CEOCOMP – Real Total Annual CEO Compensation ($M, 1994),
CDFSD – The Cumulative Density Function of the Annualized Standard Deviation of Daily Stock Returns,
CEOEQ – Real Value of Shares, Restricted Shares and the Estimated Real Black-Scholes Value of Options Held by the CEO ($B, 1994),
DELTA – Estimated Delta of the CEO's Equity Portfolio,
DELTA2 – DELTA Squared.

*The minimum values of CEOCOMP and CEOEQ are not exactly $0. Several CEO's served for nominal salaries when their firms were in difficulty. The lowest paid CEO was Steve Jobs of Apple Computer, who received $0.71 in 2005. The CEO with the lowest stock holdings was Jeff Swartz of Timberland, who held $205.30 in stock in 1994.

from utilities and financial firms.[7] We also eliminate all observations when a CEO serves for only part of a year at either the beginning or end of his tenure. Our final aggregate sample contains 12,597 firm-year observations spread over fourteen years, from 1992 to 2005. This represents observations on 3,101 CEOs from 1,972 firms. Univariate summary statistics for the 13 variables for the sample are presented in Table 1.

4. MODELS AND ECONOMETRIC METHODOLOGY

We specify four models with the portions of each of the components of CEO compensation (SALRYPC, BONUSPC, OPTGRPC and RSGRP) as the dependent

7 SIC codes 4900 – 4999 and 6000 – 6999.

variables. For instance, the model to explain the portion of salary paid to the CEO is:

$$\begin{aligned}\text{SALRYPC} = \alpha_0 &+ \alpha_1\text{TENURE} + \alpha_2\text{LEQMARK} + \alpha_3\text{M/B} + \alpha_4\text{ROA} + \alpha_5\text{RET} \\ &+ \beta_1\text{CEOCOMP} + \beta_2\text{CDFSD} + \beta_3\text{CEOEQ} + \beta_4\text{DELTA} + \beta_5\text{DELTA2} \\ &+ \sum_{i=1}^{f}\text{CEO}_i + \sum_{j=1}^{y} Y_j + e.\end{aligned}$$

The parameter values α_m ($m = 1, 2 \ldots, 5$) are associated with the control variables, the β_n ($n = 1, 2 \ldots, 5$) with the variables proxying the personal risk faced by the CEO, and e is an error term.

Murphy (1985), Himmelberg et al. (1999) and Palia (2001) argue that it is important to control for firm-specific fixed effects in studies of managerial compensation. However, there is also considerable evidence that when a firm changes its chief executive, pay packages often undergo a radical transformation. Therefore, instead of firm-specific adjustments, we include one/zero dummy variables, CEO_i, for each of i executives in our sample.

There have also been important systematic changes in the patterns of executive compensation over time during our study period. Since we are trying to isolate the effects of the personal risks faced by the CEO on the design of compensation contracts, it is important to control for year-specific effects by including the Y_j that are one/zero dummy variables for each of the j years.[8]

As a preliminary step, we estimate each of the four models for the portions of salary, bonuses, option grants and restricted stock grants using OLS, and identify any outliers that seriously bias parameter estimates. We eliminate all observations that have residuals with a Cook's D value higher than one, and/or an R-Student value with an absolute value greater than three. See Welsch (1980) for more details.

All of our dependent variables are proportions with values between zero and one, and are continuous in that range. This distribution is an example of what Wooldridge (2002, pp. 518–20) calls a 'corner solution outcome.' He argues that the proper approach to such data is to use a standard censored Tobit model. Moreover, a very sizable portion of the CEOs in the sample receive 0% of their compensation as bonuses, options or restricted stock grants (what are traditionally called left-censored values). Greene (2012, pp. 852–57) notes that a Tobit model is especially well-suited for data with a large cluster of observations at or near zero. Several earlier studies of executive compensation (Yermack, 1995; Bryan et al., 2000; and Ryan and Wiggins, 2001) that use proportional measures as the dependent variable have also employed Tobit models. All of these precedents suggest that Tobit specifications are the best approach for our data.

The magnitudes of coefficient estimates for discrete choice models (such as Logit, Probit and Tobit) tend to be greater than those for linear models. Therefore, when presenting results for nonlinear specifications it is common to provide estimates of the marginal effects at the conditional mean for the sample (see Dittmar, 2000). These provide some notion of the magnitude of an ordinary slope coefficient. We

8 Because of these concerns with the time-series elements of the data we also conduct year-by-year analyses, which are described in the section on sensitivity tests below.

approximate these marginal effects following the method of Greene (1999). The marginal effects for each observation (i) are calculated as:

$$\frac{\partial E\,(Y_i/X_i)}{\partial X_i} = \beta\Phi\left(\frac{\beta' X_i}{\sigma}\right),$$

where β is the estimated coefficient on the independent variable X from the Tobit model, σ is the standard deviation of Y, and Φ is the standard normal cumulative density function. Then, the value of this function is estimated at the conditional mean. See Greene (2012, pp. 693–95) for details.

5. EMPIRICAL RESULTS

The parameter estimates for the four Tobit specifications are presented in Table 2. The marginal effects at the conditional mean for the samples are also shown. This table contains summary statistics on the log-likelihood statistic for each model, the number of firm-year observations after eliminating the outliers, the number of left and right-censored observations, and the number of CEO-specific cross-sections.[9]

We include five control variables. CEO tenure (TENURE) is significantly positively related only with restricted stock grants. Our proxy for firm size (LEQMARK) is positively (negatively) correlated with the portions of bonuses and option grants (salary). The market-to-book ratio (M/B) is positively (negatively) correlated with the portion of salary (bonus payments). Return-on-assets (ROA) is positively (negatively) related to the portion of bonuses (salary and option grants). Annual stock returns (RET) are positively (negatively) correlated with the portions of bonuses and restricted stock grants (salary and option grants).

We test five hypotheses to better understand how four factors that affect the undiversifiable personal risks managers face, influence the design of CEO compensation contracts. The estimates of β_1 in the four Tobit specifications provide convincing support for hypotheses H_1. The portions of salary and bonuses are negatively and significantly correlated with CEOCOMP, while the portion of option and restricted stock grants are significantly positively related. These results are consistent with the standard microeconomic utility argument that risky stock compensation has lower value to managers. Therefore, higher total remuneration is required to compensate the CEO for risk if the package contains more stock-based pay.

Our second hypothesis concerns how the risk of the firm's equity affects the design of CEO compensation contracts. Our proxy for this risk is the cumulative density function of the annualized standard deviation of daily stock returns (CDFSD).

The results of our empirical tests are mixed. The portion of salary compensation is positively related to equity risk (at a significance level of slightly over 5%), corresponding to the standard utility argument. But, bonuses are negatively correlated with risk. As noted before, we feel that bonuses create higher personal risks for CEOs than salary compensation. Our results suggest that managers of risky firms prefer the absolute safety of salary compensation over bonuses.

9 As is common for fixed-effects models, we do not present the coefficients for the numerous CEO and year-specific dummy variables, but these are available from the authors upon request.

Table 2
Fixed Effects Tobit Regression Results

		SALRYPC				*BONUSPC*		
Parameter		*Ex*	*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*	*Ex*	*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*
TENURE	α_1		0.0002	0.8844	0.0002		−0.0001	0.9998	−0.0000
LEQMARK	α_2		−0.0615	<0.0001	−0.0531		0.0108	0.0037	0.0082
M/B	α_3		0.0038	0.0007	0.0033		−0.0052	<0.0001	−0.0039
ROA	α_4		−0.1337	<0.0001	−0.1155		0.3271	<0.0001	0.2471
RET	α_5		−0.0213	<0.0001	0.0184		0.0746	<0.0001	0.0563
CEOCOMP	β_1	−	−0.0067	<0.0001	−0.0058	−	−0.0054	<0.0001	−0.0041
CDFSD	β_2	?	0.0188	0.0752	0.0163	?	−0.0742	<0.0001	−0.0560
CEOEQ	β_3	+	0.0134	<0.0001	0.0116	+	0.0009	0.6582	0.0007
DELTA	β_4	−	−1.9652	0.0001	−1.6979	−	−1.6952	0.0009	−1.2803
DELTA2	β_5	+	1.1043	0.0001	0.9540	+	1.2310	<0.0001	0.9297
Observations			12,363				12,467		
Cross-Sections (CEOs)			3,080				3,095		
Right Censored(100%)			154				0		
Left Censored (0%)			46				2,212		
Log Likelihood			8,389.04				6,102.22		

Table 2 (Continued)

		OPTGRPC				*RSGRPC*		
Parameter		*Ex*	*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*	*Ex*	*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*
TENURE	α_1		0.0023	0.4537	0.0017		0.0097	0.0223	0.0021
LEQMARK	α_2		0.0778	<0.0001	0.0591		−0.0065	0.4941	−0.0014
M/B	α_3		−0.0009	0.6901	−0.0006		−0.0084	0.1000	−0.0018
ROA	α_4		−0.0835	0.0073	−0.0634		0.0630	0.2648	0.0138
RET	α_5		−0.0342	<0.0001	−0.0260		0.0436	<0.0001	0.0096
CEOCOMP	β_1	+	0.0135	<0.0001	0.0103	+	0.0022	<0.0001	0.0005
CDFSD	β_2	?	0.0339	0.0937	0.0257	?	−0.0895	0.0004	−0.0196
CEOEQ	β_3	−	−0.0450	<0.0001	−0.0342	−	0.0366	0.0119	0.0080
DELTA	β_4	+	8.1742	<0.0001	6.2078	−	−2.5179	0.0196	−0.5632
DELTA2	β_5	−	−5.2113	<0.0001	−3.9586	+	1.5192	0.0157	0.3327
Observations			12,495				12,286		
Cross-Sections (CEOs)			3,096				3,095		
Right Censored(100%)			17				0		
Left Censored (0%)			3,153				9,706		
Log Likelihood			−1,055.03				−139.33		

Notes:
SALRYPC – Salary as a Percentage of Total Annual CEO Compensation,
BONUSPC – Bonuses as a Percentage of Total Annual CEO Compensation,
OPTGRPC – Option Grants as a Percentage of Total Annual CEO Compensation,
RSGRPC – Restricted Stock Grants as a Percentage of total Annual CEO Compensation,
TENURE – CEO Tenure (Years),
LEQMARK – Natural Logarithm of the Market Value of Equity,
M/B – Market-to-Book Ratio of Firm Assets,
ROA – Return on Assets (Ratio of Net Earnings to Total Assets),
RET – Annual Geometric Return on the Market Value of Equity,
CEOCOMP – Real Total Annual CEO Compensation,
CDFSD – The Cumulative Density Function of the Annualized Standard Deviation of Daily Stock Returns,
CEOEQ – Real Value of Shares, Restricted Shares and the Estimated Real Black-Scholes Value of Options Held by the CEO,
DELTA – Estimated Delta of the CEO's Equity Portfolio,
DELTA2 – DELTA Squared.

The portion of option grants is positively related with our instrumental variable proxy for equity risk at a 10% level. Not unexpectedly, this is contrary to the standard utility theory argument, and corresponds to earlier findings such as those of Smith and Watts (1982) and Demsetz and Lehn (1985). On the other hand, the portion of restricted stock grants is significantly negatively correlated with equity risk, in accordance with standard utility theory. This difference in signs between option and restricted stocks might arise because the convexity of option contracts shields managers from down-side risk, while restricted shares do not.

Our third set of hypotheses are that the dollar amount of firm equity held by the CEO (CEOEQ) should be positively correlated with the cash-based components of compensation, and negatively with the stock-based components. For the most part our results support hypothesis H_3. As expected, the portion of salary paid to the CEO is significantly positively related with managerial equity holdings, and the relationship between CEOEQ and the portions of option and restricted stock grants are negative. There is no evidence of a significant relationship between the portion of bonuses and CEO equity holdings.

Our results support hypotheses H_4 and H_5. For the portions of salary, bonuses and restricted stock grants, the parameter β_4 on DELTA is negative and β_5 on DELTA2 is positive, the expected U-shaped relationship. The two parameters have the opposite signs ($\beta_4 > 0$ and $\beta_5 < 0$) in the model of the portion of option grants, implying an inverted U-shape.[10] The signs and magnitudes of the estimates of β_4 and β_5 suggest that there is a turning inflection point in all four of the relationships between delta and the elements of CEO compensation. These turning points are all within the range of the data,[11] but they are all at values considerably lower than the mean and median of delta as shown in Table 1. Therefore, most of the managers in this sample have portfolio holdings with delta in a range where it is negatively correlated with the portion of option grants. These results support Lambert et al.'s (1991) contention that for typical CEOs of these large firms, the concavity in the utility functions dominates the utility arising from increases in the value of their option holding with increasing equity risk caused by the convexity of the contracts.

6. SENSITIVITY TESTS

We are concerned about the 1992 revision of the Internal Revenue Service code, Section 162(m), which prohibits the deduction of compensation over one million dollars that is not tied to firm performance. This feature of the tax code might induce a purely mechanical negative relationship between the dollar-value of CEO pay and the portion of salary compensation.

A reasonable method to test whether limiting the tax deductibility of high salary payments has affected the design of CEO compensation packages is to include a dummy variable set to one when the nominal salary is in a range approaching the

10 The magnitudes of the parameters β_4 and β_5 are much larger in the model for the portion of option grants, than those in the model for the other three elements of CEO compensation, suggesting that option compensation is much more sensitive to delta.

11 For the portion of salary the turning point of delta is 0.8898, for bonuses 0.6886, for option grants 0.7843, and for restricted stock grants 0.8287.

one million dollar taxable threshold. We also add cross-product terms of this dummy with the five test variables. Therefore, we extend the original model as follows:

$$\begin{aligned}\text{SALRYPC} = {} & \alpha_0 + \alpha_1\text{TENURE} + \alpha_2\text{LEQMARK} + \alpha_3\text{M/B} + \alpha_4\text{ROA} + \alpha_5\text{RET} \\ & + \beta_1\text{CEOCOMP} + \beta_2\text{CDFSD} + \beta_3\text{CEOEQ} + \beta_4\text{DELTA} + \beta_5\text{DELTA2} \\ & + \delta_0\text{MIL} + \delta_1\text{CEOCOMP}^*\text{MIL} + \delta_2\text{CDFSD}^*\text{MIL} + \delta_3\text{CEOEQ}^*\text{MIL} \\ & + \delta_4\text{DELTA}^*\text{MIL} + \delta_5\text{DELTA2}^*\text{MIL} + \sum_{i=1}^{f}\text{CEO}_i + \sum_{j=1}^{y} Y_j + e.\end{aligned}$$

MIL is a dummy variable set to one if nominal CEO salary compensation is between $750,000 and one million dollars, and otherwise is set to zero. We estimate similar models for the portion of each of the four forms of CEO compensation to total pay using Tobit models. In this specification the parameters β_m $(m = 1, \ldots, 5)$ are now interpreted as the result for CEOs whose salary does not fall in this range, while the δ_n $(n = 1, \ldots, 5)$ explain how these relationships differ for CEOs with salary approaching one million dollars.

We again compute marginal effects at the conditional means for the sample. For all of the non-interactive coefficients these effects are calculated as described in the previous section. However, Ai and Norton (2003) show that marginal effects for interaction terms in nonlinear models can be misleading. The signs on the coefficients can differ widely across the sample distribution. Therefore, we use the method presented by Greene (2012, pp. 699–701) to compute the marginal effects for the coefficients δ_n $(n = 1, \ldots, 5)$ at the conditional sample mean. For example, the marginal effect for each observation for the coefficient δ_1 on the interactive term CEOCOMP*MIL is:

$$\frac{\partial E\,(Y_i/X_{1i})}{\partial X_{1i}} = \Phi\left(\frac{\beta' X_i}{\sigma}\right)(\beta_1 + \delta_1\text{MIL}),$$

where X_{1i} in this case is CEOCOMP_i. The marginal effects for the other four interactive terms are estimated in the same way.

The estimates for the coefficients and the marginal effects for the four Tobit models are shown in Table 3 . The signs and magnitudes of the Tobit parameter estimates for almost all of the original regression variables are virtually the same between the results shown in Table 2 and those in Table 3. These results confirm that most of the findings presented in the previous section are little affected by the tax penalty on executive salaries over one million dollars.

It is especially important to concentrate on the model of the salary compensation. Here, the parameter β_1 is still negative and significant, and of roughly the same magnitude as in Table 2. This supports our main contention, that for most firms, the relationship of the portion of CEO salary with total compensation is still negative, even after controlling for any shift away from salary caused by the tax consequences of the implementation of Internal Revenue Service code, Section 162(m).

The Tobit parameter estimate of δ_1 on CEOCOMP*MIL is significantly negative in the model for the portion of salary compensation, and is positive in the model for option grants. The signs and magnitudes on the marginal effects reinforce these findings. These results suggest that when nominal CEO salary falls in the range

Table 3

Fixed Effects Tobit Regression Results Controlling for the Effects of Real CEO Salary Between $750,000 and $1M

		SALRYPC			*BONUSPC*		
Parameter		*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*	*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*
TENURE	α_1	0.0004	0.8148	0.0003	0.0001	0.9718	0.0000
LEQMARK	α_2	−0.0591	<0.0001	−0.0528	0.0130	0.0005	0.0099
M/B	α_3	0.0034	0.0032	0.0030	−0.0057	<0.0001	−0.0043
ROA	α_4	−0.1335	<0.0001	−0.1193	0.3280	<0.0001	0.2477
RET	α_5	−0.0214	<0.0001	−0.0191	0.0737	<0.0001	0.0557
CEOCOMP	β_1	−0.0066	<0.0001	−0.0059	−0.0052	<0.0001	−0.0040
CDFSD	β_2	0.0140	0.1969	0.0126	−0.0765	<0.0001	−0.0578
CEOEQ	β_3	0.0118	<0.0001	0.0105	−0.0007	0.7428	−0.0005
DELTA	β_4	−1.9537	0.0003	−1.7453	−1.7426	0.0017	−1.3158
DELTA2	β_5	1.1025	0.0004	0.9849	1.2721	<0.0001	0.9605
MIL	δ_0	−0.2028	0.7041	−0.1812	−0.1532	0.7732	−0.1156
CEOCOMP*MIL	δ_1	−0.0045	<0.0001	−0.0065	−0.0025	<0.0001	−0.0043
CDFSD*MIL	δ_2	0.0505	0.0031	0.0197	0.0146	0.3912	−0.0558
CEOEQ*MIL	δ_3	0.0110	0.1559	0.0121	0.0020	0.8142	−0.0003
DELTA*MIL	δ_4	0.4764	0.6942	−1.6775	0.4714	0.6959	−1.2535
DELTA2*MIL	δ_5	−0.2669	0.6963	0.9469	−0.3312	0.6267	0.9168
Observations		12,362			12,473		
Cross-Sections (CEOs)		3,080			3,095		
Right Censored (100%)		154			0		
Left Censored (0%)		47			2,212		
Log Likelihood		8,419.23			6,107.24		

Table 3 (Continued)

		OPTGRPC			*RSGRPC*		
Parameter		*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*	*Parameter Estimate*	*Chi Sq Prob*	*Marginal Effect*
TENURE	α_1	0.0020	0.4961	0.0016	0.0094	0.0257	0.0021
LEQMARK	α_2	0.0742	<0.0001	0.0597	−0.0062	0.5198	−0.0014
M/B	α_3	0.0002	0.9313	0.0002	−0.0096	0.0635	−0.0021
ROA	α_4	−0.0833	0.0072	−0.0670	0.0646	0.2534	0.0142
RET	α_5	−0.0319	<0.0001	−0.0256	0.0451	<0.0001	0.0099
CEOCOMP	β_1	0.0122	<0.0001	0.0098	0.0020	<0.0001	0.0004
CDFSD	β_2	0.0586	0.0049	0.0472	−0.0862	0.0011	−0.0189
CEOEQ	β_3	−0.0357	<0.0001	−0.0288	0.0385	0.0101	0.0085
DELTA	β_4	8.8692	<0.0001	7.1365	−3.4746	0.0052	−0.7620
DELTA2	β_5	−5.6315	<0.0001	−4.5313	2.0502	0.0037	0.4496
MIL	δ_0	1.3800	0.1617	1.1104	−1.9354	0.0686	−0.4244
CEOCOMP*MIL	δ_1	0.0055	<0.0001	0.0106	0.0024	0.0146	0.0006
CDFSD*MIL	δ_2	−0.1080	0.0007	0.0316	0.0025	0.9465	−0.0188
CEOEQ*MIL	δ_3	0.0118	0.4144	−0.0271	−0.565	0.4508	0.0056
DELTA*MIL	δ_4	−3.2980	0.1412	6.6628	4.5498	0.0612	−0.5287
DELTA2*MIL	δ_5	1.9733	0.1196	−4.2479	−2.6675	0.0538	0.3128
Observations		12,487			12,287		
Cross-Sections (CEOs)		3,080			3,095		
Right Censored (100%)		17			0		
Left Censored (0%)		3,153			9,707		
Log Likelihood		−1,005.6			−136.73		

Notes:
SALRYPC – Salary as a Percentage of Total Annual CEO Compensation,
BONUSPC – Bonuses as a Percentage of Total Annual CEO Compensation,
OPTGRPC – Option Grants as a Percentage of Total Annual CEO Compensation,
RSGRPC – Restricted Stock Grants as a Percentage of Total Annual CEO Compensation,
TENURE – CEO Tenure (Years),
LEQMARK – Natural Logarithm of the Market Value of Equity,
M/B – Market-to-Book Ratio of Firm Assets,
ROA – Return on Assets (Ratio of Net Earnings to Total Assets),
RET – Annual Geometric Return on the Market Value of Equity,
CEOCOMP – Real Total Annual CEO Compensation,
CDFSD – The Cumulative Density Function of the Annualized Standard Deviation of Daily Stock Returns,
CEOEQ – Real Value of Shares, Restricted Shares and the Estimated Real Black-Scholes Value of Options Held by the CEO,
DELTA – Estimated Delta of the CEO's Equity Portfolio,
DELTA2 – DELTA Squared,
MIL – Dummy Variable Set to One if Nominal CEO Salary is Between $750,000 and $1 Million.

between $750,000 and one million dollars, firms employ a lower portion of salary compensation and a higher portion of option grants than they normally would after controlling for all of the other factors. Thus, the tax penalty in Section 162(m) of the Internal Revenue Service code does have some discernable effect of the structure of CEO salary compensation.

Another important bias that may have distorted our regression results is the systematic growth of option compensation during our study period. To demonstrate that our findings are not a vestige of these systematic shifts in the structure of CEO compensation during our study period, we specify a series of Tobit models of the following form for each year:[12]

$$\begin{aligned} \text{SALRYPC} = {} & \alpha_0 + \alpha_1 \text{TENURE} + \alpha_2 \text{LEQMARK} + \alpha_3 \text{M/B} + \alpha_4 \text{ROA} + \alpha_5 \text{RET} \\ & + \gamma_1 \text{NODIV} + \gamma_2 \text{HIDIV} + \gamma_3 \text{CC} + \beta_1 \text{CEOCOMP} + \beta_2 \text{CDFSD} \\ & + \beta_3 \text{CEOEQ} + \beta_4 \text{DELTA} + \beta_5 \text{DELTA2} + e. \end{aligned}$$

Since these are now cross-sectional regressions, we cannot include the CEO or year-specific dummy variables. Therefore, we include three more control variables suggested by Core and Guay (1999) to try to capture more firm-specific effects. NODIV is a dummy variable set to one if the firm pays no dividends.[13] HIDIV is a dummy variable set to one if the firm pays high dividends.[14] Finally, CC is a measure of cash constraint.[15] The γ_p ($p = 1,2,3$) are the parameters on these new control variables.

A summary of the results for these year-by-year regressions is presented in Table 4. The most striking feature is a comparison of the results of the regressions for the portions of salary paid and option grants. The portion of salary is negatively related to the level of total CEO compensation in all fourteen years, and the portion of option grants is positively related with total pay in each year. These findings strongly reinforce our confidence in the results shown in Table 2, supporting hypothesis H_1.

The results also reinforce the earlier confirmation of hypotheses H_4 and H_5 for the portions of salary paid and option grants to CEO. In all but one of the years (2002), the U-shaped relationship of delta with salary compensation and the inverted U-shaped relationship of delta with option grants shine through.

There is a consistent positive relationship between the proxy for equity risk and the portion of executive option grants in the years from 1992 through 2001. We also find strong negative relationships of the portion of bonus compensation with both total CEO compensation and the measure of firm equity risk. These results reinforce the evidence of the negative relationships reported in Table 2.

12 Again, we execute initial OLS regressions to eliminate outliers.

13 This includes share repurchases as well as common and preferred cash dividends.

14 This dummy is set to one if common and preferred cash dividends (and/or share repurchases) are more than 50% of retained earnings.

15 First, calculate the sum of common or preferred cash dividends, capital expenditures, and cash investment expenditures. Then subtract cash flows from operations. The sign of the difference indicates whether cash outflows are greater than cash inflows. Finally, the difference is scaled by total assets.

Table 4
Year-By-Year Tobit Model Estimation

SALRYPC						
Year	*Obs*	*CEOCOMP*	*CDFSD*	*CEOEQ*	*DELTA*	*DELTA2*
1992	182	−0.0550***	−0.0127	0.1029*	−13.6956***	7.8225***
1993	600	−0.0797***	−0.0505	0.0197	−4.2638**	2.5662**
1994	805	−0.0521***	−0.0137	0.0371	−17.8031***	10.0281***
1995	855	−0.0472***	−0.0260	0.0296**	−5.6416***	3.3097***
1996	889	−0.0240***	−0.0692*	0.0288**	−13.8035***	7.6832***
1997	906	−0.0118***	−0.1075***	0.0345*	−25.7864***	14.4052***
1998	917	−0.0179***	−0.1106***	0.0318	−9.6696***	5.6151***
1999	935	−0.0056***	0.0003	0.0130***	−12.5936***	7.2249***
2000	719	−0.0031***	−0.0639*	0.0554***	− 7.7076***	4.3620***
2001	878	−0.0104***	−0.1160***	0.0458***	−10.2212***	5.8614***
2002	898	−0.0260***	0.0768**	0.0106	− 0.7395	0.2708
2003	1,029	−0.0211***	0.0419	0.0055	−14.0924***	8.1312***
2004	962	−0.0187***	0.0352	0.0195	−5.7690***	3.3950***
2005	739	−0.0120***	−0.0140	0.0700***	−4.5741***	2.5837***
BONUSPC						
Year	*Obs*	*CEOCOMP*	*CDFSD*	*CEOEQ*	*DELTA*	*DELTA2*
1992	181	−0.0077	−0.0457	0.0637	0.4335	−0.1031
1993	598	−0.0030	−0.0762*	0.0029	−3.3138*	2.0607*
1994	805	−0.0109***	−0.1319***	0.0016	−2.7383	0.1583
1995	857	−0.0065***	−0.1924***	−0.0061	−0.6600	0.5024
1996	888	−0.0025***	−0.1322***	0.0061	−2.3534	1.5494
1997	902	−0.0072***	−0.1199***	0.0121	6.9337**	−3.6181*
1998	914	−0.0042***	−0.1326 ***	0.0176	0.1715	0.0100
1999	935	−0.0035***	−0.2517***	0.0012	−2.0567	1.2662
2000	722	−0.0011*	−0.2015***	0.0000	1.2326	−0.5657
2001	875	−0.0020*	−0.1286***	0.0050	2.1994	−0.9699
2002	905	−0.0086***	0.0349	−0.0100	1.4697	−0.7735
2003	1,027	−0.0063***	−0.1298***	0.0019	−2.6285	1.5976
2004	976	−0.0064***	−0.0294	−0.0156	−3.5995**	2.1939***
2005	754	−0.0066***	0.0363	−0.0330*	−3.6762*	2.2647**
OPTGRPC						
Year	*Obs*	*CEOCOMP*	*CDFSD*	*CEOEQ*	*DELTA*	*DELTA2*
1992	182	0.0447***	0.2753***	−0.1769	14.4000**	−8.6693***
1993	601	0.0921***	0.1529**	−0.0605	12.5284***	−7.6894***
1994	811	0.0694***	0.1650**	−0.1160	38.2405***	−21.7455***
1995	859	0.0547***	0.2578***	−0.0711	11.3814***	−6.9423***
1996	893	0.0310***	0.2654***	−0.0554*	27.3028***	−15.7033***
1997	914	0.0197***	0.4173***	−0.1006**	27.9358***	−16.1651***
1998	922	0.0243***	0.3538***	−0.0762**	15.3053***	−9.3209***
1999	942	0.0103***	0.3464***	−0.0262***	18.5723***	−11.0491***
2000	731	0.0057***	0.3915***	−0.0838**	11.9400***	−7.1170***
2001	888	0.0057***	0.3991***	−0.0690***	8.8135**	−5.6155**
2002	908	0.0356***	−0.0360	0.0137	−0.1494	0.0584
2003	1,034	0.0167***	0.1812***	−0.0286	22.8058***	−13.4529***
2004	982	0.0120***	0.0713	−0.0130	14.2626***	−8.7939***
2005	757	0.0101***	−0.0501	−0.0459	18.6286***	−11.2568***

Table 4 (Continued)

			RSGRPC			
Year	*Obs*	*CEOCOMP*	*CDFSD*	*CEOEQ*	*DELTA*	*DELTA2*
1992	180	0.0208	−0.5292*	−0.1454	15.9939	−8.8041
1993	586	0.0153	−0.5784***	−0.3071	3.9387	−1.9344
1994	789	0.0082	−0.2422**	4.1052	−2.2498	0.2547
1995	834	0.0079*	−0.2564***	−0.0238	2.1468	−1.3608
1996	863	0.0071*	−0.3175***	−0.2285	8.0658	−4.3480
1997	883	0.0004	−0.4309***	−0.0388	7.8770	−4.4205
1998	895	0.0073**	−0.2749***	−0.0374	−0.1187	0.0830
1999	913	0.0050**	−0.1703**	−0.5347*	11.0368*	−6.1784*
2000	717	0.0000	−0.2275***	0.0530	12.8173*	−7.1932*
2001	864	0.0023	−0.2199***	0.0083	7.8550	−4.5749
2002	880	0.0162***	−0.2815***	−0.1789	1.7010	−0.7982
2003	1,012	0.0281***	−0.2544***	0.0181	9.2801	−5.3201
2004	965	0.0179***	−0.3073***	0.0089	5.4988	−3.1149
2005	750	0.0146***	−0.500	0.0277	0.2066	0.0967

Notes:
SALRYPC - Salary as a Percentage of Total Annual CEO Compensation,
BONUSPC - Bonuses as a Percentage of Total Annual CEO Compensation,
OPTGRPC – Option Grants as a Percentage of Total Annual CEO Compensation,
RSGRPC – Restricted Stock Grants as a Percentage of Total Annual CEO Compensation,
CEOCOMP – Real Total Annual CEO Compensation,
CDFSD – The Cumulative Density Function of the Annualized Standard Deviation of Daily Stock Returns,
CEOEQ – Real Value of Shares, Restricted Shares and the Estimated Real Black-Scholes Value of Options Held by the CEO,
DELTA – Estimated Delta of the CEO's Equity Portfolio,
DELTA2 – DELTA Squared.
*** 99% Confidence Level ** 95% Confidence Level * 90% Confidence Level.

7. SUMMARY AND CONCLUSION

We conduct an empirical study of the interrelationship of the major components of managerial compensation, salary, bonuses, option grants and restricted stock grants, using several variables proxying managerial risk-bearing and firm-specific operating characteristics. We are primarily interested in how the personal risks faced by CEOs influence the design of their compensation contracts.

Using the portions of the components of compensation is a fundamental element of our research design, as these measures capture the interactions among the components. The use of the proportional measures is consistent with how weights are assigned to the elements of compensation in a constrained maximization setting.

Collectively our results provide considerable evidence that the personal risks faced by CEOs have significant effects on the design of their compensation contracts. However, they also highlight important differences between the various components of cash and stock-based pay.

We confirm all five of our hypotheses about the portion of salary compensation. As expected from the standard utility argument, salary is negatively correlated with the level of executive compensation and positively correlated with equity risk and managerial equity holdings. It also has the anticipated U-shaped relationship with the delta of the managers' equity portfolios.

We also find that the 1992 revision of the Internal Revenue Service code, Section 162(m), which disallows the tax deductibility of compensation over one million dollars that is not tied to firm performance, does have some impact on the relationship between total compensation and the portion of salary. We find that when CEOs' nominal salary is between $750,000 and one million dollars, executives appear to receive a lower portion of salary than is justified by the other firm and managerial characteristics.

Bonuses are the other widely-used form of cash-based compensation. They are usually rewards for meeting performance targets, and they do expose managers to some important personal risk. Consistent with this notion, we find subtle differences between bonuses and salary. Like salary, they are negatively correlated with the level of managerial compensation, and have a U-shaped relationship with the delta of the CEOs' equity portfolio. However, unlike salary, they are negatively correlated with firm equity risk.

As expected, option grants are positively correlated with the level of annual CEO compensation, and they are negatively related to executive equity holdings. Contrary to the standard utility argument, we find weak evidence of a positive relationship between option grants and firm equity risk. Most notably, we find strong support for the hypothesis that the portion of option grants has a powerful inverted U-shaped relationship with the delta of CEO equity portfolios.

In the early years of our study, restricted stock grants were very rare, but their popularity has recently exploded. As expected from the standard utility argument, restricted stock grants are positively related to the level of annual CEO pay, and they are negatively correlated with our proxy for firm equity risk. They also have the anticipated U-shaped relationship with delta.

Our set of unified tests of all four major forms of CEO compensation adds interesting new insights into the continuing debate on executive pay. Our findings reinforce the notion that the salary component of executive pay is balancing some of the personal risks the CEOs bear from the other elements of their compensation packages and their equity portfolios.

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