The Sarbanes Oxley Act of 2002: Implications for Compensation Contracts and Managerial Risk-Taking

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Abstract

The Sarbanes Oxley Act of 2002 (SOX) introduced several governance reforms that considerably increased the total risk exposure of CEOs. We examine the effects of these regulatory changes on compensation contracts of CEOs and their effect on risk taking subsequent to SOX. We find that while overall compensation did not change, salary and bonus compensation increased and option compensation decreased following the passage of SOX. The sensitivity of CEO's wealth to changes in shareholder wealth also decreased after SOX. These results indicate that the pay for performance sensitivity of CEO compensation has declined following SOX. Our results indicate that these changes reduced investments in research and development, and capital expenditures. We also document that the above changes in CEOs' pay for performance sensitivities and their risky investments following SOX are associated with a reduction in stock return volatility. However, we do not find any evidence indicating that these changes are associated with lower future operating performance.

1. Introduction

In response to the recent corporate scandals, the U.S Congress enacted the Sarbanes Oxley Act in 2002 (henceforth, SOX) aimed at regulating the governance of firms. The primary purpose of SOX is to rebuild investors' confidence in capital markets. SOX introduces several provisions, such as Section 404 rules on internal controls, which are likely to prevent or limit fraudulent financial reporting. However, critics argue that SOX may not prevent future corporate scandals and is likely, in fact, to result in significant costs (see, for example, Ribstein, 2005).

Our primary objective in this paper is to examine whether SOX had adverse economic consequences. Specifically, we begin by studying two implications of the governance regulations imposed by SOX: firms' responses in terms of CEOs' compensation contracts, and how CEOs' responded to these changes in terms of their investments in risky projects.

The motivation behind investigating changes in managerial actions after SOX is to assess whether the passage of SOX is costly to shareholders. If the structure of incentives of CEOs were optimal prior to SOX, then changes in these levels after SOX will result in changes in real decisions made by CEOs, and hence will be costly to investors.[1] Thus, our third objective is to investigate whether changes in compensation contracts and risk-taking activities by CEOs after SOX had adverse consequences on subsequent operating performance.

[1] For example, Zhang (2007) estimates that, as a consequence of the passage of SOX, the market capitalization of the firms traded on US exchanges fell by $1.4 trillion. Since there are approximately 10,000 publicly traded firms, the net effect of SOX is around $140 million per firm. This amount, in turn, is unlikely to simply reflect the present value of the incremental direct compliance costs of SOX. A switch to less risky corporate strategies (assuming the previous strategies were optimal) could easily result in a reduction of shareholders' wealth in the magnitude documented by Zhang (2007).

Several mandates in SOX impose specific additional liabilities on CEOs. For instance, CEOs face higher risk from misstatements of financial information in the form of increased criminal and civil penalties, and broader financial reporting responsibilities, including the certification of financial statements and developing an internal control system for financial reporting. One likely consequence of these mandates is that firms alter compensation contracts to protect their CEOs from these added risks.

We begin by examining changes in the total compensation, individual components of compensation (including salary, bonus, option grants), the ratio of incentive compensation to fixed salary, as well as changes in two commonly used pay for performance sensitivities (namely, the *Jensen-Murphy* statistic and portfolio equity incentives) of CEOs after the passage of SOX.[2]

We do not find evidence that overall compensation levels increased after the passage of SOX. However, we find that the levels of salary and bonus compensation increased after SOX, while the value of option grants decreased after SOX. Further, the ratio of incentive compensation (the sum of bonus, options and restricted stocks) to fixed salary declined after SOX. Thus, the evidence suggests that CEOs were given lesser incentive compensation in the post-SOX period, and firms switched to more bonus awards rather than option grants. This shift is likely to represent firms' response for shielding executives from some of the risks imposed by SOX. We also document that the above compensation changes resulted in significant declines in the *Jensen-Murphy* statistic and

[2] The *Jensen-Murphy* statistic is defined as the dollar change in CEO wealth for a $1000 change in firm value, and the measure of the CEOs portfolio equity incentives corresponds to a dollar change in CEO wealth for a 1% change in firm value (Core and Guay, 1999).

in CEOs' portfolio equity incentives, indicating that pay for performance sensitivities for CEOs were significantly lower after the passage of SOX.

The new regulatory environment and the resulting changes in the compensation and incentives of CEOs are likely to affect their real decisions, such as inducing them to deviate from value-maximizing actions. One potential deleterious effect of governance reforms such as SOX is reduced risk-taking activities by managers – incentives to undertake risks are reduced when managers face penalties for bad outcomes.[3]

Our next objective is to examine whether there was a change in risky investments made by CEOs after the passage of SOX. We compute total risky investments as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firms.[4] We find that these risky investments declined significantly in the post-SOX period, even after controlling for the effects of the economic environment and compensation structure on executives' real actions.

In our final analyses we examine the performance consequences of the changes in compensation and risky investments after SOX. Specifically, we investigate whether these changes are related to future operating performance. We also examine whether these changes are associated with future stock return volatility which is a summary measure of the consequences of all risky investments made by firms. We document that the changes in CEOs' pay for performance sensitivities and their risky investments after

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[3] Note that the board can "undo" the negative incentives of the penalties by adjusting the CEO's compensation package. Thus, only if the board chooses not to do so, then there will be consequences in terms of reduced risk taking.

[4] These variables have been used in the literature as measures of risky investments (e.g., Kothari, Laguerre, and Leone 2002; Coles, Daniel, and Naveen, 2006; Verdi, 2007).

SOX are negatively related to future stock return volatility. However, we do not find evidence that these changes are detrimental to future operating performance.

The economic implications of governance reforms form an important research topic, and there has been considerable academic interest in the consequences of SOX (e.g., Li, Pincus and Rego 2007; Cohen, Dey and Lys 2008; Engel, Hayes and Wang 2007; Leuz, Triantis and Wang 2007, among others). We contribute to this growing literature by providing evidence on the impact of the regulations introduced by SOX on compensation structures of CEOs and their investment decisions. Further, we investigate whether these changes had an impact on subsequent operating performance. This evidence is likely to be relevant to both academics and regulators, and consists of a useful addition to current debates on the costs and benefits of SOX.

The remainder of the paper proceeds as follows. Section 2 presents the research questions and develops the hypotheses. Section 3 discusses the research design, including the data, summary statistics and the model used in the analysis. Section 4 presents the results of the tests. Section 5 discusses some additional analysis we conduct to relate our results to SOX, and Section 6 concludes.

2. Research Questions and Hypotheses Development

Optimal contracting involves minimizing agency costs without unduly reducing the benefits of the agents. This involves encouraging the agent to take the owners' interests into account without forcing her to bear too much of the firm's risks and at the same time not to behave more cautiously than the owners would want her to. Regulation can affect this in unpredictable ways, depending on how increased liability and regulation attributes affect the agents' incentives.[5]

We examine the effect regulation can have on agents' actions and how firms respond to them from the perspective of the rules imposed by SOX. Two related papers in this area include Wang (2005) and Carter, Lynch, and Zechman (2007). Wang (2005) examines changes in the level and structure of CFO compensation and documents a decrease (increase) in the weights on public performance measures for firms with strong (weak) board structures and high (low) proportion of uncontrollable risk after the passage of SOX. Carter, Lynch and Zechman (2007) document that firms placed more weight on reported earnings in the design of bonus contracts after the implementation of SOX.[6]

SOX requires firms to increase the quality of financial reporting and disclosures. In addition, Sections 302 and 304 of SOX require CEOs to return any incentive-based compensation they received in the event of subsequent accounting earnings restatements. This provision explicitly provides for liability up to the amount of incentive-based compensation for the misconduct by others in the organization, regardless of the CEO's knowledge, even if the CEO were to exercise reasonable care in monitoring and instituting controls.

The above specific requirements impose additional liabilities on CEOs, and firms are likely to respond by increasing compensation levels in order to maintain the executives at their original utility levels. On the other hand, there has been a lot of criticism regarding the high levels of CEO compensation, and the recent accounting scandals have

[5] Prior studies have documented an increase in overall compensation levels as well as an increase in performance related pay following deregulation in the banking industry and the adoption of state-level anti-takeover laws (Hubbard and Palia, 1995; Bertrand and Mullainathan, 1999).
[6] See Hermalin and Weisbach (2005) for a theoretical framework for evaluating these reforms in SOX.

focused attention again on this issue. Moreover, several studies have documented that CEOs in the US are overpaid, and that option grants mainly contribute to the excessive CEO pay (Conyon and Murphy, 2000; Bebchuk and Fried, 2004; Jensen, Murphy and Wruck, 2004). Thus, if in response to the high publicity after the scandals and SOX, firms reduced option grants but did not increase other forms of compensation to make up for the difference, then there is likely to be a drop in overall observed compensation levels. We begin by examining the trend in total compensation levels in the period leading to SOX and after the passage of SOX.

Predictions regarding the individual components of compensation levels are not clear as well. If firms choose to compensate CEOs for the additional liability imposed on them by SOX, they can do so by increasing both salary and incentive-based compensation, by increasing salary levels only, by increasing the level of incentive-based compensation only (both bonus and stock-based compensation), or by altering the mix of incentive-based compensation. For instance, executives may be awarded more bonus compensation and less option compensation, if the associated risk is lower with bonus compensation. Bonus awards are typically made with reference to some performance standard, and firms can always select a performance standard that is less risky. The original utility level of the executive can be maintained by adjusting the salary component. Firms could also reduce option grants in the post-SOX period in response to criticisms on excessive CEO pay. Our second research objective is to examine changes in specific components of compensation structure in the post-SOX period. Specifically, we examine trends in the levels of fixed and incentive-based compensation, as well as changes in the ratio of incentive to fixed compensation post-SOX.

We also investigate the implications of such changes in compensation structures for CEOs' pay for performance sensitivities. Prior literature documents that the explicit relation between CEO stock and option holdings and shareholder wealth provides most of executives' incentives (Jensen and Murphy, 1990; Hall and Liebman, 1998). Thus, we examine changes in two pay for performance measures commonly used in the literature: the *Jensen-Murphy* statistic, defined as the dollar change in CEO wealth for a $1000 change in firm value; and the measure of the CEOs portfolio equity incentives as defined in Core and Guay (1999), which corresponds to a dollar change in CEO wealth for a 1% change in firm value.

Any changes in compensation contracts made after SOX could be merely cosmetic, or they could have real economic effects through executives' observed actions. Moreover, by itself, regulation that imposes additional risks on executives is likely to induce them to respond in ways to reduce their risks of liability.

Under SOX, CEOs and CFOs are required to vouch for their firms' financial statements and internal controls systems, by certifying in each annual and quarterly report that "based on the officer's knowledge" the statements fairly describe the financial condition of the company. This provision may impose costs based on a court's ex-post judgment that the executive certified controls that proved to be inadequate. In other words, SOX penalizes executives for misconduct by others, even when they might have taken reasonable care in monitoring their subordinates ex ante. This could lead executives to avoid investing in projects that they do not have much control over, but will still be held liable for the outcomes. Second, the SOX regulation raises the cost of failure. These provisions therefore require executives to bear some of the risk of fraud formerly borne more cheaply by diversified investors. This may induce the agents (in our case, the CEOs) to act more conservatively than the owners would prefer them to unless they are compensated for the additional risk. Our next objective is to investigate managers' investment policies post-SOX by looking at their investments in research and development and capital expenditures.

Note that firms could alter compensation structures that would prevent such declines in risk-taking incentives of managers. If firms respond to SOX by fully indemnifying the executives, then the additional liability may have little effect on their incentives and real actions. In this case, we would not observe a significant change in the risk-taking activities of executives.[7] To be able to address whether these changes had any adverse consequences for subsequent firm performance, we examine whether compensation and risky investment variables are related to future return on assets after SOX. We also examine whether these variables are related to subsequent stock return volatility, which aggregates the risk-taking effects of several risky actions such as mergers, R&D investments, and capital expenditures (Hanlon, Rajgopal and Shevlin, 2004). Thus, any changes in risky investments after SOX are also likely to affect observed future stock return volatility.

3. Research Design

3.1 Data and Summary Statistics

Our sample is selected from the set of industrial companies, excluding utilities, financial, and transportation firms per the COMPUSTAT annual industrial and research

[7] On the other hand, even fully indemnified executives may act more cautiously because of the risk of reputational harm, in which case we would still observe a drop in risk taking activity.

files, and EXECUCOMP for the period 1992-2006.[8] Merging the COMPUSTAT and EXECUCOMP databases results in a sample of 1,279 firms with 14,013 firm-year observations. This final sample represents only firm-year observations where data for all variables included in the analysis is available.

Table 1 presents the mean and the median values of the main variables employed in the analysis. The sample is dominated by large firms, primarily due to the requirement that firm observations be present in the EXECUCOMP database. An analysis of the medians indicates that, consistent with the recent literature on executive incentive-based compensation, options form the dominant component of compensation for the sample firms, followed by salary and bonus compensation. The ratio of option and bonus compensation to salary indicates that on average the incentive-based compensation for the sample firms was more than double the fixed salary component.

3.2. Model

Compensation Structure and Risky Investments

In analyzing CEOs' action choices and their compensation, we take into account the endogenous relation between these variables. CEOs make action choices in response to the incentives provided to them through their compensation contracts, and executive compensation takes into account what actions CEOs are likely to take given their incentives. Thus, the action choice and the compensation structure are likely to be directly related to each other, and studying these choices in a single decision framework may lead to erroneous inferences.

[8] Our sample begins from 1992 as EXECUCOMP does not have data prior to this year.

We employ a two stage least squares (2SLS) model as the empirical representation of the relationship between the investment choices of CEOs, and the components of their compensation. The structural equations for the two stage least squares regressions are the following:

$$\begin{aligned} COMP\_VAR_{j,t} = {} & \alpha_0 + \alpha_1 \times LOGASSETS_{jt} + \alpha_2 \times INVEST_{jt} + \alpha_3 \times DEV\_INC_{jt} \\ & + \alpha_4 \times RETURN_{jt} + \alpha_5 \times O\_COMP\_VAR_{jt} + \alpha_6 \times AGE_{jt} \\ & + \alpha_7 \times TIME_{jt} + \alpha_8 \times SOX_{jt} + \alpha_9 \times INVEST_{jt} \times SOX_{jt} + \varepsilon_{jt} \end{aligned} \quad \ldots.(1)$$

$$\begin{aligned} INVEST_{j,t} = {} & \alpha_0 + \alpha_1 \times Lag\_INVEST_{jt} + \alpha_2 \times LOGASSET_{jt} + \alpha_3 \times \Delta LOGSALES_{jt} \\ & + \alpha_4 \times RETURN_{jt} + \alpha_5 \times STDROA_{jt} + \alpha_6 \times M\_B_{jt} + \alpha_7 \times AGE_{jt} \\ & + \alpha_8 \times COMP\_VAR_{jt} + \alpha_9 \times TIME_{jt} + \alpha_{10} \times SOX_{jt} \\ & + \alpha_{11} \times COMP\_VAR \times SOX_{jt} + \varepsilon_{jt} \end{aligned} \quad \ldots..(2)$$

In equation (1), we investigate the changes in two compensation variables, represented as *COMP_VAR*, which is either *L_EQUITY_INCENTIVES* or *CASH_COMP*. The variable *L_EQUITY_INCENTIVES* is the logarithm of [1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held)], and *CASH_COMP* is the sum of salary and bonus, divided by total compensation. For each of the dependent compensation variables, we include the other compensation variable as a control (represented by *O_COMP_VAR* in equation (1)) since compensation committees are likely to set each element of compensation conditioned on the other compensation variable.

In equation (2), our dependent variable measuring the total risky investments made by firms is represented by *INVEST* which is calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets. This is consistent with the measures of risky investments employed in prior studies (e.g., Verdi, 2007).[9]

In the above system of equations, the investment variable, *INVEST*, and the compensation variables, *L_EQUITY_INCENTIVES* and *CASH_COMP* are likely to be jointly determined. We predict a positive association between *INVEST* and *L_EQUITY_INCENTIVES*, as such incentives are likely to induce executives to undertake more risky projects. However, the relation between *INVEST* and *CASH_COMP* is not clear. Berger et al. (1997) argue that CEOs with more cash compensation are more likely to be entrenched and will seek to avoid risk. In this case, we would observe a negative relation between *INVEST* and *CASH_COMP*. On the other hand, CEOs with higher cash compensation are likely to be better diversified and have more money to invest outside the firm and therefore are less risk averse (Guay, 1999). Under this scenario, there will be a positive relation between *INVEST* and *CASH_COMP*.

The control variables we use in equations (1) and (2) are consistent with those used in prior studies (e.g., Guay, 1999; Coles, Daniel and Naveen, 2006; Bens, Nagar and Wong, 2003). In equation (1), *LOGASSET* is the logarithm of total assets which is our proxy for firm size. Larger firms require more talented managers who are more highly compensated (Smith and Watts, 1992). Under the typical assumption that managers' utility functions exhibit declining absolute risk aversion, CEOs of larger firms are likely to have higher equity incentives (e.g., Core and Guay, 1999; Himmelberg et al., 1999). Thus we expect firm size to be positively related to both our compensation variables.

The variable *DEV_INC* is the logarithm of (actual incentive level/predicted incentive level) for year t-1, where actual incentive level is the delta of the equity portfolio and

[9] We set research and development equal to zero when it is missing in COMPUSTAT.

predicted incentive level is based on the Core and Guay (1999) model. We include this variable to control for the possibility that firms may provide compensation to CEOs in response to the extent to which their existing incentive levels have deviated from the optimal incentive levels, and expect *DEV_INC* to have a negative coefficient.

The variable *RETURN* is the cumulative 12 months returns for year t for firm j. We expect a positive relation between compensation levels and *RETURN* because executives in better performing firms are likely to be awarded greater bonus and other incentive-based compensations. We include the age of the CEO, *AGE*, as a control based on prior research that has shown CEO age to be significantly related to pay sensitivities (Gibbons and Murphy, 1992). Further, pay sensitivities offered to CEOs have been shown to be strictly increasing in CEO reputation (Milbourn, 2003). To the extent the age of the CEO is correlated with the CEO's reputation, we expect a positive association between CEO age and the compensation variables. On the other hand, compensation committees might award lower risk-taking incentives to older CEOs to prevent them from investing in excessively risky projects just before retirement. If this is true, we would find a negative relation between *AGE* and *L_EQUITY_INCENTIVES.*

Finally, we include two dummy variables, *TIME* which is defined as the calendar year minus 1992, and *SOX* which takes a value of 1 if the observation is from year 2002 through 2006. These variables capture whether CEO compensation has been increasing over time and whether there was a significant increase in these compensation variables after the passage of SOX.

In our risky investments equation (equation (2)) we include control variables that are likely to be associated with investments as evidenced in prior studies. We include the lagged investment variable, *Lag_INVEST* in the above regressions to control for any omitted correlated variables. Prior research has shown that these investment choices are significantly associated with the lagged values of these variables (e.g., Bens et al. 2003). As in prior literature, we include *LOGASSET* (defined earlier) to proxy for firm size and expect a negative relation between *INVEST* and *LOGASSET*. We also include Δ*LOGSALES* defined as the change in the natural logarithm of sales from the prior year to measure the growth rate in sales of the firm, and expect a positive relation for this variable (Coles et al., 2006).

Guay (1999) shows that firms with greater growth opportunities provide more risk-taking incentives and that firm risk is indeed greater when managers have more risk-taking incentives. Thus, we include the market to book ratio, *M_B*, as the measure of growth opportunities and expect a positive coefficient on this variable. We control for the operating uncertainty by including the standard deviation of *ROA* over the five years period prior to the current year (*STDROA*), and expect that more risky investments are associated with more uncertainty. Bhagat and Welch (1995), in a study of R&D expenditures, show that in addition to the market-to-book ratio, a firm's stock returns can affect the investment decision. We also include the cumulative 12 months stock returns as a control variable and expect a positive relation between stock returns and risky investments. Apart from being a measure of performance, high stock returns are also likely to signal future opportunities and lower current cost of capital, and managers in such firms are likely to increase investments in risky projects.

Finally, we use the age of the CEO, *AGE*, to control for the level of risk aversion of CEOs. Older executives who are approaching retirement may have lesser incentives to undertake risky projects. Dechow and Sloan (1991) document that CEOs in their final years in office reduce research and development spending, presumably to increase reported earnings. Thus, we expect negative coefficients for *AGE*.

The variable $TIME$ captures the trend over time in the corresponding dependent variables. The dummy variable SOX captures the change in the risky investments by CEOs and the changes in compensation structures after the passage of SOX.[10]

Impact on Future Return Volatility and Future Operating Performance

Next, we investigate the performance consequences of any changes in compensation contracts and CEOs' investment choices after SOX. We study whether compensation and risky investments of CEOs' after SOX are related to one year ahead stock return volatility and one year ahead return on assets.[11] We perform the following OLS regressions:

$$\begin{aligned} STD\_RET_{j,t+1} = {} & \alpha_0 + \alpha_1 \times L\_EQUITY\_INCENTIVES_{jt} + \alpha_2 \times CASH\_COMP_{jt} + \alpha_3 \times INVEST_{jt} \\ & + \alpha_4 \times LEVERAGE + \alpha_5 \times FIRM\_AGE_{jt} + \alpha_6 \times LOGASSET_{jt} + \alpha_7 \times TIME_{jt} + \alpha_8 \times SOX \\ & + \alpha_9 \times L\_EQUITY\_INCENTIVES_{jt} \times SOX + \alpha_{10} \times CASH\_COMP_{jt} \times SOX \\ & + \alpha_{11} \times INVEST_{jt} \times SOX + \varepsilon_{jt} \end{aligned} \quad \ldots(3)$$

$$\begin{aligned} ROA_{j,t+1} = {} & \alpha_0 + \alpha_1 \times L\_EQUITY\_INCENTIVES_{jt} + \alpha_2 \times CASH\_COMP_{jt} + \alpha_3 \times INVEST_{jt} \\ & + \alpha_4 \times SALES + \alpha_5 \times STDROA_{jt} + \alpha_6 \times TIME_{jt} + \alpha_7 \times SOX \\ & + \alpha_8 \times L\_EQUITY\_INCENTIVES_{jt} \times SOX + \alpha_9 \times CASH\_COMP_{jt} \times SOX \\ & + \alpha_{10} \times INVEST_{jt} \times SOX + \varepsilon_{jt} \end{aligned} \quad \ldots(4)$$

[10] We also repeated the above tests by including cash flows from operations, CFO, in the two equations to proxy for the real economic environment and performance. We include this variable to control for the effect of economic activity on firms' research and development expenses and capital expenditures, and on the incentives offered to them. Cash flow from operations is positive and significant in both cases, but the results for the other variables are materially unchanged. The results remain unchanged on repeating the tests using the annual percentage change in real GDP instead of cash flow from operations to control for overall changes in macroeconomic conditions.

[11] When we compute *ROA* we subtract out research and development expenses to prevent any mechanical relations with the variable *INVEST* on the right hand side of the equation.

In equation (3), *STD_RET* is the annualized standard deviation of daily stock returns, *LEVERAGE* is defined as total debt divided by total assets and *FIRM_AGE* is defined as the number of years the firm appears on COMPUSTAT. In equation (4), the dependent variable is *ROA*, the return on assets defined as income from continuing operations divided by total assets and *SALES* are total sales for the year. All other variables are defined as before.

The specifications for the above models and the control variables we consider are based on prior studies in the area. In particular, we refer to Guay (1999) and Coles, Daniel and Naveen (2006) to motivate the inclusion of control variables in equation (3) and Core et al. (1999) for specification (4). We include a measure of leverage in equation (3) based on prior research that suggests that financial leverage creates incentives for managers to assume excessively risky projects on behalf of shareholders (e.g., Harris and Raviv, 1991; Leland, 1998). We thus expect a positive relation between *STD_RET* and *LEVERAGE*. We control for firm age, *FIRM_AGE*, in equation (3) because younger firms are likely to experience greater stock return volatility (e.g., Pastor and Veronesi, 2003; Hanlon, Rajgopal and Shevlin, 2004). Consistent with prior studies, we expect a negative relation between firm size, *LOGASSET*, and stock return volatility, because smaller firms are likely to be riskier (Hanlon, Rajgopal and Shevlin, 2004).

As in prior studies, we include *SALES* and *STDROA* as controls in equation (4). We include *STDROA* given the Core et al. (1999) argument that one needs to control for any relation between firm risk and future reported earnings, and expect a negative coefficient for *STDROA*. Further, there is prior evidence of a negative relation between future operating performance and stock return volatility (Minton, Schrand and Walther, 2002).

Given that earnings volatility is likely to be reflected in the standard deviation of ROA, we expect a negative relation between future ROA and *STDROA*. We predict a positive relation between future ROA and *SALES* because firms with better current sales are expected to perform better in the future. Finally, we include industry dummies (*IND*) in equation (3) and (4) to control for any unmodeled differences in stock return volatility (future performance) that may covary with industry. The next section discusses the results of the hypotheses tested.

4. Results

Section 4.1 reports the descriptive statistics of the individual components of compensation, the incentive compensation–salary mix, the pay for performance variables, the variables measuring risky investments, future stock return volatility and future return on assets, over time. Section 4.2 presents the results for the various compensation variables in equation (1), Section 4.3 discusses the results for the risky investment variables corresponding to equation (2), and Section 4.4 presents the results for the future return volatility and future operating performance as described in equations (3) and (4). All results reported in Tables 2, 3, and 4 are based on robust standard errors (see Petersen, 2007).

4.1 Descriptive Statistics: Executive Compensation Structure and Risky Investments

Table 2 reports the summary statistics of the total compensation (*TOTAL*), salary (*SALARY*), bonus (*BONUS*), option grants (*OPTION*), the two pay for performance measures, namely the *Jensen-Murphy* statistic (*JENSEN_MURPHY*) and equity incentives (*EQUITY_INCENTIVES*), the ratio *MIX*, which is the ratio of *OPTION* plus *BONUS* over *SALARY*, the investment variable, *INVEST*, the future stock return volatility (*STD_RET*) and future return on assets (*ROA*). We also separately examine the trends in the two primary components of the *INVEST* variable, namely research and development expenses, *RD*, and capital expenditures, *CAPEX*. We summarize the data by estimating the following regressions. We regress each of the variables of interest on a time trend and a dummy variable taking the value of one in the post-SOX period (2002 onwards) and zero otherwise. We choose this procedure to describe the variables given the events in the last decade (such as the bursting of the stock market bubble, and the corporate scandals), as many of our variables may exhibit significant time trends (non-stationarity), rendering a traditional summary statistics uninformative.

The results indicate that total compensation has been significantly increasing over time, and it increased after the passage of SOX although this increase is not statistically significant. Further, there were significant over-time decreases in both salary and bonus compensation, and an over-time increase in stock options, which is consistent with the trend in stock option compensation documented in the literature. The dummy variable for the post-SOX period is positive and significant for salary and bonus compensation, and negative and significant for options. These results indicate the CEOs were granted less options after SOX, but their salary and bonus compensations were significantly higher. Firms could have substituted between incentive-based compensations by switching more to bonus awards due to the increased publicity of excessive option grants to CEOs, particularly after the accounting scandals. The ratio of incentive-based compensation to salary, *MIX*, also increased over time, with a significant decrease following the passage of SOX.

Both the pay for performance variables, *JENSEN_MURPHY* and *EQUITY_INCENTIVES* increased over time, with significant declines after SOX. This is consistent with the declines in the option-based compensation after SOX. The trends in the above compensation and incentive variables are depicted graphically in Figures 1A through 1E.

The results for the investment variable *INVEST*, and its components *RD* and *CAPEX*, indicate significant over-time increases in risky investments. The dummy variable for the post-SOX period is negative and statistically significant for all three variables, suggesting that the passage of SOX was associated with a decline in executives' spending on risky investments. Figure 2 illustrates these trends over the time period studied.

The trends in stock return volatility indicate that *STD_RET* increased significantly over time and decreased significantly after the passage of SOX. This is consistent with a decline in overall risk-taking activities of executives after SOX. The future return on assets, *ROA*, shows no significant increasing trend over time, however, there is a significant decrease in operating performance after the passage of SOX.

In summary, the above preliminary analysis indicates that following the passage of SOX, there was a shift in the compensation structure towards more fixed salary, more bonus compensation and less option-based compensation. Although we find evidence that firms altered the structure of CEO compensation, we do not find a statistically significant increase in overall compensation levels after SOX. The negative publicity regarding excessive levels of CEO compensation, particularly during the accounting scandals period, could have resulted in firms being more conservative in terms of overall compensation packages offered to CEOs. The trend towards more fixed versus incentive-based compensation after SOX is likely to be related to the requirement in SOX that executives need to reimburse incentive-based compensation following accounting misstatements.

These preliminary results indicate that the above compensation changes had some real economic effects as well. Specifically, there appears to have been a significant decline in risky investments by firms in the post-SOX period as compared to the period prior to SOX. The results on the future stock return volatility are consistent with such a behavior. The effects of the regulations in SOX on two primary components of compensation, equity-based incentives and cash compensation, and CEOs' investments in risky projects are more formally investigated in the next two sections.

4.2. Compensation Structure

Table 3, Panels A and B summarizes the results of equation (1) for the various compensation variables. Panel A (left column) reports the results when *L_EQUITY_INCENTIVES* is the dependent compensation variable, and Panel B (right column) reports the results when *CASH_COMP* is the dependent compensation variable. We first discuss the results in Panel A.

Consistent with the results of the summary statistics, equity incentives of CEOs increased over time and declined significantly after SOX. This trend is likely to be due to the decline in option-based compensation, which forms a significant part of the equity incentives. We obtain a positive coefficient for *INVEST*, consistent with the notion that higher incentive-based compensation is associated with more investments in risky projects. However, the interaction term *INVEST×SOX* is negative and statistically significant, providing evidence that in the post-SOX period there was a decrease in risky investments. One possible explanation for this result is that although options awarded to CEOs after SOX provided them with incentives to invest in risky projects, they reallocated investment dollars to less risky projects that are not captured by our investment measure. Another possibility is that given that CEOs are required to return incentives-based compensation and stock profits following restatements after SOX, the more equity incentives they have, the more wary they are of investing in risky projects following SOX.

For the control variables, as expected, for the equity incentives variable, a positive and significant coefficient is obtained for *LOGASSET* suggesting that larger firms offer higher equity incentives to their CEOs. As in Core and Guay (1999), a negative and significant coefficient is obtained for *DEV_INC*, indicating that the equity incentives awarded to CEOs depends on the extent to which their existing incentives deviate from optimal levels. We obtain a positive and significant coefficient for *RETURN*, suggesting that CEOs of better performing firms have higher levels of equity incentives. We obtain a positive and significant coefficient for *O_COMP_VAR* (which is *CASH_COMP* in this case), implying that CEOs with more equity incentives also get more cash compensation.

The results in Panel B indicate that, as in the summary statistics, cash compensation decreased over time, but increased significantly after SOX. This is also consistent with the claim that after SOX firms redesigned compensation contracts to provide more cash-based compensation to their CEOs. As with equity incentives, we also obtain a positive coefficient for *INVEST* for cash compensation. This is consistent with the argument in Guay (1999) that CEOs with more cash compensation are better diversified and are less risk-averse. Thus, they are likely to invest in more risky projects.

The interaction term *INVEST*×*SOX* is positive and statistically significant, providing evidence that in the post-SOX period, corresponding to an increase in cash compensation, there was an increase in risky investments. This implies that in the post-SOX period higher levels of cash compensation to CEOs are more likely to have reduced their risk aversion as per the argument in Guay (1999). This result may appear surprising given the earlier result in Panel A supporting the claim that CEOs are likely to be more wary after SOX and invest less in risky projects. However, it is possible that given that a major part of cash compensation is salary, which is not subject to the same return policy following restatements as incentive-based compensation is, CEOs with more cash compensation are more willing to invest in risky projects.

For the other control variables, we find a positive and significant coefficient for *LOGASSET*, suggesting that CEOs of larger firms get more cash compensation, which we interpret as reflecting firms' demand for higher-quality managerial talent. The coefficient on the stock return variable *RETURN* exhibits a positive and significant association with cash compensation consistent with existing evidence in the literature (e.g., Core et al., 1999). As expected, we obtain a positive and significant coefficient for *O_COMP_VAR* (which is *L_EQUITY_INCENTIVES* in this case), confirming the results in Panel A that CEOs with more equity incentives also get more cash compensation.

As suspected, the variable *DEV_INC* is not statistically significant. The variable *AGE* is not significant for both *L_EQUITY_INCENTIVES* and *CASH_COMP*. The next section formally examines changes in risky investments by CEOs in the period after SOX.

4.3.Investment Decisions

Table 4, Panels A and B summarizes the results of equation (2) of the system of equations discussed in Section 4. Panel A (left column) reports the results when the compensation variable is *L_EQUITY_INCENTIVES*, and Panel B (right column) reports the results when the compensation variable is *CASH_COMP*. The results for the two compensation variables are similar and we discuss only Panel A, but point out the differences in results.

The results for the risky investments are also similar to the results presented in Table 2. Investments in risky projects increased over time, while there was a significant decline in risky investments by CEOs in the post-SOX period. One interpretation of this evidence is that after the passage of SOX, increased risk aversion on the part of executives resulted in their spending less on risky projects.

Both equity incentives and cash compensation are associated with more risky investments. This is consistent with the claim that equity incentives and cash compensation (by reducing risk aversion of CEOs) provide CEOs more incentives to substitute towards more risky investments. The results for the interaction terms indicate that $L\_EQUITY\_INCENTIVES \times SOX$ is negative and significant, but the coefficient corresponding to $CASH\_COMP \times SOX$ is positive and significant. These results are consistent with those reported in the previous section. As discussed in the previous section, CEOs with incentive compensation could be more wary after SOX due to the policy that requires them to return any incentive-based compensation following an earnings restatement. There is a possibility that CEOs could have reallocated investment dollars to lesser risky projects which is not captured by our measures. However, this concern is less for cash compensation which is likely to explain the positive coefficient on the interaction term, $CASH\_COMP \times SOX$. These results are consistent with greater risk aversion on the part of CEOs after the passage of SOX.[12]

Among the control variables, as expected, the lagged value of risky investments, *Lag_INVEST*, is positive and highly significant. Consistent with prior studies, risky investments are negatively related to *RETURN* and *LOGASSET*, and positively related to the market to book ratio, *M_B*. The coefficient for *ΔLOGSALES* is negative and significant. The coefficient for *STDROA* is positive and significant as expected, indicating that more risky investments are related to higher operating uncertainty. The coefficient corresponding to *AGE* is negative and significant, as expected. This supports prior results in the literature that older managers, who are likely to retire soon, reduce their investments (e.g., Dechow and Sloan, 1991 in the context of R&D expenses).

4.4. Economic Consequences of Changes in Compensation and Risky Investments

Table 5 summarizes the results of equation (3) which examines the relation between compensation and risky investments and the future standard deviation of stock returns. As expected, we find that *STD_RET* is positively and significantly related to

[12] A caveat: although the finding of changes in compensation structure and a decline in risk taking activity in the period following the passage of SOX does provide evidence of an impact of this new regulation, we cannot attribute these changes solely to SOX due to a number of concurrent events in the post-SOX period. Nevertheless, we conduct additional analyses in Section 5 to address this issue.

L_EQUITY_INVESTMENTS and *INVEST*.[13] Thus, future stock return volatility is associated with higher equity incentives for CEOs and riskier investments. We get a negative and significant coefficient for *CASH_COMP* indicating that firms with a higher proportion of cash in the compensation structure have lower standard deviation of stock returns.

The variable *TIME* is positive and significant, suggesting that stock return volatility has increased over time, and the variable *SOX* is negative and significant indicating a reduction in volatility in the period following SOX. Thus, there appears to be an overall decline in risky investments made by firms after SOX. This is consistent with our results in the previous section. The interaction term *L_EQUITY_INCENTIVES×SOX* is negative and significant, consistent with the results discussed in Section 4.2. If executives with more equity incentives invest less in risky projects post-SOX, this would translate into lower future standard deviation of stock returns. We also find that the term *INVEST×SOX* is negative and significant. This suggests that firms with more risky investments after SOX are associated with lower standard deviation of returns. One explanation for this result is that CEOs are likely to have reallocated dollars to relatively less risky projects among the available pool of investments after SOX, which translates into lower standard deviation of stock returns. These results corroborate the notion that there is likely to be greater risk aversion on the part of CEOs after SOX.

Consistent with predictions and prior studies, smaller firms, firms with more leverage and younger firms exhibit greater future stock return volatility. Thus, overall, the

[13] We also repeated our tests by substituting the variables *MIX* and *OPTION* in place of *L_EQUITY_INCENTIVES*, and the results are similar to those obtained when *L_EQUITY_INCENTIVES* is used. Thus we only report the results with *L_EQUITY_INCENTIVES*, but the results for the other two variables are available on request.

inferences from these set of results are consistent with the prediction that incentives provided to CEOs and their risky investments after SOX reflect greater risk aversion on their part as reflected in future stock return volatility.

Table 6 summarizes the results of equation (4) which examines the relation between compensation and risky investments and the future operating performance of the firm as proxied by the future return on assets. Future operating performance has been increasing over time, but consistent with our earlier results, there is a significant decline after SOX. We find that both equity incentives and cash compensation are associated with higher future operating performance. We also find a positive relation between risky investments and future return on assets. However, none of the interaction terms, *L_EQUITY_INCENTIVES×SOX*, *CASH_COMP×SOX* and *INVEST×SOX* are significant, suggesting that these did not incrementally affect future performance after the passage of SOX. Among the other variables, as in prior studies, *SALES* is positive and significant and *STDROA* is negative and significantly associated with future firm performance. Overall, we do not find evidence suggesting that changes in the compensation structure of CEOs and risky investments made by them after SOX had adverse consequences for subsequent operating performance.

5. Additional Tests: Interpreting the Evidence in Relation to SOX

One limitation of this study lies in attributing the observed changes to SOX per se. The problem arises because the SOX Act was imposed on all U.S. publicly-traded firms and hence it is difficult to find a control group of firms that is not affected by SOX and is comparable to U.S. firms.[14] In this section we perform a test in order to have some assurance that we can attribute the above results to the passage of SOX as opposed to other concurrent events.

We posit that managers in firms that are mostly affected by SOX are likely to be more risk averse post-SOX and are thus likely to make more reductions in risky investments post-SOX. To identify such firms, we consider a set of key legislative events related to the passage of SOX as identified in Zhang (2007). These events are described in Table 7, Panel A, and are events which witnessed significant negative market reactions. We accumulate the abnormal stock return for every firm in our sample during these event windows and use these cumulative abnormal returns to form deciles based on the extent of the negative reaction. Decile (1) corresponds to the portfolio of firms that had the most negative impact, i.e., the lowest cumulative abnormal stock returns around the above events, and decile (10) corresponds to the portfolio of firms that had the least negative impact. For each one of the deciles, Table 7, Panel B reports the average investments in risky projects, *INVEST*, and the stock return volatility, *STD_RET* (a summary measure of aggregate risk-taking effects), for two time periods: before the passage of SOX corresponding to the period 1997-2001 and after the passage of SOX corresponding to 2002-2006.

The results indicate that for all firms there were significant declines in risky investments and in the standard deviation of stock returns, which is consistent with our prior results. Moreover, we find some support that the decline was greater for firms with

[14] Although there are studies that analyze the effects of SOX on foreign firms (such as Berger et al., 2006) which are likely to have a smaller benchmark problem, it is not clear that we can extrapolate their findings to U.S. firms (Leuz, 2007).

more negative reactions to SOX. The difference between the *INVEST* and *STD_RET* for firms in decile (10) and decile (1) is negative and statistically significant supporting the claim that reductions in risky investments were significantly more in firms with the greatest negative reactions to SOX as compared to firms with the least negative reactions.

We repeat this analysis by dividing firms into three groups (results reported in Table 7, Panel C) and get the same results. Although not conclusive, this analysis provides us with more confidence in attributing the changes we document primarily to the additional liabilities imposed by SOX on executives.

6. Conclusion

This paper investigates the changes in the compensation structure of CEOs and their risk-taking activities after the passage of SOX. We document increases in salary and bonus compensation, and decreases in option-based compensation in the period after SOX. The proportion of incentive-based compensation to fixed salary and the pay for performance sensitivities for CEO also declined after SOX.

We next investigate whether the new regulations and the resulting changes in CEO compensation structure had any economic effects in terms of real decisions made by CEOs. We find that, after controlling for the compensation structure on executives' action choices, there was a significant decline in risky investments by CEOs after the passage of SOX. We also document that the changes in equity incentives and risky investments are negatively related to the future stock return volatility. However, we find no evidence that these changes are detrimental to future operating performance.

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Figure 1A: Total Compensation Over Time (1992-2006)

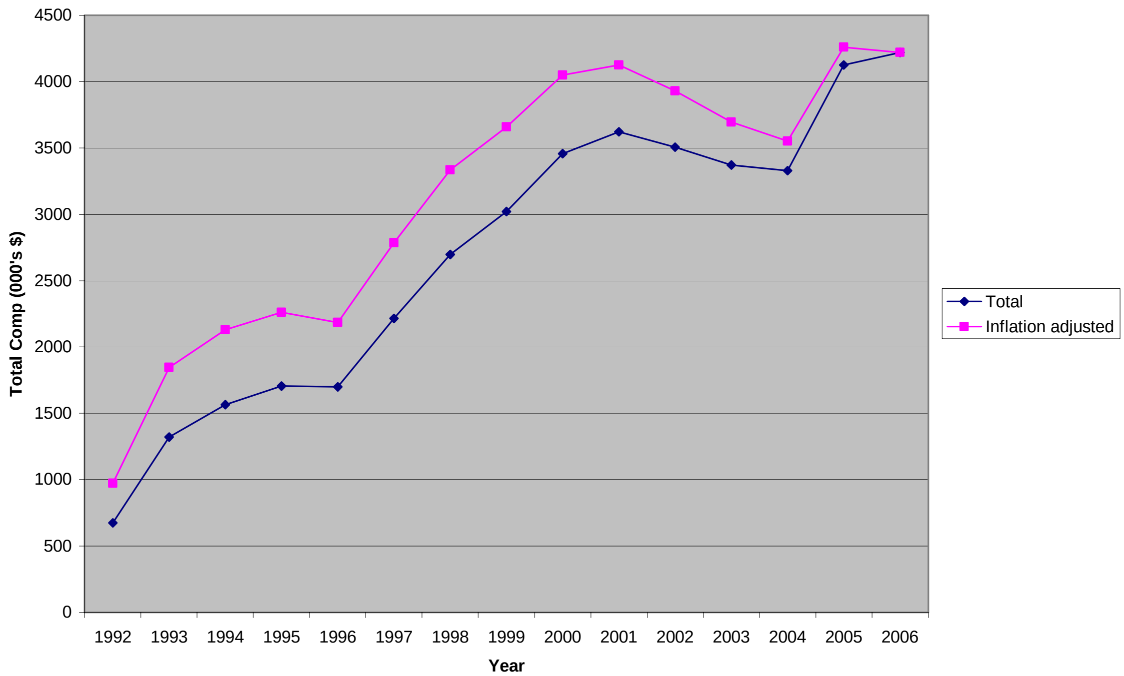

Figure 1B: Compensation Over Time as Percentage of Total Pay (1992-2006)

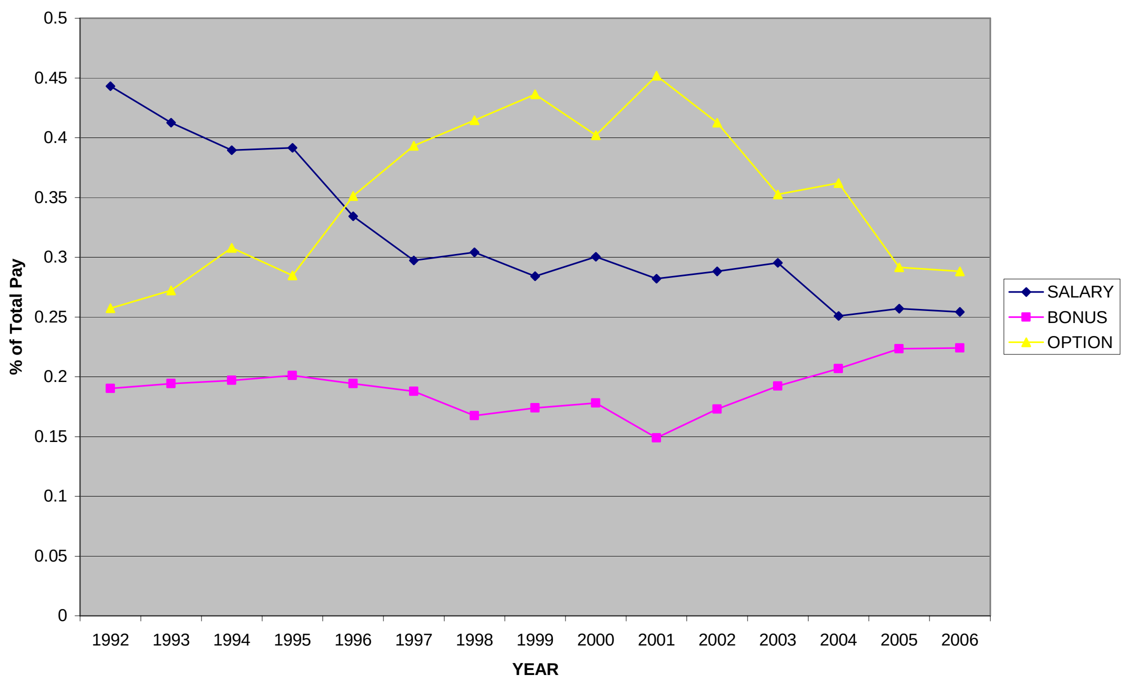

Figure 1C: Compensation Mix Over Time, 1992-2006

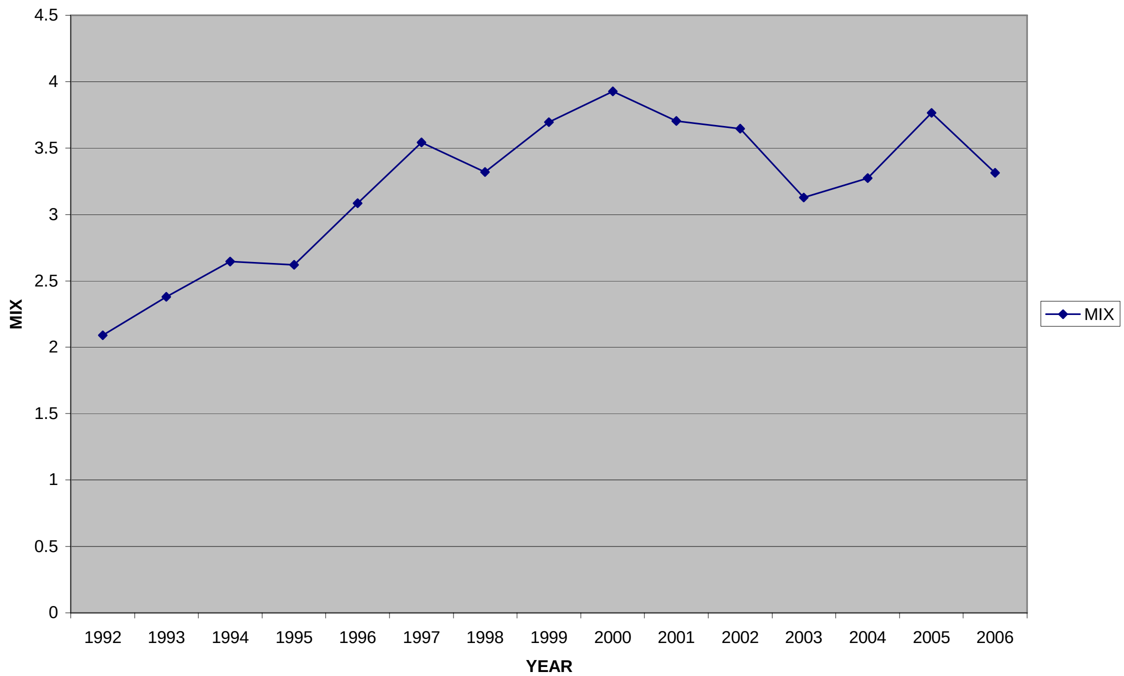

Figure 1D: Equity Incentives Over Time (1992-2006)

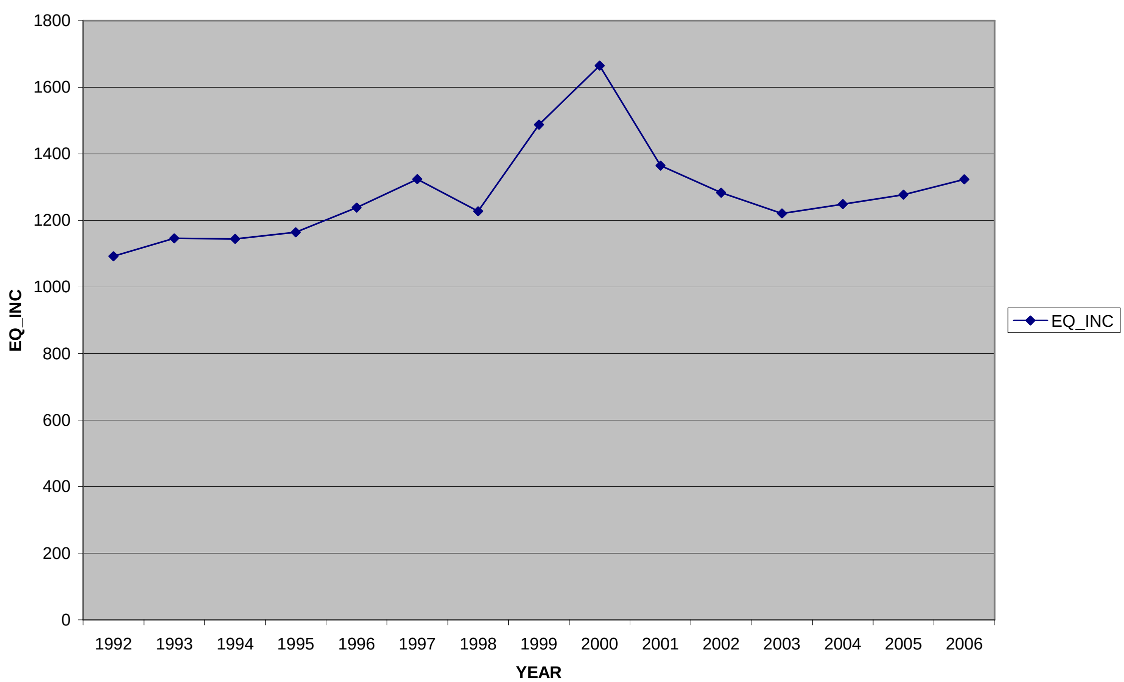

Figure 1E: Jensen_Murphy Statistic Over Time (1992-2006)

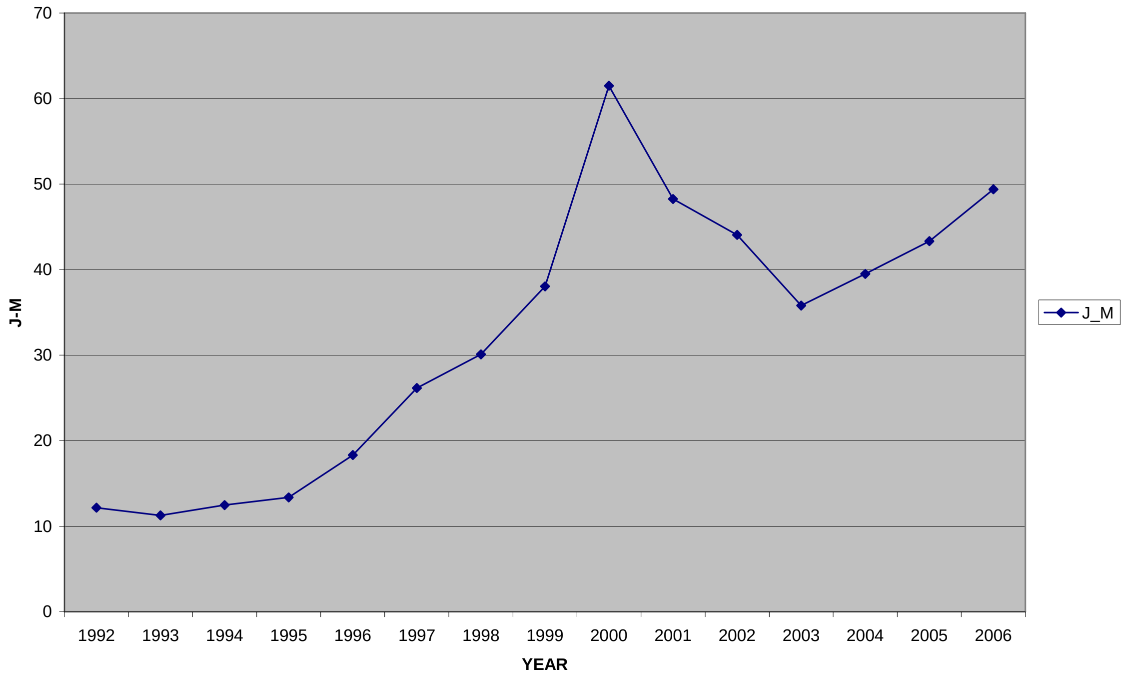

Figure 2: Investments Over Time (1992-2006)

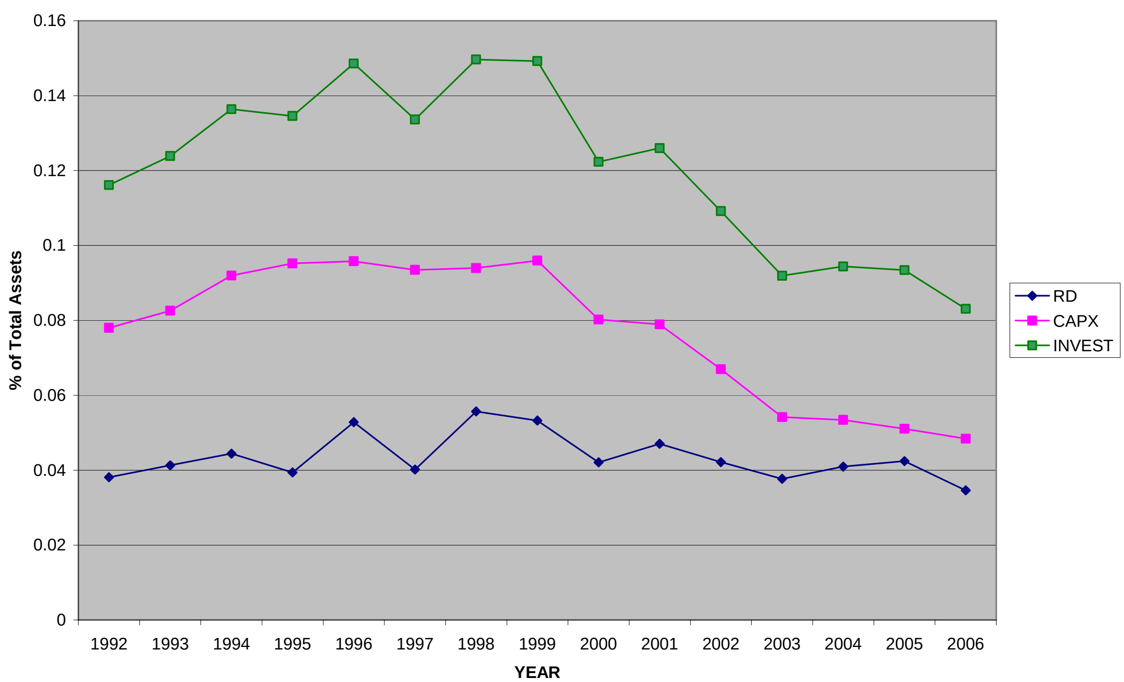

Figure 3: Annualized Standard Deviation of Daily Stock Returns Over Time (1992-2006)

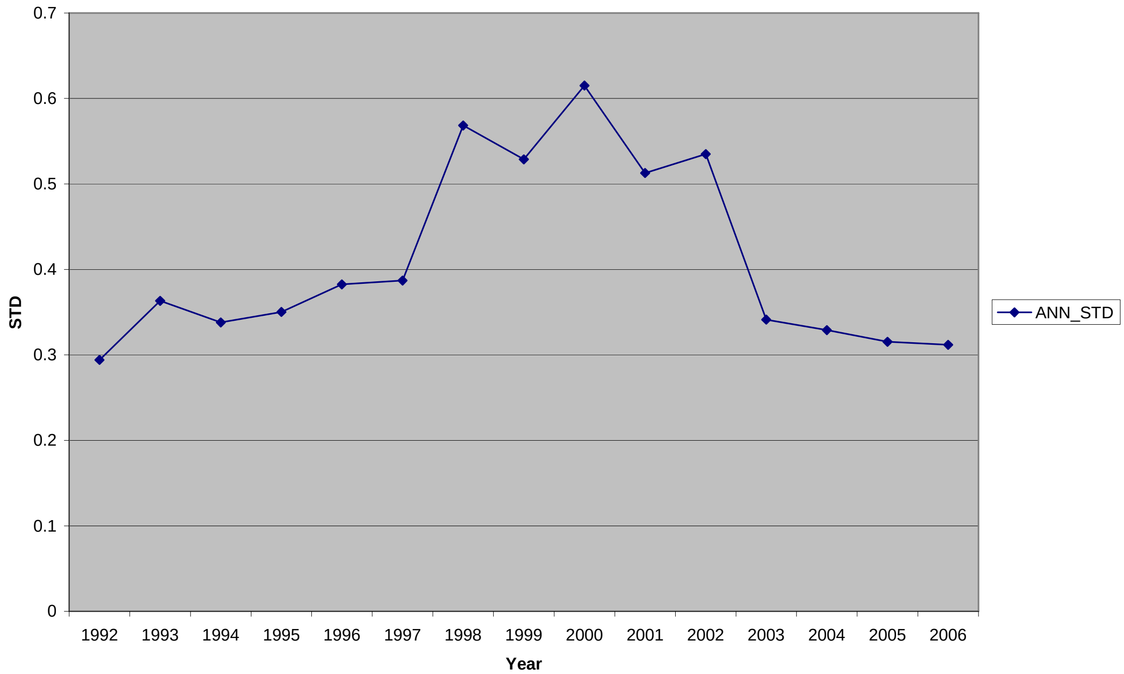

Table 1: Summary Statistics
1992 – 2006, N= 14,013

Variable	Mean	Median
TOTAL (000's $)	2279.98	1465.22
SALARY	0.36	0.29
BONUS	0.19	0.17
OPTION	0.33	0.31
MIX	3.21	2.08
JENSEN_MURPHY('000$)	32.24	29.54
EQUITY_INCENTIVES('000$)	1276.75	375.24
AGE	57.00	57.00
TENURE	60.00	31.00
INVEST	0.14	0.08
RD	0.05	0.01
CAPEX	0.08	0.05
STD_RET	0.411	0.363
ROA	0.041	0.053
SIZE	1791.40	761.732
GROWTH	0.15	0.10
CFO	0.12	0.11

TOTAL is total compensation, where total compensation is variable TDC1 from ExecuComp; *SALARY* is the salary received by the CEO of the firm as a percentage of total compensation*; BONUS* is the bonus compensation received by the CEO of the firm as a percentage of total compensation; *OPTION* is the average Black-Scholes value of options received by the CEO of the firm as a percentage of total compensation; *MIX* is the sum of the Black-Scholes value of option grants plus bonus compensation and restricted stock grants , all divided by the salary of the CEO; *JENSEN_MURPHY* is defined as: (the number of shares held divided by common shares outstanding)*$1,000+(the number of stock options held divided by common shares outstanding)*(option delta)*$1,000; *EQUITY_INCENTIVES* are defined as: 1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held); *AGE* is the CEO's age; *TENURE* is the number of months the CEO has been in office at the time of the current annual report date; *RD* is the research and development expenditures made by the firm scaled by average total assets; *CAPEX* is net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *; INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets*; STD_RET* is measured as the annualized standard deviation of daily stock returns; *ROA* is the return on assets, defined as income from continuing operations divided by average total assets; *SIZE* is the market value of the firm at fiscal year end; *GROWTH* is the growth in sales for the year; *CFO* is the cash flow from operations divided by average total assets;

Table 2: Summary Statistics of Risky Investment and CEO Compensation Measures over Time

1992 – 2006, N=14,013

Dependent Variables	$Dep_{jq} = \alpha + \beta \times Time + \gamma \times SOX + \chi \times Time \times SOX$			
	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\chi}$
TOTAL	688.181	269.832	71.671	12.251
	(8.12)	(9.72)***	(0.65)	(1.23)
SALARY	0.476	-0.018	0.047	0.042
	(13.47)***	(-8.96)***	(7.28)***	(0.97)
BONUS	0.194	-0.001	0.041	0.005
	(11.47)***	(-1.84)*	(5.57)***	(4.26)***
OPTION	0.247	0.012	-0.064	-0.019
	(9.21)***	(9.76)***	(-7.25)***	(-4.67)***
MIX	1.623	0.176	-0.549	0.028
	(24.99)***	(16.53)***	(-6.54)***	(-1.34)
EQUITY_INCENTIVES	1105.357	503.974	-409.574	-98.765
	(6.27)***	(9.69)***	(-3.26)***	(1.19)
JENSEN_MURPHY	13.401	9.101	-5.302	-1.671
	(9.74)***	(3.76)***	(-2.96)***	(-3.57)
INVEST	0.103	0.001	-0.028	-0.002
	(8.02)***	(1.08)	(-3.15)***	(-0.94)
RD	0.047	0.003	-0.009	-0.003
	(5.96)***	(1.08)	(-2.99)***	(-1.07)
CAPEX	0.078	-0.007	-0.023	-0.002
	(6.08)***	(-3.86)***	(-4.67)***	(-0.84)
STD_RET	0.367	0.022	-0.269	-0.041
	(9.81)***	(8.77)***	(-11.64)***	(-3.39)***
ROA	0.0384	0.000	-0.013	-0.001
	(9.22)***	(0.93)	(-2.64)***	(-0.28)

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level. T-statistics in parentheses are based on robust firm-clustered standard errors (Petersen, 2007).**

TOTAL is total compensation, where total compensation is variable TDC1 from ExecuComp; *SALARY* is the salary received by the CEO of the firm as a percentage of total compensation*;* *BONUS* is the bonus compensation received by the CEO of the firm as a percentage of total compensation; *OPTION* is the average Black-Scholes value of options received by the CEO of the firm as a percentage of total compensation; *MIX* is the sum of the Black-Scholes value of option grants plus bonus compensation and restricted stock grants, all divided by the salary of the CEO; *EQUITY_INCENTIVES* are defined as: 1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held); *JENSEN_MURPHY* is defined as: (the number of shares held divided by common shares outstanding)*$1,000+(the number of stock options held divided by common shares outstanding)*(option delta)*$1,000*;* *INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *RD* is the research and development expenditures made by the firm scaled by average total assets; *CAPEX* is net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is measured as the annualized standard deviation of daily stock returns; *ROA* is the return on asset defined as income from continuing operations divided by average total assets; *Time* is defined as the calendar year minus 1992; *SOX* is a dummy variable taking a value of 1 if the observation is from year 2002 through 2006.

Table 3: Compensation Determinants
1992 – 2006

$$COMP\_VAR_{j,t} = \alpha_0 + \alpha_1 \times LOGASSETS_{jt} + \alpha_2 \times INVEST_{jt} + \alpha_3 \times DEV\_INC_{jt} + \alpha_4 \times RETURN_{jt}$$
$$+ \alpha_5 \times O\_COMP\_VAR_{jt} + \alpha_6 \times AGE_{jt} + \alpha_7 \times TIME_{jt} + \alpha_8 \times SOX_{jt}$$
$$+ \alpha_9 \times INVEST_{jt} \times SOX_{jt} + \varepsilon_{jt}$$

	Compensation Variable ($COMP\_VAR_{jq}$)	
	Panel A	**Panel B**
	$L\_EQUITY\_INCENTIVES_{jt}$	$CASH\_COMP_{jt}$
	Coef. (t-stat)	**Coef. (t-stat)**
Intercept	0.082	0.053
	(5.83)***	(4.96)***
LOGASSET	0.479	0.043
	(6.72)***	(8.54)***
INVEST	0.374	0.014
	(7.27)***	(2.28)**
DEV_INC	-0.431	0.007
	(-3.24)***	(0.94)
RETURN	0.421	0.023
	(4.59)***	(5.57)***
O_COMP_VAR	0.049	0.031
	(3.97)***	(4.16)***
AGE	-0.008	-0.006
	(-0.78)	(-0.54)
TIME	0.064	-0.014
	(5.04)***	(-3.41)***
SOX	-0.029	0.027
	(-3.429)***	(3.42)***
INVEST × SOX	-0.021	0.014
	(-4.94)***	(2.21)**
N	**14,013**	**14,013**
R-SQUARE	**0.235**	**0.227**

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level. T-statistics in parentheses are based on robust firm-clustered standard errors (Petersen, 2007).**

Table 3 presents 2-SLS regression results. *COMP_VAR* and *O_COM_VAR* is either *L_EQUITY_INCENTIVES* or *CASH_COMP*, respectively; *L_EQUITY_INCENTIVES* are defined as the logarithm of: 1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held); *CASH_COMP* is the sum of salary and bonus, divided by total compensation; *LOGASSET* is the logarithm of total assets; *INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is measured as the annualized standard deviation of daily stock returns; *DEV_INC* is the logarithm of (actual incentive level/predicted incentive level) for year t-1, where actual incentive level is the delta of the equity portfolio and predicted incentive level is based on Core and Guay (1999) model; *RETURN* is the cumulative 12 months returns for year t for firm j; *AGE* is the CEO's age; *TIME* is defined as the calendar year minus 1992; *SOX* is a dummy variable taking a value of 1 if the observation is from year 2002 through 2006. Industry control dummies are included.

Table 4: Determinants of Risky Investments 1992 – 2006

$$INVEST_{j,t} = \alpha_0 + \alpha_1 \times Lag\_INVEST_{jt} + \alpha_2 \times LOGASSET_{jt} + \alpha_3 \times \Delta LOGSALES_{jt} + \alpha_4 \times RETURN_{jt}$$
$$+\alpha_5 \times STDROA_{jt} + \alpha_6 \times M\_B_{jt} + \alpha_7 \times AGE_{jt} + \alpha_8 \times COMP\_VAR_{jt} + \alpha_9 \times TIME_{jt}$$
$$+\alpha_{10} \times SOX_{jt} + \alpha_{11} \times COMP\_VAR \times SOX_{jt} + \varepsilon_{jt}$$

	Independent Variable ($COMP\_VAR_{jt}$)	
	Panel A $L\_EQUITY\_INCENTIVES_{jt}$	**Panel B** $CASH\_COMP_{jt}$
	Coef. (t-stat)	**Coef. (t-stat)**
Intercept	0.023 (4.66)***	0.041 (5.12)***
L_INVEST	0.767 (9.87)***	0.812 (9.54)***
LOGASSET	-0.002 (-2.94)***	-0.003 (-4.36)***
ΔLOGSALES	-0.002 (-4.21)***	-0.001 (-3.67)***
RETURN	-0.007 (-5.06)***	-0.008 (-7.89)***
STDROA	0.405 (3.68)***	0.384 (4.06)***
M_B	0.005 (4.35)***	0.004 (3.94)***
AGE	-0.216 (-2.19)**	-0.196 (-1.98)**
COMP_VAR	0.248 (5.96)***	0.006 (1.68)*
TIME	0.217 (4.37)***	0.208 (3.95)***
SOX	-0.092 (-5.09)***	-0.086 (-3.81)***
COMP_VAR× SOX	-0.087 (-3.51)***	0.032 (2.04)**
N	**14,013**	**14,013**
R-SQUARE	**0.241**	**0.234**

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level. T-statistics in parentheses are based on robust firm-clustered standard errors (Petersen, 2007).**

INVEST is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is measured as the annualized standard deviation of daily stock returns; *L_INVEST* is the lag variable of *INVEST; LOGASSET* is the logarithm of total assets; *ΔLOGSALES* is the change in the natural logarithm of sales from the prior year; *RETURN* is the cumulative 12 months returns for year t for firm j; *STDROA* is the standard deviation of ROA over the five years period prior to the current year; *M_B* is the market-to-book ratio; *AGE* is the CEO's age; *COMP_VAR* is either *L_EQUITY_INCENTIVES* or *CASH_COMP* where *L_EQUITY_INCENTIVES* are defined as the logarithm of: 1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held) and *CASH_COMP* is the sum of salary and bonus, divided by total compensation; *TIME* is defined as the calendar year minus 1992; *SOX* is a dummy variable taking a value of 1 if the observation is from year 2002 through 2006. Industry control dummies are included.

Table 5: Future Stock Return Volatility
1992 – 2006

$$STD\_RET_{j,t+1} = \alpha_0 + \alpha_1 \times L\_EQUITY\_INCENTIVES_{jt} + \alpha_2 \times CASH\_COMP_{jt} + \alpha_3 \times INVEST_{jt} + \alpha_4 \times LEVERAGE$$
$$+ \alpha_5 \times F\_AGE_{jt} + \alpha_6 \times LOGASSET_{jt} + \alpha_7 \times TIME_{jt} + \alpha_8 \times SOX + \alpha_9 \times L\_EQUITY\_INCENTIVES_{jt} \times SOX$$
$$+ \alpha_{10} \times CASH\_COMP_{jt} \times SOX + \alpha_{11} \times INVEST_{jt} \times SOX + \varepsilon_{jt}$$

	Coef.	**t-stat.**
Intercept	0.824	8.61***
L_EQUITY_INCENTIVES	0.130	7.34***
CASH_COMP	-0.084	-2.21**
INVEST	0.187	5.67***
LEVERAGE	0.031	3.94***
F_AGE	-0.195	-5.81***
LOGASSET	-0.041	-4.37***
TIME	0. 152	6.82***
SOX	-0.168	-4.58***
L_EQUITY_INCENTIVES× SOX	-0.091	-5.32***
CASH_COMP× SOX	0.131	3.04***
INVEST× SOX	-0.073	-8.98***
N	**12,547**	
R-SQUARE	**0.421**	

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level. T-statistics in parentheses are based on robust firm-clustered standard errors (Petersen, 2007).**

STD_RET is stock return volatility and is measured as the annualized standard deviation of daily stock returns.; *L_EQUITY_INCENTIVES* are defined as the logarithm of: 1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held); *CASH_COMP* is the sum of salary and bonus, divided by total compensation; *INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is measured as the annualized standard deviation of daily stock returns; *LEVERAGE* is total debt divided by total assets; *F_AGE* is the number of years the firm appears in Compustat; *LOGASSET* is the logarithm of total assets*; Time* is defined as the calendar year minus 1992; *SOX* is a dummy variable taking a value of 1 if the observation is from year 2002 through 2006. Industry control dummies are included.

Table 6: Future Return on Assets
1992 – 2006

$$ROA_{j,t+1} = \alpha_0 + \alpha_1 \times L\_EQUITY\_INCENTIVES_{jt} + \alpha_2 \times CASH\_COMP_{jt} + \alpha_3 \times INVEST_{jt} + \alpha_4 \times SALES$$
$$+ \alpha_5 \times STDROA_{jt} + \alpha_6 \times TIME_{jt} + \alpha_7 \times SOX + \alpha_8 \times L\_EQUITY\_INCENTIVES_{jt} \times SOX$$
$$+ \alpha_9 \times CASH\_COMP_{jt} \times SOX + \alpha_{10} \times INVEST_{jt} \times SOX + \varepsilon_{jt}$$

	Coef.	**t-stat.**
Intercept	-0.015	-9.87***
L_EQUITY_INCENTIVES	0.013	6.56***
CASH_COMP	0.023	4.46***
INVEST	0.045	3.76***
SALES	0.002	2.23**
STDROA	-0.179	-2.18**
TIME	0.003	5.85***
SOX	-0.012	-4.96***
L_EQUITY_INCENTIVES× SOX	0.008	0.49
CASH_COMP× SOX	0.011	1.03
INVEST× SOX	0.002	0.50
N		**12,547**
R-SQUARE		**0.176**

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level. T-statistics in parentheses are based on robust firm-clustered standard errors (Petersen, 2007).**

ROA is the one year ahead return on assets defined as operating income adjusted for R&D expenditures divided by average total assets; *L_EQUITY_INCENTIVES* are defined as the logarithm of: 1%*(share price)*(number of shares held) + 1%*(share price)*(option delta)*(the number of options held); *CASH_COMP* is the sum of salary and bonus, divided by total compensation; *INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is measured as the annualized standard deviation of daily stock returns; *SALES* is annual sales *STDROA* is the standard deviation of the return on assets for the prior five years; *Time* is defined as the calendar year minus 1992; *SOX* is a dummy variable taking a value of 1 if the observation is from year 2002 through 2006. Industry control dummies are included.

Table 7: Panel A
Legislative Events Related to SOX

Event Window	**Description of Event**
2/1/2002 – 2/4/2002	Treasury Secretary called for changes in rules governing corporations
7/8/2002 – 7/12/2002	Senate debated Sarbanes' bill and President Bush delivered a speech on corporate reforms. The passage of Sarbanes' bill is likely. On 7/10/2002 the Senate passed a though amendment to strengthen criminal penalties 97 to 0.
7/18/2002 – 7/23/2002	House Republican leaders reportedly retreated from efforts to dilute the Senate's tough bill.
7/24/2002 – 7/26/2002	Senate and House agreed on the final rule. Senate and House passed SOX.

The above table lists four key legislative events related to the passage and implementation of SOX which were found to have significant negative market reactions in Zhang (2007).

Table 7: Panel B
Risky Investments and SOX, Decile Analysis

Decile	**Before SOX: 1997-2001 (a)**		**After SOX: 2002-2006 (b)**		**Difference (a) – (b)**	
	INVEST	**STD_RET**	**INVEST**	**STD_RET**	**INVEST**	**STD_RET**
(1)	0.169	0.758	0.126	0.438	0.043	0.320**
(2)	0.131	0.625	0.089	0.369	0.042	0.256**
(3)	0.129	0.592	0.083	0.337	0.049	0.255**
(4)	0.133	0.528	0.091	0.313	0.042	0.215**
(5)	0.102	0.505	0.082	0.307	0.021	0.198**
(6)	0.106	0.488	0.083	0.287	0.023	0.201**
(7)	0.117	0.478	0.084	0.261	0.033	0.217**
(8)	0.144	0.544	0.107	0.302	0.037	0.242**
(9)	0.122	0.540	0.101	0.326	0.021	0.214**
(10)	0.155	0.614	0.132	0.374	0.023	0.240**
(10) – (1)	-0.014***	-0.144**	0.006**	-0.064**	-0.020***	-0.080***

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level.**

This table reports the differences in risky investments made before and after SOX by firms separated into deciles based on the reactions to key legislative events related to SOX. Decile (1) corresponds to the portfolio of firms that had the most negative impact, i.e., the lowest cumulative abnormal returns around the events listed in Table 7, Panel A, and decile (10) corresponds to the portfolio of firms that had the least negative impact around these events; *INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is stock return volatility an is measured as the annualized standard deviation of daily stock returns.

Table 7: Panel C
Risky Investments and SOX, 3 Group Analysis

Group	Before SOX: 1997-2001 (a)		After SOX: 2002-2006 (b)		Difference (a) – (b)	
	INVEST	**STD_RET**	**INVEST**	**STD_RET**	**INVEST**	**STD_RET**
(1)	0.143	0.663	0.099	0.384	0.044***	0.279***
(2)	0.112	0.524	0.085	0.297	0.029***	0.227***
(3)	0.140	0.564	0.113	0.314	0.027***	0.250***
(3) –(1)	-0.003**	-0.099***	0.015***	-0.071***	-0.018***	-0.029***

*****Significant at the 1% level; ** Significant at the 5% level; *Significant at the 10% level.**

This table reports the differences in risky investments made before and after SOX by firms separated into three groups based on the reactions to key legislative events related to SOX. Group (1) corresponds to the portfolio of 33.33% of firms that had the most negative impact, i.e., the lowest cumulative abnormal returns around the events listed in Table 7, Panel A, and group (3) corresponds to the portfolio of 33.33% of firms that had the least negative impact around these events; *INVEST* is total investments calculated as the sum of research and development expenditures, acquisitions, and net capital expenditures (capital expenditures less sale of property, plant, and equipment) made by the firm divided by average total assets; *STD_RET* is stock return volatility an is measured as the annualized standard deviation of daily stock returns.