The Sarbanes Oxley Act of 2002: Implications for Compensation Structure and Risk-Taking Incentives of CEOs

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Abstract

This paper investigates the effect of the Sarbanes-Oxley Act (hereafter, SOX) on the compensation structure and the risk-taking incentives of CEOs as revealed by their research and development expenses and capital expenditures. We hypothesize that firms will respond to the additional liability imposed by SOX on corporate executives by altering the mix of incentive compensation to fixed salary awarded to them in order to provide insurance. Consistent with this claim, we find that there was a significant decline in the ratio of incentive compensation to salary after the passage of SOX. We also hypothesize and find that there was a significant decline in research and development expenses and capital expenditures made by CEOs after the passage of SOX. This result is obtained after controlling for the effects of the economic environment and changes in compensation structure on CEOs' action choices. We interpret the above as evidence of some of the potential costs of this new regulation.

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1. Introduction

The frauds of Enron, WorldCom and other companies, such as Sunbeam, Waste Management, Adelphia, Xerox, and Global Crossing, have renewed interest in the importance of corporate governance in disciplining firms. The unreliability of corporate managers, monitors and the market in these cases raised arguments in favor of the need for government regulators to restore confidence in the securities markets. The regulatory response to these corporate wrongdoings was the Sarbanes Oxley Act of 2002 (hereafter, SOX), which is the most sweeping federal law concerning corporate governance since the adoption of the initial federal securities laws in 1933 and 1934. This new law promises improvements in the accuracy and reliability of corporate disclosures by modifying governance, reporting and disclosure rules for public companies. However, it is also important to consider some of the potential costs of this new regulation. This forms the subject of this paper.

The SOX requires CEOs and CFOs to certify the veracity of their financial statements and prohibits corporate loans to senior executives and directors. It also penalizes fraud by requiring return of incentive based compensation, as well as profits from stock sales, following accounting restatements resulting from "the material noncompliance of the issuer as a result of misconduct, with any financial reporting requirement under the securities laws". The additional liability on executives can have some adverse reactions such as increasing agency costs by skewing executives' incentives to engage in value-maximizing transactions, encouraging executives to switch

to less monitored firms and activities, and increasing firms' costs of obtaining information about executives' fraudulent activities.

We focus on two research questions. First we examine the effect of SOX on executive compensation. Specifically, we investigate whether there has been a significant change in the structure of executive compensation subsequent to the passage of SOX (post-SOX period). Next, we investigate the impact of the increased liability on the risk-taking incentives of corporate executives as revealed by their investments in research and development and capital expenditures. In particular, we study whether, even after controlling for firms' responses in terms of altering compensation structure in the post-SOX period (if so), there has been a drop in risk-taking activities of executives.[1]

We consider the period from Q3, 2002 onwards as the period after the passage of SOX (the post-SOX period), consistent with SOX being signed into law by President George W. Bush on July 30, 2002. We begin by examining the change in the structure of executive compensation, namely the proportion of total compensation comprising salary, bonus and options, and the incentive compensation-salary mix (defined as the ratio of option plus bonus compensation to salary) after the passage of SOX. We hypothesize that firms will respond to the additional liability imposed by SOX on executives by altering the existing compensation structure, in order to provide some form of insurance to executives (we refer to this as the "Additional Insurance Hypothesis," or AIH). Our evidence indicates that the ratio of incentive compensation to fixed salary significantly declined in the post-SOX period, indicating an increase in the base salary as compared to incentive compensation. We interpret this result as supporting the AIH, in that firms

[1] While conducting the above analyses, we control for the endogenous relation between compensation structure and executive action choices.

responded to the increased liability imposed on executives by increasing the fixed component of their compensation.

We then investigate the changes in executives' risk-taking activities, as proxied by the research and development expenses and capital expenditures, in the post-SOX period. We hypothesize that the additional liability imposed by SOX on CEOs will result in increased risk aversion on the part of executives, and will lead them to invest less in risky projects (we refer to this as the "Risk Aversion Hypothesis," or RAH). We find that research and development expenses as well as capital expenditures declined significantly in the post-SOX period, even after controlling for the effects of the economic environment and compensation structure on executives' actions, supporting the RAH.[2]

If we assume that firms were at an optimal prior to SOX in terms of compensation structure, then any change they had to make due to the effect of regulation is costly for them.[3] Similarly, if inspite of the provision of additional insurance, executives make action choices that are more conservative than the owner of the firm would prefer, then this would increase agency costs for firms. Our analysis indicates that both these effects were present in the post-SOX period, and thus provides preliminary evidence of some of the potential costs of this new regulation.

Clearly, research on the economic implications of SOX forms an important topic to pursue. There has been considerable academic interest in this area, with mixed results regarding the benefits of this regulation (Jain and Rezaee, 2003; Bhattacharya, Groznik and Haslem, 2002; Li, Pincus and Rego, 2003; Cohen, Dey and Lys, 2004). We

[2] A caveat: although the finding of a decline in risk taking activity and change in compensation structure 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.
[3] Ceteris paribus, firms would have been awarding this compensation package prior to SOX if it were optimal to do so.

contribute to this literature by providing evidence on some of the possible costs of this regulatory intervention.

The remainder of the paper proceeds as follows. Section 2 provides an overview of the related literature, presents the research questions and develops the hypotheses. Section 3 discusses the research design, including the data and summary statistics and the model used in the analysis. Section 4 presents the results of the tests. Section 5 concludes.

2. Literature Review and Hypotheses Development

2.1 Related Research

Our study relates to the literature on the effect of regulation on the incentives of managers and as a result on their actions choices, and effect of regulation on the structure of compensation contracts. Below we briefly discuss some important studies in these areas.

Bushee, Matsumoto and Miller (2004) investigate the effect of regulation that mandates open access to information on managers' disclosure choices. They examine the effect of Regulation FD (Reg FD) on managers' decisions regarding the timing, use, and information content of conference calls. They find that Reg FD had a significant negative impact on managers' decisions to continue hosting conference calls and on their decisions regarding the optimal time to hold the call, though the magnitudes of these changes are not large. Also, they do not find evidence that Reg FD decreased the amount of information disclosed during the call period, contrary to the concerns of Reg FD opponents. Other studies on Reg FD provide mixed evidence on whether firms have reduced the amount or quality of information provided to the capital markets following

the passage of the new rule. Some studies find no deterioration in the information environment (Shane et al., 2001; Bailey et al., 2003; Heflin et al., 2003; Eleswarapu et al., 2001), while others find evidence consistent with a decline in information quality (Mohanram and Sunder, 2001; Agrawal and Chadha, 2002).

Several studies examine firms' going-private decisions by considering the effects of disclosure-regulation compliance costs on this choice (such as, DeAngelo, DeAngelo and Rice, 1984; Lehn and Poulsen, 1989), and the evidence suggests that shareholders were able to protect their interests using both voting rights and the threat of litigation, and overall they benefited from the going-private decisions made by managers. Engel, Hayes and Wang (2004) investigate firms' going-private decisions in response to the passage of the Sarbanes Oxley Act of 2002. They find that the quarterly frequency of going private has modestly increased after the passage of SOX, and conclude that the evidence is broadly consistent with the notion that the SOX Act has affected firms' going-private decisions.

Perry and Zenner (2000) examine the effects of the SEC's enhanced disclosure requirements on executive compensation and the enactment of tax legislation limiting the deductibility of non-performance related compensation over one million dollars (Internal Revenue Code Section 162(m)) in 1993. They document that some firms altered the structure of CEO compensation in response to Section 162(m) by reducing salaries and, on average, the pay for performance sensitivity increased following the regulations, especially for million-dollar firms. Greenstone, Oyer and Vissing-Jorgensen (2003) study the 1964 Securities Acts Amendments, which extended the 1934 Act to cover smaller firms. They find that increased disclosure led to substantial positive cumulative

abnormal returns for affected firms. Bushee and Leuz (2003) examine the 1999 application of the 1934 Act to firms trading on over-the-counter bulletin boards, and report increases in liquidity for those firms that adopted the new rules, but find that nearly three-fourths of firms elected to delist rather than comply.

In our analysis, we rely on prior research on the association between stock-based compensation and managerial incentives. Studies on this topic have produced both useful and contradictory findings (see Murphy, 1999 and Core, Guay and Larcker, 2002 for reviews of this literature). We briefly discuss some important studies on the use of options and managerial risk-taking incentives.

Motivating risk-averse managers to undertake risky, positive NPV projects requires the addition of an optimal amount of convexity to their compensation contracts (Lambert, 1986; Hemmer, Kim and Verrecchia, 1999; Feltham and Wu, 2001; Lambert and Larcker, 2001; Core and Qian, 2001), depending on various firm and CEO characteristics. Innes (1990) shows that even if an agent is risk-neutral, a limited liability restriction can introduce convexity into an optimal contract. In the traditional moral hazard agency model the form of the optimal contract is determined by the distribution function that maps managerial actions into the stock price and the manager's risk aversion. The contract is more convex when the distribution function is more skewed and when the manager is less risk-averse (Holmstrom, 1979; Hemmer et al, 1999).

Core and Qian (2001) show that when there are no growth opportunities, the CEO's contract contains little convexity per unit of slope, but when there are large growth options that are difficult to evaluate, the CEO's contract is both more convex and more steeply sloped. Consistent with the above, Guay (1999) shows that firms with greater

growth opportunities provide more risk-taking incentives and that firm risk is indeed greater when managers hold more risk-taking incentives.

2.2 Research Questions and Hypotheses Development

Optimal contracting in a firm involves minimizing agency costs without unduly reducing the benefits of the agents. Designing firms' contracts to maximize the net benefits of agents obviously is a complex, multi-dimensional task that requires consideration of each firm's characteristics. Optimal agency contract design involves encouraging the agent to take the owners' interests into account, but not forcing the agent to bear so much of the firm's risks that she is more cautious than the owners would want her to be. Regulation can affect this in unpredictable ways, which becomes clear on understanding the role of increased liability and regulation on agents' incentives.

The SOX requires executives to reimburse incentive-based compensation and stock profits following accounting misstatements. This provision explicitly provides for liability up to the amount of compensation or stock profits for misconduct by others in the organization regardless of the executive' knowledge about it, and indeed even if the executives exercised all reasonable care in monitoring and instituting controls. This requirement imposes additional liability on executives, and we expect firms to respond by providing some form of additional compensation, by altering the existing structure of compensation and / or by providing other forms of insurance to the executives.

Our first research objective is to investigate whether there is a significant change in the various components of executive compensation subsequent to SOX. Since risk-

averse executives will require some form of insurance for the additional liability imposed on them, firms can respond in several ways in order to maintain the executives at their original utility levels. Firms can alter the compensation structure by increasing the proportion of fixed compensation, while maintaining the original level of incentive compensation. Alternatively, firms can shift between one form of incentive compensation to another form of incentive compensation so as to lower the risk involved, but maintain the original level of incentives. 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 of the executive can be maintained by adjusting the salary. Finally, firms may keep the proportions of the different components of compensation unchanged, but additionally provide some other form of insurance to executives.

We look at the ratio of incentive compensation (the Black-Scholes value of options granted to CEOs + bonus compensation) to the salary paid to the CEO. In the first scenario described above, we expect this ratio to decrease in the post-SOX period. It is difficult to predict how this ratio will move in the second case, although it should either remain unchanged or decrease. In the third case there should be no change in this ratio. Thus, we make no predictions regarding the movement of this ratio in the post-SOX period. We test the following null hypothesis (Additional Insurance Hypothesis or AIH):

H1: There is no change in the mix of incentive compensation to fixed compensation in the post-SOX period as compared to that in the period prior to the passage of SOX.

Regulation can have adverse effects on the optimality of compensation contracts. Moreover, firms may have to incur costs in order to realign executives' incentives as a result of the increased liability imposed by regulation. Excessive risk-aversion is always a problem with agents because, unlike shareholders, agents invest their non-diversifiable human capital in the firm. It is especially a problem now in light of executives' increased liability risks. In other words, assuming that firms were at an optimal prior to SOX in terms of the compensation structure, then an alteration in compensation structure after the passage of SOX to accommodate the increased risk aversion of executives is a cost to firms resulting from the new regulation. A change in the compensation structure (directly or indirectly) could cause corporate executives to behave more like bureaucrats and less like entrepreneurs by reducing their benefits from risky decisions that pay off for the firm and their incentive to work hard to produce profits. This leads to our next research objective.

Our second goal is to investigate the effect of the increased liability imposed by SOX on the risk-taking incentives of executives. SOX requires chief executives to vouch for their firms' financial statements and internal controls, 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 permit liability on the basis of a court's ex post judgment that the executive certified controls that proved to be inadequate. The provisions therefore require executives to bear some of the risk of fraud formerly borne more cheaply by diversified investors. This may increase rather than reduce agency costs in the sense of causing the agents (or the executives) to act more conservatively than owners would prefer.

Regulation that imposes additional risks on executives who are not in a position readily to spot fraud may cause executives to respond in several ways to reduce their risks of liability. First, they may manage the firm to reduce the potential for liability. One possible approach is to reduce the variance in its expected returns, thereby reducing the chance of an earnings "surprise" that could trigger massive liability. The liability also may affect the categories of transactions executives seek to engage in on behalf of the firm. Second, liability may perversely affect the disclosure policies executives set for the firm. While executives do not get the benefits of minimizing disclosure costs or of extra clarity of disclosure, they bear the costs of failing to disclose fraud. For example, executives may under-report earnings on the theory that they are less likely to be held liable for overly conservative than for exaggerated earnings reports. Also apart from the information that is actually disclosed, executives may institute very costly information-getting procedures in the firm that produce less value for investors than they do in protecting executives from the risk of fraud liability.

Based on the above theory, we test whether there has been a change in executives' risk-taking actions in the post-SOX period. We hypothesize that there is likely to be a significant drop in such activities of corporate executives subsequent to the passage of SOX. We use two proxies to measure the risk-taking actions of executives: R&D expenses and capital expenditures. We test the following hypotheses, stated in the null form (Risk Aversion Hypothesis or RAH):

H2a: There is no significant change in R&D expenses as a proportion of sales after the passage of SOX as compared to that in the period prior to SOX.

H2b: There is no significant change in capital expenditures as a proportion of sales after the passage of SOX as compared to the period prior to SOX.

Note that if firms respond to SOX by providing the executives full protection and reimbursement, then the liability may have little effect on their incentives. In this case, we would not observe a significant change in the risk-taking propensities of executives. On the other hand, even fully reimbursed executives may act overly cautiously because of the risk of reputational harm, in which case we would still observe a drop in risk taking activity.

3. Research Design

3.1 Data and Summary Statistics

Our sample is selected from the set of S&P 500 industrial companies, excluding utilities, financial, and transportation firms per the COMPUSTAT annual industrial and research files, and EXECUCOMP for the period 1992-2003.[4] When we merge the COMPUSTAT sample with EXECUCOMP in order to include managerial compensation and incentives variables, the sample represents 277 firms with 2,183 firm-year observations. This final sample represents only firm-year observations were data for all variables included in the analysis is available. The major reason for this somewhat reduced sample is the fact that RD expenses are frequently coded as missing in COMPUSTAT. Overall, this sample captures leading companies in leading industries (see Bens et al. (2002) for similar sample selection criteria).

Table 1 presents the mean and the median values of the variables employed in the analysis. The sample is dominated by large firms, primarily due to the requirement that

[4] We had to begin our sample period from 1992 as EXECUCOMP does not have data prior to this year.

firm observations be present in ExecuComp. The data indicate that, consistent with the recent literature on executive incentive compensation, options form the dominant component of compensation for the sample firms. The mean of the variable *MIX* indicates that on average the incentive compensation for the sample firms was more than double the fixed salary portion.

3.2. Model

Any analysis of executives' action choices and their compensation has to take into account the endogenous relation between the two. Managers take action choices in response to the incentives provided to them through their compensation, and executive compensation is designed by the board of directors by taking into account what actions executives are likely to take given their incentives. This suggests that the action choice and the compensation structure may be directly related to each other. Hence, studying these choices in single decision frameworks may lead to erroneous inferences. Accordingly, this paper employs a two stage least squares (2SLS) model as the empirical representation of the relationship between action choices of executives, and the mix of incentive compensation and salary of executives. The structural equations for the two stage least squares regressions are the following:

$$MIX_{jt} = \alpha_0 + \alpha_1 \times SIZE_{jt} + \alpha_2 \times RISK\_INVT_{jt} + \alpha_3 \times SHARES_{jt} + \alpha_4 \times CFO_{jt} + \alpha_5 \times GROWTH_{jt} + \alpha_6 \times TIME + \alpha_7 \times SOX + \alpha_7 \times RISK\_INVT \times SOX$$

.....(1)

$$RISK\_INVT_{jt} = \alpha_0 + \alpha_1 \times LRISK\_INVT_{jt} + \alpha_2 \times SIZE_{jt} + \alpha_3 \times GROWTH_{jt} + \alpha_4 \times CFO_{jt} + \alpha_5 \times AGE_{jt} + \alpha_6 \times TENURE_{jt} + \alpha_7 \times MIX_{jt} + \alpha_8 \times TIME + \alpha_9 \times SOX + \alpha_{10} \times MIX_{jq} \times SOX$$

……...(2)

In the above equations, the two variables that proxy for risky investments of executives are $RISK\_INVT = RD$ and $RISK\_INVT = CAPEX$, where RD is defined as the research and development expenses as a proportion of sales and $CAPEX$ is defined as the capital expenditures scaled by total assets. Among the control variables, $LRISK\_INVT$ is the lagged investment variable, namely, the lag of research and development expenses as a proportion of sales when the investment variable used is research and development expenses as a proportion of sales, and the lag of capital expenditures scaled by total assets when the investment variable used is capital expenditures; $SIZE$ is the market value of equity at fiscal-year end; $GROWTH$ is defined as the growth in sales for the year; CFO is defined as the cash flow from operations; AGE is the CEOs age; $TENURE$ is the number of months the CEO has been in office at the date of the proxy statement filing; MIX is the ratio of the Black-Scholes value of option grants plus bonus compensation to the salary of the CEO; $TIME$ is defined as the calendar year minus 1992; SOX is a dummy variable that takes the value 1 when the proxy statement was field after July 30, 2002, and 0 otherwise; and $SHARES$ is the percent of stock held by the firm's CEO.

We include the lagged investment variable in the above regressions in order to control for any omitted correlated variables. Moreover, prior research has shown that these investment choices are significantly associated with the lagged values of these variables

(e.g., Bens et al. (2002)). We use cash flows from operations, *CFO* in the above equations to proxy for the real economic environment and performance. We include this proxy to control for the effect of economic activity on managers' spending on research and development and capital expenditures, and the incentives offered to them.

We use the two executive-specific variables, *AGE* and *TENURE* , in equation (1) in order to control for the fact that older executives who are nearing retirement may have lesser incentives to undertake risky projects (e.g., Dechow and Sloan (1991) show that CEOs in their final years in office reduced research and development spending, presumably to increase reported earnings). The variable *SHARES* is included in equation (2) since the incentives provided in the compensation package offered to managers will depend on their existing incentives based on the fraction of the firm owned by them. The variable *TIME* captures the trend over time in the corresponding dependent variables. The dummy variable *SOX* captures the change in the risky projects undertaken by executives, namely research and development spending and capital expenditures, and the change in the mix of incentives to salary offered to executives after the passage of SOX. The variables *SIZE* and *GROWTH* control for firm specific attributes that may affect action choices of managers and their compensation structure. The next section discusses the results of the hypotheses tested.

4. Results

Section 4.1 reports the descriptive statistics of risky investments, the individual components of compensation (option, bonus and salary), and the incentive compensation–salary mix over time. Section 4.2 presents the determinants of changes in

executives' incentive compensation–salary mix, and Section 4.3 discusses the results of the determinants of executives' investments.

4.1 Descriptive Statistics: Investments and Executive Compensation

Table 2 summarizes the two measures of investments, *RD* and *CAPEX*, the three components of executive compensation, *SALARY*, *BONUS*, and *OPTION*, and the ratio *MIX*, which is the ratio of *OPTION* plus *BONUS* over *SALARY*. We summarize the data by estimating the following regression. We regress each of the variables of interest on a time trend and a dummy variable taking the value of 1 in the post-SOX period (Q3, 2002 to Q4, 2003) and zero otherwise. We choose this procedure to describe the variables because given the events in the last decade (such as the bursting of the stock market bubble, and the corporate scandals), many of our variables may exhibit significant time trends (non-stationarity), rendering a traditional summary statistics uninformative.

The results in Table 2 indicate significant over-time increases both in research and development expenses and in capital expenditures. The dummy variable for the post-SOX period is negative and significant both for research and development expenses and for capital expenditures. This preliminary analysis indicates that the passage of SOX was associated with a decline in executives' spending on risky investments, as proxied by research and development expenses and capital expenditures. Figure 1A and 1B plots these trends over the time period studied.

The results on the components of compensation indicate significant over-time decreases in both salary and bonus compensation, and an over-time increase in option compensation, which is consistent with the trend in option compensation documented in

the literature. Consistent with our predictions, the dummy variable for the post-SOX period is positive and significant for salary and bonus compensation, and negative and significant for options. Figure 2 depicts the trends in these components of compensation over the time period studied. The ratio of incentive compensation to salary, *MIX*, also increased over time, with a significant decrease following the passage of SOX. Figure 3 plots the trend in the ratio *MIX* over time.

In summary, the above preliminary analysis indicates that following the passage of SOX, there was a shift in the compensation structure for executives towards more fixed salary, and less incentive-based compensation (option compensation). One explanation of this result is that firms responded to the requirement in SOX that executives need to reimburse incentive-based compensation following accounting misstatements by restructuring compensation plans in order to insure them from the related risks. Next, as expected, the above results indicate that there was a significant decline in risky investments by firms from the period prior to SOX to the post-SOX period. One interpretation of this result is that the cutting back on risky investments by executives is related to the additional liability imposed on them by SOX.[5] The determinants of executives' compensation structure and risky investments are analyzed next.

4.2. Incentive Compensation-Salary Mix

Table 3 summarizes the results of estimating equation (1). Panel A reports the results when research and development expenses (*RD*) is used to proxy for risky investments,

[5] Note that other concurrent events, such as the negative publicity of the governance failures and the arrests of several executives for fraud could have contributed to increased managerial risk aversion and awareness of reputational considerations. Moreover, simultaneous changes in compensation could have altered their investment behavior as well (we test this effect in our subsequent analysis). Thus, whether this decline in investment activity after the passage of SOX is caused by this Act or due to these other concurrent events cannot be inferred from the data.

and Panel B reports the results when capital expenditures (*CAPEX*) is used to proxy for risky investments.

All the control variables are significantly associated with the incentive compensation-salary mix. The coefficient corresponding to *SIZE* is positive and significant both when *RD* and *CAPEX* are used as proxies for risky investment, indicating that larger sample firms provide greater incentives compensation as compared to fixed salary to their top managers. Although *RD* is positive, but not significant, *CAPEX* is negative and significant, indicating that firms with greater incentive compensation as compared to salary spend less on capital expenditures. This result is surprising, since one would expect the opposite relation to hold. We elaborate on this issue later in this section.

As expected, the coefficient for *SHARES* is negative and significant both in Panel A and in Panel B, in support of the claim that managers who own a larger fraction of the firm need lesser incentive compensation in order to align their interests with shareholders. The coefficient corresponding to *CFO* is positive and significant, suggesting that the incentive compensation to salary ratio is higher for managers in periods of better performance. The coefficient corresponding to *GROWTH* is negative and significant in both Panel A and Panel B, suggesting that managers of growth firms are provided less incentive compensation as compared to salary.

In both Panel A and Panel B, the coefficient for *TIME* is positive and significant, supporting our the preliminary analysis in Table 2, as well as prior results in the literature, that there has been an increase in incentive compensation over time (particularly in option compensation). The dummy variable *SOX* is negative and significant in both panels, suggesting a decline in the incentive compensation-salary mix

in the post-SOX period. This result supports the claim that firms responded to the additional liability imposed on executives after SOX by increasing the fixed portion of their total compensation (salary) as compared to the risky incentive compensation in order to provide insurance to risk averse executives. We interpret this evidence as supporting the AIH. However, we acknowledge that we cannot attribute this result solely to SOX. Firms could have reduced option and bonus compensation due to the adverse publicity regarding soaring values of options and bonuses awarded to executives, particularly during the corporate scandals taking place.

Finally, the interaction term $RD \times SOX$ is negative and significant, while the term $CAPEX \times SOX$ is positive and significant. This result indicates that in the post-SOX period research and development expenditures decreased while capital expenditures increased as incentive based compensation increased. Note that if managers follow a strategy of overall investments in risky projects, of which research and development and capital expenditures are two components, then it is difficult to explain the associations between incentive compensation – salary mix and RD and $CAPEX$. For instance, the overall risky investments could be positively associated with MIX, but firms may also substitute between different projects (based on the individual risks of the projects), resulting in negative associations between MIX and some of the individual investments. This could be one explanation for the negative relation obtained between $CAPEX$ and MIX discussed earlier.

4.3. Research and Development Expenses and Capital Expenditures

Table 4 summarizes the results of estimating equation (2) of the system of equations discussed in Section 4. Panel A reports the results when the proxy for risky investments is research and development expenses (*RD*), and Panel B reports the results when the proxy used in capital expenditures (*CAPEX*).

In both Panel A and Panel B, the coefficient corresponding to *GROWTH* is negative and significant, suggesting that managers of growth firms spend less on research and development. The coefficient for *CFO* is positive and significant for *CAPEX*, indicating that when performance is good, there is greater spending on capital expenditures. However, the coefficient for *CFO* is negative and significant for *RD*, indicating that when performance is good, there is less spending on research and development activities. This result appears a bit counterintuitive, since one would expect more investments in research and development activities when firms have the means to do so, i.e., in good times. However, the discussion in Section 4.2 on the substitution between risky projects could be a potential explanation for this result. An alternative explanation for this result is related to earnings management activities of managers. In periods of bad performance managers are unlikely to meet their bonus targets, and thus they choose to make more research and development expenses in these periods, rather than in good periods when they would prefer to minimize expenses in order to maximize their bonus.

The coefficient corresponding to *AGE* is negative and significant, as expected, for *RD*. This supports prior results in the literature that older managers who are likely to retire soon spend less on research and development expenses (e.g., Dechow and Sloan,

1991). However, this variable is not significant for *CAPEX*. The coefficient for *TENURE* is not significant for *RD*, but is negative and significant for *CAPEX*. The latter result also supports the above theory that managers who have spent longer time in office (and hence are closer to retirement) are likely to spend less on risky projects.

Research and development expenses, *RD*, increased over time, as indicated by the positive and significant coefficient for *TIME*, supporting the results in Table 2. However, surprisingly, *TIME* is not significant for *CAPEX*. The dummy variable *SOX* is negative and significant both for *RD* and *CAPEX*, supporting our prediction that there was a decline in risky spending by executives in the post-SOX period. This result is obtained after controlling for the effects of compensation and the economic environment on such spending activity. We interpret this evidence as supporting the RAH. In other words, after the passage of SOX, increased risk aversion on the part of executives resulted in their spending less on risky projects, such as research and development activities. However, as before, we acknowledge that several simultaneous occurrences could have contributed to an increase in managerial risk aversion, and thus a decrease in risky spending, after passage of SOX, including the increased vigilance of investors, auditors and regulators, and the adverse publicity caused by the scandals. Thus, we are cautious in attributing the above result solely to the passage of SOX.

Finally, *MIX* is negative and significant both for *RD* and *CAPEX*, which is counter-intuitive, since it suggests that lesser incentive compensation as a proportion of salary is associated with greater spending on these items. The interaction term $MIX \times SOX$ is positive and significant both for *RD* and *CAPEX*, although the sum of the coefficients of *MIX* and $MIX \times SOX$ is still negative for *RD* and is slightly positive

for *CAPEX* . As discussed earlier, it is difficult to interpret the associations between *MIX* and the variables *RD* and *CAPEX* due to the possibility of managers following an overall policy of risky investments, and substituting between risky projects.

5. Conclusion

This paper investigates the changes in the mix in incentive compensation and fixed salary awarded to executives, and changes in risky investment decisions of executives after the passage of SOX. We hypothesize that firms will respond to the additional liability imposed by SOX on corporate executives by altering the mix of incentive compensation to fixed salary awarded to executives in order to provide insurance, and find evidence consistent with this claim.

We also hypothesize and find that there was a significant decline in risky investments by managers after the passage of SOX. This result is obtained after controlling for the effects of the economic environment and compensation structure on executives' action choices. Although our results provide preliminary evidence of some of the potential costs of SOX, the nature of our analysis does not provide conclusive evidence whether this reversal was caused solely by SOX, or was also due to other concurrent events.

The passage of SOX in response to the recent spate of corporate failures generated considerable interest in the academic community. Several papers document evidence consistent with benefits associated with this regulation. We contribute to this stream of research by providing evidence on some of the potential costs of this Act. However, additional data are required to be able to conduct a more meaningful analysis of the net effect of this sweeping regulation.

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Table 1

Summary Statistics
1992 – 2003

Variable	Mean	Median
BONUS	0.2003	0.2037
OPTION	0.3291	0.3343
SALARY	0.2809	0.3230
MIX	2.0382	3.1050
SHARES (%)	6.91	1.38
AGE (year)	55.0000	55.4505
TENURE (months)	80.0000	91.9649
RD	0.0534	0.0788
CAPEX	87.2055	308.0221
SIZE	2950.18	15515.25
GROWTH	0.3314	0.3684
CFO	0.0650	0.0747

BONUS is the average bonus compensation received by the firm's CEO; *OPTION* is the average Black-Scholes value of options received by the CEO of the firm; *SALARY* is the salary received by the CEO of the firm; *MIX* is the ratio of the value of the Black-Sholes value of option grants plus bonus compensation to the salary of the CEO of the firm; *SHARES* is the percent of company stock held by the firm's CEO; *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 expenses scaled by total sales; *CAPEX* is the capital expenditures scaled by 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.

Table 2

Summary Statistics of Risky Investment and CEO Compensation Measures over Time

1992 – 2003

Dependent Variables	$Dep_{jq} = \alpha + \beta \times Time + \gamma \times SOX$		
	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\gamma}$
RD	0.8410 (3.76)**	0.2205 (6.07)***	-1.4404 (-3.10)**
CAPEX	0.6583 (2.85)**	0.0687 (1.83)***	-0.8493 (-1.78)***
SALARY	0.4831 (37.77)***	-0.0245 (-11.24)***	0.0563 (2.99)***
BONUS	0.2248 (36.48)***	-0.0059 (-6.12)***	0.0371 (3.07)***
OPTION	0.1666 (8.47)***	0.0345 (11.69)***	-0.1194 (-4.10)***
MIX	1.0661 (6.19)***	0.3569 (13.83)***	-0.9223 (-3.62)***

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

SOX is a dummy variable taking a value of 1 in the period from Q3, 2002 through Q4, 2003; *Time* is defined as the calendar year minus 1992; *RD* is the research and development expenditures made by the firm scaled by sales; *CAPEX* is the capital expenditures made by the firm divided by total assets; *SALARY* is the salary compensation as a proportion of total compensation received by the CEO of the firm; *BONUS* is the bonus compensation as a proportion of total compensation received by the CEO of the firm; and *OPTION* is the Black-Scholes value of the option compensation as a proportion of total compensation received by the CEO of the firm; and *MIX* is the ratio of the value of the Black-Scholes value of option grants plus bonus compensation to the salary of CEO.

Figure 1A: RD Expenses Over Time 1992-2003

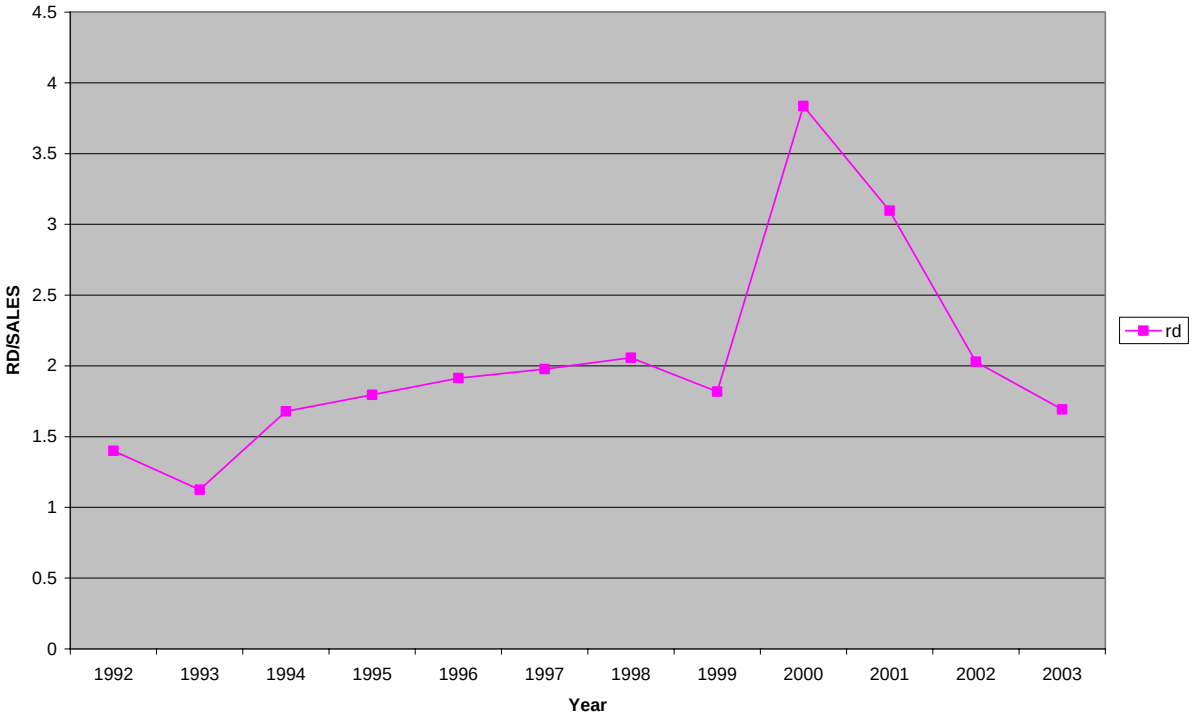


Figure 1B: Capital Expenditures Over Time 1992-2003

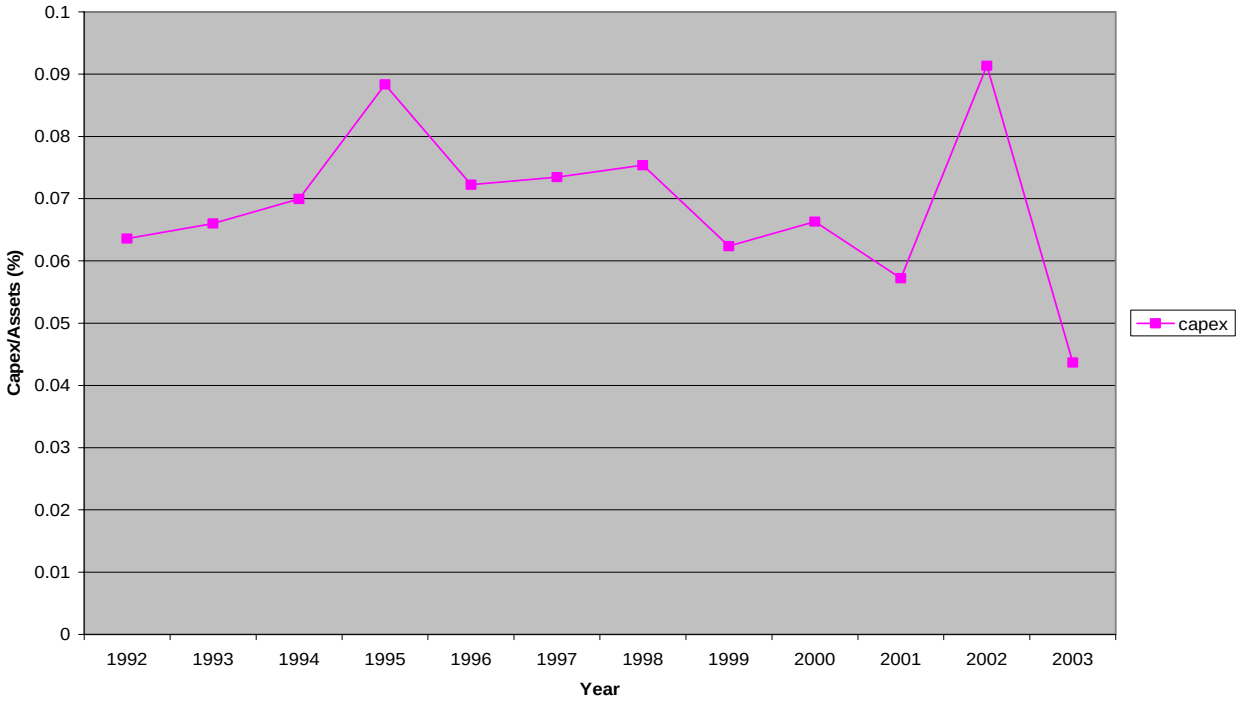


Figure 2: CEO Compensation Over Time 1992-2003

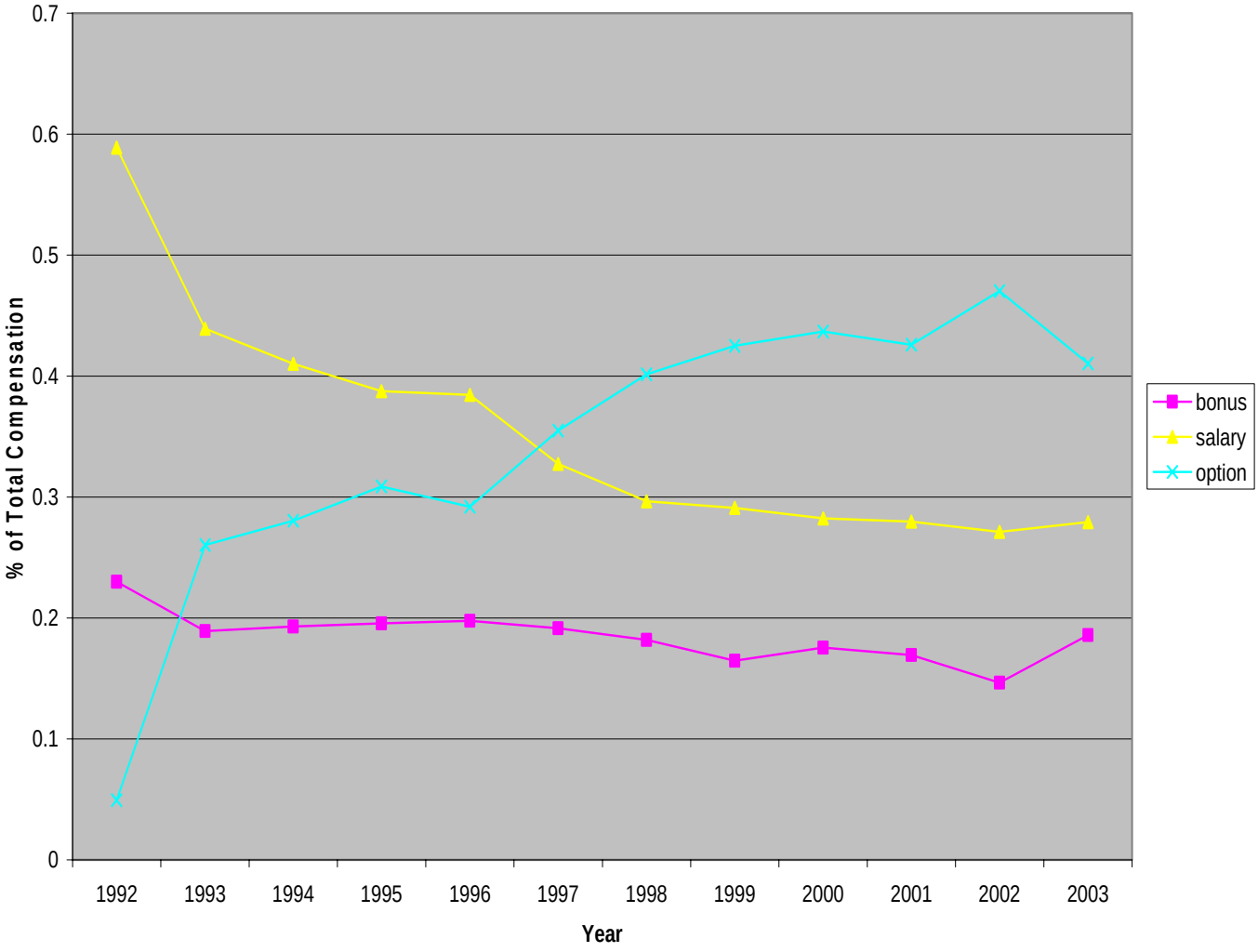
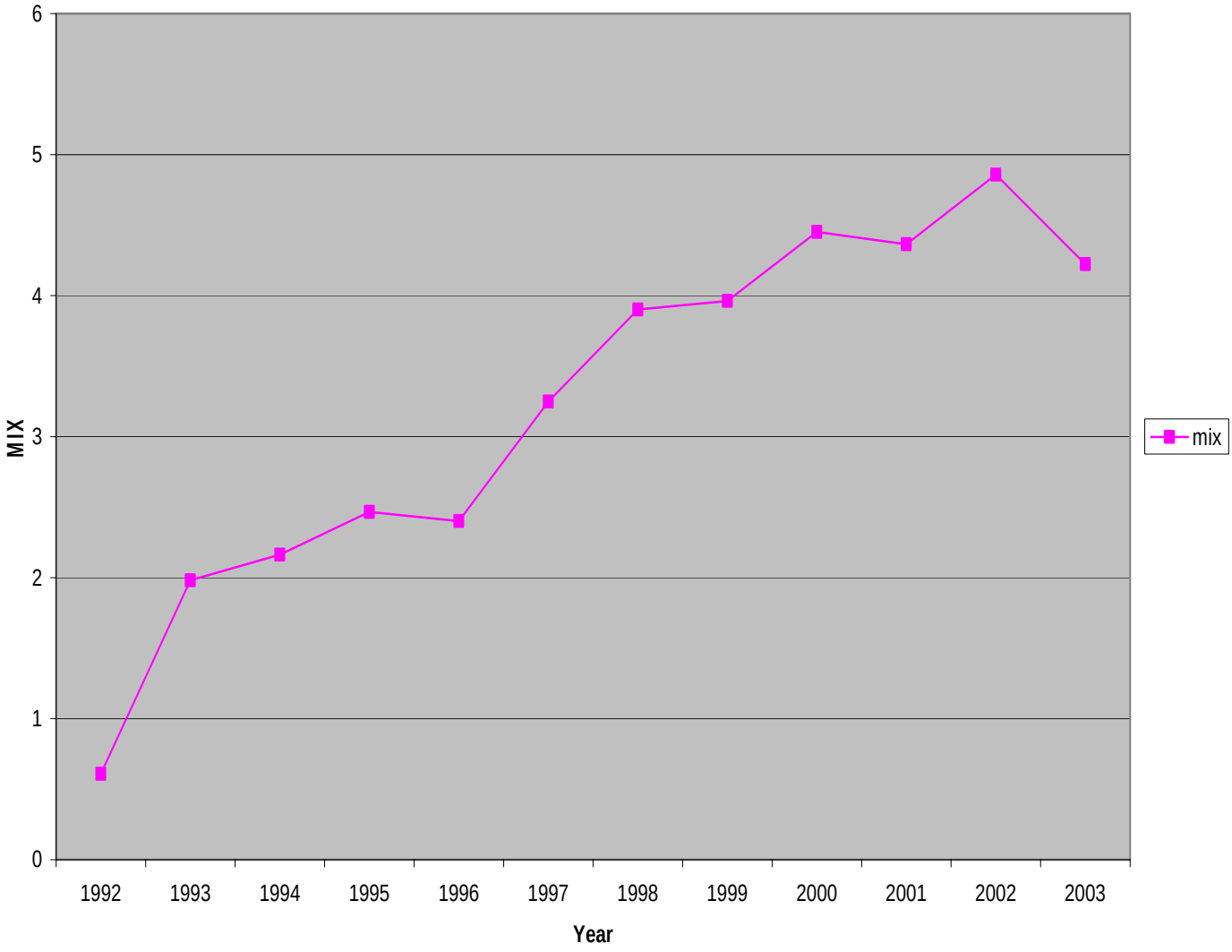


Figure 3: Incentive Compensation Mix Over Time 1992-2003



Incentive compensation mix is defined as the ratio of the value of the Black-Scholes Option value grants plus bonus compensation to the salary of CEO.

Table 3
Determinants of Incentive – Salary Mix
1992 – 2003

$$MIX_{jt} = \alpha_0 + \alpha_1 \times SIZE_{jt} + \alpha_2 \times RISK\_INVT_{jt} + \alpha_3 \times SHARES_{jt} + \alpha_4 \times CFO_{jt} + \alpha_5 \times GROWTH_{jt} + \alpha_6 \times TIME + \alpha_7 \times SOX + \alpha_8 \times RISK\_INVT \times SOX$$

	Risky Investment Variable ($RISK\_INVT_{jq}$)			
	Panel A		**Panel B**	
	RD_{jt}		$CAPEX_{jt}$	
	Coef.	t-stat	Coef.	t-stat
Intercept	1.7820	5.14***	2.9359	8.87***
SIZE	0.00007	3.76***	0.0002	7.45***
RISK_INVT	0.0525	1.40	-0.0373	-5.88***
SHARES	-0.0852	-7.77* **	-0.0877	-8.82***
CFO	4.2668	1.97**	1.9538	3.78***
GROWTH	-0.9465	-3.12***	-0.8410	-4.39***
TIME	0.2445	5.37***	0.2263	5.84***
SOX	-0.5895	-2.09**	-1.7052	-5.56***
RISK_INVT × SOX	-0.0809	-2.49**	0.0375	5.41***
N	**2,183**		**2,183**	
R-SQUARE	**0.0677**		**0.0750**	
F VALUE	**20.81**	**<0.0001**	**25.68**	**<0.0001**

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

Table 3 presents 2-SLS regression results. The dependent variable *MIX* is the ratio of the value of the Black-Sholes value of option grants plus bonus compensation to the salary of the firm's CEO; *SIZE* is the market value of equity at fiscal year end ; *RISK_INVT* equals *RD* which is the research and development expenses as a proportion of sales in Panel A, and equals *CAPEX* which is the capital expenditures scaled by total assets in panel B; *SHARES* is the percent of company stock held by the firm's CEO; *CFO* is the cash flow from operations; *GROWTH* is the growth in sales for the year; *TIME* is the calendar year minus 1992; and *SOX* is a dummy variable that takes the value 1 when the proxy statement for the year was filed after July 30, 2002, and 0 otherwise.

Table 4
Determinants of Executives Risky Investments
1992 – 2003

$$RISK\_INVT_{jt} = \alpha_0 + \alpha_1 \times LRD_{jt} + \alpha_2 \times SIZE_{jt} + \alpha_3 \times GROWTH_{jt} + \alpha_4 \times CFO_{jt} + \alpha_5 \times AGE_{jt} + \alpha_6 \times TENURE_{jt} + \alpha_7 \times MIX_{jt} + \alpha_8 \times TIME + \alpha_9 \times SOX + \alpha_{10} \times MIX_{jt} \times SOX$$

	Dependent Variable ($RISK\_INVT_{jt}$)			
	Panel A		**Panel B**	
	RD_{jt}		$CAPEX_{jt}$	
	Coef.	t-stat	Coef.	t-stat
Intercept	33.6942	3.16**	18.3501	1.22
LRISK_INVT	0.0371	1.66***	-286.1450	-6.15*
SIZE	0.00003	0.16	0.0033	11.02*
GROWTH	-18.0776	-8.10*	-6.7637	-2.03**
CFO	-57.8737	-6.28*	19.6674	2.44**
AGE	-0.3666	-2.52**	0.2734	1.36
TENURE	-0.0004	-1.20	-0.0014	-3.31**
MIX	-3.7061	-2.39**	-4.2224	-1.82***
TIME	1.4821	2.53**	0.8473	1.06
SOX	-14.3512	-2.12**	-24.0225	-2.52**
MIX × SOX	3.2604	2.10**	4.4.9416	2.14**
N	**2,183**		**2,183**	
R-SQUARE	**0.0677**		**0.1008**	
F VALUE	**20.81**	**<0.0001**	**28.30**	**<0.0001**

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

Table 4 presents 2-SLS regression results. The dependent variable *RISK_INVT* equals *RD* which is the research and development expenses as a proportion of sales in Panel A, and equals *CAPEX* which is the capital expenditures scaled by total assets in panel B; *LRD* is the; *SIZE* is the market value of equity at fiscal year end; *GROWTH* is the growth in sales for the year; *CFO* is the cash flow from operations; *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; *MIX* is the ratio of the value of the Black-Sholes value of option grants plus bonus compensation to the salary of the CEO; and *SOX* is a dummy variable that takes the value 1 when the proxy statement for the year was filed after July 30, 2002, and 0 otherwise.