EARNINGS MANAGEMENT AND ASYMMETRIC SENSITIVITY OF BONUS COMPENSATION TO EARNINGS FOR HIGH-GROWTH FIRMS

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Abstract

In this paper, we examine whether high-IOS (investment opportunity set) firms *vis-à-vis* non-growth (low-IOS) firms will not reduce discretionary expenditures, such as advertising expenses, research and development, and SG&A (selling, general and administrative) expenses, to further sustain the firm growth in a more conservative reporting environment (the post-Sarbanes-Oxley (SOX) period). We also investigate, as an extension of a prior paper, the sensitivity of CEO bonuses to earnings in the cases of high-IOS and low-IOS firms. We find a stronger association between incentive compensation and asymmetric sensitivity of bonus to earnings for high-IOS firms in the pre-SOX period, and this asymmetric sensitivity disappears even for high-IOS in the post-SOX period. As in a prior study, we also look into whether accounting conservatism is stronger in the post-SOX period for both high-IOS and low-IOS firms than in the pre-SOX period. The findings are consistent with our hypotheses that high-IOS firms *vis-à-vis* low-IOS firms will not reduce discretionary expenditures, asymmetric sensitivity bonus to earnings disappears in the post-SOX period for both high-IOS and low-IOS firms, and that accounting conservatism for both high-IOS and low-IOS firms are stronger in the post-SOX period. The documented evidence in this study shows how regulatory changes affect both accrual and real earnings management behaviors, how those regulatory changes affect the sensitivity of bonus compensation to earnings, and how accounting conservatism affects bonus compensation changes in the post-SOX period in relation to the pre-SOX period for both high-IOS and low-IOS firms.

Keywords: Accrual and Real Earnings Management, Executive Compensation, Sarbanes-Oxley, Ex Post Settling Up, Asymmetric Sensitivity

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1. INTRODUCTION

In the recently established area of research examining the accrual and real-earnings management behaviors of firms, researchers often assume that the amounts of any increases or decreases in the proxies for such earnings management are similarly made for all firms, and no cross-sectional differences are specifically scrutinized[1]. However, according to Barringer, Jones, and Neubaum (2005), Delmar and Davidson (1998), Mullins (1996), and Zook and Allen (1999), rapid-growth firms, such as Google (GOOGL), Tesla (TSLA), and Amazon (AMZN), have four of the most influential categories of variables with respect to a firm's ability to achieve and maintain rapid growth: 1) founder characteristics, 2) firm attributes, 3) business practices, and 4) human resource management (HRM) practices. The findings from the above studies reveal that rapid-growth firms differ from their slow-growth counterparts in a number of important dimensions[2]. In another line of research, Cohen, Dey, and Lys (2008) have documented that accrual-based earnings management increased steadily from 1987 until the passage of the Sarbanes–Oxley (SOX) Act in 2002, followed by a significant decline after the passage of SOX. Conversely, the level of real earnings management activities decreased prior to SOX and increased significantly after the passage, suggesting that firms switched from accrual-based to real earnings management methods after the passage of SOX. The findings of Zang (2012) and Cohen and Zarowin (2010) are consistent with the viewpoint that managers use real-activities manipulation and accrual-based earnings management as substitutes in managing earnings. Therefore, based on the above empirical findings and compelling arguments, in this study, we address the following three research issues. First, we explore whether rapid-growth (high-IOS, investment opportunity set) firms in relation to non-growth (low-IOS) firms will reduce discretionary expenditures even after SOX to sustain their growth. Second, we examine whether high-IOS firms have higher levels of sensitivity of bonus to earnings before SOX, with the sensitivity disappearing after SOX given that their compensation includes fewer stock options and there were SOX-related regulations[3]. For instance, Section 304 of SOX includes a clawback provision that requires reimbursement by chief executive officers (CEOs) and chief financial officers (CFOs) of bonuses and other incentive compensation if their company is required to restate financial statements due to material non-compliances, as a result of misconduct, with any financial reporting requirement under the securities and exchange laws and regulations. Third, our empirical evidence is also consistent with Lobo and Zhou's (2006) observations that all firms are more conservative in financial reporting in the first two years after SOX because of required regulatory changes. They found that firms incorporate losses more quickly than gains when they report earnings in the post-SOX period. In addition, SOX significantly affected the auditing profession. Feldmann and Read (2010) document auditors behaving more conservatively after SOX and found the proportion of going-concern modifications increased sharply in 2002–2003 compared to 2000–2001.

The regression test findings were based on pooled regression tests using White's (1980) heteroskedasticity-consistent covariance estimator, where the assumptions of heteroskedasticity are violated, rather than the ordinary least squares (OLS) estimator, which tends to overstate standard errors and thus understate t-statistics in the existence of heteroskedasticity. The findings were also obtained after we controlled for variables identified in prior executive compensation studies that influence the sensitivity of executive bonus compensation to earnings and stock returns. Our results remained robust after extreme values of all variables in the regression tests were winsorized at the 2.5% level of both ends.

This study adds the following contributions to the literature on IOS, compensation, and conservatism. First, we use the IOS variable as a proxy for firm growth and prior research more supported which is measured by the principal component of four IOS proxies (investment intensity, geometric mean annual growth rate of the market value of total assets, market-to-book value of total assets, and research and development expenditure to total assets) rather than the simple, frequently-used proxy for firm growth (MTB: the market-to-book value of assets).

Second, we found that regulatory mandates brought forth by SOX that changed corporate earning-management behavior have had an indirect impact on the design of compensation contracts of high-IOS firms. One notable consequence of SOX is that the board of directors reduces the asymmetric sensitivity between pay and accounting performance. The increased levels of regulatory requirements and executive responsibilities and penalties, as well as the increased efforts and diligence from the auditing profession, have acted as a system to monitor top executives, substituting the monitoring effect of compensation contracts to some degree. The evidence of high-IOS firms' increase in discretionary expenditures (and decrease in real-earnings management) even after SOX and the effects of SOX and other concurrent reforms on the sensitivity of executive bonus compensation-to-earnings changes are considered to be particularly useful information for regulators, managers, politicians, investors, and academics in their assessment of the earning-management methods differently adopted by high-IOS and low-IOS firms and the equitable relationship between executive efforts and executive compensation for firms affected by the SOX Act and levels of IOS.

Third, a strong and positive association between conservatism and bonus pay in the post-SOX period for both high-IOS and low-IOS firms implies the need to control for the level of conservatism in regression tests that examine the sensitivity of executive compensation to earnings.

[1] In this regard, Roychowdhury (2006) has already warned: "Industry membership, the stock of inventories and receivables, *growth opportunities*, and *the presence of debt* are other factors that affect variation in real activities manipulation (Real EM)" (p. 336).

[2] Barringer et al. (2005) further indicate that the founders of rapid-growth firms are better educated, have a higher incidence of prior industry experience, and have a more compelling "entrepreneurial story". Rapid-growth firms, in their sample, have a stronger commitment to growth, add more unique value, and emphasize training, employee development, financial incentives, and stock options to a greater extent than slow-growth counterparts.

[3] Cohen et al. (2008) indicate that while bonus compensation was relatively stable around 15–20 percent over 1987–2005, stock option compensation increased over time and peaked to as much as 45 percent of total compensation in 2001 and then gradually decreased back to the 25 percent range by 2005.

The remainder of this study is organized as follows. The second section develops the hypotheses by exploring and discussing previous relevant research. The third section describes the sample selection procedures and research design. Section 4 presents the empirical results. Concluding remarks are provided in the final section.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

According to Barringer et al. (2005), Delmar and Davidson (1998), Mullins (1996), and Zook and Allen (1999), high-IOS firms, such as Google (GOOGL), Tesla (TSLA), and Amazon (AMZN), have the four most influential types of variables with respect to a firm's ability to achieve and maintain rapid growth: 1) founder characteristics, 2) firm attributes, 3) business practices, and 4) HRM practices. The findings from the above studies have revealed that rapid-growth firms (high-IOS firms) differ from their slow-growth counterparts (low-IOS firms) in a number of important aspects. In another line of research, Cohen et al. (2008) showed that accrual-based earnings management rose steadily from 1987 until the enactment of the SOX Act in 2002, followed by a significant reduction after the passage of SOX. Conversely, the level of real-earnings management activities declined prior to SOX and increased significantly after the passage of SOX, suggesting that firms switched from accrual-based to real-earnings management methods in the post-SOX period. The findings of Zang (2012) and Cohen and Zarowin (2010) support the viewpoint that managers use real-activities manipulation and accrual-based earnings management as substitutes in managing earnings. Therefore, based on the above findings and convincing arguments, in this study, we examine the following first hypothesis in its alternate form:

H1: Ceteris paribus, the rapid-growth (high-IOS) firms, vis-à-vis the non-growth firms (low-IOS) firms, will not reduce discretionary expenditures even after SOX to sustain their growth.

A recent study by Leone, Wu, and Zimmerman (2006) found that CEO cash compensation was twice as sensitive to negative stock returns as to positive stock returns. They attributed this difference in sensitivity to boards of directors designing cash compensation to alleviate the ex post settling up problem. The ex post settling up problem occurs when executives are compensated for expected future cash flows that do not materialize. The higher sensitivity of cash compensation to negative stock returns than to positive stock returns offers a method to penalize executives more for unrealized losses than to reward executives for unrealized gains[4]. Leone et al. (2006) did not pursue similar predictions on the potential asymmetric association between CEO cash pay and accounting earnings. In this line of research, Kwon, Yin, and Ndubizu (2019) found that the asymmetric sensitivity of bonuses to earnings existed before SOX but disappeared post-SOX. Together with these findings, Cohen et al. (2008) observed that the effect of option compensation increased significantly right before SOX and decreased significantly after SOX. One possible reason for the decline after SOX could be the penalties on incentive compensation introduced by SOX. The second hypothesis, in its alternate form, is as follows:

H2: Ceteris paribus, there is a stronger association between incentive compensation and asymmetric sensitivity of bonus to earnings for high-IOS firms in the pre-SOX period, and this asymmetric sensitivity disappears even for high-IOS firms in the post-SOX period.

Leone et al. (2006) have argued that managers have limited tenure and limited liability, which creates a situation of costly ex post settling up where managers are paid for unrealized gains that disappear. The recovery of excess compensation payments and reparation for excess investments is difficult when the manager leaves the firm before the cash flows materialize (Watts, 2003)[5]. On the other hand, CEO pay should be reduced for unrealized losses, so that CEOs cannot avoid the consequences of poor performance. Leone et al. (2006) show that CEO cash compensation is twice as sensitive to negative stock returns as it is to positive stock returns. They do not make similar predictions on the potential asymmetric relationship between CEO cash pay and accounting earnings. One reason for this is that conservative accounting generally excludes unrealized gains from earnings and recognizes unrealized losses in a timely manner. Therefore, there would be no asymmetry in the relationship between bonus compensation and accounting earnings, as in the case of stock returns. The discussion above implies that if we can control the levels of accounting conservatism, executive bonus compensation should be more sensitive to negative earnings changes than it is to positive earnings changes, consistent with the positive correlation between unexpected earnings and abnormal stock returns, which was well-documented in Ball and Brown's (1968) study.

Bad news due to worse accounting performance often results in lower share prices in the capital markets. Barth, Elliott, and Finn (1999) and Skinner and Sloan (2002) have claimed that missing analysts' forecasts can result in a large decline in stock prices, while Bartov, Givoly, and Hayn (2002) found that firms that meet forecasts enjoy a return premium. Skinner and Sloan (2002) demonstrated that the negative stock returns for firms that face their inability to meet earnings expectations are significantly greater in magnitude than the positive stock returns for firms that exceed expectations. As Scott (2006) observed, the capital market penalizes firms that fall short of expectations more than it rewards firms that exceed them. It is likely that when designing executive compensation, the compensation committees of the firms link compensation more closely to negative earnings than to positive earnings to discourage bad performance.

As Kwon et al. (2019) indicated, the intention of the SOX Act of 2002 was to change corporate behavior, and SOX initiated stringent regulations. Section 304 of SOX sets forth a clawback provision that enables a publicly-traded company to recover

[4] Leone et al. (2006) further noted that the ex post settling up problem also exists in other types of CEO compensation, although it is likely to be more severe when payments are made in cash.

[5] Leone et al. (2006) also indicated that if the firm pays the executive a cash bonus for an unrealized gain, but that gain does not later materialize, the executive can quit the firm and the shareholders will have difficulty recovering the cash paid for that unrealized gain.

bonuses and other performance-based compensation from its CEOs if the company is required to restate financial statements due to material non-compliances as a result of misconduct, with financial reporting requirements under the security-related laws and regulations. Clawback provisions can deter managers from engaging in activities that do not maximize firm value. Because investors can recoup all or a portion of the compensation award when unrealized gains do not materialize, we hypothesize that the possibility of an ex post settling up problem would be reduced by this provision.

Section 302 of SOX requires the CEO and CFO to make certifications accompanying quarterly and annual financial reports. They must certify that they have reviewed the financial reports and that the financial reports do not contain any untrue or misleading statements of fact or omissions. They must also certify that the financial statements and other financial information included in the financial report fairly present all material respects of the financial condition and results of operations. In addition, Section 404 requires firms to monitor and assess their internal control weaknesses over financial reporting. Management evaluates and discloses in interim reports any changes in internal controls that are likely to have a material effect and discloses any material weakness. The independent auditor is required to opine on the effectiveness of the firm's internal control system and procedures in addition to the auditor's opinion. Feldmann and Read (2010) found that after SOX, auditors have behaved more conservatively and the proportion of going-concern modifications has increased markedly. These regulatory changes certainly demand more due diligence for top executives and auditors in reviewing financial statements and the underlying process in preparing financial reports. To the extent that stringent regulations reduce the likelihood that unrealized gains evaporate in the future, we expect the asymmetric sensitivity of bonuses to earnings to have decrease after SOX.

Cohen et al. (2008), Lobo and Zhou (2006), Li, Pincus, and Rego (2006), and Carter, Lynch, and Zechman (2009) have demonstrated that the reforms associated with the SOX of 2002 have considerably altered the financial reporting environment in which managers operate. They found an increase in accounting conservatism, a decrease in financial flexibility in financial reporting, and an ensuing decrease in earnings management after SOX. Higher levels of conservatism after SOX may mitigate the problem of ex post settling up because unrealized gains are thus more likely to be excluded from accounting earnings. Higher levels of conservatism, higher scrutiny from auditors and investors, increased executive personal liabilities and responsibilities in the financial reporting process after SOX, as well as the clawback provision, are likely to reduce shareholder costs when future cash flows do not materialize. Regulatory changes brought forth by SOX mitigate the impact of the costly ex post settling up problem in executive compensation, resulting in reduced asymmetric sensitivity of compensation to earnings after SOX. This discussion leads to the third hypothesis in its alternate form as follows:

H3: Ceteris paribus, accounting conservatism is stronger in the post-SOX period for both high-IOS and low-IOS firms than it was in the pre-SOX period.

3. SAMPLE SELECTION AND METHODOLOGY

3.1. Sample selection

Table 1 describes the sample selection process. As in Cohen et al. (2008), all non-financial firms with available data obtained from the Compustat Fundamental Annual (North America) file for the period of 1993–2007. We also required at least eight observations in each two-digit SIC grouping per year. Stock return data was obtained from the Center for Research in Security Prices (CRSP), and executive compensation data was gathered from ExecuComp. The final sample consisted of 2,322 (2,244) firm years for the pre-SOX period (post-SOX period). Consistent with prior research, in our research, IOS was measured by the principal component of four IOS proxies, as defined in Table 3. The principal component was calculated from eigenvectors (coefficients) and the four proxies at the beginning of fiscal year *t*, where *t* belongs to the pre-SOX period (1995–2000) and the post-SOX period (2002–2007). High-IOS and low-IOS firm-year observations for 1995–2000 (2002–2007) were made using available data. The high-IOS firm years in the pre-SOX (post-SOX) period were those with IOS composite scores above the pre-SOX (post-SOX) period sample median; the low-IOS firm years were those with IOS composite scores below the pre-SOX (post-SOX) period sample median.

Table 1. High-IOS and low-IOS firm years

IOS sample		
	1995–2000	***2002–2007***
Firm years before IOS and earnings management calculations from the annual COMPUSTAT file	53,066	47,971
Less firm years with missing IOS and earnings management data plus other COMPUSTAT data	(33,677)	(24,518)
	19,389	23,453
Less firm years with missing data in regression control (independent)		
Variables	(17,067)	(21,209)
High-IOS firm years*	1,162	1,124
Low-IOS firm years*	1,160	1,120
	2,322	2,224

Note: The high-IOS firm years have higher than the median IOS of all firm years in the period of 1995–2000 (pre-SOX) or 2002–2007 (post-Sox).

3.2. Methodology

3.2.1. Earnings management proxies

Accrual-based earnings management

Modified Jones model (Jones, 1991) and performance-matched discretionary accruals: We computed discretionary accruals using the cross-sectional modified Jones (1991) model estimated by industry and year. The cross-sectional approach has the advantage of controlling for the effects of industry-wide economic changes on total accruals and allowing the coefficients to change across years due to possible structural changes. Similar to Cohen et al. (2008), we adjusted the reported revenues for the change in accounts receivable to capture any potential accounting discretion arising from credit sales. For every year t from 1995 to 2007, the following estimation model was used:

$$\frac{TA_{i,t}}{A_{i,t-1}} = a_t\left(\frac{1}{A_{i,t-1}}\right) + b_{1t}\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}} + b_{2t}\left(\frac{PPE_{i,t}}{A_{i,t-1}}\right) + \varepsilon_{i,t} \quad (1)$$

where, for firm i at time t:
$TA_{i,t}$ = total accruals, $EBXI_{it}$ – CFO_{it} (where *EBXI* is the earnings before extraordinary items and discontinued operations, and *CFO* is the operating cash flows (from continuing operations) taken from the statement of cash flows);
$A_{i,t-1}$ = lagged total assets;
$\Delta REV_{i,t}$ = change in sales;
$\Delta REC_{i,t}$ = change in accounts receivable;
$PPE_{i,t}$ = gross property, plant, and equipment;
$\varepsilon_{i,t}$ = error term.

Discretionary accruals were estimated as the difference between reported total accruals and fitted values of total accruals (non-discretionary accruals) using coefficient estimates from equation (3) for the years 1995–2007:

$$DA_{i,t} = \frac{TA_{i,t}}{A_{i,t-1}} - [a_t\left(\frac{1}{A_{i,t-1}}\right) + \frac{b_{1t}(\Delta REV_{i,t} - \Delta REC_{i,t})}{A_{i,t-1}} + b_{2t}(PPE_{i,t}/A_{i,t-1})] \quad (2)$$

where, $DA_{i,t}$ is discretionary accruals and $\Delta REC_{i,t}$ is the change in accounts receivable (item #2).

We also adjusted discretionary accruals for performance and industry effects, as suggested by Kothari, Leone, and Wasley (2005), because potential measurement errors in discretionary accruals may correlate with industry membership, growth, or performance. We calculated the performance-matched (PM) discretionary accruals for firm i as the discretionary accruals of firm i minus the discretionary accruals of firm j, which exhibited the closest ROA in the same industry.

We used the modified cross-sectional Jones model (Jones, 1991) and estimate the industry-specific regressions, adjusting the reported revenues of the sample firms for the change in accounts receivable to capture any potential accounting discretion arising from credit sales.

Our measure of discretionary accruals was the difference between total accruals and the fitted normal accruals, as specified by Cohen et al. (2008).

Real earnings management

As in Roychowdhury (2006), Cohen et al. (2008), and Zang (2012), we focused on three proxies of the abnormal levels of cash flow from operations (CFO), discretionary expenses, and production costs to examine the levels of the following real-activities manipulations:

1. Increased price discounts and lenient credit terms will temporarily increase sales volumes and current period earnings but will disappear once the firm reverts to old prices, which will result in lower cash flows in the current period.

2. When managers produce more units, the cost of goods sold will be lowered and earnings will be increased. Fixed costs and total costs per unit that are not offset by any increase in marginal costs per unit will also be lowered with the increased production. However, the firm will still have other higher production and inventory holding costs that will lead to higher annual production costs relative to sales and lower cash flows from operations given sales volumes.

3. Decreases in discretionary expenditures from advertising expenses, research and development, and selling, general, and administrative (SG&A) expenses will lead to higher current period earnings and higher current period cash flows at the expense of lower future cash flows if the firm generally paid for such expenses in cash.

We measured the abnormal levels of CFO, production costs, and discretionary expenditures using the models developed and implemented by Dechow, Kothari, and Watts (1998) and Roychopwdhury (2006) by estimating the normal levels of CFO, production costs, and discretionary expenditures, which were deducted from their actual values as follows:

$$\frac{CFO_{i,t}}{A_{i,t-1}} = k_1\left(\frac{1}{A_{i,t-1}}\right) + k_2\frac{(Sales_{i,t})}{A_{i,t-1}} + k_3\frac{(\Delta SALES_{i,t})}{A_{i,t-1}} + \varepsilon_{i,t} \quad (3)$$

Production costs were defined as the sum of CGOS and changes in inventory during the year, as shown below (equations (4–6)).

The normal level of discretionary expenditures was estimated as follows (equation (7)):

$$\frac{COGS_{i,t}}{A_{i,t-1}} = k_1\left(\frac{1}{A_{i,t-1}}\right) + k_2\frac{(Sales_{i,t})}{A_{i,t-1}} + \varepsilon_{i,t} \quad (4)$$

$$\frac{\Delta INV_{i,t}}{A_{i,t-1}} = k_1\left(\frac{1}{A_{i,t-1}}\right) + k_2\frac{(\Delta Sales_{i,t})}{A_{i,t-1}} + k_3\frac{(\Delta SALES_{i,t-1})}{A_{i,t-1}} + \varepsilon_{i,t} \quad (5)$$

$$\frac{Prod_{i,t}}{A_{i,t-1}} = k_1\left(\frac{1}{A_{i,t-1}}\right) + k_2\frac{(Sales_{i,t})}{A_{i,t-1}} + k_3\frac{(\Delta SALES_{i,t})}{A_{i,t-1}} + k_4\frac{(\Delta SALES_{i,t-1})}{A_{i,t-1}} + \varepsilon_{i,t} \quad (6)$$

$$\frac{DiscExp_{i,t}}{A_{i,t-1}} = k_1\left(\frac{1}{A_{i,t-1}}\right) + k_2\frac{(Sales_{i,t-1})}{A_{i,t-1}} + \varepsilon_{i,t} \quad (7)$$

3.2.2. Performance measures

Studies using accounting performance to reflect managerial performance include Sloan (1993), Baber, Janakiraman, and Kang (1996), Gaver and Gaver (1998), Baber, Kang, and Kumar (1998, 1999), Leone et al. (2006), and Kwon et al. (2019). We adopted two measures of accounting performance for the present paper — changes in return on equity (*ΔROE*) and changes in earnings per share excluding extraordinary items, and discontinued operations (*ΔEPSP*) — to add generality to the analyses. The calculations of these measures are shown below:

Change in return on equity (ΔROE):

$$\Delta ROE_t = ROE_t - ROE_{t-1} \quad (8)$$

where, *ROE* = net income before *EI* and *DO*/average common equity.

Change in earnings per share, excluding EI and DO (ΔEPSP):

$$\Delta EPSP_t = \frac{\Delta(earnings\ per\ share\ excluding\ EI\ and\ D)_t}{(Stock\ Price)_{t-1}} \quad (9)$$

Following Leone et al. (2006), we used two measures of stock performance, annual market-adjusted return and annual raw return as follows in equations (10) and (11).

Annual market-adjusted return (ANNMAR):

$$ANNMAR_t = \prod_{\tau=1}^{12}(ARET_\tau + 1) - 1 \quad (10)$$

where, *ARET* = monthly CRSP raw return — value-weighted market index; τ ranged from month 1 to month 12.

Annual raw return (ANNMRR):

$$ANNMRR_t = \prod_{\tau=1}^{12}(RET_\tau + 1) - 1 \quad (11)$$

where, *RET* = monthly CRSP raw return; τ ranged from month 1 to month 12.

3.2.3. Regression models

We investigated the sensitivity of CEO compensation to accounting earnings in high-IOS and low-IOS firms using the following regression models. We estimated these models using pooled regressions:

$$\begin{aligned}\Delta BON_{i,t} = {} & \beta_0 + \beta_1 D_{i,t} + \beta_2 ANNMRR_{i,t} + \beta_3 D_{i,t} * ANNMRR_{i,t} + \beta_4 \Delta E_{i,t} + \beta_5 D_{i,t} * \Delta E_{i,t} + \beta_6 SALE_{i,t} + \\ & \beta_7 SALE2_{i,t} + \beta_8 FAGE_{i,t} + \beta_9 LEVERAGE_{i,t} + \beta_{10} MTB_{i,t} + \beta_{11} PERS_{i,t} + \beta_{12} LOSSDUM_{i,t} + \\ & \beta 13\ EQUITYINCi,t + \beta_{14} LMVE_{i,t} + \beta_{15} EPSSTD_{i,t} + \beta_{16} RETSTD_{i,t} + \beta_{17} INST_{i,t} + \beta_{18} EAGE_{i,t} + \\ & \beta_{19} MAS_{i,t} + \beta_{20} NOAA_{i,t} + \Sigma\gamma_j YEAR_j + \varepsilon_{i,t}\end{aligned} \quad (12)$$

where, for firm *i* in year *t*:
$BON = BONUS_t/SALARY_{t-1}$;
$\Delta BON = BON_t - BON_{t-1}$;
ANNMRR = cumulative annual raw returns calculated from monthly raw returns obtained from CRSP;
D = 1 if the cumulative annual market-adjusted return (*ANNMAR*) was negative, and 0 otherwise;
E = accounting earnings, alternatively measured as ROA, ROE, EPSP, or EPSEIP;
ROE = net income before *EI* and DO_t/average common equity for year *t* and *t-1*;
EPSP = EPS excluding *EI* and DO_t/(Stock Price)$_{t-1}$;
$\Delta E = E_t - E_{t-1}$;
SALE = net sales$_t$;

FAGE = firm age, calculated as year *t* minus the first year the firm appeared on CRSP;
LEVERAGE = (long-term $debt_t$ + the current portion of long-term $debt_t$)/total $assets_t$;
MTB = market value of $equity_t$/book value of common $equity_t$;
PERS = earnings persistence measured by *IMA* or *ARI*;
IMA = persistence measure calculated based on the integrated moving average model;
ARI = persistence measure based on the integrated autoregressive model;
LOSSDUM = 1 if net income including *EI* and $DO_t < 0$ and 0 otherwise.

$$EQUITYINC = (RSHN_t + OPTIONN_t + EOPN_t + UEOPN_t + SHOWN_t)/(SHOUT_t * 1{,}000) \quad (13)$$

where,
RSHN = restricted stock holdings (thousands of shares);
OPTIONN = options granted (thousands of shares);
EOPN = exercisable options (thousands of shares);
UEOPN = unexercisable options (thousands of shares);
SHOWN = shares owned with options excluded (thousands of shares);
SHOUT = common shares outstanding (millions of shares);
LMVE = log(market value of equity);
EPSSTD = earnings volatility, measured as the standard deviation of annual basic earnings per share over the past 7 years;
RETSTD = stock return volatility, measured by the standard deviation of monthly returns over the prior 60 months;
INST = percent of institutional ownership in fiscal year *t* from the TFSD ownership database;
EAGE = ln(age of the CEO);
IOS = investment opportunity set composite, computed by performing principal component analysis on the four *IOS* measures (Kwon & Yin, 2006) from all available observations for the period from 1993 to 2005;
MAS = managerial ability score, as developed in Demerjian, Lev, and McVay (2012). Data was obtained from Dr. Demerjian's website[6];
NOAA = nonoperating accruals/total assets;
YEAR = 1 if fiscal year *t* and 0 otherwise.

As in Baber et al. (1996), we deflated year *t* changes in executive compensation by prior year (*t-1*) base salary to control for size-related factors that vary cross-sectionally and to minimize the effect of year *t-1* performance on compensation metrics. Following Leone et al. (2006), we included sales (*SALE*), square of sales ($SALE^2$), firm age (*FAGE*), leverage (*LEVERAGE*), and market-to-book (*MTB*) in the model because they are potentially correlated with pay-performance sensitivity. Baber et al. (1998) demonstrated that the sensitivity of compensation to earnings varies directly with earnings persistence. Therefore, *IMA*, a proxy for earnings persistence and measured by *MA1* based on an *IMA(1,1)* time-series characterization of earnings, was included in the model. *LOSSDUM* takes a value of 1 if the net income with *EI* and *DO* is less than 0, and 0 otherwise, to control for earnings persistence when earnings are negative. *EQUITYINC*, measured as the total equity holdings as a percentage of shares outstanding, controls for the effect of equity incentives. The log of the market value of equity (*LMVE*) controls for the firm size effect (Dikolli, Kulp, & Sedatole, 2009; Garvey & Milbourn, 2006). Banker and Datar (1989), Lambert and Larcker (1987), Sloan (1993), and Leone et al. (2006) have all demonstrated that earnings volatility and stock return volatility influence the sensitivity of executive cash compensation to market and accounting performance. We included earnings volatility measured by the standard deviation of annual basic earnings per share over the last seven years and stock return volatility measured by the standard deviation of monthly returns over the prior 60 months, similar to those used in Dikolli et al. (2009). In addition, Baber et al. (1996) have shown that associations between compensation and performance measures are stronger in firms with greater investment opportunities. Following Baber et al. (1996) and Kwon and Yin (2006), we included the investment opportunity set variable (*IOS*), measured by the principal component of four IOS proxies — investment intensity, geometric mean annual growth rate of the market value of total assets, market-to-book value of total assets, and research and development expenditure to total assets — in the model.

Leone et al. (2006) asserted that if an accounting system were designed solely for use in compensation contracts — i.e., unrealized gains are excluded from income and unrealized losses are recognized immediately — there would be no asymmetry in the relationship between cash compensation and accounting earnings, as in the case of stock returns. Their claim implies that accounting conservatism can affect the sensitivity of executive compensation to earnings. Conservatism is an important variable in the compensation models for two reasons. First, Watts (2003) has observed that in practice, conservatism more than offsets managerial bias, and on average defers earnings and understates cumulative earnings and net assets. In such contracts as debt, executive compensation, and employment contracts, the conservative effects have been shown to increase firm value because they constrain management's opportunistic payments to themselves and other parties, such as shareholders. The increased firm value is shared among all corporate stakeholders, increasing everyone's welfare. Second, in compensation contracts, conservatism reduces the likelihood of overpayments to managers by constraining premature revenue recognition and asset overvaluation. As Watts (2003) has indicated, in the bonus compensation case, without verifiable earnings measures, the manager receives overpayments that leave shareholders with a lower share value, even after adjusting for the value increase through the efforts of the manager. Furthermore, the shareholders are unable to recover the overpayment because of the manager's limited liability. In sum, conservative accounting can contribute to efficient contracting, which leads to

[6] https://community.bus.emory.edu/personal/PDEMERJ/Pages/Download-Data.aspx

a lower cost of capital for the firm and an increase in firm value. Therefore, conservatism is likely to be a determinant of compensation. We expected a positive correlation between conservatism and compensation, and we used non-operating accruals (*NOAA*) to proxy for conservatism as Khan and Watts (2009), Kwon et al. (2006), and Givoly and Hayn (2000) have documented that conservative firms have more negative periodic non-operating accruals (*NOAA*). We also included a measure of managerial ability to control for CEO-specific characteristics. MAS measures O's efficiency in bringing about revenues, as advanced by Demerjian et al. (2012).

Other control variables that were expected to influence the sensitivity of the executive compensation to executive performance measures included institutional ownership (*INST*) (Dikolli et al. 2009) and the age of the executive (*EAGE*) (Garvey & Milbourn, 2006; Dikolli et al., 2009). Finally, year dummies (*YEAR*) were included to capture time-specific factors.

4. RESULTS AND DISCUSSIONS

Descriptive statistics (means and medians) are provided in the Appendix together with definitions of the variables used in regression tests.

In the pre-SOX period of 1995–2000, low-IOS firms showed higher positive changes in earnings per share measures than high-IOS firms. High-IOS firms appear to have larger assets and market capitalization and lower leverage than low-IOS firms. High-IOS firms consist of younger firms and contain higher levels of accounting conservatism, higher management ability scores, and equity incentives for their executives. During the post-SOX period, high-IOS firms have also consisted of younger firms and their CEOs and have included higher levels of accounting conservatism; furthermore, they appear to have higher management ability scores and lower levels of equity incentive for their executives than their low-IOS counterparts.

Table 2. Descriptive statistics (Panel A)

Panel A: Pre-SOX (1995–2000) period						
Variable	***High-IOS***		***Low-IOS***		***Comparison***	
	Mean	***Median***	***Mean***	***Median***	***Student's t Wilcoxon test***	***Rank-sum (Z)***
IOS	2.62	0.53	-2.56	-2.38	87.85***	67.83***
Market-to-book	5.036	3.372	3.058	2.255	6.50***	14.56***
CSALBON	0.214	0.114	0.155	0.100	1.21	0.93
CBON	-0.008	0.000	0.027	0.000	-0.56	-1.18
CSOCK	-4.044	-1.351	-1.897	-1.807	-6.73***	-7.11***
CEPSEIP	0.002	0.002	0.006	0.004	-2.12**	-2.47**
CEPSP	0.002	0.002	0.005	0.004	-1.86*	-1.71*
ANNMAR	0.052	-0.026	0.022	-0.061	1.59	1.30
ANNMRR	0.210	0.138	0.172	0.111	1.89*	1.27
Mkt. Capitalization	13,451.3	2045.4	4,994.1	1,196.9	6.52***	7.03***
RETSTD	0.100	0.093	0.087	0.081	9.20***	8.34***
PCT_INST	58.43	60.27	59.67	61.34	-1.58	-1.62
ASSET	5,763.8	1,311.7	4,042.9	1,264.6	2.19**	-0.51
CEOAGE	74.17	75.00	74.18	76.00	-0.03	-2.47**
FAGE	27.83	25.00	31.84	27.00	-5.45***	-6.20***
EPSDSTD	5.036	3.372	3.058	2.255	6.50***	14.56***
SALES	4,949.7	1322.2	4,772.4	1,758.0	0.36	-3.68***
LEVERAGE	0.194	0.184	0.231	0.231	-5.87***	-6.08***
EQUITYINC	0.39	0.33	0.28	0.27	2.40**	5.08***
NOAA	-0.013	-0.008	-0.009	-0.006	-1.69*	-2.50***
AR	0.428	0.481	0.471	0.524	-3.82***	-3.23***
MA	1.442	1.455	1.473	1.474	-1.05	-2.88***
CROE	0.003	0.001	0.001	0.002	0.35	-1.21
CROE	0.001	0.002	-0.001	0.000	0.14	1.16
MAS	0.052	0.038	0.042	0.034	1.87*	1.77*
DA	0.716	0.137	0.031	0.006	1.35	0.70
ABS DA	0.135	0.513	0.087	0.048	1.67*	1.64*
ABS PM	0.713	0.103	0.211	0.082	2.79***	2.02**
R_CFO	0.110	0.092	0.064	0.061	3.42***	3.87***
R_PROD	-0.156	-0.156	-0.102	-0.091	-2.58***	-3.10***
R_DISE	0.100	0.062	0.002	0.017	2.92***	3.26***
RM1	-0.256	-0.223	-0.104	-0.101	-3.31***	-3.51***
RM2	-0.210	-0.162	-0.066	-0.076	-3.90***	-4.34***

Note: See Section 3 and the Appendix for the definition of variables.

Table 2. Descriptive statistics (Panel B)

Panel B: Post-SOX (2002–2007) period						
Variable	*High-IOS*		*Low-IOS*		*Comparison*	
	Mean	*Median*	*Mean*	*Median*	*Student's t Wilcoxon test*	*Rank-sum (Z)*
IOS	2.02	0.93	-1.28	-1.24	27.67***	41.02***
Market-to-book	8.392	2.757	2.449	2.230	1.17	6.49***
CSALBON	0.042	0.070	0.042	0.070	0.00	0.00
CBON	-0.027	0.000	-0.027	0.000	0.00	0.00
CSOCK	-0.659	0.000	-0.909	0.000	0.62	-0.94
CEPSEIP	0.004	0.003	0.014	0.002	-0.88	-0.08
CEPSP	0.004	0.003	0.009	0.002	-0.51	0.28
ANNMAR	0.058	0.018	0.077	0.019	-1.22	-0.30
ANNMRR	0.169	0.130	0.187	0.140	-1.03	-0.41
Mkt. Capitalization	13,305.0	2,548.5	8,134.3	2,070.1	4.02***	3.76***
RETSTD	0.119	0.102	0.114	0.100	1.79*	1.80*
PCT_INST	58.43	60.27	59.67	61.34	-1.58	-1.62
CEOAGE	56.94	57.00	57.58	57.00	-2.09**	-2.11**
FAGE	2.29	1.00	2.75	3.00	-5.30***	-6.21***
EPSDSTD	1.034	0.700	1.303	0.806	-4.08***	-3.27***
SALES	8,951.2	1,714.4	7,736.3	2,322.3	1.21	-4.64***
LEVERAGE	0.204	0.195	0.215	0.195	-1.66*	-1.14
EQUITYINC	0.014	0.002	0.025	0.003	-4.35***	-3.29***
NOAA	0.010	0.010	0.021	0.017	-2.57***	-2.47***
AR	0.132	0.130	0.179	0.194	-2.54***	-2.48**
MA	-0.074	-0.273	-0.111	-0.325	1.10	0.80
CROE	0.004	0.001	-0.017	0.009	0.35	-2.71***
CROE	0.003	0.002	0.006	0.005	-0.95	-2.67***
MAS	0.020	0.008	0.007	-0.008	2.46**	2.27**
DA	0.136	0.004	0.005	0.004	1.85*	0.41
ABS DA	0.227	0.034	0.067	0.035	2.31**	0.19
ABS PM	0.859	0.064	0.313	0.060	2.01**	1.21
R_CFO	0.068	0.057	0.065	0.057	0.09	0.26
R_PROD	-0.129	0.034	-0.102	-0.091	-1.31	-0.88
R_DISE	0.210	0.034	0.028	0.000	3.17***	1.99**
RM1	-0.339	-0.143	-0.122	-0.083	-2.81***	-2.11**
RM2	-0.278	-0.100	-0.093	-0.063	-3.11***	-2.04**

Note: See Section 3 and the Appendix for the definition of variables.

Gaver and Gaver (1993) presented the use of factor analysis to measure the extent to which investment opportunities comprise firm value. Factor analysis condenses pairwise correlations between observable variables that are assumed to derive from a common unobservable construct to acquire one or more measures, called factors, that capture variation common to the observable variables. Therefore, a variety of observable variables can be reduced to a single factor. A straightforward application of their approach, however, substantially reduces the sample size. The investment opportunity set is measured by the principal component of four IOS proxies, as defined in Table 3. The principal component is calculated from eigenvectors (coefficients) and the four proxies at the beginning of fiscal year *t*, where *t* belongs to the pre-SOX period (1995–2000) and the post-SOX period (2002–2007). The high-IOS firm years in the pre-SOX (post-SOX) period were those with IOS composite scores above the pre-SOX (post-SOX) period sample median; the low-IOS firm years were those with IOS composite scores below the pre-SOX (post-SOX) period sample median.

Baber et al. (1996) and Kwon and Yin (2006) used factor analysis in gauging the extent of the investment opportunity set. In Table 3, we adopt a composite factor of commonly used proxies for a firm's IOS. This composite factor, IOS, was computed by performing a principal component analysis on four IOS proxies: investment intensity (*INVINT*), the geometric mean annual growth rate of the market value of total assets (*MVAGR*), the market-to-book value of total assets (*MTBA*), and research and development expenditure to total assets (*RNDA*) from combined observations of high-IOS and low-IOS firms from 1995 to 2007. As in prior research, the measures of IOS were obtained at the beginning of each year from 1995 to 2007. As expected, IOS was significantly associated with its four components. In Panel D of Table 3, most of Spearman's rank correlations are statistically significant at the 1% level for both high-IOS and low-IOS firms.

Table 3. Variable definitions and Spearman's rank correlations between IOS and its components high-IOS (low-IOS) firm-years, 1995–2007[a,b]

Panel A: IOS Components[a]	
1. Investment intensity (INVINT):	
$$\frac{\sum_{i=t-2}^{i=t}[Capital\ expenditures(CAPX) + R\&D\ expense(XRD) + Acquisitions(AQC)]_i}{\sum_{i=t-2}^{i=t} Depreciation(DP)_i}$$	(14)
2. Geometric mean annual growth rate of the market value of total assets (MVAGR):	
$$\sqrt[n]{\frac{Market\ value\ of\ total\ assets(AT - CEQ + PRCC\_F * CSHO)_t}{Market\ value\ of\ total\ assets\ (AT - CEQ + PRCC\_F * CSHO)_{t-n}}}$$ where, n = max[1,2,3], depending on data availability.	(15)
3. Market-to-book value of total assets (MTBA):	
$$\frac{Market\ value\ of\ total\ assets(AT - CEQ + PRCC\_F * CSHO)_t}{Book\ value\ of\ total\ assets(AT)_t}$$	(16)
4. Research and development expenditure to total assets (RNDA):	
$$\frac{Research\ and\ development\ expense(XRD)_t}{Book\ value\ of\ total\ assets(AT)_t}$$	(17)

Notes: a. The subscript t represents the current period, and i the company. Compustat data item names are given in parentheses.

Panel B: Descriptive statistics of IOS and its four components for high-IOS firms[a,b]					
Variable	***Mean***	***Median***	***Std. Dev.***	***Minimum***	***Maximum***
INVINT	1.006	-1.025	10.400	-52.097	101.835
MVAGR	0.128	-0.072	1.285	-2.253	9.719
MTBA	0.128	-0.729	61.170	-41.442	705.141
RNDA	0.041	-0.044	0.382	-0.154	3.540
Panel C: Descriptive statistics of IOS and its four components for low-IOS firms[a,b]					
Variable	***Mean***	***Median***	***Std. Dev.***	***Minimum***	***Maximum***
INVINT	-1.001	-1.975	5.933	-70.170	101.835
MVAGR	-0.093	-0.141	0.753	-2.253	9.719
MTBA	-8.681	-7.017	12.415	-41.442	705.141
RNDA	-0.044	-0.054	0.107	-0.154	3.540

Note: 1 Winsorized at 0.5% at each end.

Panel D: Spearman's rank correlations for high-IOS firms					
	IOS	***INVINT***	***MVAGR***	***MTBA***	***RNDA***
IOS	1.0000	0.0454***	0.0348***	0.6026***	0.1043***
INVINT		1.0000	0.0768***	0.0598***	0.3033***
MVAGR			1.0000	0.0381***	-0.0372**
MTBA				1.0000	0.0120***
RNDA					1.0000
Panel E: Spearman's rank correlations for low-IOS firms					
	IOS	***INVINT***	***MVAGR***	***MTBA***	***RNDA***
IOS	1.0000	0.1493***	-0.0284***	0.8592***	0.1039***
INVINT		1.0000	0.1171***	-0.0047	0.1999***
MVAGR			1.0000	-0.0378***	-0.0407***
MTBA				1.0000	0.1199***
RNDA					1.0000

Notes: a. The subscript t represents the current period, and i the company; b. The investment opportunity set composite, IOS, is computed by performing principal component analysis on the four IOS measures from combined observations of high-tech and low-tech firms, using available data from 1992–1998 (1,335 and 556 firm years, respectively). Mean-adjusted values are reported.
, **, and * indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.*

Table 4 shows time trends and correlations of accrual and real-earnings management proxies. As the first hypothesis (*H1*) claims: *Ceteris paribus, the rapid-growth (high-IOS) firms, vis-à-vis the non-growth firms (low-IOS) firms, will not reduce discretionary expenditures even after SOX to sustain their growth. High-IOS firms do not reduce discretionary expenditures in the post-SOX period because the coefficient for SOX (2002–2007) is significantly positive (0.310) at the 1% level.* Increased price discounts and lenient credit terms that the high-IOS firms use in the post-SOX period temporarily increase sales volumes and current period earnings, but disappear once the firm reverts to old prices, which results in lower cash flows in the current period. The coefficient for SOX of high-IOS firms was -0.390, which was also statistically significant at the 1% level. The coefficient for SOX of low-IOS firms was also statistically significant (0.293) at the 1% level; however, we must more carefully examine the behaviors of accrual and real-management proxies through Tables 6–9.

Table 4. Time trends and correlation coefficients

Panel A: Time trends (High-IOS)					
$DEP = A + B\ X\ PM + C\ X\ TIME + D\ X\ SOX$ (18)					
Dependent variables (DEP)	***a***	***b***	***c***	***d***	***Adjusted R²***
ABS_DA	-0.001	0.159***	0.019	0.050	0.025
R_CFO	-0.001	0.093**	0.340***	-0.390***	0.045
R_PROD	-0.001	-0.079*	0.118	-0.054	0.005
R_DISE	0.001	0.088**	-0.254***	0.310***	0.024
RMONE	-0.001	-0.098**	0.241***	-0.260***	0.018
RMTWO	-0.001	-0.118***	0.118	-0.154*	0.013
Panel B: Time trends (Low-IOS)					
$DEP = A + B\ X\ PM + C\ X\ TIME + D\ X\ SOX$ (18)					
Dependent variables (DEP)	***a***	***b***	***c***	***d***	***Adjusted R²***
ABS_DA	0.001	0.259***	0.441***	-0.494***	0.099
R_CFO	-0.001	0.125**	0.081	-0.081	0.009
R_PROD	0.001	-0.070	0.206*	-0.159	0.006
R_DISE	-0.001	0.011	-0.274**	0.293**	0.009
RMONE	0.001	-0.040	0.271**	-0.261**	0.008
RMTWO	0.001	-0.066	0.200*	-0.217*	0.006

Panel C: Spearman's correlation between the earning management proxies, 1995–2007 (High-IOS)							
	DA	***PM***	***R_CFO***	***R_PROD***	***R_DISE***	***RMONE***	***RMTWO***
DA	1	0.305***	-0.146***	-0.029	-0.040	0.010	0.081*
PM		1	-0.108**	0.058	-0.113**	0.086*	0.116***
R_CFO			1	-0.453***	0.135***	-0.334***	-0.526***
R_PROD				1	-0.628***	0.856***	0.736***
R_DISE					1	-0.903***	-0.860***
RMONE						1	0.904***
RMTWO							1

Panel D: Spearman's correlation between the earning management proxies, 1995–2007 (Low-IOS)							
	DA	***PM***	***R_CFO***	***R_PROD***	***R_DISE***	***RMONE***	***RMTWO***
DA	1	0.253***	-0.327***	0.119**	0.012	0.063	0.169***
PM		1	-0.209***	0.113**	-0.014	0.056	0.113**
R_CFO			1	-0.394***	0.048	-0.251***	-0.516***
R_PROD				1	-0.668***	0.907***	0.789***
R_DISE					1	-0.906***	-0.833***
RMONE						1	0.895***
RMTWO							1

Consistent with the empirical results of Cohen et al. (2008) and Zang (2012), accrual-based earnings management significantly declined for high-IOS firms after the passage of SOX, which is documented here in Panel A of Tables 6, 7, 8, and 9. In both high-IOS and low-IOS firms, the reduction of accrual-based earnings management proxies such as ADA (the size of modified Jones model accruals) and APDA (the size of performance-matched accruals) was positively significant at 3.51 and 2.66 (2.61 and 3.11) for high-IOS (low-IOS) firms in non-parametric tests and higher at 1.64–2.79 in the pre-SOX (post-SOX) period in both parametric and non-parametric (parametric) tests when direct comparisons between high-IOS and low-IOS firms were made in both the pre-SOX and post-SOX periods.

The empirical evidence in Panel B of Table 6 is consistent with our prediction demonstrated in *H1: Ceteris paribus, the rapid-growth (high-IOS) firms, vis-à-vis the non-growth firms (low-IOS) firms, will not reduce discretionary expenditures even after SOX to sustain their growth.* The signs of *R_CFO* and *R_PROD* are consistent with prior research by Cohen et al. (2008) and Zang (2012), in which all firms experience an increase in *R_CFO* at 2.12 and 2.91, which are statistically significant at the 5% and 1% level, respectively * in parametric and non-parametric tests and a decrease in *R_PROD* and -1.96 (significant at the 5% level) in non-parametric tests when the pre-SOX period is compared with the post-SOX period. However, the use of discretionary expenditures increased at -2.09 for high-IOS firms in the parametric tests, which was statistically significant at the 5% level. Low-IOS firms showed insignificant results. Therefore, we decided to make direct comparisons between high-IOS and low-IOS firms in both the pre- and post-SOX periods. In Panel B of Table 7 and Table 8, high-IOS firms are shown to consistently use higher levels of discretionary expenditures in both pre- (2.92 and 3.26) and post-SOX (3.17 and 1.99) periods in both parametric and non-parametric tests, which were statistically significant at the 1% or 5% level.

Table 5a. Comparison of cumulative *ADA* and *APDA* between pre-SOX and post-SOX periods for high-IOS firms

Panel A: ADA (Size of modified Jones model accruals)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.135	0.051	0.227	0.034	-1.57	3.51***
Panel B: APDA (Size of performance-matched accruals)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.713	0.103	0.859	0.064	-0.53	2.66***

Table 5b. Comparison of cumulative *R_CFO*, *R_PROD*, *R_DISX*, *RM_1*, and *RM_2* between pre-SOX and post-SOX periods for high-IOS firms

Panel A: R_CFO (Abnormal cash flow from operations)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.110	0.092	0.068	0.057	2.12**	2.91***
Panel B: R_PROD (Abnormal production costs)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
-0.156	-0.156	-0.129	-0.100	-1.05	-1.96**
Panel C: R_DISX (Abnormal discretionary expenses)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.100	0.062	0.210	0.034	-2.09**	1.20
Panel D: RM_1 (Real management 1) where RM_1 = R_DISX * (-1) + R_PROD					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
-0.256	-0.223	-0.339	-0.143	1.21	-1.20
Panel E: RM_2 (Real management 2) where RM_2 = R_CFO * (-1) + R_DISX * (-1)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
-0.210	-0.162	-0.278	-0.100	1.22	-1.94*

*Notes: Wilcoxon rank-sum and two-sample t-tests were performed between two different periods. The symbols *, **, and *** indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests.*

Table 6a. Comparison of cumulative *ADA* and *APDA* between pre-SOX and post-SOX periods for low-IOS firms

Panel A: ADA (Size of modified Jones model accruals)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.087	0.048	0.067	0.035	1.42	2.61***
Panel B: APDA (Size of performance-matched accruals)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.211	0.082	0.313	0.060	-0.83	3.11***

Table 6b. Comparison of cumulative *R_CFO*, *R_PROD*, *R_DISX*, *RM_1*, and *RM_2* between pre-SOX and post-SOX periods for low-IOS firms

Panel A: R_CFO (Abnormal cash flow from operations)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.064	0.061	0.065	0.057	-0.09	0.20
Panel B: R_PROD (Abnormal production costs)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
-0.102	-0.091	-0.094	-0.091	-0.40	-0.29
Panel C: R_DISX (Abnormal discretionary expenses)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
0.002	0.017	0.028	0.001	-0.93	0.57
Panel D: RM_1 (Real management 1) where RM_1 = R_DISX * (-1) + R_PROD					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
-0.104	-0.101	-0.122	-0.083	0.40	-0.43
Panel E: RM_2 (Real management 2) where RM_2 = R_CFO * (-1) + R_DISX * (-1)					
Pre-SOX		***Post-SOX***		***Comparison***	
Mean	*Median*	*Mean*	*Median*	*Student's t*	*Wilcoxon rank-sum (Z)*
-0.066	-0.076	-0.093	-0.063	0.85	-0.32

*Notes: Wilcoxon rank-sum and two-sample t-tests were performed between two different periods. The symbols *, **, and *** indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests. See Table 2 for variable definitions.*

Table 7a. Comparison of cumulative *ADA* and *APDA* between high-IOS firms and low-IOS firms for pre-SOX period (1995–2000)

Panel A: ADA (Size of modified Jones model accruals)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
0.135	0.051	0.087	0.048	1.67*	1.64*
Panel B: APDA (Size of performance-matched accruals)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
0.713	0.103	0.211	0.082	2.79***	2.02**

Table 7b. Comparison of cumulative *R_CFO*, *R_PROD*, *R_DISX*, *RM_1*, and *RM_2* between high-IOS firms and low-IOS firms for pre-SOX period (1995–2000)

Panel A: R_CFO (Abnormal cash flow from operations)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
-0.036	0.020	0.013	0.022	-9.03***	-4.18***
Panel B: R_PROD (Abnormal production costs)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
0.110	0.092	0.064	0.061	3.42***	3.87***
Panel C: R_DISX (Abnormal discretionary expenses)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
0.100	0.062	0.002	0.017	2.92***	3.26***
Panel D: RM_1 (Real management 1) where RM_1 = R_DISX * (-1) + R_PROD					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
-0.256	-0.223	-0.104	-0.101	-3.31***	-3.51***
Panel E: RM_2 (Real management 2) where RM_2 = R_CFO * (-1) + R_DISX * (-1)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
-0.210	-0.162	-0.066	-0.076	-3.90***	-4.34***

*Notes: Wilcoxon rank-sum and two-sample t-tests were performed between two different periods. The symbols *, **, and *** indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests. See Table 2 for variable definitions.*

Table 8a. Comparison of cumulative *ADA* and *APDA* between high-IOS firms and low-IOS firms for post-SOX period (2002–2007)

Panel A: ADA (Size of modified Jones model accruals)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
0.227	0.034	0.067	0.035	2.31**	0.19
Panel B: APDA (Size of performance-matched accruals)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon rank-sum (Z)
0.859	0.064	0.313	0.060	2.01**	1.21

Table 8b. Comparison of cumulative *R_CFO*, *R_PROD*, *R_DISX*, *RM_1*, and *RM_2* between high-IOS firms and low-IOS firms for post-SOX period (2002–2007)

Panel A: R_CFO (Abnormal cash flow from operations)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon Rank-Sum Z
0.068	0.057	0.065	0.057	0.09	0.26
Panel B: R_PROD (Abnormal production costs)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon Rank-Sum Z
-0.129	-0.100	-0.094	-0.091	-1.31	-0.88
Panel C: R_DISX (Abnormal discretionary expenses)					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon Rank-Sum Z
0.210	0.034	0.028	0.001	3.17***	1.99**
Panel D: RM_1 (Real management 1) where RM_1 = R_DISX * (-1) + R_PROD					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon Rank-Sum Z
-0.339	-0.143	-0.122	-0.083	-2.81***	-2.11**
Panel E: RM_2 (Real management 2) where RM_2 = R_CFO * (-1) + R_DISX * (-1) high-IOS					
Pre-SOX		Post-SOX		Comparison	
Mean	Median	Mean	Median	Student's t	Wilcoxon Rank-Sum Z
-0.278	-0.100	0.093	-0.063	-3.11***	-2.04**

*Notes: Wilcoxon rank-sum and two-sample t-tests were performed between two different periods. The symbols *, **, and *** indicate statistical significance levels of 10%, 5%, and 1%, respectively, in two-tailed tests. See Table 2 for variable definitions.*

Our second hypothesis (*H2*) was as follows*: Ceteris paribus, there is a stronger association between incentive compensation and asymmetric sensitivity of bonus to earnings for high-IOS firms in the pre-SOX period, and this asymmetric sensitivity disappears even for high-IOS firms in the post-SOX period.* We extend Kwon et al. (2019) based on IOS in this paper. Baber et al. (1996) predicted a stronger association between compensation and performance measures for firms with greater investment opportunities (high-IOS firms). In addition, a recent study by Leone et al. (2006) found that CEO cash compensation was twice as sensitive to negative stock returns as it was to positive stock returns. Kwon et al. (2019) further posited that the asymmetry of the sensitivity of executive bonus compensation to changes in earnings has been reduced in the post-SOX period. We expected the reduction of this asymmetric sensitivity would be revealed in both high-IOS and low-IOS firms after SOX.

As we predicted, the coefficients of $D * \Delta E$ for high-IOS (low-IOS) firms were 0.086 and 0.072 (1.144 and 0.018, respectively) in *ΔROE* and in *ΔEPSP*, respectively, which were statistically significant at the 5% (1%) and 1% (insignificant) levels in the pre-SOX period. In the post-SOX period, both coefficients became insignificant. Our third hypothesis was developed in a previous section as follows: Ceteris paribus*, accounting conservatism is stronger in the post-SOX period for both high-IOS and low-IOS firms than in the pre-SOX period.*

Panel A and Panel B of Table 9 present some evidence of stronger accounting conservatism in the post-SOX period for both high-IOS and low-IOS firms. The coefficients for *NOAA* (a proxy of accounting conservatism, Givoly and Hayn, 2000) were -1.327 and -0.334 for high-IOS firms (-0.507 and -0.508 for low-IOS firms), respectively, all of which were statistically significant at the 1% level only in the post-SOX period. This evidence is consistent with that of Lobo and Zhou (2006) and Feldmann and Read (2010) in that SOX brought forth firms' more conservative reporting behaviors.

Table 9. Relationship between *ΔBON* and independent variables, including changes in accounting earnings, annual raw returns, and other control variables (Panel A)

Panel A: High-IOS firm-years

Model A:

$$\Delta BON_{i,t} = \beta_0 + \beta_1 D_{i,t} + \beta_2 ANNMRR_{i,t} + \beta_3 D_{i,t} * ANNMRR_{i,t} + \beta_4 \Delta EPS_{i,t} + \beta_5 D_{i,t} * \Delta EPS_{i,t} + \beta_6 SALE_{i,t} + \beta_7 SALE^2_{i,t} + \beta_8 FAGE_{i,t} + \beta_9 LEVERAGE_{i,t} + \beta_{10} MTB_{i,t} + \beta_{11} PERS_{i,t} + \beta_{12} LOSSDUM_{i,t} + \beta_{13} EQUITYINC_{i,t} + \beta_{14} LMVE_{i,t} + \beta_{15} EPSSTD_{i,t} + \beta_{16} RETSTD_{i,t} + \beta_{17} INST_{i,t} + \beta_{18} CEOAGE_{i,t} + \beta_{19} MAS_{i,t} + \beta_{20} NOAA_{i,t} + \Sigma\gamma_j\, YEAR_j + \varepsilon_{i,t} \quad (19)$$

Variable	ΔEPS			
	Pre-SOX (1995–2000)		Post-SOX (2002–2007)	
	ΔROE (1)	ΔEPSP (2)	ΔROE (3)	ΔEPSP (4)
β_0 (intercept)	-0.015	-0.016	-0.015	-0.005
β_1 (D)	-0.003	0.001	-0.021	-0.026
β_2 (ANNMRR)	0.013	0.023	0.382(3.74)***	0.379(3.66)***
β_3 (D * ANNMRR)	0.050(2.48)***	0.055(2.72)***	0.064(1.85)*	0.064(1.83)*
β_4 (ΔE)	0.146(4.51)**	0.052(2.23)**	0.144	0.094
β_5 (D*ΔE)	0.086(2.06)**	0.072(3.16)***	0.157	0.040
β_6 (SALE)	0.059	0.058	0.020	0.019
β_7 ($SALE^2$)	-0.511	-0.487	0.060	0.045
β_8 (FAGE)	0.002	0.006	0.013	0.011
β_9 (LEVERAGE)	-0.020	-0.012	-0.030	-0.037(-1.72)*
β_{10} (MTB)	-0.013	0.046(0.15)	-0.819	-0.547
β_{11} (PERS)	0.100(2.41)**	0.103(2.45)**	0.002	0.001
β_{12} (LOSSDUM)	-0.030(-1.82)*	-0.035(-2.09)**	0.010	0.015
β_{13} (EQUITYINC)	-0.002	-0.003	-0.014	-0.013
β_{14} (LMVE)	0.017(1.22)	0.006	-0.038	-0.042
β_{15} (EPSSTD)	0.018	0.017	-0.013	-0.010
β_{16} (RETSTD)	-0.006	-0.001	0.028	0.032
β_{17} (INST)	-0.011	-0.016(1.59)	-0.002	-0.004
β_{18} (CEOAGE)	-0.016	-0.015	-0.023	-0.020
β_{19} (MAS)	0.002	0.001	-0.004	-0.005
β_{20} (NOAA)	-0.032	-0.018	0.327(-3.09)***	-0.334(-3.12)***
F-value	4.31***	3.48***	10.12***	10.59**
Adj. R^2	0.076	0.058	0.187	0.197

Note: Table presents pooled regression results.

Table 9. Relationship between *ΔBON* and independent variables, including changes in accounting earnings, annual raw returns, and other control variables (Panel B)

Panel B: Low-IOS firm-years				
Model B:				
$\Delta BON_{i,t} = \beta_0 + \beta_1 D_{i,t} + \beta_2 ANNMRR_{i,t} + \beta_3 D_{i,t} * ANNMRR_{i,t} + \beta_4 \Delta EPS_{i,t} + \beta_5 D_{i,t} * \Delta EPS_{i,t} + \beta_6 SALE_{i,t} + \beta_7 SALE^2_{i,t} + \beta_8 FAGE_{i,t} + \beta_9 LEVERAGE_{i,t} + \beta_{10} MTB_{i,t} + \beta_{11} PERS_{i,t} + \beta_{12} LOSSDUM_{i,t} + \beta_{13} EQUITYINC_{i,t} + \beta_{14} LMVE_{i,t} + \beta_{15} EPSSTD_{i,t} + \beta_{16} RETSTD_{i,t} + \beta_{17} INST_{i,t} + \beta_{18} CEOAGE_{i,t} + \beta_{19} MAS_{i,t} + \beta_{20} NOAA_{i,t} + \Sigma\gamma_j\, YEAR_j + \varepsilon_{i,t}$ (19)				
Variable	***ΔEPS***			
	Pre-SOX (1995–2000)		***Post-SOX (2002–2007)***	
	ΔROE (1)	***ΔEPSP (2)***	***ΔROE (3)***	***ΔEPSP (4)***
β₀ (intercept)	-0.189	0.009	0.028(1.65)*	0.032(1.88)*
β₁ (D)	0.001	-0.001	-0.037	-0.041
β₂ (ANNMRR)	0.259(2.27)**	0.069	0.571(5.29)***	0.571(5.27)***
*β₃ (D * ANNMRR)*	-0.014	0.015	0.041	0.038
β₄ (ΔE)	0.286	0.183(3.76)***	0.096	0.104
*β₅ (D*ΔE)*	1.144(2.58)***	0.018	0.012	-0.072
β₆ (SALE)	0.001(2.14)**	0.175(2.13)**	-0.011	-0.007
β₇ (SALE²)	-0.001(-2.48)**	-0.180(-2.56)***	0.001	-0.010
β₈ (FAGE)	-0.001	-0.004	0.007	0.007
β₉ (LEVERAGE)	0.276	0.043	-0.007	-0.007
β₁₀ (MTB)	-0.011	-0.006	-0.006	0.034
β₁₁ (PERS)	0.142	0.033(2.13)**	-0.016	-0.019
β₁₂ (LOSSDUM)	-0.199(-2.39)**	-0.076(-2.47)**	-0.002	0.004
β₁₃ (EQUITYINC)	0.532	0.031	-0.026	-0.024
β₁₄ (LMVE)	0.028	0.044	-0.058(-2.47)**	-0.060(-2.52)*
β₁₅ (EPSSTD)	-0.046	-0.057(-1.74)*	0.021	-0.020(-2.47)**
β₁₆ (RETSTD)	-1.956	-0.054(-1.70)*	0.020	0.021
β₁₇ (INST)	0.005	-0.003	0.017	0.021
β₁₈ (CEOAGE)	-0.001	-0.005	0.018	0.016
β₁₉ (MAS)	0.146	0.021	0.012	0.015
β₂₀ (NOAA)	0.307	0.004	-0.507(-4.72)***	-0.508(-4.72)***
F-value	2.45***	3.60***	12.37***	12.41***
Adj. R^2	0.027	0.048	0.224	0.223

Note: Table presents pooled regression results.

5. CONCLUSION

In this paper, we examine whether high-IOS firms vis-à-vis non-growth (low-IOS) firms will not reduce discretionary expenditures, such as advertising expenses, research and development, and SG&A expenses, to further sustain the firm growth in a more conservative reporting environment (the post-SOX period). We also investigate, as an extension of a prior paper, the sensitivity of CEO bonuses to earnings in the cases of high-IOS and low-IOS firms. As we hypothesize, both high-IOS and low-IOS firms showed significant decreases in the sensitivity after SOX.

Also, our empirical evidence is also consistent with Lobo and Zhou's (2006) observations that high-IOS and low-IOS firms are more conservative in financial reporting in the first two years after SOX because of required regulatory changes. Consistent with prior research, *IOS* is measured by the principal component of four IOS proxies, as defined in Table 3. The principal component was calculated from eigenvectors (coefficients) and the four proxies at the beginning of fiscal year *t*, where *t* belongs to the pre-SOX period (1995–2000) and the post-SOX period (2002–2007). The high-IOS firm years in the pre-SOX (post-SOX) period were those with IOS composite scores above the pre-SOX (post-SOX) period sample median; the low-IOS firm years were those with IOS composite scores below the pre-SOX (post-SOX) period sample median. Empirical evidence generally supports the above hypotheses. As in Zang (2012), the data was winsorized at both ends at the level of 2.5%.

In terms of contributions and limitations of this manuscript, we use the investment opportunity set variable (*IOS*) as a proxy for firm growth. The proxy was more recommended by prior research and is measured by the principal component of four IOS proxies (investment intensity, geometric mean annual growth rate of the market value of total assets, market-to-book value of total assets, and research and development expenditure to total assets) rather than the simple, frequently-used proxy for firm growth (MTB: the market-to-book value of assets). The evidence of high-IOS firms' increase in discretionary expenditures (and decrease in real-earnings management) even after SOX and the effects of SOX and other concurrent reforms on the sensitivity of executive bonus compensation-to-earnings changes are considered to be particularly useful information for regulators, managers, politicians, investors, and academics in their assessment of the earning-management methods differently adopted by high-IOS and low-IOS firms and the equitable relationship between executive efforts and executive compensation for firms affected by the SOX Act and levels of IOS. The potential limitations of this manuscript are obviously related to the use of proxies (IOS), especially for firm growth and earnings management models, which are usual for many empirical studies. Also, our findings should be understood within the context that the study relied on data from the USA, a developed country. Therefore, the findings may not be generalized to firms operating in developing countries.

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APPENDIX. DEFINITION OF VARIABLES USED IN REGRESSION TESTS

BON = The dollar value earned by the CEO of firm *i* during fiscal year *t*, $BONUS_t/SALARY_{t-1}$
$\Delta BON = BON_t - BON_{t-1}$
ANNMRR = Cumulative annual raw returns calculated from monthly raw returns obtained from CRSP
D = 1 if the cumulative annual market-adjusted return (*ANNMAR*) is negative, and 0 otherwise
E = Accounting earnings, alternatively measured as *ROE* and *EPSP*
ROE = Net income before *EI* and DO_t/average common equity for year *t* and *t-1*
EPSP = EPS excluding *EI* and $DO_t/(Stock\ Price)_{t-1}$
$\Delta E = E_t - E_{t-1}$
$SALE = Net\ Sales_t$
FAGE = Firm age, calculated as year *t* minus the first year the firm appeared on CRSP
LEVERAGE = (Long-term $debt_t$ + the current portion of long-term $debt_t$)/total $assets_t$
MTB = Market value of $equity_t$/book value of common $equity_t$;
PERS = Earnings persistence measured by *IMA* or *ARI*
IMA = Persistence measure calculated based on the integrated moving average model
ARI = Persistence measure based on the integrated autoregressive model
LOSSDUM = 1 if net income including *EI* and $DO_t < 0$ and 0 otherwise
$EQUITYINC = (RSHN_t + OPTIONN_t + EOPN_t + UEOPN_t + SHOWN_t)/(SHOUT_t * 1{,}000)$, where *RSHN* = Restricted stock holdings (thousands of shares), *OPTIONN* = Options granted (thousands of shares), *EOPN* = Exercisable options (thousands shares), *UEOPN* = Unexercisable options (thousands of shares), *SHOWN* = Shares owned with options excluded (thousands of shares), and *SHOUT* = Common shares outstanding (millions of shares)
LMVE = Log(market value of equity)
EPSSTD = Earnings volatility, measured as the standard deviation of annual basic earnings per share over the past 7 years
RETSTD = Stock return volatility, measured by the standard deviation of monthly returns over the prior 60 months
INST = % of institutional ownership in fiscal year *t* from the TFSD ownership database
EAGE = ln(Age of the CEO)
IOS = Investment opportunity set composite, computed by performing principal component analysis on the four IOS measures (Kwon & Yin, 2006), from all available observations for the period from 1993 to 2005
MAS =Managerial ability score, as developed in Demerijan et al. (2012)
NOAA = Nonoperating accruals/total assets
YEAR = 1 if fiscal year *t* and 0 otherwise
ADA = Absolute *DA* (Discretionary accruals), see subsection 3.2.1 for its calculation
APDA = Performance-matched discretionary accruals, see subsection 3.2.1 for its calculation
R_CFO = Abnormal cash flow from operation, see subsection 3.2.1 for its calculation
R_PROD = Abnormal production costs, see subsection 3.2.1 for its calculation
R_DISX = Abnormal discretionary expenses, see subsection 3.2.1 for its calculation
RM_1 = Real management 1, *R_DISX * (-1) + R_PROD*
RM_2 = Real management 2, *R_CFO * (-1) + R_DISX * (-1)*