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Risk Shifts Following Sarbanes-Oxley: Influences of Disclosure and Governance

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Abstract

The Sarbanes-Oxley Act of 2002 (SOX) aimed to improve financial reporting by enhancing corporate disclosure and governance. We find statistically significant increases, from before to after the passage of SOX, in total return variance, market risk and idiosyncratic risk. The risk increases are consistent with predictions that the legislation would cause firms to disclose more negative information, resulting in increased investment risk. However, in cross-sectional tests, post-SOX improvements in information certainty, board independence and monitoring are associated with smaller increases or greater decreases in risk. If SOX is responsible for these improvements, its effects are consistent with its purpose.

Keywords: Sarbanes-Oxley, risk shifts, corporate governance, disclosure

JEL Classifications: G14, G32, G38

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1. Introduction

Following the outbreak of scandals at Enron, Global Crossing, Tyco and other firms, legislators were prompted to develop the Sarbanes-Oxley Act of 2002 (SOX). The law includes a number of provisions that aim to improve corporate governance and accountability, as well as increase corporate financial transparency through improved disclosure. Indeed, SOX has been referred to as the most important federal securities legislation since the Securities Exchange Acts of the 1930s (e.g., Linck, Netter and Yang, 2007). At the time President Bush signed the Act, he was frequently quoted in the popular press as saying the law contained "the most far-reaching reforms of American business practices since the time of Franklin D. Roosevelt."

In the area of corporate governance, the Act addresses board composition and responsibilities, auditor independence, auditor review of internal controls and CEO and CFO certification of financial statements. The improvements in disclosure involve reporting off-balance-sheet transactions and contractual obligations, communicating information that has a material impact in a timely fashion and assessing the adequacy of internal controls. Thus, SOX is designed to improve the integrity of reporting systems, reduce the opacity of financial statements and increase confidence in investing in the U.S. financial markets.

Our central research question is whether the passage of SOX is associated with changes in total risk, as measured by the variance of returns, idiosyncratic risk and market risk. If the legislation effectively calms investors' fears, we expect investment risk in the post-Sarbanes-Oxley period to be reduced. However, our analysis shows the opposite effect, with increased capital market risk measures in the post-SOX period. In a sample of 1,160 firms, we find statistically significant increases, on average, in each of the three separate risk measures surrounding the passage of SOX. Consistent with Jorgensen and Kirschenheiter (2003), we believe that the mandatory nature of the legislation's disclosure and governance provisions likely explain the risk increases as investors anticipated disclosures of negative information that firms would otherwise choose to withhold.

Additionally, we consider whether risk shifts vary with changes in firms' disclosure and governance characteristics surrounding the Act's passage. Our study makes an important contribution in this regard given the legislation's landmark reforms in corporate governance. Our cross-sectional results show that, in general, changes in information certainty, board independence and monitoring characteristics consistent with the Sarbanes-Oxley legislation result in the beneficial effects of smaller increases or greater decreases in firm risk measures.

2. Influence of corporate disclosure and governance on firm risk

We investigate the influence of Sarbanes-Oxley on investment risk, as measured by the variance of returns, market risk and idiosyncratic risk. Market risk is the most relevant risk measure for investors. However, given that solvency and investor

confidence are critical concerns in the wake of the various frauds and unprecedented bankruptcies of Enron and WorldCom, it is also useful to measure changes in total risk and idiosyncratic risk following the passage of SOX.

Some argue that the Sarbanes-Oxley Act did little more than restate existing requirements for firms. If investors believe the legislation to be redundant, we expect there to be no significant changes in firm disclosure or governance in response to the legislation, thus no statistically significant impact on the investment risk of firms surrounding the Act's passage. To the extent that the SOX mandates are new, however, we expect firm disclosure and governance to increase after the legislation's passage. As for the risk shift effects, existing literature provides a foundation on which to hypothesize that increases, as well as decreases, in investment risk can occur with stronger firm disclosure and governance. We summarize prior studies' relevant findings and our contribution to the literature below.

We group the research on risk effects into two broad categories. In one strand of the literature, studies do not specify the mechanisms by which firms set disclosure or governance levels. Instead, they presume a disclosure or governance regime holds and analyze how risk is associated with differing levels of firm disclosure or governance within the regime. In contrast, a second strand of the literature examines the risk effects of a *change* in the information disclosure regime. That is, the second group of studies investigates the risk effects associated with mandated changes in firms' disclosure of information.

Our study is more closely aligned with the second strand of literature in that the passage of SOX represents, at least in part, a movement away from an atmosphere permitting a degree of managerial discretion in firms' disclosure and governance, toward an environment that mandates more of these choices. The imposition of SOX represents the replacement of a voluntary regime of disclosure and governance with a mandatory regime. Therefore, we expect firm disclosure and governance to increase in response to the mandatory changes.

As for the expected risk effects of changes in firm disclosure mandated by SOX, the findings of the second strand of the literature are mixed. Simon (1989) finds that measures of total risk are significantly lower for new issues of common stock following the passage of the 1933 Securities Act. She suggests that the result could reflect the improved availability of financial information imposed by the legislation. Simon's (1989) approach differs from ours in that she considers the variability of long-run (60-month) returns for new issues only. Collins and Simonds (1979) examine the effects of the Securities and Exchange Commission's (SEC's) 1970 line-of-business disclosure regulation on the betas of multisegment firms; they find both negative and positive beta shifts. Collins and Simonds (1979) suggest that the mandated increase in disclosure leads to investors' more informed assessment of operating risk, which manifests in both positive and negative risk adjustments. The finding is consistent with the theoretical model of Coles, Loewenstein and Suay (1995), which addresses the effects of estimation risk on asset prices. Their model shows that as uncertainty is resolved, there is a tendency for betas to converge to their appropriate (i.e., no

estimation risk) values. As information is revealed, both positive and negative beta shifts are predicted.

Jorgensen and Kirschenheiter (2003) consider the SEC's issuance of Financial Reporting Release No. 48, which requires firms to disclose information about their risk exposures. In a generalized model, they show that firm betas are expected to be higher with the imposition of a mandatory disclosure regime than with a voluntary disclosure regime because firms are required to disclose negative information that they otherwise would withhold.

Based on the findings of Collins and Simonds (1979), the disclosure improvements required by SOX could cause both positive and negative shifts in beta across firms, reflecting investors' reassessment of firm operating risk. As we extend the analysis of risk shifts to include measures of total risk and firm-specific risk, it is also possible that firm betas shift in one direction, reflecting a change in risk relative to the market, while total or firm-specific risk measures reflect no statistically significant effects or even opposite effects. For example, a firm's beta could increase, indicating increased risk relative to the market as a whole, while total risk could decrease as uncertainty is resolved with the improved disclosure of information. Consistent with Jorgensen and Kirschenheiter (2003), the enhanced disclosure mandated by SOX could cause firms to reveal information that they would otherwise withhold. As a result, we would expect all measures of risk effects surrounding the passage of SOX to be positive.

When considering the first strand of studies that analyze the association of risk and firm disclosure within a given regime, we again find the results to be mixed. Such studies find a negative relation between beta and firm disclosure (e.g., Barry and Brown, 1985) and plausibly a positive relation (e.g., Botosan, 1997; Botosan and Plumlee, 2002). Similarly, studies suggest a negative association between disclosure quality and total risk or idiosyncratic risk (e.g., McNichols and Manegold, 1983; Kim and Verrecchia, 1994; Sengupta, 1998; Fischer and Verrecchia, 1999), as well as a positive association (e.g., Ross, 1989; Bushee and Noe, 2000). Therefore, the expected relation of risk effects to changes in firms' disclosure practices around the passage of SOX is unclear.

The second strand of literature has little to say about SOX-mandated changes in corporate governance. Therefore, an important contribution of this paper is our analysis of risk shifts associated not only with mandated changes in firm disclosure, but also with mandated changes in firm governance as well.

In the first strand of research that examines how risk is associated with the stringency of investor protection, there are studies suggesting that there could be a positive association for each of the risk measures. John, Litov and Yeung (2005) suggest that when investor protection is low, management consumes more perks and adopts a more conservative investment policy, and vice-versa. In effect, better investor protection could align the interests of managers and shareholders, inducing managers to accept riskier projects. Badrinath, Gay and Kale (1989) find a statistically significant positive association between institutional ownership and beta, while Xu and Malkiel (2003) show that idiosyncratic risk is positively related to institutional holdings.

However, other studies suggest that enhanced corporate governance is negatively related to risk. Using a sample of financial institutions, Chen, Steiner and Whyte (1998) find a negative relation between managerial ownership and all three risk measures, while Bagnani, Milonas, Saunders and Travlos (1994) report that total risk, as measured by bond return premiums, is lower with managerial ownership in excess of 25%. Bhojraj and Sengupta (2003) find that firms with larger institutional ownership and a greater percentage of outside directors have higher bond ratings and lower yields.

Badrinath, Gay and Kale (1989) and Aggarwal and Rao (1990) show an inverse link between the proportion of institutional holdings and total risk. Using a sample of Asian firms, Chen, Chen and Wei (2003) report that market betas have a negative and statistically significant relation with focus on shareholder value, board independence, board committees' independence, effectiveness of board monitoring and fair treatment of minority shareholders. Anderson, Mansi and Reeb (2004) report that the cost of debt is lower for firms with more independent boards, larger boards and boards with fully independent audit committees.

In summary, the majority of the cited studies find an inverse relation between risk and measures of firm governance. The governance measures of Chen, Chen and Wei (2003) and Anderson, Mansi and Reeb (2004) most closely match the governance factors addressed by SOX. Therefore, we expect the risk effects to be inversely related to changes in the governance practices of firms around the passage of the Act. That is, firms that make greater (weaker) improvements in governance, consistent with the purpose of SOX, are expected to have greater (lower) offsetting effects on risk.

3. Data

We define the pre-SOX and post-SOX periods as 300, 200, 100 and 50 days before the passage of an early version of SOX by a Congressional committee on April 16, 2002 and 300, 200, 100 and 50 days following the final bill's signing into law on July 30, 2002, respectively.[1] To check robustness, we also shift the definition of the SOX period forward 45 days, between May 30, 2002 and September 15, 2002 and back 45 days, between March 1, 2002 and June 15, 2002.[2]

Our sample consists of firms that have stock return data available from the Center for Research in Security Prices (CRSP) U.S. Stock database, financial statement data available from Standard and Poor's Research Insight database and governance characteristics data available from the Board Analyst database for the years 2001 and 2002. We also require our sample firms to have the shareholder rights index of Gompers, Ishii and Metrick (2003) available for the years 2001 and 2002.[3] The imposition of these requirements results in a sample of 1,160 firms.

[1] We use an event window of (−1, 0), where April 16, 2002 is treated as day zero. See Zhang (2007) and Li, Pincus and Rego (2008) for exhaustive reviews of the legislative process leading to the passage of SOX. For identification of significant milestones in the process, see Engel, Hayes and Wang (2007), Akhigbe and Martin (2006), and Chhaochharia and Grinstein (2007).

[2] We thank an anonymous reviewer for suggesting these robustness checks.

[3] We thank Andrew Metrick for sharing these data.

4. Estimating risk shifts

We estimate and compare the pre- and post-SOX total risk, idiosyncratic risk and market risk measures for each firm in our sample similar to Amihud, DeLong and Saunders (2002). Total risk (σ_r^2) is measured as the variance of daily stock returns in the pre- and post-SOX periods and the change in total risk ($\Delta\sigma_r^2$) for each firm is

$$\Delta\sigma_r^2 = \sigma_{r,post\text{-}SOX}^2 - \sigma_{r,pre\text{-}SOX}^2. \tag{1}$$

Idiosyncratic risk (σ_e^2) is measured as the variance of the residuals from the ordinary least squares (OLS) estimation of the single-factor market model using daily returns and the CRSP equally weighted NYSE-Amex-Nasdaq market index in the pre- and post-SOX periods. The change in idiosyncratic risk ($\Delta\sigma_e^2$) for each firm is calculated as follows:

$$\Delta\sigma_e^2 = \sigma_{e,post\text{-}SOX}^2 - \sigma_{e,pre\text{-}SOX}^2. \tag{2}$$

We estimate the change in market risk for each firm using OLS with daily returns in the pre- and post-SOX periods as

$$R_t = \alpha' + \beta_1' R_{mt} + \beta_2' \delta_t R_{mt} + e_t, \tag{3}$$

where R_t is the stock return on day t, R_{mt} is the return on the CRSP equally weighted market index on day t and δ_t is equal to one on all days in the post-SOX period and zero otherwise. The intercept of the estimated model is α' and the estimated coefficients include the market beta (β_1') and the change in market exposure in the post-SOX period (β_2'). The error term on day t is e_t.

Table 1 shows that when the risk shifts are estimated using the (−300, +300) window across the periods, there are statistically significant reductions in total risk and idiosyncratic risk as measured by both the mean and median changes. With only minor exceptions, however, there are statistically significant increases in the total risk and idiosyncratic risk in the post-SOX period when using all the other windows across the three periods. Additionally, we generally find statistically significant increases in the mean and median measures of market risk.[4] With the shortest horizon around the forward-shifted period, we find no statistically significant increase in the mean beta shift. It is possible when we shift the SOX period forward and reduce the window size, the pre-SOX period could be picking up some post-SOX effects.

The results in Table 1 suggest that the (−300, +300) horizon captures different effects than the other horizons. We believe the long horizon could be picking up conditions unrelated to Sarbanes-Oxley or disclosure and governance concerns of investors. Given this concern and the above concern about the shortest horizon with

[4] Using the (−100, +100) window in the first SOX period, the Pearson correlation coefficient for the total and idiosyncratic risk shifts is 0.909. The corresponding correlation for the market risk shift and total (idiosyncratic) risk shift is 0.177 (0.168). The sign differences generally reflected in our first- and third-quartile results for shifts in beta are consistent with the findings of Collins and Simonds (1979) and Coles, Loewenstein and Suay (1995).

Table 1

Changes in capital market risk measures surrounding the passage of the Sarbanes-Oxley Act of 2002

The sample consists of 1,160 firms that have the following data available for 2001 and 2002: stock returns from the Center for Research in Security Prices (CRSP) U.S. Stock database, financial statement data from Standard and Poor's Research Insight, governance characteristics from the Board Analyst database and the shareholder rights index of Gompers, Ishii and Metrick (2003). The statistics are for changes in total risk ($\Delta\sigma_r^2$), idiosyncratic risk ($\Delta\sigma_e^2$) and market risk (β_2'), surrounding the passage of SOX. The pre-SOX and post-SOX periods include 300, 200, 100 and 50 days before April 15, 2002 and following July 30, 2002, respectively. We also shift the windows forward 45 days (between May 30, 2002 and September 15, 2002) and back 45 days (between March 1, 2002 and June 15, 2002). The change in total risk is defined as $\sigma^2_{r,post-SOX} - \sigma^2_{r,pre-SOX}$ or the difference in the post-SOX and pre-SOX variance of raw, daily returns. The change in idiosyncratic risk is defined as $\sigma^2_{e,post-SOX} - \sigma^2_{e,pre-SOX}$, the difference in the post-SOX and pre-SOX error variance. The error variances are calculated using the error terms from the OLS estimation of the single-factor market model with daily returns in the pre-SOX and post-SOX period. Estimates for β_2' are derived using OLS with daily returns from $R_t = \alpha' + \beta_1' R_{mt} + \beta_2' \delta_t R_{mt} + e_t$, where R_t is the stock return on day t, R_{mt} is the market return on day t, δ_t is a dummy variable equal to one on all days in the post-SOX period, α is the intercept, β_1' is the pre-SOX market beta, β_2' is the change in the market beta that occurs in the post-SOX period and e_t is the error term on day t. The t-test and Wilcoxon signed-rank test evaluate the null hypothesis that the mean and median change in each respective risk measure equals zero.

Period (2002)	$\Delta\sigma_r^2$				$\Delta\sigma_e^2$				β_2'			
and window	Mean	Median	Q1	Q3	Mean	Median	Q1	Q3	Mean	Median	Q1	Q3
4/15–7/30												
(−300, +300)	−0.0084***	−0.0054***	−0.0325	0.0119	−0.0025***	−0.0028***	−0.0070	0.0008	0.3134***	0.3464***	0.0932	0.5858
(−200, +200)	0.0209***	0.0077***	−0.0135	0.0300	0.0006**	−0.0002	−0.0044	0.0035	0.2689***	0.2956***	−0.0113	0.5628
(−100, +100)	0.0832***	0.0401***	0.0195	0.0822	0.0067***	0.0047***	0.0008	0.0098	0.2087***	0.2710***	−0.0929	0.5840
(−50, +50)	0.0857***	0.0449***	0.0210	0.0850	0.0074***	0.0053***	0.0006	0.0107	0.2005***	0.3061***	−0.1408	0.6630
5/30–9/15												
(−300, +300)	−0.0205***	−0.0110***	−0.0392	0.0038	−0.0037***	−0.0037***	−0.0080	−0.0002	0.2472***	0.2863***	0.0114	0.5327
(−200, +200)	0.0101***	0.0029***	−0.0172	0.0214	−0.0000	−0.0008***	−0.0046	0.0030	0.2258***	0.2531***	−0.0465	0.5374
(−100, +100)	0.0605***	0.0289***	0.0107	0.0626	0.0053***	0.0035***	0.0001	0.0080	0.0957***	0.1664***	−0.2488	0.5255
(−50, +50)	0.1125***	0.0587***	0.0268	0.1206	0.0102***	0.0079***	0.0029	0.0138	0.0290	0.1513***	−0.3904	0.6115
3/1–6/15												
(−300, +300)	0.0131***	0.0050***	−0.0167	0.0246	0.0002	−0.0008***	−0.0047	0.0029	0.3072***	0.3530***	0.0834	0.5861
(−200, +200)	0.0360***	0.0162***	−0.0031	0.0409	0.0021***	0.0010***	−0.0030	0.0049	0.2616***	0.2944***	−0.0074	0.5732
(−100, +100)	0.0881***	0.0481***	0.0242	0.0894	0.0071***	0.0053***	0.0012	0.0102	0.1022***	0.2085***	−0.2067	0.5443
(−50, +50)	0.1054***	0.0528***	0.0308	0.1036	0.0087***	0.0063***	0.0021	0.0120	0.2372***	0.3577***	−0.1252	0.6897

***, ** indicate statistical significance at the 0.01 and 0.05 level, respectively.

the shifted definition of the SOX period, we focus on the (−100, +100) and (−200, +200) horizons.

We interpret the average increase in capital market risk measures reported in Table 1 to be consistent with the findings of Jorgensen and Kirschenheiter (2003). That is, to the extent that the passage of SOX mandates disclosures that formerly were optional, our largely positive risk effects are consistent with firms, on average, disclosing negative information that they would otherwise withhold.

The passage of SOX also forces the use of formerly optional corporate governance measures. Our results are consistent with John, Litov and Yeung's (2005) contention that better investor protection induces managers to take more risk. Alternatively, the observed risk shifts might not be wholly attributable to the SOX mandates, but could reflect investors' reassessment of the value of corporate integrity in response to the frauds that led to SOX. To test the idea, we consider in the next section the relation between changes in disclosure and governance practices and changes in risk surrounding the Act's passage.

5. Measuring disclosure and governance factors

We expect changes in risk following the passage of SOX to vary with changes in disclosure and governance. Similar to Crutchley, Jensen and Marshall's (2007) analysis of corporate characteristics that influence the likelihood of accounting fraud, we reduce a set of 11 disclosure and governance characteristics using a principal axis factor analysis. The use of factor analysis has the benefits of limiting the effect of multicollinearity among the characteristics and identifying underlying latent or unobservable variables.

5.1. Descriptive statistics of firm characteristics

5.1.1. Disclosure

Based on previous studies, we gather four disclosure characteristics: the dispersion of analyst earnings forecasts, analyst following, earnings quality and the proportion of tangible assets. Since the SOX legislation calls for increased disclosure of off-balance-sheet transactions as well as information regarding changes in financial or operating conditions, we add footnote disclosures in financial statements as a fifth measure of information asymmetry.

Lang and Lundholm (1996) find that the more forthcoming the disclosure practices of firms, and hence the lower the information uncertainty, the lower the dispersion in analyst forecasts. They also predict that more informative disclosure improves the value of and increases the demand for analyst services. Consistent with the prediction, they find a positive relation between the quality of firm disclosure and number of analysts following the firm. We define *Analyst following* as the number of analysts following a firm and σ *Analyst* as the standard deviation of analysts' quarterly earnings

Table 2

Summary statistics on disclosure and governance characteristics

The sample consists of 1,160 publicly traded firms with required data for 2001 and 2002. *Analyst following* is the number of analysts following the firm, *σ Analyst* is the standard deviation of analyst earnings forecasts, *Earnings quality* is the Bradshaw, Richardson and Sloan (2001) accruals measure, *Tangible assets* is (cash + marketable securities + accounts receivable + inventory + fixed assets)/total assets and *Footnote pages* is the number of footnote pages in the annual report scaled by firm size. *Board independence* is the proportion of independent board members, *Audit committee independence* is the proportion of independent audit committee members, *Financial expert* is a dummy variable equal to one if there is a financial expert on the audit committee, *G-index* is the shareholder rights index of Gompers, Ishii and Metrick (2003), *Institutional ownership* is the proportion of institutional owners and *Insider ownership* is the proportion of shares owned by officers and directors. *Market-to-book* is equity market value/book value, *Return on equity* is EBIT/common equity, *Financial leverage* is total debt/total assets and *Firm size* is ln(equity market value). The *t*-test and Wilcoxon signed-rank test evaluate the null hypothesis that the mean and median change in each firm characteristic equals zero.

	2001		One-year change	
	Mean	Median	Mean	Median
Disclosure characteristics				
Analyst following	7.2810	6.0000	0.1138	0.0000
σ Analyst	0.2909	0.0233	−0.0123	0.0000
Earnings quality	0.0073	0.0022	−0.0016	0.0000
Tangible assets	0.6474	0.7303	−0.0030	0.0000
Footnote pages	0.2182	0.2073	0.0038	0.0038
Governance characteristics				
Board independence	0.8075	0.8333	0.0054***	0.0000
Audit committee independence	0.9829	1.0000	0.0150***	0.0000
Financial expert	0.4035	0.0000	0.5948***	1.0000***
G-index	9.3931	9.0000	0.0828***	0.0000
Institutional ownership	0.5880	0.6152	0.0990***	0.0946***
Insider ownership	0.2636	0.2411	0.0148***	0.0068
Other characteristics				
Market-to-book	2.4826	2.0036	−0.2718	0.0011
Return on equity	0.2907	0.2112	−0.0879	−0.0024
Financial leverage	0.1969	0.1766	−0.0013	−0.0007***
Firm size	7.4408	7.2908	−0.0239	0.0340***

*** indicates statistical significance at the 0.01 level.

forecasts; both come from the I/B/E/S database.[5] A greater number of analysts following a firm or a smaller dispersion in analysts' forecasts imply less informational uncertainty. Table 2 reports an average of 7.28 analysts evaluating each firm in 2001. Over the following year, there is an increase of 0.11 analysts, which is not statistically significant. The one-year change in *σ Analyst* is a decrease of 0.012 from its 2001 level, significant at the 10% level.

[5] If the database does not include an earnings forecast for the firm, we assign zero for *Analyst following* and one for *σ Analyst* to represent the uncertainty associated with an absence of analyst coverage. When we drop these observations, the results are qualitatively unchanged. If there is a single analyst forecast, the firm is assigned zero for *σ Analyst*.

Sloan (1996) and Bradshaw, Richardson and Sloan (2001) suggest that firms with high working capital accruals, associated with low reported earnings quality, have greater information uncertainty and are mispriced by investors. *Earnings quality* is the accruals measure of Bradshaw, Richardson and Sloan (2001) (also see Jones, 1991 and Dechow, Sloan and Sweeney, 1995, 1996):

$$\begin{aligned} \textit{Earnings quality} = {} & (\text{Increase in Accounts Receivable} + \text{Increase in Inventory} \\ & + \text{Decrease in Accounts Payable, Accrued Liabilities or Accrued} \\ & \text{Income Taxes Increase (Decrease) in Other Assets (Liabilities))/} \\ & \text{Total Assets,} \end{aligned} \tag{4}$$

where all data are from statements of cash flows in Research Insight. Table 2 reports that 2001 average accruals for the sample are 0.73% of total assets and drop by 0.16% of total assets in the next year. A drop in accruals indicates that earnings quality improves from 2001 to 2002, but the change is not statistically significant.

Kothari, Laguerre and Leone (2002) report that future earnings volatility associated with investment in research and development is nearly three times larger than the volatility associated with investment in physical assets. In general, we expect greater investment in tangible assets by a firm to correspond to more informative financial statements and lower information uncertainty. We define *Tangible assets* as the ratio of tangible assets to total assets, where tangible assets are the sum of current assets (cash, marketable securities, accounts receivable and inventory) and fixed assets. All data are from Research Insight. Our sample in 2001 has 64.7% tangible assets on average and the one-year change shows tangible assets dropping by 0.3% of total assets.

We define *Footnote pages* as the number of footnote pages in the firm's annual report scaled by firm size, the natural log of the market value of equity. The footnote page data are hand-collected from firm annual reports and market value of equity is from CRSP. Table 2 reports that footnote disclosures relative to firm size increase from 2001 to 2002, but the increase is not statistically significant.

Overall, the results show little change in disclosure from 2001 to 2002. Over a two-year period, not tabulated, the drop in $\sigma Analyst$ is slightly larger, 0.019 versus 0.012, and statistically significant at the 1% level versus the 10% level. We also find a statistically significant improvement in *Earnings quality* over the two-year period. The remaining disclosure characteristics show no material differences from Table 2.

5.1.2. Governance

Based on prior research, we gather six governance characteristics: independent board monitoring (three), shareholder rights and the degree of internal and external monitoring.

The governance requirements of SOX suggest that more effective monitoring could occur with independent members of the board and board committees. In support of this premise, Linck, Netter and Yang (2007) find increases in board independence and preliminary evidence of increased committee activity following the passage of

SOX. We define *Board independence* as the proportion of the firm's board that comprises independent directors. Additionally, aiming to improve oversight of corporate reporting and financial controls, SOX requires firms to have independent audit committees and to disclose whether an independent financial expert serves on the audit committee. Thus, we define *Audit committee independence* as the proportion of the audit committee that is independent and *Financial expert* as a dummy variable with a value of one when an independent financial expert serves on the audit committee (e.g., Akhigbe and Martin, 2006).

The first three governance measures are compiled from the Corporate Library's *Board Analyst* database. Table 2 reports that in 2001, the average proportion of independent board members and audit committee members are 80.8% and 98.3%, respectively. Further, 40.4% of firms have an independent financial expert serving on the audit committee. The data show that following the passage of SOX, board independence increased, consistent with the findings of Linck, Netter and Yang (2007). The one-year changes show that by 2002, nearly all firms have independent audit committees and nearly all have a financial expert serving on the audit committee. The average changes in the three governance measures are all statistically significant at the 1% level.

G-index is the shareholder rights index of Gompers, Ishii, and Metrick (2003) that is constructed from 24 anti-takeover provisions. The index ranges from 1 to 24, with a higher value indicating weaker shareholder protection. Table 2 reports an average G-index of 9.4 in 2001, with a statistically significant increase over the following year. A possible explanation for the increase is that there is a heavy degree of risk transferred to managers in the post-SOX period, causing unprotected managers to become shortsighted. In this situation, anti-takeover provisions can act as a counterbalance allowing managers to take a longer view. Sundaramurthy, Mahoney and Mahoney (1997) provide a similar argument.

Finally, we include managerial and institutional ownership structure to represent the degree of internal and external monitoring, respectively. Jensen and Meckling (1976) argue that agency costs are higher for firms where managers have little ownership stake in the firm. Shleifer and Vishny (1986) show that institutional owners with large positions have incentives to actively monitor firms. Managerial ownership (*Insider ownership*) is defined as the percentage of shares owned by officers and directors, while the percentage of shares owned by institutional investors (*Institutional ownership*) is used to capture the degree of institutional ownership. We construct the measures from the proxy statement data from *Board Analyst*. Average institutional ownership across the sample firms in 2001 is 58.8% and increases 9.9% over the following year. Average managerial ownership in 2001 is 26.4%, and the one-year change is 1.5%. The increases in both of the ownership structure measures are statistically significant at the 1% level.

5.1.3. Other financial characteristics

Four additional financial characteristics are included in our model as control variables. Based on data from *Research Insight*, we define *Market-to-book* as market

value of equity divided by book value of equity, while *Return on equity* is earnings before interest and taxes (EBIT) divided by shareholders' equity, and *Financial leverage* is total debt divided by total assets. We include the variables in our model to control for potential risk shifts associated with changes in a firm's expected growth opportunities, profitability and use of leverage, respectively.

Other studies report systematic differences in the effects of the SOX legislation on large firms and small firms (e.g., Chhaochharia and Grinstein, 2007; Linck, Netter and Yang, 2007). We define *Firm size* as the natural log of the market value of equity, as determined using CRSP.

5.2. Disclosure and governance factors

Using principal axis factor analysis, we seek to identify fundamental common elements across the 11 measures of disclosure and governance. The results suggest that the measures represent three key dimensions. Table 3 reports the VARIMAX-rotated component analysis factor matrix. The measures in boxes are those that load most heavily on each factor. We name the factors based on the variables with which they are highly correlated: *Information certainty, Independence* and *Monitoring*. The first factor loads heavily against the number of analysts following (positively) and the dispersion in analyst forecasts (negatively), and therefore represents the degree of *Information certainty*. The second factor, *Independence*, is most correlated with the degree of board independence and degree of audit committee independence. The third factor is referred to as *Monitoring* since it loads most heavily on the degree of institutional ownership and degree of insider ownership. Factor scores are created from the standardized scoring coefficients of the factor analysis and are used in the subsequent cross-sectional analysis.

6. Cross-sectional analysis on risk shifts

Using cross-sectional regression analysis, we evaluate whether changes in disclosure and governance factors significantly explain the variation in the three risk shift measures. We estimate the following model using weighted least squares:

$$\begin{aligned}\Delta Risk = {} & \gamma_0 + \gamma_1 \Delta \textit{Information Certainty} + \gamma_2 \Delta \textit{Independence} \\ & + \gamma_3 \Delta \textit{Monitoring} + \gamma_4 \Delta \textit{Market-to-book} + \gamma_5 \Delta \textit{Return on equity} \\ & + \gamma_6 \Delta \textit{Financial leverage} + \gamma_7 \Delta \textit{Firm size} + v_t,\end{aligned} \tag{5}$$

where $\Delta Risk$ is the change in total risk ($\Delta\sigma_r^2$), idiosyncratic risk ($\Delta\sigma_e^2$) or market risk (β_2'), following the passage of SOX, as defined in Equations (1), (2) and (3), respectively. The results are in Table 4.[6]

[6] As an indication of severe multicollinearity, studies use variance inflation factors greater than five (see Marquardt and Snee, 1975). Based on this standard, multicollinearity is not distorting our results.

Table 3

Factor analysis on changes in disclosure and governance characteristics

We provide the VARIMAX-rotated component factor matrix used to identify three factors. The key variables with the highest loadings on each factor are highlighted by boxes. All characteristics are the one-year changes in the measures. *Analyst following* is the number of analysts following the firm, σ*Analyst* is the standard deviation of analyst earnings forecasts, *Earnings quality* is the Bradshaw, Richardson and Sloan (2001) accruals measure, *Tangible assets* is (cash + marketable securities + accounts receivable + inventory + fixed assets)/total assets, and *Footnote pages* is the number of footnote pages in the annual report scaled by firm size. *Board independence* is the proportion of independent board members, *Audit committee independence* is the proportion of independent audit committee members, *Financial expert* is a dummy variable equal to one if there is a financial expert on the audit committee, *G-index* is the shareholder rights index of Gompers, Ishii, and Metrick (2003), *Institutional ownership* is the proportion of institutional owners, and *Insider ownership* is the proportion of shares owned by officers and directors.

One-year change measures	Factor 1 Information certainty	Factor 2 Independence	Factor 3 Monitoring
Disclosure characteristics			
Δ*Analyst following*	0.6136	−0.0033	−0.0607
Δσ*Analyst*	−0.5312	0.0392	0.0020
Δ*Earnings quality*	0.0007	0.0082	−0.0740
Δ*Tangible assets*	−0.0207	0.1472	−0.0333
Δ*Footnote pages*	−0.0938	0.0006	−0.0105
Governance characteristics			
Δ*Financial expert*	0.0198	−0.0577	0.1610
Δ*Audit committee independence*	0.0429	0.3411	−0.0055
Δ*Board independence*	0.0020	0.3301	−0.0365
Δ*G-index*	0.0159	−0.0992	0.1034
Δ*Institutional ownership*	−0.0267	0.0511	0.4580
Δ*Insider ownership*	−0.1057	0.2741	0.2495
Eigenvalue	0.7034	0.3647	0.2740

In Panel A, the original period and forward-shifted period results show an inverse relation between Δ*Information certainty* and all three risk measures. Thus, firms with larger increases in information certainty surrounding the passage of SOX have lower risk than they would have otherwise.

Across all three periods in Panel A, we find that Δ*Independence* is mainly inversely associated with the change in market risk. The forward-shifted period results also reflect a negative and statistically significant relation between Δ*Independence* and the change in total risk, $\Delta\sigma_r^2$, but the result could be driven by the strong link between Δ*Independence* and the market risk shift. The results contradict the possible conclusion from Table 1, that better investor protection provided within SOX leads to greater managerial risk taking (e.g., John, Litov and Yeung, 2005). Instead, our cross-sectional results suggest that firms with positive Δ*Independence* have lower market

Table 4

Regressions for the influence of disclosure and governance on risk shifts

Models that differ with respect to the risk shifts used as the dependent variable, the length of the horizon over which the risk shift is estimated and the period aiming to capture SOX development and passage are estimated on all 1,160 sample firms using weighted least squares. The risk shifts are change in total risk ($\Delta\sigma_r^2$), change in market risk (β_2') and change in idiosyncratic risk ($\Delta\sigma_e^2$). Information certainty, independence and monitoring are factors generated from principal axis factor analysis on 11 disclosure and governance characteristics. *Market-to-book* is equity market value/book value, *Return on equity* is EBIT/common equity, *Financial leverage* is total debt/total assets and *Firm size* is ln(equity market value).

Panel A: ± 100-day estimation of risk shifts around three periods

	4/15 – 7/30			5/30 – 9/15			3/1 – 6/15		
Factors	$\Delta\sigma_r^2$	β_2'	$\Delta\sigma_e^2$	$\Delta\sigma_r^2$	β_2'	$\Delta\sigma_e^2$	$\Delta\sigma_r^2$	β_2'	$\Delta\sigma_e^2$
Intercept	0.1116	−0.1100	0.0065	0.0649	−0.2739	0.0038	0.1000	−0.3631	0.0062
	(16.67)***	(−3.92)***	(14.76)***	(11.12)***	(−8.51)***	(9.12)***	(13.02)***	(−10.53)***	(13.20)***
Disclosure and governance factors									
Δ*Information certainty*	−0.0227	−0.0278	−0.0017	−0.0318	−0.0893	−0.0025	−0.0150	−0.0742	−0.0007
	(−2.55)***	(−0.75)	(−2.83)***	(−3.96)***	(−2.02)**	(−4.33)***	(−1.50)	(−1.65)	(−1.17)
Δ*Independence*	0.0005	−0.1867	0.0008	−0.0248	−0.2507	−0.0011	−0.0163	−0.2428	0.0000
	(0.04)	(−3.55)***	(0.91)	(−2.34)***	(−4.28)***	(−1.44)	(−1.11)	(−3.68)***	(0.01)
Δ*Monitoring*	0.0132	−0.1081	0.0005	0.0119	−0.0131	0.0006	0.0171	−0.1523	0.0005
	(1.20)	(−2.33)**	(0.75)	(1.26)	(−0.25)	(0.82)	(1.33)	(−2.65)***	(0.70)
Control variables									
Δ*Market-to-book*	0.0011	0.0006	0.0000	0.0004	−0.0009	−0.0000	0.0000	−0.0062	−0.0000
	(1.07)	(0.14)	(0.23)	(0.47)	(−0.19)	(−0.26)	(0.00)	(−1.15)	(−0.50)
Δ*Return on equity*	0.0019	0.0070	0.0002	−0.0023	−0.0066	−0.0001	0.0021	0.0060	0.0002
	(1.85)	(1.62)	(2.91)***	(−1.91)	(−0.99)	(−1.53)	(1.74)	(1.12)	(3.02)***
Δ*Financial leverage*	0.1129	0.8741	0.0101	0.0610	0.4133	0.0024	0.1787	1.0670	0.0057
	(1.38)	(2.54)***	(1.87)	(0.87)	(1.07)	(0.49)	(1.94)**	(2.65)***	(1.02)
Δ*Firm size*	−0.1831	−0.0030	−0.0125	−0.1646	−0.0176	−0.0117	−0.2040	−0.0197	−0.0129
	(−16.65)***	(−0.06)	(−17.31)***	(−17.29)***	(−0.34)	(−17.16)***	(−16.24)***	(−0.36)	(−16.93)***
Adjusted R^2	0.2280	0.0206	0.2531	0.2202	0.0151	0.2183	0.2165	0.0196	0.2370
F	49.89	4.48	57.10	47.76	3.54	47.25	46.76	4.31	52.43

(*continued*)

Table 4 (*continued*)

Regressions for the influence of disclosure and governance on risk shifts

Panel B: ± 200-day estimation of risk shifts around three periods

	4/15 – 7/30			5/30 – 9/15			3/1 – 6/15		
Factors	$\Delta\sigma_r^2$	β_2'	$\Delta\sigma^2{}_e$	$\Delta\sigma_r^2$	β_2'	$\Delta\sigma_e^2$	$\Delta\sigma_r^2$	β_2'	$\Delta\sigma_e^2$
Intercept	0.0001	0.0810	−0.0020	−0.0198	0.0174	−0.0031	0.0219	0.0176	0.0000
	(0.02)	(4.06)***	(−5.57)***	(−4.98)***	(0.82)	(−9.20)***	(4.57)***	(0.79)	(0.07)
Disclosure and governance factors									
Δ*Information certainty*	−0.0039	0.0305	−0.0011	−0.0093	0.0148	−0.0012	−0.0049	0.0158	−0.0009
	(−0.69)	(1.15)	(−2.32)**	(−1.73)	(0.52)	(−2.73)***	(−0.76)	(0.53)	(−1.84)
Δ*Independence*	0.0099	−0.0483	0.0011	−0.0055	−0.0386	−0.0003	0.0043	−0.0763	0.0008
	(1.22)	(−1.26)	(1.62)	(−0.74)	(−0.96)	(−0.48)	(0.46)	(−1.77)	(1.17)
Δ*Monitoring*	−0.0072	−0.0963	−0.0007	−0.0127	−0.0788	−0.0010	−0.0002	−0.0799	−0.0006
	(−1.02)	(−2.88)***	(−1.13)	(−1.92)	(−2.23)**	(−1.74)	(−0.02)	(−2.10)**	(−0.94)
Control variables									
Δ*Market-to-book*	0.0010	−0.0005	0.0001	0.0006	−0.0015	0.0000	0.0002	−0.0042	−0.0000
	(1.52)	(−0.15)	(0.82)	(0.91)	(−0.46)	(0.58)	(0.29)	(−1.20)	(−0.08)
Δ*Return on equity*	0.0008	0.0003	0.0001	−0.0001	−0.0030	−0.0000	0.0012	0.0014	0.0001
	(1.09)	(0.08)	(0.89)	(−0.16)	(−0.77)	(−0.53)	(1.45)	(0.35)	(1.71)
Δ*Financial leverage*	0.0374	0.7904	0.0037	0.0427	0.9497	0.0006	0.0602	0.7004	0.0037
	(0.71)	(3.19)***	(0.85)	(0.88)	(3.65)***	(0.15)	(1.00)	(2.49)***	(0.82)
Δ*Firm size*	−0.1285	−0.1369	−0.0114	−0.1154	−0.1476	−0.0109	−0.1428	−0.0722	−0.0115
	(−18.01)***	(−4.07)***	(−19.60)***	(−17.50)***	(−4.19)***	(−19.73)***	(−17.57)***	(−1.90)	(−19.04)***
Adjusted R^2	0.2491	0.0356	0.2656	0.2282	0.0346	0.2537	0.2398	0.0138	0.2705
F	55.91	7.12	60.89	49.96	6.94	57.29	53.23	3.31	62.39

***, ** indicate statistical significance at the 0.01 and 0.05 level, respectively.

risk than they would have otherwise. Additionally, since Δ*Independence* loads heavily on the degree of audit committee independence, it is arguably the factor most directly aligned with the requirements specified by SOX. In this respect, our Δ*Independence* findings lend support to the results being at least partially attributable to the legislation's passage, and not wholly driven by a general shift in market mentality.

Similar to our findings for Δ*Independence*, we also show an inverse relation between Δ*Monitoring* and the change in market risk in the original period and the backward-shifted period. Similarly, we conclude that firms with positive Δ*Monitoring* have lower market risk than they would have otherwise.

The results in Panel B for the (−200, +200) day horizon are generally consistent with, but slightly weaker than, those presented in Panel A. It is our view that the differences stem from the fact that the 200-day window is a relatively long horizon and could pick up extraneous conditions. Ultimately, the longer horizon makes it more difficult to statistically link changes in disclosure and governance to the changes in risk.

We test the robustness of our factor analysis and cross-sectional regressions by including two-year changes in the disclosure characteristics and find our results are unchanged. Additionally, we re-estimate the cross-sectional results of Panels A and B of Table 4 separately for sample firms that experience a negative risk shift and sample firms that experience a positive risk shift surrounding the passage of SOX. We also divide the positive risk shift sample into subsamples of firms that experience below- (above-) median increases in risk to see if we can refine our characterization of the statistically significant results. The results, not displayed in a table, show that on average, the number of firms experiencing positive risk shifts is three times larger than the number of firms experiencing negative risk shifts. The same is true for the division of positive risk shift firms above the median risk increase as opposed to positive risk shift firms below the median risk increase.

Generally speaking, we find that the statistically significant, inverse relation between Δ*Information certainty* and all three risk measures is primarily being driven by firms experiencing above-median increases in risk. The result suggests that an increase in information certainty could be most beneficial to firms experiencing larger increases in risk surrounding the passage of SOX.

For Δ*Independence*, the inverse association with market risk continues to be the relation that holds statistical significance, and it appears to be driven primarily by firms experiencing a negative risk shift surrounding the Act's passage. If firms that experience a decrease in investment risk are firms that are not expected to disclose unfavorable information, the result suggests that an increase in independent governance is beneficial for these firms. Also, for firms with increases in market risk and thus expected to disclose unfavorable information, having more independent governance does not seem to significantly affect their risk. Finally, for Δ*Monitoring*, the inverse association with market risk continues to be the statistically significant relation; the relation appears to be driven by both the negative risk shift sample and the sample of firms experiencing the greatest increases in risk. For firms with below-median risk

increases, estimates of the $\Delta Monitoring$ factor are generally of the same sign, but lack strong statistical significance.

Overall, we find that shifts in capital market risk reflect changes in disclosure and governance characteristics. The cross-sectional results show that, in general, changes in information certainty, board independence, and monitoring characteristics consistent with SOX are associated with smaller increases or greater decreases in firm risk measures.

7. Conclusion

The Sarbanes-Oxley Act of 2002 aims to reduce the opacity and improve the integrity of financial reporting by enhancing corporate disclosure and governance practices. This study evaluates the effect of SOX on capital market risk measures for a sample of 1,160 firms. Following the passage of SOX, we show statistically significant and positive shifts, on average, in the variance of returns, market risk and idiosyncratic risk. To the extent that the passage of SOX mandates disclosures that formerly were optional, these results are consistent with firms disclosing negative information that they would otherwise withhold (Jorgensen and Kirschenheiter, 2003).

Furthermore, we evaluate whether changes in firm-specific disclosure and governance characteristics explain the cross-sectional variation in the risk shifts. Using principal axis factor analysis, 11 disclosure and governance characteristics are reduced to three key dimensions that represent the change in information certainty, change in independence and change in monitoring. Overall, we find that shifts in capital market risk reflect changes in firms' disclosure and governance characteristics surrounding the Act's passage. For firms with the greatest risk increases in the post-SOX period, increases in information certainty appear to have an offsetting, beneficial effect. Additionally, market risk is lower for firms with increases in independence and monitoring, consistent with the mandates of the Sarbanes-Oxley legislation.

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