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The Sarbanes-Oxley Act, Security Analyst Monitoring Activity, and Firm Value

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In this study we examine the complementary monitoring activity that takes place via the Sarbanes-Oxley Act (SOX) and its effect on security analyst monitoring activity and firm value of large and small public firms. Our findings indicate that security analyst monitoring activity has decreased post-SOX while firm value has increased post-SOX for both large and small firms. We also find that the increase in firm value is more pronounced for the group of small firms. Given these results, we surmise that the complementary monitoring activity provided by SOX is effective enough to have a positive impact on firm value.

INTRODUCTION

Financial markets thrive on good information, and the more accurate the information, the more efficiently these markets function. Academicians and practitioners agree that security analysts play a very important role as information intermediaries in the financial markets. They collect and analyze information obtained from corporate managers, and present it in a form that is easy to understand. In turn, both individual and institutional investors, brokers, and other market participants use that information in making investment decisions. Thus, there is general consensus that security analysts make a key contribution in ensuring the informational efficiency of the financial markets by increasing the information set of investors.

The monitoring role played by security analysts is an essential and equally important one. Jensen and Meckling (1976) postulate that security analysts' role as monitoring agents is significant, especially when agency problems exist. It has been shown that monitoring activity can curtail managers' ability to obtain both non-pecuniary and pecuniary benefits from shareholders. Moreover, bondholders find monitoring activity by security analysts effective in helping to prevent risk shifting from shareholders to bondholders. In essence, the authors highlight the monitoring activities of security analysts as a means of reducing agency costs in public firms created by the separation of ownership and control.

Another potential impact of security analyst monitoring activity is the positive effect on corporate value. Indeed, Jensen and Meckling (1976) surmise that one of the primary advantages of security analyst monitoring activity is the higher firm value which shareholders enjoy. Additionally, Chung and Jo (1996) find that security analyst monitoring functions lead to a "significant and positive impact on firms' market value." Doukas et al. (2000) also find that security analyst monitoring activity serves to reduce agency costs, thereby curtailing misconduct by managers. Given that security analysts play a key role in

broadening the information set of investors and other market players, as well as reducing agency costs, it can be posited that there is a positive relationship between the level of security analyst monitoring activity and firm value.

The Sarbanes-Oxley Act of 2002 (hereafter SOX) was implemented after a series of high-profile corporate scandals, which included bankruptcies, inadequate accounting practices, and inefficient audit firms that chose to ignore these practices. At the core of SOX is the improvement in the quality of financial reporting and corporate governance and, by extension, the restoration of investors' confidence in the financial markets. SOX forces public companies to be more vigilant and transparent in their business activities, particularly in financial reporting. To this end, SOX mandates a number of rules and regulations: (1) chief executive officers and chief financial officers of all public firms must certify the accuracy of the financial statements; (2) audit committees must be independent; (3) there must be established procedures in place to assess the firm's internal controls; and (4) there must be increased oversight of audit firms.[1] Therefore, corporate managers and insiders are held to extremely high standards, and the fines and penalties for noncompliance with the requirements of SOX are severe.

Many years have passed since SOX was implemented, and it is still unclear whether SOX is achieving its objectives. Specifically, its ultimate impact on the U.S. financial markets is still being debated. The literature examining the impact of SOX on various aspects of the financial markets has produced conflicting results. For example, Coates (2007) finds that there has been increased trust in the U.S. financial markets as a result of the implementation of SOX. On the other hand, Engel, Hayes and Wang (2007) find that there has been an increase in firms going dark post-SOX. Moreover, Zhang (2007) and Jain and Rezaee (2006) find a negative impact on firms as a result of SOX. Piotroski and Srinivasan (2008) study listing preferences of foreign firms post-SOX, and find that although large firms are still inclined to list on U.S. exchanges, the number of smaller firms seeking to list in the U.S. has decreased.

We address the following question: What effect has SOX had on security analyst monitoring activity and firm value? If SOX is indeed meeting the objectives as set out in the rules and regulations, then there should be a positive impact as a result of additional monitoring activity and, by extension, firms should enjoy an increase in value. If, on the other hand, the rules and regulations are more superficial than substantial, then there should not be any real effect on monitoring activity and firm value. In addition, the impact on large firms may be different from the impact on small firms since prior research has concluded that firm size is positively related to analyst following ((Barth et al., (2001) and Bradley et al., (2003)). In other words, there is less security analyst monitoring activity associated with small firms.

Jensen and Meckling (1976) point out that monitoring activity also takes place directly through the restrictive covenants that are inherent in bonds. This type of monitoring may not be perfectly equivalent to security analyst monitoring activity, but may be additional to security analyst monitoring. In fact, Moyer et al. (1989) and Chung and Jo (1996) document a negative relationship between the debt ratio and security analyst monitoring activity as a result of the monitoring activity that takes place through bond covenants.

We define complementary monitoring activity as the additional monitoring activity that takes place outside of the traditional avenues such as security analyst monitoring activity, and the monitoring activity provided by financial institutions. For example, bond covenants can be deemed a form of complementary monitoring activity since they act as a monitoring mechanism outside the normal monitoring activity provided by security analysts and financial institutions. Using this theory, we conjecture that the components of SOX provide complementary monitoring activity by acting as restrictive covenants on the operations of public companies. Thus, the traditional positive relationship between analyst following and firm value may indeed break down post-SOX since the legislation provides an additional element of monitoring activity. Therefore, even though there may be an increase in firm value post-SOX, the level of security analyst monitoring may not necessarily increase because of the additional monitoring role provided by the components of SOX.

The following section of the paper provides the hypotheses. Then the data sample, descriptive statistics, and methodology are presented followed by the empirical results. In the final section, we present our conclusions.

HYPOTHESES

Three hypotheses are investigated. The first hypothesis is that security analyst monitoring activity (the number of analysts that cover a firm is used as the proxy) has decreased post-SOX. Lang et al. (2003) infer that superior corporate governance plays a significant role in whether security analysts follow particular firms. The better the corporate governance in a firm, the higher the analyst following. Using this inference, and to the extent that the provisions of SOX are creating better corporate governance and producing more accurate financial reporting, one would expect an increase in security analyst monitoring activity during the post-SOX period. However, if the legislation itself is acting as a complementary monitoring mechanism, in much the same way that bond covenants do, the level of analyst monitoring activity could actually decrease post-SOX even while an increase in firm value is realized.

The second hypothesis is that firm value (proxied by Tobin's q) has increased post-SOX. Cchaochharia and Grinstein (2007) find that SOX has had a significant effect on firm value. Specifically, they find that firms that are less compliant with SOX earn positive abnormal returns compared to firms that are more compliant. Other research concludes that there is a positive and significant relationship between security analyst monitoring activity and firm value (Chung and Jo (1996)). The research also concludes that a higher level of monitoring activity, whether it is provided directly by security analysts and financial institutions, or indirectly by restrictive covenants and/or legislation (complementary monitoring activity), leads to higher firm value. Therefore, if overall monitoring activity has increased post-SOX, it is reasonable to expect that firm value has likewise increased.

The third hypothesis examines security analyst monitoring activity and firm value within the context of firm size. We hypothesize that the effect of SOX on security analyst monitoring activity and firm value for small firms will be different from the effect on large firms. Prior research (Gao, Wu and Zimmerman, 2009) suggests that SOX has increased the incentives for smaller firms to remain small. Moreover, Wintoki (2007) finds that "one size fits all" governance regulation may be bad for certain firms, especially young, small, growth firms operating in uncertain business environments. Other research suggests that small firms are more prone to having poor corporate governance and ineffective internal control systems than large firms (Doyle et al. (2007)). As a result, these small firms are faced with less analyst following than large firms. On that basis, we expect that there will be a difference in security analyst monitoring activity and firm value between large and small firms post-SOX.

DATA AND METHODOLOGY

Data Description and Sample Selection

Stock price data are obtained from CRSP, earnings forecast data are obtained from I/B/E/S, and company financial data are obtained from COMPUSTAT. The time period under review is from January 1996 to December 2006. Since SOX was implemented on July 25, 2002, the pre-SOX period was deemed to be 1996-2002, while the post-SOX period includes the years 2003 to 2006. We use 2003 as the beginning of the post-SOX period as companies were given about four months to conform to the requirements of the new legislation. We use 2006 as the end of the post-SOX period so that our results will not be influenced by the recent financial crisis, which began in 2007. The firms used in the study come from the S&P 500 Index and the S&P Small Cap 600 Index, and include only those firms that have a December fiscal year end. We use the firms in these two indexes to get an immediate view of the impact of SOX on these two firm categories.

Following Moyer et al. (1989) and Chung and Jo (1996), the number of earnings forecasts made by the security analysts of a particular firm's stock is used as the proxy for the level of security analyst monitoring activity. For each firm, the number of security analysts making one-year ahead earnings forecasts was obtained. Firms being followed by a single security analyst were dropped from the sample since it would be impossible to calculate the dispersion of the analyst forecasts. Dispersion of analyst forecast data was obtained from I/B/E/S along with SOXual earnings per share (EPS) data. Consistent with McConnell and Servaes (1990), Tobin's q is used as the proxy for firm value. It is measured as

follows: Tobin's q = (market value of equity + assets – book value of equity) / assets. Data obtained from COMPUSTAT were used to compute Tobin's q, the debt ratio, advertising ratio, R&D ratio, return to capital, and an alternative measure of firm size based on the book value of assets. Stock price and return variance data were obtained from CRSP. Firms with missing data from these three databases were dropped from the sample.

The final sample consists of 4,642 observations, representing 422 firms. Of these firms, 230 are from the S&P 500 Index and 192 are from the S&P Small Cap Index. Approximately 37 percent of the observations are during the post-SOX period, and 46 percent of the observations represent small firms.

Methodology

Chung and Jo (1996) highlight the endogenous nature of security analyst following in their analysis of the impact of analyst monitoring activity on firm value. The authors note that increased analyst following causes an increase in firm value (Tobin's q); however, they also conjecture that firm value could in turn impact the number of analysts following a firm as more analysts may be motivated to follow high-value firms. Against this background, the following simultaneous equation system is used to empirically represent the association among firm value (q), security analyst monitoring activity (NAN), and a number of control variables post-SOX. The model defined in equations 1 and 2 represents a case of simultaneity, which occurs when there is a feedback association between one or more of the independent variables and the dependent variable.[2] Simultaneity causes the OLS-estimated coefficients and standard errors to be biased. Therefore, to eliminate the simultaneity and consistent with Chung and Jo (1996), a three stage least squares (3SLS) regression is used to estimate the fixed effects panel data model presented below.[3]

$$\ln(\text{NAN}_{it}) = a_0 + a_1 \ln(q_{it}) + a_2(\text{Debt Ratio}_{it}) + a_3(\text{Advert Ratio}_{it}) + a_4(\text{R\&D Ratio}_{it}) + a_5(1/\text{Price}_{it}) + a_6 \ln(\text{Trading Volume}_{it}) + a_7 \ln(\text{Return Variance}_{it}) + a_8 \ln(\text{Firm Size}_{it}) + a_9(\text{SOX}_t) + u_{it} \quad (1)$$

$$\ln(q_{it}) = b_0 + b_1 \ln(\text{NAN}_{it}) + b_2(\text{Debt Ratio}_{it}) + b_3(\text{Advert Ratio}_{it}) + b_4(\text{R\&D Ratio}_{it}) + b_5 \ln(\text{Dispersion}_{it}) + b_6 \ln(\text{Shareholders}_{it}) + b_7(\text{Return to Capital}_{it}) + b_8 \ln(\text{Firm Size}_{it}) + b_9(\text{SOX}_t) + u_{it} \quad (2)$$

The debt ratio (Debt Ratio_{it}) is equal to the long-term debt divided by the total common equity at year-end. Moyer et al. (1989) postulate that the higher the level of debt in a firm's capital structure, the more covenants that will be available to restrict a firm's functions. In essence, the covenants act as a monitoring mechanism, and there is a reduced need for security analyst monitoring activity. Therefore, a negative relationship between the debt ratio and security analyst monitoring activity is expected. The relationship between firm value and the debt ratio is more complicated.[4] If a firm is enjoying its optimal capital structure and the probability of financial distress is nonexistent, the tax benefits of debt will outweigh any costs and there will be a positive relationship between the debt ratio and firm value. On the other hand, if a firm has too much debt in its capital structure, then the risk of financial distress and bankruptcy increases leading to a decrease in firm value.

The advertising ratio (Advert Ratio_{it}) is equal to the annual advertising expenditure divided by annual sales. The R&D ratio ($\text{R\&D Ratio}_{it}$) is equal to annual R&D expenditure divided by annual sales. These two control variables are likely to exert a positive influence on security analyst following, as analysts would be more familiar with highly advertised firms. Likewise, more security analysts would follow firms with a high level of R&D expenditure since these firms are usually superior in terms of quality. Indeed, Chung and Jo (1996) find a positive and significant relationship between analyst following and these two variables. In terms of firm value, previous research (e.g., Hall (1993) and McConnell and Servaes (1990)) finds a positive association between advertising and R&D expenditure and firm value.

The yearly trading volume ($\text{Trading Volume}_{it}$) of each firm is calculated as the mean of the monthly dollar trading volume during each year. The return variance ($\text{Return Variance}_{it}$) is measured using the

monthly stock returns of each firm during the year. The share price ($1/Price_{it}$) for each firm is calculated using the midpoints of the bid and ask prices for each month, and then finding the average over the year. For a better model specification, and following Brennan and Hughes (1991), the reciprocal of the yearly share price is used. Consistent with Chung and Jo (1996), the book value of total assets is used as a proxy for firm size ($Firm\ Size_{it}$). The sample is divided into quartiles and four categories of firm size are used. Quartile 1 represents the smallest firms while Quartile 4 represents the largest firms. Prior studies (e.g., Moyer et al. (1989), Bhushan (1989), and O'Brien and Bhushan (1990)) have found a positive relationship between security analyst monitoring activity and trading volume, return variance and firm size, and a negative relationship with share price. However, a negative association is found between firm value and firm size.

The dispersion ($Dispersion_{it}$) of security analyst forecasts for each firm is equal to the coefficient of variation of the security analyst forecasts for each year, and is a measure of risk. The return to capital ($Return\ to\ Capital_{it}$) for each firm is equal to net operating income divided by (total assets minus cash and investments). The number of shareholders ($Shareholders_{it}$) acts as a proxy for the investor base. In terms of firm value, previous research (e.g., McConnell and Servaes (1990)) has reported a negative relationship for dispersion and firm size, while a positive relationship is reported for return to capital and the number of shareholders.

The variable SOX_t is a dummy variable that equals one for the post-SOX period, and zero otherwise. Also, being cognizant of the fact that the SOX dummy variable could reflect alternative constructs other than 'how SOX affected firms', we include in the model macroeconomic several control variables that are unrelated to SOX, which may have an impact on the cost of equity capital. These variables include gross domestic product (GDP), consumer price index (CPI), producer price index (PPI) and real retail and food services sales (RETAIL).[5]

Table 1 summarizes the descriptive statistics separately for the overall sample and for the four size groups. Panel A reports descriptive statistics for the overall sample, while Panels B and C report descriptive statistics for the size groups. For each variable, the mean, median and standard deviation (SD) are reported. Panel A shows that the average firm value (Tobin's *q*) for the entire sample is 2.10 and the average number of analysts is 12.24. The mean debt ratio is 0.82 and the mean number of shareholders is approximately 46,000. Panels B and C show that for the smallest firm size quartile (Q1), the mean number of security analysts following a firm is 5.34, while for the largest firm size quartile (Q4), the mean number of security analysts is 19.36. In terms of firm value, the smallest firms exhibited the highest

TABLE 1
DESCRIPTIVE STATISTICS OF SAMPLE (1996-2006)

Panel A: All Firms

Variable	Mean	Med	SD
NAN	12.24	11	8.38
Tobin's *q*	2.10	1.56	1.65
Debt Ratio	0.82	0.46	7.83
Advert Ratio	0.01	0	0.02
R&D Ratio	0.08	0	0.57
Share Price	36.40	32.37	22.18
Dispersion	0.04	0.02	0.63
Return Variance	7.73	1.06	34.80
Trading Volume	14,136.01	3,485.54	39,240.72
Return to Capital	0.06	0.06	0.18
Firm Size	19,683.98	2,765.80	78,648.45
Shareholders	45.73	8.26	162.60
SOX	0.37	0	0.48

Panel B: Firms by Size(Quartiles 1 and 2)

Variable	Mean		Med		SD	
	Q1	Q2	Q1	Q2	Q1	Q2
NAN	5.34	8.92	4	8	3.80	5.59
Tobin's *q*	2.29	2.13	1.75	1.36	1.69	1.78
Debt Ratio	0.44	0.62	0.16	0.49	2.00	3.72
Advert Ratio	0.01	0.01	0	0	0.02	0.02
R&D Ratio	0.21	0.04	0	0	1.11	0.15
Share Price	20.64	32.67	18.14	30.17	13.61	18.28
Dispersion	0.02	0.06	0.03	0.02	0.49	0.85
Return Variance	2.33	3.39	0.50	0.95	4.12	4.97
Trading Volume	887.68	3673.04	366.45	1721.29	1554.30	6672.03
Return to Capital	0.03	0.07	0.07	0.06	0.34	0.06
Firm Size	352.63	1488.85	342.03	1350.93	175.65	602.11
Shareholders	3.86	7.86	1.65	3.63	5.33	11.73
SOX	0.26	0.39	0	0	0.44	0.49

Panel C: Firms by Size(Quartiles 3 and 4)

Variable	Mean		Median		SD	
	Q3	Q4	Q3	Q4	Q3	Q4
NAN	15.07	19.36	14	19	7.37	7.85
Tobin's *q*	2.00	1.99	1.63	1.53	1.68	1.41
Debt Ratio	0.62	1.27	0.49	0.68	3.72	14.33
Advert Ratio	0.01	0.01	0	0	0.03	0.02
R&D Ratio	0.03	0.03	0	0	0.06	0.06
Share Price	41.70	50.06	39.49	47.52	19.90	23.79
Dispersion	0.05	0.03	0.02	0.02	0.25	0.76
Return Variance	4.31	4.79	1.64	1.89	5.44	5.75
Trading Volume	12305.05	38699.29	6152.30	18067.02	24209.05	67026.52
Return to Capital	0.08	0.06	0.07	0.05	0.05	0.05
Firm Size	6027.18	70559.25	5516.92	26707.17	2491.37	145452.90
Shareholders	26.33	144.87	13	54.99	48.24	299.90
SOX	0.38	0.45	0	0	0.49	0.50

Note: The table shows descriptive statistics of number of analysts (NAN), Tobin's *q* (market value of equity + assets – book value of equity)/assets, debt ratio (long-term debt/common equity), advertising ratio (advertising expenditure/total sales), R&D ratio (R&D expenditure/total sales), share price, dispersion (coefficient of variation of the consensus forecasts over the year), return variance (the variance of the monthly stock returns for each firm over the year), trading volume (the mean of the monthly dollar trading volume over the year), return to capital (net operating income/ (total assets - cash - investments)), firm size (book value of total assets), the number of shareholders, and the dummy variable SOX, which is equal to one if the forecast period is within the post-SOX period and zero otherwise. Firms are also put into quartiles depending on their level of total assets. Quartile 1 (Q1) represents the smallest firms while quartile 4 (Q4) represents the largest firms. In order to achieve better model specification, the reciprocal of price as well as the log of NAN, Tobin's q, number of shareholders, trading volume, dispersion, and firm size are used in the regressions. The number of shareholders is reported in thousands, the trading volume is reported in thousands of dollars, and the firm size is reported in millions of dollars.

mean Tobin's *q* (2.29), while the largest firms had a mean Tobin's *q* of 1.99. This result is consistent with Chung and Jo (1996) who find that smallest firms have higher *q* ratios. In terms of the debt ratio, as expected, the smallest firms have the lowest mean debt ratio (0.44) compared to the mean debt ratio of the largest firms (1.27).

EMPIRICAL RESULTS

This section reports the results on the effect of SOX on security analysts monitoring activity and firm value as defined in the structural model (equations 1 and 2). First, the impact of the legislation on analyst monitoring activity (or analyst following) is examined. Then, given the documented positive relationship between analyst following and firm value (Tobin's q), the impact of the legislation on firm value is examined to determine whether that relationship has changed post-SOX. Finally, the effect on various firms (grouped by size) is investigated.

Security Analyst Monitoring Activity

Panel A of Table 2 presents the results on the impact of SOX on security analyst monitoring activity. We hypothesize that security analyst monitoring activity has changed post-SOX. The tests are motivated by two main ideas: (1) Security analysts tend to follow firms that have high corporate value, better corporate governance systems, and are more transparent in their financial reporting and other corporate disclosure; and (2) the more covenants that govern/restrict a firm's activities, the lower would be the demand for security analysts monitoring activity, *ceteris paribus*, because the covenants would essentially be acting as a additional monitoring mechanism.

As expected, Panel A shows a positive and statistically significant relationship between security analyst monitoring activity and firm value. Specifically, for every one percent increase in the firm value, the results show that analyst monitoring activity (analyst following) increases by 0.5213 percent. However, the results further suggest that security analyst monitoring has decreased post-SOX providing empirical support for the conjecture that the legislation acts similar to a bond covenant restricting public firms' activities, thereby diminishing the need for security analyst monitoring. The coefficient on SOX is negative and highly significant (*t-statistic* = -8.51).

Consistent with previous research (Moyer et al. (1989)), the results show a negative and significant association between the debt ratio and analyst following. Also, the results indicate security analyst monitoring activity is positively and significantly associated with the R&D ratio, trading volume, and firm size. However, no statistical significance was found between analyst monitoring activity and the advertising ratio, share price and the variance of returns.

Firm Value

Panel B of Table 2 presents the results on the effect of SOX on firm value. It is hypothesized that firm value has increased post-SOX. Consistent with this study's earlier findings, the results indicate a positive and significant relationship between firm value and analyst following (*t-statistic* = 5.01). However, the results show that firm value has increased post-SOX (*t-statistic* = 4.49) despite the earlier finding of a decrease in analyst following post-SOX. This corroborates the conjecture that the legislation is indeed playing a monitoring role. There is no vacuum created by the decrease in security analyst monitoring activity because of the monitoring mechanism called SOX. Therefore, it is no surprise that this study finds an increase in the firm value alongside a decrease in analyst following post-SOX because the legislation essentially provides a level of monitoring activity.

The results also indicate a positive and significant association between firm value and the debt ratio, the R&D ratio, and the number of shareholders (i.e., the investor base). Consistent with previous research, the results show a negative and significant relationship between firm value and firm size, as well as the dispersion of analyst forecasts. No significant association was reported between firm value and the advertising ratio or the return to capital.

TABLE 2
3SLS REGRESSION OF SECURITY ANALYST MONITORING AND FIRM VALUE

Panel A: Security Analyst Monitoring Activity(NAN)

Variable	Coefficient	*t*-Statistics
ln (*q*)	0.5213	6.36***
Debt Ratio	-0.0526	-2.92***
Advert Ratio	1.490	1.39
R&D Ratio	1.959	3.04***
1/Share Price	0.0653	0.15
ln (Return Variance)	0.004	1.50
ln (Trading Volume)	0.053	2.82***
ln (Firm Size)	1.490	10.21***
SOX	-0.1127	-8.51***
Adjusted R^2	0.14	

Panel B: Firm Value (Tobin's q)

Variable	Coefficient	*t*-Statistics
ln (NAN)	3.533	5.01***
Debt Ratio	0.2065	2.63***
Advert Ratio	6.055	1.57
R&D Ratio	0.4481	12.44***
ln (Dispersion)	-0.0976	-3.50***
ln (Shareholders)	0 .216	3.27***
Return to Capital	0.6309	0.58
ln (Firm Size)	-0.7261	-5.09***
SOX	0.4286	4.49***
Adjusted R^2	0.16	

*** Denotes statistical significance at the 1% level in two-tailed tests.

Firm Size

The results on the impact of SOX on security analyst monitoring activity and firm value by firm size are presented in Table 3. The hypothesis is that the impact of SOX on security analyst monitoring activity and firm value post-SOX for small firms will be different from the impact on large firms. Panel A shows the results for quartile 1, which represents the smallest firms based on the book value of assets. A positive and significant two-way relationship is reported between firm value and security analyst following. Moreover, the results show an increase in firm value (*t-statistic* = 2.83) and a decrease in analyst following (*t-statistic* = -3.05) post-SOX. Again, the results lend empirical support to the hypothesis that the legislation plays a monitoring role, which lessens the need for security analyst monitoring activity even among the smallest group of firms. In this quartile, the findings also show that analyst following is positively and significantly associated with only firm size and trading volume. In terms of firm value, there is a positive and significant relationship with return to capital, but a negative and significant relationship with dispersion and firm size.

The results for quartile 2 are presented in Panel B. The results are consistent with the previous findings in this study. Security analyst following and firm value are positively and significantly associated. However, the increase in firm value post-SOX occurs in tandem with a decrease in security analyst following, reflecting the findings of the firms in quartile 1. Looking at the other variables, security analyst following is positively and significantly associated with the share price, return variance, trading volume, and firm size, and firm value is negatively associated with firm size.

The results for quartile 3 are presented in Panel C and are in agreement with the other findings. A two-way positive and significant relationship is reported between firm value and security analyst following. As expected, a decrease in security analyst following is reported, alongside an increase in firm value post-SOX. It should be noted here that in this quartile representing the larger firms, the increase in firm value (0.03 percent) is less than the increase in firm value in quartiles 1 and 2 (0.13 percent and 0.22 percent, respectively). The difference is statistically significant suggesting that SOX has indeed been more beneficial to smaller firms. The results also show a negative and significant association between analyst following and the debt ratio, and a positive and significant association between analyst following and the advertising ratio, R&D ratio, trading volume and firm size. In terms of the firm value, findings indicate a positive and significant relationship with the advertising ratio, return to capital, and firm size.

Quartile 4 (Panel D) represents the largest firms, and the findings are similar to what has been presented. A decrease in security analyst monitoring activity is recorded post-SOX. However, the increase in firm value post-SOX is 0.06 percent, which is significantly less than the increase in firm value for the smaller firms in quartiles 1 and 2. This finding provides empirical support to the postulation put forth by Kamar et al. (2007) highlighting the potential benefits to small firms as a result of implementing the various components of SOX. The authors suggest that as a result of the legislation, small firms (usually characterized by poor internal control systems) will become more efficient because of increased accountability, stricter internal control systems and financial reporting. In terms of the other variables, the findings for this quartile of firms indicate a positive and significant relationship between firm value and the advertising ratio as well as the return to capital. A negative and significant relationship is reported between firm value and the dispersion of analyst forecasts. Security analyst following is negatively associated with the debt ratio, but positively and significantly associated with the advertising ratio, the R&D ratio, and the trading volume.

TABLE 3
3SLS REGRESSION OF SECURITY ANALYST MONITORING AND FIRM VALUE BY FIRM SIZE

Panel A: Quartile 1

Variable	NAN Coefficient	NAN *t*-Statistics	Tobin's *q* Coefficient	Tobin's *q* *t*-Statistics
ln (NAN)			1.4783	5.16***
ln (*q*)	0.1809	1.73		
Debt Ratio	-0.0031	-0.07	-0.0092	-0.13
Advert Ratio	-0.0339	-0.01	1.0203	0.24
R&D Ratio	0.8547	0.74	-1.6787	-0.97
1/Share Price	0.3564	0.38		
ln (Dispersion)			-0.0505	-2.73***
ln (Return Variance)	0.0033	0.48		
ln (Trading Volume)	0.1130	2.57***		
Return to Capital			3.8846	5.02***
ln (Firm Size)	0.1806	1.91*	-0.4194	-3.26***
ln (Shareholders)			-0.0491	-1.08
SOX	-0.0950	-3.05***	0.1342	2.83***
Adjusted R^2	0.09			

Panel B: Quartile 2

Variable	NAN Coefficient	NAN *t*-Statistics	Tobin's *q* Coefficient	Tobin's *q* *t*-Statistics
ln (NAN)			1.5651	1.69*
ln (*q*)	0.9708	4.28*		
Debt Ratio	-0.0438	-1.00	0.0063	0.08
Advert Ratio	-2.1523	-0.88	5.699	1.34
R&D Ratio	-0.4750	-0.23	0.2691	0.08
1/Share Price	2.1671	1.98**		
ln (Dispersion)			-0.0440	-1.15
ln (Return Variance)	0.0142	2.17**		
ln (Trading Volume)	0.1517	2.88***		
Return to Capital			2.4192	1.47
ln (Firm Size)	0.4610	4.46***	-0.3091	-2.02**
ln (Shareholders)			-0.0370	-0.67
SOX	-0.0935	-2.76***	0.2169	1.70*
Adjusted R^2	0.08			

Panel C: Quartile 3

Variable	NAN Coefficient	NAN *t*-Statistics	Tobin's *q* Coefficient	Tobin's *q* *t*-Statistics
ln (NAN)			0.6427	2.29**
ln (*q*)	0.4170	2.79***		
Debt Ratio	-0.0770	-2.51***	0.0186	0.54
Advert Ratio	9.3005	4.44***	7.2853	2.30**
R&D Ratio	2.6569	2.19**	-0.7919	-0.65
1/Share Price	-1.1094	-1.54		
ln (Dispersion)			-0.0067	-0.65
ln (Return Variance)	0.0001	0.01		
ln (Trading Volume)	0.1081	2.90***		
Return to Capital			3.7538	8.87***
ln (Firm Size)	0.2496	4.21***	-0.0348	3.52***
ln (Shareholders)			0.0812	1.94*
SOX	-0.0967	-3.76***	0.0338	1.88*
Adjusted R^2	0.09			

Panel D: Quartile 4

Variable	NAN Coefficient	NAN *t*-Statistics	Tobin's *q* Coefficient	Tobin's *q* *t*-Statistics
ln (NAN)			0.1296	1.88*
ln (*q*)	0.3884	2.90***		
Debt Ratio	-0.0810	-2.84***	-0.0075	-0.33
Advert Ratio	3.7062	2.33***	3.0977	2.77***
R&D Ratio	1.955	1.94*	-0.6434	-0.88
1/Share Price	-0.5607	-0.69		
ln (Dispersion)			-0.0173	-3.27***
ln (Return Variance)	0.0024	0.65		
ln (Trading Volume)	0.1130	4.38***		
Return to Capital			3.7097	11.79***
ln (Firm Size)	0.0139	0.30	0.0035	0.12
ln (Shareholders)			0.0805	2.67***
SOX	-0.0439	-2.31**	0.0582	3.66***
Adjusted R^2	0.12			

*** Denotes statistical significance at the 1% level in two-tailed tests.
** Denotes statistical significance at the 5% level in two-tailed tests.
* Denotes statistical significance at the 10% level in two-tailed tests.

CONCLUSIONS

This study investigates the effect of SOX on security analyst monitoring activity and firm value, seeking evidence on whether security analyst following has changed post-SOX and the effect (if any) on the traditional positive two-way relationship between security analyst following and firm value (Tobin's *q*). Moreover, the complementary monitoring role played by SOX is examined to determine its effect on firm value. We use a simultaneous equation 3SLS method to conduct the tests.

The evidence presented supports the view that security analyst monitoring activity has changed post-SOX. In fact, findings indicate that there has been a decrease in security analyst after SOX was implemented, even though an increase in firm value was recorded during the same time period. This suggests that the traditional positive bidirectional association between analyst following and firm value has changed because of the additional monitoring activity that SOX provides in the financial markets. In much the same way that bond covenants reduce the need for security analysts monitoring activity, the legislation (SOX) can be deemed a covenant, or a complementary monitoring mechanism, governing all internal aspects of public firms, likewise reducing the need for security analyst monitoring. In essence, a bond covenant restricts an issuer's activities and aims to maintain financial prudence, which is similar to SOX's emphasis on better corporate governance, accurate financial disclosure and minimizing fraudulent behavior. Therefore, SOX motivates managers and their firms to be efficient leading to a decrease in agency costs and in turn, a decrease in security analyst monitoring activity.

The findings in this study also support the view that SOX has had a positive impact on firm value. Critics of the legislation have always highlighted the high costs of compliance and the burdensome nature of SOX itself as obstacles to any potential benefits. They are of the view that SOX would hinder innovation, risk taking and productivity stunting economic growth in the process. However, this study finds support for an increase in firm value for every firm in the sample.

The potential effect of SOX on small firms has been somewhat difficult for academicians and practitioners alike to analyze. On one hand, some believed that the compliance costs of SOX would be too great for these small firms to realize any benefits. Conversely, others believe that SOX will go a long way in making these small firms more efficient. The results of this study indicate that SOX has had a positive

impact on the firm value of small firms. Moreover, the increase in firm value for small firms has increased by a greater percentage than the increase for the group of larger firms. This gives credence to the view that smaller firms may actually benefit more from SOX than larger firms because of the increased transparency that these small firms enjoy post-SOX.

Overall, this body of research is consistent with the view that all monitoring activity, whether it is directly through security analysts and financial institutions, or indirectly through bond covenants and legislation such as SOX, plays a key role in increasing firm value.

ENDNOTES

1. Sarbanes-Oxley Act of 2002, Pub. L. No. 107-204, 116 Stat. 745
2. See Pindyck and Rubenfeld (1997) for a thorough discussion on simultaneous equations and endogeneity.
3. Schaffer, M.E., 2007. xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models. http://ideas.repec.org/c/boc/bocode/s456501.html.
4. See Modigliani and Miller (1958) for their seminal research on capital structure and firm value.
5. Data is obtained from The Federal Reserve Bank of St. Louis (http://research.stlouisfed.org/fred2/)

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