Corporate governance and information risk post Sarbanes Oxley

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Abstract

This study investigates the relationship between corporate governance and information risk in the period post introduction of the Sarbanes Oxley Act (2002). Previous studies investigate internal control weaknesses, and discretionary accruals surrounding reforms (Doyle et al. 2007; Asbaugh-Skaife et al. 2008; Lobo & Zhou, 2006; Cohen et al. 2005) but fail to link this to a comprehensive measure of corporate governance or at information risk specifically. A weighted internal corporate governance index is developed overcoming issues with previous efforts. We find that the quality of reported earnings figures improved significantly post SOX and that better governed firms are thus likely to have less information risk. We contribute to literature by extending previous research on information risk to corporate governance and reforms. These findings provide additional insight to the importance of good corporate governance for capital markets. Investors should be aware of the quality of firm corporate governance when assessing financial statements as this provides valuable information on their quality.

Corporate governance and disclosure quality post Sarbanes Oxley

1. Introduction

This study investigates the relationship between corporate governance and information risk in the period post introduction of the Sarbanes Oxley Act of 2002 (SOX hereafter). Information risk stems from the likelihood that firm specific information important to investor decision making is of low quality (Francis et al. 2005). Previous studies investigate internal control weaknesses, and discretionary accruals surrounding reforms (Doyle et al. 2007; Asbaugh-Skaife et al. 2008; Lobo & Zhou, 2006; Cohen et al. 2005) but fail to link this to a comprehensive measure of corporate governance. A weighted internal corporate governance index is developed overcoming issues with previous efforts. We find that the quality of reported earnings figures improved significantly post SOX and that better governed firms do have less information risk. We contribute to literature by extending previous research on information risk to corporate governance and reforms. These findings provide additional insight to the importance of good corporate governance for capital markets. Investors should be aware of the quality of firm corporate governance when assessing financial statements as this provides valuable information on their quality.

We are motivated to investigate this issue for a number of reasons. First, the extant literature investigating measures of reporting or information quality focus on internal control weaknesses and discretionary accruals (Doyle et al. 2007; Bedard et al. 2007; Asbaugh-Skaife, 2008; Lobo & Zhou, 2006; Cohen et al. 2005) and links these to individual measures of corporate governance (Chambers & Payne, 2008). There is limited evidence of a relationship between governance and information risk surrounding introduction of SOX and few studies implement a comprehensive measure of governance quality. Second, following the introduction of SOX (2002) many studies have investigated its impact, but not specifically whether governance, improved post SOX (2002) reducing the information risk borne by investors. Previous studies employ mostly "arbitrary indices"[1] of anti-takeover measures[2] to proxy for governance. We attempt to overcome this problem by employing principal component analysis (PCA) to calculate a weighted internal governance index.

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[1] "Arbitrary indices" naively sum a set of dummy indicators to compute their index value. This implies equal weighting of governance factors without consideration of correlations between variables. All governance factors are not equally important and are sometimes highly correlated nd so equal weighting is a problem.

[2] External governance provisions (anti-takeover provisions, shareholders activism etc.) are considered to reduce firm value (Larcker et al. 2007) and are driven mainly by country laws and institutions, cultural norms and other monitors (Cremers & Nair, 2005). Evidence show good internal governance is needed in certain instances to ensure functioning of external governance mechanisms (John & Kedia, 2006).

A sample of 871 listed US companies is examined for the period 1998 – 2006. Information risk is proxied for by the Dechow & Dichev (2002) accruals quality measure (a proxy for information risk)[3]. A weighted internal governance index is developed to proxy for governance quality (see section 5). The results indicate that internal governance quality improved following SOX. In addition firms with good governance are found to have less information risk. Investigations of this relationship post reforms indicate that there is less information risk post SOX (2002) providing evidence of its impact.

This study makes several contributions to the literature. First, we add to the research on the determinants of information risk and extend the literature investigating information risk (Francis et al. 2005; Easley and O'Hara, 2004; Leuz & Verrecchia, 2005) to corporate governance. Second, we investigate whether internal (firm-level) governance improved post SOX (2002) and reduced information risk. Third, whilst previous studies have looked at internal control weaknesses & discretionary accruals in relation to individual governance measures, we include a comprehensive measure of firm-governance to identify whether a relationship with information risk exists. This proxy for governance overcomes many issues with previous efforts (Gompers et al. 2003).

The remainder of the paper is structured as follows: Section two discusses the link between corporate governance and information risk. Section three investigates governance reforms and why SOX (2002) should result in better quality disclosures. Section four discusses existing governance proxies whilst Section five presents the data, sample and methodology. Section six contains both the descriptive statistics and empirical results, Section seven robustness tests and Section eight concludes the paper.

2. Corporate governance and information risk

Information risk refers to the likelihood that disclosed financials, relevant to investor decision making, is of low quality (Francis et al. 2005). Such disclosure quality is important to investors (Francis et al. 2005) and informs them of the mapping of accruals into cashflows, allowing them to value securities accurately. In fact, it appears that investor's price information risk (Francis et al. 2005). When the mapping of accruals into cashflows is low, investors face more information risk since their valuation decisions are based on incomplete information (especially in relation to privately informed parties) and are likely to be inaccurate. Easley and O'Hara (2004) similarly show that information risk increases as more private information exist. This is because investors are not able to adjust their portfolios to incorporate that information. Such investors are likely to require

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[3] See Francis et al (2002; 2005); Rajgopal & Venkatachalam (2006).

higher returns (Easley & O'Hara, 2004; Leuz & Verrecchia, 2005). Improved reporting quality mitigates information asymmetries and reduces the volatility of stock prices (Diamond & Verrechia, 1991; Healy et al. 1999).

Corporate governance is the system by which companies are directed and controlled (Gillan & Starks, 1998). Governance benefits shareholders by improving the firm's overall level and quality of communication (e.g. financial statements). The extant literature show that those firms with weaker governance have lower quality accruals (Ashbaugh-Skaife et al. 2008; Doyle et al. 2007; Cohen et al. 2005; Lobo & Zhou, 2006) indicating that better governed firms are likely to have better quality accruals and less information risk. Whilst there is evidence to suggest such a relationship, previous studies have not measured overall firm level (or internal) governance in relation to information risk and as such this study addresses that question. This discussion develops hypothesis H1:

H1: Good corporate governance is associated with less information risk.

3. **Governance Reforms: the Sarbanes Oxley Act (2002) and information risk**

The Sarbanes Oxley Act (2002)[4] was introduced following corporate scandals at Enron, and Worldcom. Its main purpose is "to protect investors by improving the accuracy and reliability of corporate disclosure ...", and the expectation is that it would have increased the quality of reported financials (and thus earnings and accruals). SOX requires firms to improve the quality of financials and disclosures through certification, independent audit committees and the monitoring of management (see Section 301,302, 404 and 906) and results in severe penalties for non-compliance. SOX should therefore increase both the quality of reported financials as well as the overall quality of corporate governance in an organisation. If governance quality is better post reforms, accruals and earnings quality should improve, leaving investors with less uncertainty and information risk. Studies show firms with internal control weaknesses have lower quality accruals and financial disclosures (Doyle et al. 2007; Bedard et al. 2007). As such, post SOX (2002), firms should have better governance and internal controls and so investors should face less information risk when making their valuation decisions.

This discussion leads to the second hypothesis tested in this study:

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[4] The Sarbanes Oxley Act require firms CEO and CFO to certify financial statements, stating that there are sufficient internal controls and ensuring that the audit committee consist of independent directors only. For more information see http://www.sec.gov/about/laws/soa2002.pdf. Additional reforms followed in 2003 from the New York Stock Exchange (NYSE) and National Association of Securities Dealers Automated Quotation (NASDAQ), which make similar requirements.

H2: Firms have better less information risk post reforms.

4. Corporate Governance Measures

The mechanisms associated with governance of public firms can be categorised as being internal or external (Cremers & Nair, 2005). Internal governance relates to the firm level control mechanisms (i.e. independent board of directors) implemented when firms strive to obtain good governance. External governance pertain more to takeovers and the market for corporate control and is driven mainly by country laws and institutions, cultural norms and other monitors. Evidence show that firms with better internal governance have better external governance (Gillan et al. 2003) and that good internal governance is needed (in certain instances) to ensure adequate functioning of external governance mechanisms (John & Kedia, 2006). It seems internal corporate governance quality is likely to signal the quality of monitoring and disclosures to investors (since firms have control over this) and should therefore receive more consideration when determining a firm's governance quality. Regulatory reforms (SOX 2002, NYSE 2003 and NASDAQ 2003)[5] provide guidance as to what constitutes best practise in terms of monitoring management and financial disclosure. We can therefore define a firm with good internal governance as one that implements monitoring, disclosure and control mechanisms (in accordance with reforms) to ensure best practise is followed.

To investigate whether governance quality has improved post reforms one must first have a comprehensive measure of such quality. Earlier studies use individual aspects such as audit committee characteristics (Klein, 2002; Xie et al. 2003) or a combination of independent governance variables in their regressions (Davidson *et al.* 2005; Benkel et al. 2006) as a proxy. Unfortunately these fail to recognise that certain governance characteristics are highly correlated and that they are not equally important in ensuring quality. Comprehensive governance indexes have also been developed but suffer from many problems (Gompers et al. 2003; Bebchuk et al. 2009; Brown & Caylor, 2006; Larcker et al. 2007). Gompers *et al.* (2003) and its "G-Index" does have broad variable coverage but its equal weighting of all components ignore their relative importance and contribution. In any case, it is essentially an anti-takeover rights measure (external corporate governance, Cremers & Nair, 2005) which is problematic since such measures are generally associated with bad performance (Larcker et al. 2007).

Other governance indices (Bebchuk et al. 2009; Brown & Caylor, 2006) suffer from similar problems. They compute an "arbitrary index" – one where a set of binary variables are naively summed to form the end product, the governance score (Gompers et al. 2003; Bebchuk & Cohen, 2005; Brown and Caylor, 2006). Variables included in these scores are done so simply because they

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are available from their relevant data providers. For some, these variables are then converted to binary (dummy) variables, based upon what the data providers "best practise guidelines" recommend and summed to calculate the governance score (Gompers et al. 2003; Bebchuk & Cohen, 2005). Brown & Caylor (2006) include their 51 variables as independent variables in a regression on Tobin's Q and assign binary values to the seven with the most significance to calculate their summary index. These studies all make the assumption that the variables included in their indices are equally important and ignore correlations between these. This assumption is not necessarily correct, studies show that certain governance variables have significantly more explanatory power whilst others are highly correlated (Larcker et al. 2007). In addition, assigning dummy scores based on the data providers assessment of what good governance constitutes (as opposed to regulatory requirements) is problematic.

One approach to address previous index problems is to factor in interrelationships between variables and to calculate weightings consistent with each variable's contribution. Principle Component Analysis (PCA) is a statistical data reduction technique that does this and is commonly used in research to determine comprehensive measures (Tetlock, 2007; Banker & Mashruwala, 2007; Larcker *et al.* 2007). PCA considers the correlations between variables and ensures they are weighted accordingly and that they are not included on an equal basis. In light of the prior problems, Larcker et al. (2007) calculates a governance index using exploratory principal component analysis (PCA), including 39 structural measures of corporate governance. This is a significant improvement on previous efforts since it allows for weighted indices compiled of variables that explain most of the variance. Their model overcomes the arbitrary index problem but unfortunately still suffers from a number of drawbacks. They concede that some of their PCA results (and variable loadings) are unexpected. Surprisingly instead of recalculating their analysis with a different component number specification or alternative procedure (such as alpha factoring), they simply assume that their measure is correctly specified. They include dummy variables in their PCA; a setback since an underlying assumption of PCA is that variables are continuous. When employing PCA with dichotomous variables, tetra choric correlations or unconditional maximum likelihood (Christoffersson, 1975) needs to be employed. Larcker et al. (2007) do not employ his procedure. Similarly when testing the internal reliability of their measure, a Cronbach alpha of 0.532 is stated to be acceptable whilst the acceptable range is generally >0.7 (Nunnally, 1976).

This study develops a comprehensive measure of firm-governance to identify whether a relationship with information risk exists. This is proxy for governance overcomes many issues with previous efforts (Gompers et al. 2003) and is discussed in greater detail in the next section.

5. Data and Methodology

Data and Sample

Data necessary for determining the quality of accruals (and thus information risk) is obtained from Compustat for 1998 to 2006 (includes cash flows from 1997 – 2007). Other accounting data collected include book to market value ratios, return on assets and log market value of equity as control variables. Governance data is obtained from ISS-Proxy.   The sample selection process commenced with all companies in the ISS-proxy dataset (approx 1400 companies per year). These companies were then matched to the Compustat database, leaving approximately 1100 with matched data. Not all companies in the original sample were listed for the full sample period. If a firm delists or list within the period, its data is included for as long as it remains listed. Following prior studies (Kraft *et al.* 2007) all financial firms are excluded due to the special nature of their accruals. The final sample includes 852 firms with data for estimation of accruals quality for hypothesis H1. A number of observations are lost due to unavailable control variable data so that H1 includes 780 firms. Next, in order to calculate pre and post reform accruals quality values, a firm must have complete cash flow data for the entire period 1997 – 2007 (at least 5 complete observations are required to calculate a Dechow & Dichev (2002) model accruals quality value)[6]. The pre period is defined as 1998 – 2001 and the post period 2002 – 2006[7]. A number of cash flow observations for 2007 were still unavailable at the time of calculation and so decreases the sample size to 756 firms for the pre and post analysis (thus 1512 observations).

Control variables

In order to manage the effect of possible confounding factors (Bartov *et al*. 2000) variables previously found to be associated with accruals or governance are also included in the model. These variables include a control for size (log of market value of equity)[8] since larger firms are known to have better quality accruals (Dechow & Dichev, 2002) and is found to be positively associated with accrual quality (Lang & Lundholm, 1993). A measure of profitability (return on assets) is included since this information is likely to be considered when making decisions in regards to earnings and accruals. Lastly market to book value ratio is included since it is found to be positively associated with good governance (Klein, 2002).

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[6] Our proxy for information risk.

[7] We include 2002 here as "post reform period" since the market expected these changes in regulation and it is likely that some firms adjusted their governance standards prior to announcement. Even if this is not true, this assumption (and inclusion of 2002 as post reforms) will bias this study against finding results. As such we do not feel that this is a weakness.

[8] Total assets was also used with similar results.

Measurement of Variables

Each hypothesis investigated in this study requires a proxy for corporate governance. To date, there has been little conformity on what constitutes an appropriate governance proxy (see section 4). We contribute by developing a weighted internal governance index as a comprehensive measure of internal corporate governance. This measure is computed using principal components analysis (PCA). PCA is a data reduction technique that identifies associated variables within a dataset and loads them on relevant components[9]. The result is a number of components that each includes variables measuring similar concepts. The combined components should capture a significant part of the variance in the original dataset. In calculating the index, PCA considers the correlations between variables and then weighs them according to their component scores. This overcomes problems with equal weightings of binary variables (see section 4).

The original PCA analysis was conducted using 12 governance characteristics empirically found (as shown in table 1) to have been significant in improving reporting or governance quality.

Table 1
Governance characteristics employed in Principal Component Analysis

Characteristic	Evidence supporting its importance as a governance mechanism	Conclusion
Board Size (Bsize)	Yermack, 1996; Jensen, 1993	Smaller Boards are better.
Board Independence (Bindep)	Fama & Jensen (1983); Dahya & McConnell (2005); Chen-Lung *et al.* (2006); Beasley, 1996; Uzun *et al.* (2004).	Benefits for majority independent board.
Board Meetings (Bmeet)	Vafeas, 1999	Meeting more often better
Inside Directors (Inside)	Regulatory requirement (SOX / NYSE / NASDAQ)	Given the inside director % is below 50%, the lower the better.
Gray Directors (Gray)	Klein, 1998	Less gray directors (%) better
Diversity	Carter *et al.* (2003)	Diversified boards better
Audit Committee Size (Asize)	Klein, 2002	Larger audit committee better

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[9] The use of PCA overcomes many problems associated with previous efforts to calculate governance indexes (see section 4).

Audit Committee Independence (Aindep)	Abbott *et al.* (2004); Agrawal & Chadha (2005); Klein, 2002.	Majority independent better
Audit Committee Meetings (Ameet)	Regulatory requirement* (SOX / NYSE / NASDAQ)	Recommend regular meetings to review financials
Nomination Committee Meetings (Nmeet)	Regulatory requirement* (SOX / NYSE / NASDAQ)	Regular meetings required
Remuneration Committee Meetings (Rmeet)	Regulatory requirement* (SOX / NYSE / NASDAQ)	Regular meetings required
Remuneration Committee Size (Rsize)	Regulatory requirement* (SOX / NYSE / NASDAQ)	At least 3 members

"Regulatory requirement" indicates one or all of the regulatory reforms have this requirement. Where SOX refers to the Sarbanes Oxley Act (2002) available at http:www.sec.gov/about/soa2002.pdf; NYSE is the New York Stock Exchange Governance rules available at http:www.nyse.com/pdfs/finalcorpgovrules.pdf and NASDAQ is the National Association of Securities Dealers Automated Quotation Governance rules (2003) available at http:www.nasdaq.com/about/corpgovsummary.pdf

We establish that there are no individual correlations between our governance variables larger than 0.7[10]. First, the gray director and audit committee independence variables are excluded due to low sampling adequacy (0.4). Next, diversity and board meetings are also excluded since they do not load on any one of the three components with Eigen values larger than unity (all components with an Eigen value larger than unity is retained)[11].

The PCA is then run again, including only the remaining 8 variables (listed in the lower panel of table 2). These variables each have a Kaiser Myer Olkin (KMO) score larger than 0.5 and none appear to have a complex structure. The overall sampling adequacy measure is 0.734 and the Bartlett's test of Sphericity is significant indicating our model is appropriate for PCA. As shown in table 2, the three components (Board Size, Board Activity and Board Independence), consisting of 8 variables, explain 68.74% of the variance in original data. This condensed result is rotated using the Varimax procedure in order to ease interpretation.

Component scores are calculated as follows: First the variable weights (eigenvectors) are multiplied by the observed values for each variable in each component and summed (see table 2). This yields a component score for each of our three components, Board Size, Board Activity and Board Independence. Next the component loadings are reverted to percentages

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[10] Correlation coefficients are available from the authors upon request.

[11] Alpha Factoring, a different methodology for factor analysis is also employed to confirm the number of components, with similar results (not shown here).

out of 100 using 68.743 (the total cumulative explanatory %) as a base. This establishes the weight of each component (Board Size, Board Activity and Board Independence) in the index (i.e. 37.41% for Board Size, 32.47% for Board Activity and 30.12% for Board Independence). The internal governance score (IGS) is calculated as the component score multiplied by the

Table 2

Component loadings from PCA

Component	Total	% of Variance	Cumulative %	Component Weight (% out of 100)
1. Board Size	2.057	25.714	25.714	37.41
2. Board Activity	1.786	22.323	48.037	32.47
3. Board Independence	1.657	20.706	68.743	30.12

Component constituents (variables) from PCA with variable weights			
	Eigenvectors (variable weights)		
	Board Size	Board Activity	Board Independence
ASIZE	0.82	.	
BSIZE	0.793	.	
RSIZE	0.789	.	
AMEET	.	0.787	
RMEET	.	0.774	
NMEET	.	0.697	
INDEP	.		0.891
INSIDE			-0.83
Varimax Rotation with Kaiser Normalization			

Where *ASIZE* is audit committee size, *BSIZE* is board committee size, *RSIZE* is remuneration committee size, *AMEET* is number of audit committee meetings, *RMEET* is remuneration committee meetings, *NMEET* is nomination committee meetings, *INDEP* is percentage independence of the board, *INSIDE* is percentage inside (employee) directors on the board.

This IGS score is computed for each sample firm over the whole period, as well as on a pre and post reform basis. There are thus 3 scores (overall, pre and post) for each firm. These scores will proxy for governance in this study, where a higher score is indicative of better governance. Whilst this approach may appear to be a "tick the boxes" approach to measuring governance there is

substantial evidence that compliance with regulatory requirements do increase the quality and effectiveness of governance measures and improves valuation and performance (Guest, 2008; Kalbers & Fogarty, 1993; Bedard et al. 2004; Xie et al. 2003; Gompers et al. 2003).

The three components (Board Size, Board Activity and Board Independence) and their associated variables (table 2) evaluate three distinct components of internal corporate governance. Each component is named based on the characteristics of those factors loading on that component. Component 1 is labelled "Board Size" since it considers the sizes of various board committees. The second component, "Board Activity", includes measures of board and committee meetings. The third component, "Board Independence", accounts for independence of the board. The solution for PCA seems satisfactory given the three categories identified from table 2 and this solution is used to compute the final governance score.

The PCA allows for calculation of a weighted internal governance score from the three components identified through the rotated component matrix. This is an improvement on previous efforts since these weightings should reflect the importance of each factor in explaining internal governance. Component one (Board Size) contributes 37.41% to the calculation of the score, component two (Board Meetings) 32.47% and component three (Board Independence) 30.12% (from table 2). The descriptive statistics of the overall governance score are shown later in table 4.

Information risk

Information risk is measured with the cross-sectional model of Dechow & Dichev (2002) used in Francis *et al.* (2005) and Core *et al.* (2007). Accruals quality (Dechow & Dichev, 2002) is often used as a proxy for earnings quality, disclosure quality and information risk (Francis et al. 2002; Francis et al. 2005; Rajgopal & Venkatachalam, 2006 and Aboody et al. 2006). The model considers whether misspecification in accruals (deliberate or not) impacts on their quality. Accruals quality is calculated as the standard deviation of the residuals from the regression of working capital accruals over past, present and future cash flows from operations. The greater the unexplained variation in working capital accruals (larger std. dev of residuals), the poorer is the accruals quality and the higher information risk. Following Hribar & Collins (2001) both the cash flow and balance sheet method of calculating accruals are employed. The cash flow method results are presented since the two methods yielded similar results and the cash flow method is proposed to be better specified (Hribar & Collins, 2001)[12]. Information risk measure is computed using the following modified Dechow & Dichev (2002) model:

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[12] Results for the balance sheet method are available on request.

$$\Delta WC_{i,t} = \beta_{0,i} + \beta_{1,i}CFO_{i,t-1} + \beta_{2,i}CFO_{i,t} + \beta_{3,i}CFO_{i,t+1} + \epsilon_{i,t}$$

Where: $\Delta WC_{i,t}$ = change in working capital accruals for firm i for year t, scaled by average total assets. $\Delta WC_{i,t}$ = ΔCurrent Assets - Δ Cash -Δ Current Liabilities + Δ Short term Debt + Δ Sales Revenue ., $CFO_{i,t}$ = cash flow from operations for firm i for period t, scaled by average total assets, this is measured as NPAT – Total Accruals (as in Sloan 1996). $\varepsilon_{i,t}$ = the residual of firm i for time t.

Regression models

This study utilises two regression models: one to measure the relationship between governance and information risk over the whole sample period and the second to examine the position pre and post reforms. The research objective investigating the relationship between governance and accruals (disclosure) quality of US firms employs the following model:

$$AQ_{i,t} = \alpha_0 + \beta_1 IGS_{i,t} + \beta_2 SIZE_{,t} + \beta_3 BM_{i,t} + \beta_4 PROF_{,t} + \varepsilon$$

Where $Y_{AQ,i}$ = accruals quality, a proxy for information risk. $\alpha_{0,i}$ = the intercept coefficient of the regression. $\beta_{1,i}$ = the coefficient of the IGS_i score from the regression. IGS_i= average internal governance score for each firm (-). Control Variables include SIZE (log market value of equity), BM (book-to-market value) and PROF - profitability (ROA). These were discussed earlier in this section.

The second model employed to investigate the relationship between governance and information risk pre and post reforms take the following form:

$$AQ_{i,t} = \alpha_0 + \beta_1 IGS_{i,t} + \beta_2 IGSREF_{,t} + \beta_3 REF_{i,t} + \beta_4 SIZE_{,t} + \beta_5 BM_{,t} + \beta_6 PROF_{,t} + \varepsilon$$

Where $Y_{AQ,i}$ = accruals quality, a proxy for disclosure quality. $\alpha_{0,i}$ = the intercept coefficient of the regression. $\beta_{1,i}$ = the coefficient of the IGS_i score from the regression. IGS_i= average internal governance score for each firm (-). IGSREF = the interaction term between governance score and the dummy variable for pre and post reforms. REF = dummy variable where 0 = period pre reforms and 1 = post reforms. (-). Control Variables include SIZE (log market value of equity), BM (book-to-market value) and PROF - profitability (ROA). These were discussed earlier in this section.

6. Results

Hypothesis H1: Corporate Governance and Information risk

Descriptive statistics for the Hypothesis H1 variables are presented in table 3. The mean accruals quality measure is 0.021 and ranges from 0 to 0.312; firms with better quality accruals will have a value closer to zero and will have low information risk. The mean (median) of the internal governance score (IGS) is 8.284 (8.227) with a minimum of 2.86 and a maximum of 15.43; firms with good corporate governance will have governance scores closer to 15.43. The rest of the variables are control variables and are reported in table 3.

Table 3

Descriptive Statistics for full sample

Variable	Mean	Median	Std Deviation	Min	Q1	Q3	Max

AQ	0.021	0.012	0.029	0	0.006	0.022	0.312
IGS	8.284	8.227	1.703	2.86	7.09	9.45	15.43
SIZE	3.265	3.170	0.676	1.16	2.80	3.69	5.58
BM	0.397	0.360	0.328	-3.34	0.23	0.53	3.05
PROF	5.728	10.65	29.85	-214.79	-5.46	17.19	141.54

Where *AQ* is accruals quality, IGS is the internal governance score, SIZE is log market value of equity, BM is book to market value ratio and PROF is return on assets. Min (minimum observed value), Q1 (value at quartile 1), Q3 (value at quartile 3), Max (maximum value) is descriptive values for the data in order to provide an overview of the distribution.

Table 4 presents the pre and post reform scores for the information risk proxy (AQ) and internal governance score (IGS).The PRE IGS and POST IGS scores indicate that the governance quality has increased post reforms (Pre IGS mean = 7.491 compared to Post IGS = 9.081). Similarly accruals quality has also improved post reforms (evident from the lower POST AQ mean score) indicating there is less information risk post reforms. These statistics support both our hypotheses. Next, we employ regression models to test our hypotheses.

Table 4
Descriptive Statistics pre and post reforms

Variable	Mean	Median	Std Deviation	Min	Q1	Q3	Max
PRE IGS	7.491	7.35	1.902	3.56	5.98	8.84	13.56
POST IGS	9.081	9.035	1.804	3.93	7.83	10.41	15.43
PRE AQ	0.0172	0.011	0.03	0	0.0057	0.02	0.5925
POST AQ	0.0102	0	0.0518	0	0	0.0027	1.105

PRE and POST IGS is the values for governance score in the pre and post SOX periods. PRE and POST AQ is the accruals quality measure for the pre and post SOX period.

The first hypothesis tests whether better governed firms have better quality disclosures for the period pre reforms. The regression results (see table 5) indicate that the corporate governance variable (IGS) is negative (-0.0015) and significant (t-statistic = -2.85, p-value =0.0045) as shown in table 5. That is, the higher the corporate governance quality (higher internal governance score), the smaller the standard deviation of the residual (higher accruals quality and lower information risk). We also document that accruals quality is affected significantly by profitability. More specifically firms with higher profitability seem to have lower standard deviation of accruals (and less information risk).

Table 5

The results from the regression of information risk on corporate governance score

$$AQ_{i,t} = \alpha_0 + \beta_1 IGS_{i,t} + \beta_2 SIZE_{,t} + \beta_3 BM_{i,t} + \beta_4 PROF_{,t} + \varepsilon$$

	Parameter Estimate	Standard Error	t-statistic	P-value
Intercept	0.0402	0.0064	6.26	<0.0001
IGS	-0.0015	0.0005	-2.85	0.0045
SIZE	-0.0015	0.0013	-1.10	0.2711
BM	-0.0008	0.0026	-0.34	0.7345
PROF	-0.0005	0.0001	-9.30	<0.0001

R Square	Adjusted R Square
0.1086	0.1042

Where *AQ* is accruals quality, IGS is the internal governance score, SIZE is log market value of equity, BM is book to market value ratio and PROF is return on assets.

This is consistent with the idea that profitable firms have more to lose when earnings restatements have to be made and so should ensure their disclosure quality remains high.

Hypothesis H2: Corporate Governance and Information risk pre and post SOX (2002)

The results from the regression for hypothesis H2 is presented in table 6. The main variable of interest from this regression is the interaction term between governance score and reference period dummy (IGSREF). This term reveals whether there is a change in information risk post reforms. Reference dummy is 0 pre reforms and 1 post. The coefficient for the interaction term is positive (0.0010) since it is the product of the IGS (negative) and REF (negative) term. The t-statistic is significant (3.57) at the 99% level. In addition the reference dummy (REF) is also negative (-0.0191) and significant (-7.76). This result implies that there is a change in accruals quality post reforms associated with improved governance quality. The reference term indicates that accruals quality improved in the period post reforms implying that information risk should be lower. The corporate governance variable (IGS) is (consistent with H1) negative (-0.001) and significant (t-statistic = -4.64, p-value =0.0001). That is, the higher the corporate governance quality (higher internal governance score) the smaller the standard deviation of the residual (higher accruals quality and lower

information risk). These findings provide support for hypothesis 2 that information risk is lower post reforms. Tests for endogeneity and other potential problems are conducted in Section 7.

Table 6

The results from the regression of corporate governance and information risk pre and post SOX (2002)

$$AQ_{i,t} = \alpha_0 + \beta_1 IGS_{i,t} + \beta_2 IGSREF_{,t} + \beta_3 REF_{i,t} + \beta_4 SIZE_{,t} + \beta_5 BM_{,t} + \beta_6 PROF_{,t} + \varepsilon$$

	Parameter Estimate	Standard Error	t-statistic	P-value
Intercept	0.0251	0.0016	15.52	<0.0001
IGS	-0.0010	0.0002	-4.64	<0.0001
IGSREF	0.0010	0.0002	3.57	0.0004
REF	-0.0191	0.0024	-7.76	<0.0001
SIZE	-0.0007	0.0001	-4.80	<0.0001
BM	-0.0005	0.0003	-1.52	0.1277
PROF	0.0001	0.00001	5.71	<0.0001

R Square	Adjusted R Square
0.2778	0.2748

Where *AQ* is accruals quality, IGS is the internal governance score, IGSREF = the interaction term between governance score and the dummy variable for pre and post reforms. REF = dummy variable where 0 = period pre reforms and 1 = post reforms. (-). SIZE is log market value of equity, BM is book to market value ratio and PROF is return on assets.

7. Robustness tests

Firm governance is endogenous, which implies that firms can adjust governance quality as they please in order to signal to the market. If this is the case, it is possible that a firm that has less information risk could signal to the market that it has high quality disclosures and accruals. This could be achieved by ensuring the strictest of governance requirements are met. The implication of this is that lower information risk (and better quality accruals) could also drive better corporate governance. Whilst most governance studies do include some test of endogeneity, few include a

simultaneous test for sample selection bias. Most governance studies include only the largest listed companies (potentially due to data constraints). This study contributes by not only controlling for endogeneity but also correcting for sample selection bias using the model of Mroz (1987) employed in a governance setting by Renders & Gaeremynck (2008). This method uses a multi-stage model (3 stage least squares) in which sample selection bias and endogeneity is simultaneously controlled for. It encompasses the two-stage least squares method as employed by Doyle et al. (2007) and the use of instrumental variables and the inverse Mills ratio. This model comprises three equations:

Selection equation

Probit (*indicator variable - included in the sample*) = f(*variables that define the selection process*)   (1)

Reduced form equation

Endogenous Variable (*governance*) = f(*instrumental variable, control variables*)   (2)

Structural equation

Dependent variable (AQ) = f(*predicted value of endogenous variable from (2), inverse Mills ratio from (1),*

control variables).   (3)

In the first stage (selection equation) the coefficients of the regressions involving governance and the accruals quality are used to compute the inverse Mills ratio (*INVMIL*) and to mitigate the problem of selection bias. In the second stage (reduced form equation) a regression with governance as dependent variable (the endogenous variable) is constructed with instrumental variables (lag governance score, board size and size dummy) as well as control variables. Theoretically a good instrumental variable has a strong correlation with the endogenous variable without being correlated with the error term of the structural equation (exogenous). It is quite difficult to identify such a variable (Maddala, 1977) and most studies employ a variable that does not meet this criterion (Renders & Gaeremynck, 2008). An improved method of including instrumental variables proposed by Renders & Gaeremynck (2008) is to include semi-endogenous variables. As such this study includes lag governance score as the first instrumental variable. In order to ensure consistency with previous studies traditional instrumental variables (thought to be exogenous) are also included.

These include board size (Wintoki et al. 2008) and asset size dummy (Kim et al. 2006). In order to access and control the self selection bias discussed above, the inverse Mills ratio is then added as an independent variable in the logistic regression in the third equation (structural equation). The dependent variable here is accruals quality and independent variables include the predicted value for governance from the reduced form equation (2) as well as the inverse Mills ratio (1). Control variables are also again included.

The results from the selection equation [13] (1) indicate that most independent variables in the model are significant implying that selection seem to rely more on variables than just on market value. In order to overcome any "large firm bias" we calculate the Inverse Mills ratio from equation 1 and include this in the structural equation to reduce the impact of sample selection bias on the relationship between governance and accruals quality (information risk). Results from the reduced form equation (2) indicate that the instrumental variables employed are appropriate. All three instrumental variables are significantly related to governance rating. The adjusted R-square of the regression is 72.06% and the F-value larger than 1000. The inverse Mills ratio is also not significant here. Lastly, for equation 3 (the structural equation) assessment is made whether the predicted governance ratings is significant. A significant loading on this would indicate that endogeneity is present. Results indicate that the predicted governance values are not significant in the regression indicating that endogeneity is not a problem for this study.

Additional variance inflation factors and tolerance tests confirm that multicollinearity is not present for either of the hypotheses tested in this study. Unreported results using the Sloan (1996) balance sheet method of calculating accruals support this finding. Our measure is therefore robust to the inclusion of alternative accrual measures.

6. Conclusion

This study investigated the relationship between corporate governance and information risk for US listed firms following the introduction of the Sarbanes Oxley Act (2002). A weighted internal governance measure is developed to proxy for governance. We propose that this measure is an improved alternative to using a single characteristic or an arbitrarily assigned dummy model to proxy for corporate governance.

The findings indicate that better governed firms do have better accruals and thus less information risk. In addition it appears that accruals quality has improved following governance reforms so that investors' bear even less information risk in the period post SOX (2002).

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[13] Results from endogeneity tests are not included in this paper but are available from the author by request.

This study makes several contributions to the literature. First, we attempt to identify whether governance quality is a determinant of information risk. Second, we investigate whether internal (firm-level) governance has actually improved following the Sarbanes Oxley Act to provide some evidence on its impact. We also investigate whether accruals quality has improved post reforms, again providing new evidence on the impact that SOX (2002) has had. Third, whilst previous studies have looked at internal control weaknesses only, we include a comprehensive measure of firm-governance to identify whether a relationship with information risk exists. This proxy for governance overcomes many issues with previous efforts (Gompers et al. 2003).

These findings have implications for investors, firms and regulators. Investors should note that good governance contributes to the quality of firm disclosures and so pay attention to governance quality when valuing firms. Directors of firms should note that governance quality has changed substantially in recent times and that investors are likely to be aware of such changes. Lastly, for regulators, SOX (2002) appears to have had the desired impact of improving governance and disclosure quality amongst listed firms.

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