Non-Financial Key Performance Indicators and Quality of Earnings

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We examine the association between the extent of key performance indicators (KPI) disclosures and the quality of earnings measured by both the conventional earning response coefficient and the E-loading factor developed by Ecker et al. (2006). The E-loading factor captures the sensitivity of the firm's return to earnings quality, similar to beta which captures the sensitivity of returns to market movements and is used as a proxy for the perceptions of investors about the earnings quality. The results indicate a positive association between non-financial KPI disclosures and the quality of earnings only for companies in oil and gas industry, but the association is mainly non-linear.

INTRODUCTION

Ample evidence shows that proper use of key performance indicators (KPIs) improves the company's performance (Marshall et al., 2000; Reck, 2001; Larcker et al., 2007; Jackson, 2008). KPI disclosures are expected to affect business practices that can result in better performance. Rational expectation implies that more transparency through KPI disclosure can improve the perception of investors because in competitive stock markets and limited resources, investors scrutinize companies and invest their money in companies which are more productive and more transparent. This expectation is consistent with Cheung et al. (2010) who find a positive association between more transparency and market valuation in 100 major Chinese listed companies. However, Smith et al (2009) conclude that this association varies among different companies in different countries (e.g. Japan, Sweden, and France). The importance of KPI disclosures in corporate reporting is underscored in the UK Companies Act of 1985 and the report of the Advisory Committee on Improvements to Financial Reporting (ACIFR) to the United States Securities and Exchange Commission (SEC) in 2008.

In this paper, we examine the association between the extent of KPI disclosures and earnings quality (The importance of earnings quality is discussed by Caylor et al. (2007). The quality of earnings is measured by both the conventional earning response coefficient (ERC) and the E-loading factor developed by Ecker, Francis, Kim, Olsson, and Schipper (2006). The E-loading factor captures the sensitivity of the firm's return to earnings quality, similar to beta which measures the sensitivity of returns to market movements. As shown in Ecker et al. (2006), the calculations of e-loading factor are affected by financial KPIs, but no nonfinancial KPIs are involved in e-loading calculations. In other words, the e-loading captures the perceptions of investors about the firm's earnings quality. We originally started with a sample of 200 companies from each selected industry and ended up with companies that had complete

data for both 2006 and 2007 years. All companies in related populations are numbered starting from 1 and we used a table of random numbers to select our sample companies. Our final samples include a random sample of 156 companies listed on S&P 500, a random sample of 135 manufacturing companies listed on the New York Stock Exchange (NYSE), and a random sample of 113 oil and gas companies listed on NYSE. We choose a random sample of S&P500 companies because of the importance of the economic impacts of large companies and to facilitate efforts in hand-collecting data on KPI disclosure. Also the choice of manufacturing and oil and gas companies is based on the importance of social, environmental, and sustainability reporting in this industry (e.g., Laine 2010; Johansen 2010). Given the nature of hand collecting KPI data, the sample sizes are increased enough both to be cost effective and results to be generalizable.

The overall results indicate that for companies in the oil and gas industry there is a positive association between non-financial KPI disclosures and the quality of earnings, but the association is mainly non-linear. This study is expected to contribute to the literature in several ways. First, we investigate the association between the extent of non-financial KPI reporting and the quality of earnings. To the best of our knowledge, this is the first study that addresses this issue. Second, using the econometrics technique of goodness of fit for model selection, we have shown that a non-linear model can better explain the association between ERC and KPI disclosure, so we question the use of linear models in the ERC and E-loadi.ng studies. Finally, while the SEC and the U.S. Treasury Department have shown growing interests in KPI disclosures, no empirical results are available to support such interest. The policy implication of this study in providing empirical evidence regarding the recommendations made by the Advisory Committee on Improvements to Financial Reporting (ACIFR) in 2008 is to encourage the Securities and Exchange Commission (SEC) and the Financial Accounting Standards Board (FASB) to define specific KPIs and require companies in each industry to consistently report them. Details and different perspectives of KPI disclosures are shown in Appendix A.

The remainder of the paper is organized as follows. Section II includes a discussion of KPIs and their relevance in financial and nonfinancial reporting. Our hypotheses development is presented in Section III. Section IV explains the sample design, data, and methodology. Section V presents the results. Summary and implications are discussed in Section VI.

Relevance of KPIs

Traditional financial statements provide historical financial information concerning an entity's financial positions and results of operations as proxies for future business performance. Investors demand forward-looking financial and nonfinancial information on key performance indicators (KPIs) relevant to the entity's governance, economic, ethical, social, and environmental activities. Parmenter (2008) defines KPI as a set of measures focusing on factors that are most critical for the success of the organization. KPIs were first introduced by Kaplan and Norton (1996) as balanced score cards and redefined by Norreklit (2003) and used in different studies (e.g., Herath et al. 2009). KPIs include both financial and non-financial measures (Burton et al., 2006; Wiersma, 2008; Veen-Dirks and Van, 2009). Standard setters worldwide are considering overhauling financial reporting and restructuring financial statements by focusing on KPIs and providing information concerning how businesses are actually run (Reilly, 2007). The U.K. Companies Act 2006 significantly expands corporate responsibility reporting to include both financial and other KPIs concerning information about the company's policies pertaining to environmental matters, employee activities, and social and community issues (UK Companies Act, 2006). Furthermore, the importance of KPI reporting can be seen in the final, report of the Advisory Committee on Improvements to Financial Reporting (ACIFR) to the United States Securities and Exchange Commission (SEC) in 2008.which recommends the extensive use of KPIs. For importance and relevance of more disclosure and transparency see Hughes et al. (2001), Gordon et al. (2002), Ettredge et al. (2002), Arya et al. (2005), Reck and Wilson (2006), Tadesse (2006), and Kelton and Yang (2007).

Investors demand forward-looking financial and nonfinancial information and companies have strived to provide such information. Traditionally, public companies have focused on achieving their primary economic objective of making profit and enhancing shareholders' wealth by engaging in operating,

investing, and financing activities to provide and distribute goods and services. This narrow focus on achieving economic performance has been criticized for ignoring other social, ethical, and environmental responsibilities of corporations (Rezaee, 2007). The multiple bottom lines (MBL) objectives of economic, social, ethical, and environmental (ESEE) performance have been advocated by global business and investment communities (GRI, 2002). With the MBL objectives, the primary goal is to achieve economic performance of creating shareholders' value while giving proper consideration to other measures of performance including social, ethical and environmental measures. Discussions of environmental accounting and the effects and importance of environmental measures can be found in Patten (2002), Villiers and Staden (2006), Burnett and Habsen (2008), Lohmann (2s'009), Hopwood (2009), and Veen-Dirks and Van (2009). Furthermore, Riley et al. (2003) examine the value relevance of nonfinancial information in Airline industries and conclude that nonfinancial information are more value relevant compare to traditional accounting metrics.

Ghalayini and Noble (1996) posit that the objective of performance measurement has changed and the traditional performance measures based on productivity are no longer applicable to the new global competitive market. New measures are being developed based on combination of a variety of performance measures. They review and analyze the limitations of traditional measures and discuss the characteristics of the new performance measures. Furthermore, Epstein and Roy (2001) discuss the increasing trend in recognition of the importance of corporation social responsibility and present a framework to evaluate the drivers of corporate social performance and actions that management can take to affect performance. They argue that with the knowledge of drivers of social responsibility and their effects on stockholders, managers can make significant contributions to their companies and the society. They provide a framework, which includes factors that they claim can change the culture of an organization by presenting a new direction that improves both social and financial performance.

Moreover, there has been a growing trend in international interest in multiple bottom lines performance reporting, which includes environmental, social, and governance issues. It is believed that reporting these bottom lines performances can affect the performance of portfolios, so they must be properly managed and reported. Because of the importance of this issue, the United Nations Secretary General in 2005 invited a group of representatives of 20 investment organizations from 12 different countries and asked them to establish a set of global best practice principles for responsible investment (United Nations 2005). Also, the UK Carbon Reduction Commitment (CRC), which requires companies to measure and report their carbon emissions from energy use, soon became effective and close to 10,000 companies were affected by this requirement. The compliance with this regulation will have significant effects on companies' cash flows. In short, organizations with 500,000 British Sterling or more are required to: (1) measure their energy sources, (2) report the usage to the government, and (3) pay for their pollution.

In short, KPIs help an organization define its goals. After an organization identifies its goals and its stakeholders, the organization needs to measure its performance in achieving the organization's sustainable goals. The preparation and use of KPIs both provide management with information needed for improving performance to achieve organizational goals and help investors to evaluate management performance. The ACIFR report recommends that the SEC should encourage public companies to use KPIs in their business reports. The committee recommends that the SEC should encourage private sectors to disclose understandable, consistent, relevant, and industry-specific KPIs in their Management Discussions and Analyses (MD&A) and other companies' disclosure. The committee claims that KPIs will provide incremental information beyond what is traditionally provided in conventional financial statements reporting and can provide more transparency about a company to its stockholders. They argue that more transparency reduces the cost of capital and improves the market efficiency. However, the committee does not provide any evidence to support the recommendations. The results presented in this paper provide some preliminary evidence to support the committee's recommendation.

In this study the transparency is used to indicate the extent to which companies reveal information that financial statements users would like to know. KPIs are integral components of strategic decisions and sustainability reporting, and they are relevant to the operational performance of organizations of any

type and size. Having predetermined KPIs as their goals, companies can better direct their operations to achieve these preset goals. If KPIs are to be used for judgment and decision making, they must be properly defined and consistently applied. The research question addressed in this paper is whether there is an association between the extent of non-financial KPI disclosure and the quality of earnings.

HYPOTHESIS DEVELOPMENT

There is no requirement in the United States for disclosure of nonfinancial KPIs, and even though in the United Kingdom the UK Companies Act of 1985 requires the publication of certain KPIs in accordance with the EU Accounts Modernization Directive for all except small companies, the Act only requires the publication of financial KPIs. Anecdotal evidence suggests that companies in general do not voluntarily disclose non-financial information because a) there is not enough external pressure from regulatory and accounting standard setting bodies, investors, and other stakeholders for disclosure of non-financial information, b) management does not perceive that the benefits from disclosing non-financial information exceeds its implication costs, and c) management does not consider the non-financial information (e.g., social responsibility and sustainability reporting) to be of a critical importance to companies (Deloitte 2007). Nonetheless, the recent interest in and move toward business sustainability of triple bottom line reporting of social, environmental and economic performance should encourage businesses to disclose KPIs. Corporate social responsibility and sustainability reporting and their relevance to corporate reporting are discussed in details by Cooper et al. (2007) and Gray (2010).

Prior studies such as Copeland, Koller, Murrin, and Foote (2000), Dowling (2006), and Zhang and Rezaee (2009) follow a four stage model to link financial and non-financial information to corporations' both financial and market performance. Consistent with this model, McGuire (1998), Ruf et al. (1972), Moskowitz (1972), Simpson and Kohers (2002), and Verschoor (1998) have established a link between corporation social responsibility and financial performance, Zhang and Rezaee (2009) document a link between the credibility of firms and a higher earnings quality, and Pinnuck and Potter (2009) discuss the importance of earnings in measuring the economic performance of Australian local governments. Furthermore, Dedman et al. (2008) and Chan et al. (2009) show how voluntary disclosure and the quality of accounting information affect the stock prices for a sample of U.K. companies. A study by the Hackett Group (2006) shows that proper use of KPI reporting helps the company's finance department to decrease costs and improve productivity of its operations. In another study, Lambert et al. (2005) examine the association between accounting information and disclosure, as well as the cost of capital and conclude that the quality of information can both directly and indirectly impact the cost of capital.

We argue that KPIs can be integrated into accounting disclosures and reporting systems to improve performance and to provide investors with information to meet their needs. The overall quality of the management information system, which includes both financial and non-financial information, can positively affect the performance of the firm. Furthermore, we argue that firms align their financial and non-financial information to positively influence their performance. That is, we posit that there is a positive association between non-financial KPIs and quality of earnings. We test the following overall hypothesis:

H1: The extent of non-financial KPI reporting is associated with earnings quality.

To measure the quality of earnings, we use a metric, e-loading factor, developed by Ecker et al. (2006), and the conventional earning response coefficient (ERC). Ecker et al. (2006) provide an innovative metric for measuring the sensitivity of the firm's return to earnings quality in a specific period of time as short as a quarter. Their metric postulates that the coefficient on the earning quality factor, called "e-loading", captures the sensitivity of the firm's return to earning quality, similar to beta which captures the sensitivity of returns to market movements. In other words, the e-loading captures the perceptions of investors about the firm's earnings quality. Ecker et al. (2006) show that e-loadings vary cross- sectionally with other characteristics of earnings quality. They also show that investors consider the

lower ERC to be related to higher e-loading factor. Based on prior studies as mentioned earlier, we argue that the perceived higher earnings quality is a leading driver of investors' positive market reactions. E-loading can be measured for firms that have limited time-series accounting data, which usually is required for estimating earnings quality using other accounting-based measures, so an important advantage of the e-loading factor is its ability to increase the sampling power and the generalizability (external validity) of the results.

This argument, together with our discussions in the previous paragraphs, leads to the following hypotheses:

H1a: The extent of non-financial KPI disclosure is associated with financial reporting quality measured by the e-loading factor.

Assuming that KPIs are accurate and appropriate, they will reduce uncertainty, so we also hypothesize that:

H1b: The extent of non-financial KPI disclosure is associated with financial reporting quality measured by the earnings response coefficient.

The above hypotheses are used to test the possible association between the extent of non-financial KPI reporting and the quality of earnings. That is, an improvement in earnings quality is expected to be associated with the extent of KPI disclosure.

SAMPLE DESIGN, DATA, AND METHODOLOGY

Sample Design

We have originally started with a sample of 200 companies from each selected industry to facilitate hand-collection efforts and ended up with companies that had complete data for both 2006 and 2007 years. All companies in related populations are numbered starting from 1 and we used a table of random numbers to select our sample companies. Our final samples include a random sample of 156 companies listed on S&P 500, a random sample of 135 manufacturing companies listed on the New York Stock Exchange (NYSE), and a random sample of 113 oil and gas companies listed on NYSE. We choose a random sample of S&P500 companies because of the importance of the economic impacts of large companies. Also the choice of manufacturing and oil and gas companies is based on the importance of social, environmental, and sustainability reporting in this industry (e.g., Laine 2010; Johansen 2010). Given the nature of hand collecting KPI data, the sample sizes are increased enough both to be cost effective and results to have external validity. Contrary to prior research such as Lambert and Larcker (1987) and Ittner and Larcker (1998), which have used a cross-sectional regression model with only one year observation, we have looked at a two year period, 2006 and 2007, with hand collecting data for about 400 companies with 800 observations. Furthermore, in some cases, to calculate the change in lags and variances of some variables, we have extracted data for three to five years.

Data

We have collected our data from companies' websites, the Research Insight database, CRSP database, and 10-Ks filed with the SEC. We have collected our sample companies from the Research Insight database and searched on the LexisNexis Academic Business library database for 10-K filings during fiscal year ending on December 31, 2006 and 2007. We then examined the sample companies' websites, 10-K filings, the MD&A and other information disclosed in these documents and search for disclosures of factors that prior studies consider the critical success factors beyond conventional financial reporting. Using the detailed information listed on Appendix A, we determined the extent of both financial and non-financial KPI disclosure on the following eight KPI perspectives: 1) investor perspective, 2) employee

perspective, 3) customer perspective, 4) supplier perspective, 5) social perspective, 6) internal perspective, 7) innovation perspective, and 8) environmental perspective.

Then, to calculate KPI variables, we have used a content analysis in which the KPI index is calculated as a ratio of the total number of KPI key words disclosed to total words included in management discussion and analysis (MD&A) of the sample companies. The use of content analysis for analyzing non-financial information has been extensively used in accounting literature (e.g., Unerman, 2000; Furrer, Thomos, and Goussevskaia, 2008; Adams and Frost, 2008; Damirel and Bozcuk, 2009). We used the "myWORDCOUNT" software to count total words in MD&A as well as total words pertaining to KPIs. The words were grouped into financial and non-financial KPIs and we focus on non-financial KPIs primarily because disclosures of financial KPIs are typically regulated and standardized. The non-financial KPI scores of each firm in our three samples (all firms, manufacturing firms and firms in the oil and gas industry) are computed based on the ratio of the total KPI related words to total words included in MD&A. This method of content analysis is the simplest, the most dependable, and the least subjective way of analyzing qualitative information. E-loading data are extracted from the database provided by Professor Olsson and other faculty members in the Duke University, and data required for running the Fama and French three-factor model are extracted from the database linked to their website. All analysts' earnings forecasts and abnormal earnings are collected from the latest edition of the Institutional Brokers' Estimate System **(**I/B/E/S**).** Financial data are mainly extracted from the Research Insights database and the Center for Research in Security Prices (CRSP).

Methodology

We use a metric, e-loading factor, developed by Ecker et al. (2006), and the conventional earning response coefficient (ERC) as proxies for earnings quality. Ecker et al. (2006) consider earnings quality as a metric of information risk and define earnings quality with respect to the mapping of current accruals into last, current, and next period cash flows. Ecker et al. (2006) follows Dechow and Dichev (2002) to call this mapping "accrual quality". As mentioned by Ecker et al. (2006), e-loadings are similar to s-loading and h-loading and do not follow any theoretical foundations. Only the beta, risk factor, is based on the capital asset pricing model (CAPM) and theoretical foundations such as the Efficient Market Hypothesis (EMH). Ecker et al. (2006) provide empirical evidence to show that e-loading can be measured for firms that lack time-series data. They show that a larger e-loading implies greater sensitivity to poor earnings quality. In other words, the e-loading captures the sensitivity of stock returns to earnings quality. S-loading is the coefficient of SMB (Small minus Big), which shows the sensitivity of stock returns to a firm's size. SMB is the difference between the average return on three small and three big portfolios (French, 2009).

To test the association between the extent of non-financial KPI reporting and the quality of earnings, first we use the following model:

$$\begin{aligned} Ch\_ELOD_i = {} & \alpha_0 + \alpha_1 DNFKPI_i + \alpha_2 SIZE_i + \alpha_3 Ch\_ROE_i + \alpha_4 Ch\_MKtoBK_i + \\ & \alpha_5 Ch\_BETA_i + \alpha_6 Sale\_Growth_i + \alpha_7 AGE + \alpha_8 Ch\_LVRG + \alpha_9 Ch\_CASH + \\ & \alpha_{10} Ch\_PROFIT + \sum_{j=11}^{K+10} \alpha_j INDS_j + e_i \end{aligned} \quad (1)$$

Definitions of all variables are shown in Appendix B. The dependent variable, *Ch_ELOD*, is an e-loading variable reflecting the financial reporting quality determined based on Ecker et al. (2006). The process of calculating the e-loading variable is discussed next. Consistent with the hypothesis of this study, we expect the coefficient of change in nonfinancial *KPI to* be significant and negative, indicating that companies with high quality of earnings provide more extensive non-financial disclosure.

We look at e-loading instead of stock returns, because a change in stock returns is a reflection of many factors and we are only interested in the portion that can be attributed to the impact of KPI reporting. E-loading is a metric that isolates the impact of KPI reporting on earnings quality, which in turn is expected to result in a positive market reaction, a lower cost of capital and higher stock return (Lambert et al. 2005). Following McNichols (2002) and Ecker et al. (2006), we have used the following modified version of Dechow and Dichev's model:

$$TCA_{j,T} = \alpha_{0,j} + \alpha_{1,j} CFO_{j,T-1} + \alpha_{2,j} CFO_{j,T} + \alpha_{3,j} CFO_{j,T+1} + \alpha_{4,j} \Delta \mathrm{Re} v_{j,T} + \alpha_{5,j} PPE_{j,T} + u_{j,T} \quad (2)$$

Where: $TCA_{j,T} = \Delta CA_{j,T} - \Delta CL_{j,T} - \Delta Cash_{j,T} + \Delta STDEBT_{j,T} = \text{Total current accruals in year T.}$

We estimate equation (2) in annual industry cross-sections for Fama and French (1997) industries with sufficient industry-year observation to calculate residuals, $\hat{u}_{j,T}$. According to Ecker et al. (2006), the earnings quality metric for firm j in year T is the standard deviation of firm j's residuals over the last five years. Then we calculate the accrual quality variable as:

$$AQfactor_{j,T} = \sigma(\hat{u}_{j,T}), \text{ for T= T-5, …, T-1.} \quad (3)$$

Then, we form a dynamic portfolio by forming deciles based on the value of AQ available on the first day of each month, with the smallest AQ values placed on the first decile and the largest AQ on the tenth decile. Next, we calculate the average daily return for each decile. We then calculate the AQ factor-mimicking portfolio, AQfactor, which is the difference between the daily returns of the largest four AQ deciles (deciles 7-10) and smallest four deciles (deciles 1-4). This process results in a time-series of daily returns for each decile. Then, we correlate the AQ factor with the returns of each firm to determine the exposure of the firm to the poor earnings quality in a similar way as we correlate a firm's returns with the market risk premium to determine the exposure of the firm to market risk (BETA). Consistent with Ecker et al. (2006), we estimate the following three-factor asset pricing model modified for e-loading factors:

$$R_{j,t} - R_{F,t} = \gamma_{0,j,T} + \gamma_{1,j,T}(R_{M,t} - R_{F,t}) + s_{j,T} SMB_t + h_{j,T} HML_t + \delta'_{j,T} AQfactor_t + \in_{j,t} \quad (4)$$

In this model, the estimates of other coefficients capture the firm's exposure to return representations of market risk, size, and book to market, respectively, in year T. The main financial data used in this study are collected from companies' 10-K fillings to the SEC, CRSP, Compustat Research Insight databases, companies' websites, the Fama-French website, and E-loading database. The SMB and HML data are collected from the Ken French website.

Furthermore, to test the association between the extent of KPI reporting and quality of earnings using the ERC (H1b), we examine ERCs at the earnings announcement dates to assess the difference in share price reactions in companies with different KPI disclosure levels. The difference in share price reactions provides evidence about the information content of the KPI disclosure. Our regression model to test this hypothesis (H1b) is derived from models used by Collins and Kothari (1989), Dhaliwal et al. (1991), and Dhaliwal and Reynolds (1994):

$$CAR_i = \beta_0 + \beta_1 UE_i + \beta_2 UE_i * LOSS_i + \beta_3 UE_i * Ch\_MKtoBK_i + \beta_4 UE * Ch\_BETA_i +$$
$$\beta_5 UE_i * LnMKTE_i + \beta_6\, UE_i * DNFKPI_i + \sum_{j=7}^{K+6} \alpha_j INDS_j + e_i \qquad (5)$$

Definitions of all variables are provided in Appendix B. All independent variables are for fiscal years 2006 and 2007. Those that have not been previously defined are *LOSS*, which is a dummy variable equal to 1 if income before extraordinary items is negative for firm i, and zero otherwise, and *LnMKTE*, which is the natural log of market value of equity at the end of year 2007. Finally, the dependent variable, cumulative abnormal return (*CAR),* is a three-day cumulative abnormal return for firm i in year 2007, which is the residual obtained from a market model estimated over a three-day period around the earnings announcement day. We use the most recent I/B/E/S median analysts' earnings-per-share available prior to each earnings announcement date as the expected earnings to calculate the unexpected earnings as:

$$UE_i = \frac{(AE_i - EE_i)}{P_i} \qquad (6)$$

That is, the unexpected earnings are equal to the difference between actual earnings (AE) and expected earnings (EE) in 2007 divided by stock price (P) at the end of the year.

Consistent with our second hypothesis (H1b), we expect β_6 to be significant and positive.

ANALYSES AND RESULTS

Table 1 provides descriptive statistics for dependent and independent variables. The first two columns of Table 1 show descriptive statistics for a sample of 156 companies listed in the S&P 500 index, the second two columns show descriptive statistics for a sample of 135 manufacturing companies listed on the NYSE, and the last two columns show descriptive statistics for a sample of 113 oil and gas companies listed on the NYSE. Table 2 presents the correlation matrices for these three samples.

TABLE 1
DESCRIPTIVE STATISTICS

	All industries		Manufacturing		Oil and Gas	
Variable	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Ch_ELOAD	.008	.60	.03	.57	-.11	.61
DFKPI	.02	1.95	.03	1.56	.19	2.78
DNFKPI	.01	.87	-.02	.78	.22	1.30
SIZE	7.19	2.19	7.14	2.37	6.58	2.24
Ch_ROE	-8.98	40.79	4.96	136.	-5.47	42.98
Ch_MKtoBK	-.45	27.04			-.37	5.60
Ch_Beta	.03	.78	.11	.68	.18	1.02
Sale_Growth	.23	.58	.17	.35	.73	4.24
AGE	.04	.05	.03	.054	.07	.08
Ch_LVRG	.01	.11	.00	.10	.36	3.52
Ch_CASH	-.01	.10	-.01	.10	-.01	.12

TABLE 2
CORRELATION MATRICES

Panel A: Random sample of 156 companies from all industries (S&P 500 Index)

	Ch_ELOAD	DFKPI	DNFKPI	SIZE	Ch_ROE	Ch_MKtoBK	Ch_Beta	Sale_Growth	AGE	Ch_LVRG	Ch_CASH
Ch_ELOAD	1.00										
DFKPI	0.04	1.00									
DNFKPI	0.07	**0.90*****	1.00								
SIZE	-0.05	-0.03	-0.06	1.00							
Ch_ROE	0.11	0.00	-0.08	0.25***	1.00						
Ch_MKtoBK	0.03	0.02	0.03	0.01	0.13	1.00					
Ch_Beta	0.14	0.01	0.00	0.05	0.08	0.01	1.00				
Sale_Growth	0.04	0.00	0.01	-0.16**	0.01	-0.01	-0.09	1.00			
AGE	-0.06	-0.02	0.04	-0.14*	-0.05	0.11	-0.17**	0.57***	1.00		
Ch_LVRG	0.01	0.12	0.19**	-0.23***	-0.46***	-0.09	0.07	0.16**	0.22***	1.00	
Ch_CASH	-0.10	0.05	0.11	0.11	-0.02	-0.02	0.11	-0.09	-0.07	-0.13	1.00
Ch_PROFIT	0.06	0.03	-0.03	0.19**	**0.76*****	0.04	0.06	0.19**	-0.15*	-0.15*	-0.05

*, **, ***, significance at .01, .05, and .10 level, respectively.
(Ch_PROFIT and DFKPI are dropped from analysis because of their high correlation with other independent variables)

Panel B: Random sample of 135 companies from manufacturing industry (listed on NYSE)

	Ch_ELOAD	DFKPI	DNFKPI	SIZE	Ch_ROE	Ch_MKtoBK	Ch_Beta	Sales_Growth	AGE	Ch_LVRG	Ch_CASH
Ch_ELOAD	1.00										
DFKPI	-0.06	1.00									
DNFKPI	-0.03	**0.87*****	1.00								
SIZE	0.02	-0.10	-0.09	1.00							
Ch_ROE	-0.02	0.00	0.00	0.04	1.00						
Ch_MKtoBK	-0.02	0.00	0.00	0.01	**0.97*****	1.00					
Ch_Beta	0.17**	0.02	0.02	0.05	0.01	-0.03	1.00				
Sales_Growth	0.02	-0.11	-0.21**	-0.04	-0.01	-0.02	0.02	1.00			
AGE	0.00	0.03	0.00	-0.27***	0.12	0.13	-0.25	0.26	1.00		
Ch_LVRG	0.07	0.09	0.08	-0.19**	-0.26***	-0.11	-0.04	0.14	0.04	1.00	
Ch_CASH	0.00	0.07	0.08	0.22***	0.03	-0.02	0.04	-0.06	-0.21**	-0.18**	1.00
Ch_PROFIT	-0.13	-0.05	-0.07	0.13	0.14	-0.01	0.14	0.02	0.11	-0.53***	0.12

*, **, ***, significance at .01, .05, and .10 level, respectively.
(Ch_PROFIT and DFKPI are dropped from analysis because of their high correlation with other independent variables)

Panel C: Random sample of 113 companies from oil and gas industry (listed on NYSE)

	Ch_ELOAD	DFKPI	DNFKPI	SIZE	Ch_ROE	Ch_MKtoBK	Ch_Beta	Sales_Growth	AGE	Ch_LVRG	Ch_CASH
Ch_ELOAD	1.00										
DFKPI	0.04	1.00									
DNFKPI	0.02	**0.93*****	1.00								
SIZE	0.15	-0.07	-0.08	1.00							
Ch_ROE	0.00	0.01	-0.05	0.19**	1.00						
Ch_MKtoBK	-0.02	0.10	0.10	0.15	0.25***	1.00					
Ch_Beta	0.06	-0.06	-0.04	-0.05	-0.19*	0.08	1.00				
Sales_Growth	0.03	0.17*	0.31***	-0.14	0.06	-0.06	-0.16	1.00			
AGE	0.09	0.07	0.08	-0.03	0.08	0.18*	-0.04	0.27***	1.00		
Ch_LVRG	0.14	-0.02	-0.05	-0.50***	-0.26***	-0.04	-0.18	0.18*	-0.04	1.00	
Ch_CASH	-0.05	0.11	0.15	0.19*	-0.06	0.12	0.26**	-0.18*	0.00	-0.53***	1.00
Ch_PROFIT	-0.26***	0.02	0.05	0.49***	**0.71*****	0.04	0.18	0.22**	0.04	**-0.498*****	0.53***

*, **, ***, significance at .01, .05, and .10 level, respectively.
(Ch_PROFIT and DFKPI are dropped from analysis because of their high correlation with other independent variables)

All panels of Table 2 show that financial and non-financial KPIs are highly correlated with each other. Evidence collected in this study shows that companies with more financial KPI disclosure tend to disclose more non-financial KPIs; therefore, to avoid the multicollinearity problem, we have dropped the financial KPIs and focused only on the disclosure of non-financial KPIs. For the same reason, we have dropped returns on equity from our models.

The results of testing the first hypothesis (H1a) are provided in Table 3. The first two columns of this table show that, after controlling for different industries grouped by the first digit SIC industry code, the coefficient of non-financial KPIs is not statistically significant at any conventional levels. The inability to detect significance can be attributed to: first, the cross sectional analysis conducted in this study which focuses only on data for two years, 2006 and 2007. The lack of KPI time series data, the likelihood that confounding events influence the results are among possible reasons for not having the significance. Other possible reasons will be discussed later in this paper. The second two columns of Table 3 show the results of estimating the model using data from a sample of manufacturing companies. As these two columns show, the coefficient of change in KPIs is not significant, providing no support for H1a when a sample of manufacturing companies is used. Finally, the last two columns of Table 3 show the results of estimating the model using data from a sample of oil and gas companies. As these two columns show, the coefficient of change in KPI is not significant; therefore, the results do not support the first hypothesis (H1a) when the sample is limited to companies from oil and gas industry. As mentioned earlier, the goodness of fit techniques shows that for all three sample data the use of linear models is not appropriate.

Diagnostic tests of the residuals of these regressions provide some evidence that the use of linear regression for these e-loading models is not appropriate, as there is robust evidence that the association between the change in the e-loading variable and change in KPI index, as well as, other independent variables are non-linear. Application of non-linear models is not uncommon in accounting literature; the most commonly used non-linear models are Logit models, in which the dependent variable is a dichotomous variable (i.e., Stone and Rasp 1991; Barniv and McDonald 1999; Jones and Hensher 2004, 2007; Ge and Whitmore 2005; Baxter et al. 2007). Examples of other non-linear models can be found in studies conducted by Kim and Mcleod (1999), Kohn (2003), Freeman and Tse (1992), Subramanyan (1996), and Stone and Rasp (1991). Kim and Mcleod (1999) show how, compared to simple linear models, non-linear models better explain factors that affect the accuracy of the prediction by experts.

Therefore, in the following, we rerun our models using the optimal scaling regression to control for the observed non-linearity issue. Although we re-perform the test for each of our three samples, we focus on the samples from the manufacturing and oil and gas industries, to reduce industry effects and improve the power of our tests.

TABLE 3
RESULTS FROM E-LOADING TESTS USING LINEAR REGRESSION

$$Ch\_ELOD_i = \alpha_0 + \alpha_1 DNFKPI_i + \alpha_2 SIZE_i + \alpha_3 Ch\_ROE_i + \alpha_4 Ch\_MKtoBK_i + \alpha_5 Ch\_BETA_i + \alpha_6 Sale\_Growth_i + \alpha_7 AGE + \alpha_8 Ch\_LVRG + \alpha_9 Ch\_CASH + \alpha_{10} Ch\_PROFIT + \sum_{j=11}^{K+10} \alpha_j INDS_j + e_i$$

Sample of:	**All industries**		**Manufacturing**		**Oil and Gas**	
	Coeffi.	**t-stat**	**Coeffi.**	**t-stat**	**Coeffi.**	**t-stat**
(Constant)	.030	.114	.197	1.048	-.565**	.045
DNFKPI	.040	.536	-.050	-.816	.103*	.064
SIZE	-.022	-.782	-.020	-.938	.047	.189
Ch_ROE	.002	1.172	.001	.740	-.006	.478
Ch_MKtoBK	.001	.110	-.012	-.808	.013	.612
Ch_Beta	.088	1.209	.111	1.532	.155**	.014
Sale_Growth	-.057	-.351	-.034	-.211	-.053	.679
AGE	.848	.443	.775	.371	.362	.832
Ch_LVRG	-.033	-.048	.393	.630	-.580	.274
Ch_CASH	-.762	-1.313	.210	.428	-1.82**	.031
SIC_1	-.089	-.199				
SIC_2	.248	.566				
SIC_3	.216	1.562				
SIC_4	.131	.390				
SIC_5	.390	.881				
SIC_6	.180	.484				
SIC_7	.173	.528				
Adj. R-squared		-.048		.035		.131
F-stat		.646		.238		2.12**

***, **, * Significance at the 0.01, 0.05, and 0.10 level, respectively.
(This test includes a random sample of 156 companies from all industries, a random sample of 135 companies from manufacturing industry, and a random sample of 113 companies from oil and gas industry, respectively)

The results of running the non-linear version of the above models are shown in Table 4. The first two columns of Table 4 show the results of estimating the model using data from a sample of all industries. As these two columns show, the coefficient of change in KPIs is not significant, thereby not supporting the first hypothesis of this paper. The significant coefficients are those of SIZE (negative), Change in ROE (positive), market to book ratio (positive), change in BETA (positive), sales growth (negative), and liquidity (negative). The second two columns of this table show the results of estimating the model using data from a sample of manufacturing companies. As these two columns show, the coefficient of change in KPIs is not significant, thereby not supporting the first hypothesis, which is consistent with the result of the linear model. Other significant coefficients are those of SIZE (negative), leverage (positive), and sales growth (negative). The last two columns of Table 4 show the results of estimating the model using data from the sample of oil and gas companies. As these two columns show, the coefficient of KPIs is highly significant, which provides support for the first hypothesis of this study. Other significant coefficients are

those of change in ROE (negative), change in market to book ratio (positive), change in BETA (positive), sales growth (negative), and change in liquidity (negative).

TABLE 4
RESULTS FOR E-LOADING TESTS USING OPTIMAL SCALING REGRESSIONS

$$Ch\_ELOD_i = f(DNFKPI_i, SIZE_i, \text{Ch}\_ROE_i, GRWT_i, \text{Ch}\_BETA_i, Sale\_Growth_i, \text{AGE}_i, Ch\_LVRG_i, Ch\_CASH_i, Ch\_PROFIT_i)$$

Sample of:	**All industries**		**Manufacturing**		**Oil and Gas**	
	Coeffi.	**F-stat**	**Coeffi.**	**F-stat**	**Coeffi.**	**t-stat**
DNFKPI	.103	1.377	.032	.119	-.248**	4.716
SIZE	-.22***	6.010	-.31***	10.444	.145	1.781
Ch_ROE	.218***	5.477	-.321	1.708	-.236**	4.579
Ch_MKtoBK	.168**	3.684	.361	1.945	.176*	2.523
Ch_Beta	.175**	3.743	.119	1.705	.308***	8.367
Sale_Growth	-.25***	7.870	.198**	4.407	-.211**	2.688
AGE	.130	2.023	.059	.302	.163	1.762
Ch_LVRG	-.104	1.291	.165*	2.871		
Ch_CASH	-.28***	9.694	.055	.353	-.235**	4.683
Adj. R-squared		.104		.035		.154
F-stat		1.75**		1.24		1.86**

***, **, * Significance at the 0.01, 0.05, and 0.10 level, respectively.
(This test includes a random sample of 156 companies from all industries, a random sample of 135 companies from manufacturing industry, and a random sample of 113 companies from oil and gas industry, respectively)

The overall results show that only for companies in oil and gas industry there is a positive association between non-financial KPI disclosure and the quality of earnings measured by e-loading factor, but the association as shown on the last two tables (Tables 3 and 4) is non-linear.

The results of testing the second hypothesis H1b, using all three previously explained samples, are shown in Table 5. The first two columns of Table 5 show that, after controlling for different industries, the coefficient of interaction of change in KPIs and unexpected earnings is not statistically significant when the sample includes 156 companies from all industries. The results show that only the coefficients of interaction of unexpected earnings and market to book value of equity as well as some industry sector codes are significant, indicating that cumulative abnormal returns vary by both the growth level of the company and the industry. The next two columns of Table 5 show the results of estimating the model using data from a sample of 135 manufacturing companies. These two columns show that the coefficient of interaction between change in KPIs and unexpected earnings is not statistically significant. No other coefficients in for this sample companies is statistically significant. Finally, the last two columns of Table 5 provide the results of estimating the model using data from the sample of oil and gas companies. The results for the sample of oil and gas companies show that the interaction between unexpected earnings and the disclosure of non-financial KPIs is not significant, providing no support for the second hypothesis of this study. The only significant coefficient is the coefficient of interaction between unexpected earnings and change in market to book ratio (positive).

TABLE 5
RESULTS FOR ERC TESTS USING LINEAR REGRESSIONS

$$CAR_i = \beta_0 + \beta_1 UE_i + \beta_2 UE_i * LOSS_i + \beta_3 UE_i * Ch\_MKtoBK_i + \beta_4 UE * Ch\_BETA_i +$$
$$\beta_5 UE_i * LnMKTE_i + \beta_6\ UE_i * DNFKPI_i + \sum_{j=7}^{K+6} \alpha_j INDS_j + e_i$$

Sample of:	**All industries**		**Manufacturing**		**Oil and Gas**	
	Coeffi.	**t-stat**	**Coeffi.**	**t-stat**	**Coeffi.**	**t-stat**
(Constant)	-.366	-.716	.015*	1.817	.010*	1.986
UE	-.400	-.011	.168	.606	-.615	-.894
UE_LOSS	23.434	.626	-.326	-1.097	.610	1.222
UE_Ch_MKtoBK	2.29**	2.035	-.071	-.490	.39***	2.781
UE_BETA	3.110	.136	.009	.095	.222	1.055
UE_LnMKTE	-1.362	-.224	-.227	-.625	-.014	-.018
UE_DNFKPI	16.352	.429	.127	.280	.165	.735
SIC_1	-.597	-.305				
SIC_2	-1.961	-1.176				
SIC_3	1.069	1.472				
SIC_4	3.63**	2.237				
SIC_5	1.074	.547				
SIC_6	3.056*	1.694				
SIC_7	2.894*	1.780				
Adj. R-squared		.068		-.026		.086
F-stat		1.425		.742		2.17*

***, **, * Significance at the 0.01, 0.05, and 0.10 level, respectively.
(This test includes a random sample of 156 companies from all industries, a random sample of 135 companies from manufacturing industry, and a random sample of 113 companies from oil and gas industry, respectively)

However, the residuals obtained from the above models and other diagnostic analyses reveal that the use of linear regression for these models is not appropriate. There is robust evidence that the association between the cumulative abnormal return (CAR) and change in KPI disclosure and other independent variables is not linear. Furthermore, the overall model using a random sample of manufacturing companies is not significant, indicating that the linear model used in this study is not capable to deal with many complexities of manufacturing companies.

Using the econometrics technique of goodness of fit, we provide evidence that the association between ERC and KPI is non-linear. The results of running the non-linear version of the above models are provided in Table 6. The first two columns of Table 6 show the results of estimating the model using data from a sample companies listed in the S&P 500 index from various industries. As these two columns show, the coefficient of interaction of unexpected earnings and change in KPI is not significant, providing no support for the second hypothesis of this study. Significant coefficients for this sample are those of interaction between unexpected earnings and loss (positive), interaction between unexpected earnings and market to book value of equity (negative), interaction between unexpected earnings and change in BETA (positive), and interaction between unexpected earnings and natural log of market value of equity (negative). The next two columns show the results of estimating the model using data from a sample of manufacturing companies. In short, when the study is limited to a sample of manufacturing companies, the complexity involved in manufacturing companies cannot be captured with the models used in this study. As a result, the evidence obtained from testing manufacturing companies provides no support for the second hypothesis of this study.

Finally, the last two columns of Table 6 show the results for a sample of oil and gas companies. The results show that for oil and gas companies there is a significant association between unexpected earnings and change in non-financial KPI disclosure, supporting the second hypothesis of this study. This result is consistent with the result obtained using e-loading factors, so we can argue that the association between non-financial KPIs and earnings quality is positive and robust. Other significant coefficients are those of interaction between unexpected earnings and loss (negative), and the interaction between unexpected earnings and market to book value of equity.

TABLE 6
RESULTS FOR ERC TESTS USING OPTIMAL SCALING REGRESSION

$$CAR_i = g(UE_i, UE_i * LOSS_i, UE_i * Ch\_MKtoBK_i, UE * Ch\_BETA_i, UE_i * LnMKTE_i, UE_i * DNFKPI_i)$$

Sample of:	**All industries**		**Manufacturing**		**Oil and Gas**	
	Coeffi.	**F-stat**	**Coeffi.**	**F-stat**	**Coeffi.**	**F-stat**
UE	.114	.632	.215	.580	-.276	1.625
UE_LOSS	.31**	4.662	-.191	2.163	.481***	6.736
UE_Ch_MKtoBK	-.38***	14.642	.361	.200	.911***	35.041
UE_Ch_BETA	.82***	9.908	.135	.041	.294	2.186
UE_LnMKVEQ	-.69***	5.247	-.284*	2.598	-.108	.414
UE_DNFKPI	.124	1.391	.096	.035	.533***	10.884
Adj. R-squared		.197		-.016		.352
F-stat		2.98***		.892		3.91***

***, **, * Significance at the 0.01, 0.05, and 0.10 level, respectively.
(This test includes a random sample of 156 companies from all industries, a random sample of 135 companies from manufacturing industry, and a random sample of 113 companies from oil and gas industry, respectively)

CONCLUSIONS

The results presented in this paper provide some evidence for the association between KPI disclosure and the quality of earnings for companies in the oil and gas industry. When the conventional ERC or the more recently developed e-loading factor is used for the analysis, we show that the use of conventional linear approach may not be appropriate in all cases, and there is a need for the use of a non-linear approach. Using a non-linear approach, we document a significant association between the change in KPI disclosure and the quality of earnings only for companies in the oil and gas industry, but we found no association for the other two samples. Using both ERC and the e-loading approach, we show that for companies in the oil and gas industry the direction of association is consistent with our hypotheses when using either non-linear ERC or non-linear e-loading approach. Therefore, to improve transparency of the financial statements especially during the recent financial crises, we at least call for the compulsory publication of nonfinancial KPIs in the oil and gas industry.

This study is expected to contribute to the literature in several ways. First, we investigate the association between the change in KPI reporting and quality of earnings using both e-loading and ERC approaches for companies in the oil and gas industry. To the best of our knowledge, this is the first study addressing this issue. Second, we extend the literature on the relevance of corporate voluntary disclosures. Finally, the UK Companies Act of 1985, the SEC and the US Treasury department have shown their interests in disclosing KPI information, but no empirical results are available to support such interest. The policy implication of this study in providing empirical evidence regarding the recommendations made by the ACIFR in 2008 is to encourage the SEC or FASB to define industry specific KPIs and require companies in each industry to report them on a consistent basis.

Results presented in this study should be interpreted with care because of the following potential limitations. First, this paper investigates only the potential association between KPIs disclosure and quality of earnings and as such does not establish any causal relationship between the variables of interest. Second, a two year analysis conducted in this paper focuses only on data for the two years of 2006 and 2007. Because of the lack of time series KPI data, this study does not include a time-series analysis of KPI disclosure. Third, there exists the likelihood that confounding events influence the results. Future research is encouraged to focus on multiple year observations of KPI reporting as well as research on comparing mandatory versus voluntary KPI disclosure.

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APPENDIX A

List of Key Performance Indicators (Adapted from Boesso, 2004, which are mainly based on Kaplan and Norton, 1994)

Investor Perspective

1 Stocks performance, shareholder & investor return (dividends, trends, Eps, stock and debt ratings)
2 Management's presentation of measures adopted as critical success factors (Balanced scorecard, milestone achievements, goals)
3 Non-Mandatory analyses of profitability and financial structure (VA, Cash flow, ROI, ROE, Debts ratios, Pro-forma data)
4 Description of a total results by business/geographic units (% of total export);
5 Intangible Assets Monitor or Intellectual Capital Statement (value of assets internally developed)
6 Economic profit and value based management (EP, EVA)

Employee Perspective

7 Wages, contracts and benefits other than stock options (& pensions for US) (avg. amount by category)
8 Training & internal education (hours, number of employees involved)
9 Employee compositions by professional category, age, country, minority (%, trends)
10 Number of employees, turnover and hiring/firing procedures (numbers, %, trends)
11 Productivity (volumes/sales/value added by employee)
12 Employee satisfaction, competence and commitment (indices, surveys)

Customer Perspective

13 Main customers, contractual relationships, prices, bargaining power (average numbers, purchases, products or services bought)
14 Geographic diversification & characteristic of retail network (%, number of dealers)
15 Market share, penetration & benchmarking with competitors (%, trends)
16 Brands, license and trademarks (numbers, value creation, evaluation)
17 Customer satisfaction, retention, loyalty (indices, surveys, complains, defects, warranty claims, repeat sales)
18 Customer profitability & reliance (indices, trends)

Supplier Perspective

19 Main suppliers, contractual relationship and bargaining power (average numbers, discounts)
20 Geographic diversification & policies (%, trends)
21 Partnership, alliances' operational data and firm specific investments (value, %)
22 Certified quality of partners and inputs (numbers, quantities of raw materials, services)
23 Supplier satisfaction, retention, commitment (indices, surveys)
24 Cost accounting for suppliers (cost saving & indices)

Social Community Perspective

25 Donations and other social expenses, without quoting the programs' details and results (amount, %)
26 Description of social, ethic activities and projects (information about the project,
27 Diversity and equal opportunities (%, distribution)

Internal Processes Perspective

28 Product capacity, acquisition, synergies, reorganizations project. Analysis of services and investments for banks & insurances
29 Nature of the main industry: structure, cyclicability, seasonality (timing, %, trends) - direct quote to company's performance/strategy
30 Total quality management products and services (warranty claims, defects, ranking, ISO9000, ratings for banks' products)
31 Cost accounting & cost saving by country, production line or project (%, amounts, operating cost per employee)
32 Manufacturing cycle time, internal service responsiveness, effectiveness, and productivity (hours, days, delivery and waiting time)
33 Outsourcing, digitalization and internationalization of processes (%, geographical distribution, volumes)

Innovation and Learning Perspective

34 Processes' innovations, patents, standards, suggestion developed (numbers, value)
35 R&D projects and expenditure (numbers, employees, %, trends) - description of specific projects or growth
36 New products, projects, reserves, services, customers (numbers, objective, market share, investments)
37 Decision making, segment strategy & responsibilities maps (levels, objectives, parameters)
38 Time to market of new products/strategies/contracts (days, months, costs)
39 Historical product's cycle life analysis (timing, market share, trends)

Environmental Perspective

40 Environmental performance and social impact (awards, consumption rate, toxic emission, etc.)
41 Litigations, legal actions and claims, included accounting litigations (expenses, number)
42 Environmental profitability and cost accounting (ratios, trends, indices, value added)

APPENDIX B

Definitions of Variables

AGE_i = Age of the firm measured as the inverse of the summation of one and firm's age

Ch_BETA_i = Change in firm's specific risk factor (beta)

CAR_i = A three-day cumulative abnormal return for firm i in year 2007, which is the residual obtained from a market model estimated over a three-day period around the earnings announcement day

$CFO_{j,T}$ = cash flow from operations in year T

Ch_CASH = The sum of cash and short term investment divided by total assets

Ch_PROFIT = earnings divided by total assets

$DFKPI_{j,T}$ = firm j's change in non-financial KPIs in year T

$DNFKPI_{j,T}$ = firm j's change in financial KPIs in year T

$ELOD_i$ = E-loading variable reflecting the quality of earnings determined based on Ecker et al. (2006)

$INDS_j$ = K industry dummy variables (K is the number of industries included in the sample.)

Sales_Growth_i = Growth in sales revenue in 2007

$Ln(MA/BK)_i$ = Natural log of market to book ratio for firm i

$LOSS_i$ = A dummy variable equal to 1 if income before extraordinary items is negative, and zero otherwise

Ch_MKtoBK_i = Change in market to book ratio at the end of year 2007

Ch_ROE_i = Change in return on equity at the end of the current fiscal year

Sales_Growth_i = Growth in sales revenue in 2007

$SIZE_i$ = Size measures as the natural log of total assets

$TA_{j,T}$ = firm j's total accrual in year T

$$= \Delta CA_{j,T} - \Delta CL_{j,T} - \Delta Cash_{j,T} + \Delta CDEBT_{j,T} - DEPR_{j,T}$$

$TCA_{j,T}$ = total current accruals in year T

$= \Delta CA_{j,T} - \Delta CL_{j,T} - \Delta Cash_{j,T} + \Delta CDEBT_{j,T}$, where

UE_i = Unexpected earnings is equal to the difference between actual and expected earnings in 2007

$UE_i = (AE_i - EE_i)$

$VAROE_i$ = variance of ROE, measured from historical data for the last five years before 2007

$\Delta CA_{j,T}$ = firm j's change in current assets in year T

$\Delta CL_{j,T}$ = firm j's change in current liabilities in year T

$\Delta Cash_{j,T}$ = firm j's change in cash in year T

$\Delta CDEBT_{j,T}$ = firm j's change in debt in current liabilities in year T

$= NIBE_{j,T} - TA_{j,T}$

$\Delta \text{Re}v_{j,T}$ = firm j's change in revenue in year T