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# Using the FASB's qualitative characteristics in earnings quality measures

Abhijit Barua

Louisiana State University and Agricultural and Mechanical College, [Abhijit.Barua@lsu.edu](mailto:Abhijit.Barua@lsu.edu)

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**USING THE FASB'S QUALITATIVE  
CHARACTERISTICS IN  
EARNINGS QUALITY MEASURES**

A Dissertation

Submitted to the Graduate Faculty of the  
Louisiana State University and  
Agricultural and Mechanical College  
In partial fulfillment of the  
Requirements for the degree of  
Doctor of Philosophy

in

The Department of Accounting

by

Abhijit Barua

B.Com. (Honors), University of Chittagong, 1991

M.Com., University of Chittagong, 1993

MBA, University of Dhaka, 1996

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## **ABSTRACT**

In this study, I develop a measure of earnings quality by using qualitative characteristics of financial statement information specified in the Statement of Financial Accounting Concepts (SFAC) No. 2 (FASB 1980). I derive a summary measure of earnings quality by applying factor analysis on fifteen variables representing different components of two primary dimensions of earnings quality: relevance and reliability. I then test the validity of the earnings quality construct by examining whether the construct reflects decision usefulness that is operationalized in two ways: value relevance and cost of capital analyses. I provide empirical evidence suggesting that the earnings quality construct reflects decision usefulness to investors, which is consistent with the FASB's assertion. Finally, I explore the relative desirability of each dimension in light of decision usefulness of earnings information, and find that investors, in general, prefer the relevance to the reliability dimension of earnings.

## 1. INTRODUCTION

This study develops a measure of earnings quality in line with the primary quality characteristics specified in the Statement of Financial Accounting Concepts (SFAC) No. 2 (FASB 1980). Extant research in accounting uses various definitions for earnings quality, which include persistence, predictability of future performance, level of accruals relative to economic fundamentals and the relationship of earnings with cash-flows and accruals, etc.<sup>1</sup> According to the SFAC No. 2, the primary determinants of accounting information quality are relevance and reliability, and these two dimensions make accounting information useful for decision making (FASB 1980). Extant studies (e.g. Mikhail, Walther and Willis [2003], Cohen [2004], Francis et al. [2005]) that test or measure earnings quality are focused on either of the two dimensions of earnings quality or components of either dimension.<sup>2</sup> By focusing on one dimension or one component of a single dimension, existing studies do not portray a complete story about the quality of earnings. In this study, I develop a measure of earnings quality that encompasses various components of both dimensions of earnings quality; reliability and relevance.

I then test whether the earnings quality construct developed in this study reflects decision usefulness to investors, since the FASB claims that these qualitative characteristics make accounting information useful in decision making. I focus on decision usefulness from the investors' point of view as they are the major users of

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<sup>1</sup> Discussions on these studies are provided in later in this paper (section 4.1, 7.1 etc).

<sup>2</sup> Concurrently one study by Lee (2004) considers both dimensions of earnings quality as specified in the SFAC No. 2. However, this study and method of measuring earnings quality construct are different from her study. The differences are discussed below (section 4.0).

financial information.<sup>3</sup> I define decision usefulness as the extent to which accounting numbers reflect information used by investors in valuing firm's equity, which I operationalize in two ways. First, I test the association between earnings and market price or returns to assess the extent to which information in earnings is reflected in market price. Prior studies in accounting (e.g. Ball and Brown [1968], Lev [1989], Lev and Zarowin [1999], Barth, Beaver and Landsman [2001]) suggest that the value relevance approach can be employed to assess usefulness of accounting information. I use earning response coefficients (ERCs) and explanatory powers ( $R^2$ ) from regressions of market metrics (price and return) on earnings to test whether the earnings quality construct reflects decision usefulness. Specifically, I expect ERCs and  $R^2$  to be increasing with the quality of earnings. Second, I test the relationship between the quality of earnings and the expected rate of returns that investors implicitly use to discount future cash flows in evaluating the prospects of their investments. A number of recent studies (e.g. Francis et al. [2004, 2005], Aboody et al. [2005], Barone [2003]) provide consistent evidence of a negative association between earnings quality and the cost of capital. Given the evidence in prior empirical studies, finding a negative relationship between earnings quality and cost of capital provides a further validation of the earnings quality construct developed in this study.

Although the FASB's conceptual framework suggests that the degree of desirability of reliability and relevance can vary, it does not prescribe any particular threshold for either dimension. Existing studies also do not attempt to provide any evidence showing the relative preference of one dimension over the other. In this study, I

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<sup>3</sup> In the conceptual framework (SFAC No.1, para 24), the FASB mentioned more than two dozens of users of financial information. Due to the diversity of the users, the process of assessing decision usefulness is context specific.

explore the relative desirability of one dimension over the other from the viewpoint of decision usefulness.

I exclusively use financial statement data to measure different variables representing ingredients of earnings quality and derive summary measures for relevance and reliability by applying principal factor analysis with those variables. These summary measures are the basis of assessing the quality of earnings. Consistent with my expectations, empirical results show that firms with higher quality earnings have significantly higher ERCs and  $R^2$ s in regressions of prices or returns on earnings. In cost of capital analyses, I find consistent and significant negative relationships between earnings quality and cost of capital with two different proxies, which is in line with the findings of prior theoretical and empirical studies (e.g. Easley and O'Hara [2004], O'Hara [2003], Francis et al. [2005a, 2005b]). Empirical results from both value relevance and cost of capital analyses implies that the earnings quality construct developed in this study reflects the usefulness of earnings information for decision making.

In the analyses of relative preference between relevance and reliability, both ERCs and  $R^2$ s are greater in firms with high relevance and low reliability compared to firms with high reliability and low relevance. However, differences in ERCs are not statistically significant at a conventional level. Findings from this analysis indicate that investors in general prefer relevance to reliability dimension of earnings.

This study contributes to the literature in a number of ways. First, this study not only operationalizes different aspects of earnings quality as specified in the conceptual framework of the FASB, it also tests whether the earnings quality construct reflects the



decision usefulness of earning information. Especially, no prior study demonstrates whether the earnings quality construct based on the conceptual framework empirically reflects decision usefulness. One possible reason could be the difficulties in operationalizing those qualitative attributes (Joyce, Libby and Sunder [1982], Barth, Beaver and Landsman [2001]) and in measuring separately each attribute due to interactions among the attributes (Schipper and Vincent [2003]). Concurrently, one study by Lee (2004) uses an approach similar to mine. However, my study differs from hers in terms of variable measurements, methodology and research questions. Unlike Lee (2004), this study validates the earning quality construct in light of decision usefulness measures of earnings, which is especially important because the FASB defines accounting information quality from the viewpoint of decision usefulness. Thus this study contributes to the literature by providing a more complete measure of the earnings quality construct, which considers both of the primary determinants of earnings quality as specified in the FASB's conceptual framework.

Second, this study explores the relative importance of one dimension of earnings quality over the other (relevance versus reliability) in making earnings information useful for decision making. The relative importance of each dimension of earnings quality is important to policy-makers and corporate managers because they can use this knowledge in evaluating and/or selecting accounting alternatives. Third, this study contributes to the debate on 'the relevance of value-relevance literature' by showing whether value-relevance studies can be treated as a basis for earnings quality assessments.<sup>4</sup> Finally, this

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<sup>4</sup> In the literature, several studies debate on questions about the contribution of value relevance studies in standard setting processes (e.g. Holthausen and Watts [2001], Barth, Beaver and Landsman [2001])

study extends the existing research on the association between earnings quality and the cost of capital by testing a more complete earnings quality construct.

The remainder of this paper is organized as follows. The next section discusses the earnings quality construct as specified in the concept statements. Section 3.0 describes empirical hypotheses along with a review of related literature. Section 4.0 presents sample, data and variable measurements, section 5.0 reports empirical results, section 6.0 provides robustness tests, and section 7.0 summarizes and concludes the paper.

## 2. EARNINGS QUALITY CONSTRUCT

The FASB specifies quality of accounting information from the viewpoint of decision usefulness to the users. According to the FASB's conceptual framework, decision usefulness of financial information primarily depends on the relevance and reliability of the reported information (FASB 1980).<sup>5</sup> To be relevant, information should have predictive value or feedback value or both, and information should be provided in a timely manner. Ingredients for reliability are representational faithfulness, verifiability and neutrality. Here, I provide a brief discussion of these components.<sup>6</sup>

### 2.1 Relevance

#### 2.1.1 Predictive Value

Predictive value relates to relevance in that “information can make a difference to decisions by improving decision makers’ ability to predict (FASB 1980, para 51).” In this study, predictive value of earnings refers to the ability of current earnings to predict future earnings and future cash flows. Earnings predictability is important for relevance because it can influence decisions by forming expectations about future earnings that are correlated with future cash flows. Prior studies document that earnings predictability can affect the response coefficients to an earnings release (Imhoff and Lobo [1992]; Pincus [1983]) and the adverse selection component of bid-ask spreads (Affleck-Graves, Callahan and Chipalkatt [2002]). I measure earnings predictability by modeling future

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<sup>5</sup> Long before the FASB's conceptual framework in SFAC No.2, a committee of the American Accounting Association had prepared a Statement of Basic Accounting Theory that mentioned four essential criteria of accounting information for decision usefulness, which include relevance, verifiability, freedom from bias and quantifiability (Snively 1967). Snively (1967) proposes a framework that includes six essential criteria for the usefulness of accounting information; those criteria are relevance, reliability, understandability, significance, sufficiency and practicality. Although SFAC No.2 recognizes all these characteristics in the hierarchy of accounting information quality, it mentions two primary dimensions of information quality: relevance and reliability.

<sup>6</sup> Measurements of variables that proxy for these components are described in section 7.1.

earnings as a function of current earnings as well as components of current earnings. SFAC No.1 states that one of the main objectives of accounting earnings is to predict the timing, amount and uncertainty of future cash flows (FASB 1978, para, #37). Cohen (2004) uses the ability of earnings to predict future cash flows as a measure of earnings quality. In this study, I also measure predictive value in terms of the ability of current earnings to predict future cash flows.

### **2.1.2 Feedback Value**

According to the SFAC No. 2, feedback value refers to the ability of information to influence decisions by confirming or correcting earlier expectations of decision-makers (FASB 1980 para-51). Although predictive value and feedback value go hand in hand, I use a separate measure for feedback value, which considers the ability of current earnings to change predictions about future earnings.

### **2.1.3 Timeliness**

Timeliness implies providing information in the financial statements in a timely manner, which means recognizing all pertinent information (e.g., revenues, expenditures, changes in the value of assets) to enable the users of current financial statements to form an expectation about the future cash flows of the business. However, financial information inherently suffers from the lack of timeliness due to conservatism. SFAC No. 2 also states that “timeliness is an ancillary aspect of relevance” (FASB 1980 para-56).

## **2.2 Reliability**

According to SFAC No.2 (para-33), “to be reliable, information must have representational faithfulness and it must be verifiable and neutral.” Accounting information contains a considerable amount of estimates (especially accrual components),

which may be influenced by biases in the estimation process or estimators' judgments that result in misrepresentation of economic phenomena. Reliability of earnings may also be affected by the lack of neutrality.

### **2.2.1 Representational Faithfulness and Verifiability**

“The reliability of a measure depends on the faithfulness with which it represents what it purports to represent, coupled with an assurance for the user, which comes through verification, that it has representational quality (FASB 1980).” Although there is no separate measure for representational faithfulness and verifiability, extant studies use abnormal accruals, extreme accruals or accrual estimation errors (e.g. Dechow and Dichev [2002]) as inverse measures of earnings reliability or quality. I use a number of measures of abnormal accruals, abnormal working capital accruals and accrual estimation errors to capture the lack of representational faithfulness and verifiability.

### **2.2.2 Neutrality**

Neutrality means “information should be free from bias towards a predetermined result (FASB 1980, para-99).” Although the SFAC No. 2 implies neutrality in standard-setting as well as in standard implementing, the focus in this study is neutrality in financial report preparation. Extant accounting studies provide evidence suggesting that firms manipulate accounting measures to report earnings purposefully that meet or exceed some predetermined earnings benchmarks—non-negative earnings, prior years' earnings and analysts' earnings expectations ( e.g., Burgsthaler and Dichev [1997], Degeorge et al. [1999], Barua et al. [forthcoming]). I use an indicator variable for firm-years that exactly meet or exceed those earnings thresholds by a small amount as an inverse measure of neutrality.

To measure the earnings quality construct, I consider various variables representing the components of relevance and reliability and estimate a factor score for each dimension. These scores are the basis of my measure of earnings quality. However, I have not considered a timeliness measure in the earnings quality construct for several reasons. First, lack of timeliness is inherent in GAAP (conservatism, delaying in recognition of future benefits until they are realized, etc.). Second, prior studies document that due to the asymmetry in recognizing future benefits versus losses or expenditures, delays in recognizing changes in asset values and failure to reflect changes accounting earnings fail to reflect pertinent information in a timely manner, which is impounded in the market price (e.g., Lev [1989], Collins et al. [1994], Lev and Zarowin [1999], Ryan and Zarowin [2003]). Third, the FASB, in SFAC No. 2, also portrays timeliness as an “ancillary aspect” of earnings quality. Finally, the underlying constructs of timeliness measures in existing literature (e.g.,  $R^2$  from earnings-returns regressions in Ball et al. [2000]) are captured by other components of reliability and relevance.<sup>7</sup>

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<sup>7</sup> For example, Francis et al. (2004) do not find any significant relationship between timeliness and cost of equity capital after controlling for other earnings attributes (accrual quality, predictability, smoothness, value-relevance etc.).

### **3. RELATED LITERATURE AND HYPOTHESES**

Although the FASB's conceptual framework suggests two primary dimensions (relevance and reliability) of accounting information quality, the information economics (IE) framework does not support this separate dimensionality in an information-system choice setting (Vickrey [1985]). Demski (1973) argues that qualitative characteristics can not rank accounting alternatives in accordance with preference and beliefs, and that such qualitative criteria in making information system choices cannot exist in general in an information-economics framework. Using former members of the Accounting Principles Board (APB) and FASB in an experimental study, Joyce, Libby and Sunder (1982) test the effectiveness of the FASB's qualitative characteristics in selecting financial accounting methods by standard setters. Their findings are pessimistic about the ability of the qualitative characteristics to facilitate accounting policy making. While these studies focus on the efficacy of the FASB's qualitative characteristics in making choice among alternative accounting methods, I focus on measuring quality of reported accounting information (i.e., earnings) by using those same characteristics. More specifically, I develop a measure of earnings quality based on the FASB's qualitative characteristics and test whether the construct reflects decision usefulness of information users. Next, I discuss a number of studies that are closely related to my research and outline empirical predictions in the context of those studies.

#### **3.1 Earnings Quality Measures**

This study relates to a number of prior studies that use earnings quality measures in empirical investigations. Extant studies in accounting use diverse measures of earnings quality constructs that include predictive value of earnings (e.g., Mikhail, Walther and

Willis [2003], Cohen [2004]), persistence of earnings (e.g., Penman and Zhang [2002], Skinner [2004]), relationship of accruals with cash flows (e.g., Dechow and Dichev [2002], Francis [2005]), abnormal accruals (e.g. Aboody et al. [2005], Lee and Yue [2004]), and total and operating accruals (e.g. Richardson [2003]). Earnings quality constructs used in these studies measure either one dimension or a single component of one dimension of earnings quality as specified in the conceptual framework of the FASB. By focusing on one dimension or aspect of earnings quality, prior studies do not capture all information about earnings quality in their empirical measures. I consider both of the primary dimensions—relevance and reliability—of earnings quality specified in the FASB’s conceptual framework. However, various empirical measures developed and applied in these prior studies are also used in my study to measure different ingredients of each dimension (more detailed and specific discussion in section 7.1).

This study is also related to another recent study by Francis et al. (2005), who consider seven earnings attributes—accrual quality, persistence, predictability, smoothness, value relevance, timeliness and conservatism—to characterize different aspects of information quality. They measure the first four attributes by using accounting data and the last three by using both accounting and market data. They find accounting-based attributes are more consistent with their hypotheses regarding information quality. In this study, different components of earnings quality are measured by using fifteen variables that are based mainly on accounting data.

One concurrent study by Lee (2004) uses an approach similar to this study to measure the earnings quality construct. However, my earnings quality construct differs from hers in a number of ways. First, measures of different ingredients of reliability and



relevance in this study differ from her measures. Unlike her study, I measure all component variables by using accounting data, while she uses return based measures for feedback value and timeliness.<sup>8</sup> She uses adjusted  $R^2$ s from regressions of returns on levels and changes of earnings as her measure of feedback value. However, explanatory powers from return-earnings regressions reflect both relevance and reliability of earnings (Barth 1994). I use a more specific measure for feedback value that is consistent with the definition given in the SFAC No. 2. Second, Lee (2004) uses adjusted  $R^2$ s from firm-specific time-series regressions of future earnings or cash-flows on current earnings to proxy for predictive value. On the other hand, I use four inverse measures for predictive value, which are firm-and year-specific residuals from time-series regressions of future earnings and cash flows on current earnings as well as components of current earnings. Third, Lee uses  $R^2$ s from reverse returns-earnings regressions and average abnormal return volatility as measures of timeliness. I do not include any measures of timeliness (for the reasons stated previously in section 3.0). Fourth, she measures representational faithfulness by restatements of earnings. However, all unfaithful representations in financial statements are not followed by restatement, especially when those representations are undetected. I use abnormal accruals and accrual estimation errors as combined measures of representational faithfulness and verifiability. Fifth, she summed standardized factor scores of all dimensions to derive a composite earnings quality score, which puts the same weight on all dimensions. I use relevance and reliability scores individually to determine the quality of earnings. Finally, unlike Lee (2004), I test

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<sup>8</sup> Francis et al. (2004) find that accounting based measures of earnings attributes are more consistent with their conjectures than those based on both market variables and accounting data.

whether my earnings quality measures reflect decision usefulness to investors, which is the main objective for specifying quality characteristics by the FASB.

### **3.2 Earnings Quality and Value Relevance**

According to the conceptual framework, earnings quality refers to the attributes of earning information that make information useful for decisions (FASB 1980). Long before the issuance of the SFAC No. 2 that describes qualitative characteristics of accounting information, Ball and Brown (1968) suggested that usefulness of earnings information can be assessed by the association between returns and earnings. Later in a review of studies relating to the return-earnings association, Lev (1989) argues that usefulness of earnings are reflected in the estimates of correlations between stock returns and earnings. Lev and Zarowin (1999) use the returns-earnings association as measure of usefulness of financial statement information. They label the decline in association as a decrease in usefulness of financial information because such association reflects consequences of investors' actions. In the same vein, Barth (1991, 1994) compared relevance and reliability of alternative accounting measures by examining the relationship between alternative measures and market values. In a debate on 'relevance of value-relevance research,' Barth, Beaver and Landsman (2001) suggest that the value relevance approach measures both relevance and reliability because accounting information will be reflected in the price when the information is relevant and reliable to investors. In a recent study, Ghosh and Moon (2005) use earning response coefficients (ERC) as a measure of investors' perception of earnings quality. I use value relevance measures as benchmarks to validate the earnings quality construct that is operationalized in this study by using accounting based data. In line with their argument, I test the effectiveness of the

earnings quality construct developed in this study in light of decision usefulness that is measured by the association between earnings and market prices.

I predict a higher quality of earnings measured by the intersection of higher reliability and relevance will be associated with higher explanatory powers and estimated coefficients from regressions of price or return on earnings. Formally, my first set of hypotheses is, in alternative format:

**H1a: Earnings response coefficients (ERCs) are significantly higher in portfolios of firms with high quality earnings (HH) compared to firms with low quality earnings (LL).**

**H1b: Explanatory powers of earnings to explain market price are significantly higher in portfolios of firms with high quality earnings (HH) compared to firms with low quality earnings (LL).**

### **3.3 Earnings Quality and Cost of Capital**

One way to validate the conjecture that the earnings quality measure reflects the decision usefulness is to show whether the quality of earnings affects the expected rate of returns that investors implicitly use to discount future cash flows in evaluating the prospects of their investments.

In the corporate disclosure literature, a number of studies examine the association between disclosure quality and cost of capital, where researchers posit that the quality of disclosure mitigates information asymmetry and thus reduces the cost of capital (e.g., Botosan [1997], Botosan and Plumlee [2002]). However, earnings information is the single most important summary measure about firms' performances among all

information disseminated through corporate disclosure procedures.<sup>9</sup> Hence, the quality of earnings has an important influence on the overall information regarding firms' performances and thus may have a role in mitigating information asymmetry. A number of recent studies (e.g. Francis et al. [2004, 2005], Aboody et al. [2005], Barone [2003]) examine the association between earnings quality and cost of capital, where researchers hypothesize and find a negative relation between earnings quality and cost of capital. Their conjectures are based on the theoretical models that show information risk is a non-diversifiable risk factor (e.g., Easley and O'Hara [2004], O'Hara [2003]) and earnings quality is a proxy for the information risk. Francis et al. (2005) test the association between cost of capital and accrual quality that is measured by absolute abnormal accruals and by the extent to which accruals map into cash flows, in line with the Dechow and Dichev (2002) model. They document a significantly negative relation between accrual quality and cost of equity and debt. In another study, Francis et al. (2004) consider seven earnings attributes to examine relationships between the cost of capital and each of these attributes individually as well as conditionally on the other attributes. They document consistent evidence of a significant association in expected directions with accrual quality, persistence, smoothness, and value relevance by using different proxies for the cost of capital construct. Barone (2003) develops two proxies for perceived earnings quality based on the fundamentals identified in Lev and Thiagarajan (1993) and relations between financial statement line items, and documents a negative association between earnings quality and implied cost of capital.

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<sup>9</sup> The SFAC No.1 states that "the primary focus of financial reporting is information about earnings and its components (FASB 1978, para-43)."

This study extends prior studies by using a more complete measure for the earnings quality construct that considers relevance and reliability dimensions. By testing the relationship between earnings quality and cost of capital, I provide evidence on whether the earnings quality construct reflects decision usefulness to investors.

### **3.4 Relative Preference of Relevance and Reliability**

Although the FASB conceptual framework in SFAC No. 2 states that degrees of reliability and relevance can vary, it does not specify any particular mix between relevance and reliability required for the quality of information or any minimum threshold of each dimension. However, the SFAC No.2 mentions that one cannot ignore one dimension completely for the other. Neither the conceptual framework nor the extant research indicates which dimension is more desirable for better information quality. This offers an opportunity to explore which dimension of earnings quality is more desirable from the perspective of decision-usefulness of earnings. Here the premise is that the decision usefulness of earnings increases with the extent to which earnings information is associated with the market value.

In an experiment using former members of the APB and FASB, Joyce, Libby and Sunder (1982) find considerable disagreement among the policy makers regarding the relative importance of those qualitative characteristics. I do not have a priori expectations regarding the relative desirability of relevance and reliability from the decision usefulness point of view because prior studies also do not provide any clear guidance in this regard.<sup>10</sup> I expect investors' preferences for the two dimensions will be dissimilar. My

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<sup>10</sup> A number of studies (e.g., Sloan 1996, Xie 2001) suggest that investors can not completely assess the influence of the accruals portion of earnings on future performance. However, accruals can affect both relevance and reliability of earnings.

hypotheses regarding relative preference are non-directional, which are more formally stated in alternative form:

**H2a: ERCs are significantly different between the portfolios of firms with high relevant and low reliable (HL) earnings versus low relevant and high reliable (LH) earnings.**

**H2b: Explanatory powers of earnings to explain market price are significantly different between the portfolios of firms with high relevant and low reliable (HL) earnings versus low relevant and high reliable (LH) earnings.**

The test of H2 can have a number of possible results. If I fail to reject H2a and H2b, (find no significant differences in coefficients and explanatory powers between the two portfolios) it indicates that increased reliability (at the expense of relevance) can mitigate the effect of decreased relevance or vice versa; If coefficients and explanatory powers for HL are significantly higher (lower) than for LH, investors prefer more relevance (reliability) in the earnings information than reliability (relevance). Another possibility is one group of firms may have higher response coefficients (explanatory power) than the other or vice versa.

#### 4. SAMPLE, DATA AND VARIABLE MEASUREMENTS

The main analyses of earnings quality are done by using annual observations over a period from 1988 through 2003. Since a number of variables are estimated using a rolling ten-year window, a firm-year observation must have required data from years  $t-9$  through  $t$  to be included in the sample in year  $t$ . In addition, a firm-year observation must have necessary data to estimate all variables representing components of the earnings quality measures. Most of this study's variable measures require one-year ahead data, so actual empirical tests will be based on a 15-year period (1988-2002).

Over the sample period, I include all industries except utilities, financial institutions, insurance and real estate firms (SIC code 4900 and 6000-6999), because accruals and cash flow patterns of these firms are different from other firms. All accounting data are collected from COMPUSTAT annual (active and research) files and returns data are collected from CRSP annual and monthly files. In estimating one proxy for implied cost of capital, I require analysts' earnings forecast data for which I use the I/B/E/S database. For cost of capital analyses, I use Fama-French factors (Fama and French, 1993) from Kenneth French's website.

Table 1 presents the number of firms included in each year in estimating different variables representing components of earnings quality over the sample period. The last column of table 1 shows the number of firms that meet data requirements for estimating all variables for each year across the sample period. Overall 27,668 firm-year observations have all necessary data to estimate all 15 variables used in the factor analysis to obtain the summary measures for relevance and reliability.

To conduct empirical analyses I require price, return and other control variables. The sample is further narrowed due to non-availability of price, return and other control variables data. Finally, to eliminate effects of extreme variables, I trimmed the sample at 1% and 99% of price and earnings per share. The final sample used in empirical analyses consists of 24,384 firm-year observations.

**TABLE 1**  
**Annual Observations Used in Measuring Different Variables**

<b>Year</b>	<b>Abnormal Accruals</b>	<b>Accrual Quality</b>	<b>Neutrality</b>	<b>Predictive and Feedback value</b>	<b>Overall Sample used in Factor Analysis</b>
1988	3647	2061	5467	2131	1427
1989	3813	2022	5324	2141	1491
1990	3767	2064	5316	2156	1517
1991	3874	2096	5286	2281	1569
1992	4107	2217	5427	2373	1692
1993	4459	2314	5636	2451	1739
1994	4670	2354	6627	2623	1777
1995	5096	2525	6984	2766	1862
1996	5712	2631	7753	2774	2112
1997	5867	2601	8263	2678	2077
1998	5782	2510	8190	2596	2046
1999	5861	2449	8029	2572	2042
2000	5901	2444	8197	2578	2063
2001	5579	2460	8063	2641	2091
2002	5258	2545	7703	2668	2163
<b>Total</b>	<b>73,393</b>	<b>35,293</b>	<b>102,265</b>	<b>37,429</b>	<b>27,668</b>

#### 4.1 Measures of Variables<sup>11</sup>

The main focus of this study is to construct a summary measure for earnings quality in line with the SFAC No. 2 and to validate the measure by showing that the

<sup>11</sup> A summary of all variable measures is shown in table B1 of Appendix B



earnings quality construct reflects decision usefulness. To construct a summary measure, I consider different variables that encompass components of the relevance and reliability of earnings as specified in the SFAC No. 2. Here, I discuss the measures of those variables.

#### 4.1.1 Relevance Measures

##### 4.1.1.1 Predictive Value

Predictive value is measured in terms of the ability of earnings to predict future earnings and future cash flows. To measure the predictive ability of earnings, I use four models where future earnings and cash flows are regressed on current earnings as well as on components of current earnings.

- Future Earnings on Current Earnings

$$ROA_{t+1} = \lambda_0 + \lambda_1 ROA_t + e_t \quad (1)$$

Where,

ROA Earnings before extraordinary items and discontinued operations (Compustat data item #18) scaled by average total assets.

$e_t$  error term

Following Francis et al. (2004), I estimate an autoregressive model [AR(1)] specified in equation (1) using maximum likelihood estimation.

- Future Earnings on Components of Current Earnings

Fairfield, Sweeney and Yohn (1996) demonstrate that disaggregation of earnings into components (operating earnings, non-operating earnings, tax and special items) improves the predictive ability to forecast year-ahead earnings. I decompose earnings into cash flows, accruals and special items, and the second measure of predictive value is estimated from equation (2).

$$E_{t+1} = \delta_0 + \delta_1 OCF_t + \delta_2 TAC_t + \delta_3 SI_t + e_t \quad (2)$$

Where,

$OCF_t$  Operating cash flow of firm  $i$  for year  $t$  ( $E_t$ -TAC).  
 $TAC_t$  Total accruals of firm  $i$  for year  $t$ .<sup>12</sup>  
 $SI_t$  Special items of firm  $i$  for year  $t$ .

All variables are scaled by average total assets.

- Future Cash Flows on Current Earnings

I use the following regression model to estimate the ability of earnings to predict future cash flows.

$$OCF_{t+1} = \alpha_0 + \alpha_1 E_t + \omega_t \quad (3)$$

Both  $OCF_{t+1}$  and  $E_t$  are deflated by average total assets for year  $t$ .

- Future cash flows on components of current earnings

Barth, Cram and Nelson (2001) show that by disaggregating components of earnings the predictive ability can be increased significantly. In line with equation (2), I decompose earnings into three components and specify following cash flow prediction model (4)

$$OCF_{t+1} = \pi_0 + \pi_1 OCF_t + \pi_2 TAC_t + \pi_3 SI_t + \omega_t \quad (4)$$

All variables are as described in equation (2) and are scaled by average total assets.

I estimate equation (1)–(4) over rolling 10-year windows for each firm-year observation. That is, to estimate the predictive ability of a firm for year  $t$ , I estimate all four equations (1-4) with firm-specific observations from year  $t-9$  through  $t-1$  and use the estimated parameters to derive prediction errors for year  $t$  from each model. Absolute

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<sup>12</sup> I calculate total accruals by using a balance-sheet approach because I need data starting from 10 years before the sample period (1988-2002) and cash-flow statement data is only available from 1987. Total Accruals =  $\Delta CA - \Delta CL - \Delta \text{Cash} - \Delta \text{CDEBT} - \text{DEP}$ , where  $\Delta CA$ =Change in current assets,  $\Delta CL$ =Change in current liabilities,  $\Delta \text{Cash}$ =Change in cash balance,  $\Delta \text{CDEBT}$ =Change in current portion of long term debt,  $\text{DEP}$ = Depreciation and amortization

values of the prediction errors from these estimates are inverse measures of the predictive ability of current earnings.

#### **4.1.1.2 Feedback Value**

I estimate the feedback value of earnings by measuring the ability of current year's earnings to change the predictions about next year's earnings. The feedback value is measured by the difference between absolute prediction errors for the next year before and after considering current year's earnings.

$$FV_t = [ |PE_B| - |PE_A| ] \quad (5)$$

Where,

$FV_t$  Feedback value of earnings for year  $t$

$PE_B$  Prediction error of next years earnings without considering current earnings

$PE_A$  Prediction error of next years earnings after considering current earnings

If the absolute prediction error after considering current earnings is smaller than the absolute prediction error before considering current earnings, then this provides evidence of positive feedback value. However, to be consistent with other inverse measures, I use the negative value of  $FV_t$  as the inverse measure of feedback value. I use two measures of feedback value based on two prediction models—equations (1) and (3). Appendix A provides a detailed description of methods.

#### **4.1.2 Reliability Measures**

I use several variables based on abnormal accruals and accrual estimation errors to measure representational faithfulness and verifiability, and two indicator variables to measure neutrality.

##### **4.1.2.1 Representational Faithfulness and Verifiability**

Three measures of abnormal accruals, three measures of abnormal working capital accruals and one measure of accrual estimation errors are used to proxy for

representational faithfulness and verifiability. I use a cross-sectional estimation process for the different accrual models.<sup>13</sup>

- Abnormal Accruals

I estimate abnormal accruals by using the variation of the Modified-Jones Model developed by Dechow et al. (1995) shown in equation (6). I estimate equation (6) cross-sectionally for each of the 48 industries classified by Fama and French (1997):

$$TA_{it} = \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \varepsilon_{it} \quad (6)$$

where,

$TA_{it}$	Total accruals for firm $i$ for year $t$ scaled by total assets for year $t-1$ (COMPUSTAT data item # 6),
$A_{it-1}$	Total assets for year $t-1$ ,
$\Delta REV_{it}$	Revenues (COMPUSTAT data item # 12) for firm $i$ for year $t$ less revenues for firm $i$ for year $t-1$ scaled by total assets for year $t-1$ ,
$\Delta REC_{it}$	Receivables (COMPUSTAT data item #302) for firm $i$ for year $t$ less receivables for firm $i$ for year $t-1$ scaled by total assets for year $t-1$ , and
$PPE_{it}$	Gross property plant and equipment (COMPUSTAT data item # 8) for firm $i$ for year $t$ scaled by total assets for year $t-1$ .
$\varepsilon_{it}$	Error term

I estimate total accruals by subtracting annual cash flows from operations (Compustat data item #308) from net income before extraordinary items (Compustat data item #18) following Hribar and Collins (2002). Abnormal accruals ( $AA_i$ ) for year  $t$  are estimated as the absolute values of residuals from the cross-sectional ordinary least-square (OLS) estimates of equation (6).

- Performance Matched Abnormal Accruals

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<sup>13</sup> Prior studies (Subramanyam 1996, Bartov et al. 2001) suggest that the cross-sectional versions of the Jones (1991) model and the Modified Jones Model are better specified than their time-series counterparts.

Performance matched abnormal accruals (PMAA) are estimated following Kothari, Leone and Wasely (2005). Performance matched abnormal accruals (PMAA) are estimated as the difference between firm  $i$ 's abnormal accruals ( $AA_i$ ) from the Modified Jones Model and the median value of AA from its industry return-on-assets (ROA) decile, where median is calculated excluding firm  $i$ . Absolute values of PMAA are an inverse measure of representational faithfulness and verifiability.

- Forward Looking Model

Previous studies (e.g. Dechow et al. 1995) show that cash flows are negatively associated with accruals, and in line with that finding, Kasznik (1999) adds operating cash flows (OCF) as an additional explanatory variable to the Modified Jones Model. McNichols (2000) provides evidence that firms' growth prospects are positively associated with accruals and argues that accrual models are better specified by adding a growth variable—book to market (BM). The third measure of abnormal accruals is derived as the absolute values of the residuals from the annual regressions of equation (7), which is estimated cross-sectionally for each of the 48 industries classified by Fama and French (1997):

$$TA_{it} = \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 OCF_{it} + \beta_5 BM_{it} + \varepsilon_{it} \quad (7)$$

OCF is operating cash flow scaled by lagged total assets and BM is the ratio between the book value and market value of equity. All other variables are the same as described in equation (6).

- Abnormal Working Capital Accruals

Three measures of abnormal working capital accruals are used in this study. The first measure is derived from the following model (eq-8), which is another version of the

Modified Jones Model. The dependent variable is working capital accruals (WCA) and the independent variable is the difference between the change in revenue and the change in receivables.

$$WCA_{it} = \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \varepsilon_{it} \quad (8)$$

Where,  $WCA = (\text{Total accruals} + \text{Depreciation and amortization})/A_{it-1}$

All other variables are the same as described in equation (6). Equation (8) is estimated annually for each of 48 Fama-French industries and the absolute values of residuals from the regression is a measure of abnormal working capital accruals (AWCA).

- Performance Matched Abnormal Working Capital Accruals

Performance matched abnormal working capital accruals (PMAWCA) is estimated as the difference between firm  $i$ 's abnormal working capital accruals (AWCA <sub>$i$</sub> ) estimated from equation (8) and the median value of AWCA from its industry ROA decile, where median is calculated excluding firm  $i$ . Absolute values of PMAWCA are inverse measures of representational faithfulness and verifiability.

- Defond and Park Measure

Defond and Park (2001) estimate abnormal working capital accruals as the difference between actual and expected working capital accruals, where the expectation is based on the relationship between prior period working capital and sales. Following Defond and Park (2001), I estimate abnormal working capital accruals in the following manner:

$$AWCA\_DP_t = WC_t - [(WC_{t-1}/S_{t-1}) * S_t] \quad (9)$$

Where,

AWCA\_DP      Abnormal working capital accrual for the year  $t$   
using Defond and Park (2001) model.

$WC_t$	Non-cash working capital of current year $t$ [(current assets – cash and short term investments) – ( current liabilities – short-term debt)]
$S$	Sales

- Accrual Estimation Errors

Dechow and Dichev (2002) specify a model considering the extent to which working capital (WC) accruals are reflected into past, present and future cash flows to estimate the quality of working capital accruals and earnings. Following Dechow and Dichev (2002), I estimate the following model using rolling 10-year windows for each firm-year observation.

$$WCAC_t = \gamma_0 + \gamma_1 OCF_{t-1} + \gamma_2 OCF_t + \gamma_3 OCF_{t+1} + v \quad (10)$$

Where,

$WCAC$	Working capital accruals
$OCF$	Operating cash flow

All variables in equation (10) are scaled by average total assets. Standard deviations of residuals from equation (10) are an inverse measure of accrual quality.

#### 4.1.2.2 Neutrality

I use two inverse measures of neutrality based on current and prior period reported earnings per share (EPS). These two measures are indicator variables (Neu1 and Neu2) for firms meeting or slightly beating earnings thresholds: avoiding negative earnings and avoiding earnings decrease.<sup>14</sup> Neu1 (Neu2) is an indicator variable for firm-year observations that fall in the first bin to the right of zero in the distribution of EPS

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<sup>14</sup> I do not use the other earnings management threshold (i.e. analysts' forecasts) because all my measures are based on only financial statement data. Also, an inclusion of a measure based on analyst data drastically reduces my sample size.

(change in EPS) scaled by fiscal year-end price. I define the distribution bin width at 0.50%.<sup>15</sup>

## **4.2 Deriving Relevance and Reliability Scores**

I use factor analysis on the variables described in the previous section to extract the underlying constructs from these variables that characterize different ingredients of the two primary dimensions (relevance and reliability) of earnings quality. Although the application of factor analysis is not very common in accounting research, a number of studies have applied these techniques (e.g., Dechow, Sloan and Sweeney (1996), Bushee (1998) and Cohen, Dey and Lys (2004) among others). A concurrent working paper by Lee (2004) also uses factor analysis on a number of variables representing the relevance and reliability dimensions of earnings quality. She finds three dimensions that are labeled as: relevance, reliability and timeliness. In this study, I do not include the timeliness variables as discussed earlier.

I obtain two major factors from the factor analysis and as expected, those factors correspond to the two dimensions of earnings quality: relevance and reliability.<sup>16</sup> Since both dimensions can be correlated with each other, I use an oblique rotation technique in factor analyses. A detailed description of the factor analysis is furnished in Appendix-B. All fifteen variables considered in the factor analysis are inverse measures for different ingredients of relevance and reliability. Thus, derived scores from factor analyses represent an inverse measure of each dimension of the overall earnings quality.

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<sup>15</sup> The choice of bin width at 0.50% is ad hoc. Prior studies use different bin widths. For example, Altamuro et al. (2005) use 0.75%, and Brown and Caylor (2005) report results using 0.25%. I also test robustness by using bin widths at 0.25%, 0.75% and 1%, and results remain largely similar in each case.

<sup>16</sup> Given the disagreement about the multidimensionality of earnings quality in an information economics framework (Vickrey 1985), I also conduct a test as to whether reliability and relevance constitute separate dimensions by using confirmatory factor analysis. If the test fails to reject the hypothesis that relevance and reliability do not constitute separate dimensions, I will have a single score that can be labeled as an earnings quality score.



I divide the factor scores of each dimension into three classes—high, medium and low. I then form four portfolios of firms every year based on high and low scores: (1) high relevance and high reliability (HH) (2) high relevance and low reliability (HL) (3) low relevance and low reliability (LL) and (4) low relevance and high reliability (LH) (shown in the Fig-1).

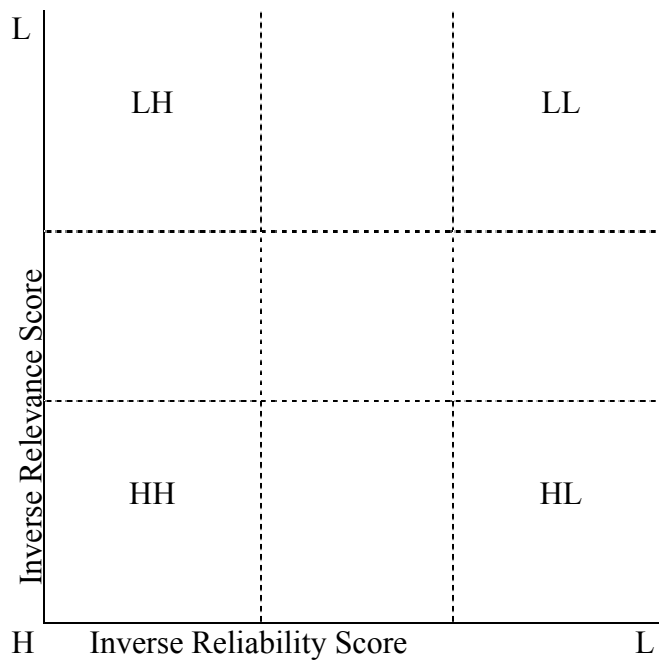


Figure-1 Earnings Quality Portfolios

Observations in the HH (LL) portfolio have higher (lower) quality earnings because the both relevance and reliability of earnings of these firms are high (low). These two portfolios are formed to test hypotheses regarding high quality versus low quality earnings. On the other hand, the other two portfolios—HL and LH—are formed to test hypotheses regarding relative desirability between the two dimensions (relevance and reliability) of earnings quality from a decision usefulness point of view.

## 5. EMPIRICAL RESULTS

### 5.1 Descriptive Statistics

Table 2 presents descriptive statistics of different variables of the final sample that is used in testing different hypotheses. For brevity, I report only the mean and median of all variables. To provide an insight on fundamentals across different earnings quality portfolios (viz. HH, LL, HL, LH and all other firms), I report the mean and median of all variables for the whole sample as well as for each earnings quality portfolio. Average stock price, earnings per share (EPS) and return for the whole sample are respectively \$18.27, \$0.79 and 12.3%, respectively. Due to the restrictions for data availability, the sample is comprised of larger firms (average market value is \$2.5 billion) relative to the COMPUSTAT population. However, average stock price and EPS are comparable with COMPUSTAT averages for the same period.

Mean and median values of firm specific variables differ across earnings quality portfolios, and the differences are pronounced between high quality (HH) and low quality (LL) portfolios. Firms in the HH (LL) portfolio usually have higher (lower) stock price, EPS and equity value, and lower (higher) earnings variability and systematic risks compared to all other firms. Empirical models used in this study control for fundamental firm characteristics like earnings variability, systematic risks, growth and leverage. Mean and median of implied cost of capital measure ( $r_{PEG}$ ) in the HH (LL) portfolio are respectively 11.2% and 10.05% (19.7% and 17.30%), which are the lowest (highest) among all portfolios. This descriptive result is consistent with the conjecture that earnings quality and cost of capital are negatively related.

**TABLE 2**  
**Descriptive Statistics**

Variable	Whole Sample N=24,384		HH portfolio N=2,812		LL portfolio N=2,190		HL portfolio N=2,836		LH portfolio N=2,736		All Other N= 13, 810	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Price	18.27	13.00	29.38	25.28	7.03	3.38	17.89	13.50	17.35	12.02	18.05	12.88
Ret	0.1230	0.0424	0.1309	0.0900	0.0634	-0.1453	0.1386	0.0600	0.1148	0.0286	0.1282	0.0449
EPS	0.7925	0.6200	1.5985	1.4400	-0.2230	-0.1000	0.8931	0.6900	0.6712	0.5000	0.7928	0.6200
MV	2,509.38	131.02	5,124.87	785.10	457.56	22.68	2,411.31	116.04	1,869.12	134.46	2,449.18	127.06
BV	779.65	82.11	1,788.48	400.37	140.33	10.25	789.30	73.82	545.38	93.79	720.05	78.71
Size	5.0272	4.8753	6.6419	6.6658	3.3286	3.1214	4.8679	4.7539	5.0489	4.9013	4.9963	4.8447
BVE	9.5213	7.3332	15.0940	12.3082	3.1476	1.6594	9.3463	7.3580	9.7760	7.5862	9.3827	7.3215
Growth	0.1249	0.0929	0.1199	0.1018	0.0994	0.0436	0.1498	0.1109	0.1179	0.0836	0.1262	0.0931
MB	2.5018	1.6708	2.3795	1.8040	3.8785	1.9008	2.3196	1.6380	2.1129	1.4789	2.4228	1.6600
DE	1.3242	0.8571	1.2301	0.9326	1.5521	0.7934	1.3351	0.8642	1.3434	0.8799	1.3011	0.8374
EVAR	27.7714	1.7011	14.7465	0.2138	43.7721	5.2635	22.7662	1.4529	26.7702	2.0542	29.1124	1.8320
beta	1.0355	0.9710	0.8454	0.8493	1.4627	1.3635	1.0266	0.9710	1.0491	0.9819	1.0499	0.9869
r <sub>PEG</sub>	0.1386	0.1166	0.1120	0.1005	0.1970	0.1730	0.1368	0.1201	0.1464	0.1240	0.1396	0.1178
Loss	24%		6%		59%		15%		27%		23%	

Where,

HH Firms with high relevance and high reliability of earnings

LL Firms with low relevance and low reliability of earnings

HL Firms with high relevance and low reliability of earnings

LH Firms with low relevance and high reliability of earnings

Price Stock price at the end of year  $t$

Ret Return holding period return for a year starting 9 months before and 3 months after the fiscal year ends.

EPS Earnings per share of year  $t$

MV Market value of earnings at the end of year  $t$

BV Book value of earnings at the end of year  $t$

Size Natural logarithm of market value

BE Book value of equity divided by number of shares outstanding

Growth Average growth of book-value over past six years

MB Market to book ration

DE Debt to equity ratio

EVAR Variance of changes in EPS over the previous five years

beta Firm-specific beta estimated by using 24 months of time series data

r<sub>PEG</sub> Implied cost of capital using PEG model

LOSS Percentage of firms reporting losses.

## 5.2 Earnings Quality Reflects Decision Usefulness

### 5.2.1 Earnings Quality and Value Relevance

The decision usefulness of earnings is defined as the extent to which accounting earnings reflects information used by investors in valuing firms' equity, which is measured by the response coefficients (ERC) and explanatory powers ( $R^2$ ) from price or return regressions on earnings. Although both price and return regressions are employed to test the hypothesis that the earnings quality construct reflects decision usefulness, I report results from price regressions for two reasons. First, the earnings quality construct in this study does not consider timeliness of accounting earnings; thus, the price model is more appropriate than the return model (Barth, Beaver and Landsman [2001]). Second, Kothari and Zimmerman (1995) show that price models are better specified than return models as the slope coefficients from the former, but not the later, are unbiased.<sup>17</sup>

I use the following equation based on Ohlson's (1995) valuation model as applied in Barth et al. (1999).

$$\text{Price} = \delta_0 + \delta_1 \text{BVE} + \delta_2 \text{EPS} + \delta_7 (\text{EPS} * \text{Growth}) + \delta_8 (\text{EPS} * \text{DE}) + \delta_9 (\text{EPS} * \text{EVAR}) + \psi \quad (11)$$

Where,

Price	Price per share at fiscal year end
BVE	Book value of equity (COMPUSTAT data item # 60) divided by number of shares outstanding (COMPUSTAT data item #25).
EPS	Earnings per share before extraordinary item and discontinued operation (COMPUSTAT data item # 58)
Growth	Average growth of book-value over past six years $((BVE_t / BVE_{t-5})^{\frac{1}{5}} - 1)$ .
DE	Debt-equity ratio
EVAR	Variance of the past five year's changes in EPS $(\text{EPS}_t - \text{EPS}_{t-1}) / \text{abs}(\text{EPS}_{t-1})$

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<sup>17</sup> Kothari and Zimmerman (1995) also argue that the price model suffers from more econometrics problems like heteroscedasticity than return models. To overcome heteroscedasticity problem, I use adjusted standard errors (White [1980]). I also conduct a return-based analysis and discuss the results in the robustness test.

The primary interest is the ERC, which is the coefficient of EPS. Prior studies document that ERCs are influenced by firm-specific characteristics that may also be associated with earnings quality. Following Barth et al. (1999), I also include growth and risk (DE and EVAR) variables in equation (11) to control for influences of these variables. I estimate equation (11) separately in the high quality earnings portfolio (HH) and low quality earnings portfolio (LL) over a 15-year sample period (1988-2002). I estimate pooled regressions and assess the statistical significance by using White's (1980) consistent standard error estimates to address the potential problems of heteroscedasticity due to the scale differences (Christie 1987). To mitigate issues relating to dependencies in error terms through time and among firms in cross-sectional analyses, I use between-effect estimation and annual cross-sectional estimations. In the between-effect estimation approach, I use average values across time for all variables in equation (11) and estimate cross-sectional regressions and calculate standard errors using the White (1980) method. In the annual estimation, I estimate yearly cross-sectional regressions for each of the 15 years in the sample period and test significance using the time-series standard errors of coefficient estimates (Fama-MacBeth 1973).

Table 3, Panel A reports coefficients, t-statistics and adjusted  $R^2$  from regressions in all three approaches for both the HH and LL portfolio. ERCs from the pooled and between-effect estimates are respectively 7.21 (White t-stat=15.08) and 7.83 (White t-stat=8.79) for the HH portfolio, which are consistently higher compared to 1.95 (White t-stat=7.94) and 2.34 (White t-stat=6.47) for the LL portfolio. In the annual cross-sectional estimations, the ERC in the HH portfolio is consistently higher than that of the LL portfolio in each year over the sample period. For brevity, I report average annual

**TABLE 3**  
**High Quality versus Low Quality Earnings**

$$\text{Price} = \delta_0 + \delta_1 \text{BVE} + \delta_2 \text{EPS} + \delta_3 (\text{EPS} * \text{Growth}) + \delta_4 (\text{EPS} * \text{DE}) + \delta_5 (\text{EPS} * \text{EVAR}) + \psi \quad (11)$$

*Panel A*

	HH Portfolio			LL Portfolio		
	Pooled Sample	Between-effect Design	Annual Regression	Pooled Sample	Between-effect Design	Annual Regression
Variables <sup>§</sup>	Coefficients (t-stat*)	Coefficients (t-stat*)	Average Estimates (t-stat)	Coefficients (t-stat*)	Coefficients (t-stat*)	Average Estimates (t-stat)
<b>Intercept</b>	8.2675 (18.29)	6.4120 (9.40)	7.5110 (16.39)	3.7293 (13.43)	4.0943 (10.77)	3.2160 (9.31)
<b>BE</b>	0.5161 (13.24)	0.5110 (8.08)	0.4870 (9.00)	1.1399 (13.58)	1.1702 (12.14)	1.2360 (11.79)
<b>EPS</b>	7.2083 (15.08)	7.8295 (8.79)	7.9720 (16.74)	1.9457 (7.94)	2.3404 (6.47)	1.7690 (4.88)
<b>EPS*Growth</b>	6.1650 (3.12)	6.2509 (1.62)	7.5740 (5.38)	0.8181 (0.94)	0.7291 (0.54)	2.6180 (2.62)
<b>EPS*DE</b>	0.3853 (2.36)	0.2102 (0.70)	0.1770 (0.70)	-0.0835 (-1.89)	-0.1254 (-2.08)	-0.0160 (-0.16)
<b>EPS*EVAR</b>	-0.0032 (-2.88)	-0.0038 (-2.09)	-0.0050 (-2.68)	-0.0022 (-1.79)	-0.0023 (-1.31)	-0.0020 (-1.50)
<b>Adj-R<sup>2</sup></b>	57%	60%	60%	39%	43%	46%

*Panel B*

**Tests of differences**

Tests	Test statistic	P-value
EPS <sub>HH</sub> > EPS <sub>LL</sub>	12.48	<.0001
Adj-R <sup>2</sup> <sub>HH</sub> > Adj-R <sup>2</sup> <sub>LL</sub>	4.20	0.0009
<b>Cramer's Z-test for difference in Adj-R2 (Adj-R<sup>2</sup><sub>HH</sub> &gt; Adj-R<sup>2</sup><sub>LL</sub>)</b>		
Pooled estimation	10.3949	<.0001
Between-effect	7.0803	<.0001
Annual estimations	Significant in 13 out of 15 annual regressions	

§ All variables are as described in table 2

\* t-statistics are based on White's (1980) consistent standard error estimates.

estimates and t-statistics based on the time-series standard errors of these estimates following Fama and MacBeth (1973). The average ERC for the HH portfolio is 7.97 (White t-stat=16.74) versus 1.77 (White t-stat=4.88) for the LL portfolio. I conduct a univariate test of differences in ERCs estimated from 15 annual cross-sectional regressions for both portfolios and report results in Panel B. The test results indicate that ERCs in the HH portfolio are significantly (t-stat=12.48 p<0.0001) higher than ERCs in the LL portfolio. These findings are consistent with my prediction and support my hypothesis **H1a**.

Panel A of Table 3, also presents explanatory power ( $R^2$ ) for each estimation.  $R^2$  from pooled and between-effect estimation are respectively 57% and 60% for the HH portfolio compared to 39% and 43% for the LL portfolio. In annual estimations, explanatory powers in the HH portfolio are also consistently higher than those of the LL portfolio for every year. I report average adjusted  $R^2$ s for both portfolios. A univariate t-test of differences in  $R^2$  (results reported in Panel B) between the two portfolios from 15 pairs of annual regressions shows that the explanatory power in the HH portfolio is significantly (t-stat=4.20, P<0.0009) higher than the explanatory power in the LL portfolio. I then test the differences in adjusted  $R^2$  between HH and LL portfolios by using methods described in Cramer (1987) and report test results in Panel B of Table 3.<sup>18</sup> Cramer's Z-statistics indicate that explanatory powers of price-earnings regressions in the

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<sup>18</sup> Following Harris et al. (1994), I test the differences in  $R^2$  by using following formula:

$$Z = \frac{(R_{HH}^2) - (R_{LL}^2)}{\sqrt{\sigma^2(R_{HH}^2) + \sigma^2(R_{LL}^2)}}$$

$\sigma^2$  = Variance  
Z is approximately standard normal.

HH portfolio are significantly ( $P < .0001$ ) higher than that of the LL portfolio in both the pooled and between-effect estimations. In annual estimations, explanatory powers in the HH portfolio are significantly higher in 13 out of 15 years. These findings are consistent with my prediction (**H1b**).

I expect control variables for two risks measures (DE and EVAR), interacted with EPS to be negatively associated with price. I expect growth interacted with EPS to be positively associated.<sup>19</sup> Results for these variables are consistent with my expectations, except that DE\*EPS in the HH portfolio is not significant in between-effect and annual estimations.

### **5.2.2 Earnings Quality and Cost of Capital**

As a second validation of the earnings quality construct developed in this study, I test the negative relationship between earnings quality and cost of capital to provide further support for the earnings quality construct. In cost of capital studies, a common problem is the selection of a proxy for cost of capital while there is no consensus on which one is the best measure. The finance literature has conventionally used realized returns as a proxy for ex-ante cost of capital. The problem of using ex-post returns as a proxy for the ex-ante cost of capital is the potential noise and bias due to information surprises contained in the realized return (Elton [1999], Fama and French [2002]). To avoid this problem, studies in accounting develop and apply a number of measures of implied cost of capital.<sup>20</sup> However, recent studies (Guay, Kothari and Shu [2003], and

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<sup>19</sup> I estimate equation (11) on the whole sample that includes all observations as a benchmark. I find the directions and significance of all coefficients are consistent with my expectations and previous studies (e.g. Barth et al. 1999).

<sup>20</sup> In the existing literature, different studies use different measures or proxies for implied cost of capital, which include the earnings-price ratio (Francis et al. [2005]), modified PEG ratio (Easton [2004]), dividend discount model (Botoson [1997], Botoson and Plumlee [2002], Lee [2004]), Brav, Lehavy and Michaely's



Easton and Monahan [2005]) raise serious concerns about the validity of these implied cost of capital measures and conclude that those measures are unreliable.<sup>21</sup> To avoid this debate, I use both a measure of implied cost of capital and ex-post realized returns as proxies for cost of capital.

### 5.2.2.1 Tests Based on Implied Cost of Capital

Given the wide disagreement among prior studies about the best measure of implied cost of capital, I use the PEG model by Easton (2004) for two reasons. First, in an evaluation of alternative measures, Botosan and Plumlee (2005) find that the PEG model dominates other models of implied cost of capital. Secondly, the PEG model is relatively simpler compared to other measures. The implied cost of capital proxy is measured as the positive root of the following quadratic equation (12):

$$r^2 - (eps_2 - eps_1) / P_0 = 0 \quad (12)$$

Where,

$r$	Implied cost of capital
$P_0$	Current stock price
$eps_t$	Analysts' consensus forecast of earnings per share for year $t$ (where, $t=1, 2$ ).

To provide evidence of a negative relationship between cost of capital and the earnings quality construct developed in this study, I specify cost of capital as a function of known systematic risk factors and my earnings quality measure. I use relevance and reliability scores as measures of two dimensions of earnings quality.

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(2003) ex ante measures of capital with value-line based estimates and Ohlson and Juettner-Nauroth (2000) model.

<sup>21</sup> Guay et al. (2003) evaluate four accounting based implied cost of capital measures and the Fama-French three factor model, and report that all these measures are uncorrelated with realized returns. Easton and Monahan (2005) evaluate seven accounting based implied cost of capital measures and conclude that these measures are unreliable proxies for the ex-ante cost of capital. Even after controlling for the bias in the realized return, they do not find a significantly positive association between accounting based implied cost of capital measures and realized returns.

$$r_t = \delta_0 + \delta_j \sum_j F_{-CC_{jt}} + \theta_1 RELEVANT_t + \theta_2 RELIABLE_t + \psi_t \quad (13)$$

Where

$r$	Implied cost of capital measure from equation (12)
RELEVANT	Factor score of relevance dimension (inverse measure)
RELIABLE	Factor score of reliability dimension (inverse measure)
$F_{-CC_j}$	a vector of $j$ risk factors {BETA, SIZE, BM}
BETA	Firm-specific beta estimated by using 24 months of time series data
SIZE	Natural log of firm's market value at beginning of the year
BM	Book to market ratio at the beginning of year

The variables of interest are the measures of two dimensions of earnings quality—*RELEVANT* and *RELIABLE*, which are inverse measures of relevance and reliability of earnings. Positive coefficients on these two variables are evidence of an inverse relationship between cost of capital and earnings quality.

Since the earnings quality construct is comprised of both relevance and reliability, and I define high (low) quality earnings as earnings with high (low) relevance and high (low) reliability, I also use an alternative specification (equation 14) by replacing *RELEVANT* and *RELIABLE* variables in equation (13) with indicator variables for high and low quality of earnings.

$$r_t = \delta_0 + \delta_j \sum_j F_{-CC_{jt}} + \theta_1 HH_t + \theta_2 LL_t + \psi_t \quad (14)$$

Indicator variable HH (LL) takes value of 1 if a firm-year observation is in the HH portfolio (LL portfolio) and zero otherwise. All other variables are the same as described in equation (14). The negative relationship between cost of capital and earnings quality implies that firms with high (low) quality earnings have low (high) cost of capital. So I expect a negative coefficient for HH and a positive coefficient for LL in equation (14).

I estimate both equations (13) and (14) for each of the 15 years in my sample to mitigate the issues relating to cross-sectional dependencies, and report average coefficient estimates and Fama-MacBeth (1973) t-statistics. I also estimate pooled regressions for both equations. Table 4 presents results from regression analyses of these two equations. In equation (13), coefficients of *RELEVANT* and *RELIABLE* are significantly positive and consistent for both pooled regressions (t-statistic =17.87 and 3.96 for *RELEVANT* and *RELIABLE*, respectively) and annual estimations (Fama-MacBeth t-statistic =12.06 and 3.69 for *RELEVANT* and *RELIABLE*, respectively). These findings are consistent with the negative relationship between earnings quality and cost of capital. Moreover, significant results for each of the two dimensions of earnings quality support the FASB's assertion that both relevance and reliability are two integral components of earnings quality.

Results for equation (14) show that coefficients for HH are significantly negative in both pooled regressions (t-statistic= - 6.49) as well as annual regressions (Fama-MacBeth t-statistic= - 12.00), which suggests high quality earnings are associated with low cost of capital. Consistent with this result, coefficients for LL are significantly positive in both pooled regressions (t-statistic= 12.50) as well as annual regressions (Fama-MacBeth t-statistic= 10.24) suggesting that low quality earnings are associated with high cost of capital.

For both equations (13) and (14), regression coefficients of known systematic risk factors—BETA, SIZE and BM—are significant in the expected directions and consistent with prior studies (e.g. Francis et al. [2005]). In both pooled and annual regressions for both equations, coefficients of BETA and BM are significantly (below 1% level) positive

**TABLE 4**  
**Cost of Capital Analysis**

$$r = \delta_0 + \delta_j \sum_j F\_CC_{jt} + \theta_1 RELEVANT_t + \theta_2 RELIABLE_t + \psi_t \quad (13)$$

$$r = \delta_0 + \delta_j \sum_j F\_CC_{jt} + \theta_1 HH_t + \theta_2 LL_t + \psi_t \quad (14)$$

Variable	Predicted Sign	Regression Results on pooled sample				Annual Regression Results (Fama-Macbeth Method)			
		Coefficient Estimate	t-stat	Coefficient Estimate	t-stat	Average coefficients	t-stat	Average coefficients	t-stat
INTERCEPT		0.19729	72.80	0.22462	102.73	0.18000	24.88	0.20900	33.10
BETA	+	0.00838	10.17	0.01011	12.34	0.01100	4.46	0.01300	5.14
SIZE	-	-0.01430	-45.80	-0.01546	-50.79	-0.01300	-19.42	-0.01400	-24.20
BM	+	0.00103	3.63	0.00109	3.84	0.01200	3.41	0.01100	3.10
RELEVANT	+	0.00401	17.87			0.00400	12.06		
RELIABLE	+	0.00086	3.96			0.00100	3.69		
HH	-	-	-	-0.01063	-6.49	-	-	-0.01100	-12.00
LL	+	-	-	0.03420	12.50	-	-	0.03700	10.24
<b>Adjusted R-Square</b>		21.3%		20%		22.8%		21.4%	
<b>N</b>		14,198		14,198		14,198		14,198	

Where,

$r = \text{Cost of capital}_{PEG}$

Cost of capital estimate is the positive root of r from the equation  $(eps_2 - eps_1) / P_0 = r^2$ , where  $P_0$  is current stock price and  $eps_t$  are the analysts' consensus forecast (median estimates) for earnings per share.

**RELEVANT** Factor score of relevance dimension (inverse measure)

**RELIABLE** Factor score of reliability dimension (inverse measure)

**F\_CC** = {**BETA**, **SIZE**, **BM**}

**BETA** Firm-specific beta estimated using 24 months of time series data

**SIZE** Natural log of firm's market value at beginning of the year

**BM** Book to market ratio at the beginning of year

and coefficients of SIZE are significantly (below 1% level) negative for both equations. These results suggest that firms with higher (lower) betas, firms with higher (lower) book-to-market ratios and firms with smaller (larger) market capitalizations are associated with higher (lower) cost of capital.

### 5.2.2.2 Tests Based on Realized Returns

Following Francis et al. (2005) and Aboody et al. (2005), I use a four-factor asset pricing model, which is an extended version of the three-factor model by Fama and French (1993). The four-factor model is shown in equation (15) where the fourth factor is earnings quality ( $EQ$ ).

$$(R_{j,m} - R_{f,m}) = \alpha_j + \beta_j(R_{m,m} - R_{f,m}) + s_jSMB_m + h_jHML_m + f_jEQ_m + \varepsilon_m \quad (15)$$

Where

$R_{j,m}$	Stock return of firm $j$ for month $m$
$R_{f,m}$	Risk-free rate (one month T-bill rate)
$R_{m,m}$	Market return (CRSP value weighted index) for month $m$
$SMB$	Return to size mimicking portfolio
$HML$	Return to book-to-market mimicking portfolio
$EQ_m$	Hedge portfolio equally weighted return for month $m$ by going long in the low earnings quality (LL) firms and going short in the high earnings quality (HH) firms.

The variable of interest is the earnings quality factor (EQ), for which I expect to have a significantly positive loading along with the other three Fama-French factors. I estimate equation (15) by using firm-specific regressions for firms with at least 24 months time series data available in my sample. Table 5 presents mean and median estimates, t-statistics based on standard errors of firm-specific coefficient estimates, and two z-statistics based on the mean and standard deviation of firm-specific t-statistic.<sup>22</sup>

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<sup>22</sup> Formulas for estimating test statistic are given in Table 5. T-statistic is based on Fama-MacBeth (1973) methodology. Two Z-statistics are estimated following Barth et al. (1999). Z1 assumes residual independence, which will be overstated by correlation among residuals. Z2 relaxes these assumptions and hence provide a more conservative estimate.

**TABLE 5**  
**Cost of Capital Analyses –**  
**Realized Return and Four Factor Model**

$$(R_{j,m} - R_{f,m}) = \alpha_p + \beta_p (R_{m,m} - R_{f,m}) + s_p SMB_m + h_p HML_m + f_p EQ_m + \varepsilon_m \quad (15)$$

Variable	Mean Estimate	Median Estimate	T-stat	Z1	Z2
<b>Intercept</b>	0.007	0.006	15.46	22.50	23.30
<b><math>R_{mt} - R_{ft}</math></b>	0.9180	0.914	62.25	140.84	31.65
<b><i>SMB</i></b>	0.5190	0.461	21.66	52.38	36.23
<b><i>HML</i></b>	0.4380	0.441	16.68	45.68	31.65
<b><i>EQ</i></b>	0.2750	0.0750	17.73	15.90	9.69
<b>Adj-R<sup>2</sup></b>	16%				
<b>No of firms</b>	2761				

Where

$R_{j,m}$	Stock return of firm $j$ for month $m$
$R_{f,m}$	Risk-free rate (one month T-bill rate) for month $m$
$R_{m,m}$	Market return (CRSP value weighted index)
<i>SMB</i>	Return to size mimicking portfolio
<i>HML</i>	Return to book-to-market mimicking portfolio
<i>EQ</i>	Hedge portfolio return going long in the low earnings quality (LL) firms and going short in the high earnings quality (HH) firms.
$t_{jm}$	$= \frac{meanest}{stdest / \sqrt{n-1}}$ where meanest=mean coefficient estimate, stdest=standard deviation of estimates and n=number of firms
Z1	$\frac{1}{\sqrt{n}} \sum_{j=1}^n \left( \frac{t_j}{\sqrt{k_j / (k_j - 2)}} \right)$ where, $t_j$ =t-statistics for the regression of firm $j$ , $k_j$ =degree of freedom, n=number of firms.
Z2	$\frac{meant}{stdt / \sqrt{n-1}}$ where, meant= mean of t-statistics, stdt= Standard deviation of t-statistics and n=number of firms.

Coefficients on the three Fama-French factors, market risk premium ( $R_{m,m} - R_{f,m}$ ), the size factor (SMB) and the book-to-market factor (HML) are significantly positive, consistent with prior studies (e.g. Fama and French [1993], Francis et al. [2005], Aboody et al. [2005]). The mean (median) coefficient of the earnings quality factor ( $EQ$ ) is 0.28 (0.08), which is significantly positive (t-statistic=17.73) suggesting that firms with low quality earnings are subject to high cost of capital.

Given the widespread evidence of a negative relationship between earnings quality and cost of capital provided by theoretical and empirical studies (e.g., Easley and O'Hara [2004], O'Hara [2003], Francis et al. [2005], Aboody et al. [2005] etc.), consistent findings provide additional support for the earnings quality construct developed in this study.

### **5.3 Relative Preference of Relevance and Reliability**

To test the hypothesis regarding the relative desirability between relevance and reliability of earnings information, I compare coefficients and explanatory powers of price-earnings regressions between two portfolios of firms with high relevance low reliability (HL) and with low relevance high reliability (LH). I use equation (11) separately for both portfolios (HL and LH) in three different estimation processes – pooled, between-effect and annual estimation. If, in general, investors prefer one dimension of earnings quality over the other, I expect significant differences in ERCs and explanatory powers between two portfolios.

Table 6, Panel A reports coefficients, t-statistics and adjusted  $R^2$  from regressions in all three approaches for both the HL and LH portfolios. ERCs from pooled and between-effect estimates are respectively 5.39 (White t-statistic=10.83) and 5.60 (White t

**TABLE 6**  
**High Relevance Low Reliability versus Low Relevance High Reliability**  
Price =  $\delta_0 + \delta_1 \text{BVE} + \delta_2 \text{EPS} + \delta_3 (\text{EPS} * \text{Growth}) + \delta_4 (\text{EPS} * \text{DE}) + \delta_5 (\text{EPS} * \text{EVAR}) + \psi$  (11)

*Panel A*

Variables	HL Portfolio			LH Portfolio		
	Pooled Sample	Between-effect Design	Annual Regression	Pooled Sample	Between-effect Design	Annual Regression
	Coefficients (t-stat)*	Coefficients (t-stat)*	Average Estimates (t-stat)	Coefficients (t-stat)*	Coefficients (t-stat)*	Average Estimates (t-stat)
<b>Intercept</b>	5.5289 (16.53)	5.3282 (12.88)	5.0440 (11.29)	6.7571 (18.84)	6.1957 (15.33)	6.0320 (14.55)
<b>BE</b>	0.7124 (14.29)	0.7545 (11.75)	0.6750 (13.22)	0.7482 (18.50)	0.7407 (15.62)	0.7970 (16.46)
<b>EPS</b>	5.3919 (10.83)	5.5989 (8.40)	5.7090 (9.76)	4.8829 (13.23)	6.1370 (12.03)	4.8060 (12.78)
<b>EPS*Growth</b>	5.0471 (2.69)	3.1299 (1.42)	7.7450 (4.14)	0.1703 (0.13)	-1.1196 (-0.67)	0.6110 (0.31)
<b>EPS*DE</b>	0.1371 (0.67)	0.1466 (0.58)	0.0270 (0.14)	-0.0135 (-0.10)	-0.1969 (-1.19)	-0.0450 (-0.39)
<b>EPS*EVAR</b>	-0.0021 (-0.73)	-0.0006 (-0.16)	-0.0090 (-3.06)	-0.0014 (-0.94)	-0.0011 (-0.62)	-0.0030 (-0.51)
<b>Adj-R2</b>	52%	52%	58%	46%	51%	51%

*Panel B*

Tests of differences		
Tests	t value	Pr >  t
$\text{EPS}_{\text{HL}} > \text{EPS}_{\text{LH}}$	1.50	0.1564
$\text{Adj-R}^2_{\text{HL}} > \text{Adj-R}^2_{\text{LH}}$	3.38	0.0045

Where,

BE	Book value of equity divided by number of shares outstanding
EPS	Earnings per share
HL	Group of firm-year observations with high relevance and low reliability
LH	Group of firm-year observations with low relevance and high reliability
Growth	Average growth of book-value over past six years
DE	Debt-equity ratio
EVAR	Variance of past five year's changes in EPS

\*t-statistics are based on White's (1980) consistent standard error estimates.



statistic=8.40) for the HL portfolio, 4.88 (White t-statistic=13.23) and 6.14 (White t-statistic=12.03) for the LH portfolio. In the annual cross-sectional estimations, the ERCs in the HL portfolio are higher than that of the LH portfolio in 10 out of 15 years of my sample period (results not reported). For brevity, I report average annual estimates and t-statistics based on the time-series standard errors of these estimates following Fama and MacBeth (1973). The average ERC for the HL portfolio is 5.71 (t-statistic=9.76) versus 4.81 (t-statistic=12.78) for LH portfolio. On the other hand,  $R^2$ s from all three approaches vary from 52% to 58% for HL compared to 46% to 51% for LH. In annual estimations,  $R^2$  in HL is higher than  $R^2$  in LH in 12 out of 15 yearly regressions; however, the differences are statistically significant in seven years by using methods described in Cramer (1987). Apparently, coefficients and explanatory powers in the HL portfolio are higher than those of the LH portfolio. I conduct univariate tests for the significance of differences in ERCs and explanatory powers between the HL and LH portfolios over the sample period and report results in panel B, table 6. Results show that ERCs in HL are higher than ERCs of LH but the difference is not significant (p-value=0.15) at conventional levels, which is not consistent with my hypothesis **H2a**. However, consistent with hypothesis **H2b**,  $R^2$ s for HL are significantly higher than that of LH (t=3.38, p-value=0.0045) suggesting that explanatory powers of earnings are higher for the relevance compared to the reliability dimension of earnings.

Results from the analyses of the HL and LH portfolios are not consistently strong for two hypotheses across the different estimation approaches used. Although both ERCs and  $R^2$ s are higher in the HL portfolio compared to the LH portfolio, only  $R^2$  results are

statistically significant at an acceptable level. I interpret these results as evidence that investors prefer relevance of earnings to reliability in general.

#### 5.4 Tests for ERC in Four Portfolios

I use an alternative specification to test hypotheses (H1a) and (H2a), where I use a single price-earnings equation similar to equation (11) incorporating a slope dummy interacting with EPS for each of the four portfolios as shown in equation (16):

$$\text{Price} = \delta_0 + \delta_1 \text{BVE} + \delta_2 (\text{EPS} * D_{\text{HH}}) + \delta_3 (\text{EPS} * D_{\text{LL}}) + \delta_4 (\text{EPS} * D_{\text{HL}}) + \delta_5 (\text{EPS} * D_{\text{LH}}) + \delta_6 (\text{EPS} * \text{Growth}) + \delta_7 (\text{EPS} * \text{Lev}) + \delta_8 (\text{EPS} * \text{EVAR}) + \psi \quad (16)$$

Where,  $D_p$  is an indicator variable that takes on a value of 1 if a firm year observation is in the portfolio  $p$  and 0 otherwise, where  $p = \text{HH, LL, HL and LH}$ . All other variables are the same as described in equation (11). I estimate equation (16) with firm-year observations in four portfolios (i.e., HH, LL, HL and LH) together by using pooled and between-effect approaches. I also estimate 15 annual cross-sectional regressions by using equation (16) and report average coefficients and Fama-MacBeth (1973) t-statistics. Estimated coefficients on portfolio indicator interaction variables are ERCs for respective portfolios. I then test the differences in ERCs among four portfolios.

Table 7, panel A presents regression results from three different estimations. In the pooled (between-effect) regression, ERCs for the HH, HL LH and LL portfolios are 7.41, 5.66, 4.91 and 2.06 respectively (9.12, 6.23, 5.70 and 1.95 respectively). In annual cross-sectional regressions, the average ERCs for the HH, HL LH and LL portfolios are 7.55, 5.75, 4.94 and 2.25, respectively. Thus, ERCs of these four portfolios show a consistent pattern (i.e.,  $\text{ERC}_{\text{HH}} > \text{ERC}_{\text{HL}} > \text{ERC}_{\text{LH}} > \text{ERC}_{\text{LL}}$ ) in all three estimation processes. To test the statistical significance of this pattern, I conduct the following six tests of differences in each estimation approach:

**TABLE 7**  
**Tests for ERCs**

$$\text{Price} = \delta_0 + \delta_1 \text{BVE} + \delta_2 (\text{EPS} * \text{D}_{\text{HH}}) + \delta_3 (\text{EPS} * \text{D}_{\text{LL}}) + \delta_4 (\text{EPS} * \text{D}_{\text{HL}}) + \delta_5 (\text{EPS} * \text{D}_{\text{LH}}) + \delta_6 (\text{EPS} * \text{Growth}) + \delta_7 (\text{EPS} * \text{Lev}) + \delta_8 (\text{EPS} * \text{EVAR}) + \psi \quad (16)$$

*Panel A*

Variables	Pooled Estimates		Between-effect Estimates		Annual Regressions	
	Parameter Estimate	White's t-stat	Parameter Estimate	White's t-stat	Parameter Estimate	Fama-MacBeth t stat
<b>Intercept</b>	6.2033	38.9418	5.4434	22.2680	5.8400	19.26
<b>BVE</b>	0.6906	31.5322	0.6702	19.1320	0.6850	20.41
<b>EPS*D<sub>HH</sub></b>	7.4081	30.0058	9.1182	14.7341	7.5450	33.58
<b>EPS*D<sub>LL</sub></b>	2.0625	7.5319	1.9496	3.5673	2.2470	6.96
<b>EPS*D<sub>HL</sub></b>	5.6573	20.0061	6.2332	10.2320	5.7530	17.86
<b>EPS*D<sub>LH</sub></b>	4.9072	17.4648	5.7026	8.6032	4.9420	13.02
<b>EPS*Growth</b>	2.7529	3.7549	1.2161	0.7767	3.8350	4.22
<b>EPS*LEV</b>	0.0858	1.1956	-0.0169	-0.1648	0.0960	0.95
<b>EPS*EVAR</b>	-0.0025	-3.4316	-0.0034	-4.0816	-0.0030	-2.86
<b>Adj-R<sup>2</sup></b>	60%		63%		63%	

**Tests of differences**

*Panel B*

Tests	Pooled Sample		Between-effect estimation		Annual Regression
	Chi-square	p-value	Chi-square	p-value	# of years significant
<b>(i) ERC<sub>HH</sub> &gt; ERC<sub>LL</sub></b>	296.78	<.0001	87.64	<.0001	15
<b>(ii) ERC<sub>HH</sub> &gt; ERC<sub>HL</sub></b>	44.19	<.0001	16.32	<.0001	11
<b>(iii) ERC<sub>HH</sub> &gt; ERC<sub>LH</sub></b>	81.32	<.0001	17.84	<.0001	14
<b>(iv) ERC<sub>HL</sub> &gt; ERC<sub>LH</sub></b>	5.86	0.0155	0.49	0.4860	5
<b>(v) ERC<sub>HL</sub> &gt; ERC<sub>LL</sub></b>	113.43	<.0001	38.36	<.0001	13
<b>(vi) ERC<sub>LH</sub> &gt; ERC<sub>LL</sub></b>	72.06	<.0001	26.16	<.0001	12

Where,

ERC<sub>p</sub> = The ERC for portfolio P, where P=HH, LL, HL and LH. ERC<sub>p</sub> is the coefficient of interaction term between EPS and a portfolio indicator variable (D<sub>p</sub>). All other variables are same as described in Table 6.

- |  |   |
|--|---|
| (i) $ERC_{HH} > ERC_{LL}$ ( <b>H1a</b> ) | (iv) $ERC_{HL} > ERC_{LH}$ ( <b>H2a</b> ) |
| (ii) $ERC_{HH} > ERC_{HL}$               | (v) $ERC_{HL} > ERC_{LL}$                 |
| (iii) $ERC_{HH} > ERC_{LH}$              | (vi) $ERC_{LH} > ERC_{LL}$                |

Panel B of Table 7 presents results from these tests. In pooled and between-effect regressions, all but test (iv) are highly significant (below 0.01% level). Test results in annual regressions are also consistent with that of pooled and between effect estimations. Highly significant t-statistics for test (i) in both pooled and between-effect estimation and in all 15 annual estimations provide support for **H1a** and also consistent with the results in the previous section. Most importantly, ERCs in the HH (LL) portfolio are unambiguously and significantly higher (lower) than the two intermediate portfolios (i.e., HL and LH) across all estimations, which not only supports my prediction in H1a but also provide strong validation for the earnings quality construct used in this study and suggest that firms with higher quality of earnings have higher response coefficients.

Results for test (iv) are mixed. The test of difference in ERCs between HL and LH portfolios is significant ( $p=.0155$ ) in the pooled estimation, insignificant in the between-effect estimations, and significant in 5 out of 15 annual estimations. Thus, the results do not provide unambiguous support for my prediction (hypothesis **H2a**) that the degree of preference of one dimension of earnings quality is significantly different from the other. Interpretations for other test results are as follows:

(a) Results for tests (v) and (vi) are significant in pooled ( $p=<.0001$ ), between-effect ( $p=<.0001$ ) and in (respectively 13 and 12 out of 15) annual estimations. These results suggest that investors' usefulness of earnings information can be increased by increasing one dimension (either relevance or reliability) of earnings quality.

(b) Results for tests (ii) and (iii) are significant in pooled ( $p < .0001$ ), between-effect ( $p < .0001$ ) and in (respectively 11 and 14 out of 15) annual estimations. These findings suggest that the quality of earnings is higher when both relevance and reliability are high. These results support FASB's assertion that two primary criteria for the quality of accounting information are relevance and reliability and by increasing one dimension and ignoring the other, one cannot achieve high quality earnings.

## 6. ROBUSTNESS TESTS

### 6.1 Return Specification

Christie (1987) argues that the price model can be misspecified due to the potential scale differences among the firms in cross-section. Kothari and Zimmerman (1995) show that coefficients from price models are less biased than return models but price models suffer from more specification problems. Although price models are more appropriate for this study, I supplement the main results with additional analyses using return specifications. I specify a return-earnings model (equation 17) by using both earnings levels and changes as explanatory variables following prior studies (e.g. Easton and Harris [1991], and Ali and Zarowin [1992]).

$$R_{it} = \alpha_t + \beta_{1t} E_{it} + \beta_{2t} \Delta E_{it} + \varepsilon_t \quad (17)$$

$R$  denotes annual returns calculated over a period starting from the first trading day of the ninth month prior to fiscal year-end to the last trading day of the third month after the fiscal year-end.  $E$  denotes actual annual earnings of the current fiscal year (income before extraordinary items and discontinued operations) scaled by market value at the beginning of the period.  $\Delta E$  denotes the change in actual annual earnings in the current fiscal year from the prior year scaled by market value at the beginning of the period (i.e.  $\Delta E = E_t - E_{t-1}$ ).

#### 6.1.1 Return Specification- HH versus LL Portfolio

I estimate equation (17) separately using observations in the HH and LL portfolios to test hypotheses (H1a and H1b) that ERCs and explanatory powers are higher for firms with high quality (HH) earnings than those of low quality (LL) earnings. I estimate both pooled regressions and annual cross-sectional regressions following the

**TABLE 8**  
**Return Specification: High Quality versus Low Quality Earnings**

$$R_{it} = \alpha_t + \beta_{1t} E_{it} + \beta_{2t} \Delta E_{it} + \varepsilon_t \quad (17)$$

*Panel A*

Variable	HH Portfolio				LL Portfolio			
	Annual Regressions (Fama-Macbeth Method)				Annual Regressions (Fama-Macbeth Method)			
	Pooled Sample		Pooled Sample		Pooled Sample		Pooled Sample	
	Parameter Estimates	t -stat	Average Estimates	t -stat	Parameter Estimates	t -stat	Average Estimates	t -stat
Intercept	0.04666	4.51	0.02400	2.18	0.11826	5.36	0.04100	2.14
E	1.35589	11.34	1.12500	6.95	0.38866	5.98	0.38000	3.01
$\Delta E$	0.18960	2.87	0.50600	2.58	0.03586	1.29	0.12500	1.43
ERC	1.54549		1.631		0.42452		0.505	
Adj-R <sup>2</sup>	5.33%		5.9%		2.65%		4.9%	

*Panel B*

Tests of differences		
Variable	t Value	Pr >  t
$E_{HH} > E_{LL}$	4.39	.0006
$\Delta E_{HH} > \Delta E_{LL}$	1.99	.06
$ERC_{HH} > ERC_{LL}$	4.89	.0002
$Adj-R^2_{HH} > Adj-R^2_{LL}$	0.03	0.9758

Where,

- R Annual returns calculated over a period starting from the first trading day of the ninth month prior to fiscal year-end to the last trading day of the third month after the fiscal year-end.
- E Actual earnings of the current fiscal year (income before extraordinary items and discontinued operations) scaled by market value at the beginning of the period.
- $\Delta E$  the change in actual annual earnings in current fiscal year from prior year scaled by market value at the beginning of the period (i.e.  $\Delta E = E_t - E_{t-1}$ )
- ERC  $\beta_1 + \beta_2$

Fama-Macbeth method and report results in Table 8. Panel A of Table 8 presents estimated coefficients, t-statistic and explanatory powers. The ERC in pooled regression for the HH portfolio is 1.55, which is more than three times the ERC for the LL portfolio (0.42). In annual cross-sectional regressions, the average ERC for the HH portfolio is 1.63 compared to 0.50 for the LL portfolio. This finding is consistent with the hypothesis H1A and also with the results presented in the main analysis.  $R^2$  from pooled regressions and average  $R^2$ s from annual estimations are respectively 5.33% and 5.9% for the HH portfolio compared to 2.65% and 4.9% for the LL portfolio. To test the differences in ERCs and  $R^2$ s from 15 annual regressions between the HH and LL portfolios, I conduct t-test and report results in panel B of Table 8. Results show that ERCs in the HH portfolio are significantly (less than 1% level) higher than ERCs in the LL portfolio, which is consistent with my prediction and with the results presented in section 5.2. However, the differences in  $R^2$  are not significant.

### **6.1.2 Return Specification- HL versus LH Portfolio**

I also conduct a similar analysis by using equation (17) in the HL and LH portfolios to test the relative preference between relevance and reliability, and report results in Table 9. Panel A of Table 9 presents results from pooled regressions and average estimates from annual cross-sectional regressions. The ERC from the pooled regression and the average ERC from annual regressions are respectively 0.88 and 1.29 for the HL portfolio, compared to 0.58 and 0.82 for the LH portfolio, which is consistent with the results reported in section 5.3. The  $R^2$  in pooled regressions for the HL portfolio is 3.81%, which is slightly higher than the  $R^2$  (3.17%) for the LH portfolio. However, the average  $R^2$  from annual regressions in LH portfolio is 7.5% compared to 5.8% in HL



**TABLE 9**  
**Return Specification: High Relevance Low Reliability versus Low Relevance High Reliability**

$$R_{it} = \alpha_t + \beta_{1t} E_{it} + \beta_{2t} \Delta E_{it} + \varepsilon_t \quad (17)$$

**Panel A**

	HL Portfolio				LH Portfolio			
	Annual Regression (Fama-Macbeth Method)				Annual Regression (Fama-Macbeth Method)			
	Pooled Sample				Pooled Sample			
Variable	Parameter Estimates	t -stat	Average Estimates	t -stat	Parameter Estimates	t -stat	Average Estimates	t -stat
Intercept	0.0959	7.91	0.0400	3.17	0.1088	8.89	0.0540	3.43
E	0.7602	8.28	1.0640	5.75	0.3707	5.04	0.2100	1.68
$\Delta E$	0.1172	4.50	0.2210	1.69	0.2083	4.86	0.6130	3.51
ERC	0.8774		1.2850		0.5790		0.8230	
Adj-R <sup>2</sup>	3.81%				3.17%			
	5.8%				7.5%			

**Panel B**

Tests of differences			
Variable		T Value	Pr >  t
$E_{HL}$	> $E_{LH}$	2.73	0.0162
$\Delta E_{HL}$	> $\Delta E_{LH}$	-2.19	0.0462
ERC <sub>HL</sub>	> ERC <sub>LH</sub>	1.13	0.2776
Adj-R <sup>2</sup> <sub>HL</sub>	> Adj-R <sup>2</sup> <sub>LH</sub>	-0.74	0.4719

Where,

- R Annual returns calculated over a period starting from the first trading day of the ninth month prior to fiscal year-end to the last trading day of the third month after the fiscal year-end.
- E Actual earnings of the current fiscal year (income before extraordinary items and discontinued operations) scaled by market value at the beginning of the period.
- $\Delta E$  the change in actual annual earnings in current fiscal year from prior year scaled by market value at the beginning of the period (i.e.  $\Delta E = E_t - E_{t-1}$ )
- ERC  $\beta_1 + \beta_2$

portfolio. Panel B of Table 9 presents univariate test results for the differences in ERCs and  $R^2$ s between the HL and LH portfolios. Overall, ERCs for the HL portfolio are greater than ERCs for the LH portfolio but the differences are not statistically significant. The difference in  $R^2$ s between HL and LH portfolios in annual regressions is insignificant and inconsistent with the results reported in section 6.3.

### 6.1.3 Return Specification- Test for ERC

I estimate ERCs by using a return specification in a single equation with intercept and slope dummies for four portfolios (i.e. HH, LL, HL and LH) and test the differences in ERCs among these portfolios. I specify the following return model (equation 18) with earnings levels and changes, and indicator variables interacting with earnings variables.

$$R_i = \alpha_0 + \alpha_1 D_{HH} + \alpha_2 D_{LL} + \alpha_3 D_{HL} + \alpha_4 D_{LH} + \beta_1 E_i + \beta_2 \Delta E_i + \beta_3 (E_i * D_{HH}) + \beta_4 (E_i * D_{LL}) + \beta_5 (E_i * D_{HL}) + \beta_6 (E_i * D_{LH}) + \beta_7 (\Delta E_i * D_{HH}) + \beta_8 (\Delta E_i * D_{LL}) + \beta_9 (\Delta E_i * D_{HL}) + \beta_{10} (\Delta E_i * D_{LH}) + \varepsilon_i \quad (18)$$

Where,  $D_p$  is an indicator variable that takes on a value of 1 if a firm year observation is in portfolio  $p$  and 0 otherwise, where  $p=$  HH, LL, HL and LH. All other variables are the same as described in equation (17). The primary interest is the ERC, which is the sum of coefficients for earnings level ( $E_i$ ) and change ( $\Delta E_i$ ). Sum of coefficients for the interaction of earnings level and change variables with a portfolio indicator variable is the incremental ERC for that portfolio. For example,  $(\beta_3 + \beta_7)$  is the incremental ERC for the HH portfolio,  $(\beta_4 + \beta_8)$  is the incremental ERC for the LL portfolio, etc. The ERC for a portfolio is  $(\beta_1 + \beta_2 + \text{incremental ERC for that portfolio})$ . I estimate equation (18) by using both pooled regression and annual cross-sectional regressions, and report results in Table 10. Panel A of Table 10 presents coefficient estimates, t-statistic and  $R^2$ s. ERCs for HH, HL, LH and LL are respectively 1.55, 0.88, 0.58 and 0.42, which suggests a

**TABLE 10**  
**Tests for ERCs –Whole Sample**

$$R_i = \alpha_0 + \alpha_1 D_{HH} + \alpha_2 D_{LL} + \alpha_3 D_{HL} + \alpha_4 D_{LH} + \beta_1 E_i + \beta_2 \Delta E_i + \beta_2 (E_i^* D_{HH}) + \beta_3 (E_i^* D_{LL}) + \beta_4 (E_i^* D_{HL}) + \beta_5 (E_i^* D_{LH}) + \beta_2 (\Delta E_i^* D_{HH}) + \beta_3 (\Delta E_i^* D_{LL}) + \beta_4 (\Delta E_i^* D_{HL}) + \beta_5 (\Delta E_i^* D_{LH}) + \varepsilon_i$$

*Panel A*

Variables*	Pooled Regression		Annual Regression (Fama-Macbeth Method)	
	Parameter Estimate	t Value	Parameter Estimate	t Value
Intercept	0.11507	21.61	-0.02200	4.01
D <sub>HH</sub>	-0.06841	-4.13	-0.05600	-2.12
D <sub>LL</sub>	0.00319	0.19	0.00400	0.09
D <sub>HL</sub>	-0.01923	-1.39	-0.02200	-2.36
D <sub>LH</sub>	-0.00624	-0.47	0.00400	0.27
E <sub>i</sub>	0.51585	15.78	0.26800	3.59
ΔE <sub>i</sub>	0.10190	6.38	0.48200	5.87
E <sub>i</sub> * D <sub>HH</sub>	0.84004	4.56	0.64300	3.89
E <sub>i</sub> * D <sub>LL</sub>	-0.12720	-2.26	-0.10100	-0.66
E <sub>i</sub> * D <sub>HL</sub>	0.24437	2.40	0.32400	2.23
E <sub>i</sub> * D <sub>LH</sub>	-0.14514	-1.82	-0.27200	-2.39
ΔE <sub>i</sub> * D <sub>HH</sub>	0.08770	0.86	0.23800	1.05
ΔE <sub>i</sub> * D <sub>LL</sub>	-0.06604	-2.61	-0.14300	-1.22
ΔE <sub>i</sub> * D <sub>HL</sub>	0.01532	0.48	-0.06100	-0.51
ΔE <sub>i</sub> * D <sub>LH</sub>	0.10641	2.35	0.34500	1.84
Adj-R <sup>2</sup>	3.51%		6.4%	

*Panel B*

Tests of differences

Variable	F- Value	Pr >  t
ERC <sub>HH</sub> > ERC <sub>LL</sub>	26.18	<0.0001
ERC <sub>HH</sub> > ERC <sub>HL</sub>	7.93	0.0049
ERC <sub>HH</sub> > ERC <sub>LH</sub>	18.19	<0.0001
ERC <sub>HL</sub> > ERC <sub>LH</sub>	5.59	0.0181
ERC <sub>HL</sub> > ERC <sub>LL</sub>	16.28	<0.0001
ERC <sub>LH</sub> > ERC <sub>LL</sub>	3.12	0.0771

\*D<sub>p</sub> is an indicator variable takes a value of 1 if a firm year observation is in the portfolio *p* and 0 otherwise, where *p*= HH, LL, HL and LH. All other variables are the same as described in table 9.

pattern that  $ERC_{HH} > ERC_{HL} > ERC_{LH} > ERC_{LL}$ . This finding is consistent with the results reported in the main analyses with price specifications. I then test the differences in ERCs among these portfolios and report results in Panel B of Table 10. Tests results are consistent with hypotheses H1A and H2A and also with the pattern that  $ERC_{HH} > ERC_{HL} > ERC_{LH} > ERC_{LL}$ .

Overall, ERC analyses (H1A and H2A) based on the return specification support the results presented in the main analyses using price specification. However, results relating to explanatory powers (H1B and H2B) of return specifications are not consistent with that of price specification. One plausible explanation for this inconsistency between the two sets of results could be the timeliness component of earnings quality, which is not considered in my earnings quality measures while return specification captures the timeliness components. Barth et al. (2001) suggests price specification is more appropriate when the timeliness is not considered.

## **6.2 Results after Eliminating All Loss Firms**

As shown in the descriptive statistics, the low quality earnings portfolio has a higher number of loss firms than other portfolios. Since loss firms have relatively lower ERCs than profit reporting firms (Hyan 1995), the preponderance of loss firms may confound the results reported in section 5.0. To isolate the effect of loss firms, I eliminate firms with negative earnings from the sample and re-run all analyses. Results from this analysis are similar to the main results reported in previous sections.

## 7. SUMMARY AND CONCLUSIONS

This study operationalizes the primary qualitative characteristics specified in the FASB's conceptual framework to measure earnings quality. According to the SFAC No. 2, the primary determinants of earnings quality are relevance and reliability. More specifically, I derive a summary measure of earnings quality by applying factor analysis on different variables representing different components of relevance and reliability dimensions. I then provide a validation of the earnings quality construct by testing whether the construct reflects decision usefulness to investors, which I operationalize by using a value relevance approach and cost of capital analysis. Finally, I explore the relative desirability of each dimension based on the decision usefulness of the earnings information.

By using factor analyses on fifteen variables representing quality attributes specified in the FASB's Concept Statement No. 2, I obtain two dimensions that correspond to components of relevance and reliability. Results from the value relevance analyses show that ERCs and explanatory powers of earnings are increasing in the quality of earnings, suggesting that the earnings quality construct reflects decision usefulness. In cost of capital analyses, I find a negative relationship between earnings quality and measures of implied cost of capital, which suggests that the quality of earnings influences the expected rate of returns that investors implicitly use to estimate present value of future cash flows for evaluating their investments. In turn, it provides evidence that the earnings quality construct reflects decision usefulness. Thus, findings in this study support the assertion that the FASB's earnings quality attributes make accounting information useful for decision making.

In the analyses of relative desirability between relevance and reliability, ERCs and explanatory powers in price (or return)-earnings regressions are higher for relevance than reliability. Although the differences in ERCs are not significant at conventional levels, results indicate that investors, in general, prefer relevance to reliability. The results, however, are not strong. It is possible that the relative preference between relevance and reliability may vary among investors groups. For example, investors with shorter (longer) horizons may prefer relevance (reliability) to reliability (relevance). Future research can extend this study by examining the relative preference of relevance and reliability among different investor groups.

This study can be further extended in two ways. First, earnings quality may have substantial effect on the overall information quality of firms. Future research can investigate this empirically by using existing information quality metrics (e.g. BKLS metric in Barron et al. [1998]) and also test how earnings quality affects private versus public information. Second, an extension of this study is to examine whether any trend in earnings quality exists over the last couple of decades and whether the quality of earnings is associated with the gradual decline in value relevance, which is documented in prior studies (e.g. Francis and Schipper [1999], Lev and Zarowin [1999], Ely and Waymire [1999]).

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## APPENDIX A: ESTIMATING FEEDBACK VALUE

I formulate two measures of feedback value of earnings:

- (1) FV\_pve1: Feedback value measure based on earnings prediction model (equation 1)
- (2) FV\_pvcf1: Feedback value measure based on cash flow prediction model (equation 3)

### 1. FV\_pve1

$$\text{Prediction model: } ROA_{t+1} = \lambda_0 + \lambda_1 ROA_t + e_t \quad (1)$$

Where,

ROA Earnings before extraordinary items and discontinued operations (COMPUSTAT annual data item #18) scaled by average total assets.

e error term

Here, I provide a description of the method that I use to estimate feedback value through an example. Suppose, I estimate the feedback value of earnings for 1988 of a particular firm.

#### Step1: Estimate prediction error of 1989 based on actual earnings of 1988

I derive  $\hat{\lambda}_0$  and  $\hat{\lambda}_1$  from equation (1) by estimating regressions with observations over a period starting from 1979 through 1988.

$$PROA_{1989} = \hat{\lambda}_0 + \hat{\lambda}_1 * ROA_{1988}$$

$$PErrorA_{1989} = ROA_{1989} - PROA_{1989}$$

Where,

PROA<sub>1989</sub>=Predicted ROA for 1989 by using time-series data through 1988

PErrorA<sub>1989</sub>=Prediction error for 1989 using time-series data through 1988.

#### Step2: Estimate prediction error of 1989 based on actual earnings of 1987

I derive  $\hat{\lambda}_0$  and  $\hat{\lambda}_1$  from equation (1) by estimating regressions with observations over a period starting from 1979 through 1987.

$$PROA_{1988} = \hat{\lambda}_0 + \hat{\lambda}_1 * ROA_{1987}$$

$$PROA\_B_{1989} = \hat{\lambda}_0 + \hat{\lambda}_1 * PROA_{1988}$$

$$PErrorB_{1989} = ROA_{1989} - PROA\_B_{1989}$$

Where,

PROA<sub>1988</sub> = Predicted ROA for 1988 by using time-series data through 1987.

PROA\_B<sub>1989</sub> = Predicted ROA for 1989 based on predicted ROA of 1988.

PErrorB<sub>1989</sub>= Prediction error for 1989 using time-series data through 1987.

#### Step3: Feedback value (FV) of earnings for 1988

$$FV\_pve1_{1988} = | PErrorB_{1989} | - | PErrorA_{1989} |$$

### 2. FV\_pvcf1

I measure FV\_pvcf1 by using a similar methodology as described above. The only difference is the prediction model. I use the following cash flow prediction model (equation 3) as described in the text

$$OCF_{t+1} = \alpha_0 + \alpha_1 E_t + \omega_t \quad (3)$$

## APPENDIX B: FACTOR ANALYSIS

I use fifteen variables that are inverse measures (discussed in section 4.1) of different components of relevance and reliability dimensions of earnings quality as outlined in the conceptual framework. A summary of different models used to measure different components of earnings quality is presented in Table B1. Details about those models are given in the text. Table B2 presents Pearson (above diagonal) and Spearman (below diagonal) correlations among the variables. The shaded region in the upper left-hand (lower right-hand) corner of table B2 shows correlations among variables representing components of reliability (relevance). Most of the variables within each earnings quality dimension are significantly (below the 1% level) positively correlated and the degree of correlation in all cases is more than 25% except neutrality variables (Neu1 and Neu2) in the reliability group and the feedback value variables (FV\_pve1 and FV\_pvcf1) in the relevance group.

I conduct a principal factor analysis to extract underlying constructs from these 15 variables. Table B3 presents information relating to possible factors and their relative explanatory powers in terms of eigenvalues that are used to determine the number of factors to be retained. By applying the latent root criterion (eigenvalues > 1.0), two factors are retained. These two factors account for 80.51% variance of the 15 variables used in the factor analysis. I report factor patterns and loadings of all variables in each factor in Table B4. Since the reliability and relevance measures can be correlated, I use an oblique rotation method that does not assume independence between factors. Factor loadings of each variable in these two factors indicate that variables representing representational faithfulness and neutrality are loaded in factor 1, which I label as the *RELIABILITY* factor, and variables measuring predictive value and feedback value loaded in factor 2, which I label the *RELEVANCE* factor. In the rotated factor pattern columns, relatively higher factor loadings of each variable are highlighted. Although some cross-loadings exist, the overall results from the factor analysis is consistent with the FASB's conceptual framework that representational faithfulness and neutrality are ingredients of reliability, and predictive value and feedback value are ingredients of relevance.

I then obtain factor scores for each factor, which are the summary measures of relevance and reliability—the two primary dimensions of earnings quality. Since all variables used in the factor analysis are inverse measures, the relevance and reliability scores are also inverse measures of the relevance and reliability of earnings.

**TABLE B1**  
**Summary of Variables Used in Factor Analysis**

Relevance	Reliability
<p><b>Predictive value</b></p> <p>Prediction errors from following models are inverse measures of predictive value.</p> <p><i>Earnings prediction models</i></p> <ol style="list-style-type: none"> <li><math>ROE_{t+1} = \lambda_0 + \lambda_1 ROE_t + e_t</math></li> <li><math>E_{t+1} = \delta_0 + \delta_1 OCF_t + \delta_2 TAC_t + \delta_3 SI_t + e_t</math></li> </ol> <p><i>Cash-flow prediction models</i></p> <ol style="list-style-type: none"> <li><math>OCF_{t+1} = \alpha_0 + \alpha_1 E_t + e_t</math></li> <li><math>OCF_{t+1} = \beta_0 + \beta_1 OCF_t + \beta_2 \Delta REC_t + \beta_3 \Delta INV_t + \beta_4 \Delta AP_t + \beta_5 DEPR_t + \beta_6 OTHER_t + e_t</math></li> </ol> <p><u>Predictive value measures</u></p> <p><b>Pve1</b> Prediction error from (1)  <b>Pve2</b> Prediction error from (2)  <b>Pvcf1</b> Prediction error from (3)  <b>Pvcf2</b> Prediction error from (4)</p>	<p><b>Representational faithfulness and verifiability</b></p> <p><i>Abnormal accruals</i></p> <p><b>AA</b> abnormal accruals using Modified Jones (MJ) model  <b>PMAA</b> Performance matched abnormal accruals  <b>FLAA</b> Forward looking model</p> <p><i>Abnormal WC accruals</i></p> <p><b>WCAA</b> Working Capital Abnormal Accruals  <b>PMWCAA</b> Performance matched abnormal working capital accruals  <b>AWCA_DP</b> Abnormal working capital accruals following Defond and Park measure</p> <p><i>Accruals mapping into cash</i></p> <p><b>AQ</b> Accrual quality measure following Dechow and Dichev (2002) model</p>
<p><b>Feedback value</b></p> $FV_t = [  PE_B  -  PE_A  ]$ <p>Where,  <b>FV<sub>t</sub></b> Feedback value of earnings for year <i>t</i>  <b>PE<sub>B</sub></b> Prediction error of next years earnings without considering current earnings  <b>PE<sub>A</sub></b> Prediction error of next years earnings after considering current earnings</p> <p><u>Feedback value measures</u></p> <p><b>FV_pve1</b> Feedback value measure where prediction errors are estimated by using earnings prediction model (1).  <b>FV_pvcf1</b> Feedback value measure where prediction errors are estimated by using earnings prediction model (3).</p>	<p><b>Neutrality</b></p> <p><b>Neu1</b> indicator variable takes value of 1 if firm-year observations fall in the first bin to the right of zero in the distribution of EPS scaled by fiscal year-end price.  <b>Neu2</b> indicator variable takes value of 1 if a firm-year observation falls in the first bin to the right of zero in the distribution of change in EPS (<math>EPS_t - EPS_{t-1}</math>) scaled by fiscal year-end price.</p>

**TABLE B2**  
**Correlation among Variables Used in Factor Analysis**

	AA	PMA A	FLA A	WCA A	PM WCA A	AWC A DP	AQ	Neu1	Neu2	Pve1	Pve2	Pvcf1	Pvcf2	Fv_ pve1	Fv_ pvcf1
<b>AA</b>	1	0.8202	0.6318	0.5472	0.5329	0.2157	0.1720	0.0313	0.0182	0.1312	0.1385	0.1348	0.1370	-0.0200	0.0090
<b>PMAA</b>	0.7070	1	0.5990	0.6622	0.6989	0.2926	0.2235	0.0445	0.0326	0.1652	0.1799	0.1785	0.1877	-0.0149	0.0202
<b>FLAA</b>	0.7016	0.5615	1	0.4695	0.4503	0.2967	0.2740	0.0474	0.0251	0.2434	0.2418	0.2212	0.2224	-0.0079	-0.0017
<b>WCAA</b>	0.6401	0.6183	0.5310	1	0.9382	0.4105	0.3036	0.0611	0.0412	0.1994	0.2046	0.2258	0.2231	-0.0135	0.0213
<b>PMWCA A</b>	0.5829	0.7407	0.4747	0.7634	1	0.4114	0.2867	0.0638	0.0445	0.1895	0.2008	0.2223	0.2262	-0.0091	0.0283
<b>AWCA_ DP</b>	0.4557	0.4763	0.4082	0.6711	0.5840	1	0.3166	0.0137	0.0050	0.1992	0.2171	0.2365	0.2443	-0.0145	0.0086
<b>AQ</b>	0.2832	0.3000	0.3094	0.3739	0.3321	0.3819	1	0.0734	0.0517	0.4469	0.4201	0.3760	0.3267	-0.0402	-0.0078
<b>Neu1</b>	0.0290	0.0315	0.0324	0.0349	0.0278	0.0270	0.0634	1	0.3514	0.0319	0.0207	0.0203	0.0092	-0.0184	-0.0185
<b>Neu2</b>	0.0181	0.0173	0.0204	0.0258	0.0222	0.0134	0.0434	0.3514	1	0.0261	0.0208	0.0164	0.0076	-0.0098	-0.0064
<b>Pve1</b>	0.2011	0.1989	0.2282	0.2288	0.2057	0.2315	0.4892	0.0455	0.0345	1	0.7244	0.6831	0.4950	0.2272	0.1129
<b>Pve2</b>	0.2175	0.2240	0.2427	0.2502	0.2293	0.2584	0.4906	0.0420	0.0327	0.7377	1	0.5321	0.6492	0.1290	0.0838
<b>Pvcf1</b>	0.2063	0.2180	0.2134	0.2573	0.2336	0.2596	0.3826	0.0269	0.0175	0.4816	0.4250	1	0.6626	0.1107	0.3143
<b>Pvcf2</b>	0.2300	0.2440	0.2388	0.2838	0.2637	0.2938	0.3822	0.0217	0.0068	0.4247	0.5023	0.6819	1	0.0757	0.1679
<b>FV_pve1</b>	-0.0174	-0.0268	-0.0145	-0.0209	-0.0179	-0.0299	-0.0622	-0.0092	-0.0111	0.1305	0.0643	0.0116	0.0092	1	0.5518
<b>FV_pvcf1</b>	0.0163	0.0182	0.0135	0.0297	0.0233	0.0234	-0.0092	-0.0032	0.0039	0.0168	0.0152	0.2611	0.1148	0.2769	1

**TABLE B3**  
**Eigenvalues – Determining number of factors**

<b>Eigenvalues of the Reduced Correlation Matrix: Total = 8.06021054 Average = 0.53734737</b>				
	<b>Eigenvalue</b>	<b>Difference</b>	<b>Proportion</b>	<b>Cumulative</b>
<b>1</b>	<b>4.32599559</b>	2.16241176	0.5367	0.5367
<b>2</b>	<b>2.16358383</b>	1.24429095	0.2684	0.8051
<b>3</b>	0.91929288	0.32045013	0.1141	0.9192
<b>4</b>	0.59884276	0.12410002	0.0743	0.9935
<b>5</b>	0.47474274	0.21942870	0.0589	1.0524
<b>6</b>	0.25531404	0.11494159	0.0317	1.0841
<b>7</b>	0.14037245	0.03490992	0.0174	1.1015
<b>8</b>	0.10546254	0.12505542	0.0131	1.1146
<b>9</b>	-0.01959289	0.04184927	-0.0024	1.1121
<b>10</b>	-0.06144215	0.03366971	-0.0076	1.1045
<b>11</b>	-0.09511186	0.02725258	-0.0118	1.0927
<b>12</b>	-0.12236445	0.03129297	-0.0152	1.0775
<b>13</b>	-0.15365742	0.07194690	-0.0191	1.0585
<b>14</b>	-0.22560432	0.02001888	-0.0280	1.0305
<b>15</b>	-0.24562320		-0.0305	1.0000



**TABLE B4**  
**Factor Pattern**

	Principal Factors Pattern		Rotated Factor Pattern	
	Factor1	Factor2	Factor 1 <i>RELIABILITY</i>	Factor 2 <i>RELEVANCE</i>
AA	0.64551	-0.43465	<b>0.77733</b>	-0.03686
PMAA	0.73607	-0.44774	<b>0.86155</b>	-0.00108
FLAA	0.61326	-0.21812	<b>0.63746</b>	0.13156
WCAA	0.78195	-0.40258	<b>0.87736</b>	0.06133
PMWCAA	0.78179	-0.41103	<b>0.88160</b>	0.05402
AWCA_DP	0.45127	-0.03920	<b>0.40617</b>	0.20053
AQ	0.48489	0.19485	0.31353	<b>0.41807</b>
Neu1	0.06723	-0.02446	<b>0.07017</b>	0.01395
Neu2	0.04957	-0.01293	<b>0.04909</b>	0.01465
Pve1	0.57807	0.58962	0.18846	<b>0.80393</b>
Pve2	0.57225	0.54462	0.20682	<b>0.76244</b>
Pvcf1	0.57977	0.56341	0.20351	<b>0.78240</b>
Pvcf2	0.55087	0.48956	0.21710	<b>0.70426</b>
Fv_pve1	0.07809	0.27231	-0.07446	<b>0.27332</b>
Fv_pvcf1	0.12547	0.28250	-0.03923	<b>0.30661</b>
Variance explained by each factor	4.3259956	2.1635838		
Variance Explained by Each Factor Ignoring Other Factors			3.9052332	3.1562399
Squared multiple correlation of variables with each factor			0.9466	0.8906

## VITA

Abhijit Barua earned his bachelor and master degrees in commerce with a major in accounting from the University of Chittagong, Bangladesh. He then completed master of business administration (MBA) degree with a major in finance from the Institute of Business Administration (IBA), University of Dhaka (DU), Bangladesh. After the completion of his MBA degree, he served in Procter & Gamble Bangladesh, a subsidiary of P&G USA Inc. as an assistant manager–Finance & Accounts. Having two and a half years of industry experience, Mr. Barua joined academia. He worked as a full-time faculty in AMA International University, Bangladesh, for one year. He then worked for two years as a full time Lecturer in IBA-DU, the largest and leading business school of Bangladesh. In the Fall 2001, Mr. Barua joined the accounting doctoral program of the Louisiana State University. During his doctoral study at LSU, he taught accounting courses at the undergraduate level and conducted a number of research projects. The general area of his research interest is financial reporting issues and interactions of those issues with capital markets. Besides the dissertation research, one of his working papers is accepted for publication (forthcoming 2006) in *the Journal of Business Finance and Accounting*. Recently, he accepted a position of assistant professor in the School of Accounting at the Florida International University, Miami, starting from August 2006.