The Impact of Non-audit Services on Capital Markets

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Job Talk Paper

Preliminary Draft

7 January 2005

Abstract

The framers of the Sarbanes–Oxley Act (SOA) presume that non-audit services lower the quality of financial statements, so they have prohibited auditors from offering most non-audit services. In addition, regulators believe that non-audit services (NAS) may cause the auditor to be perceived as "dependent" in appearance, thus increasing information risk, even if they have no impact on the quality of financial statements.

I investigate two hypotheses using pre-SOA data. First, I ask whether the proportion of non-audit services fees to total fees has a positive or negative association with the ability of financial statements to predict a firm's future cash flows, which can be considered a measure of the quality of the statements. Second, I ask whether the proportion has a negative or positive association with the cost of capital and the bid/ask spread, controlling for the predictive ability. The cost of capital and the bid/ask spread serve as proxies of information risk.

Contrary to the proponents of prohibiting NAS, I find that the proportion of non-audit services fees to total fees has a positive association with the predictive ability. If we control for the quality of financial statements, non-audit services still have a negative association with the cost of capital and the bid/ask spread as proxies for information risk. These findings suggest that there are benefits from non-audit services, both to the quality of financial statements and to reducing information risk.

The Impact of Non-audit Services on Capital Markets

1. Introduction

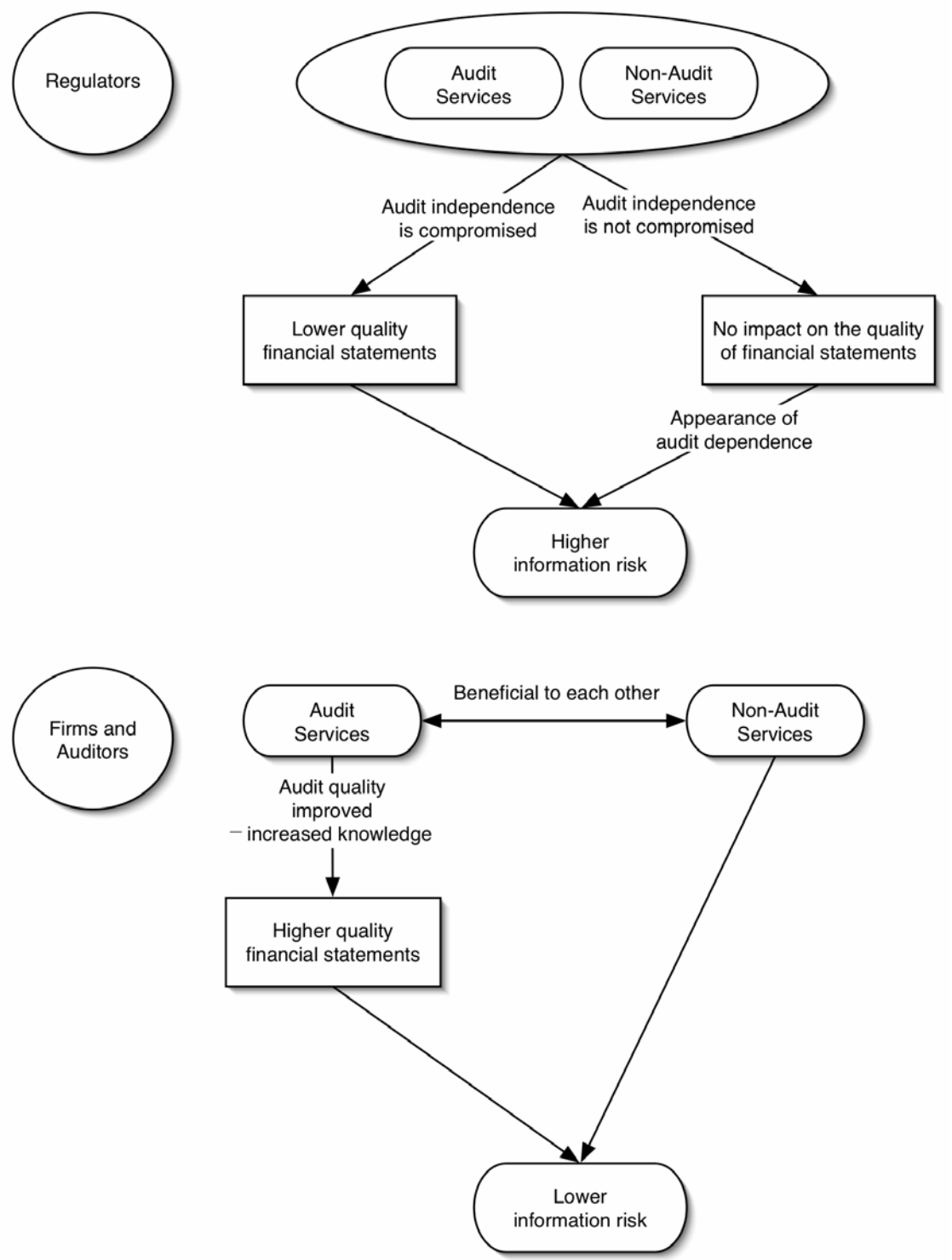
In response to a flood of accounting scandals in 2002, the Sarbanes-Oxley Act prohibits accounting firms from offering non-audit services (NAS) other than tax services,[1] because Congress concluded that they impaired auditors' independence and therefore their opinions. The audit industry does not agree with this view. Indeed, it is often argued that audits can be more efficient thanks to non-audit services, as the auditor acquires more knowledge of the firm's business model from these additional services.

Hence, the impact of non-audit services on the quality of financial statements may be either positive or negative. On one hand, such services could induce errors and biases that would decrease the quality of the audit. On the other hand, some prior theoretical and empirical research (Simunic, 1984; FASB, 1978) suggests that audit quality actually increases because non-audit services (management advisory services, in particular) enhance the auditors' corporate knowledge of the audited firm. Such improved knowledge regarding the information in the financial statements would increase their quality. The impact on the capital markets is more complicated; Figure 1 shows how different parties view this impact.

In theory, the information risk attributable to non-audit services depends on their impact on the quality of financial statements. High quality financial statements reduce information risk. The story does not end here, however, because of the importance of "appearance" to the audit. Conceptually, the auditor should be independent both in fact and in appearance. Not surprisingly, the SEC and the authors of the Sarbanes-Oxley Act argue that the net impact of non-audit services on the capital markets would be negative.

[1] To provide tax services, the auditor needs the approval of the audit committee of the firm that is audited.

Figure 1. The impact of non-audit services on the quality of financial statements and capital markets—Different views



Impairment in audit quality decreases the quality of financial statements, and this lowered quality entails additional information risk. Furthermore, the regulators argue that non-audit services impose additional risk by reducing the appearance of independence and suggesting economic bonds between the firm and the auditor. This argument implies that, whether or not non-audit services have an impact on the quality of financial statements, they have a positive association with information risk.

On the other hand, the audit industry often argues that non-audit services facilitate better audits due to increased knowledge of the firm's operations, so information risk should decrease as the quality of financial statements increases. Firms argue that purchasing both audit non-audit services from the auditor is synergetic, and audit independence is not affected. Under this view, audit and non-audit services reinforce each other. Non-audit services such as design and implementation of a financial information system and consulting should help the managers of the firm to make informed decisions and streamline their financial reporting, therefore mitigating information asymmetry. If so, non-audit services will be positively associated with the quality of financial statements, and they will decrease information risk. Although many recent studies have investigated the impact of non-audit services on the quality of financial statements, my research contributes to the literature by considering the impact of these services on the information risk of the capital markets as well.

Using data on non-audit services in 2001–2003,[2] I analyze their impact on both the quality of financial statements and the capital markets. Specifically, I test two hypotheses: (1) Non-audit services have a positive (negative) association with the quality of financial statements; (2) controlling for the quality of financial statements, non-audit services have a negative (positive) association with the cost of capital and the bid/ask spread as proxies for information risk.

The proportion of non-audit services to total fees represents the level of non-audit services that a firm purchases. For the proponents of strict regulation, this can be interpreted as the extent that the audit's independence is violated. For the opponents of

[2] Disclosure of non-audit services is mandated from March 2001.

such strictness, the proportion represents the extent that audit and non-audit services benefit each other. Users of financial statements find them an important basis for predicting firms' future cash flows; investors find financial statements more useful or of higher quality if they can predict such cash flows better. In this study, the ability of information in financial statements to predict the future cash flows proxies for the quality of those statements. I compare the various models that predict future cash flows and pick the model that has the lowest prediction error (the absolute deviation of the prediction from the realized one-period-ahead cash flows from operations).[3] The literature on disclosure and information-based trading has identified two proxies for firms' information risk: the cost of capital and the bid/ask spread. Under the view of the proponents (opponents) of strict regulation, non-audit services have a negative (positive) association with the predictive ability of financial statements; they have a positive (negative) association with the proxies of information risk, controlling for this predictive ability.

I find that non-audit services are positively associated with the predictive ability and negatively associated with these proxies of information asymmetry. There is no indication that non-audit services result in a decrease in the quality of financial statements. Indeed, there is some evidence that non-audit services improve their quality. The information in financial statements is often neither timely nor comprehensive. Therefore, prediction based solely on information in financial statements may not be efficient. Analysts often have more information on firms and use more sophisticated methods to predict their future earnings per share (EPS). I therefore replace the ability of financial statement to predict future cash flows with the analysts' forecast error and repeat the analysis. I find that the analysts' forecast error is negatively associated with the fees for non-audit services. Hence, analysts do not have more difficulties in forecasting future EPS for firms receiving a high proportion of non-audit services from their auditors. These findings suggest that the Sarbanes-Oxley Act may have constituted an overreaction to a few, albeit prominent, aberrations in a general trend toward complex responses to complex operating environments.

[3] See Appendix C for further discussion.

In the period after the Sarbanes-Oxley Act, the only non-audit services that auditors can provide are tax services. It is informative to find out how tax services are associated with the quality of financial statements and information risk. I use individual components of non-audit services fees and show that fees on tax services are not associated with the predictive ability of financial statements. Controlling for the predictability, the tax services are negatively associated with the proxies of information risk. These results contribute to current debates on the permissibility of non-audit tax services by showing that tax services in the period before the Sarbanes-Oxley Act decreased information risk.

The rest of the paper is organized as follows. In section 2, I review the history of non-audit services as well as previous literature. I develop my hypotheses in section 3 and the research design in section 4. Section 5 contains a discussion of the data and descriptive statistics, and univariate tests are presented in section 6. In section 7, I describe the main results, and in section 8, the robustness of these results. In section 9, I offer my conclusions and suggestions for future research and normative action.

2. Background and Literature Review

Concerns regarding audits performed by firms also offering non-audit services (NAS) go back to Mautz and Saraf (1961), who asserted that the management advisory and tax services that auditors provide tend to reduce the appearance of audit independence. After several studies, the AICPA formed the Cohen committee to investigate the various facets of non-audit services. In 1978, the SEC adopted disclosure requirements (ASR 250) that required audited firms to disclose non-audit service fees (as a ratio based on the audit fees) and the nature of the services in a proxy statement. The Public Oversight Board conducted an extensive study of audit independence and management advisory services and concluded that there was no evidence of "abuse" or "impairment" (FASB, 1978).[4] As a result, the SEC repealed ASR 250, stating that the

[4] The POB concluded: "From the voluminous record before the Board, it is apparent that documented evidence of MAS abuses or impairment of independence through the use of

disclosure requirement in ASR 250 "was not generally of sufficient utility to investors to justify continuation." The time when ASR 250 was in effect, namely 1978 to 1981, is the only period before 2001 in which both the audit fee and non-audit fees were disclosed publicly in proxy statements.

The academic research on this period can be summarized as follows. Simunic (1984) showed that the audit fees of firms that purchased management advisory services (MAS) were significantly higher than those of firms that did not, but their internal audit fees were not higher. He interpreted this result as indicating the existence of efficiencies from joint production. In addition, he found that the accounting performance of firms that purchased MAS—measured by ROA and the incidence of negative net income—was not different from the performance of firms that did not. Knapp (1985) hypothesized that the user of financial statements—a bank loan officer, in particular—perceives that a firm's management is more likely to obtain its preferred resolution in a conflict issue with the auditor when the auditor provides MAS to the firm, controlling for the firm's financial condition and competition in the audit industry. He used an experimental design in which bank loan officers participated and found that the effect of MAS was minimal, despite its statistical significance. Palmrose (1986) replicated Simunic's (1984) work using more detailed fee categories and investigated whether each higher amount in each category was associated with a higher audit fee. She showed that higher MAS fees were associated with higher audit fees, but she also found that even MAS not provided by the auditor

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MAS is virtually nonexistent. Many concerned persons point to a feeling that 'it doesn't look right' or a speculation that some services 'might' or 'could' impair independence, but no one can counter the demonstrated benefits of MAS with some proof that specific practices lead to actual impairment...."

"[T]he absence of any known cases, while comforting, does not serve to prove conclusively that independence has not been, or will not be, impaired due to the furnishing of MAS to audit clients. ... [T]he problem ... is not so much lack of independence in fact as the appearance of lack of independence."

"There are many potential benefits to be realized by permitting auditors to perform MAS for audit clients that should not be denied to such clients without a strong showing of actual or potential detriment...."

were associated with higher audit fees. Simunic (1984) and Palmrose (1986) took the view that the audit fee proxies for the audit's quality.

After the SEC's decision to rescind ASR 250, the accounting research on non-audit services nearly dried up due to lack of data. Davis et al. (1993), using audit-hour and billing rate data provided by a large public accounting firm, tested whether there existed efficiencies from non-audit services by showing a negative relation between audit hours (un-weighted and weighted by the billing rates) and non-audit services. They found a weakly positive relation, suggesting that more audit effort is associated with non-audit services. Firth (1997) studied firms in the UK, where legislation requires the disclosure of audit and non-audit services fees.[5] He hypothesized that firms with higher agency costs purchase more non-auditing services because those firms, knowing the high information asymmetry between firms and investors, want to reassure investors by using an independent auditor. He found, however, that management-consulting services were negatively associated with his proxies for high agency costs.

Controversy over non-audit services re-emerged as fees for such services rose dramatically in the late 1990s. The landscape of non-audit services had changed significantly. Abbott (2001) found that only 4% of firms purchased no non-audit services whatsoever, and, on average, the mean of the ratio of non-audit services fees to audit fees was over 100%. In the 1980s, according to ASR 250 disclosures, the mean ratio was about 20%.

Speeches by SEC chairman Arthur Levitt and chief accountant Lynn Turner sparked public debate, and an increased incidence of restatements led the SEC to decide on a new rule requiring disclosure of both the audit fee and fees for FISDI (Financial Information System Design and Implementation) and other non-audit services. Although the initial draft of the rule banned all non-audit services, the SEC adopted a much weaker disclosure requirement and simply warned investors of reduced audit independence. This disclosure requirement was considered weaker than ASR 250, because ASR 250 required

[5] The Companies Act 1989; Disclosure of Remuneration for Non-audit Work and Regulation 1991.

the disclosure of all non-audit services and the amount of the fees scaled by the audit fees. During this period of heated debate, investors seemed to be surprised by the high proportion of non-audit services, and investment watchdogs such as Institutional Shareholder Services scrutinized the proxy statements for explanations why firms were paying the auditor for them.[6] In 2004, the California Public Employees' Retirement System (CalPERS) opposed the re-election of two directors of Emerson and the re-election of KPMG as auditor because the directors approved non-audit services from KPMG.

Since 2001, numerous researchers have examined the impact of non-audit services on audit quality or audit independence, or, more specifically, the negative association between non-audit services and the quality of financial statements. DeFond et al. (2002) found, using a sample of 4,105 firms that filed a proxy in 2001, that auditors' decisions to issue going concern audit opinions and total fees for non-audit services (weighted by the total fees paid to the auditors) were not associated.[7] On the other hand, Frankel et al. (2002) found that non-audit services were positively associated with earnings management. They found that the rank based on the ratio of a firm's total NAS fees over the auditor's total fees received was positively associated with beating analysts' forecasts by a very small margin and discretionary accruals from the modified Jones model, a proxy for earnings management**.** Chung and Kallapur (2003) did not find that the ratio of non-audit services to the audit firms' total US revenue was associated with abnormal accruals (also using the modified Jones model) for the Big 5 audit firms. Similarly, Antle et al. (2002) and Ashbaugh et al. (2003) did not find evidence of earnings management. Larcker and Richardson (2004) found that the ratio of NAS fees to

[6] Institutional Shareholder Services Vice President Pat McGurn said: "The initial reaction [to the large amounts spent on non-audit services] has been a surprise. During the debate on the issue the accounting side said that this wasn't a problem, that it was rare to find a company with huge margins. Now the disclosure comes out and the gap is enormous. Companies that have huge differences and don't provide an explanation will be in trouble. We are going to be looking at proxies on a company-by-company basis and advising shareholders to vote against members of audit boards when it looks like there is a conflict. This isn't a problem with the auditing firms but with the auditing committees for allowing a potential conflict to take place."

[7] They obtained this result after controlling for the firms' financial health, such as Z-score, book-to-market, age, and equity or debt issuance.

total fees had a positive association with the absolute value of accruals (similar to Frankel et al. (2002)), but the positive association occurred for about only 8.5% of the sample.

Kinney et al. (2004), using a sample of five non-audit services from 1995 to 2000, showed that the incidence of restatements was not significantly associated with FISDI and internal audit fees but was positively associated with fees for other non-audit services. Tax service fees were negatively associated with the incidence of restatements. They interpreted this result as indicating a net benefit from tax services. Similarly, Raghunandan et al. (2001) did not find an association between restatements and unexpected non-audit services, fee ratios, and total fees.[8] In a survey of 1,500 certified public accountants (CPA) before and after the Enron scandal, Lindberg and Beck (2002) found that the CPAs considered non-audit services other than FISDI more harmful to audit independence and the appearance of audit independence after the scandals.

In summary, research in the 1980s did not find that non-audit services caused lower audit quality. These studies focused, however, on the audit quality, not directly on the quality of financial statements. Contemporary research on non-audit services, on the other hand, has found a few negative, though mostly insignificant, impacts on indicators of the quality of financial statements, such as accruals, analysts' forecasts, going concern opinions, and restatements. The results, then, are mixed, and the significance of non-audit services is unclear.

3. Development of Hypotheses

As discussed above, the impact of non-audit services on the quality of financial statements is ambiguous. Although the independence of auditors is a major concern for SEC regulators, particularly after the numerous accounting scandals in 2002, the benefits accruing from more efficient audits may not be negligible. The increasing complexity of the operating environment of corporations in the United States implies more uncertainties

[8] The unexpected fees were the residuals of regressing fees for non-audit services on economic factors such as profitability, performance, growth, and the auditor's reputation (DeFond et al., 2002). I discuss the model more in section 8.

and difficulties for auditors when they audit. For firms, the intricacy of financial reporting due to the changing environment is no less severe. Therefore, as long as the independence of the auditor is adequately preserved, it is possible that non-audit services may improve both financial reporting and the quality of the audits themselves. Auditors and firms often argue that it also is cost-effective for the auditor to provide non-audit services, because the auditor already knows the firm's business.

The impact of non-audit services on the capital market is also uncertain. The SEC and proponents of strict regulation conjecture that they will increase the information risk in the capital market. On the other hand, if an improvement in audit quality can be attributed to non-audit services, then the information risk will decrease. Even if we control for the quality of financial statements, the impact of non-audit services on information risk is still unclear. Some argue that, even if there is no impact on the quality of financial statements, non-audit services mar the appearance of audit independence. In other words, even if the auditor makes the audit decision independently, investors and users of the firm's financial statements will not be reasonably confident that the information is reliable, because of a suspicion that the managers of the firm and the auditor will maximize their own profit, not necessarily shareholders' interests. This suggests that the impact of non-audit services on information risk is positive. Firms and auditors, however, argue that non-audit services have a negative association with information risk.

Although direct empirical evidence of compromised audit quality, not to mention an impact on the capital markets, was lacking, the Sarbanes-Oxley Act of 2002 now prohibits most non-audit services. Even anecdotal evidence that non-audit services compromise audit quality is meager. Yet the audit industry, firms, and other proponents of non-audit services lack proof that non-audit services improve audit quality. Since the Act, the audit industry has undergone numerous business model changes, including reinforcement of auditors' independence and the sale of consulting divisions. The initial concern after the passage of the Sarbanes-Oxley Act of 2002, that the audit industry would suffer immensely, has proved unfounded, in part because of increased audit fees.

In this study, I examine whether non-audit services increase information risk and whether the prohibition of non-audit services in the Sarbanes-Oxley Act is justifiable. After all, it is the shareholders who are affected by the firm's performance and audit independence, and, in theory, they decide whether paying the auditor for non-audit services is justified. I also address the current debates on the allowed non-audit services—tax services—by examining the impact of detailed fees on the quality of financial statements and the proxies for the information risk. In particular, I test the following two hypotheses:

Hypothesis 1

Non-audit services have a positive (negative) association with the quality of financial statements.

Hypothesis 2

Controlling for the quality of financial statements, non-audit services have a negative (positive) association with the cost of capital and the bid/ask spread as proxies for information risk.

3.1. Measures of information risk

I employ two widely used measures—the cost of capital and the bid/ask spread—as proxies of information risk. Economic theory predicts a negative association between information asymmetry and the cost of capital. Investors demand higher return when they face a higher degree of information asymmetry. Diamond and Verrecchia (1991) show that public disclosure to reduce information asymmetry can reduce the cost of capital. The literature on disclosure often uses the implied cost of capital based on analysts' forecasts; I use one of those approaches, the implied cost of capital, derived from Ohlson (2000).[9]

Since the cost of capital captures more than just information risk, it is desirable to have an additional proxy. Another measure is the bid/ask spread. Even in competitive

[9] See Appendix B for details.

markets, information-based trading creates a spread between the bid and the ask price (Copeland and Galai, 1983; Glosten and Milgrom, 1985) because of the information asymmetry between informed and uninformed traders. Traders strive to become more informed to realize the profit created by the spread. In this study, I use the quoted percentage bid/ask spread.

3.2. Measures of the quality of financial statements

Past literature has often considered discretionary accruals as an indicator of the quality of financial statements, since excessive discretionary accruals are positively associated with opportunistic earnings management. Restatements and going concern opinions have also been used as indicators of quality. Others prefer the ability to predict future cash flows. FASB Concept Statement No. 1 (1978) states that the financial statement is not an end, but a means to provide "Information Useful in Assessing Cash Flow Prospects,"[10] and earnings and their components provide better indications of firms' performance. High quality financial statements should provide information to predict future cash flows accurately.

The first two approaches listed above are past oriented; they seek to explain how the current accounting performance is associated with past accounting information. These may not be relevant measures for the investment decision process of forward-looking investors. The third method, which attempts to predict future performance, captures the usefulness of financial statements for investors. Investors process information on the incidence of restatement, going concern opinions, and discretionary accruals when they predict future performance. Several researchers, such as Dechow et al. (1998) and Barth et al. (2001), used regression-based prediction. For example, Barth et al. (2001) regressed

[10] FASB Concept No. 1 states: "Financial reporting should provide information to help present and potential investors and creditors and other users in assessing the amounts, timing, and uncertainty of prospective cash receipts from dividends or interest and the proceeds from the sale, redemption, or maturity of securities or loans. Since investors' and creditors' cash flows are related to enterprise cash flows, financial reporting should provide information to help investors, creditors, and others assess the amounts, timing, and uncertainty of prospective net cash inflows to the related enterprise."

the future CFO on the contemporary CFO and components of accruals. This model suffers from several drawbacks. First, the developed model is for an individual firm. Since data on CFO are available only after 1987 (SFAS 87), the model cannot be fitted at the firm level. This is a problem for any model that includes CFO as an independent variable. To estimate firm-specific coefficients reliably, researchers need about 60 observations for each firm.[11] Inevitably, the regression is run over a cross-sectional time series. Then the regression requires the fitted coefficients to be the same over the cross-section. Alternatively, one may run the regression based on industry portfolio or year. Second, the model assumes that coefficients on the changes in accounting receivables and in inventory are positive, but the fitted coefficients are negative for several annual regressions, and the explanatory power (R^2) of annual regressions fluctuates significantly over the years. Third, the test that is relevant to investors would be based on out-of-sample prediction, not the explanatory power (R^2) of the regression. The fitted coefficients of the regression represent the historical elasticity of the independent variables. The relevant test for the users of the financial statements is instead whether investors can predict future cash flows.

Due to these limitations, I instead use an ordinary income-based predictor (Ronen and Sadan, 1981) that employs current ordinary income, the average of non-recurring and non-operating items in previous years, and an average of change in ordinary income in the past. Then, I use the deviation of a predictor based on the contemporary and historical financial statements from the future realization of CFO as a measure for the quality of the financial statements. This approach has two major advantages: (1) the prediction is firm-specific and does not require a regression; and (2) its prediction error is, on average, smaller than that of the regression-based model (see details in Appendix C). In addition, I use analysts' ability to forecast as a measure of predictability. Analysts often use more sophisticated, firm-specific models to predict a firm's future profit and impound updated information beyond the financial statements. Their forecasts therefore should be more precise than the ordinary income-based predictor.

[11] For example, to estimate a firm's beta, most research uses 60 monthly returns. However, it is not entirely clear how many observations are optimal to estimate firm-specific coefficients.

3.3. The ordinary income-based predictor

The predictor in this study is based on ordinary income. The firm's ordinary income proxies for its recurring net operating profit under GAAP, as it excludes non-recurring items (special items) and non-operating expenses from the earnings before extraordinary items. The ordinary income-based predictor, I_t, is defined as follows (Ronen and Sadan, 1981):

$$I_t = O_t + \frac{\sum_{i=1}^{n}(E_{t-i-1} - O_{t-i-1})}{n} + \frac{\sum_{i=1}^{n-1}(O_{t-i} - O_{t-i-1})}{n-1} \quad \text{.....,(1),}$$

$$n = 6$$

where ordinary income, O_t, is defined as follows:

O_t = Net income before extraordinary items + (Non-operating expense + Special Items) × (1 – effective tax rates);[12]

E_t = Net income before extraordinary items.

Predictive ability is measured by the absolute deviation of the ordinary income-based predictor from the one-period ahead CFO, $AbsDEV_t = | CFO_{t+1} - I_t |$.

The second term, the average of the sum of non-operating expenses and special items, provides an expectation of the average non-recurring items and non-operating items in the future. The third term adjusts for the change in the firm's ordinary income in the past. After I calculate the predictor, the difference between the next-period CFO and the predictor is the portion that is not explained by the information in the past financial statements. Let us suppose that the net income before extraordinary items of firm A in year 2001 is 100, the sum of the after-tax non-operating expense and special items is 5, and the average of them in the past 6 years is 4. In addition, the average of the change in the ordinary income over the past 5 years is 10, and the realized CFO of firm A in 2002 is

[12] In Compustat, Net income before extraordinary items (DATA 18), Non-operating expense (DATA 61), Special Items (DATA 17), Effective tax rates = Income Taxes (DATA 16) / Pretax Income (DATA 170). CFO = Operating Activities, Net CF (DATA 308) – Extraordinary income and Discontinued operations in cash flow statements (DATA 124) are used in the calculation of ordinary income.

90. Then the ordinary income is 95, the ordinary income-based predictor is 109 (95+4+10), and AbsDEV = 19. The ordinary income-based predictor captures the core operating performance and adjusts for the average of non-recurring items in the past and the average growth in ordinary income. The predictor's absolute deviation from the future cash flows captures its predictive ability. The lower the absolute deviation, the more useful the information in the firm's financial statements.[13]

3.4. Non-audit services fees

In this study, I use the proportion of non-audit services over total fees (NASRATIO) as a measure of the level of non-audit services that a firm purchases. The total fees include both audit fees and fees for non-audit services. Prior researchers have used several other measures, such as non-audit services fees over audit fees or the rank based on the ratio of a firm's total non-audit services fees over the auditor's total fees received (Frankel et al., 2002), and the ratio of non-audit services to the audit firms' total U.S. revenue (Chung and Kallapur. 2003). Since the results based on analysis using non-audit services fees over audit fees are similar, I omit them.

The determinants of predictive ability, H1

Predictability is measured by the absolute deviation of the ordinary income-based predictor from the future cash flows from operation (AbsDEV). AbsDEV is likely to be affected by various accounting characteristics.

a. Size.

The absolute deviation of bigger firms will be larger than that of smaller firms. I control for size by dividing AbsDEV by total assets.[14] Size also measures the

[13] Another dimension not considered in this study is the variance of the absolute deviation. The variance captures the reliability of the prediction. I intend to include the variance in a future study.

[14] I also present the results when using AbsDEV divided by the market cap (AbsDEV/MKTCAP).

information environment of the firm. It could affect AbsDEV negatively, because larger firms receive greater attention from regulators. I explain how I control for the information environment below.

b. Variability of ROE

If the past accounting performance of the firm is more volatile, it is more difficult to predict its future performance with a high degree of precision. I use the standard deviation of ROE to control for the variability of past ROE. From the viewpoint of shareholders, ROE is a more relevant measure. One could also use standard deviation of ROA, EPS, or EPS growth. Since the result is qualitatively similar when these other measures are used, I proceed with ROE. I predict a negative association between the variability of ROE and the predictive ability measures (that is, a positive association between the variability of ROE and the absolute deviation).

c. Growth—Book-to-market

I control for a firm's growth by using the book-to-market ratio. It is more difficult to predict the future performance of high-growth firms, because they face greater uncertainty. One problem with the variable is that in some cases the ratio is negative. To control for this possibility, I expect that a positive book-to-market ratio is positively associated with the deviation and a negative ratio is negatively associated with the deviation. I employ an indicator variable for the negative book-to-market ratio and an interactive variable of the indicator and the ratio.

d. Operating complexity—Number of segments

More complex environments also affect the ability to predict future performance. The number of segments in a firm proxies for its operating complexity. Operating complexity is predicted to be negatively associated with the measures of predictive ability (positively associated with the deviation).

e. Discretionary accruals

Earnings management literature often uses discretionary accruals as a proxy for the quality of financial statements. However, it is not yet known whether such discretion

adds to or decreases predictability. I use the absolute value of discretionary accruals (scaled by total assets) from the modified Jones model to ascertain whether there is an impact on predictability. The larger the discretionary accruals are, the more likely they signal that the firm manages earnings in opportunistic ways, which would reduce the predictive ability of its financial statements.

f. Information environment—Number of analysts and a loss indicator

As mentioned above, the information environment of large firms differs from that of smaller firms. There are many proxies for the information environment, such as total assets, market capitalization, and number of analysts following. Because I deflate AbsDEV by total assets or market capitalization, I control for the information environment using the number of analysts following the firm. In addition, prior literature has shown that the information environment of loss firms could be different than that of non-loss firms (Hayn, 1995). Such firms are operated with a higher degree of information asymmetry (Ertimur, 2004), so there is more uncertainty regarding their future performance. To a certain extent, controlling for loss also controls for other financial distress. I therefore include an indicator for a firm if the firm's earnings after extraordinary items are negative.

g. Audit quality—The Big 5/4 and going concern opinions

The audit quality of a firm affects the reliability of the information in its financial statements. I control for such reliability by using two measures: Big 5/4 auditors and the auditor's going concern opinion. There is evidence that the market perceives the audit quality of the Big 5/4 to be higher (Teoh and Wong, 1993; Krishnan, 2003a). Their audit clients have higher quality earnings, because the auditors are more likely to issue modified audit opinions (Francis and Krishnan, 1999, 2002), and these clients also have lower discretionary accruals (Becker et al., 1998; Francis et al., 1999; Krishnan, 2003b). The auditor's going concern opinion constitutes another measure of the reliability of a firm's financial statements. Predicting the future cash flows of firms with going concern audit opinions will be more difficult than for firms with clean audit opinions. I employ an indicator variable that equals 1 in the case of a clean opinion and 0 in the case of a going

concern opinion. I expect these two measures to be positively associated with the predictive ability.

h. Leverage

Firms with high leverage tend to choose less risky projects (Myers, 1977). In this case, predictability increases. The leverage is, however, also a measure of risk. Thus, it is unclear whether leverage will have a positive or negative association with predictive ability.

i. Industry effects

Finally, I control for industry effects. When a firm is in an industry that tends to be more stable, such as utilities, prediction is easier. I use the mean of AbsDEV/TA of firms in the same industry to control for such effects.

Given the control variables described above, I obtain the following regression:

$$\begin{aligned} AbsDEV_{it}/TA_{it} = {} & \alpha_{it} + \beta_1 NASRATIO_{it} + \beta_2 BTM_{it} + \beta_3 I\_NEGBTM_{it} + \beta_4 I\_NEGBTM_{it} \\ & \times BTM + \beta_5 STDROE_{it} + \beta_6 LEVERAGE_{it} \\ & + \beta_7 AbsDACC_{it} + \beta_8 SEGMENT_{it} + \beta_9 NUMEST_{it} + \beta_{10} LOSS_{it} \\ & + \beta_{11} Big5/4_{it} + \beta_{12} AUDITOPINION_{it} + \beta_{13} \overline{AbsDEV/TA_{ind}}. \end{aligned}$$

The determinants of the cost of capital

a. Risk factors

My determinants of the cost of capital mostly follow previous literature (Gode and Mohanram, 2003). The accounting-based cost of capital measure is associated with the following risk factors: (1) beta(measured over the previous 60 months)—the capital assets pricing model predicts that the cost of capital is positively associated with beta; (2) the *volatility of unsystematic returns* in the past year—this is positively associated with the cost of capital (Malkiel and Xu, 1997); (3) *earnings volatilities*—these measure the stability of a firm's earnings, and the stability is negatively associated with the cost of capital. I use the same measure as the one in the predictive ability regression (STDROA, the standard deviation of the previous 5 years of ROA). The result is unchanged when

using different measures, such as the standard deviation of ROE, EPS, EPS growth, and analysts' forecasts. To a certain extent, the predictive ability measure, AbsDEV, captures some of the stability effects. I do not control for PE ratios or market-to-book ratios because the Ohlson-Juettner model uses E/P directly, and including the PE ratio would result in misspecification in the regression (Gode and Mohanram, 2003). The final risk factor that I include as a regressor is *leverage*. Modigliani and Miller (1966) have shown that leverage is positively associated with the cost of capital. Despite the controversy on the optimal debt structure, it is generally accepted that leverage is a risk factor that affects the cost of capital.

b. The information environment—Number of analysts and a loss indicator

The literature on disclosure has shown that a higher level of disclosure can mitigate the information asymmetry between the capital market and firms, so disclosure will have a negative association with the cost of capital (Botosan, 1997; Botosan and Plumlee, 2001). I incorporate the number of analysts that follow the firm (and issue forecasts) to control for the information environment, and I use a loss indicator to control for the abnormal information environment of loss firms.

c. Industry effects—$\overline{COC}_{Ind}$

Gebhardt et al. (2001) found that the industry mean of the cost of capital is dominant in explaining the cross-sectional variation in the cost of capital. I therefore control for the industry effect.

I run the following regression for the cost of capital:

$$COC_{it} = \alpha + \beta_1 \frac{AbsDEV_{it}}{TA_{it}} + \beta_2 NASRATIO_{it} + \beta_3 NUMEST_{it} + \beta_4 STDROA_{it} + \beta_5 beta_{it} + \beta_6 UNSYST_{it} + \beta_7 LEVERAGE_{it} + \beta_8 LOSS_{it} + \beta_9 \overline{COC}_{Ind} + \eta_{it}.$$

The determinants of the bid/ask spread

Prior literature has identified the following control variables for the bid/ask spread: size, variability of returns, trading volume, exchange, and losses. The size

controls for the information available in the capital market (Roulstone, 2003). Market makers require higher inventory costs for stock with high volatility attributable to noisy trading (Kyle, 1985; Roulstone, 2003). Trading volume is inversely related to the bid/ask spread, since specialists anticipate a certain level of inventory, thereby lowering inventory costs (Benston and Hagerman, 1974; McInish and Wood, 1992; Roulstone, 2003). There are institutional differences between NYSE and NASDAQ firms. The trading costs for NASDAQ-listed firms are higher (Macey and O'Hara, 2002), and the degree of adverse selection is higher for NYSE-listed firms (Bessembinder and Kaufman, 1997). The better way to control for these structural differences is partitioning the sample into two groups and estimating the regression separately. To preserve a larger sample, I instead use an indicator variable for NASDAQ firms. I control for loss firms as well, as losses have been shown to be positively associated with the bid/ask spread (Ertimur, 2004). Finally, I include the industry mean of the bid/ask spread to control for industry-wide information asymmetry. I estimate the following regression:

$$SPREAD_{it} = \alpha + \beta_1 \frac{AbsDEV_{it}}{TA_{it}} + \beta_2 NASRATIO_{it} + \beta_3 SIZE_{it} + \beta_4 VOLUME_{it} + \beta_5 RETVOL_{it} + \beta_6 LIST_{it} + \beta_7 LOSS_{it} + \beta_8 \overline{SPREAD_{ind}} + \phi_{it}.$$

4. Research Design

The two hypotheses, H1 and H2, and the discussion in section 3 can be translated into the following system of equations:

H1:

$$\begin{aligned} AbsDEV_{it} / TA_{it} = {} & \alpha_{it} + \beta_1 NASRATIO_{it} + \beta_2 BTM_{it} + \beta_3 I\_NEGBTM_{it} \\ & + \beta_4 I\_NEGBTM_{it} \times BTM + \beta_5 STDROE_{it} + \beta_6 LEVERAGE_{it} \\ & + \beta_7 AbsDACC_{it} + \beta_8 SEGMENT_{it} + \beta_9 NUMEST_{it} + \beta_{10} LOSS_{it} \\ & + \beta_{11} Big5/4_{it} + \beta_{12} AUDITOPINION_{it} + \beta_{13} \overline{AbsDEV / TA_{ind}} \end{aligned} \quad \text{.....(2)}$$

H2

$$COC_{it} = \alpha + \beta_1 \frac{AbsDEV_{it}}{TA_{it}} + \beta_2 NASRATIO_{it} + \beta_3 NUMEST_{it} + \beta_4 STDROA_{it} + \beta_5 beta_{it} + \beta_6 UNSYST_{it}$$
$$+ \beta_7 LEVERAGE_{it} + \beta_8\ LOSS_{it} + \beta_9 \overline{COC}_{Ind} + \eta_{it} \quad \text{.....(3)}$$

$$SPREAD_{it} = \alpha + \beta_1 \frac{AbsDEV_{it}}{TA_{it}} + \beta_2 NASRATIO_{it} + \beta_3 SIZE_{it} + \beta_4 VOLUME_{it} + \beta_5 RETVOL_{it}$$
$$+ \beta_6 LIST_{it} + \beta_7 LOSS_{it} + \beta_8 \overline{SPREAD_{ind}} + \phi_{it} \quad \text{.....(4)}$$

In addition, I include indicator variables for the year, 2001 and 2002, in (2), (3), and (4) to control for the time effect that might have existed during 2000-2002.

Definitions of the Variables

AbsDEV = $|CFO_{t+1}$ – the ordinary income-based predictor in (1), where CFO_t = DATA308-DATA124.
AbsDEV/TA = AbsDEV/Total assets
$\overline{AbsDEV / TA_{ind}}$: Average of AbsDEV/TA of all other firms in the same industry.
AUDITOPINION = 1 if a clean opinion, 0 if the audit opinion includes a going concern opinion (hand collected in the proxy statement, DEF 14A).
beta: beta measured over the previous 60 months (OLS regression).
Big5/4 = 1 if the audit firm is one of the Big 5/4, 0 otherwise (DATA149 in Compustat).
BTM = Book value / Market capitalization.
COC: Cost of capital based on the Ohlson-Juettner (2001) model, where EPS_1 and EPS_2 are measured in the 6 months before the end of fiscal year t+1; see Appendix A.
$\overline{COC}_{Ind}$: Average COC of all other firms in the same industry.
AbsDACC: | Discretionary Accruals |/Total assets (using the modified Jones model, Appendix B).
I_NEGBTM = 1 if BTM is negative, 0 otherwise.
LEVERAGE = Long-term debt/Total assets.
LIST = 1 if the firm is listed on NASDAQ, 0 otherwise.
NASRATIO = Total non-audit services fees/Total fees paid to the auditor.
NUMEST: Number of analysts' forecasts.
RETVOL: Natural logarithm of the standard deviation of the holding period return over 1 year starting from 3 months after the end of fiscal year t.
SEGMENT: Number of segments.
SIZE: Natural logarithm of the market capitalization.
SPREAD: Mean bid/ask spread over 1 year starting from 3 months after the end of fiscal year t.
$\overline{SPREAD_{ind}}$: Average spread of all other firms in the same industry.
STDROA: Standard deviation of ROAs in the past 5 years.
STDROE: Standard deviation of ROEs in the past 5 years.

LOSS = 1 if the firm reports a negative net income before extraordinary items, 0 otherwise.
UNSYST: Volatility based on the residual of the market model over the year.
VOLUME: Natural logarithm of the mean trading volume over 1 year starting from 3 months after the end of fiscal year t.

Although (2) and (3) or (2) and (4) form a system of equations that normally requires instrumental variables estimation or second-stage linear regression (2SLS), the equations are in fully recursive form,[15] so a separate OLS regression is as efficient as 2SLS. (Greene, 2002). Since using 2SLS did not change the result qualitatively, I present the result of OLS regression, using White's (1980) heteroskedasticity-adjusted variance estimator.

The coefficients on NAS in (2) and in (3) and (4) address the bi-directional hypotheses H1 and H2, respectively. If non-audit services affect the predictive ability positively, the coefficient on NAS in (2) will be positive. Similarly, if the information risk decreases because of non-audit services, the coefficient on NAS in (3) and (4) will be positive. I also expect that the predictive ability (AbsDEV/TA) is positively associated with the cost of capital and the bid/ask spread (negative coefficients on AbsDEV/TA in (2) and (3)). The predictive ability may be positively associated with a firm's disclosure quality. If investors were able to predict its future cash flows with high precision (lower absolute deviation), one can argue that the firm's disclosure quality is high. To the extent that proxies for the information environment in both (2) and (3) control for the level of disclosure, the impact of AbsDEV/TA could be insignificant.

5. Sample and Descriptive Statistics

[15] If one can combine equations in the simultaneous equations model linearly, and, as a result, each equation in the model is identified, we call the model fully recursive. For example, the simultaneous equations below are fully recursive.
$y_1 = x' \beta_1 + \varepsilon_1$ (a)
$y_2 = x' \beta_1 + y_1 + \varepsilon_1$ (b)
Equation (a) is identified, and if we replace y_1 in (b) with equation (a), (b) is identified. In the case of fully recursive model, separate OLS is as efficient as 2SLS. (Greene, 2002).

I gathered the samples meeting the requirements of H1 and H2 separately.[16] For H1 (equation (2)), the sample consists of firms meeting the following conditions simultaneously:

1. For fiscal years 2000–2002, data on non-audit services are available in the Compustat Audit Fees database.[17]
2. Data for calculation of the ordinary income in the current fiscal year and the preceding 5 years are available in Compustat Industrial.
3. CFO_{t+1} is available in Compustat Industrial.
4. The firm is not in the financial industry (SIC 6000-6999).
5. Data for calculation of the book-to-market ratio (BTM), the standard deviation of ROAs in the previous 5 years (STDROA), leverage (LEVERAGE), the loss indicator (LOSS), and the Big 5/4 auditor indicator (Big5/4) are available in Compustat Industrial.
6. The number of segments (SEGMENT) is available in Compustat Business.
7. An indicator of the auditor's going concern opinion (AUDITOPINION) is identified in the proxy statements (DEF 14A).

I gathered data on non-audit services in Compustat Audit Fees. The number of firms that disclosed non-audit services during 2000–2002 and not in the financial industry (SIC 6000-6999) is 7,324. There are 4,129 firms that meet the requirements above. Due to requirement 3, firms that went out of business in the following year are eliminated, so my results could suffer from survivorship biases. Requirement 2 precludes young firms, e.g., Internet firms that were IPOed in the late 1990s and early 2000s. In H2, I run two regressions, equations (3) and (4). To maximize the sample size, from the sample that meets 1–7 above, I construct the two samples for H2 under the following conditions:

[16] Ideally, the sample should be gathered to run H1 and H2 simultaneously, but the sample size would be smaller due to various requirements in IBES and TAQ. The results using the sample that meets the data requirements of all three equations are qualitatively similar. The sample was constructed to meet all requirements, 1-7, 8a-11a, and 8b-11b. The total number of firms in the sample is 2,219.

[17] This database contains auditor name, audit fee, non-audit services fees, and detailed disclosure of audit fees and non-audit services fees in the proxy statements (DEF 14A).

For equation (3) in H2:

8a. EPS_1 and EPS_2 are available in IBES 6 months before the fiscal year end of t+1. The number of estimates (NUMEST) is the number of analysts' estimates of EPS_1.

9a. Monthly returns of the previous 60 months are available in CRSP (for the calculation of beta).

10a. Daily returns are available over the year starting from 3 months after the end of the current fiscal year (for the calculation of the volatility of unsystematic returns and return variability).

11a. Data for calculation of leverage and standard deviation of ROA for the previous 6 years are available in Compustat.

There are 2,323 firms that meet requirements 8a–11a.

For equation (4) in H2:

8b. The bid and ask (offer) price is available in TAQ Quote.

9b. The amount of trading is available in TAQ Trade.

10b. The exchange list is available in CRSP.

11b. Daily returns are available over the year starting from 3 months after the end of the current fiscal year (for the calculation of the volatility of unsystematic returns and return variability).

There are 2,785 firms that meet requirements 8b–11b.

Table 2a describes the sample[18]. The firms included in the sample (N = 4,129) tend to be sizeable. Fees for non-audit services constitute 45% of the total fees. Among four categories of non-audit services,[19] the proportion for other non-audit services is highest. The mean of beta is 0.90, and the volatility and the daily unsystematic return volatility average 3.4% and 3.6% respectively. ROA averages -4.1%. and the standard

[18] In Table 1, the data in the variables at the highest 1% and the lowest 1% are excluded in the calculation of mean, standard deviation, minimum and maximum.

[19] The four categories are audit-related services, financial information systems design and implementation (FISDI), tax-related services, and other services.

deviation of ROA, which indicates the volatility in firms' profitability, averages 13.6%. The cost of capital averages 15.9% (N = 2,323), and the average daily percentage bid/ask spread is about 7.5% (N = 2,785). On average, the absolute deviation of the ordinary income-based predictor from one-period-ahead CFO is 15.9% of total assets. Industry composition is shown in Table 2b. Although firms in manufacturing occur most often, there was no significant clustering in any one industry.

Overall, the firms included in the sample can be characterized as having sizeable market capitalization and total assets, and spending more on non-audit services, compared to the firms excluded from the sample.[20]

6. Univariate Tests

I form the decile portfolios based on the proportion of non-audit services fees over total fees and then compare the mean of absolute deviation/total assets, the measure of predictive ability, the cost of capital, the bid/ask spread, and other variables between the highest and lowest decile. In Table 3, I report the t-test of the mean differences of the various measures of interest between the two deciles. The highest decile, which has the most non-audit services, has lower absolute deviation/total assets (the difference = -0.211, p-value = 0.00%). It also has lower cost of capital and a lower bid/ask spread. The differences are -6.5% (p-value = 0.00%) for the cost of capital and -2.46% for the bid/ask spread (p-value = 0.00%).

It is difficult to conclude which group is more risky. The highest decile has a higher beta and more operating segments, but the lowest decile has more volatile earnings (standard deviations of ROA and ROE) and slightly more volatile unsystematic returns. Leverage and book-to-market are not significantly different between the two deciles. The firms with the highest fees for non-audit services tend to be larger in total assets and more capitalized. ROA and ROE are larger, and the stability of ROA and ROE is lower in the

[20] Initially, the number of the firms that reported the non-audit services fees in 2000–2002 is 7,324. The number of the firms excluded in the sample totals 3,195.

highest decile; firms with a higher proportion of non-audit services fees are more profitable, and the profitability is more stable. The trading volume is higher for the highest decile.

The information environment seems to be more favorable for the highest decile. The number of analysts following the firms is higher, and the deviation of analysts' forecasts from the actual EPS is lower. As stated earlier, total assets and market capitalizations are higher. In addition, the incidence of loss is lower for the highest decile.

The results of the univariate tests show that non-audit services are positively associated with predictive ability and negatively associated with proxies of information risk. However, the control variables that affect predictability, the cost of capital and the bid/ask spread, are not similar between the two deciles.

In Table 3c, I compare the accounting scandal firms and their industry peers. After all, these accounting scandals triggered the restrictions on non-audit services. Accordingly, it is instructive to investigate whether there exists a difference in non-audit services, predictive ability, and information risk proxies. Not all of the scandals are included in the constructed sample, in part because of mergers and acquisitions. For example, AOL Time Warner, which inflated its results via "round-trip" deals with advertisers and suppliers and barter deals in fiscal year 2001, is excluded because data to calculate its ordinary income-based predictor and beta (from before the merger) are unavailable. The constructed sample includes 15 of the 23 scandal firms from the period 2001–2002. Some firms went out of business (notably, Enron) and thus appear in the sample only once or twice. Industry peers are gathered in the constructed sample (the sample of H1).[21]

There was no difference in non-audit services fees/total fees between the scandal firms and their industry peers. Likewise, predictive ability did not differ between the two

[21] It should be noted that some of the firms in the peer group might have accounting problems, but they have not been spotted. To the extent that the peer groups include those firms, the comparisons are not meaningful. Investigating how the accounting scandal firms were different needs more careful and sophisticated methodology.

groups. The cost of capital was lower for the scandal firms (by -5.9%, p-value = 0.06%). There was no significant difference in the bid/ask spread. These results in the univariate tests show that the fees for non-audit services were not higher and the proxies of information risk were not greater for these firms than for their industry peers. This suggests that the cause of the accounting scandals may not be related to the non-audit services they received. In addition, the scandal firms were larger and were more stable in ROA. There were no differences in beta, volatility of unsystematic returns, and book-to-market ratio.

7. Results on the Main Hypotheses

The results of the regressions of equations (2), (3), and (4) are reported in Tables 5, 6, and 7. In addition to AbsDEV/TA, I use a different measure of predictability: absolute deviation divided by market capitalization (AbsDEV/MKTCAP). I also measure the predictive ability as the deviation of the one-period-ahead earnings (before extraordinary items).[22]

Column 1 of Table 4 shows that the ratio of non-audit services fees to total fees is negatively associated with AbsDEV/TA (-0.057, p-value <1%), which suggests that there exists a benefit from such services. This result, however, is sensitive to the choice of deflator. Of the other three measures available, for two, non-audit services are positively associated with predictive ability. In the remaining case, that is, when AbsDEV/MKTCAP is used as the dependent variable, non-audit services fees have an insignificant association with predictive ability. The control variables, in general, have the predicted sign. Earnings volatility (STDROE) is positively associated with the deviation (0.032, p-value < 0.1%). Leverage has a negative but statistically insignificant association (0.113, p-value = 0.47%). The number of analysts following has a negative association with the deviation (-0.001, p-value = 8%), indicating that it is easier to predict a firm's future cash flows when its information environment is more favorable. The loss

[22] Although it is common to measure future performance as the one-period-ahead CFO or aggregate of CFO, there are some disagreements on which measure captures future performance better. Among the other measures that have been used are earnings.

firm indicator is also positively associated with the absolute deviation (0.121, p-value < 0.1%), reflecting a negative information environment. Discretionary accruals have a positive but insignificant association with the absolute deviation (0.008, p-value = 15%). Since such accruals have been used to assess the quality of financial statements, this association requires further investigation. One possible answer is that the independent variables in the regression also proxy for the quality of financial statements. Book-to-market ratio (BTM) has an insignificant association with the absolute deviation when it is positive. On the other hand, when BTM is negative, it affects the absolute deviation positively. The number of segments, which captures the complexity of a firm's operations, does not have a significant association with the deviation. Big5/4 and AUDITOPINION, which proxy for the reliability of the information in a firm's financial statements, have a negative association with the absolute deviation (-0.087, p-value = 1%; -0.026, p-value = 7%, respectively). The industry mean of AbsDEV/TA is positively associated with each firm's AbsDEV/TA (0.037, p-value < 0.1%). The industry mean captures the cases in which a firm is in an industry wherein it is more difficult to predict the future cash flows from operations. The indicator for the year did not have a material impact on the absolute deviation.

Table 6 presents the results of the regression of equation (3). The absolute deviation has a positive association with the cost of capital for all measures of predictive ability (the p-value is at least 1%). Thus, the higher the predictability, using a predictor based on the information in a firm's financial statements, the lower the cost of capital. The ratio of fees for non-audit services to total fees has a negative association with the cost of capital (p-value < 1%). In the test of H2, therefore, I find that the information risk attributable to non-audit services is lower, controlling for the impact of the quality of financial statements. The control variables have the predicted association with the cost of capital. The volatility of unsystematic returns, leverage, and earnings volatility have the predicted positive coefficients (p-value < 1%). beta, however, does not have a significant association with the cost of capital. This result is in line with Gebhardt et al. (2001), who show that the impact of beta is insignificant when the industry mean of the cost of capital is included. The information environment variables have the predicted sign; the number

of analysts' forecasts has a negative association. The loss firm indicator has a positive association. This supports the argument that the information environment of negative earnings is different, creating more uncertainty (higher information asymmetry).

Table 7 reports the regression result of the bid/ask-spread equation (3). The predictive ability does not have the expected positive association. One possible explanation is misspecification of the period of the bid/ask spread. Although the fees a firm pays for non-audit services are publicized in the first or second month prior to the fiscal year-end, the firm's financial statements are available in the third month of the next period of the fiscal year. Since most of the information is already available when earnings are announced, the specified period may not be matched with the period of interest to this study.[23]

On the other hand, the ratio of non-audit services fees to total fees are negatively associated with the bid/ask spread in all the regressions (-0.023, p-value < 1%). I therefore find that the information risk is lower for firms with high fees for non-audit services ratio.

The firm's market capitalization, which measures its information environment, has a negative association with the spread (-0.019, p-value < 0.1%). The coefficient on trading volume is positive associated with the spread (0.041, p-value <0.1%), and return variability has also positive association (0.61, p-value < 10%). On the other hand, the loss indicator has an insignificant association. This differs from Ertimur's (2004) result, which showed that loss firms have a positive association with the bid/ask spread. The industry mean of spread explains the cross sectional difference explain much of cross sectional variance of firms' bid/ask spread; the former has a positive association with the spread (0.743, p-value < 0.1%). The indicator for NASDAQ-listed firm has a negative association with the spread (-0.073, p-value < 0.1%).

[23] I discuss this issue further in section 8 and intend to address this concern in the next draft.

The analysts' consensus forecast as a predictor

In Table 8, I repeat the analysis based on the analysts' forecast error.[24] The predicted value is the firm's actual EPS in the next period after the fiscal year-end, t+1, and its predictor is the consensus forecast (EPS_1). The forecast error is defined as $\frac{\left|\text{Actual EPS}_{t+1}\text{-Analysts' Consensus Forecast}\right|}{\text{Actual EPS}_{t+1}}$. If analysts process information on the firms more efficiently, their forecasts should indicate the future more accurately. Also, their forecast models of EPS tend to be more sophisticated, firm-level models, whatever their exact form might be. The association between non-audit services and analysts' predictive ability tests the usefulness of non-audit services for their forecasts. I estimate equation (2), after replacing STDROE with the standard deviation of the analysts' consensus forecast. The variable controls for the forecast environment in the analysts' community.[25] The result is reported in the second column of Table 8. The coefficients on non-audit services are negative (-0.06, p-value < 5%). The results for equations (3) and (4) are qualitatively similar. Fees for non-audit services are negatively associated with the cost of capital and the bid/ask spread (-0.041, p-value < 0.1%; -0.004, p-value < 1%, respectively). The deviation of the analysts' forecast is positively associated with the cost of capital, but not with the bid/ask spread.

Do the components of non-audit services have differing impacts on predictive ability and information risk?

In Table 8, the total fees for non-audit services are broken into their individual components: information system design (INFORATIO), audit-related (AUDITRELRATIO), tax (TAXRATIO), and other (OTHERRATIO). In particular, it should prove interesting to determine the impact of tax services on predictive ability and

[24] The total numbers of observations (N) in H1 and H2 are different due to the availability of analysts' forecast errors in the IBES database. In H1, there are 4,858 firm-year observations. In H2, N = 3,893 for the cost of capital regression and N = 2,827 for the bid/ask spread regression.

[25] The result is qualitatively similar when both STDROE and STDEV are included in the regression.

information risk. Under the current regulatory regime, tax services are the only non-audit services that the auditor can provide. The results in Table 8 show that all the components other than tax service have a negative association with both absolute deviation scaled by total assets (AbsDEV/TA). Therefore, tax services have no impact on the predictive ability. Controlling for AbsDEV/TA, all the components other than the information system design have negative association with the cost of capital. Other than the impact on the predictive ability, there is no positive benefit from the information system design. Two of the components – other and audit related non-audit services – have a negative association with the mean bid/ask spread. None of the components in non-audit services have positive association with either the predictive ability or the proxies for information risk.

8. Robustness of the Results

As reported in Tables 5-8, I repeat the analysis using different inflators and different predicted variables. The choice of deflator for absolute deviation (AbsDEV) does not affect materially the results of the main tests. Prediction of future earnings, rather than future CFO, does not change the results, either. I also deflate AbsDEV by the realization of CFO at t+1. Non-audit services do not have a negative association with $AbsDEV/CFO_{t+1}$, but they do have a negative association with the cost of capital and the bid/ask spread. In H2, I include the firm's size (log of total assets or log of market capitalization) and institutional holdings as independent variables and obtain qualitatively similar results. In the regression of H2, both variables have a negative association with the cost of capital.

The quoted percentage bid/ask spread has a limitation, in that the spread does not reflect actual trading. In the microstructure literature, the use of the effective spread is common:

$$\text{Effective spread} = 2 \times |\text{Transaction price} - \text{midpoint of bid and ask price}|$$

$$\text{Percentage effective spread} = \frac{2 \times |\text{Transaction price} - \text{mid point of bid and ask price}|}{\text{mid point of bid ask price}}.$$

It is also possible to decompose the effective spread into adverse selection, trading, and inventory components. For example, Glosten and Harris (1985) run the following regression:

$$\Delta P_t = c_0 Q_t + c_1 Q_t V_t + z_0 Q_t + z_1 Q_t V_t + \varepsilon_t \quad \text{.....(5)}$$

where P is the transaction price;
Q is the trading sign, equaling 1 if buyer-initiated, -1 if seller-initiated;[26] and
V is the trading volume.

The adverse selection component is calculated as follows:

$$Z_i = \frac{2(z_{0,i} + z_{1,i}\overline{V}_j)}{2(c_{0,i} + c_{1,i}\overline{V}_j) + 2(z_{0,i} + z_{1,i}\overline{V}_j)} \quad \text{.....(6)},$$

where $\overline{V}$ is the average trading volume over the period of the regression.

Calculating the midpoint of the bid and ask price just before the transaction and calculating the trading sign are challenging tasks. The trading data are created second by second, and trading has increased enormously in recent years. I intend to repeat the analysis using the effective spread in the future. For now, I have picked 1,000 firms randomly among the sample of bid/ask regression (4) and found that the result is qualitatively similar. I also calculated the adverse selection component of the bid/ask spread as in Glosten and Harris (1985). Although the component captures the information asymmetry, there are indications that it still contains trading and inventory information (Van Ness et al., 2001). I therefore replaced the quoted percentage bid/ask spread with the information asymmetry part of bid/ask spread (6) from Glosten and Milgrom (1985) in regression (4) and repeated the analysis. The result was qualitatively similar, and AbsDEV was positively associated with the adverse selection components of the bid/ask spread. It should be noted that I conducted the analysis with the reduced sample, and analysis with the full sample may yield different results.

[26] Lee and Ready (1991) provide the algorithm for measuring the trading sign.

Another concern is endogeneity of the non-audit services in the model. Firms may choose varying levels of non-audit services due to their size, risk, pension plan, mergers and acquisitions, and financing, such as issuance of equity or debt. These variables could jointly determine non-audit services fees, the predictive ability and proxies of information risk – cost of capital and bid/ask spread. In this case, the endogeneity of the non-audit services is a concern. DeFond et al. (2002) suggest a model to control for expected fees. I employed a similar model of non-audit services fees[27] and repeated the analysis using 2SLS (not reported). The result is qualitatively similar—non-audit services fees have a negative association with absolute deviation scaled by total assets (AbsDEV/TA) and, controlling for AbsDEV/TA, non-audit services fees are negatively associated with the cost of capital and the bid/ask spread.

9. Conclusion

In this study, I investigate the impact of non-audit services on the predictive ability of financial statements and their impact on information risk as reflected in the capital market. I do not find that non-audit services are negatively associated with them. At a minimum, there is evidence that non-audit services contribute to the predictive ability incrementally. Information risk also decreases, even after controlling for

[27] Similar to DeFond et al. (2002) I modeled the non-audit services fees as follows:

$$\frac{NAS\ FEES}{ASSETS} = \beta_0 + \beta_1 Big5 + \beta_2 ROA + \beta_3 RETURN + \beta_4 LEV + \beta_5 INSTITUTIONAL$$
$$+\beta_6 SPECIAL\ ITEMS + \beta_7 BOOK\ TO\ MARKET + \beta_8 SEG + \beta_9 FOROPS + \beta_{10} EMPLAN\ ,$$
$$+\beta_{11} INITIAL\ YEARS + \beta_{12} MERGER + \beta_{13} FINANCE + \beta_{14} SALES\ GROWTH + \varepsilon$$

where RETURN = the firm's stock returns over the fiscal year; LEV = total liabilities over total assets; INSTITUTIONAL = the percentage of institutional holdings at the fiscal year-end; SPECIAL ITEMS = 1 if the firm had negative special items, 0 otherwise; SEG = the number of segments disclosed in the segment footnote; FOROPS = 1 if the firm had foreign operations, and 0 otherwise; EMPLAN = 1 if the firm had a pension or post-retirement plan, 0 otherwise; MERGER = 1 if the firm had acquisitions during the fiscal year , 0 otherwise; Finance = 1 if the firm issued equity or debt during the fiscal year; SALES GROWTH = the growth in sales over the prior year.
My model differs from that in DeFond et al.; they used Log (NAS FEES) as dependent variables and Log (Assets) as explanatory variables in their model.

predictive ability. This raises a question about the justification for the restrictions imposed by the Sarbanes-Oxley Act on non-audit services provided by auditors for more than 30 years.

One caution to interpretation is that my results do not indicate causality; namely, it does not indicate that non-audit services induce a lower cost of capital or a lower bid/ask spread. My results show simply associations between the non-audit services and information risk. As a researcher, I can only observe the outcomes—fees for non-audit services, predictive ability, the cost of capital, and the bid/ask spread. Disclosures of non-audit services fees are insufficient to reveal exactly what services the auditor provided and how much benefit was expected. Often the footnotes following the disclosures are vague and do not provide an exact breakdown of the charges. What has been surprising is that not much effort has gone into investigating the specific and actual interactions among audit services, non-audit services, and firms. Without such detail, the causality of the relations cannot be identified. Future research would do well to focus on this issue, particularly when arguing for repeal of the Sarbanes-Oxley restrictions.

Moreover, despite many restrictions on non-audit services and safeguards put in place to guide the audit committee and management in the Sarbanes-Oxley Act of 2002, the auditor can still communicate with the firm. The economic bonding problem cannot be solved completely so long as the firm pays the auditor's fee. Even after the ban on most non-audit services, auditors' compensation did not decline materially, in part because of increased audit fees and new opportunities arising from Section 404 of the Act.

In addition, a market failure attributable to accounting scandals in 2001 and 2002 did indeed occur, and the systemic reasons have yet to be discovered. If non-audit services and bundled offers are not to blame, what factors should be held accountable?

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Table 1. Definitions of the Variables

Variables	*Definition*
NASRATIO	Total non-audit service fees/ Total fees paid to auditor.
INFORATIO	Financial Information System Designs and Implementation (FISDI) fees/Total fess paid to auditor
OTHERRATIO	Fees on Other non-audit services/Total fees paid to auditor
AUDITRELRATIO	Audit related non-audit services fees/Total fees paid to auditor
TAXRATIO	Tax related non-audit services fees/Total fees paid to auditor
AbsDEV/MKTCAP	$\left\|\frac{CFO_{t+1} - \text{Ordinary income-based CFO Predictor}_t}{Market\ capitalization_t}\right\|$; see section 4.1 for a precise definition of the ordinary income-based CFO predictor.
AbsDEV/TA	$\left\|\frac{CFO_{t+1} - \text{Ordinary income-based Predictor}_t}{Total\ Assets_t}\right\|$.
$AbsDEV_{Earn}/TA$	$\left\|\frac{Earnings_{t+1} - \text{Ordinary Income based Predictor}_t}{Total\ Assets_t}\right\|$, where earnings is adjusted for the extraordinary items.
AbsDACC	| Discretionary accrual based on modified Jones model | / Total assets.
Analysts' Forecast Error	$\left\|\frac{Actual\ EPS_{t+1} - \text{Analysts' Consensus Forecast}}{Actual\ EPS_{t+1}}\right\|$, where the analysts' consensus forecast is determined 6 months before the fiscal year-end of t+1.
$\overline{AFE}_{Ind}$	The average analysts forecasts error of all other firms in the same industry.
AUDITOPINION	AUDITOPINION = 1 if a clean opinion, 0 if the audit opinion includes a going concern opinion.
beta	β computed using 60 months of lagged monthly returns.
Big5/4	Big5/4 =1 for Big5/4 audit firms, = 0 otherwise.
BTM	Book value / Market capitalization
Cost of Capital	Ohlson-Juettner (2000) model of Cost of capital; see Appendix 1 for the precise definition. EPS_1 and EPS_2 are measured 6 months before the fiscal year-end of t+1.

I_NEGBTM	I_NEGBTM = 1 if book-to-market ratio < 0, 0 otherwise
LEVERAGE	Total debt (long-term and short-term)/Total assets.
LOSS	LOSS = 1 if earnings before extraordinary items < 0.
MKTCAP (in $ mil)	Market capitalization (Price × Share outstanding) at the end of fiscal year t.
LIST	Equals 1 if the firm is listed in NASDAQ, 0 otherwise.
NUMEST	Number of analysts' forecasts.
RETVOL	Standard deviation of the daily holding period return, measured over 1 year starting from 3 months after the end of the fiscal year t.
ROA	Earnings before extraordinary items / Average of total assets.
ROE	Earnings before extraordinary items / Average of equity.
SEGMENT	Number of segments reported in Compustat Segment files.
SIZE	Natural logarithm of market capitalization at the end of fiscal year t
SPREAD	Average of the daily percentage spread $\frac{Ask - Bid}{\frac{1}{2}(Ask + Bid)}$, measured over 1 year starting from 3 months after the end of the fiscal year t.
STDEV	Standard deviation of analysts' forecasts
STDROA	Standard deviation of previous 5 years' ROA.
STDROE	Standard deviation of previous 5 years' ROE.
TA	Total assets (in $ mil), DATA 6 in Compustat Industrial Annual.
UNSYST	Unsystematic return volatility of daily returns in the previous year, where the unsystematic return is the residual of the market model.
VOLUME	Natural logarithm of average daily trading, measured over 1 year starting from 3 months after the end of the fiscal year t.

Table 2. Descriptive Statistics

Panel A. Non-audit services and firm characteristics, N= 4,129[28]

Variable	Mean	Std. Dev.	Min	Max
Audit Fees (in thousands)	$749.7	$1,724.2	$3.0	$38,700.0
Non-audit services Fees (in thousands)	$1,248.6	$4,140.0	$-	$79,700.0
Total Fees (in thousands)	$1,998.3	$5,458.1	$3.0	$103,600.0
NASRATIO	45.23%	22.56%	0.00%	99.29%
INFORATIO	1.42%	8.18%	0.00%	92.89%
AUDITRELRATIO	4.24%	9.31%	0.00%	74.51%
OTHERRATIO	30.23%	27.63%	0.00%	94.78%
TAXRATIO	9.34%	16.22%	0.00%	87.30%
AbsDEV/TA	15.90%	38.10%	0.00%	816.80%
AbsDEV/MKTCAP	28.70%	75.50%	0.00%	980.10%
$AbsDEV_{Earn}$ /TA	12.10%	32.10%	0.00%	559.60%
Analysts' Forecasts Error	67.20%	157.10%	0.00%	1575.00%
CFO_{t+1}(in thousands)	$176.6	$404.1	$(98.2)	$3,321.0
TA (in thousands)	$1,927.0	$4,291.9	$2.8	$33,792.0
MKTCAP (in thousands)	$1,938.4	$4,846.5	$2.0	$51,058.6
Cost of Capital[29]	0.159	0.101	0.032	1.571
BTM	0.659	0.653	-2.230	4.275
LEVERAGE	0.259	0.306	0.000	6.598
beta	0.904	0.905	-2.454	4.391
ROA	-0.041	0.242	-1.955	0.256
ROE	-0.019	0.604	-4.564	3.620
SPREAD	0.075	0.075	0.000	0.480
UNSYST	0.034	0.020	0.006	0.365
RETVOL	0.036	0.020	0.008	0.367
AUDITOPINION	0.951	0.481	0	1
STDROA	0.136	0.432	0.001	10.046
STDROE	0.458	1.141	0.002	10.820

For the definitions of the variables, see Table 1.

[28] N= 3,350 for Spread, beta, UNSYST, and RETVOL.
[29] N= 3,027 for Cost of Capital.

Panel B. Industry composition

1-Digit SIC	Freq.	Percent
0, Agriculture, Forestry	12	0.29%
1 (Mining and Construction)	209	5.06%
2,3 (Manufacturing)	2,108	51.07%
4 (Transportation, Communication, Utility)	440	10.66%
5 (Wholesale and Retail)	547	13.25%
7,8 (Services)	790	19.14%
9 (Public Administration)	22	0.53%
Total	4,128	100%

Panel C. Frequencies of the fiscal year

Fiscal Year	Freq.
2000	1,017
2001	1,552
2002	1,559
Total	**4,129**

Table 3a. Nonparametric comparison of absolute deviation, cost of capital and risk factors between the lowest NAS/total fee decile and the highest decile

Mean	Lowest Decile	Highest Decile	Diff	H0 : Diff ≠ 0	H0 : Diff >(<)0
NASRATIO	6.21%	81.92%	75.72%	0.00%	0.00%
NAS Fees	33.01	5,578.62	5,545.52	0.00%	0.00%
Cost of Capital	0.194	0.129	-0.065	0.00%	0.00%
SPREAD	8.11%	5.64%	-2.46%	0.00%	0.00%
VOLUME	6.356	6.576	0.220	0.00%	0.00%
AbsDEV/TA	30.66%	9.49%	-21.17%	0.00%	0.00%
AbsDEV/MKTCAP	45.62%	16.99%	-28.63%	0.00%	0.00%
$AbsDEV_{Earn}$/TA	23.11%	7.89%	-15.22%	0.00%	0.00%
Analysts Forecast Errors	159.04%	70.05%	-88.99%	1.85%	1.85%
|Analysts' Forecast Deviation|	0.899	0.265	-0.633	0.00%	0.00%
NUMEST	4.753	11.706	6.952	0.00%	0.00%
STDEV	10.56%	3.64%	-6.92%	0.00%	0.00%
beta	0.926	0.969	0.043	69.71%	69.71%
UNSYST	3.82%	3.19%	-0.63%	0.00%	0.00%
LEVERAGE	33.31%	23.65%	-9.66%	0.77%	0.77%
ROA	-642.53%	1.43%	643.96%	0.28%	0.28%
ROE	-9.10%	11.14%	20.24%	63.11%	63.11%
STDROE	98.27%	39.52%	-58.75%	0.00%	0.00%
STDROA	310.18%	6.64%	-303.55%	25.20%	25.20%
SEGMENT	1.829	2.569	0.740	0.00%	0.00%
AbsDACC	1.036	0.879	-0.157	27.31%	27.31%
% Big5/4	79.10%	99.76%	20.67%	0.00%	0.00%
% Loss	45.84%	27.01%	-18.83%	0.00%	0.00%
TA (in $ mil)	774.80	6,800.04	6,025.25	0.00%	0.00%
MKTCAP (in $mil)	579.80	10,388.71	9,808.91	0.00%	0.00%
BTM	-0.936	0.519	1.454	17.47%	17.47%

For the definitions of the variables, see the Table 1. Each decile has 413 firms. For comparison of Cost of Capital, SPREAD**.** VOLUME, NUMEST, STDEV, and beta and α of the Fama and French 3-factors model,the number of firms in each decile is less than 413. Comparison of decile 2 and decile 9 shows that the difference in AbsDEV/TA, the volatility of unsystematic returns, ROA, ROE, % Big5/4, Total assets, MKTCAP and BTM are statistically significant.

I also used the Mann-Whitney two-sample test (rank-sum test) and median comparison. The result is similar, except that the difference in beta is not significant, and differences in ROE and Leverage are significant.

Table 3b. Industry composition of the lowest and highest deciles

1-Digit SIC	Lowest Decile	Highest Decile
0, Agriculture, Forestry	2	2
1 (Mining and Construction)	43	10
2,3 (Manufacturing)	172	210
4 (Transportation, Communication, Utility)	55	50
5 (Wholesale and Retail)	56	47
7,8 (Services)	82	91
9 (Public Administration)	3	2
Sum	**413**	**412**

Table 3c. Univariate t-test of the mean difference of the variables between scandal firms in 2000-2002 and their industry peers

MEAN	Scandal Firms - Years(N=25)	Non-Scandal Firms – Years (N= 696)	Diff	H0 : Diff ≠ 0	H0: Sign test – diff > 0 (or < 0)
NASRATIO	48.88%	48.85%	5.92%	91.19%	45.59%
Cost of Capital	0.107	0.166	-0.059	0.11%	0.06%
Spread	6.51%	6.52%	-0.01%	99.53%	49.77%
AbsDEV/TA	6.67%	17.42%	-10.75%	28.13%	14.07%
MKTCAP (in $ mil)	35,400.2	3,935.6	31,464.6	0.00%	0.00%
beta	1.74	0.96	0.77	46.57%	23.29%
UNSYST	3.54%	4.01%	-0.47%	32.86%	16.43%
STDROA	8.65%	16.18%	-7.52%	18.47%	9.24%
BTM	56.02%	46.74%	9.28%	77.42%	38.71%
VOLUME	7.31	6.49	0.82	0.00%	0.00%

Accounting scandal firms include Enron, Halliburton, Homestore, Bristol Myers Squibb, Merck, Xerox, Qwest Communication, Duke Energy, CMS Energy, Nicor, El Paso, Mirant, Tyco International, and Global Crossing in 2000–2002. The non-scandal firms include firms in the same industries in 2000–2002. Both scandal firms and non-scandal firms are included in the main sample.

Table 4. Correlation Table

	NASRATIO	Cost of Capital	Spread	AbsDEV/ TA	AbsDEVearn/ TA	AbsDEV/ MKTCAP	TA	SEGMENT	BTM	LEVE RAGE	beta	UNSYST	STDROA	% Loss	% Big5/4	AbsD ACC
NASRATIO	1.00															
Cost of Capital	-0.20	1.00														
SPREAD	-0.03	0.08	1.00													
AbsDEV/TA	-0.11	0.27	0.01	1.00												
AbsDEVearn/ TA	-0.06	0.26	0.01	0.80	1.00											
AbsDEV/ MKTCAP	-0.04	0.17	0.20	0.18	0.13	1.00										
TA	0.10	-0.08	0.00	-0.07	-0.06	-0.01	1.00									
# Segment	0.11	-0.13	0.10	-0.13	-0.12	-0.02	0.28	1.00								
BTM	0.00	-0.07	-0.05	-0.03	-0.02	-0.78	-0.01	0.03	1.00							
LEVERAGE	0.02	0.06	0.19	-0.07	-0.09	0.15	0.08	0.13	-0.10	1.00						
beta	0.01	-0.02	0.02	0.00	0.01	-0.01	0.01	0.01	0.01	0.06	1.00					
UNSYST	-0.05	0.31	0.17	0.37	0.43	0.25	-0.10	-0.21	-0.02	-0.01	-0.02	1.00				
STDROA	-0.12	0.27	-0.01	0.47	0.45	0.08	-0.05	-0.14	-0.02	-0.10	0.00	0.27	1.00			
% Loss	-0.09	0.27	0.09	0.35	0.35	0.15	-0.04	-0.09	0.02	0.01	0.02	0.50	0.30	1.00		
% Big5/4	0.10	-0.07	-0.11	-0.07	-0.04	-0.02	0.03	0.01	-0.02	0.02	0.00	-0.10	-0.13	-0.04	1.00	
AbsDACC	0.00	-0.02	0.01	-0.06	-0.06	-0.03	0.10	0.10	0.01	0.07	0.02	-0.06	-0.05	-0.04	0.03	1.00

Table 5. OLS regression of predictability (AbsDEV) on the ratio of non-audit services fees to total fees (NASRATIO) and control variables

Dependent Variables	$\frac{AbsDEV}{TA}$	$\frac{AbsDEV}{Mktcap}$	$\frac{AbsDEV_{EARN}}{TA}$
Regressors	**Coeff T-Stat**	**Coeff T-Stat**	**Coeff T-Stat**
Constant	0.218 (5.77)***	-0.061 -0.88	0.148 (4.13)***
NASRATIO	-0.057 (2.72)**	-0.066 -1.32	-0.04 (2.25)*
BTM	-0.007 -1.28	0.277 (9.42)***	-0.005 -0.85
I_NEGBTM	0.216 (3.46)***	0.476 (3.18)***	0.222 (3.88)***
I_NEGBTM × BTM	0.004 -0.55	-0.489 (10.36)***	0.002 -0.32
STDROE	0.032 (5.20)***	0.072 (4.80)***	0.033 (5.66)***
LEVERAGE	0.113 0.47	0.038 0.55	0.141 4.53
AbsDACC	0.008 1.46	0.007 1.57	0.009 1.61
SEGMENT	0.035 -1.15	-0.028 (2.52)*	0.021 -1.38
NUMEST	-0.001 (1.71)$	-0.003 -1.52	-0.001 (1.91)$
LOSS	0.121 (11.12)***	0.228 (10.65)***	0.118 (11.17)***
Big5/4	-0.087 (2.77)**	-0.004 -0.08	-0.046 (1.66)$
AUDITOPINION	-0.026 (2.30)*	-0.058 (2.35)*	-0.019 (1.70)$
$\overline{\left(\frac{AbsDEV}{TA}\right)}_{Ind}$	0.037 (3.18)***		
$\overline{\left(\frac{AbsDEV}{Mktcap}\right)}_{Ind}$		0.025 (2.93)**	
$\overline{\left(\frac{AbsDEV_{EARN}}{TA}\right)}_{Ind}$			0.038 (3.09)***
Observations	4,219	4,219	4,438
R-squared	**0.21**	**0.34**	**0.20**

Additionally, indicators for the years 2001 and 2002 are included in the regressions. Their coefficients are not significant. The t-statistic is based on White's (1980) heteroskedasticity-adjusted variance: $ significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%.

Table 6. OLS regression of the cost of capital (Ohlson-Juettner, 2000) on predictability (AbsDEV), the ratio of non-audit services fees to total fees (NASRATIO), and control variables

Dependent variable: Cost of Capital			
Regressors	**Coeff T-Stat**	**Coeff T-Stat**	**Coeff T-Stat**
Constant	0.024 (2.32)*	0.029 (2.80)**	0.027 (2.65)**
NASRATIO	0.073 (3.94)***		
$\frac{\text{AbsDEV}}{\text{TA}}$		0.016 (2.95)**	
$\frac{\text{AbsDEV}}{\text{Mktcap}}$			0.103 (4.54)***
$\frac{\text{AbsDEV}_{\text{EARN}}}{\text{TA}}$	-0.024 (3.11)**	-0.020 (2.58)**	-0.020 (2.59)**
NUMEST	-0.002 (12.45)***	-0.002 (11.57)***	-0.002 (12.09)***
STDROA	0.039 (2.64)**	0.053 (3.78)**	0.039 (2.38)*
beta	-0.003 -1.51	-0.003 -1.52	-0.003 -1.54
UNSYST	0.754 (5.37)***	0.828 (5.45)***	0.727 (4.66)***
LEVERAGE	0.045 (4.73)***	0.034 (3.23)**	0.043 (4.31)***
LOSS	0.016 (3.31)**	0.014 (2.78)**	0.012 (2.39)*
$\overline{COC}_{Ind}$	0.724 (12.91)***	0.701 (12.46)***	0.711 (12.71)***
Observations	2,323	2,323	2,430
R-squared	**0.30**	**0.31**	**0.32**

Additionally, indicators for the years 2001 and 2002 are included in the regressions. The indicator for 2001 has negative coefficients (for example, -0.009, p-value < 1% for the second column). The indicator for 2002 is negative but not significant. The t-statistic is based on White's (1980) heteroskedasticity-adjusted variance:
$ significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%..

Table 7. OLS regression of the mean bid/ask spread on predictability (AbsDEV), the ratio of non-audit services fees to total fees (NASRATIO), and control variables

Dependent variable is SPREAD			
Regressors	**Coeff T-Stat**	**Coeff T-Stat**	**Coeff T-Stat**
Constant	-0.098 (3.76)***	-0.082 (3.12)***	-0.081 (3.06)***
$\frac{\text{AbsDEV}}{\text{TA}}$	-0.005 -0.55		
$\frac{\text{AbsDEV}}{\text{Mktcap}}$		0.000 0.00	
$\frac{\text{AbsDEV}_{\text{EARN}}}{\text{TA}}$			-0.005 -0.53
NASRATIO	-0.023 (2.90)**	-0.024 (2.99)**	-0.025 (3.09)**
SIZE	-0.019 (12.91)***	-0.019 (12.52)***	-0.019 (12.68)***
RETVOL	0.61 (1.73)$	0.642 (1.79)$	0.641 (1.79)$
VOLUME	0.041 (8.13)***	0.039 (7.63)***	0.038 (7.57)***
LIST	-0.073 (12.56)***	-0.071 (11.98)***	-0.070 (12.08)***
LOSS	-0.005 -0.89	-0.004 -0.73	-0.003 -0.62
$\overline{SPREAD}_{Ind}$	0.743 (12.06)***	0.731 (11.57)***	0.725 (11.50)***
Observations	2,785	2,785	2,838
R-squared	**0.38**	**0.37**	**0.36**

Additionally, indicators for the years 2001 and 2002 are included in the regressions. The indicator for 2001 has positive coefficients (for example, 0.037, p-value < 0.1% for the second column). The coefficient of the indicator for 2002 is also positive (0.045, p-value <0.1%). The t-statistic is based on White's (1980) heteroskedasticity-adjusted variance: $ significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%..

Table 8. Regressions of the deviation of the analysts' forecast error as predictability, the cost of capital, and the mean bid/ask spread on the ratio of non-audit services fees to total fees

Dependent Variables	Analysts' Forecast Error	Dependent Variables	Cost of Capital	Dependent Variables	SPREAD
Constant	0.364 (5.59)***	Constant	0.023 (2.67)**	Constant	-0.147 (5.26)***
NASRATIO	-0.086 (2.04)*	NASRATIO	-0.041 (5.92)***	NASRATIO	-0.004 (2.63)**
BTM	0.073 (5.15)***	Analysts' Forecast Error	0.007 (3.01)**	Analysts' Forecast Error	0.003 -1.07
I_NEGBTM	0.057 -1.08	NUMEST	-0.002 (14.56)***	SIZE	-0.021 (16.10)***
I_NEGBTM × BTM	-0.069 (4.77)***	STDROA	0.059 (4.94)***	RETVOL	-0.196 -1.18
STDEV	0.000 -1.23	beta	0 -1.33	VOLUME	0.052 (11.45)***
LEVERAGE	-0.059 -1.34	UNSYST	0.908 (7.06)***	LOSS	0.002 -0.62
AbsDACC	-0.002 -1.56	LEVERAGE	0.049 (6.31)***	LIST	-0.063 (14.96)***
SEGMENT	-0.027 -0.33	LOSS	0.015 (3.15)**	$\overline{SPREAD}_{Ind}$	0.406 (4.58)***
NUMEST	-0.005 (4.08)***	$\overline{COC}_{Ind}$	0.746 (16.26)***		
LOSS	0.224 (11.10)***				
Big5/4	-0.087 -1.48				
AUDITOPINION	0.009 -0.50				
$\overline{AFE}_{Ind}$	0.11 (8.90)***				
Observations	4,803		3,810		2,741
R^2	**0.12**		**0.30**		**0.40**

Additionally, indicators for the years 2001 and 2002 are included in the regressions. The indicator for 2001 has negative coefficients in the first two regressions and positive coefficients in the third regression. The coefficients of the indicator for 2002 are insignificant, negative and positive in the three regressions, respectively. The t-statistic is based on White's (1980) heteroskedasticity-adjusted variance: $ significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%..

Table 9. Regressions of predictability (AbsDEV/TA), the cost of capital, and the mean bid/ask spread on the ratio of the fees for specific non-audit services

Dependent Variables	ABSDEV/TA	Dependent Variables	Cost of Capital	Dependent Variables	SPREAD
Constant	0.219 (5.90)***	Constant	0.018 -1.81	Constant	-0.156 (5.54)***
INFORATIO	-0.049 (2.07)*	INFORATIO	-0.014 -1.31	INFORATIO	-0.017 -1.44
OTHER-RATIO	-0.061 (2.53)*	OTHER-RATIO	-0.024 (3.29)**	OTHER-RATIO	-0.017 (2.11)*
AUDITREL-RATIO	-0.080 (1.80)$	AUDITREL-RATIO	-0.045 (2.44)*	AUDITREL-RATIO	-0.067 (2.96)**
TAXRATIO	-0.039 -0.88	TAXRATIO	-0.06 (4.80)***	TAXRATIO	-0.018 -1.49
BTM	-0.007 -1.3	ABSDEV/TA	0.058 (3.14)**	ABSDEV/TA	-0.03 (2.15)*
I_NEGBTM	0.216 (3.47)**	NUMEST	-0.003 (14.75)***	SIZE	-0.021 (13.17)***
I_NEGBTM × BTM	0.004 -0.56	STDROA	0.044 (3.21)**	RETVOL	0.498 -1.26
STDROA	0.032 (5.20)***	beta	0 -0.7	VOLUME	0.051 (9.43)***
LEVERAGE	-0.112 (2.46)*	UNSYST	0.861 (6.19)***	LOSS	-0.074 (13.15)***
AbsDACC	0.008 -1.46	LEVERAGE	0.05 (5.71)***	LIST	-0.004 -0.68
SEGMENT	0.035 -1.15	LOSS	0.012 (2.33)*	$\overline{SPREAD}_{Ind}$	0.471 (4.88)***
NUMEST	0 -0.68	$\overline{COC}_{Ind}$	0.747 (14.31)**		
LOSS	0.122 (11.08)**				
Big5/4	-0.087 (2.75)**				
AUDITOPINION	-0.026 (2.26)*				
$\overline{\left(\frac{\mathbf{AbsDEV}}{\mathbf{TA}}\right)}_{Ind}$	0.037 (3.19)**				
Observations	4,129		2,323		2,785
R^2	**0.21**		**0.30**		**0.40**

Additionally, indicators for the years 2001 and 2002 are included in the regressions. The coefficients of the indicator for 2001 are insignificant (AbsDEV/TA regression), negative (Cost of Capital regression) and positive (SPREAD regression). The coefficients of the indicator for 2002 are insignificant, insignificant and positive in the three regressions. The t-statistic is based on White's (1980) heteroskedasticity-adjusted variance: $ significant at 10%; * significant at 5%; ** significant at 1%; *** significant at 0.1%..

Appendix A. The Ohlson-Juettner (2000) Model of the Cost of Capital

The Ohlson-Juettner model (2000) of the cost of capital is represented as follows:

Reduced form of Ohlson-Juettner (2000) model of the cost of capital

$$OJCOC = \frac{\gamma - 1}{2} + \sqrt{\left(\frac{\gamma - 1}{2}\right) + \frac{eps}{P} \times \left(g_2 - (\gamma - 1)\right)},$$

where the $g_2 = \frac{\text{EPS}_2 - \text{EPS}_1}{\text{EPS}_1}$.

The full model uses the dividend payout ratio. That is,

$$OJCOC = A + \sqrt{A^2 + \frac{eps}{P} \times \left(g_2 - (\gamma - 1)\right)},$$

where $A = \frac{1}{2}\left(\gamma - 1 + \frac{dps_1}{P_0}\right)$.

Calculation of the Ohlson-Juettner estimate of the cost of capital requires EPS_1 and EPS_2; it does not use long-term growth or 5-year forecasts. Gode and Mohanram (2003) argue that it is not necessary to control for growth because analysts set long-term growth very similar to g_2. In this study, I use the reduced form, which does not require dividend forecasts. Since analysts predict earnings instead of dividends, I assume that the current dividend payout would be maintained in the future.

Appendix B. The modified Jones model

The modified Jones model is the residual of the following regression:

$$\frac{\text{TACC}_{it}}{\text{Total Assets}_{it-1}} = \alpha \frac{1}{\text{Total Assets}_{it-1}} + \beta_1 \left(\frac{\Delta\text{REV}_{it} - \Delta\text{REC}_{it}}{\text{Total Assets}_{it-1}}\right) + \beta_2 \frac{PPE_{it}}{\text{Total Assets}_{it-1}} + \varepsilon_{it}$$

TACC is the total accrual. In this study, I measure TACC by subtracting the cash flows from operations (adjusted for the extraordinary items in the cash flow statements) from the earnings before extraordinary items: Compustat DATA 18 – (DATA 308 – DATA 123).

ΔREV is the change in Sales, DATA 12.
ΔREV is DATA302 if available. If the data item is not available, I use the change in AR (DATA2).
PPE is gross Property, Plant & Equip, DATA 7.
DACC is the residual of the regression, namely,

$$DACC_{it} = \frac{\text{TACC}_{it}}{\text{Total Assets}_{it-1}} - \left[\frac{\alpha}{\text{Total Assets}_{it-1}} + \beta_1 \left(\frac{\Delta \text{ REV}_{it} - \Delta\text{REC}_{it}}{\text{Total Assets}_{it-1}} \right) + \beta_1 \frac{PPE_{it}}{\text{Total Assets}_{it-1}} \right].$$

Appendix C. On the predictive ability of the ordinary income-based predictor

Here I discuss how the predictive ability of the different models is compared in out-of-sample data and show that the *ordinary income-based* predictor (Ronen and Sadan, 1981) is more accurate than regression-based prediction. In prior research (Barth et al, 2001; Cohen, 2003), the usefulness of a firm's financial statements was measured in terms of how much of its future CFO was explained by the current information, such as current earnings, or CFO and accruals (or components of accruals). For example, Barth et al. (2001) compared the following two models:

$$CFO_{t+1} = \beta_0 + \beta_1 CFO_t + \beta_2 \Delta AR_t + \beta_3 \Delta INV_t + \beta_4 \Delta AP_t + \beta_5 DEPR_t + \beta_6 DEPR_t + \beta_7 OTHER_t + \varepsilon \quad \ldots\ldots (1)$$

$$CFO_{t+1} = \beta_0 + \beta_1 Earn_t + \beta_2 Earn_{t-1} + \beta_3 Earn_{t-2} \quad \ldots\ldots (2)$$

Barth et al. found that the R^2 from (1) is higher than from (2), so they argued that the components of accruals are relevant in predicting the future cash flows from operations. However, their regression contains the following caveats:

a. The main regression was run over a cross-sectional sample for 1988–1997. The coefficients from the regression were the same for all the firms. This restriction is unrealistic, because each firm has different business practices, so the portion of

the accrual that is realized in the future CFO would be different for each firm, not to mention that the time series pattern of the turnover would be different.

b. At a minimum, one could run regression (1) over the cross-sectional sample each year. Barth et al. ran such a regression and argued that their result was unchanged. I have replicated the regression, however, and it results in a lower R^2 in some years and insignificant t-statistics of the components of the accruals (not reported).

c. To control for firm-specific business practices, one could run regression (1) using the sample in an industry each year.

d. The ultimate test of the predictive ability should be based on out-of-sample properties.

To address the caveats and examine whether the *ordinary income-based* predictor is appropriate as a predictor, I compare the prediction errors of the models (defined as the absolute deviation of the predictor from one-period-ahead CFO scaled by total assets) using out-of-sample information. Namely, I compare,

The ordinary income-based predictor (as shown in section 3)

$$\text{Prediction Error}_{\text{OI}} = \frac{\left| CFO_{t+2} - \text{Ordinary Income predictor}_{t+1} \right|}{Total\ Assets_{t+1}}$$

The Barth model—CFO and components of accruals model (Barth et al., 2001)

$$CFO_{t+1} = \beta_0 + \beta_1 CFO_t + \beta_2(\Delta AR_t) + \beta_3(\Delta INV_t) + \beta_4(\Delta AP_t) + \beta_5(DEPR_t) + \beta_6(DEPR_t) + \beta_7(OTHER_t) + \varepsilon$$

$$Barth\ predictor = \hat{\beta}_0 + \hat{\beta}_1 CFO_{t+1} + \hat{\beta}_2 \Delta AR_{t+1} + \hat{\beta}_3 \Delta INV_{t+1} + \hat{\beta}_4 \Delta AP_{t+1} + \hat{\beta}_5 DEPR_{t+1} + \hat{\beta}_6 Amort_{t+1} + \hat{\beta}_7 OTHER_{t+1}$$

$$\text{Prediction Error}_{\text{Barth}} = \frac{|CFO_{t+2} - Barth\ Predictor|}{Total\ Assets_{t+1}}$$

Lev et al. (2004) also question the methodology and results in Barth et al. (2001). The predicted variable in Lev et al. (2004) encompasses a firm's free cash flows (defined as the difference between capital expenditures and cash flows from operations), and they show that the CFO alone predicts the future free cash flows better than the CFO and the components of the accruals. Thus, I include the following regression for the comparison of the prediction errors:

The CFO-only model

$$CFO_{t+1} = \gamma_0 + \gamma_1 CFO_t$$

$$CFO\text{-}only\ predictor = \hat{\gamma}_0 + \hat{\gamma}_1 CFO_{t+1}$$

$$\text{Prediction Error}_{\text{CFO-only}} = \frac{|CFO_{t+2} - CFO\text{-}only\ predictor|}{Total\ Assets_{t+1}}$$

It is possible that the components do not contribute to the predictive ability because of a correlation between the components and the noise in the accruals. Such a problem would be more prevalent in short-term accruals, such as the change in accounts receivable and accounts payable. The multicollinearity does not affect the bias of the coefficient, but it can affect the reliability or the confidence interval of the prediction (Greene, 2002). Addressing such a problem is beyond the scope of this study. Also, disaggregating the accruals into several components could result in noise in the data. To examine whether the disaggregation causes inefficiency in the prediction, I run the following regression and calculate the prediction error:

The CFO and Accruals model

$$CFO_{t+1} = \eta_0 + \eta_1 CFO_t + \eta_2 ACC_t$$

$$CFO\ and\ Accrual\ predictor = \hat{\eta}_0 + \hat{\eta}_1 CFO_{t+1} + \hat{\eta}_2 ACC_{t+1}$$

$$\text{Prediction Error}_{\text{CFO and accrual}} = \frac{\left| CFO_{t+2} - CFO\ and\ Accrual\ predictor \right|}{Total\ Assets_{t+1}}$$

Data

The following data are gathered to compare the predictive ability of the *ordinary income-based* predictors and the predictors of the *CFO-only, CFO and Accruals*, and *Barth* models.

1. In Compustat, data on CFO, accruals, and change in AR, AP, Inventory, depreciation, and amortization are available in firms' cash flow statements.
2. If data on change in AR, AP, and Inventory are not available in firms' cash flow statements, then data on AR, AP, and Inventory are available in the balance sheets for years t and t-1. If data on depreciation and amortization are missing from the cash flow statements, then I use the data on depreciation and amortization in the income statements.
3. As in Barth et al. (2001), if information on the amortization expense is missing, it is replaced with total depreciation and amortization minus depreciation and minus depletion; in a related note, if data on depletion are missing and the SIC code of the firm is not 1000–1499 (Mining), 2900–2999 (Petroleum refining), and 4600–4699 (Pipeline), then depletion is assumed to be zero.
4. Firms in the financial industry (6000-6999) are excluded.
5. Data to calculate the ordinary income for year t and the previous 6 years are available.
6. The total number of firms in the same 2-digit SIC is at least 40.

The total sample that meets the data requirements contains 23,022 firms.[30]

Regressions

Due to the caveats that I outlined above, I run two regressions for each model. First, I run a cross-sectional annual regression. The coefficients from the regressions are the same for each firm, but different each year. Second, I run industry-by-industry regressions for each year. Firms with the same 2-digit SIC codes are assumed to be in the same industry.[31] The minimum number of firms in the same industry is set to 40, so that the regression's degrees of freedom are sufficiently large. The coefficients of the regressions are the same for firms with the same 2-digit SIC code and different each year. There are not enough observations to run a firm-specific regression, since the CFO is only available since 1987. The coefficients of the industry-by-industry regressions are closer to the firm-specific coefficients, as firms in the same industry tend to operate similarly. Finally, the independent variables in each model are deflated by the average of total assets in year t and t+1.

I do not report the results of the regression. The R^2 of the *Barth* model, however, is higher than that of the *CFO and Accruals* model, on average. Also, the R^2 of the *CFO and Accruals* model is higher than that of the *CFO-only* model in cross-sectional annual regressions. The same inference can be drawn from the annual industry-by-industry regressions, on average. The confidence interval of the in-sample predictor of the *Barth* model is the smallest, although the difference from the other models is negligible. Thus, in terms of in-sample properties, the *Barth* model seems to be the appropriate choice. The more relevant test of the usefulness of the financial statements would be whether the predictions of future CFO based on the coefficients of the regressions result in lower prediction errors (absolute deviation deflated by total assets).

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[30] The final sample excludes firms with prediction errors for the four models—(3), (4), (5), and (6)—over 10 (the absolute deviation in dollar terms exceeds 10 times the firm's total assets). The number removed from the sample accounts for approximately 2% of the total prediction.

[31] The inference is qualitatively the same if 3- or 4-digit SIC codes are used instead.

Result

Table D. 1 presents the mean, median, standard deviation, minimum, and maximum of the prediction errors from the next period CFO. The mean prediction error of the *ordinary income-based* predictor is smallest overall, as is the standard deviation of the prediction error. In the cross-sectional annual regression, the *CFO-only* predictor has a smaller mean prediction error (35.62%) than the *Barth* predictor (56.55% of total assets). This result is in line with Lev et al. (2004). However, *the CFO and Accruals* predictor has a slightly lower mean absolute deviation divided by total assets (33.58%, as opposed to 35.62% for the *CFO-only* predictor).

Table D.1 Comparison of prediction errors—Absolute deviation/Total assets—from the various prediction models (N=23,015)

Panel 1. Descriptive statistics

Absolute deviation/Total assets		**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**
Ordinary income-based predictor		16.79%	7.71%	40.67%	0.00%	995.95%
CFO-only predictor	Cross-sectional annual regression	35.56%	15.51%	53.71%	0.00%	867.63%
CFO and Accruals predictor		33.49%	14.71%	52.14%	0.00%	861.35%
Barth predictor		56.55%	17.55%	111.94%	0.00%	999.99%
CFO-only predictor	Annual industry-by-industry regression	30.17%	8.18%	81.33%	0.00%	953.47%
CFO and Accruals predictor		23.34%	7.52%	56.31%	0.00%	996.68%
Barth predictor		30.67%	8.22%	83.00%	0.00%	997.41%

Panel B. The t-test and median test

Difference betweens Absolute deviation/ Total assets		**T-test**	**Median Test**
Ordinary income-based predictor	- *CFO-only* predictor, CS	<0	<0
	- *CFO and Accruals* predictor, CS	<0	<0
	- *Barth* predictor, CD	<0	<0
	- *CFO-only* predictor, Industry	<0	<0
	- *CFO and Accruals* predictor, Industry	<0	>0
	- *Barth* predictor, Industry	<0	<0
CFO-only predictor, CS^{+}	- *CFO and Accruals* predictor, CS	>0	>0

	- *Barth* predictor, Industry	<0	<0
	- *CFO-only* predictor, Industry	>0	>0
CFO and Accruals predictor, CS	- *Barth* predictor, CS	<0	<0
	- *CFO and Accruals* predictor, Industry	>0	>0
CFO-only predictor, Industry++	- *CFO and Accruals* predictor, Industry	<0	<0
	- *Barth* predictor, Industry	=0	<0 *
CFO and Accruals predictor, Industry	- *Barth* predictor, Industry	<0	<0

+ Coefficients are from the cross-sectional annual regression.
++ Coefficients are from the annual industry-by-industry regression.
* The inequality sign has a p-value of less than 0.01%, except the inequality with * (6.07%). Equality implies that the p-value is larger than 10%.

The differences are statistically significant (p-value < 0.01%). It appears that the disaggregation of the accruals results in higher prediction errors. This is surprising, since the R^2 of the *Barth* model is highest, but the prediction error based on that model is also highest. On the other hand, the R^2 (absolute deviation /total assets) of the *CFO and Accruals* model is higher (lower) than that of *CFO-only* model. Although the accruals do contribute to the model's predictive ability, the disaggregation of the accruals does not. This could be because of noise in the components of the accruals.

The annual industry-by-industry regression seems to capture firm-specific coefficients, reducing the prediction errors in each model. The mean and median prediction errors from the coefficients of each model decrease when the annual industry-by-industry regression is run, most noticeably in the *CFO and Accruals* model (a decrease from 33.58% to 23.34%). The mean prediction error of the *Barth* model is still higher than that of the *CFO-only* model, but the difference is insignificant. On the other hand, the median of the *Barth* model is higher, and the difference in the median is significant (p-value = 6.07%). Hence, there is no evidence that the components of accruals contribute to the ability to predict future CFO. Accruals, however, do contribute to the ability to predict the future CFO. The mean prediction error decreases when the accruals are included in the regression and the subsequent prediction. In fact, the median of the prediction error of the *CFO and Accruals* predictor is smaller than that of the *ordinary income-based* predictor. Since the mean of the prediction error of the

CFO and Accruals model is higher, it is not clear which model results in a more accurate prediction. This dilemma can be resolved by comparing the overall distribution or cumulative frequency of prediction errors. In Figures D.1 and D.2, I present graphs of the prediction errors. The x-axis represents the absolute deviation of the models from the future CFO, deflated by total assets. The y-axis shows the cumulative frequencies; it therefore has a maximum value of 1. The value plotted implies the cumulative frequencies for a given prediction error. In figure D.1, I compare the prediction errors of the *ordinary income-based* predictor with those of the *CFO-only, CFO and Accruals*, and *Barth* predictors, when the regression is run over the cross-sectional annual sample. The *ordinary income-based* predictor stochastically dominates the other models. This is not surprising because when the mean and median of the prediction error are lower, we should see stochastic dominance. In Figure D.2, I compare the prediction errors of the *ordinary income-based* predictor with those of the *CFO-only, CFO and Accruals*, and *Barth* predictors, when the regression is run over the industry annual sample. The *ordinary income-based* predictor still dominates the other predictors, although the extent to which it dominates the other predictors decreases. This dominance, along with the fact that the standard deviation of the prediction errors of the *ordinary income-based* predictor is smaller, suggests that the predictor is an appropriate proxy for the ability to predict a firm's future CFO.

The *ordinary income-based* predictor is firm-specific and uses more information (data on past ordinary incomes). The *CFO-only, CFO and Accruals*, and *Barth* models may predict better when firm-specific regression is feasible, and this is probably the case, given that the prediction errors decrease fast when the industry-by-industry regressions are run. This issue is discussed further in Brochet et al. (2005).

Figure D.1 Cumulative distribution of Prediction Errors (Absolute Deviation/Total assets) – Ordinary income-based, CFO-only, CFO and Accruals, Barth models

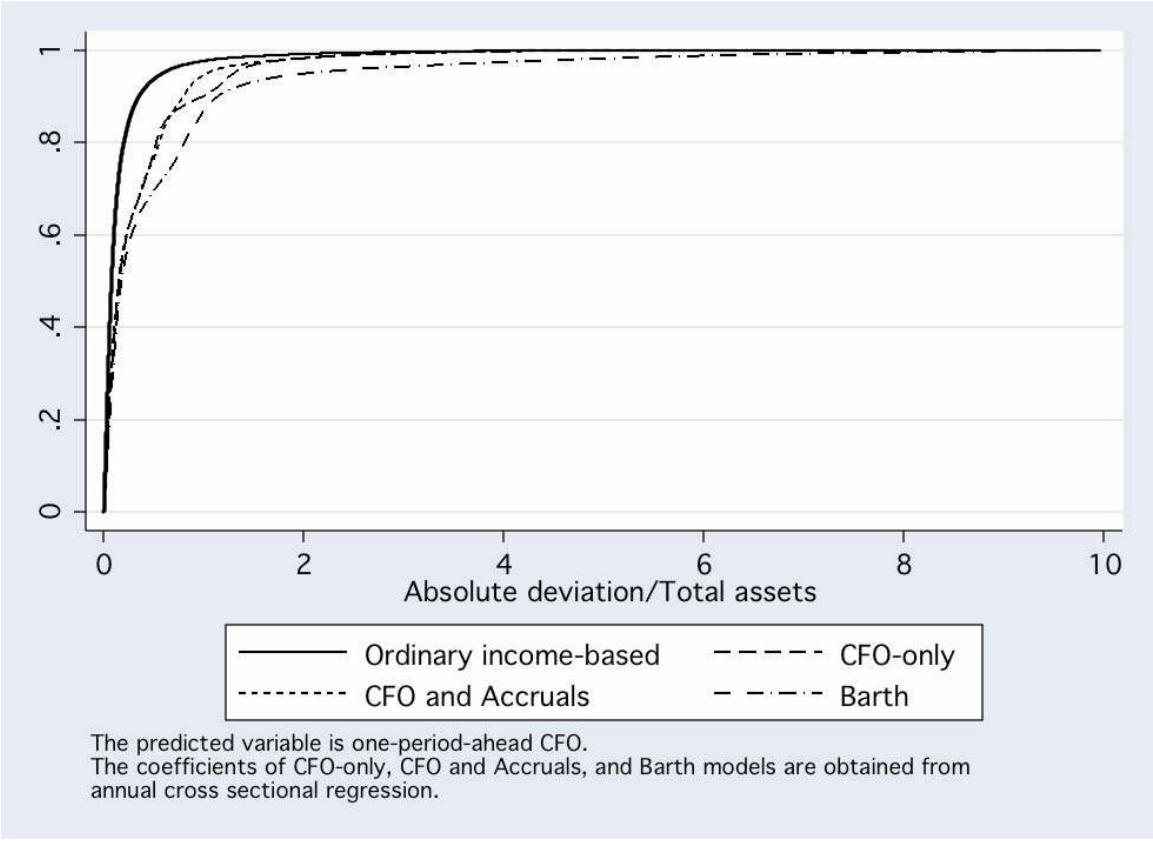

Figure D.2 Cumulative distribution of Prediction Errors (Absolute Deviation/Total assets) – Ordinary income-based, CFO-only, CFO and Accruals, Barth models