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Cash Flow and Accrual Uncertainty and Variation in Earnings Response Coefficients

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Abstract

This paper extends results reported by Pincus [1983], Lipe [1990], and Imhoff and Lobo [1992] by examining the cash flow and accrual determinants of earnings forecast uncertainty and their impact upon longitudinal and cross-sectional earnings response coefficients. We expect to find a monotonic relation between the variability of cash flows and accruals and earnings forecast uncertainty, and an inverse relation between the variabilty of cash flows and accruals and longitudinal and cross-sectional earnings response coefficients. We observe a strong

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monotonic relation between the variability of cash flows and accruals and dispersion of analysts' earnings forecasts, as well as strong inverse relation between the variability of cash flows and accruals and longitudinal and cross-sectional earnings response coefficients. These results suggest that the variability of cash flow and accruals are indicators of the ability of current earnings to predict future earnings, potentially increasing disagreement about future earnings and decreasing the equity security price respose to earnings news. Our results provide added descriptive insight into how earnings forecast uncertainty impacts the equity security price response to firms' earnings news.

Key words

Cash Flows - Accrulas - Forecasting - Earings - Uncertainty.

Introduction

. A segment of the literature regarding the usefulness of earnings releases in securities markets[3] specifically examines the impact of earnings forecast uncertainty upon the equity security price response to earnings news. Pincus [1983], Lipe [1990], and Imhoff and Lobo [1992] have empirically examined the impact of

3- Easton and Zmijewski [1989, p. 118] provide a discussion of the intuition underlying the association between unexpected earnings and unexpected security price changes in terms of unexpected earnings providing investors with a signal regarding prospective changes in investment-related cash flows. Following their retionale, the discounted implications of investment-related cash flow changes signaled by unexpected earnings explain, in part, the observed security price adjustment associated with earnings news.

measures of predisclosure earnings uncertainty upon the security price response to firms' earnings news. Their results indicate that the security price response to firm's earnings news decreases in relation to predisclosure earnings uncertainty.[4]

4- Extant information economics-based theory and econometric-errors-in-variables results suggest that these empirical observations are an indication that predisclosure earnings uncertainty arises as a manifestation of "noise" in reported earnings. Cho and Jung [1991] characterize the Holtheausen and Verrecchia [1988], Lev [1989], and Choie and Salamon [1990] results as information economics-based approaches. Cho and Jung [1991, p. 89] reconcile their results, demonstrating that their implications for the earnings/results relation are identical. Imhoff and Lobo [1992, p. 437] conclude that:

"Firms with relatively more (less) ex-ante uncertainty in earnings appeared to have smaller (larger), less significant (more significant) earnings response coefficients. Theory suggests that uncertainty should have this observed effect on earnings response coefficient when it reflects noise in the earnings signal. Hence, we infer that the dispersion in preannouncement analysts' earnings forecasts is a proxy for noise in the firms' earnings number (emphasis added)."

Consequently, the information economics-based analysis have been used to empirically assess whether proxies for earnings forecast uncertainty reflect attributs of uncertainty associated with price-relevant cash flows or noise in earnings via their impact upon cross-sectional earnings response coefficients (e. g. Imhoff and Lobo [1992]). The information economics-based results have also been used to assess changes in earnings quality following upon implementation of new accounting standards. For example, Collins and Salatka [1989] use the information economics-based results to assess whether SFAS No, 52; produced relatively less noisy measures of earnings (vis-a-vis

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The purpose of this research is to provide descriptive evidence regarding the impact of the variability of cash and accrual components of reported earnings on predisclosure earnings forecast uncertainty and the equity security price response to firms' earnings news.

Predisclosurd earnings uncertainty is represented by the divergence of analysts' earnings forecasts. The security price response to firms' earnings news is captured using longitudinal as well as cross-sectional measures of earnings respons coefficients. We observe that (1) the variability of cash flows and accruals are important determinants of the divergence of analysts' earnings forecasts, and (2) longitudinal and cross-sectional measures of the security price response to earnings news decreases in relation to the varibility of cash flows and accruals.

These results provide insight into how the behavior of accrual and cash components of firms' earnings may give rise to predisclosure earnings forecast uncertainty and thereby impact

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conomic earnings--where economic earnings are considered price relevant earnings) than SFAS No. 8. The observes increase in earnings response coefficients subsequents to firms adoption of SFAS No. 52 suggests that SFAS No. 52 produced less noisy measures of earnings relative to SFAS No. 8. Wasley [1991] uses the information economics-based results to assess changes in the quality of earnings following upon the adoption of SFAS No. 2 by former capitalizers, and observe a subsequent increase in earning response coefficients.

the security price response to earnings news.

The remainder of this paper is presented in three sections. The first section discusses the underlying intuition and research motivation. The second section describes the firms and data used, as well as the research method and empirical results. The last section discusses the conclusions of this research.

Motivation and Underlying Intuition

The observed association between accounting earnings and security returns adds credence to the propostion that reported earnings provide investors with relatively good proxies for long run average cash flows to firms. However, the degree of variation in the earnings/returns relation at the firm level[5]has motivated the

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5- Beaver, Clarke, and Wright [1979], for example, report correlations between earnings forecast errors and risk-adjusted security returns as high as 90% at the portfolio level, although the relation is weaker and exhibits considerable variation at the firm level. Comparing Table 7 and Table 8 form Beaver, Clarke and Wright [1979], pp. 331-332.]. the mean Spearman Rank Correlations reported for the ten years examined based upon 25 portfolios per year are 0.7381, 0.6607 (percentage forecaste error), and 0.6949 and 0.6902 (standardized forecast error) for the two earnings forecast models employed. The mean Spearman Rank Correlations reported for the ten years examined based upon firm-specific observations are 0.3783, 0.3161 (percentage forecast error), and 0.3284, and 0.3303 (standardized forecast error) for the two ernings forecast models used.

development of a substantial body of literature specifically identifying determinants of variation in the earnings/returns relation.[6]

The results of this literature suggest that firm-specific earnings forecast errors provide information regarding firms' future earnings patterns to varying degrees. Consequently, questions naturally arise as to whether the uncertainty underlying earnings forecasts is reflected in the behavior of the accrual and cash components of earnings, potentially contributing the disagreement regarding future earnings and explaining, in part, the observed decrease in the security price response to earnings relative to earnings foecast uncertainty.

Cross-Sectional Variation in Earnings Response Coefficients: Empirical Foundations

Empiriacal work has examined the impact of earnings forecast

6- In additon to earnings variability (discussed subsequently), factors which have identified as important in describing the cross-sectional variation in earnings response coefficients are: (1) earnings persistence--positive association (Kormendi and Lipe [1987], Eston and Zmijewski [1989], Collins and Kothari [1989], and Lipe [1990]. systematic risk--negative association (Collins and Kothari [1989], and Easton and Zmijewski [1989]; earnings growth--positive assocation (Collins and Kothari [1989]; and firm size--negative association (Grant [1980], Atiase [1985, 1987], Freeman [1987], and Collins, Kothari and Rayburn [1987].

uncetainty upon the security price response to earnings news using several surrogates for predisclosure earnings uncertainty.[7] Pincus [1983] examines the impact of earnings variability upon the security price response to earnings news using the Value Line Earnings Variablity Index[8]as a proxy for earnings forecast uncertainty. The results reported by Pincus [1983] provide weak evidence of increasing security price a djustments in relation to earnings forecast uncertainty, suggesting that the Index moderately reflects cash flow uncertainty. Lipe [1990] examines the relation between longitudinal earnings response coefficients and earnings variability using the variance of mechanical earnings forecast errors as a surrogate for earnings forecast uncertainty. The results reported by Lipe [1990] provide convincing evidence that response coefficient decrease in relation to earnings uncertainty, suggesting that the ability of current earnings to predict future earnings is an important deteminant of the equity security price response to firms earnings news. Imhoff and Lobo

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7- Theoretical research examining the impact of uncertainty upon the security price response to price-relevant information includes Verrecchia [1980], Marshall [1980], Robichek and Myers [1966], and Epstein and Turnbull [1980].

8- The Value Line Earnings Variability Index is calculated based upon the standard deviation of percentage quarterly earnings changes measured over a ten-year period. Value Line uses various data transformations to address problems arising form small, zero, and negative earnings . Large indices represent predicatble earnings series.

[1992] examine the impact of the standard deviation of analysts' earnings forecasts upon the cross-sectional variation in firms' earnings response coefficients. Their results suggest that earnings response coefficients decrease (in cross-section) in relation to the standard deviation of analysts' earnings forecasts. Based upon information economics-based results, the findings of Imhoff and Lobo [1992] indicate that the earnings content associated with divergence of analysts' opinions are price-irrelevant (i-e.,either nonrecurring, noncash, or have been previously impounded in price).

This Study

We examine the impact of the accrual and cash flow sources of earnings forecast uncertainty upon (1) the divergence of analysts' opinions, and (2) the longitudinal and cross-sectional security price response to firms' earnings news. We propose that the (residual) variability of the accrual and cash flow components of earnings empirically behave as though they are indicators of the ability of current earnings to predict future earnings. We expect the divergence of analysts' opinions to be positively related to the variability of the accrual and cash flow variables, a result suggesting that the variability of accruals and cash flows components of earnings uncertainty give rise to disagreement (relative to alternative sources of information) regarding the future performance of firms. We expect longitudinal and

cross-sectional earnings response coefficients to decline relative to accrual and cash flow sources of earnings uncertainty, because investors perceive similar magnitudes of earnings forecast errors to be differentailly informative regarding future earnings. Consequently, the contribution of the research is to (1) provide evidence corroborating and integrating the results reported by Imhoff and Lobo [1992] and lipe [1990] suggesting that uncertainty regarding future earnings decreases the equity security price response to earnings news, and (2) provide additional insight into how predisclosure earnings uncertainty impacts the equity security price response to fimrs' earnings news.

Data Measurement and Empirical Method and Results

Sample Firms and Firm Specific Data:

The firms used in this research meet the following data availability criteria:

- They have the following non-missing security return, share and dividend data in the 1991 CRSP Daily files for trading days associated with earnings release dates corresponding to quarters ending between January 1, 1981 and December 29, 1990 (inclusive):

(a) close common share price;

(b) close-to-close common share price returns;

(c) outstanding number of common shares; and

(d) stock dividend and stock split adjustment factors.

● They have non-missing data available in the Compustat Quarterly data files for the first quarter of 1981 and extending through the fourth quarter of 1990:[9]

(a) earnings announcement date;

(b) earnings before discontinued operations and extraordinary items;

(c) depreciation and amortization;

(d) deferred taxes and investment tax credit liability;

(e) net trade receivables;

(f) inventories;

(g) other current assets;

(h) accounts payable;

(i) income taxes payable ; and,

(j) other current Liabilities.

● They have non-missing quarterly primary earnings-per-share (before discontinued operations and extraordinary items), quarterly mean analysts' earnings forecasts, and standard diviation of mean analysts' earnings forecats in the 1990 IBES data files from 1984 and extending through 1990.[10]

9- The source for the earnings announcement date data are the **Wall Street Journal** or the Dow Jones News Service. The two sources may differ in their reporting of earnings releases by one day when the earnings release appears on the Broad Tape on the floor of the exchange the afternoon preceding its appearance in **Wall Street Journal.**

10- Of the multiple analysts' earnings forecasts which may be available for a specific →

Empirical Method: Variability of Cash flows and Accruals

We operationalize the variability of cash flows[11] and accruals using the standard dieviation of the errors of the forecast models shown in Equation (1) and Equation (2) shown below. Thus, the variability of both cash flows and accruals represent the unexplained variablity in a seasonal first order autoregressive model. In these forecast models, i indexes the firm and j indexes the quarterly observatins used to calculate ordinary least-squares parameter estimates. For each firm-quarter observation in the time period with the first quarter of 1985 and ending with the last quarter of 1990, observations from the preceding 20 quarter period (i. e., ex-ante to the firm-quarter) are used to estimate the parameters. The estimation is repeated for each firm-quarter in the 20-quarter period form 1985 to 1990. These firms' quarter-specific parameter estimates are used to calculate the standard deviation of the forecast errors. The resulting measures of variability are subsequentlty denoted by STD [CFO_{ij}] and STD [ACC_{ij}].

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firm- quarter, we employ the consensus earnings forecast in the month with the least forecast horizon (i. e., the earnings forecast immediately preceding the earnings release date).

11- The eight data items shown in 2. (c-j) are used to adjust earnings in calculating cash flow from operations in a manner analogous to Bowen et. al. [1987, 1986], and Rayburn [1986].

$$\frac{CFO_{ij}}{PRICE_{ij} \cdot NOS_{ij}} = a_{i0} + a_{i1} \cdot \frac{CFO_{ij-4}}{PRICE_{ij-4} \cdot NOS_{ij-4}} + u_{ij} \quad (1)$$

$$\frac{ACCRUAL_{ij}}{PRICE_{ij} \cdot NOS_{ij}} = b_{i0} + b_{i1} \cdot \frac{ACCRUAL_{ij-4}}{PRICE_{ij-4} \cdot NOS_{ij-4}} + v_{ij} \quad (2)$$

Equation (3) shows an earnings respons regression[12]which is

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12- The market model is used to calculate expected security retruns and is shown in Equation (a) below. Expected security retruns are calculated for each earnings release date corresponding to the 40 quarter period beginning with the first quarter of 1981 and extending through the last quarter of 1990. The market model is estimated using the natural logarithm of the security returns. The natural logarithm of (one plus) returns are used for the following two regsons: (1) the cumulation of the unexpected (residual) returns results in compounded daily unexpected returns (rather than additive), which is a conceptually preferable approach and (2) the logarithmic transformation appeals to the central limit theorem regarding the normal distribution of the data (including reducing the skewness of the data). For each firm announcement, the market model is estimated over the 60 trading-day period beginning 70 days prior to the earnings release date, and ending 11 days prior to the earnings release date. Daily unexpected returns (UR_{it}) (Equation (b)) are calculated as the actual return minus the expected return. The unexpected returns are deflated by the standard deviation of the market model residuals, where the standard deviation is adjusted for prediction outside of the estimation period using the Patell [1976] procedure. The standardization produces measures of daily unexpected returns which are unit normal distributed. Though standardization may marginally reduce the explanatory power of earnings, it has the added effect of →

estimated over the same time period in order to obtain longitudinal measures of firm quarter-specfic earnings response coefficients (d_{it}).

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mitigating the undesirable impact of heteroscedasticity in earnings response regression analyses.

(a) $$\ln(r_{it}+1) = \beta_{i0} + \beta_{i1}\cdot\ln(r_{Mt}+1) + e_{it}$$

(b) $$UR_{it} = \frac{\ln(r_{it}+1) - \beta_{i0} - \beta_{i1}\cdot\ln(r_{Mt}+1)}{\sigma_{Fi}}$$

r_{it} = i th firm-quarter's security price return for trading-day t,

r_{Mt} = market average return for trading-day t,

β_{io} = i th firm-quarter's ordinary least-squares intercept estimate,

β_{it} = i th firm-quarter's ordinary least-squares slope coefficient estimate, and

e_{it} = i th firm-quarter's ordinary least-squares residual for trading-day t.

The adjustment factor (C_{it}) used to scale the standard deviation of the markert model residuals (σ_i) is proportional (under the radical) to the ratio of the independent variable t th daily (announcement period) deviation from the mean to the estimation period sum of squared errors. The standard error of the estimate (σ_{Fi}) is used to deflate event period market model residuals, where $\sigma_{Fi} = C_{it}$, and

$$C_{it} = \sqrt{1 + \frac{1}{T} + \frac{(\ln(r_{Mt}+1) - \ln(\bar{r}_M+1))^2}{\sum_T (\ln(r_{Mt}+1) - \ln(\bar{r}_M+1))^2}}$$

Cumulation of daily standardized unexpected returns is indicated by $UR_{it}[-5, 0]$, where the cumulation period begins five trading days preceding the earnings release date and ends with the earnings release date (t= 0).

$$UR[-5,0]_{ij} = d_{i0} + d_{i1} \cdot \frac{IBEI_{ij} - IBEI_{ij-4}}{PRICE_{ij} \cdot NOS_{ij}} + x_{ij} \quad (3)$$

Table 1 shows the descriptive statistics for the residual variability of cash flows, residual variability of accruals, divergence of analysts', divergence of analysts' earnings forecasts, and estimated earnings response coefficients. Table 2 shows the Spearman cross-correlations of the variables.[13]

Table 2 shows a significant rank correlation at the $\alpha = 0.05$ confidence level for all pair-wise comparisons. The dispersion of analysts' opinions is directly related to the variability of cash flows and accruals. This result suggests that the dispersion of analysts' opinions increases as the predictability of cash flows and accruals - and thereby, earnings - increases. Longitudinal earnings response coefficients are inversely related to the residual variability of cash flows and accruals. This result is an indication that highly predictable cash flows and accruals are preceived by investors contributing to the predictability of future earnings.

13- The Spearman correlations between longitudinal earnings response coefficients and dispersion of analysts' opinions is significantly less than zero at the α=0.05 confidence level, suggesting (without controlling for other factors that dispersion of analysts' earnings forecasts reflects uncertainty about future earnings resulting in a decrease in the equity security price response to earnings news.

Table 1
Descriptive Statistics for Variability of Cash Flows and Accruals, Divergence of Analysts' Earnings Forecasts, and Longitudinal Earnings Response Coefficients

$STD[CFO_{ij}]$	0.000627	0.004214	0.070579	0.000001
$STD[ACC_{ij}]$	0.000416	0.003263	0.057692	0.000001
STD_{ij}	0.081460	0.146960	4.380000	0.010000
ERC: d_{ij}, Equation (3)	3.567684	18.111459	73.642517	-53.180658

Definition of variables:

$$\frac{CFO_{ij}}{PRICE_{ij} \cdot NOS_{ij}} = a_{i0} + a_{i1} \cdot \frac{CFO_{ij-4}}{PRICE_{ij-4} \cdot NOS_{ij-4}} + u_{ij}$$

$$STD[ACC_{ij}] = \sqrt{\sum_{j-20}^{j-1} \frac{v_{ij}^2}{19}}$$

$$STD[CFO_i] = \sqrt{\sum_{j-20}^{j-1} \frac{u_{ij}^2}{19}}$$

STD_{ij} : standard deviation of analysts' (least horizon) earnings forecasts for firm i and quarter j.

d_{ij} : earnings response coefficient for firm i and quarter j. Estimated as slope coefficient from earnings response regression shown in Equation (3).

$$\frac{ACCRUAL_{ij}}{PRICE_{ij} \cdot NOS_{ij}} = b_{i0} + b_{i1} \cdot \frac{ACCRUAL_{ij-4}}{PRICE_{ij-4} \cdot NOS_{ij-4}} + v_{ij}$$

$$UR(-5,0)_{ij} = d_{i0} + d_{i1} \cdot \frac{IBEI_{ij} - IBEI_{ij-4}}{PRICE_{ij} \cdot NOS_{ij}} + x_{ij}$$

Table 2
Cross-Correlation of Source and Earnings Uncertainty Variables:
Spearman Rank Correlations [a]

	$STD[CFO_{ij}]$	$STD[ACC_{ij}]$
STD_{ij}	0.24492 (0.000)†	0.18907 (0.000)†
d_{ii}	-0.11725 (0.000)†	-0.13288 (0.000)†

†: Correlation coefficient is significantly different from zero (under the null hypothesis) at the $\alpha=0.05$ confidence level.

a: p-values shown in parentheses below correlation coefficient.

Empirical Method: Determinants of Dispersion of Analysts' Earnings Forecasts

In this section, we investigate the multiple linear regression relationship between the dispersion of analysts' earnings forecasts and the residual variability of cash flows and accruals,[14] while

14- We use the standard deviation of the forecast model residuals (and standard deviation of analysts' earnings forecasts) divided by the absolute value of analysts' forecast earnings to stratify the sample because it controls for the magnitude of earnings and is conceptually preferable. We stratifed the sample using the raw standard deviation of the forecast model residuals (and standard diviation of analysts' earnings forecasts) and observe that the results are virtually identical.

explicitly controlling for the impact of systematic risk, equity share price, and capitalized equity value. The pooled regression model used to characterize the relation between these variables is shown in Equation (4).[15] The θ_{ik} ($\forall$ 1, 1 $\in$ [1, ... , 2]) are ordinary least - squares parameter estimates, ζ_{ik} are errors with zero mean and constant variance[16]. We hypothesize (under the alternative) that

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15- A rank data transformation is used for all independent variables used in the regressions described in this paper. The rank transformation substitutes the value of the variable with the value of its sample rank. This technique provides additional confidence in the statistical results because: (1) the results are independent of assumptions regarding the distribution of the data (i. e., it is a distribuition free technique); (2) the transformation generalizes the functional form of the regression equation, since it provides the same results as all ordinal transformations; and (3) it mitigates the impact of measurement error, outliners, and residual heterosedasticity on the regression results. Rank ties are replaced with the mean value, rather than the high or low value. Percentile ranks are used rather than the raw ranks because they are independent of the maximum rank, and, therefore, more general. Percentile ranks express the variable rank as a percent of the maximum raw rank. Consequently, the data range from zero to one. See Iman and Conover [1979] for details regarding the use of rank data transformations in regression analysis.

16- The severity of the heteroscedasticity of the residuals of the pooled earnings response regression is evaluated over each of the uncertainty measures employed using the White [1980, pp. 824- 825] x^2 test. The White test regresses the earnings response regression squared residuals onto the independent variables and their cross-products (eliminating duplicates). The product of the R^2 of this regression and the number of →

each of the residual variability variables at the margin is positively related to the dispersion of analysts' opinions.

$$STD_{ij} = \theta_{0k} + \theta_{1k} \cdot B_{ij} + \theta_{2k} \cdot PRICE_{ij} + \theta_{3k} \cdot VALUE_{ij} + \theta_{4k} \cdot \Delta_{ijk} + \zeta_{1kj}^{(4)}$$

$H1_{0k}$: $\theta_{4k} \leq 0$ ($\forall$ k, k $\in$[1,...,2])

The results obtained for Equation (4) are shown in Table 3. For both residual variability variables the null hypothesis is rejected at the $\alpha = 0.05$ confidence level, indicating that after controlling for the magnitude of beta, price and value the residual cash flow and accrual variability variables (proxies for variabiltiy of alternative sources of information) are positively related to dispersion of analysts' earnings forecasts. This result suggests that (1) the dispersion of analysts' earnings forecasts is a manifestation, in part, of the predictability of these components of future earnings, and (2) corroborates and provides additional insight into the results reported by Imhoff and Lobo [1992].

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observations used is a test statistic which is approximately x^2 ½ $(k+k^2)$ (k is the number of independent variables) distributed under the null hypothesis of homoscedasticity (consequently, one wants to not reject the null hypthesis using this test). When this test is rejected , the t-statistics shown in Tables 3, 4, and 5 are calculated using heteroscedasticity- consistent variance estimates. The heteroscedasticity-consistent t - statistic are similar to the t - statistics calculated using conventional standard deviation estimates.

Empirical Method: Determinants of Longitudinal Earnings Response Coefficients

In this section, we investigate the relation between longitudinal earnings response coefficients and the residual variability of cash flows and accruals while explicitly controling for the potential impact of systematic risk, equity share price, and capitalized equity value. In addition to the residual variability of cash flows and accruals, we also examine the impact of dispersion of analysts earnings forecasts upon longitudinal earnings response coefficients. The pooled regression model used to characterize the relation between these variables is shown in Equation (5). δ_{ik} ($\forall$ k , k$\in$ [1, ... ,3]) are ordinary least-squares parameter estimates, ε_{ijk} are errors with zero mean and constant variance. We hypothesize (under the alternative) that the residual variability of the cash flow and accrual components of earnings are inversely related to longitudinal earnings response coefficients. In addition, we expect the longitudinal earnings response coefficients to decrease in relation to the dispersion of analysts' opinions (Imhoff and Lobo [1992].

$$d_{ijl} = \delta_{0k} + \delta_{1k}\cdot B_{ij} + \delta_{2k}\cdot PRICE_{ij} + \delta_{3k}\cdot VALUE_{ij} + \delta_{4k}\cdot \Delta_{ijk} + \varepsilon_{ijk} \quad (5)$$

$H2_{0k}$: $\delta_{4k} \geq 0$ ($\forall$ k, k $\in$ [1,...,3])

The results obtained for Equation (5) are shown in Table 4. For the residual variability of cash flows and accruals and for dispersion of analysts' earnings the null hypothese is rejected at

Table 3
Regression Results Characterizing the Relation Between the Standard Deviation of Analysts' Earnings Forecasts and Measures of Predisclosure Uncertainty

Uncertainty Measure: Δ_{ijk}	Intercept: θ_{0k} (H_{0k}: θ_{0k}=0)	$BETA_{ij}$: θ_{1k} (H_{0k}: θ_{1k}=0)	$PRICE_{ij}$: θ_{2k} (H_{0k}: θ_{2k}=0)	$VALUE_{ij}$: θ_{3k} (H_{0k}: θ_{3k}=0)	Δ_{ijk}: θ_{4k} ($H1_{0k}$: θ_{4k}≤0)	Regression R^2 (AdjustedR^2)	White's χ^2 [b] (p-value)
$STD[CFO_{ij}]$ (k = 1)	3563.458633 (7.772)†	-104.939400 (-2.085)†	-6.193497 (-4.414)†	-75.750415 (3.239)†	0.469131 (23.455)‡	0.2081 (0.2071)	74.1069 (0.0000)■
$STD[ACC_{ij}]$ (k = 2)	3325.974104 (7.153)†	-106.665048 (-2.115)†	-5.650279 (-3.721)†	-80.639125 (-3.415)†	0.322144 (22.775)‡	0.2087 (0.2077)	102.9823 (0.0000)■

†: The null hypothesis that the regression coefficient is equal to zero is rejected at the $\alpha = 0.05$ confidence level using two-tailed t-tests. The critical t-statistic value for the two-tailed t-tests is $|t| = 1.95$.

‡: The null hypothesis that the regression coefficient is greater than or equal to zero is rejected at the $\alpha = 0.05$ confidence level using one-tailed t-tests. The critical t-statistic value for the one-tailed t-tests is $|t| = 1.65$. These hypothesis tests correspond to $H1_{0k}$ shown in the text.

■: The t-statistics are calculated using heteroscedasticity consistent variance-covariance estimates when the null hypothesis of homoscedasticity for the regression model is rejected at the α=0.05 confidence level using the White [1980] test procedure. The reported t-statistics are similar in magnitude to t-statistics calculated in the conventional manner and produce similar results for the hypotheses tested.

Table 3 Continued...

Regression Equation:

$$STD_{ij} = \theta_{0k} + \theta_{1k} \cdot \beta_{ij} + \theta_{2k} \cdot PRICE_{ij} + \theta_{3k} \cdot V_{ij} + \theta_{4k} \cdot \Delta_{ijk} + \zeta_{ijk}$$

Definition of Variables:

STD_{ij}= standard deviation of analysts' earnings forecasts for ith firm-quarter observation deflated by the absolute value of actual earnings (i.e., coefficient of variation)

β_{ij} = systematic risk measure for i^{th} firm earnings release, proxied by slope coefficient from market model estimated over a 60 trading-day period beginning 70 trading days prior the earnings release and ending 11 trading days prior to the earning release.

$VALUE_{ij}$ = capitalized equity value for i^{th} firm earnings release, estimated as the product of price and number of outstanding common shares on the 11^{th} trading-day prior to the earnings release.

$PRICE_{ij}$ = close security price on the 11^{th} trading-day prior to the earnings release, estimated as the bid price for the last purchase of the trading-day or the ask price for the last sale of the trading-day.

Δ_{ijk} = k=1: standard deviation of cash flow from operations forecast errors
k=2: standard deviation of accrual component of earnings forecast error

the $\alpha=0.05$ confidence level, indicating that these variables are inversely related to longitudinal earnings response coefficients. This result (1) indicates that the residual variability of cash flowsand accruals reflect underlying uncertainty regarding future earnings, (2) suggests that the dispersion of analysts'earnings forecasts arises, in part, as a result of uncertainty regarding firms' future earnings performance, and (3) corroborates and provides additional insight into the results reported by Imhoff and Lobo [1992] and Lipe [1990].

Empirical Method: Cross-Sectional Variation in Earnings Response Coefficients

In this section, we examine the impact of the variability of cash flows and accruals upon the cross-sectional variation in earnings response coefficients using a method paralleling Imhoff and Lobo [1992] for comparative purposes.[17] Pooled earnings response regression analyses are used to evaluate the explanatory power of analysts' earnings forecast errors (FE_{ij})[18] with respect to

17- Imhoff and Lobo [1992] examine the impact of the standard deviation of analysts' earnings forecasts upon cross-sectional variation in the annual earnings/returns relation using data from 1979 to 1984.

18- The firm quarter-specific earnings forecast errors are calculated as actual earnings per share minus analysts' forecasted earnings per share (deflated by close price per share on the eleventh trading preceding the earnings release date). The forecasted earnings per share figure used is the least forecast horizon mean forecast (i. e., the most recent mean forecast).

Table 4
Regression Results Characterizing the Relation Between Longitudinal Earnings Response Coefficients and Measures of Predisclosure Uncertainty

Uncertainty Measure: Δ_{ijk}	Intercept: δ_{0k} (H_{0k}: δ_{0k}=0)	$BETA_{ij}$: δ_{1k} (H_{0k}: δ_{1k}=0)	$PRICE_{ij}$: δ_{2k} (H_{0k}: δ_{2k}=0)	$VALUE_{ij}$: δ_{3k} (H_{0k}: δ_{3k}=0)	Δ_{ijk}: δ_{4k} ($H2_{0k}$: $\delta_{4k} \geq 0$)	Regression R^2 (Adjusted R^2)	White's χ^2 [b] (p-value)
STD [CFO_{ij}] (k = 1)	12698 (19.697)†	-211.083611 (-3.238)†	10.938323 (4.380)†	-425.091327 (-12.701)†	-0.197849 (-8.075)‡	0.0805 (0.0794)	547.6170 (0.0000)■
STD [ACC_{ij}] (k = 2)	12982 (19.767)†	-209.265392 (-3.218)†	10.297910 (4.087)†	-426.973966 (-12.636)†	-0.156652 (-9.041)‡	0.0860 (0.0848)	539.9229 (0.0000)■
STD_{ij} (k=3)	12215 (18.880)†	-226.454898 (-3.473)†	12.194933 (4.867)†	-411.426861 (-12.208)†	-0.099966 (-4.995)‡	0.0706 (0.0694)	615.4207 (0.0000)■

†: The null hypothesis that the regression coefficient is equal to zero is rejected at the $\alpha = 0.05$ confidence level using two-tailed t-tests. The critical t-statistic value for the two-tailed t-tests is $|t| = 1.95$.

‡: The null hypothesis that the regression coefficient is greater than or equal to zero is rejected at the $\alpha = 0.05$ confidence level using one-tailed t-tests. The critical t-statistic value for the one-tailed t-tests is $|t| = 1.65$. These hypothesis tests correspond to $H2_{0k}$ shown in the text.

■: The t-statistics are calculated using heteroscedasticity consistent variance-covariance estimates when the null hypothesis of homoscedasticity for the regression model is rejected at the α=0.05 confidence level using the White [1980] test procedure. The reported t-statistics are similar in magnitude to t-statistics calculated in the conventional manner and produce similar results for the hypotheses tested.

Table 4 Continued...

Regression Equation:

$$d_{ijl} = \delta_{0k} + \delta_{1k}\cdot\beta_{ij} + \delta_{2k}\cdot PRICE_{ij} + \delta_{3k}\cdot VALUE_{ij} + \delta_{4k}\cdot\Delta_{ijk} + \varepsilon_{ijk}$$

Definition of Variables:

d_{ijl}= firm-specific longitudinal earnings response coefficient. The earnings response coefficient is the estimated slope coefficient from the earnings response regression shown in Equation (4).

β_{ij} = systematic risk measure for i^{th} firm earnings release, proxied by slope coefficient from market model estimated over a 60 trading-day period beginning 70 trading days prior the earnings release and ending 11 trading days prior to the earning release.

$VALUE_{ij}$ = capitalized equity value for i^{th} firm earnings release, estimated as the product of price and number of outstanding common shares on the 11^{th} trading-day prior to the earnings release.

$PRICE_{ij}$ = close security price on the 11^{th} trading-day prior to the earnings release, estimated as the bid price for the last purchase of the trading-day or the ask price for the last sale of the trading-day.

Δ_{ik} = k=1: standard deviation of cash flow from operations forecast errors
k=2: standard deviation of accrual component of earnings forecast error
k=3: standard deviation of analysts' earnings forecasts

unexpected security price returns (UR_{ij} [-5,0]). The earnings response regression is shown in Equation (6).[19] Ordinary least - squares estimation techniques are used. The frim-quarter observations are assigned to one of two equal-sized strata on the basis of the rank of the variability of cash flows and accruals and the standard deviation of analysts' earnings forecasts using

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19- Cheng, Hopweed, and McKeown [1992] perform a thorough specification analysis of the earnings response regression. Based upon their results, the form of the regression shown in Equation (5) (without qualitative variables) appears to be the best specification of the model, and is, therefore, employed herein. Systematic risk (β_i), capitalized equity value (V_i) and share price (P_i) are included in Equation (5) to improve the specification of the earnings response regression. The systematic risk measure for i^{th} firm earnings release is proxied by slope coefficient from market model estimated over a 60 trading-day period beginning 70 trading days prior the earnings release and ending 11 trading days prior to the earnings release and is measured from daily returns using the market model (see footnote 12). Share price is the close security price on the 11^{th} trading-day prior to the earnings release, estimated as the bid price for the last purchase of the trading-day or the ask price for the last sale of the trading -day. Capitalized equity value is calculated as the product of close price and number of outstanding shares on the 11^{th} trading-day preceding the earnings release date. The coefficients for these variables are not directly of interest in evaluating the impact of residual standard deviation of cash flows. Accruals and cash flows given earnings upon the relation between magnitudes of risk-adjusted security retruns and unexpected earnings. See Johnston [1984] for an explanation of the interpretation of coefficients estimated from regressions employing qualitative variables.

qualitative variables (D_{ijk}). The first stratum contains the low variability firm-quarter obervations ($D_{ijk} = 0$); the second stratum contains the high variability firm-quarter observations ($D_{ijk} = 1$). Within each stratum, observations are sorted by the magnitude of the forecast error. Portfolios of ten observations are formed, and portfolio mean values for each of the variables are calculated.[20] A percentage rank tranformation is employed for the mean values. Because we believe the variability of cash flows and accruals to increase in relation to the uncertainty associated with future earnings, we expect cross-sectional earnings response coefficients to decrease as the standard deviation of regression errors increases. The earnings coefficient for low standard deviation portfolios is γ_{5k} ($\forall$ k, k $\in$ [1, ...,3]), and is expected to be significantly greater than zero at the α=0.05 confidence level. The

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20- Regresssion portfolios may be formed using either the independent or dependent variables. The use of portfolios mitigate the impact of measurement error if the variable used to form the portfolios is (1) unrelated to measurement error, and (2) related to the "true" variable. Use of the dependent variable to form portfolios is more likely to satisfy these conditions because cumulative risk-adjusted returns are likely to be unrelated to measurement error in earnings forecast errors. However, dependent variable based portfolios are likely to induce an artificial correlation between the independent variable and the regression error. This trade off is not easily resolved. We choose to form portfolios based upon an independent variable (i. e., earnings forecast errors) for purpose of comparison with Imhoff and Lobo [1992].

earnings coefficient for the high standard deviation portfolios is $\gamma_{5k} + \gamma_{6k}$, and is expected to be significantly less than γ_{5k} at the α=0.05 confidence level. The reduction in the earnings response coefficients for the high standard deviation observations provides an indication that the standard deviation of the earnings component is a proxy for the perceived transient content of earnings.

$$UR_{ij}[-5,0] = \gamma_{0k} + \gamma_{1k} \cdot D_{ijk} + \gamma_{2k} \cdot B_{ij} + \gamma_{3k} \cdot PRICE_{ij} + \gamma_{4k} \cdot VALUE_{i} + \gamma_{5k} \cdot FE \quad (6)$$

where

$$FE_{ij} = \frac{EPS_{ij} - E[EPS_{ij}]}{PRICE_{ij}} \quad (7)$$

$H3_{0k}$: $\gamma_{5k} \leq 0$ ($\forall$ k, k $\in$ [1,...,3])

$H4_{0k}$: $\gamma_{6k} \geq 0$ ($\forall$ k, k $\in$ [1,...,3])

Table 5 shows the results of the qualitative variable earnings response regressions indicated in Equation (6). Two of the regressions use observations partitioned based upon residual variability of cash flows and accruals variables. The additional regression uses the divergence of analysts' earnings forecasts to partition the observations. The latter regression is included for comparative purposes.

Table 5
Results of Cross-Sectional Earnings Response Regression Used to Assess the Impact of Predisclosure Uncertainty Upon Earnings Response Coefficients

Stratification Variable	$D_{ijk} \cdot \gamma_{1k}$ [a] $H_{0k}: \gamma_{1k}=0$	$BETA_{ij} \cdot \gamma_{2k}$ $(H_{0k}: \gamma_{2k}=0)$	$PRICE_{ij} \cdot \gamma_{3k}$ $(H_{0k}: \gamma_{3k}=0)$	$VALUE_{ij} \cdot \gamma_{4k}$ $(H_{0k}: \gamma_{4k}=0)$	$FE_{ij} \cdot \gamma_{5k}$ $(H3_{0k}: \gamma_{5k} \leq 0)$	$D_{ijk} \cdot FE_{ij} \cdot \gamma_{6k}$ $(H4_{0k}: \gamma_{6k} \geq 0)$	Reg. R^2 Adjusted R^2	White's χ^2 [b] (p-value)
$STD[CFO_{ij}]$ (k = 1)	0.524265 (2.608)†	0.000307 (2.531)†	-0.000167 (-0.874)	0.000072 (0.378)	0.001222 (6.744)‡	-0.000547 (-2.311)‡	0.0497 (0.0458)	78.2836 (0.2052)
$STD[ACC_{ij}]$ (k = 2)	0.264290 (1.624)	0.000035 (0.362)	-0.000331 (-1.841)	0.000067 (0.381)	0.001243 (8.753)‡	-0.000354 (-1.878)‡	0.0779 (0.0741)	26.9172 (0.2595)
STD_i (k=3)	0.282068 (1.365)	0.000265 (2.427)†	-0.000002 (-0.016)	-0.000116 (-0.660)	0.001324 (6.919)‡	-0.000380 (-1.632)	0.0690 (0.0652)	26.4984 (0.2779)

a: The regression intercept term (γ_{0k}) for the low variability strata is significantly different from zero at the α=0.05 confidence level for all variability measures ($\forall$ k, k ε [1,...,3]) and is not shown in the Table. Because of the manner in which the qualitative variables D_{ijk} are used, γ_{1k}represents the change in the regression intercept term between the low and high variability strata.

†: Null hypothesis rejected at the α = 0.05 confidence level using two-tailed t-tests. The critical t-statistic value for the two-tailed t-tests is $|t| = 1.95$.

‡: Null hypothesis rejected at the α = 0.05 confidence level using one-tailed t-tests. The critical t-statistic value for the one-tailed t-tests is $|t| = 1.65$. These hypotheses correspond to $H3_{0k}$ and $H4_{0k}$ in the text.

Table 5 Continued...

b: The t-statistics are calculated using heteroscedasticity consistent variance-covariance estimates when the null hypothesis of homoscedasticity for the regression model is rejected at the $\alpha = 0.05$ confidence level using the White [1980] test procedure. The reported t-statistics are similar in magnitude to t-statistics calculated in the conventional manner and produce similar results for the hypotheses tested.

$$CAR_{ij}\,[-5,0] = \gamma_{0k} + \gamma_{1k}\cdot D_{ijk} + \gamma_{2k}\cdot\beta_{ij} + \gamma_{3k}\cdot PRICE_{ij} + \gamma_{4k}\cdot VALUE_{ij} + \gamma_{5k}\cdot FE_{ij} + \gamma_{6k}\cdot$$

Definition of Variables:

$CAR_{ij}[1,m]$ = standardized risk-adjusted returns cumulated over a six trading-day period beginning five trading days preceding the earnings release date and extending through the earnings release date. Daily unexpected returns are estimated in logarithmic form (resulting in compounded cumulations), and are standardized using the Patell [1976] procedure.

β_{ij} = systematic risk measure for i^{th} firm earnings release, proxied by slope coefficient from market model estimated over a 60 trading-day period beginning 70 trading days prior the earnings release and ending 11 trading days prior to the earning release.

$VALUE_{ij}$ = capitalized equity value for i^{th} firm earnings release, estimated as the product of price and number of outstanding common shares on the 11^{th} trading-day prior to the earnings release.

$PRICE_{ij}$ = close security price on the 11^{th} trading-day prior to the earnings release, estimated as the bid price for the last purchase of the trading-day or the ask price for the last sale of the trading-day.

FE_{ij} = unexpected earnings estimated as forecast earnings minus actual earnings (quantity) divided by P_{ij}. Forecast earnings is estimated using analysts' concensus earnings forecast.

D_{ijk} = 1 if firm-quarter observation is an element of a high variability stratum ($\forall$ k, k ε [1,...,3])
0 otherwise

Indeed , γ_{5k} is significantly greater than zero at the α=0.05 confidence level for all ($\forall$ k, k $\in$ [1, ... , 3]) of the regression shown. The earnings coefficient for the high standard deviation stratum ($\gamma_{5k} + \gamma_{6k}$), is significantly less than the coefficient for the low standard deviation stratum (γ_{5k}) at the α= 0.05 confidence level for all ($\forall$ k, k $\in$ [1, ... , 3]) of the regressions shown. As a result, we find evidence that magnitudes of analysts' earnings forecast errors associated with high levels of cash flow and accruals have smaller earnings response coefficients than similar magnitudes of analysts' earnings forecast errors which are associated with low levels of cash flow and accruals.[21] These results (1) indicate that uncertainty regarding the predictability of cash and accrual components of earnings is an important factor

21- We also estimated Equation (5) using three strata (following Imhoff and Lobo [1992] rather than two. The results reported in our Table 8 are similar to the results reported in Imhoff and Lobo (Table 3, p. 435). When using three strata, the middle stratum seldom produces earnings coefficients which are significantly less than the earnings coefficients for the low standard deviation stratum, while the high standard deviation stratum produces earnings coefficients which are always significantly less than the earnings coefficients for the low standard deviation stratum. Because of the insignificance of the middle stratum, we use only two, acknowledging that the more parsimonious design probably dilutes the results reported for the high standard deviation stratum.

explaining differences in the security price response to earnings, (2) suggest that uncertainty as to the future cash and accrual contents of earnings drives earnings forecast uncertainty, and (3) corroborates and provides additional insight into the results reported by Imhoff and Lobo [1992] and Lipe [1990].

Conclusion

The purpose of this research is to investigate the behavior of predisclosure earnings uncertainty and earnings response coefficients in terms of cash flow and accrual uncertainty. We propose that uncertainty underlying cash flow and accrual components of earnings manifest as predisclosure earnings uncertainty and are reflected in the dispersion of analysts' earnings forecasts. We investigate whether the (residual) variability of cash flow and accrual components of earnings behave empirically as if they are "indicators" of the uncertainty about future earnings.

Our results indicate that cash flow and accrual uncertainty are monotonically related to the dispersion of analysts' earnings forecasts. Results reported by Imhoff and Lobo [1992] suggest that dispersion of analysts' earnings forecasts arises as a mainfestation of uncertainty regarding future earnings. In addition, results reported by Lipe [1990] suggest that (residual) earnings variability likewise arises as a manifestation of uncertainty about future earnings.

Because (residual) variability of cash flows and accruals are components of the unpredictable aspects of earnings, our results "suggest" that these variables are indicators of the uncertainty underlying future earnings. Our results also corroborate previously reported results and provide added insight into the determinants of predisclosure earnings uncertainty.

Our results indicate that cash flow and accrual uncertainty are inversely related to longitudinal and cross-sectional earnings response coefficients. These results "suggest" that (residual) cash flow and accrual uncertainty proxy for the nonsustainable content of the respective components of earnings. In addition, we provide evidence corroborating the results reported by Imhoff and Lobo [1992] and Lipe [1990] suggesting that earnings forecast uncertainty arises as a manifestation of transitory content of earnings and povide additional insight into how predisclosure earnings uncertainty impacts the equity security price response to firms' earnings news.

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