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We examine the market-relevance of disaggregating earnings into cash flow and accrual components. Unlike the majority of capital markets accounting research to-date, which has restricted analysis to price effects (returns), we focus on belief asymmetry as our measure of market-relevance. Specifically we examine the effect, which the earnings component disclosure has on the level of belief asymmetry in the market. Our measure of belief asymmetry is based on the model developed by Kim and Verrecchia (1991). Cross-sectional ordinary least square regression models are used to analyse the market response to measures of cash flow and accrual surprise.

Using belief asymmetry resolution as our measure of market relevance, we find that (i) the cash flow component of earnings has information content for investors, and that (ii) earnings decomposed into cash flows and accruals provides incremental information content (in terms of belief asymmetry) over disclosure of an aggregate earnings number alone.

1. Introduction

We investigate how the disclosure of cash flow and accrual components of earnings affects belief asymmetry among investors. Our paper is, in part, motivated by the model developed by Kim and Verrecchia (1991) who articulate a belief asymmetry measure of market response to announced information. In this model the trading volume reaction to an earnings announcement is a function of both the magnitude of the price reaction and the level of pre-announcement belief asymmetry. They argue (p.313) that "… the use of volume and returns together could potentially generate insights about the multiple, which depends on traders risk attitudes and the degree of differential precision among them. … This line of thinking also offers an alternative way to understand differences in volumes relative to returns".

We start by examining the volume responses to accounting information. Based on the theoretical relation between belief asymmetry on the one hand, and price and volume on the other, we then use several measures of belief asymmetry to assess the market effect of the earnings components.

The approach we adopt, of using a belief asymmetry measure which combines the price and volume reactions to earnings announcements, adds to the existing body of literature on the information content of accounting data since previous studies, with limited exceptions, have primarily focused on price (return) measures alone.

Analysing market response in this way may help to explain how and to what extent investors use accounting information. Earnings and earnings components information have been shown (by price response studies) to have information content for the market as an aggregate; however as Kim and Verrecchia argue, such information may be used differentially by individual investors. Accordingly, the absence of a price response to new information does not imply that the new information is not of importance to market participants in their economic decision-making.

A large change in share price may be caused by the trading of a subset of sophisticated investors who draw on information that is largely ignored by or not available to the rest of the market. Conversely, new earnings information may lead a large number of investors to revise their valuations without significantly altering the share price. Our belief asymmetry measure distinguishes these scenarios, not captured by traditional information content studies.

Consequently, we are able to offer broader insights into the market reaction to specific accounting information.

We hypothesise that the disclosure of earnings components such as cash flows and accruals can affect the level of belief asymmetry across all traders and potential traders. In contrast, the typical price/returns analysis only captures the first moment of the belief distribution; the overall market level of belief asymmetry may thus change (even though price may not). Support of this hypothesis has policy implications insofar as it captures more of the effects of new information. Rather than just the effect on – potentially sophisticated – price-setting investors, we also capture the extent to which investors change their shareholdings, including those – potentially unsophisticated investors – who do so through trades which may not affect price.

We also hypothesise that disclosed cash flow is more meaningful to investors than disclosed accruals, i.e. that cash flows have more information content relative to accruals. Given that cash is generally easier to interpret than accruals, cash flow information should affect individual investors' expectations more than accruals information and thus have a greater impact on the level of belief asymmetry in the market.

We use a sample of 1,244 firm-year observations drawn from NYSE and AMEX; we first compare means of price and volume reactions across different levels of cash and accruals surprise, before undertaking a cross-sectional regression analysis. The significance of cash flow and accrual disclosure is tested by regressing both volume and change in belief asymmetry against earnings surprise component variables (as well as a number of control variables). Market response, in terms of change in belief asymmetry, is measured over a short three- and seven-day event window surrounding the announcement date, while investors' expectations are estimated using both an analysts' forecasts model and a naïve expectations model.

Our results suggest that cash flows and accruals are associated with a change in the level of belief asymmetry, but that it takes several days for the effect to transpire. Consistent with our hypothesis, we find that cash flow information is positively related to the change in belief asymmetry and affects it more strongly than accruals information. Furthermore, it appears that different subsets of investors respond differently to the same set of information. For example, sophisticated investors' shareholdings (and hence trading volume) seem to be less affected by

an earnings announcement than relatively "naïve" or inexperienced investors as they have wider access to pre-disclosure information.

In this paper, we contribute to existing literature by introducing belief asymmetry resolution as a new measure of market response to accounting information. In looking at the role of accounting in changing belief asymmetry we consider, in particular, the relative roles of cash and accruals. Finally, by sourcing both forecast and actual accounting data from the same database, we avoid the problems relating to different and mutually inconsistent data adjustments identified by Givolvy *et al* (2008).

The remainder of the paper is structured as follows. Section 2 reviews relevant literature and formally states our hypotheses. Our method and sample selection are discussed in section 3. Descriptives and results are described in section 4. We offer concluding remarks in section 5.

2. Literature Review and Hypotheses

Three branches of literature are particularly relevant to our research: (i) Studies on the information content of earnings components traditionally build on the association between the informative disclosure and the market's price reaction. (ii) Volume-based studies use an alternative metric for the market response, but focus on the association with aggregate earnings (Beaver 1968; Bamber 1986). (iii) The relative price-volume response has mostly been examined analytically (Kim and Verrecchia, 1991) with limited empirical evidence (Bamber and Cheon, 1995).

Standard-setters consider earnings components information relevant to users of financial reports and thus require the disclosure of cash-based earnings (in the statement of cash flows) in addition to accrual-based earnings (in the income statement). Whilst accrual earnings are considered to be a more accurate measure of firm performance (Statement of Financial Accounting Concepts No. 1) than cash[1], they are more likely to be affected by earnings management as revenues and expenses may be discretionally allocated across different accounting periods (Dechow *et al*, 1995). Since cash flows provide information on the firm's ability to generate positive future net cash flows (Statement of Financial Accounting Standards 95, Paragraph 5a), they can be used to assess the quality of earnings (Schipper and Vincent, 2003). A rising private interest in the cash component of earnings is evidenced by a recent increase in financial analysts disseminating not only earnings, but also cash flow

[1] Cash transactions are prone to timing and matching problems that are resolved by accrual accounting (Dechow 1994)

forecasts. Between 1993 and 2005 the proportion of US firms for which both types of forecasts were issued increased from just 2.5% to more than 50% (Givoly *et al*, 2008).

Prior research finds that accruals and cash flows are individually significant in explaining market response in terms of returns (Rayburn, 1986; Ali, 1994; Defond and Hung, 2003; Givoly, 2008), however studies on the relative market evaluation of these components provide mixed results. Wilson (1987) shows that accruals have incremental information content beyond the information contained in cash flows, but Bernard and Stober (1989) find that Wilson's results, which are based on two years of (US) data, are not generalisable. They conclude that there is no evidence that earnings components have differential information content. In contrast, Bowen *et al* (1987) and Garrod and Hadi (1998) report that cash flows are relatively more informative to investors than accruals. Further evidence also indicates that the cash and accrual components of earnings provide different signals to investors and that accruals are mis-priced by the market (Sloan, 1996).[2]

These studies exclusively draw on the earnings-return relationship to assess the usefulness of earnings component information, however, empirical evidence that differences exist between the price reaction and the trading volume reaction to an earnings announcement may warrant the re-examination of this issue with regards to volume response. Turning to the second group of studies, Morse (1981) shows that whilst most of the price reaction and the volume reaction occur on the day before and the day of an (quarterly) earnings announcement, the volume reaction seems to persist longer than price reaction. The lagged adjustment of trading volume versus the almost instantaneous incorporation of information could indicate that there may be different factors influencing price reaction and volume reaction. Furthermore, Bamber and Cheon (1995) find that despite the magnitudes of price reaction and trading volume reaction being positively related on average, there are a significant number of differential price and volume reactions to earnings announcements. They conclude that the relationship may be closer to independence than to a strong positive association as up to a quarter of earnings announcements are shown to lead to either very high trading but little price change or large price change but little trading.

In contrast to the earnings-return relation, there exists no generally accepted theory as to what exactly drives volume response. Share trading may arise from a number of factors that affect individual investors such as changes in beliefs based on information, changes in share price, changes in risk preferences, changes in liquidity requirements, changes in taxation, changes in

[2] Xie (2001) finds that the mis-pricing of accruals is largely due to abnormal accruals.

consumption opportunities, changes in wealth, etc. (Morse, 1980; Ziebart, 1990). Beaver (1968) proposes an intuitive relation between the price response and the volume response to an earnings announcement, which can then be used to develop a framework for interpreting trading volume reaction. In his view, the trading volume reaction to an earnings announcement represents the sum of all individual investors' trades. In contrast, the price reaction is regarded as the change in the market's average expectations following the informative disclosure. Therefore, the two measures differ as volume response preserves the differences in beliefs among individual investors, whereas these differences are cancelled out in the price response, as this measure only considers average beliefs (Atiase and Bamber, 1994).

Kim and Verrecchia (1991) provide a formal analytical framework to Beaver's intuition, by relating the trading volume reaction of an earnings announcement to the belief structure in the market. They argue that differences in the individual investors' pre-disclosure expectations, (i.e. the pre-disclosure belief asymmetry) arise as private information of varying precision is unevenly distributed in the market prior to the earnings announcement. Thus, an investor, who has access to high-quality pre-disclosure private information and has confidence in its precision, will be less surprised by the earnings announcement and consequently trade little or not at all as his shareholdings already reflect the private information. On the other hand, an investor, who has no private pre-disclosure information or relies on low-quality private information, will reassess his shareholdings upon the earnings announcement to incorporate the newly available public information. Atiase and Bamber (1994) provide empirical evidence supporting this proposition by showing that the volume response to earnings announcements is an increasing function of both the magnitude of the associated price reaction[3] and the level of pre-disclosure belief asymmetry.

Following these findings, we extend the test of the conventional earnings-return relationship to test the association between the disclosure of earnings components information and the market's volume reaction. Adopting a model similar to Rayburn (1986), abnormal trading volume is substituted for abnormal return and regressed against the unexpected portion of the earnings components:

$$(1)\ \Delta V_{it} = \beta_0 + \beta_1\ UCPS_{it} + \beta_2\ UAC_{it} + \beta_i\ Controls + \varepsilon_i$$

[3] Price reaction and trading volume reaction to an earnings announcement have been found to be positively correlated, e.g. actively traded shares are associated with a price increase (Lamont and Frazzini 2008).

where ΔV_{it} is the abnormal trading volume, $UCPS_{it}$ and UAC_{it} represent the unexpected portions of the firm's reported cash flows and accruals respectively, and Controls are various control variables.

As standard-setters claim that the statement of cash flows provides information to investors that may be relevant to investment decisions, and at the same time stress the objective of accrual accounting is to make earnings more meaningful, we expect that the decomposition of earnings adds to the informative value of earnings. Both cash flows and accruals are expected to be individually significant with respect to abnormal trading volume and provide information beyond that contained in earnings:

$$H_1: \beta_1 \neq 0$$

$$H_2: \beta_2 \neq 0$$

Prior research indicates that investors place relatively more importance on cash flow information than on accruals information (Sloan, 1996). Given that cash flow information is easier to interpret than accrual information, we expect that the disclosure of cash flow information affects investors' beliefs relatively more than accruals. In this case cash surprise should have a greater impact on trading volume than accrual surprise.

$$H_3: \beta_1 > \beta_2$$

The third branch of literature we address focuses on belief asymmetry among investors. Conventionally information asymmetry is proxied by the bid-ask spread. However, a fundamental problem of this measure, as suggested by current finance literature, is that it is only one of the costs faced by a dealer and that the other components would have to be assumed to be either nil or constant across firms and time[4].

Based on Kim and Verrecchia's (1991) theoretical trading volume proposition it is possible to use an alternative measure of belief asymmetry. If the difference between price and volume reaction is explained by the change in belief asymmetry, then the relative price-volume response to an earnings announcement should capture the change in belief asymmetry.

$$(2)\ f(RET_{it}, \Delta V_{it}) = \gamma_0 + \gamma_1\, UCPS_{it} + \gamma_2\, UAC_{it} + \gamma_I\, Controls + \varepsilon_i$$

[4] The quoted bid-ask spread (the difference between the ask price quoted by a dealer and the bid price quoted by a dealer at a point in time) covers the three costs faced by a dealer: (i) order processing (transaction) costs; (ii) inventory holding costs (the costs of compensating the dealer resulting from a loss of diversification; and (iii) "adverse information costs" (Stoll 1989)).

where $f(RET_{it}, \Delta V_{it})$ is the combined price-to-volume response and the remaining variables are defined as above.

As we assume the relative price volume response to be a more direct measure of belief asymmetry, the hypothesis stated above in terms of the volume reaction should also, or especially, apply to this new response variable.

Assuming that an increase in the available information set affects belief asymmetry, providing information in the statement of cash flows that is otherwise not reported in the balance sheet or income statement, the new information should be significantly related to the change in belief asymmetry.

H_4: $\gamma_1 \neq 0$

H_5: $\gamma_2 \neq 0$

For the same reasons stated in the volume-response discussion in the previous section, cash flow information is expected to more strongly affect belief asymmetry than price as more investors rely more heavily on an accounting number that they can understand and interpret.

H_6: $\gamma_1 > \gamma_2$

3. Method

Measurement of Earnings, Accruals and Cash from Operations

Both earnings (π) and net cash flows from operations (CFO) are explicitly separately disclosed in the financial statements. The accruals (ACCR) component can be estimated as the change in non-cash current assets less depreciation expense and change in current liabilities (excluding short-term debt) and taxes payable, from information provided in the balance sheet and the income statement (Sloan, 1996; Houge and Loughran, 2000). Alternatively, a measure of accruals can be directly computed as the difference between earnings and cash flows from operations.

Given a firm's earnings can be decomposed into its cash flow and accrual components:

(3) $\pi = CFO + ACCR$; then:

(4) $ACCR = \pi - CFO$

Earnings and its components are standardised by the firm's number of ordinary shares outstanding as reported by IBES, so that:

(5) EPS = CPS + ACS; and

(6) ACS = EPS – CPS;

where EPS are earnings per share, CPS are operating cash flows per share, and ACS are accruals per share.

This approach is adopted as it provides a more accurate measure of accruals[5]. Given that the inclusion of statements of cash flows in general purpose financial reports has been mandated by the Financial Accounting Standards Board since 1987, cash flow information is available for the entire period under observation (from 1997 to 2006)[6].

Measurement of Earnings, Cash flow and Accrual Surprise

Prior research finds abnormal returns around the annual earnings announcement dates to be more closely related to earnings surprise based on an analysts' forecast model than on a time-series based model (Fried and Givoly, 1982). In contrast, abnormal trading volume in the announcement period appears to be more closely associated with unanticipated earnings estimated by a random walk (i.e. naïve expectations) model than by an analysts' forecasts model (Bamber, 1986). These relations may also hold for an earnings component analysis. Hence, two measures of unanticipated cash flow and accruals are used – one based on analysts' forecasts and another based on a random walk model.

Unanticipated cash flows are estimated as the difference between the forecasted cash flows per share (CFF) and the cash flows per share actually reported (CFA) scaled by the forecasted value. This forecast error will subsequently be referred to as cash flow surprise per share (CFS).

(7) $CFS_{it} = CFA_{it} / CFF_{it} - 1$

No forecasts are issued for accruals, but using analysts' earnings per share forecasts (EF), together with CFF, accruals surprise per share (ACS) can be computed using the earnings relation stated in equation (4) above. Accruals forecasts (ACF) are implied by the difference between earnings forecasts (EF) and cash flow forecasts (CFF), and actual accruals (ACA) are

[5] Current liabilities and current assets, for example, may include non-ordinary items from the acquisition or disposal of subsidiaries, which are not considered as accruals.

[6] 'Statement of Cash Flows', Statement of Financial Accounting Standards No. 95, FASB (1987)

calculated as the difference between actual earnings (EA) and actual cash flows (ACF). Thus the implied accruals surprise (ACS) can be calculated as in equation (6).

$$(8)\ ACS_{it} = ACA_{it} / ACF_{it} - 1$$

$$(9)\ ACA_{it} = EA_{it} - CFA_{it}$$

$$(10)\ ACF_{it} = EF_{it} - CFF_{it}$$

$$(11)\ ACS_{it} = (EA_{it} - CFA_{it}) / (EF_{it} - CFF_{it}) - 1$$

Naïve Expectations Model

The alternative proxy for the market's pre-announcement expectations is based on the naïve expectations model. Assuming that earnings and cash flows follow a random walk, i.e. that they are mean reverting, expectations are proxied by the cash flows per share (CFA_{t-1}) and accruals per share ($ACA_{t-1} = EA_{t-1} - CFA_{t-1}$) reported in the previous year, and thus unexpected cash flows (ΔCF) calculated as follows:

$$(12)\ \Delta CF = CFA_t / CFA_{t-1} - 1$$

Similar to the analysts' forecast model, an implied measure of unexpected accruals will be obtained by drawing on the earnings relation:

$$(13)\ \Delta AC = ACA_t / ACA_{t-1} - 1$$

$$(14)\ ACA_{t-1} = EA_{t-1} - CFA_{t-1}$$

$$(15)\ ACA_t = EA_t - CFA_t$$

$$(16)\ \Delta AC = (EA_t - CFA_t) / (EA_{t-1} - CFA_{t-1}) - 1$$

where ΔAC are unexpected accruals; ACA, EA and CFA are defined as above with time subscripts added.

Measurement of Market Response

IBES is used as the source of the earnings announcement date.[7] Abnormal price response is defined as a firm's unsystematic share returns using the Capital Asset Pricing Model (CAPM)

[7] To ensure that this date refers to the initial earnings announcement, a random sample of 25 firm-years was drawn and the announcement date verified by consulting the firm's media releases published on the firm's

(e.g. Rayburn, 1986). This approach isolates the firm-specific components of returns from market systematic returns. The cumulative abnormal return is calculated for three- and seven-day windows as follows:

$$(17)\ CAR_{iA} = RET_{iA} - \alpha_i + \beta_i\ RET_{MA}\ ;$$

where:

CAR_{iA} is firm i's cumulative abnormal return in the three-day (or seven-day) announcement period;

RET_{iA} is firm i's total return in the three-day (or seven-day) announcement period;

RET_{MA} is the market's total return in the three-day (or seven-day) announcement period; and

α_i and β_i are the firm specific return parameters determined by an estimated market model, which regresses a firm's return against the market return:

$$(18)\ RET_{iNA} = \alpha_i + \beta_i\ RET_{MNA} + \varepsilon_i;$$

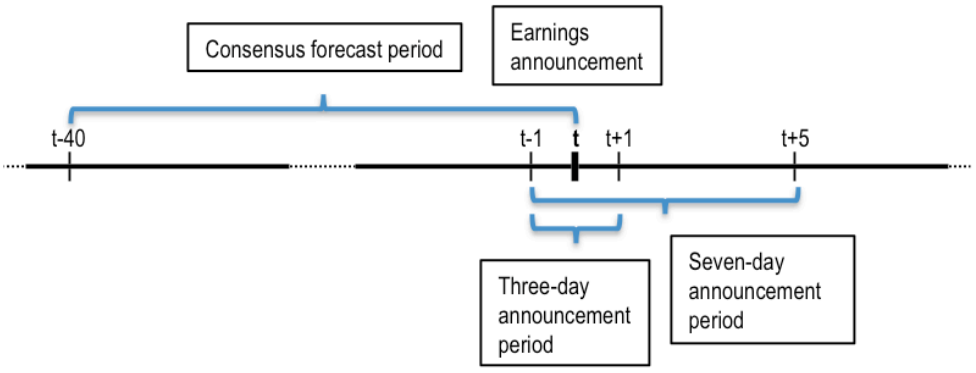
where:

RET_{iNA} is firm i's total return in the 250-day non-announcement period ending on day t-2[8];

RET_{MNA} is the market's total return in the 250-day non-announcement period; and

ε_i is the firm specific error term.

Exhibit 1: Forecast and announcement period



The different market response and market reaction variables can now be substituted into equation (1). Thus, the regression models for the volume-based analysis are specified as:

website, or if unavailable the Form 8-K filings that are filed by the SEC. If neither sources are available (footnote) references to the earnings announcement are searched in the Wall Street Journal (through Factiva).

[8] This 250-day estimation window excludes any previous announcements.

M1: $VOL_{it} = \beta_0 + \beta_1 CFS_{it} + \beta_2 ACS_{it} + controls$

M2: $VOL_{it} = \beta_0 + \beta_1 \Delta CF_{it} + \beta_2 \Delta AC_{it} + controls$

A firm-specific median-adjusted trading volume measure is used (refer Atiase and Bamber, 1994). Abnormal trading volume (VOL) is defined as the difference between the average number of shares traded during the announcement period and the median number of shares traded during the non-announcement period, divided by the number of shares outstanding on the balance date:

(19) $VOL_{iA} = [\Sigma V_{iA} / n – md(V_{iNA})] / \text{Total Shares} * 100;$

where:

VOL_{iA} is firm i's abnormal daily trading volume during the three-day (or seven-day) announcement period;

$\Sigma V_{iA} / n$ is the average number of firm i's shares traded during the three-day (or seven-day) announcement period (n is the length of the window);

$md(V_{iNA})$ is the median number of firm i's shares traded during the 250-day non-announcement period ending on day t-2; and

Total Shares is the number of firm i's ordinary shares outstanding on the balance date.

The average daily trading volume is used for the announcement period as it is more representative of the total number of shares traded within that period. In contrast, the level of "regular" (pre-announcement) trading volume is measured as the median non-announcement period daily trading volume as the median is less affected by unusually high trading volume generating events.

For the belief asymmetry analysis, a measure that combines the price and volume response is developed. The measure derived from the Kim and Verrecchia model (1991) as well as an alternative measure is used.

The first measure of absolute belief asymmetry resolution, from the Kim and Verrecchia (1991) model is the ratio of the volume response (VOL) to the price (CAR) response, which is calculated for three-day and seven-day windows. As their measurement bases are different, both variables are standardised by taking the z-scores of their absolute values.

(20) $VoP_{iA} = zscore(VOL_{iA}) / zscore(CAR_{iA})$[9]

A VoP measure close to one indicates that the volume response to an earnings announcement is proportionate to its price response. However, the magnitudes of the volume reaction and the price reaction may vary. If an earnings announcement leads to a stronger (weaker) price reaction relative to the volume reaction, the VoP measure will approach zero (infinity). This may be interpreted as a small (large) revision in belief asymmetry.

A potential weakness of this measure is that while it is bounded by zero on one side, it can take very large positive values if the price response is sufficiently small. To mitigate this effect, the abnormal return variable (CAR) is winsorised at the 1 and 99 percentile[10].

The regression equations are specified as:

M3: $VoP_{it} = \beta_0 + \beta_1 CFS_{it} + \beta_2 ACS_{it} + controls$

M4: $VoP_{it} = \beta_0 + \beta_1 \Delta CF_{it} + \beta_2 \Delta AC_{it} + controls$

Another method used to address the issue of extreme values is to take the difference between the standardised volume response and price response variables rather than the ratio:

(21) $VminP_{iA} = zscore(VOL_{iA}) – zscore (CAR_{iA})$

Whilst this proxy for belief asymmetry may not seem as intuitive as the VoP measure, it preserves the relative difference between price response and volume response. Thus, VminP can be interpreted correspondingly to VoP. VminP will be close to zero if price and volume response are similar in magnitude, but negative (positive) if the price reaction is relatively stronger (weaker) than the volume reaction.

The regression analyses are performed on the following equations:

M5: $VminP_{it} = \beta_0 + \beta_1 CFS_{it} + \beta_2 ACS_{it} + controls$

M6: $VminP_{it} = \beta_0 + \beta_1 \Delta CF_{it} + \beta_2 \Delta AC_{it} + controls$

[9] CAR is constructed as an absolute value as it is the magnitude rather than the direction of the price change that reflects the importance of information, irrespective of whether it is good or bad news (see Section 4.6).

[10] Various other variables, including the abnormal trading volume (VOL), are winsorised.

A slightly different approach to measuring the change in belief asymmetry is to regress the abnormal volume response not only on the earnings components, but also on abnormal returns and the interaction between the measures of earnings surprise and returns:

$$M7: VOL_{it} = \beta_0 + \beta_1 CFS_{it} + \beta_2 ACS_{it} + \beta_3 CAR_{it} + \beta_4 CFS_{it} * CAR_{it} + \beta_5 ACS_{it} * CAR_{it} + controls$$

$$M8 : VOL_{it} = \beta_0 + \beta_1 \Delta CF_{it} + \beta_2 \Delta AC_{it} + \beta_3 CAR_{it} + \beta_4 \Delta CPS_{it} * CAR_{it} + \beta_5 \Delta AC_{it} * CAR_{it} + controls$$

These equations are transformations of M1 and M2. Conceptually, the coefficient on CAR_{it} (β_3) represents the average measure of belief asymmetry resolution as it describes the market's volume reaction to the earnings announcement relative to the price reaction. Furthermore, the interaction coefficients β_4 and β_5 indicate how the interaction between return and surprise in earnings components affects belief asymmetry.

Control variables

Firm size (FSIZE) is used as a proxy for the firm's pre-announcement information (Bamber, 1986). It is argued that the larger the firm, the more it is under the public eye, (i.e. the more information is available about the firm and the lower is the level of surprise upon the earnings announcement). Thus pre-announcement expectations may be more accurate for large firms than for small firms, which could weaken the impact of the earnings announcement, as its unanticipated portion will be relatively small. Firm size is measured as the natural logarithm of the firm's total assets[11].

Leverage is measured by the debt-to-equity ratio. It is used to proxy for the value of the firm's assets relative to its growth opportunities.

LEV_{it} = Total Liabilities / Total Owners' Equity

Analyst following for a given firm (ANA_{it}), is also a proxy for the level of pre-announcement information. The number of analysts that issue forecasts for a given firm is indicative of the amount of information circulated about this firm. ANA_{it} is measured as the number of analysts issuing cash flow forecasts for firm i in year t.

Earnings quality (EQ) describes the extent to which investors can rely on accrual earnings to truthfully reflect a firm's financial performance. Commonly, earnings quality is proxied by

[11] Other studies use total market capitalisation to measure firm size.

the earnings response coefficient (ERC). As a reliable estimate requires a firm's annual financial data for at least thirty years (i.e. thirty observations), an alternative measure is selected[12]. Defining earnings quality more narrowly as the extent to which accrual earnings reflect cash earnings, it is calculated as the ratio of cash flows from operations to net income (e.g. Green, 1999).

EQ = Cash Flows from Operations / Net Income

Similarly, auditor quality (AQ) proxies for the extent to which investors rely on accounting information. Investors may have more confidence if a firm's accounts are audited by a reputable auditor. Thus a dummy variable (AQ) is added for the large accounting firms[13]:

AQ = 1 if audited by Big 4 auditor and 0 otherwise.

Finally, two variables are included to control for the level of pre-announcement belief asymmetry, as it may be positively related to the level of belief asymmetry change. These variables are included as control variables as the market response is a function of information asymmetry in the Kim and Verrecchia (1991) framework. Forecast dispersion (DISP) is calculated as the standard deviation of the analysts' forecasts (CF) for a particular firm within the forecast period while forecast range (RANGE) is the difference between analysts' highest and lowest forecast for a given firm in the forecast period.

DISP = st.dev(CF) / med(CF)

RANGE = [large(CF) / small (CF)] / med(CF)

The forecast period comprises the forty trading days prior to the earnings announcement as illustrated in Figure 1.

Absolute values are used for all variables. Whilst it is possible to form expectations regarding the direction of the relationship between earnings components and returns (e.g. high cash flow surprise would be expected to be associated with higher abnormal returns), it is the magnitude and not the sign of the change in beliefs that is of interest in this study.

As some variables are ratios of proportions, they may take extreme values and magnify the skewness of the distribution as the denominator approaches zero. To mitigate the impact, all variables that are calculated as a percentage change are winsorised at the 1 and 99 percentile.

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[12] Actual earnings are obtained from IBES. As this database has only collected data from the 1970 onwards (Schipper, 1991), there would not be sufficient data available to compute this variable without substantially reducing the size of the sample.

[13] AQ firms refer to the four largest operating auditing firms, which include PricewaterhouseCoopers, KPMG, Ernst & Young, and Deloitte & Touche.

i.e. the values of the bottom and top one percent observations are substituted by the lowest and highest observation within the range.

Sample

The sample is drawn from firms listed on the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX).[14] Whilst a number of international firms are listed on the NYSE, the sample is restricted to US firms to reduce cross-sectional differences.

The period under observation is from 1997 to 2006. The first year with cash flow forecasts made available on the relevant database is 1993, however a later starting date is chosen as the proportion of firms with cash flow forecasts is very low from 1993 to 1996.[15] The most recent financial year for which all accounting information is available is 2006.

Share prices and daily trading volume data was obtained from the CRSP database. The relevant data items are summarised in Exhibit 2, Panel A. Earnings and cash flow forecasts together with actual reported earnings and cash flows (per share) are collected from the IBES database.[16]

As the consensus forecasts computed by IBES may include old and/or revised forecasts, individual analysts' forecasts and their issue dates are obtained from the IBES detail history. This allows a consensus forecast to be computed for forecasts issued within a specified time window. In contrast, the IBES consensus forecasts include all analysts' forecasts on file until they are revised or withdrawn. Whilst this may comprise a greater number of observations, it could also distort the quality of forecasts for firms which have their earnings and cash flows less frequently forecasted.

A firm's consensus earnings (cash flow) forecast is calculated as the average of analysts' earnings (cash flow) forecasts made with respect to this firm and issued within forty trading days prior to the firm's earnings announcement date.[17] This ensures that information from the third quarter reports was available and could have been taken into account, while still

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[14] We use U.S. data in this study as cash flow forecasts are available in the IBES database.

[15] Only 2.5% of all firms with earnings forecasts on IBES were also issued with cash flow forecasts in 1993. This proportion increases to 14% in 1997, and by 2005 IBES provides cash flow forecasts for more than half of the firms with earnings forecasts (Givoly *et al*, 2008).

[16] Cash flow per share forecasts and actuals are defined as "cash flow from operations, before investing and financing activities, divided by the weighted average number of common shares outstanding for the year" (Thomson Financial Glossary, 2004).

[17] For comparative purposes, consensus forecasts for twenty and sixty days prior to the announcement date are computed as well.

providing sufficient data to compute consensus analysts' forecasts for an adequately sized sample.

Actual earnings and cash flows are obtained from the amounts recorded on the IBES database to ensure that both variables have the same measurement basis, which is of importance when computing the forecasting error.[18] Cash flow forecasts are generally issued on a per share basis, but actual cash flow per share are not reported as such in the financial statements[19]. Exhibit 2, Panel B lists the data items obtained from IBES.

Exhibit 2: Collected data items by source

This table lists the data items required for the regression analyses and their sources.

Panel A: CRSP data items	
Closing share price – daily	
Number of shares traded – daily	
Panel B: IBES data items	
Earnings forecasts	Cash flow forecasts
Earnings actuals	Cash flow actuals
No. of analysts issuing earnings forecasts	No. of analysts issuing cash flow forecasts
Earnings announcement date	Cash flow announcement date
Panel C: Compustat	
Total assets	Auditor
Total liabilities	GICS sector code
Total owners' equity	GICS industry group code
Net income	GICS industry code
Net cash flow from operating activities	

Accounting data

For the control variables, financial report data is retrieved from Standard & Poor's Compustat database [Exhibit 2, Panel C]. These include total assets (Compustat item #4), total liabilities (Compustat item #5), auditor (Compustat item #149), net income (Compustat item #172), total stockholders' equity (Compustat item #216), and net cash flow from operating activities

[18] Cash flows per share as reported in IBES cannot be easily reconciled with cash flows as reported in the statement of cash flows without further adjustments. Givoly *et al* (2008) note that for only five percent of observations the actual cash flow number provided by IBES is identical to the one reported on CompuStat. This difference is due to the adjustments IBES makes to the reported earnings figure to ensure comparability with the estimates (Thomson Financial Glossary, 2006).

[19] FASB Statement 95 Statement of Cash Flows specifically states that cash flows are not to be presented on a per share basis. Item 10(e) of Regulation S-K reinforces the prohibition of non-GAAP financial measures in materials filed with the SEC, which included the annual reports.

(Compustat item 308). Furthermore the Global Industry Classification Standard (GICS) codes are collected at sector, industry group, and industry level.

Selection criteria and final sample

Firms selected have to initially meet the following criteria, which are quantified in Exhibit 3 in terms of sample size:

- Firms are issued with at least one one-year ahead earnings forecast with matching earnings actual amount between 1997 and 2006;
- Firms are listed on the New York Stock Exchange or the American Stock Exchange;
- Firms are issued with at least one year-ahead cash flow forecast with matching cash flow actual amount;
- Firms' earnings and cash flows forecasts are issued by at least two different analysts;
- Firms' share trading volume on the announcement date is non-zero (e.g. daily trading volume data is available).

The sample for the analysts' forecasts based model thus comprises 1,244 firm-year observations. Whilst it would be preferable to only include firms with cash flow forecasts covering the entire period under observation, this criterion would substantially reduce the sample, as cash flow forecasts have become prevalent only in recent years. Including all firms for which at least one observation can be obtained may introduce survivorship bias; however, it enables full exploitation of the available cash flow forecast data.

For the alternative naïve expectations model, in addition to meeting the criteria listed above, earnings and cash flow data from the previous year have to be available. As firms may have gone public during the observation period, the sample is further reduced to 809 firm-year observations.

Exhibit 3: Selection criteria and sample size

This table summarises the selection criteria and their effect on the sample size.

All IBES forecasts	65,535
- with earnings actuals	44,044
- issued between 1997 - 2006	30,761
- listed on NYSE or AMEX	13,398
- with cash flow forecasts & actuals	2,429
- CFF and EF issued by > 2 analysts	1,419
- announcement period trading volume > 0	1,244

4. Results and Analysis

Descriptive Statistics

Table 1 presents and discusses the descriptive statistics for the regression variables of the models based on analysts' forecast model and the naïve expectations model.

As expected, the cash flow surprise variable as proxied by the median analysts' forecasts errors (9%) is smaller than the market surprise based on naïve expectations (20%). The distribution is negatively (left) skewed with most forecast errors being relatively small. On the other hand, surprise based on naïve models is more spread (e.g. standard deviation, inter-quartile range) than those based on analysts' forecasts.

Insert Table 1 here

Furthermore it appears that accruals are more difficult to predict than cash flows, as the implied accrual surprise variables measured using the two models, are significantly higher than the equivalent cash flow surprise variables.

The correlations between these variables are described in Table 2. Several expected relationships hold. Absolute return is positively related to trading volume and there are positive relations between most of the absolute market surprise variables (based on analysts' forecasts or the naïve expectations model) and the absolute market response variables (return and trading volume).

Insert Table 2 here

Comparison of the mean price and volume response

The expectation that cash and accrual information may have a differential impact on belief asymmetry motivates the joint examination of the two components of belief asymmetry. To determine whether earnings components have differential information content, i.e. whether cash flow and accrual information significantly differently affect market reaction, a comparison of means test is undertaken prior to the regression analyses. The pooled sample is divided into four groups according to the absolute magnitudes of the surprise measures. Each cash flow surprise and accrual surprise observation is ranked as either high or low relative to the median value of each measure, and firm-year observations are grouped according to the joint cash flow and accrual surprise. The process is repeated for the unexpected cash flow and accrual measures calculated using the naïve expectation model. Table 3 provides the results of the means comparison.

Insert Table 3 here

From the descriptive statistics of the analysts' forecast model [Table 3, Panel A (i)] it appears that more surprise is associated with higher price and higher volume response. Firms with relatively low accrual and cash flow surprise experience, on average, an abnormal return of 3.16% and abnormal trading volume of 41.79% during the three days surrounding the announcement date, while firms with relatively high accrual and cash flow surprise have, on average, an abnormal return of 4.29% and abnormal trading volume of 60.77%. The mean values for abnormal return and trading volume of the mixed response groups (where only one the surprise measure is classified as high) also suggest that price response and volume response may be higher for firms with high cash flow surprise relative to accrual surprise (ΔP: 4.63% > 3.88%; ΔV: 52.27% > 43.76%). These comparisions suggest that price and volume react differentially to cash flow and accrual information.

To test the significance of these mean differences one-way ANOVAs are undertaken to compare the average price response and volume response for these groups. As the dependent variables (except for abnormal volume in the naïve model sample) do not have homogenous variances (Levene's statistic < 5; $p < .000$) and the groups vary in size, the non-parametric Tamhane test is used to compare the means of abnormal volume and abnormal return across the surprise groups and determine the statistical significance [Table 3, Panel B].

Based on the analysts' forecast surprise measures [Table 3, Panel C (i)], the results indicate that a combination of high cash flow surprise and high accrual surprise ("jointly high surprise"), on average, leads to higher abnormal return than announcements containing

relatively little cash flow and accrual surprise (mean difference = .01125; $p < .05$). Similarly, abnormal trading volume is on average higher for the jointly high surprise group than for the jointly low surprise group (mean difference = .1898; $p < .05$).

Of greater interest are the two cases with differential cash flow and accrual surprise. The mean price response to disclosures with high cash flow and low accruals surprise is significantly greater than those with low cash flow and low accruals surprise (mean difference = .0146; $p < .05$). At the same time, the volume response differs significantly between cases with jointly high cash flow and accrual surprise and cases with high accruals, but low cash flow surprise (mean difference = .1701; $p < .05$). Given that the level of cash flow surprise is the only variable that differs in these cases, the impression that cash flows drive both price response and volume response is reinforced.

The mean comparison tests based on the naïve model's unexpected change measures produce findings which are consistent with respect to price response [Table 3, Panel C (ii)]. Jointly high unexpected cash flow and accrual changes are shown to be associated with abnormal returns significantly different from those of jointly low unexpected changes (mean difference = 0.009; $p < .05$). Furthermore, significant price response differences exist when the level of unexpected cash flows is the only variable that varies in the group (mean difference = .009; $p < .05$). On the other hand, there is no empirical evidence using the naïve model that abnormal trading volume reacts differentially to high or low levels of unexpected change ($F = 1.730$; p = n.s.). This could indicate that volume may be mainly driven by investors who follow analysts' recommendations. If analysts' recommendations are heavily based on cash, as found in the previous section, then his would also affect naïve investors.

Tests of the market's volume response

The significance of cash flows and accruals in explaining market response in terms of volume is tested individually (H_1: $\beta_1 \neq 0$ and H_2: $\beta_2 \neq 0$ respectively) and relative to one another (H_3: $\beta_1 > \beta_2$).

Table 4 presents the results of the regression models with respect to volume-based market response. Analyses of the regression models based on analysts' forecast surprise [M1(a) and (b), Panel A] precede those based on the naïve expectation model [M2(a) and (b), Panel B].

Insert Table 4 here

Based on the volume response to earnings announcements, it is evident that cash flows have information content for investors, supporting H_1. Panel A of Table 4 shows that cash flow

surprise is significantly positively related to abnormal trading volume ($4.500 < t < 4.902$; $p < .01$).

On the other hand, there is no evidence that the disclosure of accruals affects trading volume, and H_2 is thus rejected. The coefficient is statistically insignificant across both time windows (and independent of control variables). A direct test of equality of the coefficients on cash flow surprise and accruals surprise reveals that cash flow surprise has a significantly greater impact than accruals surprise, thus supporting H_3. Investors appear to ignore accruals surprise measured with respect to analysts' forecasts. As the accruals surprise measure used in this model is actually an implied measure computed from earnings and cash flow surprise, it may be argued that accruals are not specifically disclosed and as such no reaction should be expected. However, investors can easily derive this figure provided earnings and cash flow information is available. Whether they choose or not choose to do so or whether accruals do not play a role in their trading decisions cannot be determined at this stage of the analysis.

Several other factors explain abnormal volume. The association between abnormal volume and cash flow surprise weakens the more information is available about a firm before the disclosure, i.e. the more closely it is under public scrutiny. Proxied by firm size, the coefficient is negative at the one percent significance level ($t = -3.621$ for the three-day window and $t = -5.471$ for the seven-day window).

As another proxy for pre-announcement information availability, increasing analyst following lessens the volume response to new cash flow information. This effect is only significant for the three-day window ($t = -3.067$; $p < .01$) it may be possible that investors using analysts' forecasts react to new information more timely than other investors.

Audit quality seems to reassure investors in their reliance on accounting information. They may be more likely to trade based on information issued by a firm, which is audited by one of the AQ than a smaller auditing firm. The coefficient of the AQ dummy is positive at the one percent significance level using a three-day trading window ($t = 2.385$).

The level of leverage also seems to affect the investors' trading decision around the earnings announcement date. For both the three- and seven-day window, the coefficient is positive ($2.836 < t < 4.186$; $p < .01$) suggesting that investors are more likely to trade based on new information if the firm is highly leveraged.

The results of the regression analyses based on the naïve expectation model [M2(a) and (b), Panel B] largely correspond to the results of the analysts' forecasts based regressions. Based on the coefficients of cash flows and accruals, H_1 is accepted and H_2 is rejected. Unexpected

cash flows are significant and positively related to abnormal trading volume ($2.680 < t < 3.696$; $p < .01$) while unexpected accruals are insignificant across all time windows. As in the regressions based on analysts' forecast surprise, firm size ($-4.603 < t < -3.048$; $p < .01$) and analyst following ($-4.053 < t < -2.666$; $p < .01$) are control variables significantly negatively associated with abnormal trading volume while audit quality ($2.129 < t < 2.553$; $p < .05$) and leverage ($3.210 < t < 4.783$; $p < .01$) are significantly positively related. Forecast range and dispersion are insignificant in this these models as well.

As in the price-base analysis, the significance of the cash flow component of earnings and insignificance of the accrual component of earnings imply that cash flows are more closely associated with the market response (i.e. trading volume in this model) than are accruals. Thus H_3 is confirmed.

Tests of change in belief asymmetry

Volume-to-price response ratio

The first measure of belief asymmetry is the ratio of abnormal trading volume to abnormal return. Results of the related regression analysis are presented in Table 5 Panel A summarises the results for tests based on the analysts' forecasts surprise model and Panel B for those based on the naïve expectation model. In neither case are the coefficients of the cash flow or accruals surprise variables significant.

Insert Table 5 here

This result is contrary to expectations (H_4 and H_5). However, the lack of significance might be due to model specification rather than the hypotheses. As cautioned in section 3, the dependent variable is prone to extreme values – as the denominator approaches zero, the dependent belief asymmetry variable becomes disproportionately large. The descriptive statistics of the regression variables [Table 1] show that the absolute values of the abnormal trading volume variable are much more spread than those of the abnormal return variable. Over the three-day announcement window, half the observations have an absolute cumulative abnormal return between 1.249 and 5.003 percent compared to a volume response between 9.003 and 73.971 percent. This effect may not have been sufficiently controlled for even though outliers were winsorised at the 1 and 99 percentile.

Volume-price response difference

To avoid the extreme values caused by low price response, we use an alternative model based on the difference between the standardised abnormal trading volume and standardised

abnormal return. Whilst a ratio may be a more intuitive measure, the difference measure also captures a measure of the relative magnitude of volume response and price response. Table 6 summarises the results of the regression analyses based on this model for both a 3-day and a 7-day window. Results for the analysts' forecast model are presented in Panel A and the results for the naïve model in Panel B.

Insert Table 6 here

In the regression models based on analysts' forecast surprise, the coefficients for cash flow surprise are significant at the ten percent level over a seven-day announcement period, (weakly) confirming H_4 that cash flow disclosure contributes to resolving belief asymmetry. This finding is consistent with the results of the volume-based analysis, where it was shown that cash flows are significant in explaining the abnormal trading volume over both the three- and seven-day window in that model. The finding that the market response to earnings over a three-day window is not significant in the belief-asymmetry model could suggest that the immediate volume response is more closely related to factors other than the change in belief asymmetry. For instance, abnormal trading volume may be generated partly based on share price changes, which normally adjust to new information very quickly (e.g. Morse, 1978). Individual investors, however, may require some time to obtain the information and translate it into a trading decision if the disclosure alters their expectations.

The regression analysis based on the naïve model, on the other hand, shows that cash flows are significant in resolving belief asymmetry over both time windows, even though the significance level is lower for the three-day window ($p < .1$ compared to $p < .05$).

In contrast, accruals information does not appear to contribute to resolving belief asymmetry (H_5). After including controls, there is a weakly significant relationship using the naïve expections model and a seven-day window. However, using the analysts' forecast model, we find no such relationship.

Volume response regressed on earnings surprise components and price reaction

In the model we isolate the effect of cash flow and accrual disclosure on belief asymmetry by including abnormal return as an independent variable in a regression explaining volume response. We draw conclusions about effects on changes in belief asymmetry by examining the interactions between the surprise measures and abnormal returns. A significant relationship between an interaction term and the volume response would be indicative of a relationship between the surprise measure and changes in belief asymmetry. Table 7 reports the results.

Insert Table 7 here

In the analysts' forecast based regression model, cash flow and accrual surprise are significant at the five or ten percent level. While the coefficient on accrual surprise is close to zero, the positive coefficient on cash flow surprise implies that cash flow information may generate trading volume beyond that motivated by price changes.

As we expect, abnormal returns are highly significant in explaining abnormal trading volume (three-day: $t = 12.370$; $p < .05$ and seven-day: $t = 8.930$; $p < .01$) [Table 7, Panel A], confirming that much of the trading volume surrounding the announcement day is motivated by the change in price.

We obtain similar results in the regression analysis based on the naïve expectation model [Table 7, Panel B]. Both unexpected cash flows and unexpected return are significant at the one percent level across the three- and the seven-day window. Taken together these results provide strong support that cash flow disclosure significantly affects the level of belief asymmetry following the earnings announcement.

The effects on belief asymmetry change are measured by the coefficients on the interaction terms. In the analysts' forecast based models, the interaction between abnormal return and cash flow surprise and the interaction between abnormal return and accruals surprise are consistently significant for the three-day window, but not for the seven-day window. In the regressions based on the naïve expectation measures, the interaction variables are not significant at all.

5. Conclusion

In this paper, we consider how the disclosure of cash flow and accrual components of earnings affects belief asymmetry among investors. We examine how surprise in these earnings components explains market response, using the framework developed by Kim and Verrecchia (1991). Their framework formalises the relationship between price response and volume response suggested by Beaver (1968). We add to the extant literature by considering trading volume and change in belief asymmetry as additional measures of market response to accounting information. Analysing market response in this way helps us to explain how, and to what extent, investors use the information in the cash and accruals components of earnings. This is an extension of earlier work which focuses on the value relevance of accounting information, where value relevance is assessed based on the price response to the information in earnings.

We hypothesise that the market response to the announced earnings, both in terms of volume and change in belief asymmetry, is driven more by the cash flow component of earnings surprise than by the accrual component. Using a sample of 1,244 firm-year observations from NYSE and AMEX, we first compare means of price and volume reactions across different levels of cash and accruals surprise. We then regress both market response measures against the components of earnings surprise and a set of control variables.

The main findings can be summarised as follows. Firstly, cash flow disclosure is found to be significantly associated with the volume response following the earnings announcement. This result is consistent for different event windows and different proxies of market expectations and market surprise. Secondly, there is strong evidence that cash flows affect the level of belief asymmetry among investors. It appears that different investors respond differently to the same set of information. Finally, no evidence was found that the disclosure of accruals is associated with volume reaction of change in belief asymmetry.

Our findings may provide policy makers with additional insights into how accounting data impacts the market in a broader sense than has been considered in the past. Rather than focusing on the first moment of the distribution of investors' beliefs, as typically done in extant research, our approach considers the impact on trading activity in a general sense. We conclude that the overall market level of belief asymmetry may change as a result of accounting disclosures, even though this may not be reflected in returns. Our evidence that announcements of the cash component of earnings leads to change in belief asymmetry provides a starting point for researchers interested in using our approach to examine other accounting issues such as the disclosure of the components of cash from operations.

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Table 1: Descriptive statistics

This table reports descriptive statistics for the regression variables.

	N	Mean	Median	Std. Dev.	Skewness	25 Percentile	75 Percentile
CAR3	1,244	0.038	0.028	0.038	2.697	0.012	0.050
CAR7	1,244	0.052	0.039	0.053	3.537	0.018	0.069
VOL3	1,231	0.507	0.276	0.708	3.765	0.090	0.640
VOL7	1,231	0.374	0.203	0.513	3.892	0.072	0.474
CFS	1,244	28.584	11.157	65.923	6.746	3.717	28.209
ACS	1,244	119.844	25.688	393.101	6.773	8.243	71.404
ΔCF	809	40.131	19.633	67.184	4.215	8.350	41.239
ΔAC	809	70.529	25.668	146.502	4.471	11.330	62.993
FSIZE	1,244	8.686	8.665	1.579	0.008	7.716	9.766
LEV	1,244	1.779	1.284	28.719	-6.109	0.833	2.146
ANA	1,244	5.394	3.000	5.274	2.179	2.000	7.000
EQ	1,218	2.747	0.962	12.466	16.997	0.443	2.031
AQ	1,217	0.938	1.000	0.242	-3.621	1.000	1.000
RANGE	1,242	0.733	0.251	15.306	25.890	0.108	0.521
DISP	1244	10.337	7.786	65.831	-20.673	3.808	16.736

CAR3 = 3-day cumulative abnormal return

CAR7 = 7-day cumulative abnormal return

VOL3 = 3-day abnormal trading volume is the average change in volume traded over a 3-day period relative to the 180-day median daily trading volume (measured as the percentage of outstanding shares)

VOL7 = 7-day abnormal trading volume is the average change in volume traded over a 7-day period relative to the 180-day median daily trading volume (measured as the percentage of outstanding shares)

CFS = Cash flow surprise is the relative difference between analysts' consensus cash flow forecast and actual cash flows (in %)

ACS = Accruals surprise is the relative difference between the implied accruals forecast and implied actual accruals (in %)

ΔCF = Cash flow surprise is the relative difference between current and previous period net cash flows from operations (in %)

ΔAC = Accruals surprise calculated as the difference between implied current period accruals and implied previous period accruals (in %)

FSIZE = Firm size proxied by (the natural logarithm of) the firm's total assets

LEV = Leverage calculated as total liabilities divided by total equity

ANA = Number of different analysts issuing cash flow forecasts per firm

EQ = Earnings quality is proxied by the ratio of cash flows from operations to net income

AQ = Audit quality dummy – 1 if audited by a Big5 firm, 0 if otherwise

RANGE = Range of analysts' forecasts calculated as difference between the highest and the lowest cash flow forecast per firm within the 40-day period

DISP = Dispersion of analysts' forecasts calculated as standard deviation of cash flow forecasts issued in the 40-day period prior to the earnings announcement

Table 2: Correlations

This table reports Pearson and Spearman correlations for variables in the models.

	CAR3	CAR7	VOL3	VOL7	CFS	ACS	ΔCF	ΔAC
CAR3		0.74607	0.38395	0.33512	0.13290	0.02262	0.16803	0.01657
Sig.		0.0000	0.0000	0.0000	0.0000	0.4254	0.0000	0.6380
N		1244	1231	1231	1244	1244	809	809
CAR7	0.61474		0.25902	0.33986	0.12773	-0.00769	0.16341	0.01735
Sig.	0.0000		0.0000	0.0000	0.0000	0.7865	0.0000	0.6222
N	1244		1231	1231	1244	1244	809	809
VOL3	0.31953	0.21326		0.85024	0.13842	0.02870	0.10109	-0.00270
Sig.	0.0000	0.0000		0.0000	0.0000	0.3144	0.0040	0.9389
N	1231	1231		1231	1231	1231	808	808
VOL7	0.28287	0.25898	0.88835		0.11841	0.00408	0.13623	0.00114
Sig.	0.0000	0.0000	0.0000		0.0000	0.8862	0.0001	0.9743
N	1231	1231	1231		1231	1231	808	808
CFS	0.14463	0.09406	0.13048	0.09995		0.39908	0.18994	0.17443
Sig.	0.0000	0.0009	0.0000	0.0004		0.0000	0.0000	0.0000
N	1244	1244	1231	1231		1244	809	809
ACS	0.11587	0.04205	0.14031	0.10146	0.80318		0.12233	0.16464
Sig.	0.0000	0.1383	0.0000	0.0004	0.0000		0.0005	0.0000
N	1244	1244	1231	1231	1244		809	809
ΔCF	0.10093	0.11592	0.07345	0.12492	0.16601	0.11597		0.39070
Sig.	0.0041	0.0010	0.0369	0.0004	0.0000	0.0010		0.0000
N	809	809	808	808	809	809		807
ΔAC	0.05350	0.08227	0.02800	0.03028	0.20341	0.25765	0.48512	
Sig.	0.1284	0.0193	0.4266	0.3901	0.0000	0.0000	0.0000	
N	809	809	808	808	809	809	807	
FSIZE	-0.12960	-0.18104	-0.05239	-0.12227	0.07545	0.12825	-0.15299	-0.01702
Sig.	0.0000	0.0000	0.0662	0.0000	0.0078	0.0000	0.0000	0.6288
N	1244	1244	1231	1231	1244	1244	809	809
LEV	-0.10508	-0.11660	-0.06656	-0.08227	0.12401	0.07378	-0.12353	-0.04472
Sig.	0.0002	0.0000	0.0195	0.0039	0.0000	0.0092	0.0004	0.2039
N	1244	1244	1231	1231	1244	1244	809	809
ANA	-0.03644	0.02912	-0.13238	-0.08202	-0.28119	-0.35449	0.11230	0.00477
Sig.	0.1990	0.3048	0.0000	0.0040	0.0000	0.0000	0.0014	0.8923
N	1244	1244	1231	1231	1244	1244	809	809
EQ	0.04445	0.08511	-0.14674	-0.11997	0.04473	-0.20897	0.08076	-0.05710
Sig.	0.1210	0.0030	0.0000	0.0000	0.1187	0.0000	0.0229	0.1081
N	1218	1218	1205	1205	1218	1218	793	793
AQ	-0.03588	-0.04888	0.07173	0.04638	0.06788	0.08825	-0.01169	-0.03216
Sig.	0.2110	0.0883	0.0128	0.1077	0.0179	0.0021	0.7414	0.3639
N	1217	1217	1204	1204	1217	1217	799	799
RANGE	0.03957	0.02647	-0.00009	-0.02276	0.19487	0.17941	-0.00614	0.03193
Sig.	0.1634	0.3513	0.9975	0.4254	0.0000	0.0000	0.8618	0.3647
N	1242	1242	1229	1229	1242	1242	808	808
DISP	0.08592	0.03504	0.06292	0.02286	0.30148	0.28194	-0.01681	0.06282
Sig.	0.0024	0.2168	0.0273	0.4229	0.0000	0.0000	0.6331	0.0741
N	1244	1244	1231	1231	1244	1244	809	809

Pearson correlations are presented above the diagonal and Spearman correlations below the diagonal. Significance levels are based on a one-tailed significance test. Variable definitions are provided in Table 1.

Table 2: Correlations (cont.)

	FSIZE	LEV	ANA	EQ	AUDIT	RAN40	DSP40
CAR3	-0.1303	0.0550	-0.0348	0.0182	-0.0627	-0.0136	-0.0046
Sig.	0.0000	0.0526	0.2200	0.5258	0.0286	0.6326	0.8716
N	1,244	1,244	1,244	1,218	1,217	1,242	1,244
CAR3	-0.18279	0.04484	-0.01551	0.02198	-0.07817	-0.01815	-0.02637
Sig.	0.0000	0.1139	0.5846	0.4433	0.0064	0.5228	0.3527
N	1,244	1,244	1,244	1,218	1,217	1,242	1,244
VOL3	-0.07272	0.12222	-0.10612	0.02215	0.05805	-0.02070	0.00661
Sig.	0.0107	0.0000	0.0002	0.4424	0.0440	0.4684	0.8167
N	1,231	1,231	1,231	1,205	1,204	1,229	1,231
VOL7	-0.13243	0.08140	-0.06239	0.01912	0.03164	-0.01847	0.00484
Sig.	0.0000	0.0043	0.0286	0.5073	0.2727	0.5177	0.8654
N	1,231	1,231	1,231	1,205	1,204	1,229	1,231
CFS	0.12831	0.06387	-0.13748	0.03729	0.04837	-0.00404	-0.02408
Sig.	0.0000	0.0243	0.0000	0.1934	0.0917	0.8869	0.3961
N	1,244	1,244	1,244	1,218	1,217	1,242	1,244
ACS	0.12095	0.02645	-0.13067	0.00707	0.04693	0.02375	0.01391
Sig.	0.0000	0.3513	0.0000	0.8054	0.1017	0.4030	0.6241
N	1,244	1,244	1,244	1,218	1,217	1,242	1,244
ΔCF	-0.13452	0.00077	0.02206	0.00207	-0.01128	-0.02106	-0.00515
Sig.	0.0001	0.9826	0.5310	0.9536	0.7502	0.5500	0.8837
N	809	809	809	793	799	808	809
ΔAC	-0.06178	0.00857	0.03794	-0.01609	-0.01086	-0.00410	0.01854
Sig.	0.0790	0.8077	0.2811	0.6509	0.7593	0.9073	0.5986
N	809	809	809	793	799	808	809
FSIZE		0.04603	-0.00505	-0.02842	0.18570	0.00006	0.00925
Sig.		0.1046	0.8589	0.3217	0.0000	0.9982	0.7444
N		1,244	1,244	1,218	1,217	1,242	1,244
LEV	0.40146		-0.01020	0.00443	-0.00115	-0.00970	-0.03553
Sig.	0.0000		0.7193	0.8773	0.9679	0.7327	0.2105
N	1,244		1,244	1,218	1,217	1,242	1,244
ANA	-0.12706	-0.19256		0.02734	-0.04487	-0.01358	0.00768
Sig.	0.0000	0.0000		0.3405	0.1177	0.6326	0.7867
N	1,244	1,244		1,218	1,217	1,242	1,244
EQ	-0.08639	0.18247	0.10726		0.00010	-0.00106	0.00974
Sig.	0.0025	0.0000	0.0002		0.9973	0.9705	0.7342
N	1,218	1,218	1,218		1,200	1,216	1,218
AQ	0.19381	0.01831	-0.07352	-0.11433		0.00722	0.00323
Sig.	0.0000	0.5234	0.0103	0.0001		0.8014	0.9104
N	1,217	1,217	1,217	1,200		1,215	1,217
RANGE	0.04079	-0.03290	0.23593	0.00851	0.03882		0.01288
Sig.	0.1508	0.2466	0.0000	0.7668	0.1762		0.6502
N	1242	1242	1242	1216	1215		1242
DISP	0.06136	0.02208	0.02090	-0.01745	0.05380	0.79557	
Sig.	0.0304	0.4366	0.4614	0.5429	0.0606	0.0000	
N	1244	1244	1244	1218	1217	1242	

Pearson correlations are presented above the diagonal and Spearman correlations below the diagonal. Significance levels are based on a one-tailed significance test. Variable definitions are provided in Table 1.

Table 3: Mean comparison of volume and price response

Panel A: Descriptive statistics for (i) the analysts' forecast surprise model and (ii) the naïve expectations model

This panel reports results for the comparison of means for the price and volume response after classifying each firm-year observation based on the magnitude of cash flow and accrual surprise.

(i) Analysts' forecast model	CFS –	CFS +
ACS –	P=0.0316 V=0.4179 N=517	P=0.0463 V=0.5227 N=105
ACS +	P=0.0388 V=0.4376 N=105	P=0.0429 V=0.6077 N=517

(ii) Naïve expectations model	ΔCPS –	ΔCPS +
ΔAC –	P=0.0317 V=0.4526 N=356	P=0.0416 V=0.5737 N=152
ΔAC +	P=0.0316 V=0.5099 N=151	P=0.0408 V=0.5538 N=353

For each firm observation, the absolute values of cash flow surprise and accruals surprise are ranked as high or low relative to the measures' median values and grouped according to the surprise combination. CFS- describes absolute cash flow surprise per share (based on the 40-day analysts' consensus forecast) below and CFS+ absolute cash flow surprise above the sample's median cash flow surprise per share. ACS- and ACS+ are defined as the absolute accruals surprise below and above the sample's median accruals respectively. The descriptive statistics provide the absolute mean price response (P), the absolute mean volume response (V) and the number of observations (N) for each group.

Panel B: Results of group ANOVA and tests of homogeneity

This panel reports the results from a one-way ANOVA analysis of the differences reported in Panel A.

	Sum of squares	**df**	**Mean square**	**ANOVA (F)**	**Sig.**	**Levene statistic**	**Sig.**
(i) Analysts' forecasts surprise							
CAR3	0.04	3	0.013	9.488	0.000	9.818	0.000
VOL3	9.764	3	0.001	6.586	0.000	6.279	0.000
(ii) Naïve expectation							
CAR3	0.022	3	5.448	5.448	0.001	5.096	0.002
VOL3	2.447	3	1.73	1.730	0.159	1.612	0.185

CAR3 = unsigned cumulative abnormal return over the three-day announcement period
VOL3 = unsigned abnormal trading volume over the three-day announcement period

Panel C: Absolute mean differences for (i) the analysts' forecast surprise model and (ii) the naïve model

(i)	**CFS – ACS –**	**CFS – ACS +**	**CFS + ACS –**	**CFS + ACS +**
CFS – ACS -	-	0.00718	0.01464*	0.01125*
CFS – ACS +	0.01966	-	0.00746	0.00407
CFS + ACS –	0.10479	0.08513	-	0.00340
CFS + ACS +	0.18976*	0.17010*	0.08497	-

(ii)	**ΔCPS – ΔAC –**	**ΔCPS – ΔAC +**	**ΔCPS + ΔAC –**	**ΔCPS + ΔAC +**
ΔCPS – ΔAC -	-	0.00002	0.00993	0.00918*
ΔCPS – ΔAC +	0.05729	-	0.00995	0.00919*
ΔCPS + ΔAC –	0.12114	0.06385	-	0.00075
ΔCPS + ΔAC +	0.10125	0.04396	0.01989	-

* The mean difference is significant at the .05 level. Absolute return mean differences (ΔP) are reported above and absolute volume mean differences (ΔV) are reported below the diagonal.

Table 4: OLS regression of abnormal volume on earnings surprise components

Table 4 presents the results of the regression models with respect to volume-based market response. Analyses of the regression models based on analysts' forecast surprise [M1(a) and (b), Panel A] precede those based on the naïve expectation model [M2(a) and (b), Panel B].

Panel A: Analysts' forecast model

Independent variables	M1(a)		M1(b)	
	3-day	7-day	3-day	7-day
CFS	0.002 (4.902)***	0.001 (4.500)***	0.002 (4.561)***	0.001 (4.556)***
ACS	0.000 (-1.025)	0.001 (-1.633)	0.000 (-1.061)	0.000 (-1.417)
FSIZE			-0.047 (-3.627)***	-0.052 (-5.471)***
LEV			0.003 (4.186)***	0.001 (2.845)***
ANA			-0.012 (-3.077)***	-0.005 (-1.631)
EQ			0.001 (0.560)	0.000 (0.366)
AQ			0.200 (2.387)**	0.115 (1.891)
DISP			0.000 (0.575)	0.000 (0.477)
RANGE			-0.001 (-0.712)	-0.001 (-0.610)
R^2	2.0%	1.6%	5.5%	5.0%
ADJ R^2	1.8%	1.5%	4.8%	4.2%
F **p**	12.530 (0.000)***	10.134 (0.000)***	7.695 (0.000)***	6.889 (0.000)***

Panel B: Naïve model

Independent variables	M2(a)		M2(b)	
	3-day	7-day	3-day	7-day
∆CF	0.001 (2.680)***	0.001 (3.696)***	0.001 (2.828)***	0.001 (3.555)***
∆AC	0.000 (-0.953)	0.000 (-1.559)	0.000 (-0.816)	0.000 (-1.402)
FSIZE			-0.043 (-3.048)***	-0.048 (-4.602)***
LEV			0.003 (4.724)***	0.002 (3.210)***
ANA			-0.016 (-4.053)***	-0.008 (-2.683)***
EQ			0.002 (0.901)	0.001 (1.020)
AQ			0.271 (2.552)**	0.165 (2.129)**
DISP			-0.001 (-0.629)	0.000 (-0.536)
RANGE			0.000 (-0.620)	0.000 (-0.655)
R^2	0.8%	1.5%	5.9%	5.4%
ADJ R^2	0.6%	1.3%	5.0%	4.5%
F p	3.871 (0.021)**	7.646 (0.000)***	6.777 (0.000)***	6.214 (0.000)***

*** Significant at 0.01 ** Significant at 0.05 * Significant at 0.10. T-values are shown in parentheses.

CFS=cash flow surprise **ACS**=accruals surprise **ΔCF**=unexpected cash flows **ΔAC**=unexpected accruals **FSIZE**=firm size **LEV**=leverage **ANA**=analyst following **EQ**=earnings quality **AQ**=audit quality **DISP**=variance of analysts' forecasts **RANGE**=range of analysts' forecasts

Table 5: OLS regression of volume-to-price-response ratio on earnings surprise components (VoP)

This table reports the OLS regression results where the dependent variable is the ratio of abnormal trading volume to abnormal return. Panel A summarises the results for tests based on the analysts' forecasts surprise model and Panel B for those based on the naïve expectation model.

Panel A: Analysts' forecast model

Independent variables	M3(a)		M3(b)	
	3-day	7-day	3-day	7-day
CFS	0.020 (1.304)	0.012 (1.421)	0.016 (1.010)	0.012 (1.432)
ACS	-0.003 (-1.128)	0.000 (-0.217)	-0.004 (-1.383)	0.000 (-0.240)
FSIZE			0.028 (0.045)	-0.377 (-1.143)
LEV			0.011 (0.327)	0.002 (0.114)
ANA			-0.441 (-2.431)**	-0.042 (-0.427)
EQ			-0.090 (-1.187)	-0.066 (-1.614)
AQ			8.245 (2.078)**	5.178 (2.431)**
DISP			0.008 (0.538)	0.005 (0.594)
RANGE			-0.042 (-0.676)	-0.027 (-0.826)
R^2	0.2%	0.2%	1.3%	1.0%
ADJ R^2	0.0%	0.0%	0.5%	0.3%
F **p**	1.0700 (0.343)	1.083 (0.339)	1.696 (0.085)*	1.370 (0.197)

Panel B: Naïve model

Independent variables	M4(a)		M4(b)	
	3-day	7-day	3-day	7-day
ΔCF	0.014 (0.299)	0.005 (0.701)	0.016 (1.189)	0.006 (0.721)
ΔAC	-0.008 (0.182)	-0.003 (-0.972)	-0.008 (-1.256)	-0.003 (-0.811)
FSIZE			0.439 (0.644)	-0.009 (-0.024)
LEV			0.011 (0.345)	0.002 (0.123)
ANA			-0.565 (-2.967)***	-0.166 (-1.493)
EQ			-0.078 (-0.839)	-0.064 (-1.189)
AQ			6.043 (1.182)	7.303 (2.485)**
DISP			-0.034 (-0.557)	-0.025 (-0.696)
RANGE			-0.020 (-0.798)	-0.013 (-0.863)
R^2	0.3%	0.1%	1.6%	1.3%
ADJ R^2	0.1%	0.1%	0.7%	0.4%
F **p**	1.332 (0.264)	0.669 (0.513)	1.778 (0.068)*	1.459 (0.158)

*** Significant at 0.01 ** Significant at 0.05 * Significant at 0.10. T-values are shown in parentheses.

CFS=cash flow surprise **ACS**=accruals surprise **ΔCF**=unexpected cash flows **ΔAC**=unexpected accruals **FSIZE**=firm size **LEV**=leverage **ANA**=analyst following **EQ**=earnings quality **AQ**=audit quality **DISP**=variance of analysts' forecasts **RANGE**=range of analysts' forecasts

Table 6: OLS regression of the volume-price response difference on earnings components (VminP)

This table reports the results of an OLS regression where the dependent variable is the difference between the standardised abnormal trading volume and the standardised abnormal return using both a 3-day and 7-day window. Results for the analysts' forecast model are presented in Panel A and the results for the naïve model in Panel B.

Panel A: Analysts' forecast model

Independent variables	M5(a)		M5(b)	
	3-day	7-day	3-day	7-day
CFS	0.001 (1.002)	0.000 (1.780)	0.000 (0.377)	0.001 (1.908)*
ACS	0.001 (-0.241)	0.000 (-1.705)*	0.000 (-0.645)	0.000 (-1.424)
FSIZE			0.039 (1.637)	-0.096 (-3.784)**
LEV			0.002 (1.805)*	0.002 (1.116)
ANA			-0.019 (-2.727)***	-0.004 (-0.482)
EQ			0.000 (-0.167)	-0.002 (-0.692)
AQ			0.391 (2.555)**	0.214 (1.299)
DISP			-0.001 (-0.916)	-0.001 (-1.238)
RANGE			-0.001 (-0.243)	-0.001 (-0.585)
R^2	0.1%	0.4%	3.0%	1.9%
ADJ R^2	-0.1%	0.2%	1.9%	1.1%
F **p**	0.517 (0.596)	2.172 (0.114)	2.719 (0.004)***	2.525 (0.007)***

Panel B: Naïve model

Independent variables	M6(a)		M6(b)	
	3-day	7-day	3-day	7-day
ΔCF	0.001 (1.364)	0.001 (1.990)**	0.001 (1.679)*	0.001 (2.098)**
ΔAC	0.000 (-1.618)	0.000 (-2.031)**	0.000 (-1.485)	0.000 (-1.835)*
FSIZE			0.048 (2.234)**	0.032 (1.490)
LEV			0.002 (2.042)**	0.001 (0.958)
ANA			-0.015 (-2.514)**	-0.016 (-2.659)***
EQ			0.000 (-0.057)	-0.713 (-0.571)
AQ			0.596 (3.723)***	0.713 (4.400)***
DISP			0.000 (-0.213)	0.000 (0.005)
RANGE			-0.001 (-1.158)	-0.002 (-2.472)**
R^2	0.4%	0.7%	4.1%	4.8%
ADJ R^2	0.2%	0.5%	3.2%	3.9%
F **p**	2.081 (0.125)	3.752 (0.024)**	4.586 (0.000)***	5.429 (0.000)***

*** Significant at 0.01 ** Significant at 0.05 * Significant at 0.10. T-values are shown in parentheses.

CFS=cash flow surprise **ACS**=accruals surprise **ΔCF**=unexpected cash flows **ΔAC**=unexpected accruals **FSIZE**=firm size **LEV**=leverage **ANA**=analyst following **EQ**=earnings quality **AQ**=audit quality **DISP**=variance of analysts' forecasts **RANGE**=range of analysts' forecast

Table 7: Volume response regressed on earnings surprise components and price reaction

This table reports the results of an OLS regression where the dependent variable is abnormal trading volume over a 3 and 7 day window. Results where cash flow and accrual surprise is measured using the analysts' forecast (naïve) model are presented in Panel A (B).

Panel A: Analysts' forecast model

Independent variables	M7(a)		M7(b)	
	3-day	7-day	3-day	7-day
CFS	0.002 (4.064)***	0.001 (2.306)**	0.002 (4.081)**	0.001 (1.675)*
ACS	0.000 (-3.097)***	0.000 (-1.749)*	0.000 (-3.340)**	0.000 (-2.000)**
CAR3	7.246 (12.451)***		7.258 (12.370)**	
CFS * CAR3	-0.014 (-2.597)***		-0.017 (-3.129)**	
ACS * CAR3	0.005 (3.521)***		0.005 (3.641)**	
CAR7		3.086 (9.465)***		3.786 (8.930)***
CFS * CAR7		-0.001 (-0.215)		0.003 (0.984)
ACS * CAR7		0.001 (1.462)		0.002 (1.676)*
FSIZE			-0.021 (-1.684)	-0.037 (-4.017)***
LEV			0.003 (4.171)**	0.001 (2.368)**
ANA			-0.011 (-3.132)**	-0.004 (-1.535)
EQ			0.001 (0.372)	0.000 (0.360)
AQ			0.253 (3.249)**	0.141 (2.422)**
DISP			0.000 (0.562)	0.000 (0.533)
RANGE			-0.001 (-0.609)	0.000 (-0.482)
R^2	16.6%	12.3%	19.3%	14.3%
ADJ R^2	16.3%	12.0%	18.5%	13.4%
F **p**	48.806 (0.000)***	34.498 (0.000)***	23.701 (0.000)***	16.515 (0.000)***

*** Significant at 0.01 ** Significant at 0.05 * Significant at 0.10. T-values are shown in parentheses.

CFS=cash flow surprise **ACS**=accruals surprise accruals **FSIZE**=firm size **LEV**=leverage **ANA**=analyst following **EQ**=earnings quality **AQ**=audit quality **DISP**=variance of analysts' forecasts **RANGE**=range of analysts' forecast

Table 7.: Volume response regressed on earnings surprise components and price reaction (cont.)

Panel B: Naïve model

Independent variables	M8(a)		M8(b)	
	3-day	7-day	3-day	7-day
ΔCF	0.001 (1.741)*	0.001 (2.882)***	0.001 (2.079)**	0.001 (3.105)***
ΔAC	0.000 (-0.775)	0.000 (-1.510)	0.000 (-0.716)	0.000 (-1.622)*
CAR3	7.820 (11.707)***		7.902 (11.710)***	
ΔCF * CAR3	-0.003 (-0.619)		-0.005 (-0.999)	
ΔAC * CAR3	0.002 (0.501)		0.001 (0.304)	
CAR7		3.888 (10.810)***		3.972 (10.785)***
ΔCF * CAR7		-0.004 (-1.264)		-0.005 (-1.639)*
ΔAC * CAR7		0.004 (1.300)		0.004 (1.331)
FSIZE			-0.010 (-0.781)	-0.020 (-2.096)**
LEV			0.002 (4.025)***	0.001 (2.489)**
ANA			-0.014 (-3.861)***	-0.008 (-3.030)***
EQ			0.001 (0.519)	0.000 (.330)
AQ			0.339 (3.518)***	0.253 (3.560)***
DISP			-0.001 (-1.477)	-0.001 (-2.209)**
RANGE			-0.001 (-.510)	0.000 (-.332)
R^2	19.2%	18.6%	23.0%	20.5%
ADJ R^2	18.8%	18.2%	22.1%	21.5%
F **p**	47.077 (0.000)***	45.899 (0.000)***	24.304 (0.000)***	22.191 (0.000)***

*** Significant at 0.01 ** Significant at 0.05 * Significant at 0.10. T-values are shown in parentheses.

ΔCF=unexpected cash flows **ΔAC**=unexpected accruals **FSIZE**=firm size **LEV**=leverage **ANA**=analyst following **EQ**=earnings quality **AQ**=audit quality **DISP**=dispersion **RANGE**=range