

Do Investors Overreact or Underreact to Accruals? A Reexamination of the Accrual Anomaly

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Abstract

Sloan (1996) finds that the accrual component of earnings is negatively associated with subsequent stock returns. He interprets this negative association as evidence that investors fail to fully understand the lower persistence of accruals relative to cash flows and consequently overprice accruals. This observed overreaction to accruals has come to be known as the accrual anomaly.

This paper reexamines the accrual anomaly, concentrating on how three different features of Sloan's (1996) research design affect inferences regarding the existence of this anomaly, namely, the omission of cash flows, the use of an annual setting, and the reliance on the full sample of firms in examining investors' reaction to accruals.

The main findings of the paper are as follows: First, after controlling for cash flows and using a quarterly setting, accruals are found to be *positively* associated with subsequent returns, suggesting that investors *underreact* to accruals. This positive association is weaker than the positive association between cash flows and subsequent returns, suggesting that investors underreact to cash flows to a greater extent. Second, when cash flows are omitted, the more pronounced underreaction to cash flows than to accruals, combined with the negative correlation between accruals and cash flows, results in a severe downward bias on the association between accruals and subsequent returns. This bias conceals the underlying underreaction of investors to accruals, leading to the observed "accrual anomaly" reported by Sloan. These results hold for the full sample of firms on average and are even stronger for sub-samples of firms where accruals are likely to play a more important role in measuring firm performance. Finally, and in line with the above results, after a proper control for cash flows, financial analysts are found to underreact to accruals, in contrast to previous finding that analysts overreact to accruals.

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1. Introduction

Sloan (1996) finds that the accrual component of earnings is negatively associated with subsequent stock returns. He interprets this negative association as evidence that investors fail to fully understand the lower persistence of accruals relative to cash flows and consequently overprice accruals.¹ Over the past decade, this observed overreaction to accruals, which has been replicated by many studies, has come to be known as the “accrual anomaly” and has generated interest among both researchers and investors.²

Studies on the accrual anomaly have taken different paths. One line of studies investigates how the behavior of financial analysts, short sellers, and other third parties is related to this anomaly (e.g., Bradshaw et al., 2001; Richardson, 2003). Another line examines the role of different components of accruals in creating this anomaly (e.g., Xie, 2001; Thomas and Zhang, 2002; Richardson et al., 2005). A third line of research seeks to relate this anomaly to other market anomalies (e.g., Collins and Hribar, 2000; Fairfield et al., 2003; Desai et al., 2004). Some studies examine the relation of this anomaly to various firm characteristics and risk measures (e.g., Ali et al., 2001; Mashruwala et al., 2004; Khan, 2005). Other studies attempt to determine how widespread this anomaly is (e.g., LaFond, 2005; Pincus et al., 2005).

In this study, I reexamine the accrual anomaly, concentrating on how three different features of Sloan’s (1996) research design affect inferences regarding the existence of this anomaly. The first feature is the omission of cash flows from the

¹ Following Sloan (1996), the term overreaction (underreaction) is used to characterize a negative (positive) association between accruals or cash flows and subsequent returns. Accruals and cash flows refer to the accrual and cash flow components of earnings, and subsequent returns are the abnormal returns in the periods following the earnings report.

² Following Sloan (1996), selling high-accrual firms’ stock and buying low-accrual firms’ stock has become a popular trading strategy (see, e.g., Talley, 2003; Henry, 2004a, 2004b). Reportedly, “now investors are clamoring to exploit this market inefficiency.” (*Business Week*, October 4, 2004, cover story)

examination of the association between accruals and subsequent returns. This omission is problematic because cash flows are likely to be a significant correlated omitted variable. More importantly, given a negative relation between accruals and cash flows and an underreaction to cash flows, the omission of cash flows biases the results in favor of the accrual anomaly. I analyze the impact of this correlated omitted variable problem and examine whether, upon inclusion, the accrual anomaly still exists.

The second feature of Sloan's (1996) research design is the use of an annual setting whereby annual accruals and returns subsequent to the annual filing date are examined. The use of this annual setting to detect investors' reaction to accruals has two limitations. First, annual accruals are likely to play a relatively minor role in correcting cash flows as a measure of performance as compared to accruals for shorter measurement intervals (e.g., quarters). This is the case because over longer measurement intervals, cash flows suffer from fewer timing and matching problems, and the role of accruals diminishes. Second, the returns over the period following the annual filing date do not fully capture the potential mispricing of the first three quarters' accruals. In this study, I examine quarterly accruals and returns subsequent to the quarterly filing date.

The third feature of Sloan's (1996) research design addressed in this study is the reliance on the full sample of firms (i.e., all firms with data available) rather than on firms where accruals are more important in measuring performance. For some firms, cash flows and earnings are closely aligned; so any potential mispricing of accruals is likely to have a relatively minor impact on stock returns than for other firms where accruals are more informative. Conducting the analysis on the full sample of firms is therefore likely to reduce the test's power to detect investors' reaction to accruals. In this study, I perform

tests on sub-samples of firms where accruals are likely to be more informative. Based on prior research, these firms are identified as those with more volatile working capital requirements and investment and financing activities and those with longer operating cycles (Dechow, 1994; Dechow et al., 1998).

The main findings that emerge from the analyses are as follows. First, after controlling for cash flows and using a quarterly setting, accruals are found to be significantly *positively* associated with subsequent returns, suggesting that investors *underreact* to accruals. This positive association is weaker than the positive association between cash flows and subsequent returns, suggesting that while investors underreact to accruals, they underreact to cash flows to a greater extent. Second, the results indicate that when cash flows are omitted, the stronger underreaction to cash flows than to accruals, combined with the negative correlation between accruals and cash flows, results in a severe downward bias on the association between accruals and subsequent returns. This bias conceals the underlying underreaction of investors to accruals, leading to the observed “accrual anomaly” reported by Sloan. These results hold for the full sample of firms on average and, as expected, are even stronger for sub-samples of firms where accruals are likely to play a more important role in measuring firm performance.

To tie my results to past research on the manner by which analysts process the accrual anomaly, I examine how financial analysts react to accruals using their forecasts of future earnings. In line with my earlier results on the accrual anomaly, after a proper control for cash flows, financial analysts are found to underreact to accruals and to underreact even more to cash flows. Similarly, the results indicate that Bradshaw et al.’s

(2001) finding of analysts' overreaction to accruals is driven by the omission of cash flows from their analyses.

This study sheds light on an important topic of how investors and analysts react to accruals. It shows that the observed "overreaction" to accruals by investors and analysts (i.e., the accrual anomaly) is driven by a correlated omitted variable problem. Instead, this study offers new evidence that investors and analysts underreact to accruals.

These findings have important implications for the accrual anomaly literature which has largely focused on explaining why investors "overreact" to accruals. The challenge now is to explain why investors underreact to accruals and why investors underreact more to cash flows than to accruals. (Some possible explanations are discussed in section 6.)³ These results also help resolve a puzzling finding by previous studies of an overreaction to one major component of earnings (accruals) and an underreaction to the other major component of earnings (cash flows).⁴

In section 2, I analyze the three features of Sloan's research design that are likely to bias his results. Data and variables used in the tests are discussed in section 3, and the results of testing the association between accruals and subsequent stock returns are presented in section 4. In section 5, I examine how financial analysts react to accruals using their forecasts of future earnings. Section 6 contains conclusions and possible explanations for the findings in this study.

³The findings in this study have implications for investors implementing the "accrual anomaly" strategy of selling high-accrual firms and buying low-accrual firms. Because the "overreaction" to accruals they attempt to exploit is shown to be only *part* of the underlying underreaction to cash flows, these investors could devise investment strategies superior to that relying on accruals. This can be accomplished by either directly focusing on the first order effect, cash flows (i.e., buying high-cash flow firms and selling low-cash flow firms), or using a combined strategy of buying firms with both high cash flows and high accruals and selling firms with both low cash flows and low accruals.

⁴ As noted by Kothari (2001), "one challenge is to understand why the market underreacts to earnings, but its reaction to its two components, cash flows and accruals, is conflicting."

2. Features of Sloan's (1996) Research Design

2.1 Omission of Cash Flows

Sloan (1996) omits cash flows in his examination of the association between accruals and subsequent returns.⁵ This omission is problematic because cash flows are likely to be a significant correlated omitted variable. To analyze this problem, consider the following model which examines the association between the two earnings components and subsequent returns (firm subscripts are omitted for brevity):

$$RETURN_{t+1} = \beta_0 + \beta_1 * ACCRUALS_t + \beta_2 * CASHFLOWS_t + \varepsilon_{t+1} \quad (1)$$

where $RETURN_{t+1}$ = abnormal returns over period $t+1$;

$ACCRUALS_t$ = scaled decile portfolio rank based on accruals in period t ;

$CASHFLOWS_t$ = scaled decile portfolio rank based on cash flows in period t ;

ε_{t+1} = an error term.

In Equation (1), the accrual (cash flow) decile ranks are scaled to [0,1] such that firms with the most positive accruals (cash flows) have a portfolio rank of 1 and firms with the most negative accruals (cash flows) have a rank of 0. Under this construction, the coefficients can be interpreted as abnormal returns on portfolios with certain useful properties (see, e.g., Fama and MacBeth, 1973; Bernard and Thomas, 1990). For example, β_1 (β_2) represents the abnormal returns earned by a zero-investment hedge portfolio strategy of buying firms in the highest accrual (cash flow) decile and selling firms in the lowest accrual (cash flow) decile. Note that the “accrual anomaly” strategy

⁵ Sloan (1996) does consider both cash flows and accruals in comparing a measure of investors' pricing of accruals and cash flows with a measure of the implication of accruals and cash flows for one-year-ahead earnings (i.e., the Mishkin test) (see also Kraft et al., 2005a). However, it is important to note that Sloan omits cash flows in the examination of the association between accruals and subsequent returns.

would then earn an abnormal return of $-\beta_1$. Consistent with Sloan, a negative (positive) coefficient is interpreted as an overreaction (underreaction), and the magnitude of the coefficient indicates the economic magnitude of the overreaction (underreaction).

Sloan (1996) finds that a trading strategy of selling firms in the highest accrual decile and buying firms in the lowest accrual decile earns significant subsequent abnormal returns. This is equivalent to estimating Equation (1) excluding $CASHFLOWS_t$, and finding that the estimated coefficient on $ACCRUALS_t$ is significantly negative. However, when $CASHFLOWS_t$ are omitted, the estimated coefficient on $ACCRUALS_t$, denoted $\hat{\beta}_1$, is a biased estimate of β_1 .⁶ Specifically,

$$E(\hat{\beta}_1) = \beta_1 + \frac{Cov(ACCRUALS_t, CASHFLOWS_t)}{Var(ACCRUALS_t)} * \beta_2 \quad (2)$$

where $Cov(ACCRUALS_t, CASHFLOWS_t)$ is the covariance between $ACCRUALS_t$ and $CASHFLOWS_t$, and $Var(ACCRUALS_t)$ is the variance of $ACCRUALS_t$.

Since both $ACCRUALS_t$ and $CASHFLOWS_t$ are decile portfolio ranks ranging from [0,1], they have the same variance. Therefore, Equation (2) can be rewritten as:

$$E(\hat{\beta}_1) = \beta_1 + Corr(ACCRUALS_t, CASHFLOWS_t) * \beta_2 \quad (3)$$

where $Corr(ACCRUALS_t, CASHFLOWS_t)$ is the correlation between $ACCRUALS_t$ and $CASHFLOWS_t$. Equation (3) shows that the bias in $\hat{\beta}_1$ is determined by two factors: the correlation between accruals and cash flows, and the mispricing of cash flows.⁷

⁶ See Wooldridge (2003, Chapter 3) and Greene (2003, Chapter 8).

⁷ Similar to the omission of cash flows in examining accruals and subsequent returns, Sloan (1996) also omits accruals in documenting a positive association between cash flows and subsequent returns. By examining both accruals and cash flows concurrently, this study also provides evidence that the omission of

The primary role of accruals in mitigating timing and matching problems inherent in cash flows results in a negative correlation between the two earnings components.

Given an underreaction to cash flows (i.e., $\beta_2 > 0$), the omission of cash flows causes a

downward bias in $\hat{\beta}_1$ (i.e., $Corr(ACCRUALS_t, CASHFLOWS_t) * \beta_2 < 0$). Depending on

the severity of this downward bias, the observed “accrual anomaly” ($\hat{\beta}_1 < 0$) is consistent

with three potential explanations:

- Investors overreact to accruals (i.e., $\beta_1 < 0$). The accrual anomaly indeed holds.

However, because its magnitude is overstated due to the downward bias, the question remains as to whether or not the anomaly is economically significant.

- Investors price accruals correctly (i.e., $\beta_1 = 0$). The observed “overreaction” to accruals is driven by the downward bias, and there is no mispricing of accruals.
- Investors underreact to accruals (i.e., $\beta_1 > 0$). There appears to be an “accrual anomaly” because the downward bias dominates the positive coefficient (β_1).

Specifically, $[-Corr(ACCRUALS_t, CASHFLOWS_t)] * \beta_2 > \beta_1$. Because

$[-Corr(ACCRUALS_t, CASHFLOWS_t)]$ is between 0 and 1, this suggests that

$\beta_2 > \beta_1$, that is, investors underreact to cash flows to a greater extent than they

underreact to accruals. In other words, the apparent “accrual anomaly” is driven

by the more severe underreaction to cash flows than to accruals, combined with

the negative correlation between accruals and cash flows.

accruals biases downward the association between cash flows and subsequent returns and thus understates investors’ underreaction to cash flows (see section 4 for the results).

To summarize, the above analysis shows that the omission of cash flows from Sloan's analysis leaves the existence of the accrual anomaly an open question. To address this question, I examine the association between accruals and subsequent returns while controlling for the effect of cash flows.⁸

2.2 Use of an Annual Setting

Sloan (1996) finds the accrual anomaly in tests using annual accruals and returns subsequent to the annual filing date. The use of this annual setting to detect investors' reaction to accruals has two limitations.

First, annual accruals play a lesser role in improving cash flows as a measure of firm performance than accruals over shorter measurement intervals (e.g., quarters). The accrual process is hypothesized to mitigate the timing and matching problems inherent in cash flows over finite measurement intervals so that earnings better approximate firm performance (e.g., Watts and Zimmerman, 1986; Dechow, 1994; Dechow et al., 1998). Because cash flows suffer more severely from timing and matching problems and are thus less informative about firm performance over shorter intervals, accruals over such intervals are more important in providing value-relevant information about firm performance. Over longer intervals, cash flows have fewer problems and converge to earnings; so the role of accruals diminishes. This property of accruals suggests that accruals over a quarterly interval provide a more powerful setting in which to examine investors' reaction to accrual information.

⁸ Desai et al. (2004) also incorporate cash flows in their test of the accrual anomaly. However, they are not interested in the functional relation between accruals and cash flows. Rather, they examine whether the accrual anomaly is subsumed by the "value-glamour" anomaly. Using cash flows to capture the value-glamour distinction in an annual setting, they find that when cash flows are added to accruals in the regression, the coefficient on accruals is negative but statistically insignificant. They conclude that the accrual anomaly is the value-glamour anomaly in disguise. I show that their finding of an insignificant negative relation between accruals and subsequent returns is due to their use of an annual setting.

The second limitation of using an annual setting is that it ignores accrual information provided in interim reports. This information preempts at least part of the accrual information released in annual reports. As a result, abnormal returns measured over the period following the annual filing date reflect primarily the potential mispricing of the fourth-quarter accruals and fail to fully capture the potential mispricing of the first three quarters' accruals. For example, consider the information conveyed by first-quarter accruals. By the fourth month after fiscal year-end (when returns begin to be measured in the tests using the annual setting), first-quarter accrual information has been released for about one year; so only part, if any, of investors' initial (anomalous) reaction to this information is captured by the post-annual-report returns.

To overcome the two limitations arising from the use of the annual setting, I examine investors' reaction to accruals in a quarterly setting using quarterly accruals and returns subsequent to the quarterly filing date.

2.3 Reliance on the Full Sample of Firms

In documenting the accrual anomaly, Sloan (1996) conducts tests on the entire sample of firms (i.e., all firms with data available). However, the importance of accruals in measuring firm performance is likely to vary across firms. For some firms, cash flows suffer from more timing and matching problems than for other firms, and therefore their accruals play a more important role in measuring performance. If investors misprice accruals, this mispricing will be more pronounced (i.e., have a relatively larger impact on stock returns) for these firms. However, for some other firms, cash flows have fewer problems in measuring performance and are closely aligned with earnings; so the role of accruals diminishes. For these firms, the mispricing of accruals, if any, is likely to have a

relatively minor impact on stock returns and harder to detect statistically. The inclusion of these firms in the tests reduces the power to detect investors' reaction to accruals.

In this study, I examine sub-samples of firms where accruals are likely to play a more important role in measuring firm performance. These firms are identified as those with more volatile working capital requirements and investment and financing activities and those with longer operating cycles. Prior research documents that for these firms, cash flows suffer from more timing and matching problems and accruals are therefore more important in measuring performance (Dechow, 1994; Dechow et al., 1998).

To summarize, I reexamine the accrual anomaly, modifying the research design of Sloan (1996) by controlling for cash flows, using a quarterly setting, and partitioning the sample according to the importance of accruals in mitigating the problems of cash flows as a measure of performance. In the following two sections, I first examine the association between annual accruals and returns subsequent to the annual filing date using the full sample of firms (hereafter, the annual test) to facilitate a comparison with prior research. I then conduct the main analysis in a quarterly setting, examining quarterly accruals and returns subsequent to the quarterly filing date. This analysis is performed on the full sample first (hereafter, the quarterly test) and then on sub-samples of firms where accruals play a more important role (hereafter, the sub-sample test).

3. Sample Selection and Variable Measurement

3.1 Sample Selection

The sample used in the annual (quarterly) test consists of all available NYSE/AMEX firm-years (firm-quarters) from 1988 through 2002 with required financial

statement data on the Compustat database and monthly return data on the CRSP database.⁹ In order to ensure that cash flows and accruals are accurately measured, the sample period begins in 1988 when cash flow statement data became available.¹⁰ Following prior research, I exclude closed-end funds, investment trusts, foreign companies, and financial institutions (SIC code 6000-6999) due to the difficulty of interpreting accruals for financial firms.¹¹ This results in a sample of 25,540 firm-years for the annual test and a sample of 79,809 firm-quarters for the quarterly test, spanning a sixty-quarter period from 1988 through 2002.

3.2 Variable Measurement

Accruals are measured as the difference between earnings and cash flows from operations taken from the statement of cash flows. Earnings are income from continuing operations, and cash flows are cash flows from continuing operations. All three variables are scaled by average total assets.¹²

The abnormal return measure is the annual size-adjusted buy-and-hold returns as used in Sloan (1996). Raw returns are obtained from the CRSP monthly return file.

Abnormal returns are computed by subtracting a firm's size-matched buy-and-hold returns from the raw buy-and-hold returns. Size portfolio returns are provided by CRSP

⁹ NYSE/AMEX firms are identified using the historical exchange code (EXCHCD) from the CRSP monthly event file in the month before the return calculation. Using current exchange listing (e.g., Compustat's Zlist or CRSP's header exchange code) introduces a selection bias because changes in exchange listing are correlated with firm performance and a firm currently on the NYSE/AMEX may be traded on other exchanges in the past. Using EXCHCD avoids this selection bias (Kraft et al., 2005b).

¹⁰ Sloan (1996) uses a balance sheet approach to measure accruals. This approach introduces measurement errors into the accruals measure, particularly when a firm has been involved in mergers, acquisitions, or divestitures. Measuring accruals using cash flows statement data is more precise (see, e.g., Drtina and Largay, 1985; Hribar and Collins, 2002).

¹¹ The results are similar if these observations are included.

¹² For the annual sample, earnings are Compustat Annual Item 123, cash flows are Compustat Annual (Item 308 – Item 124), and total assets are Compustat Annual Item 6. For the quarterly sample, earnings are Compustat Quarterly Item 76, cash flows are Compustat Quarterly (Item 108 – Item 78), and total assets are Compustat Quarterly Item 44. Note that for quarterly cash flow statement items, Compustat reports data for the cumulative interim period year to date.

and calculated using all NYSE/AMEX firms based on their beginning-of-year market capitalizations. A firm's return is set to zero for any month if it is missing due to lack of trading.¹³ If a firm is delisted during the return accumulation period, the delisting return as reported in the CRSP event file for the delisting period is used, and a return equal to the firm's size portfolio return for the rest of the accumulation period is employed. If a firm is delisted due to liquidation or a forced delisting by either the exchange or the SEC and the delisting return is missing, the delisting return is set to -100%.¹⁴

Following Sloan (1996), the future buy-and-hold abnormal returns in the annual test, denoted $BHAR^{ANN}$, are measured from four months after the fiscal year-end through the fourth month of the subsequent fiscal year. Similarly, the future buy-and-hold abnormal returns in the quarterly test, denoted $BHAR^{QTR}$, span the twelve-month period beginning two months after the fiscal quarter-end for the first three fiscal quarters and four months after the fiscal quarter-end for the fourth fiscal quarter.¹⁵ Within this two-month interval, almost all firms have filed 10-Q reports for the first three fiscal quarters, and within the four-month interval, almost all firms have filed 10-K reports (Easton and Zmijewski, 1993).

¹³ This is identified using CRSP code “.B” in the return field. Excluding firms with missing returns due to a lack of trading activity disproportionately affects firms with bad stock performance, and thus excluding their returns imposes an upward bias in measuring abnormal returns (Kraft et al., 2005b). Nevertheless, the results are robust to excluding these observations or replacing these missing returns with the corresponding size decile returns.

¹⁴ The results remain unchanged if I delete these delisting firms or assume a delisting return of zero.

¹⁵ I repeat the analyses using 3- and 6-month windows. The results using these shorter return windows are stronger (see Section 4.5 for a discussion and results).

4. Results of Examining the Association between Accruals and Subsequent Returns

4.1 Descriptive Statistics and Correlations

Table 1 provides descriptive statistics (Panel A) and a correlation analysis (Panel B) for both the annual and quarterly samples. Panel A indicates that on average accruals are negative and cash flows are positive. Panel B shows that accruals are highly negatively correlated with cash flows, consistent with the primary role of accruals in mitigating the timing and matching problems inherent in cash flows. Moreover, the magnitude of the negative correlation between cash flows and accruals is larger in the quarterly sample (Spearman = -0.752) than in the annual sample (Spearman = -0.511), consistent with cash flows suffering more severely from timing and matching problems and accruals playing a more important role in mitigating these problems over shorter performance measurement intervals (Dechow, 1994).

4.2 Annual Test

Table 2, Panel A replicates the accrual anomaly using the annual sample. To conduct this analysis, each year firms are ranked by their prior annual accruals and placed into ten equal-size portfolios, denoted A1 to A10. An equally-weighted abnormal return is computed for each portfolio. The reported t-statistics are calculated using the Fama-MacBeth (1973) method and corrected for auto-correlation using Newey and West (1987) standard errors. Panel A presents the average portfolio returns, accruals, and cash flows over fifteen years for each of the ten accrual portfolios.

The results are consistent with the accrual anomaly: a hedge portfolio strategy of selling the most positive accrual firms (portfolio A10) and buying the most negative accrual firms (portfolio A1) yields an annual abnormal return of 9.3%. On the other hand,

given the strong negative correlation between accruals and cash flows, it is not surprising to find that firms in the most positive (negative) accrual portfolio also have extremely negative (positive) cash flows. Because this univariate analysis does not control for the effect of cash flows, the negative association between accruals and subsequent returns cannot be unambiguously interpreted as evidence that investors overreact to accruals. Panel B repeats the above analysis on cash flows. The results indicate that a strategy of selling the most negative cash flow firms (portfolio C1) and buying the most positive cash flow firms (portfolio C10) yields an annual abnormal return of 11.9%.

To control for the effect of cash flows, I regress subsequent returns on the scaled accrual decile ranks (*ACCRUALS*) and the scaled cash flow decile ranks (*CASHFLOWS*). The scaled decile ranks are constructed by ranking all firms in each period independently on accruals and cash flows into deciles 0-9 and then dividing the decile ranks by 9 so that they range from 0 (for the lowest decile) to 1 (for the highest decile).

Under this construction, the coefficient on *ACCRUALS* can be interpreted as the abnormal returns to a zero-investment trading strategy of buying firms in the highest accrual decile and selling firms in the lowest accrual decile (Bernard and Thomas, 1990). The coefficient on *CASHFLOWS* can be interpreted similarly. To ensure that the results are not merely driven by the size or market-to-book effects, the scaled decile ranks for size (*SIZE*) and market-to-book ratios (*MB*), constructed in a similar way, are included as additional controls (see Kothari, 2001, for a discussion).¹⁶

¹⁶ Size is included as an additional control because size-adjusted returns may not fully control for the size effect (Bernard, 1987). The results are similar if these controls are not included. The results are robust to controlling for the market beta calculated using the prior 60-month return period. Note that controlling for the momentum factor is inappropriate because the underreaction to accruals and cash flows examined in this study is a momentum (drift) phenomenon.

Table 3, Panel A reports Fama-MacBeth mean coefficient estimates from annual regressions of $BHAR^{ANN}$ on the scaled decile ranks based on prior annual accruals ($ACCRUALS$) and cash flows ($CASHFLOWS$). The coefficient on $ACCRUALS$, before controlling for cash flows, is -0.086 (significant at the 0.01 level), consistent with the accrual anomaly. However, after controlling for cash flows, the coefficient on $ACCRUALS$ decreases to -0.024 and becomes statistically insignificant (t-stat = -0.93).¹⁷ The omission of cash flows causes a downward bias of -0.061 (significant at the 0.01 level) in the coefficient on $ACCRUALS$.¹⁸ This insignificant relation between accruals and subsequent returns after controlling for cash flows is consistent with two potential explanations: (1) investors price accruals correctly, or (2) the annual test has limited ability to detect the mispricing of accruals.

The analyses in Panel A constrain the coefficients on the quarterly components of annual accruals to be equal. As discussed in section 2.2, one problem that arises with the use of this annual setting is that the dependent variable, $BHAR^{ANN}$, reflects primarily the potential mispricing of the fourth-quarter accruals and fails to fully capture the potential mispricing of the first three quarters' accruals. In Table 3, Panel B, I allow the coefficient to vary across the quarterly components of annual accruals and focus on the association between $BHAR^{ANN}$ and the fourth-quarter accruals. Column 1 reports the mean coefficient estimates from annual regressions of $BHAR^{ANN}$ on the scaled decile ranks based on the

¹⁷ Untabulated analyses indicate that this result is sensitive to some possible outliers. After deleting 1% of the annual sample with the largest squared residuals (Knez and Ready, 1997), I find that the coefficient on $ACCRUALS$ is 0.048 (t-stat = 2.81) after controlling for cash flows.

¹⁸ To assess potential multicollinearity for the regression analyses including both accruals and cash flows, I compute the variance-inflation factor (VIF) for all the regressions. A general rule of thumb is that a VIF less than 20 does not indicate severe multicollinearity. Untabulated results show that no variable in any regression has a VIF more than 10 (e.g., in the 60 quarterly regressions including both accruals and cash flows as reported in Table 5, the median (maximum) VIF for $ACCRUALS$ and $CASHFLOWS$ is 2.43 (5.41) and 2.58 (5.66) respectively), indicating multicollinearity is not a problem. (For a discussion about multicollinearity, see Maddala, 2001, and Greene, 2003).

prior year's fourth-quarter accruals ($Q_4ACCRUALS$) and cash flows ($Q_4CASHFLOWS$). The sample consists of all the firm-years in the annual sample with the required fourth-quarter data for that firm-year. The coefficient on $Q_4ACCRUALS$ (after controlling $Q_4CASHFLOWS$) is 0.075 (significant at the 0.05 level). The coefficient on $Q_4CASHFLOWS$ is also significantly positive (0.143, significant at the 0.01 level) and almost twice as large as the coefficient on $Q_4ACCRUALS$. In Column 2, I repeat the analyses in Column 1 but control for the first three quarters' accruals and cash flows. The results are very similar: the coefficient on $Q_4ACCRUALS$ is significantly positive (0.075, significant at the 0.01 level), and the coefficient on $Q_4CASHFLOWS$ is twice as large as the coefficient on $Q_4ACCRUALS$ (0.154, significant at the 0.01 level).¹⁹

The results in Panel B suggest that the insignificant relation between annual accruals and subsequent returns in Panel A is likely driven by the limited ability of the annual test to detect investors' reaction to accruals. Allowing coefficients to vary across the quarterly components of annual accruals gives evidence consistent with investors underreacting to accruals (see Panel B).

4.3 Quarterly Test

Table 4 replicates the accrual anomaly using the quarterly sample. To conduct this analysis, ten equal-sized portfolios are formed each quarter based on prior quarterly accruals, and an equally-weighted abnormal return ($BHAR^{QTR}$) is then computed for each portfolio. T-statistics are calculated using Fama-MacBeth type time-series mean portfolio returns with Newey-West (1987) standard errors. Panel A of Table 4 reports the average portfolio return and accruals and cash flows over sixty quarters for each of the ten

¹⁹ The coefficients on $Q_iACCRUALS$ ($i = 1,2,3$) are generally not significant except $Q_2ACCRUAL$ (-0.067, t-stat = -2.86). Further analyses indicate that this is caused by a few extreme observations. After deleting 1% of the sample with the largest squared residuals, this coefficient becomes -0.023 (t-stat = -0.88).

portfolios. The results are consistent with the accrual anomaly: a trading strategy of selling the most positive accrual firms and buying the most negative accrual firms yields a significant annual abnormal return of 6.8%. Panel B indicates that a trading strategy of selling firms with the most negative cash flow and buying firms with the most positive cash flow yields an even greater abnormal return, 13.1% per year.

Table 5 reports Fama-MacBeth mean coefficient estimates from quarterly regression analyses of $BHAR^{QTR}$ on the scaled decile ranks based on prior quarterly accrual (*ACCRUALS*) and cash flow (*CASHFLOWS*). When cash flows are omitted, the coefficient on *ACCRUALS* is -0.062 (significant at the 0.01 level), consistent with the accrual anomaly. However, the sign of the coefficient on *ACCRUALS*, after controlling for cash flows, becomes positive, and this positive coefficient is both economically and statistically significant (0.084, significant at the 0.05 level). Thus, when cash flows are omitted, the omission of cash flows causes a downward bias (-0.146, significant at the 0.01 level) in the coefficient on *ACCRUALS*. This bias is so severe that it dominates the underlying positive relation between accruals and subsequent returns.

Similarly, the results indicate that the omission of accruals also biases downward (but does not dominate) the association between cash flows and subsequent returns. Specifically, the coefficient on *CASHFLOWS* is 0.196 when accruals are controlled for, but is reduced to 0.130 by the omission of accruals.

The relative magnitude of the coefficients on *ACCRUALS* and *CASHFLOWS* is noteworthy. When both are included in the regression, the positive coefficient on *CASHFLOWS* is more than twice as large as the positive coefficient on *ACCRUALS*, with the difference of 0.112 between the two coefficients (significant at the 0.01 level). This

large difference between the two coefficients explains why the omission of cash flows not only biases downward the coefficient on accruals but turns it negative and significant (see section 2.1).²⁰

These results suggest: (1) investors underreact to accruals; (2) while underreacting to accruals, investors underreact even more to cash flows; and (3) when cash flows are omitted from the analysis, the stronger underreaction to cash flows than to accruals, combined with the negative correlation between the two, imposes a downward bias on the association between accruals and subsequent returns. This bias dominates the underlying underreaction to accruals, leading to the observed “accrual anomaly.”²¹

4.4 Sub-sample Test

The sub-sample test, like the quarterly test above, also examines quarterly accruals and returns subsequent to the quarterly filing date. However, instead of using the full sample of firms, the sub-sample test examines sub-samples of firms where cash flows are likely to suffer from more timing and matching problems and where accruals therefore play a more important role in measuring firm performance. Based on prior research, these firms are identified as those with more volatile working capital requirements and investment and financing activities and those with longer operating cycles. Because examining these firms provides a relatively more powerful test of investors’ reaction to accruals than examining all firms, I expect to find even stronger evidence of investors’ underreacting to accruals in this sub-sample test.

²⁰ To ensure that the results are not driven by particular fiscal quarters, I repeat the analyses separately for each fiscal quarter and find that the results for the whole sample hold for each fiscal-quarter sample.

²¹ Xie (2001) finds that the negative association between accruals and subsequent returns is primarily attributable to abnormal accruals calculated from the Jones model. This finding is not surprising given that the negative correlation between accruals and cash flows is primarily attributable to the abnormal accruals (see, e.g., Xie, 2001, Table 1). Therefore, the downward bias caused by the omission of cash flows is expected to be largely captured by the abnormal accruals. The untabulated results indicate this is the case.

Following Dechow (1994), the volatility of working capital requirements and investment and financing activities is measured by the absolute magnitude of accruals, and the length of operating cycles is measured each quarter as follows:

$$Operating\ cycle = \left(\frac{(AR_t + AR_{t-1})/2}{SALES/90} \right) + \left(\frac{(INV_t + INV_{t-1})/2}{COST\ of\ GOODS\ SOLD/90} \right) \quad (5)$$

where *AR* is accounts receivable (Compustat Quarterly Item 37), *INV* is inventory (Compustat Quarterly Item 38), *SALES* are net sales (Compustat Quarterly Item 2), and *COST of GOODS SOLD* is cost of good sold (Compustat Quarterly Item 30). In Equation (5), the first component captures the speed of converting credit sales into cash, and the second measures the number of days it takes to produce and sell products.²²

Table 6, Panel A reports the results for sub-samples partitioned based on the absolute magnitude of accruals (a measure of the volatility of working capital requirements and investment and financing activities). The quarterly sample is partitioned into two sub-samples with an equal number of firms based on firms' median absolute magnitudes of quarterly accruals. The same analysis as in Table 5 is performed separately for the two sub-samples. Compared with the results based on the full quarterly sample (see Table 5), the test based on a sub-sample of firms with larger magnitudes of accruals yields stronger evidence of investors underreacting to accruals. For this sub-sample of firms, the coefficient on *ACCRUALS*, after controlling for cash flows, is 0.155 (significant at the 0.01 level), and much larger compared with that for the full sample

²² I also use a second measure proposed by Dechow (1994) for the length of operating cycles, which is calculated as:

$$Trade\ cycle = \left(\frac{(AR_t + AR_{t-1})/2}{SALES/90} \right) + \left(\frac{(INV_t + INV_{t-1})/2}{COST\ of\ GOODS\ SOLD/90} \right) - \left(\frac{(AP_t + AP_{t-1})/2}{PURCHASES/90} \right)$$

where *AP* is accounts payable. The results using this second measure are similar to those using the first measure.

(0.084, Table 5). For other firms with smaller magnitudes of accruals, the coefficient on *ACCRUALS*, after controlling for cash flows, is only weakly positive and statistically insignificant (0.014, t-stat = 0.56). In addition, when cash flows are omitted, the downward bias in the coefficient on *ACCRUALS* is more severe for firms with larger magnitudes of accruals (-0.221) than for other firms (-0.075).

Table 6, Panel B reports the results for sub-samples partitioned based on the length of operating cycles. For each firm-quarter, an operating cycle is computed using Equation (5). A firm-specific operating cycle is calculated as the median of all the computed operating cycles for this firm. The quarterly sample is then partitioned into two sub-samples with an equal number of firms based on firm-specific operating cycles. The analyses are conducted separately for the two sub-samples. As expected, the test using firms with longer operating cycles provides stronger evidence of an underreaction of investors to accruals. For firms with longer operating cycles, the coefficient on *ACCRUALS*, after cash flows are controlled for, is 0.120 (significant at the 0.01 level), compared with 0.084 for the full sample (Table 5) and 0.056 for firms with shorter operating cycles. Also, the downward bias in the coefficient on *ACCRUALS* caused by the omission of cash flows is more severe for firms with longer operating cycles (-0.195) than for firms with shorter operating cycles (-0.102).

4.5 Additional Analyses

Shorter return windows

The analyses so far have used a 12-month return window, in line with Sloan (1996). However, previous studies show that most of the market's delayed response (drift) occurs in the subsequent 3 to 6-month period (see, e.g., Bernard and Thomas,

1989; Jegadeesh and Titman, 1993), suggesting that tests using a shorter return window are relatively more powerful. I repeat the analyses using 3- and 6-month return windows. Panel A and B of Table 7 report the results of repeating the analyses in Table 5 using a 3-month window and a 6-month window respectively. As expected, the results for these shorter windows show *stronger* evidence of an underreaction of investors to accruals.

December year-end firms

The analyses so far have used firms with all fiscal year-ends to maximize sample size. One potential concern is that the portfolio assignment is based on the distribution for all firms in each period, including some that have not yet reported their accruals for that period. If the distribution of accruals varies systematically with fiscal year-end, this may cause a hindsight problem. I repeat the analyses using only December year-end firms and find that my inferences remain unaltered (see Panel C of Table 7).

Influential observations

To ensure that the results are not driven by a small number of influential observations, I repeat the analyses after excluding 1% of observations with the largest squared residuals (Knez and Ready, 1997) and find that my inferences remain unchanged (see Panel D of Table 7).

Small and illiquid firms

To investigate whether the results are primarily driven by small, illiquid firms, I repeat the analyses after excluding all firms with stock prices lower than \$5, and all firms with a market capitalization that would put them into the smallest NYSE/AMEX size decile (Jegadeesh and Titman, 2001). I find that my inferences remain unchanged after excluding these small, illiquid stocks (see Panel E of Table 7).

5. Tests of Analysts' Earnings Forecasts

In this section, I investigate financial analysts' reaction to accruals through the examination of the relation between accruals and their forecasts of future earnings. To the extent that analysts' forecasts of future earnings can be used as a proxy for investors' expectations (e.g., Brown and Rozeff, 1978; Fried and Givoly, 1982; O'Brien, 1988), this analysis provides me a setting to directly examine the link between accruals and investors' expectations of future firm performance. Since this analysis does not rely on stock prices, it helps mitigate some of the concerns that unknown risk factors or research design flaws may confound the return-based tests reported in Section 4.

Bradshaw et al. (2001) also investigate how analysts react to accruals. They find a negative association between accruals and errors in analysts' forecasts of future earnings (defined as actual earnings minus forecast earnings). They interpret this negative association as evidence that financial analysts, like investors, also overreact to accruals. They conclude that this evidence confirms and complements the accrual anomaly reported by Sloan (1996). However, Bradshaw et al. (2001) omit cash flows in their examination of the association between accruals and analyst forecasts. So their result is potentially biased by a similar correlated omitted variable problem that affects the inferences concerning the accrual anomaly.

To assess the presence and extent of such a bias, I examine the association between accruals and analysts' forecast errors while controlling for the effect of cash flows. Specially, I estimate the following model:

$$FERROR_{t+1} = \alpha_0 + \alpha_1 * ACCRUALS_t + \alpha_2 * CASHFLOWS_t + v_{t+1} \quad (6)$$

where $FERROR_{t+1}$ is forecast errors for earnings in period $t+1$, $ACCRUALS_t$ is accruals in period t , and $CASHFLOWS_t$ is cash flows in period t . If analysts incorporate the information in accruals efficiently, there should be no relation between accruals and forecast errors. Otherwise, consistent with Bradshaw et al. (2001), a negative (positive) coefficient on accruals is interpreted as an overreaction (underreaction) to accruals by financial analysts. A similar interpretation applies to cash flows.

The sample used for estimating Equation (6) consists of all the observations in the quarterly sample for which analysts' median consensus forecasts and IBES actual earnings are available on the IBES summary statistics file. Following Bradshaw et al. (2001), the equation is estimated for each fiscal month from the month following quarter t earnings announcement through the month before quarter $t+1$ earnings announcement. Specifically, I initially measure the forecast for quarter $t+1$ earnings in the first month after the quarter t 's earnings announcement and then track forecast errors over the months leading up to the quarter $t+1$'s earnings announcement. I use Month 1, Month 2, and Month 3 to denote the first, second, and third month after the quarter t announcement but before the quarter $t+1$ announcement. Forecast errors are calculated as the difference between IBES realized earnings and analysts' median consensus forecasts, scaled by the stock price at the end of quarter t . There are 53,923, 52,316 and 42,327 observations in the samples for Month 1, 2, and 3 respectively.

Table 8 reports the summary statistics of the three monthly samples. The mean forecasts suggest that analysts are optimistic. This optimism declines from Month 1 to Month 3. The median forecast, however, does not show any obvious optimism or pessimism. These patterns are consistent with prior findings (e.g., O'Brien, 1988;

Abarbanell and Lehavy, 2003). For all three samples, the Spearman correlation between accruals and forecast errors is consistently negative and significant, while the Spearman correlation between cash flows and forecast errors is consistently positive and significant.

Table 9 reports the results from estimating Equation (6). To mitigate the influence of potential outliers caused by data error or extreme forecast errors (e.g., Abarbanell and Lehavy, 2003; Gu and Wu, 2003), I perform a rank regression analysis using scaled decile ranks for all the variables.²³ Forecast errors, accruals, and cash flows are assigned into deciles each quarter, and the quarterly decile ranks are scaled to the range [0,1] as before. A separate estimation of Equation (6) is performed for each quarter, and the mean coefficients, Fama-MacBeth t-statistics with Newey-West standard errors, and average R-squares for the 60 quarterly estimations are reported in Table 9.

The tests on the three monthly samples (Month 1, 2, and 3) generate similar findings. Specifically, when the effect of cash flows is controlled for, the association between accruals and forecast errors is positive and significant. This positive association is significantly smaller than the positive association between cash flows and forecast errors. When cash flows are omitted, the association between accruals and forecast errors is biased downward to such an extent that this association becomes negative and significant, consistent with Bradshaw et al. (2001).

These results complement and reinforce the evidence concerning investors' reaction to accruals reported in Section 4. The results suggest: (1) financial analysts underreact to accruals; (2) analysts underreact to cash flows to a greater extent; and (3) when cash flows are omitted, the stronger underreaction to cash flows than to accruals, combined with the negative correlation between accruals and cash flows, produces a

²³ The inferences are unchanged if I use winsorized raw forecast errors instead of ranks.

severe downward bias on the association between accruals and forecast errors. This bias dominates the underlying underreaction of analysts to accruals, leading to Bradshaw et al.'s (2001) finding that analysts overreact to accruals.

6. Conclusion

In this study, I reexamine the accrual anomaly, focusing on how three features of Sloan's (1996) research design affect inferences regarding the existence of the accrual anomaly. The first is the omission of cash flows from the examination of the association between accruals and subsequent returns, which creates a correlated omitted variable problem. The second is the use of an annual setting, which limits the test's ability to detect investors' reaction to accruals. The third design feature is the reliance on the full sample of firms, which reduces the test's power. After controlling for cash flows and conducting the test of the anomaly in a quarterly setting, the evidence shows that investors underreact to accruals and they underreact to cash flows to a greater extent. When cash flows are omitted from the analyses, the stronger underreaction to cash flows than to accruals, combined with the negative correlation between the two, imposes a severe downward bias on the association between accruals and subsequent returns. This bias conceals the underlying underreaction of investors to accruals, leading to the observed "accrual anomaly" reported by Sloan (1996). These results hold on average for the full sample of firms and, as expected, are even stronger for firms where accruals play a relatively more important role in measuring firm performance. Similarly, financial analysts are found to underreact to accruals once cash flows are accounted for, reversing the previous finding that analysts act in accordance with the accrual anomaly.

The challenge presented by the findings in this paper is to explain why investors and analysts appear to underreact to both accruals and cash flows and why they appear to underreact more to cash flows than to accruals. Possible explanations include risk mis-measurement or unknown research design flaws. Another possibility is that investors do not fully understand the time-series properties of quarterly earnings (see, e.g., Bernard and Thomas, 1989, 1990; Ball and Bartov, 1996). Investors may act as if quarterly earnings follow a seasonal random walk process, while the true earnings process might be a seasonally differenced first-order auto-regressive process with a seasonal moving-average term to reflect the seasonal negative autocorrelation (Brown and Rozeff, 1979). Although this explanation was originally proposed for investors' underreaction to earnings information in the post-earnings-announcement-drift literature, it also provides a possible explanation for the findings in this study. Assuming that cash flows are more persistent than accruals, when earnings surprises consist relatively more of cash flow (accrual) surprises, the positive autocorrelation between adjacent earnings surprises is relatively stronger (weaker). If investors ignore this autocorrelation when forming their expectations of future earnings, we would observe a stronger (weaker) underreaction (or drift) when earnings surprises are due more to cash flow (accrual) surprises. The investigation of these and other possible explanations for what appears to be an *underreaction* to accruals and cash flows represents fertile avenues for further work aimed at understanding how investors value accruals and cash flows.

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Table 1
Summary Statistics for the Annual and Quarterly Samples^a

Panel A: Descriptive statistics

Variable	Mean	Median	Std.Dev.	25%	75%
Annual sample (N = 25,540 firm-years)					
<i>Earnings</i>	0.024	0.041	0.173	0.009	0.076
<i>Cash flows</i>	0.074	0.084	0.155	0.037	0.131
<i>Accruals</i>	-0.050	-0.046	0.108	-0.084	-0.010
Quarterly sample (N = 79,809 firm-quarters)					
<i>Earnings</i>	0.005	0.010	0.055	0.002	0.021
<i>Cash flows</i>	0.018	0.020	0.062	-0.001	0.041
<i>Accruals</i>	-0.013	-0.011	0.059	-0.030	0.008

Panel B: Pearson (upper diagonal) and Spearman (lower diagonal) correlations^b

Annual sample (N = 25,540 firm-years)			
	<i>Earnings</i>	<i>Cash flows</i>	<i>Accruals</i>
<i>Earnings</i>	1.000	0.786	0.467
<i>Cash flows</i>	0.554	1.000	-0.179
<i>Accruals</i>	0.292	-0.511	1.000
Quarterly sample (N = 79,809 firm-quarters)			
	<i>Earnings</i>	<i>Cash flows</i>	<i>Accruals</i>
<i>Earnings</i>	1.000	0.493	0.418
<i>Cash flows</i>	0.385	1.000	-0.584
<i>Accruals</i>	0.169	-0.752	1.000

^aThe annual and quarterly samples include all U.S. common stocks (except financial firms) on NYSE or AMEX that have the necessary financial data on Compustat and monthly return data on CRSP from 1988 through 2002.

Earnings = income from continuing operations (Compustat Annual Item 123 for the annual sample and Compustat Quarterly Item 76 for the quarterly sample).

Cash flows = cash flows from continuing operations (Compustat Annual (Item 308 – Item 124) for the annual sample and Compustat Quarterly (Item 108 – Item 78) for the quarterly sample).

Accruals = the difference between *Earnings* and *Cash flows*.

All three variables are scaled by average total assets (Compustat Annual Item 6 for the annual sample and Compustat Quarterly Item 44 for the quarterly sample).

^bAll reported correlations are significant at the 0.001 level, using a two-tailed test.

Table 2
Time-series Means of Portfolio Abnormal Returns ($BHAR^{ANN}$) of Ten Portfolios
Formed Annually Based on either Prior Annual Accruals or Cash Flows^a

Panel A: Accrual portfolios (N = 24,540 firm-years)											
Accrual Deciles	A1 (lowest)	A2	A3	A4	A5	A6	A7	A8	A9	A10 (highest)	Hedge (A1-A10)^b (t-stat)^c
<i>BHAR^{ANN}</i>	0.050	0.039	0.004	0.035	0.009	0.019	0.001	-0.027	-0.035	-0.043	0.093
<i>Accruals</i>	-0.240	-0.113	-0.084	-0.067	-0.053	-0.040	-0.027	-0.009	0.018	0.114	(3.68)
<i>Cash flows</i>	0.110	0.125	0.116	0.106	0.095	0.080	0.072	0.059	0.038	-0.051	
Panel B: Cash flow portfolios (N = 24,540 firm-years)											
Cash flow Decile	C1 (lowest)	C2	C3	C4	C5	C6	C7	C8	C9	C10 (highest)	Hedge (C10-C1)^b (t-stat)
<i>BHAR^{ANN}</i>	-0.083	-0.019	-0.024	0.024	0.017	0.021	0.009	0.036	0.033	0.037	0.119
<i>Accruals</i>	0.011	-0.010	-0.026	-0.036	-0.044	-0.055	-0.063	-0.071	-0.084	-0.124	(4.08)
<i>Cash flows</i>	-0.175	0.004	0.036	0.058	0.075	0.092	0.109	0.131	0.161	0.247	

^aThis table reports the time-series means of the annual portfolio abnormal returns over 15 years from 1988 through 2002 using the annual sample. To form the portfolios, each year firms are ranked by their prior annual accruals (Panel A) or cash flows (Panel B) and placed into ten equal-size portfolios, and an equally-weighted abnormal return ($BHAR^{ANN}$) is computed for each portfolio. $BHAR^{ANN}$ is annual size adjusted buy-and-hold abnormal returns, beginning four months after the fiscal year end through the fourth month of the subsequent fiscal year. The time-series means of the average accruals and cash flows of the annual portfolios are also reported. See Table 1 for additional variable definitions.

^bThe accrual hedge portfolio strategy (Panel A) buys firms in the lowest accrual decile (A1) and sells firms in the highest accrual decile (A10). The cash flow hedge portfolio strategy (Panel B) buys firms in the highest cash flow decile (C10) and sells firms in the lowest cash flow decile (C1).

^cT-statistics are calculated using Fama-MacBeth type time-series mean portfolio returns with Newey-West (1987) standard errors.

Table 3
Fama-MacBeth Regression Analyses of Relations between $BHAR^{ANN}$ and
Prior Annual Accruals and Cash Flows^a

Panel A: Using prior annual accruals and cash flows

(N = 24,540 firm-years)

	Intercept	<i>ACCRUALS</i>	<i>CASHFLOWS</i>	<i>SIZE</i>	<i>MB</i>
Mean	0.084**	-0.086***		0.007	-0.079**
(t-stat) ^b	(2.79)	(-6.84)		(0.24)	(-2.62)
Mean	0.005		0.130***	-0.025	-0.103***
(t-stat)	(0.14)		(5.86)	(-0.99)	(-3.80)
Mean	0.019	-0.024	0.117***	-0.024	-0.098***
(t-stat)	(0.42)	(-0.93)	(3.40)	(-1.10)	(-3.67)
Bias in <i>ACCRUALS</i>		-0.061***			
(t-stat)		(-3.81)			

Panel B: Using the quarterly components of prior annual accruals and cash flows

(t-statistics provided in parentheses)^b

	Using prior year's fourth-quarter (Q4) cash flows and accruals	Using prior year's four quarterly (Q1-4) cash flows and accruals
Intercept	-0.047 (-1.01)	-0.006 (-0.08)
<i>Q4ACCRUALS</i>	0.075** (2.54)	0.075*** (3.34)
<i>Q4CASHFLOWS</i>	0.143*** (3.81)	0.154*** (4.13)
<i>Q3ACCRUALS</i>		-0.021 (-1.05)
<i>Q3CASHFLOWS</i>		0.080*** (3.71)
<i>Q2ACCRUALS</i>		-0.067** (-2.86)
<i>Q2CASHFLOWS</i>		-0.020 (-0.70)
<i>Q1ACCRUALS</i>		-0.045 (-1.11)
<i>Q1CASHFLOWS</i>		-0.009 (-0.21)
<i>SIZE</i>	-0.018 (-0.79)	-0.034 (-1.32)
<i>MB</i>	-0.090** (-2.60)	-0.086** (-2.67)
N	19,973	19,529

*, **, *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively.

^a This table reports Fama-MacBeth mean coefficient estimates from 15 annual regressions of $BHAR^{ANN}$ on prior annual accruals and cash flows (Panel A) and on the quarterly components of prior annual accruals and cash flows (Panel B). Panel A uses the annual sample and Panel B requires additional non-missing quarterly data. $BHAR^{ANN}$ is annual size adjusted buy-and-hold abnormal returns, beginning four months after the fiscal year end through the fourth month of the subsequent fiscal year. All regressors are assigned to deciles annually and scaled so that they range from 0 (for the lowest decile) to 1 (for the highest decile). $ACCRUALS$ and $CASHFLOWS$ are scaled decile ranks based on prior annual accruals and cash flows, respectively.

$Q_iACCRUALS$ and $Q_iCASHFLOWS$ are scaled decile ranks based on prior year's quarter i accruals and cash flows, respectively ($i = 1, 2, 3$ or 4). $SIZE$ and MB are scaled decile ranks for firm size (Compustat Annual Item 199 * Item 25) and market-to-book ratios (Compustat Annual (Item 199 * Item 25)/Item 60) measured at the prior year-end.

^bT-statistics are calculated using Fama-MacBeth type time-series mean coefficients with Newey-West (1987) standard errors.

Table 4
Time-series Means of Portfolio Abnormal Returns ($BHAR^{QTR}$) of Ten Portfolios
Formed Quarterly Based on either Prior Quarterly Accruals or Cash Flows^a

Panel A: Accrual portfolios (N = 79,809 firm-quarters)

Accrual Deciles	A1 (lowest)	A2	A3	A4	A5	A6	A7	A8	A9	A10 (highest)	Hedge (A1-A10) ^b (t-stat) ^c
$BHAR^{QTR}$	0.023	0.022	0.020	0.014	0.007	0.005	-0.001	-0.015	-0.022	-0.045	0.068
Accruals	-0.109	-0.046	-0.031	-0.022	-0.015	-0.008	-0.001	0.008	0.022	0.077	(3.95)
Cash flows	0.075	0.047	0.038	0.030	0.024	0.019	0.012	0.004	-0.010	-0.060	

Panel B: Cash flow portfolios (N = 79,809 firm-quarters)

Cash flow Decile	C1 (lowest)	C2	C3	C4	C5	C6	C7	C8	C9	C10 (highest)	Hedge (C10-C1) ^b (t-stat)
CAR^{QTR}	-0.079	-0.050	-0.022	-0.010	0.011	0.016	0.018	0.021	0.050	0.052	0.131
Accruals	0.050	0.014	0.003	-0.004	-0.010	-0.015	-0.020	-0.026	-0.037	-0.080	(7.25)
Cash flows	-0.086	-0.017	-0.001	0.009	0.017	0.024	0.032	0.041	0.055	0.105	

^aThis table reports the time-series means of the quarterly portfolio abnormal returns over 60 quarters from 1988 through 2002 using the quarterly sample. To form the portfolios, each quarter firms are ranked by their prior quarterly accruals (Panel A) or cash flows (Panel B) and placed into ten equal-size portfolios, and an equally-weighted abnormal return ($BHAR^{QTR}$) is computed for each portfolio. $BHAR^{QTR}$ is annual size adjusted buy-and-hold abnormal returns, beginning 2 months after the prior fiscal quarter-end for the first three fiscal quarters and four months after the prior fiscal quarter-end for the fourth fiscal quarter. The time-series means of the average accruals and cash flows of the quarterly portfolios are also reported. See Table 1 for additional variable definitions.

^bThe accrual hedge portfolio strategy (Panel A) buys firms in the lowest accrual decile (A1) and sells firms in the highest accrual decile (A10). The cash flow hedge portfolio strategy (Panel B) buys firms in the highest cash flow decile (C10) and sells firms in the lowest cash flow decile (C1).

^cT-statistics are calculated using Fama-MacBeth type time-series mean portfolio returns with Newey-West (1987) standard errors.

Table 5
Fama-MacBeth Regression Analyses of Relations between $BHAR^{QTR}$ and
Prior Quarterly Accruals and Cash Flows^a

(N = 79,809 firm-quarters)

	Intercept	<i>ACCRUALS</i>	<i>CASHFLOWS</i>	<i>SIZE</i>	<i>MB</i>
Mean	0.052***	-0.062***		0.033	-0.073**
(t-stat) ^b	(2.92)	(-5.10)		(1.37)	(-2.01)
Mean	-0.028		0.130***	0.010	-0.082**
(t-stat)	(-1.32)		(9.52)	(0.46)	(-2.31)
Mean	-0.094**	0.084**	0.196***	-0.003	-0.086**
(t-stat)	(-2.67)	(2.32)	(5.19)	(-0.17)	(-2.40)
Bias in <i>ACCRUALS</i>		-0.146***			
(t-stat)		(-5.39)			

*, **, *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively.

^aThis table reports Fama-MacBeth mean coefficient estimates from 60 quarterly regressions of $BHAR^{QTR}$ on prior quarterly accruals and cash flows and controls using the quarterly sample. $BHAR^{QTR}$ is annual size adjusted buy-and-hold abnormal returns, beginning two months after the prior fiscal quarter-end for the first three fiscal quarters and four months after the prior fiscal quarter-end for the fourth fiscal quarter. All regressors are assigned to deciles quarterly and scaled so that they range from 0 (for the lowest decile) to 1 (for the highest decile). *ACCRUALS* and *CASHFLOWS* are scaled decile ranks based on prior quarterly accruals and cash flows, respectively. *SIZE* and *MB* are scaled decile ranks for firm size (Compustat Quarterly Item 14 * Item 61) and market-to-book ratios (Compustat Quarterly (Item 14 * Item 61)/Item 59) measured at the prior quarter-end, respectively.

^bT-statistics are calculated using Fama-MacBeth type time-series mean coefficients with Newey-West (1987) standard errors.

Table 6
Sub-sample Analyses Based on the Absolute Magnitude of Accruals
or on the Length of Operating Cycles^a

Panel A: Sub-samples partitioned on the absolute magnitude of accruals

Model	Intercept	<i>ACCRUALS</i>	<i>CASHFLOWS</i>	<i>SIZE</i>	<i>MB</i>
Firms with larger absolute magnitudes of accruals					
(N = 35,386 firm-quarters)					
Mean	0.049**	-0.065***		0.050	-0.100**
(t-stat) ^b	(2.09)	(-3.28)		(1.38)	(-2.23)
Mean	-0.050**		0.164***	0.015	-0.096**
(t-stat)	(-2.03)		(10.11)	(0.44)	(-2.24)
Mean	-0.177***	0.155***	0.289***	-0.013	-0.094**
(t-stat)	(-3.93)	(3.10)	(5.99)	(-0.43)	(-2.40)
Bias in <i>ACCRUALS</i>		-0.221***			
(t-stat)		(-6.11)			
Firms with smaller absolute magnitudes of accruals					
(N = 44,423 firm-quarters)					
Mean	0.059***	-0.061***		-0.006	-0.033
(t-stat)	(3.28)	(-6.19)		(-0.22)	(-0.93)
Mean	-0.003		0.092***	-0.016	-0.052
(t-stat)	(-0.16)		(5.75)	(-0.54)	(-1.45)
Mean	-0.015	0.014	0.103***	-0.016	-0.053
(t-stat)	(-0.49)	(0.56)	(3.28)	(-0.58)	(-1.47)
Bias in <i>ACCRUALS</i>		-0.075***			
(t-stat)		(-3.37)			
Difference between Bias in <i>ACCRUALS</i>		-0.146***			
		(-4.58)			

Panel B: Sub-samples partitioned on the length of operating cycles

Model	Intercept	<i>ACCRUALS</i>	<i>CASHFLOWS</i>	<i>SIZE</i>	<i>MB</i>
Firms with longer operating cycles					
(N = 42,727 firm-quarters)					
Mean	0.064***	-0.074***		0.049*	-0.097**
(t-stat)	(3.04)	(-4.69)		(1.80)	(-2.48)
Mean	-0.033		0.156***	0.020	-0.106***
(t-stat)	(-1.39)		(9.66)	(0.77)	(-2.78)
Mean	-0.128***	0.120***	0.253***	0.001	-0.115***
(t-stat)	(-3.33)	(3.06)	(6.33)	(0.04)	(-3.02)
Bias in <i>ACCRUALS</i>		-0.195***			
(t-stat)		(-6.59)			
Firms with shorter operating cycles					
(N = 37,082 firm-quarters)					
Mean	0.038	-0.046***		0.018	-0.048
(t-stat)	(1.70)	(-3.71)		(0.60)	(-1.32)
Mean	-0.021		0.098***	0.002	-0.058
(t-stat)	(-0.86)		(5.38)	(0.08)	(-1.57)
Mean	-0.065	0.056	0.141***	-0.006	-0.060
(t-stat)	(-1.52)	(1.35)	(3.09)	(-0.23)	(-1.58)
Bias in <i>ACCRUALS</i>		-0.102***			
(t-stat)		(-3.09)			
Difference between Bias		-0.093***			
in <i>ACCRUALS</i>		(-2.70)			

*, **, *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively.

^aThis table reports the results of separate Fama-MacBeth regression analyses of relations between $BHAR^{QTR}$ and prior quarterly accruals and cash flows (comparable to Table 5) using sub-samples portioned based on the absolute magnitude of accruals (Panel A) or on the length of operating cycles (Panel B). In Panel A, the quarterly sample used in Table 5 is partitioned into two sub-samples with an equal number of firms, based on firms' median absolute magnitude of accruals. In Panel B, the quarterly sample is partitioned into two sub-samples with an equal number of firms, based on firms' median length of operating cycles. Operating cycle is calculated for the quarterly interval as follows:

$$Operating \quad cycle = \left(\frac{(AR_t + AR_{t-1}) / 2}{SALES / 90} \right) + \left(\frac{(INV_t + INV_{t-1}) / 2}{COST \quad of \quad GOODS \quad SOLD / 90} \right)$$

where *AR* is accounts receivable, *INV* is inventory, *SALES* is net sales, and *COST of GOODS SOLD* is cost of good sold.

^bT-statistics are calculated using Fama-MacBeth type time-series mean coefficients with Newey-West (1987) standard errors.

Table 7
Additional Analyses of Relations between $BHAR^{QTR}$ and
Prior Quarterly Accruals and Cash Flows^a

	Intercept	<i>ACCRUALS</i>	<i>CASHFLOWS</i>	<i>SIZE</i>	<i>MB</i>
Panel A: Using a 3-month return window					
(N = 79,809 firm-quarters)					
Mean	-0.002	-0.006		0.006	-0.006
(t-stat) ^b	(-0.51)	(-1.34)		(0.62)	(-0.49)
Mean	-0.017***		0.031***	-0.001	-0.007
(t-stat)	(-2.69)		(6.86)	(-0.01)	(-0.63)
Mean	-0.051***	0.043***	0.065***	-0.006	-0.010
(t-stat)	(-5.96)	(4.70)	(7.34)	(-0.82)	(-0.88)
Panel B: Using a 6-month return window					
(N = 79,809 firm-quarters)					
Mean	0.004	-0.017***		0.013	-0.018
(t-stat)	(0.38)	(-3.32)		(0.78)	(-0.80)
Mean	-0.030**		0.066***	0.001	-0.021
(t-stat)	(-2.55)		(8.16)	(0.04)	(-0.98)
Mean	-0.089***	0.076***	0.125***	-0.011	-0.026
(t-stat)	(-4.66)	(4.15)	(6.12)	(-0.87)	(-1.19)
Panel C: Using only December year-end firms					
(N = 48,983 firm-quarters)					
Mean	0.061***	-0.067***		0.018	-0.069*
(t-stat)	(2.70)	(-4.95)		(0.66)	(-2.00)
Mean	-0.022		0.137***	-0.006	-0.082**
(t-stat)	(-0.86)		(8.20)	(-0.25)	(-2.40)
Mean	-0.081**	0.075**	0.196***	-0.017	-0.088**
(t-stat)	(-2.01)	(2.14)	(4.77)	(-0.74)	(-2.48)

Table 7 (continued)

	Intercept	ACCRUALS	CASHFLOWS	SIZE	MB
Panel D: Excluding 1% of the quarterly sample with the largest squared residuals					
(N = 79,011 firm-quarters)					
Mean	-0.040**	-0.035***		0.144***	-0.092***
(t-stat)	(-2.25)	(-3.48)		(5.62)	(-3.01)
Mean	-0.107***		0.127***	0.123***	-0.100***
(t-stat)	(-5.37)		(11.86)	(5.05)	(-3.31)
Mean	-0.216***	0.140***	0.236***	0.101***	-0.110***
(t-stat)	(-7.86)	(5.38)	(8.69)	(4.48)	(-3.65)
Panel E: Excluding firms with stock prices lower than \$5 or that are in the bottom NYSE/AMEX size decile					
(N = 64,794 firm-quarters)					
Mean	0.045***	-0.061***		0.014	-0.038
(t-stat)	(3.40)	(-5.40)		(0.66)	(-1.20)
Mean	-0.027		0.105***	0.007	-0.053*
(t-stat)	(-1.66)		(11.68)	(0.31)	(-1.71)
Mean	-0.079***	0.063**	0.157***	0.003	-0.061*
(t-stat)	(-3.21)	(2.20)	(5.81)	(0.13)	(-1.82)

*, **, *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively.

^aThis table reports additional analyses of relations between $BHAR^{QTR}$ and prior quarterly accruals and cash flows (comparable to Table 5). Panel A and B report the results of using a 3-month return window and a 6-month return window, respectively. Panel C reports the results using only December year-end firms. Panel D reports the results after excluding 1% of the quarterly sample with the largest squared residuals. Panel E reports the results after excluding firms with stock prices lower than \$5 or that are in the bottom NYSE/AMEX size decile.

^bT-statistics are calculated using Fama-MacBeth type time-series mean coefficients with Newey-West (1987) standard errors.

Table 8
Summary Statistics for the Analysts' Forecast Samples^a

Panel A: Descriptive statistics							
Month	Variable	N	Mean	Median	S.D.	25%	75%
1	$FError_{1,t+1}$	53,923	-0.0029	0.0000	0.0133	-0.0029	0.0011
2	$FError_{2,t+1}$	52,316	-0.0022	0.0000	0.0116	-0.0021	0.0012
3	$FError_{3,t+1}$	42,327	-0.0016	0.0000	0.0107	-0.0012	0.0012

Panel B: Correlations between $FError_{s,t+1}$ and $Accruals_t$ (p-value, two-tailed)			
Month	N	Pearson correlation between $FError_{s,t+1}$ and $Accruals_t$	Spearman correlation between $FError_{s,t+1}$ and $Accruals_t$
1	53,923	0.011 (p=0.011)	-0.030 (p<0.0001)
2	52,316	0.002 (p=0.652)	-0.039 (p<0.0001)
3	42,327	-0.001 (p=0.884)	-0.038 (p<0.0001)

Panel C: Correlations between $FError_{s,t+1}$ and $Cashflows_t$ (p-value, two-tailed)			
Month	N	Pearson correlation between $FError_{s,t+1}$ and $Cashflows_t$	Spearman correlation between $FError_{s,t+1}$ and $Cashflows_t$
1	53,923	0.105 (p<0.0001)	0.110 (p<0.0001)
2	52,316	0.099 (p<0.0001)	0.098 (p<0.0001)
3	42,327	0.098 (p<0.0001)	0.080 (p<0.0001)

^aThe samples include all the firm-quarters (quarter t) in the quarterly sample for which median consensus forecasts and actual earnings for quarter $t+1$ are available on the IBES summary file. The forecast for quarter $t+1$ earnings is initially measured in the first month after the quarter t 's earnings announcement, and then tracked over the months leading up to the quarter $t+1$'s announcement. Month 1, 2, and 3 denote the first, second, and third month, respectively, following the quarter t announcement and before the quarter $t+1$ announcement.

$FError_{s,t+1}$ is the monthly forecast error for quarter $t+1$ earnings in month s ($s = 1, 2, \text{ or } 3$) following quarter t earnings announcement and before quarter $t+1$ announcement, calculated as quarter $t+1$ earnings less median consensus forecasts in month s , scaled by the stock price at the end of quarter t . $Accruals_t$ and $Cashflows_t$ are quarter t accruals and cash flows, scaled by average total assets. See Table 1 for additional variable definitions.

Table 9
Fama-MacBeth Regression Analyses of Relations between Forecast Errors
($FError_{s,t+1}$) and Prior Quarterly Accruals and Cash Flows^a

	Intercept	<i>ACCRUALS</i>	<i>CASHFLOWS</i>	Ave. R^2
Panel A: Month 1 Sample (N = 53,923 firm-quarters)				
Mean	0.510***	-0.021***		0.003
(t-stat) ^b	(172.49)	(-3.46)		
Mean	0.448***		0.104***	0.014
(t-stat)	(128.36)		(15.39)	
Mean	0.298***	0.167***	0.237***	0.028
(t-stat)	(17.57)	(9.94)	(13.59)	
Bias in <i>ACCRUALS</i>		-0.188***		
(t-stat)		(-12.89)		
Panel B: Month 2 Sample (N = 52,316 firm-quarters)				
Mean	0.512***	-0.024***		0.003
(t-stat)	(179.76)	(-4.35)		
Mean	0.457***		0.087***	0.010
(t-stat)	(121.38)		(11.59)	
Mean	0.343***	0.126***	0.188***	0.021
(t-stat)	(20.17)	(7.77)	(10.35)	
Bias in <i>ACCRUALS</i>		-0.150***		
(t-stat)		(-9.98)		
Panel C: Month 3 Sample (N = 42,327 firm-quarters)				
Mean	0.514***	-0.029***		0.003
(t-stat)	(170.96)	(-6.53)		
Mean	0.465***		0.069***	0.008
(t-stat)	(113.26)		(8.48)	
Mean	0.395***	0.078***	0.132***	0.016
(t-stat)	(20.70)	(4.43)	(6.30)	
Bias in <i>ACCRUALS</i>		-0.107***		
(t-stat)		(-6.18)		

*, **, *** denote two-tailed significance levels of 10%, 5%, and 1%, respectively.

^aThis table reports Fama-MacBeth mean coefficient estimates from 60 quarterly regressions of monthly forecast errors for quarter t+1 earnings, $FError_{s,t+1}$ ($s = 1, 2, \text{ or } 3$), on quarter t accruals and cash flows. All variables are assigned to deciles quarterly and scaled so that they range from 0 (for the lowest decile) to 1 (for the highest decile). See Table 8 for variable definitions.

^bT-statistics are calculated using Fama-MacBeth type time-series mean coefficients with Newey-West (1987) standard errors.