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The Quality of Analysts' Cash Flow Forecasts

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ABSTRACT: This study examines properties of analysts' cash flow forecasts and compares them to those exhibited by analysts' earnings forecasts. Our results indicate that analysts' cash flow forecasts are less accurate than analysts' earnings forecasts and improve at a slower rate during the forecast period. Further, cash flow forecasts appear to be a naïve extension of analysts' earnings forecasts, thus providing limited information on expected changes in working capital. We also find that analysts' forecasts of cash flows are of limited information content and are only weakly associated with stock returns. Finally, estimating expected accruals as the difference between analysts' earnings forecasts and their cash flow forecasts does not result in a better detection of earnings management than achieved by commonly used accrual models.

Keywords: *analysts' cash flow forecasts; earnings forecasts; forecast accuracy; earnings management; accruals.*

Data Availability: *Data are available from public sources indicated in the text.*

I. INTRODUCTION

Financial analysts generate a number of important products, among them earnings forecasts, stock recommendations, and target stock prices. In recent years, analysts have gradually introduced yet another product—forecasts of firms' operating cash flows. Our analysis shows that the percentage of firms receiving earnings forecasts that also

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receive cash flow forecasts has increased from 2.5 percent in 1993 to 57.2 percent in 2005. This trend, along with the greater availability of analysts' cash flow forecasts through commercial databases, has led to an increased number of studies that employ these forecasts in a variety of research settings.

The main explanation offered in the literature for the upward trend in the frequency of analysts' cash flow forecasts and for its cross-sectional variation is investor demand. Specifically, these forecasts are demanded by investors and supplied by analysts in cases where earnings are likely to be of low quality (see DeFond and Hung 2003). The "demand hypothesis" implicitly assumes that analysts' cash flow forecasts are of a sufficiently high quality to create such a demand and that they cannot be simply replicated by an extrapolation of analysts' already-produced earnings forecasts.

The quality of cash flow forecasts relative to earnings forecasts is likely to be affected by a myriad of factors. These include the inherent variability and measurement errors in cash flows as compared with accruals, different incentives and opportunities for management to manipulate cash flows and earnings, and different incentives of analysts to invest resources in the production of cash flow versus earnings forecasts. The effects of these factors, which are further discussed in Section III, are often offsetting, rendering the relative quality of cash flow forecasts an empirical question.

While the accounting and finance literature has extensively examined various properties of analysts' *earnings* forecasts, very little is known about the properties of analysts' cash flow forecasts, possibly due to their short history and their more limited availability. One of the objectives of this study is to close this knowledge gap by exploring basic forecasting properties such as accuracy, bias, and efficiency, and by benchmarking the performance of analysts' cash flow forecasts against that of the well-studied earnings forecasts. In addition to examining basic forecasting properties, we investigate the degree of sophistication reflected in analysts' cash flow forecasts by testing the extent to which these forecasts incorporate projections of working capital accruals and other adjustments to income rather than merely representing the addition of some estimate of depreciation and amortization to the existing earnings forecasts.

Another objective of testing the properties of analysts' cash flow forecasts is to provide insights on the plausibility of the demand explanation for the intra-temporal and cross-sectional variation in the provision of analysts' cash flow forecasts. Finding that analysts' cash flow forecasts are inaccurate or that they are merely a simple extrapolation of analysts' earnings forecasts would not be supportive of the "demand hypothesis."

In addition to exploring key properties of analysts' cash flow forecasts, we evaluate two potential uses of these forecasts in research settings. The first is as a proxy for the unobservable market expectation of cash flows. In line with past research on analysts' earnings forecasts, we gauge the extent to which analysts' cash flow forecasts represent the market expectation by examining the association between their forecast errors and stock returns. The second potential use of these cash flow forecasts is as a basis for estimating expected accruals and extracting unexpected accruals. Expected accruals can be inferred by subtracting analysts' cash flow forecasts from their contemporaneous earnings forecasts. We test the power and efficiency of this "accruals model" in detecting earnings management and compare the results to those produced by the modified Jones model (Dechow et al. 1995) and that employed by Dechow and Dichev (2002), models commonly used in the literature.

Our results indicate that while analysts' cash flow forecasts are more accurate than forecasts derived from a time-series model, they are less accurate than their earnings forecasts. This lower accuracy is only partially attributable to data-quality issues or the inherent difficulty of forecasting cash flows stemming from the higher variability of the cash flow series as compared with the earnings series. Further, the rate of improvement in the accuracy of cash flow forecasts over the forecast period is much lower than that of earnings forecasts. We also find that analysts' cash flow forecasts are, in essence, a naïve extension of their earnings forecasts. As a result, they provide limited incremental information on expected changes in firms' working capital.

The findings that analysts' cash flow forecasts are less accurate than their earnings forecasts and that cash flow forecasts are merely a simple extrapolation of their earnings forecasts do not necessarily mean that they are not potentially useful to investors. However, the findings suggest that there are factors beyond forecasting effectiveness that make cash flow forecasts useful and which may explain their increased availability. We comment on the implications of our findings for the ''demand hypothesis'' in Section VII, after presenting the results of our tests.

We also report on two additional findings. First, in contrast to analysts' earnings forecasts, analysts' cash flow forecasts are only weakly associated with stock price movements and thus do not appear to be a good surrogate for the unobservable market expectation of cash flows. Second, we show that estimating expected accruals based on the difference between analysts' earnings and cash flow forecasts is not more effective in detecting earnings management than other models used by researchers.

The study contributes to the accounting literature in several ways. It is the first to comprehensively document important properties of cash flow forecasts and to assess their quality. The finding of a low accuracy of these forecasts, the fact that they represent in essence a trivial extension of analysts' earnings forecasts, and the evidence of serious data-quality issues are relevant for investors who might consider these forecasts in valuation and investment decisions and researchers who employ cash flow forecasts in various research contexts. Researchers using cash flow forecasts may also be guided in their sample selection criteria by our finding that the quality of cash flow forecasts varies considerably depending on certain firm attributes. Finally, two additional results are relevant for future research. First, our finding that errors in analysts' cash flow forecasts are only marginally associated with stock price movements (after controlling for analysts' earnings forecasts) is relevant for any research in which these forecasts might be used as a surrogate for the unobservable market expectation of cash flows. Second, our finding that analysts' earnings and cash flow forecasts are unlikely to generate an accruals expectation model that is superior to those commonly used in the literature is relevant for research on earnings management.

In the next section we review the related research on cash flow forecasts. In Section III we frame our research questions, discussing the expectations regarding the relative accuracy of earnings and cash flow forecasts. The empirical design and tests used to explore the properties and attributes of cash flow forecasts are contained in Section IV. Section V contains a description of the sample and the data used in the tests. The results are presented and discussed in Section VI. The relevance of the findings to the ''demand hypothesis'' is discussed in Section VII. Section VIII contains a summary and concluding remarks.

II. RELATED RESEARCH

DeFond and Hung (2003) is the first study to document the increased propensity of analysts to issue cash flow forecasts and to examine the explanation for this trend. They hypothesize and find empirical support consistent with the notion that analysts have provided more cash flow forecasts in recent years in response to demand by investors who are increasingly concerned about the inherent shortcomings of accrual accounting, such as its subjective nature and its susceptibility to earnings management.[1] Since cash flow from operations is perceived to be more objective and less vulnerable to management manipulation, it is commonly viewed as a valuable supplement to earnings information. DeFond and Hung (2003) show that, consistent with cash flow forecasts being driven by investor demand, analysts' propensity to produce these forecasts increases with the magnitude of accruals, latitude available to management in choosing accounting methods, earnings volatility, capital intensity, and financial distress.[2] In a complementary study, DeFond and Hung (2007) examine analysts' propensity to issue cash flows across countries with different reporting regimes. They find that analysts are more likely to supplement their earnings forecasts with cash flow forecasts in countries where investor protection is poor and earnings are of a lower quality, providing further support for the demand hypothesis.[3]

In line with the notion that cash flow forecasts are driven by investor demand arising from earnings quality concerns, a number of studies examine how the presence of such forecasts affects earnings quality, predictability, and valuation. McInnis and Collins (2008) find that the presence of cash flow forecasts elevates earnings quality, a finding that they attribute to the implicit forecast of accruals provided by comparing the earnings and cash flow forecasts and the increased transparency of any accrual manipulations that might be undertaken to meet earnings thresholds.

While cash flow forecasts might reduce earnings management, Call (2007) finds that their presence increases the propensity of firms to manipulate their cash flow from operations. Further, he finds that when cash flow forecasts are provided, investors assign more weight to the cash flow component of earnings in stock valuation, consistent with the signaling value of the presence of cash flow forecasts.

A number of studies show that the mere existence of cash flow forecasts has an indirect benefit on the accuracy of analysts' earnings forecasts, thus likely incentivizing analysts to engage in cash flow forecasting. Pae et al. (2007) and Call et al. (2009) find that analysts' earnings forecasts are more accurate if they also produce a cash flow forecast. Call et al. (2009) further find that analysts who issue cash flow forecasts have a better understanding of the time-series properties of the earnings process and are less likely to be terminated, suggesting that cash flow forecast accuracy is relevant for analysts' career success (see Lehavy 2009).

Other studies use analysts' cash flow forecasts to proxy for the market expectation of cash flows. DeFond and Hung (2003) use these forecasts to estimate the unexpected cash flows in their analysis of earnings announcement period returns. Similarly, McInnis and Collins (2008) use cash flow forecasts to derive unexpected cash flows in their analysis of investors' differential response to cash flow and accrual information provided in the earnings announcement.

Brown and Pinello (2008), McInnis and Collins (2008), and Melendrez et al. (2009) use analysts' cash flow forecasts to form a measure of unexpected accruals by subtracting them from their corresponding analysts' earnings forecasts. Finally, the errors in analysts' cash flow forecasts are used by Zhang (2008) to examine the market reward and analysts' response to meeting or beating these forecasts, and by Brown and Pinello (2008) to

[1] Investor demand is also among the factors found to prompt management to provide cash flow forecasts (see Wasley and Wu 2006).
[2] Ertimur and Stubben (2005) show that the supply of cash flow forecasts, in addition to being affected by demand factors, is also influenced by analyst and brokerage house characteristics.
[3] Hail (2007) concludes that the DeFond and Hung (2007) findings, which are based on cross-sectional analyses, do not necessarily hold in a time-series setting.

analyze the circumstances present when firms meet either the earnings or cash flow forecast, but not both.

As this literature review indicates, some studies incorporate the values of the cash flow forecasts in their design, while others use merely the presence of cash flow forecasts as an indicator variable. The results of our study regarding the quality of cash flow forecasts have implications for both types of studies. As discussed in Section VII, our results are relevant to the plausibility of the demand hypothesis and the notion that the presence of cash flow forecasts dampens the propensity to manage earnings.

III. RELATIVE QUALITY OF CASH FLOW AND EARNINGS FORECASTS

A priori, it is not clear whether earnings or cash flow forecasts would be of a higher quality. On one hand, given the smoothing effect that accruals have on earnings, the earnings series may be smoother and thus easier to predict than the presumably more volatile cash flow series. Further, because they are the most acceptable summary measure of the company's results from operations and are followed more by the media, one would expect analysts to invest greater resources in forecasting earnings than other performance measures and, as a result, to produce earnings forecasts that are of a higher quality than cash flow forecasts. It also seems logical to assume that operating cash flow forecasts are prepared after projections of revenues and expenses (that is, earnings) are made. If earnings forecast errors are not negatively correlated with the errors in the estimated adjustments that are made to earnings when predicting cash flows, then the accuracy of cash flow forecasts will be lower than that of earnings forecasts. Finally, the effect of various economic events such as new orders, interest rate changes, or restructuring activities on earnings is likely to be much easier to identify and estimate than the impact of these events on the cash flows in a given reporting period.

On the other hand, accrual-based earnings are subject to a host of estimation errors that make their forecasting difficult. Further, earnings may be more prone to manipulation by management both because many accruals are based on management estimates (creating an opportunity to manage earnings) and because management compensation is typically based on earnings rather than cash flows (providing an incentive to manage earnings). The fact that earnings are more susceptible to manipulation than cash flows is likely to make earnings more difficult to forecast and, in turn, result in earnings forecasts that are of a lower quality than cash flow forecasts. The quality of earnings forecasts may also depend on the concurrent production of cash flow forecasts. As noted earlier, prior research shows that analysts' forecasts of earnings are more accurate when accompanied by cash flow forecasts (Call et al. 2009; Pae et al. 2007) suggesting that analysts adopt a more structured and disciplined approach to forecasting earnings when they also issue cash flow forecasts.

IV. EMPIRICAL DESIGN AND TESTS

Properties of Analysts' Cash Flow Forecasts

We examine four properties of the performance of analysts' forecasts of cash flows: accuracy, bias, efficiency, and intra-year improvement. We then compare these properties of analysts' cash flow forecasts to those of analysts' earnings forecasts. We also compare analysts' ability to forecast cash flows to that of a mechanical, time-series model. In these analyses, we examine cash flow forecasts for year t made at two points in time: at the beginning of the year soon after the announcement of the prior year's (year $t-1$) earnings and at the end of the year immediately before the announcement of the current year's (year t) earnings.

Accuracy is assessed using two forecast error measures, the absolute forecast error and the squared forecast error, as follows (the subscripts i and t are used to indicate the firm and year, respectively):

$$\text{Absolute Error} = |A_{it} - F_{it}| \tag{1a}$$

$$\text{Squared Error} = (A_{it} - F_{it})^2, \tag{1b}$$

where A is the actual value of earnings per share or cash flow per share and F is the forecasted value. *Bias* is measured as the signed forecast error:

$$Bias_{it} = (A_{it} - F_{it}). \tag{2}$$

All three measures are deflated, alternately, by the absolute value of the actual value and by the end-of-period price.

Forecast efficiency is gauged by the serial correlation in the prediction error. Serial correlation is measured by the slope coefficient, β, of the following time-series regression that relates the signed cash flow forecast error (i.e., the bias) in the current year to that in the prior year:

$$FE_{it} = \alpha + \beta FE_{it-1} + \varepsilon_{it}. \tag{3}$$

The forecast error, FE, is alternately standardized by the absolute value of the actual value or the end-of-period price. The presence of a significant correlation as indicated by the significance of β would indicate that information contained in the prediction error is not used efficiently in generating future forecasts.

Intra-year improvement in the forecasts is measured as the extent of decline in the analysts' forecast error between the beginning-of-year and end-of-year forecasts. Specifically:

$$Improvement_{it} = 1 - (\text{Error}_{i,\text{END}(t)}/\text{Error}_{i,\text{BEG}(t)}) \tag{4}$$

where Error is the absolute or squared error (Equation (1a) or (1b) above). We compare these four properties of analysts' forecasts of cash flows to those of analysts' earnings forecasts.

We also compare the first three properties discussed above, accuracy, bias, and forecast efficiency, to a time-series model that relies on past cash flows and the reversal of past accruals. As shown by Dechow et al. (1998), past earnings are a better predictor of future cash flows than are past cash flows. Extending this work, Barth et al. (2001) find that disaggregating past cash flows and accruals into their components improves cash flow predictability. We follow their approach, predicting cash flow from operations (CF) in year t as a function of the previous year's cash flow from operations, changes in working capital accounts (accounts receivable (AR), inventory (INV), and accounts payable (AP)), the amount of the depreciation and amortization expense (DEP), and other accruals ($Other$),[4] as follows:

[4] *Other* is computed as income from continuing operations *(INCCO)* minus the sum of cash flow from operations, the change in the three working capital accounts, and the depreciation and amortization expense as follows: $Other_{it-1} = INCCO_{it-1} - [CF_{it-1} + \Delta AR_{it-1} + \Delta INV_{it-1} + \Delta AP_{it-1} + DEP_{it-1}]$.

$$CF_{it} = \varphi_0 + \varphi_1 CF_{it-1} + \varphi_2 \Delta AR_{it-1} + \varphi_3 \Delta INV_{it-1} + \varphi_4 \Delta AP_{it-1} + \varphi_5 DEP_{it-1} + \varphi_6 Other_{it-1} + \varepsilon_{it}. \quad (5)$$

Sophistication of Analysts' Cash Flow Forecasts

A simple relation exists between earnings and cash flow from operations. Specifically, cash flow from operations is equal to earnings plus depreciation, amortization, and other non-cash charges, minus (plus) non-cash gains (losses) and the net increase (decrease) in working capital accruals. Since analysts' earnings forecasts routinely accompany their cash flow forecasts, a question arises regarding the incremental contribution of the latter. Do analysts' cash flow forecasts merely represent their earnings forecasts adjusted for projected depreciation and amortization or are they more sophisticated as a result of incorporating the more challenging prediction of working capital accruals? A review of scores of analysts' research reports indicates that although some appear to have incorporated working capital accruals in their cash flow forecasts, most do not spell out how they define cash flows, nor do they detail the derivation of their cash flow forecasts. The underlying assumption of most studies that use analysts' cash flow forecasts either as proxy for market expectations or as a signal of earnings quality is that these forecasts are more sophisticated than a simple derivative of analysts' own earnings forecasts. We test whether cash flow forecasts are indeed sophisticated or are of a more naïve form such as a straightforward extension of analysts' earnings forecasts.[5]

We assess the extent of sophistication inherent in analysts' cash flow forecasts through three related tests. First, we examine the incremental accuracy of analysts' forecasts of cash flows over a cash flow prediction model that represents a naïve extrapolation of analysts' own earnings forecasts. Specifically, we model analysts' cash flows forecasts for the current year, $F(CF)$, as a simple addition of their contemporaneous forecast of earnings for the same year, $F(Earnings)$, plus the current year's realized depreciation and amortization expense on a per share basis, DEP, as follows:

$$F(CF_{it}) = F(Earnings_{it}) + DEP_{it}. \quad (6)$$

We compare the magnitude of the absolute error and the squared error (standardized, alternately, by the actual cash flow or the firm's end-of-period stock price) of this naïve extrapolation with the errors from analysts' cash flow forecasts (Measures (1a) and (1b) as described above).

The second test of the extent of sophistication in analysts' cash flow forecasts is based on the correlation between the error in analysts' earnings forecasts and the error in their cash flow forecasts. If analysts' cash flow forecasts are merely a naïve extrapolation of their earnings forecasts, then we would observe a high correlation between their respective forecast errors.

The third test of the extent of sophistication in analysts' cash flow forecasts focuses on the degree to which these forecasts incorporate projections of the changes in working capital accounts as well as other adjustments to earnings, in addition to the trivial adjustment for depreciation and amortization. For this test, we estimate the following regression:

[5] DeFond and Hung (2003, 84) conclude from several full-text reports by analysts whose forecasts are included in the I/B/E/S database that "it appears that the cash flow forecasts are not a trivial translation of predicted earnings, but rather the result of difficult and costly information processing that involves the prediction of working capital and deferred taxes." Subsequent studies by McInnis and Collins (2008, 5) and Pae et al. (2007, 7) appear to rely on DeFond and Hung's (2003) conclusion to motivate their use of analysts' cash flow forecasts.

$$F(CF_{it}) = \gamma_0 + \gamma_1 F(Earnings_{it}) + \gamma_2 DEP_{it} + \gamma_3 \Delta WC_{it} + \gamma_4 Other_{it} + \eta_{it} \tag{7}$$

where $F(CF_t)$ and $F(Earnings_t)$ are the analysts' forecasts for, respectively, cash flows and earnings for year t, and DEP_t, ΔWC_t, and $Other_t$ are, respectively, the forecasted values for year t of the depreciation and amortization expense, change in the working capital accounts (Accounts Receivable, Inventory, and Accounts Payable), and all other adjustments needed to reconcile income from continuing operations in year t with cash flow from operations. The sign of the independent variables in Regression (7) is constructed in such a way that a positive (negative) sign indicates that the amount should be added to (subtracted from) earnings to derive cash flow from operations. Since the forecasted values of DEP_t, ΔWC_t, and $Other_t$ are not observable, we assume perfect foresight by analysts and use the actual values of these variables in year t.

If analysts form their cash flow forecasts by adding depreciation to their earnings forecasts and then subtracting (or adding) the net increase (decrease) in the working capital accounts, the slope coefficients of these variables (γ_2, γ_3, and γ_4) should not significantly differ from 1. If, however, analysts fail to add back depreciation, adjust for the change in working capital accounts, or make the other adjustments, these slope coefficients would not significantly differ from 0.

Analysts' Cash Flow Forecasts as a Surrogate for Market Expectations

Analysts' forecasts of earnings have been found to have information content (Givoly and Lakonishok 1979) and to be a better surrogate for the unobservable market expectation of earnings than forecasts produced by mechanical earnings prediction models (Fried and Givoly 1982; Brown et al. 1987). To gauge the extent to which analysts' *cash flow forecasts* provide a reasonable surrogate for investors' cash flow expectations, we estimate the association between abnormal returns and unexpected cash flows as proxied by the prediction error of analysts' cash flow forecasts, controlling for unexpected earnings. Specifically, we estimate the incremental association between abnormal returns and unexpected cash flows over the forecasted year t, controlling for unexpected earnings, using the following regression:

$$CAR_{it} = \alpha + \beta_1 FE(Earnings_{it}) + \beta_2 FE(CF_{it}) + \varepsilon_{it} \tag{8}$$

where CAR is the cumulative abnormal return over the 12-month period beginning with the fourth month after the end of fiscal year $t-1$ and ending with the third month following the end of fiscal year t.[6] $FE(Earnings)$ and $FE(CF)$ are, respectively, the beginning-of-the-year forecast errors for earnings and cash flows, deflated by price. We also examine the association between the earnings announcement period returns and the errors in the forecasts of cash flow and earnings outstanding at the time of the announcement by estimating Regression (8) over the four-day window beginning one day prior to the earnings announcement. Additionally, we assess the incremental information content of cash flow forecasts with respect to the mechanical cash flow prediction model by adding the prediction

[6] To calculate monthly abnormal returns over the forecast year (year t), the market model is estimated over the 60-month period ending with the last month of fiscal year $t-1$. The value-weighted index is used to proxy for the market return. Regression parameters from the market model are then used to calculate monthly abnormal returns. The cumulative abnormal return, *CAR,* for year t is the sum of the 12 monthly abnormal returns beginning with the fourth month of fiscal year t in order to exclude the effect of the announcement of earnings for year $t-1$. Very similar results are obtained when size-adjusted returns are used.

error from the mechanical model specified in Equation (5) as an explanatory variable in Regression (8).

Use of Analysts' Cash Flow Forecasts to Form an Accruals Expectation Model

Accounting research, primarily studies on earnings management, has been challenged by the daunting task of measuring what has been termed "abnormal" or "discretionary" accruals. While a variety of models have been used to estimate these accruals, there is a general understanding that these models suffer from various limitations and rely on certain assumptions about the functional relationship between accruals and the level of operating activity.

A number of recent studies use the difference between analysts' cash flow and earnings forecast errors as a measure of unexpected accruals (see, for example, Brown and Pinello 2008; McInnis and Collins 2008; Melendrez et al. 2009). We test the power and efficiency of this analyst-based accruals expectation model in detecting earnings management by comparing it to the performance of the modified Jones model (Dechow et al. 1995) and the Dechow and Dichev (2002) models, two commonly used models in the literature.

To conduct tests on how effective the analyst-based accruals expectation model is in identifying earnings management relative to the modified Jones and Dechow and Dichev models, we first identify two samples containing cases (firm-years) for which earnings management is likely to have occurred. The first sample consists of firm-years for which earnings are eventually restated downward. For this "restatement sample," the presumption is that the originally reported earnings were managed, hence prompting the need for a restatement. The second sample of cases where earnings management is likely to have occurred consists of years in which firms met or barely surpassed an earnings threshold. We consider two earnings thresholds: loss avoidance and avoidance of an earnings decline relative to the same quarter in the previous year. Earnings are identified as meeting or being just above these thresholds when they exceed the thresholds by no more than some predetermined amount. These cases are denoted as "loss avoiders" or "earnings decline avoiders."[7]

To gauge the efficacy of the accruals expectation model derived from analysts' cash flow forecasts, we compare its ability to identify earnings management cases in the two samples described above with that of the modified Jones and Dechow and Dichev models. For each of these models we derive unexpected accruals for every firm-year in the two samples. Unexpected accruals are identified as those whose standardized absolute value (the absolute value divided by the standard deviation of the unexpected accruals produced by the respective model across all firm-years) exceeds the values of, alternatively, 1.0, 1.5, or 2.0. Finally, we tally the frequency of Type I and Type II errors of the three models in classifying firm-years as containing or not containing earnings management.

V. DATA AND SAMPLE

We obtained one-year-ahead forecasts of cash flows and earnings as well as their respective actual values from the I/B/E/S detail file, which contains the forecasts made by individual analysts. For each fiscal year, we construct two measures of the consensus cash flow and the consensus earnings forecasts: one based on the forecasts outstanding at the

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[7] Earnings management is also likely to have occurred when firms report a small favorable earnings surprise. We do not consider these cases since, to the extent that the surprise is based on analysts' forecasts, use of this sample in these predictive ability tests would tilt the results in favor of the analyst-based model.

beginning of the year and the other based on the forecasts outstanding at the end of the year. To avoid stale forecasts, forecasts outstanding more than 90 days from the date of issuance are excluded.[8] The beginning-of-year consensus forecasts are computed as the mean of all individual forecasts outstanding on the 30th day subsequent to the prior year's earnings announcement. The end-of-year consensus forecasts are computed as the mean of all individual forecasts outstanding immediately prior to the announcement of the current year's earnings. To ensure comparability of the evidence on the properties of cash flow and earnings forecasts, we restrict the sample to firm-years in which both cash flow and earnings forecasts are available from the same individual analyst. Accordingly, the consensus cash flow and earnings forecasts are based on an identical number of analysts' forecasts. When available, actual values provided by I/B/E/S are used to calculate earnings and cash flow forecast errors to ensure compatibility with the forecasts.[9]

An issue identified by prior research (e.g., Melendrez et al. 2009) is that I/B/E/S does not provide the actual value of cash flows for a large number of observations. For these observations (which represent more than half of the sample, as shown later in Table 5), we use the actual values reported by Compustat (annual data item #308 divided by the number of shares outstanding from I/B/E/S). Other financial statement information is retrieved from Compustat. Return data are obtained from the Center for Research in Security Prices (CRSP).

Table 1 presents the main sample selection criteria and their effect on the sample size. The initial sample consists of 19,522 firm-years with at least one cash flow forecast available on the I/B/E/S database. Eliminating forecasts for which there is not a corresponding earnings forecast issued by the same analyst (262), stale forecasts (5,162), forecasts that are missing both the actual earnings and actual cash flow amounts (386) and forecasts for which no actual cash flow figure is available from either I/B/E/S or Compustat (2,828) results in a final sample of 10,884 end-of-year forecasts. The elimination of a greater number of stale forecasts at the beginning of the year (3,341) leads to a final sample of 7,543 such forecasts. Certain analyses have additional data requirements and therefore are conducted on reduced samples.

VI. RESULTS

Cash Flow Forecasts—Descriptive Statistics

Table 2 provides descriptive statistics on the availability of cash flow forecasts. As shown in Panel A, the frequency of cash flow forecasts has increased sharply over time, from 118 such forecasts in 1993 (2.5 percent of the firms that had earnings forecasts) to 3,261 forecasts in 2005 (57.2 percent of the firms that had earnings forecasts). Mirroring this, the mean number of forecasts provided per firm also increased over the period, from 3.2 to 14.3. Yet, the average number of cash flow forecasts per firm, even for the most

[8] The main analyses were replicating on a smaller sample that excluded forecasts older than 45 days. The results (not tabulated) for this stricter definition of ''staleness'' are essentially the same.

[9] In discussing the actual earnings data, Thomson Financial Glossary (2004), states: ''Reported earnings are entered into the database on the same basis as the analysts' forecasts. By and large, this means operating earnings as opposed to net income ... [W]ith very few exceptions analysts make their earnings forecasts on a continuing operations basis. This means that Thomson Financial receives an analyst's forecast after discontinued operations, extraordinary charges, and other non-operating items have been backed out ... Thomson Financial adjusts reported earnings to match analysts' forecasts on both an annual and quarterly basis. This is why Thomson Financial actuals may not agree with other published actuals, e.g., Compustat.'' While no explanation is provided about the adjustments made to the actual cash flow amounts, I/B/E/S representatives confirmed that this explanation applies also to the actual cash flow data.

TABLE 1
Sample Selection Criteria and Their Effect on Sample Size

Selection Criteria	Cash Flow Forecasts	Earnings Forecasts
Total number of firms with at least one one-year-ahead forecast made during the year	19,522	74,393
(1) Firm-years with an earnings forecast but no cash flow forecast by the same analyst for that firm-year	—	(55,133)
(2) Firm-years with a cash flow forecast but no accompanying earnings forecast by the same analyst for that firm-year	(262)	—
(3) Firm-years with a stale forecast[a]	(5,162)	(5,162)
(4) Both actual earnings and actual cash flow amounts are missing	(386)	(386)
(5) Actual cash flow amount is missing	(2,828)	(2,828)
Final sample of end-of-year cash flow and earnings forecasts	10,884	10,884
(6) Firm-years with a stale forecast at the beginning of the year[a]	(3,341)	(3,341)
Final sample of beginning-of-year cash flow and earnings forecasts	7,543	7,543

[a] Stale forecasts are defined as those outstanding for more than 90 days. The presence of a stale earnings or cash flow forecast results in the elimination of both forecasts.

recent year presented, is still about half the average number of earnings forecasts per firm (14.3 versus 28.0).

Panel B of Table 2 shows the frequency of cash flow and earnings forecasts across 12 industries. Over the sample period from 1993–2005, there is considerable dispersion across the industries in the frequency of cash flow forecasts. Similar to the findings of DeFond and Hung (2003), we find that cash flow forecasts are quite prevalent in the energy industry (issued for 78.7 percent of the firms) and much less common in other industries such as finance, technology, or healthcare (issued for less than 15 percent of the firms in these industries). By 2005, almost all firms in the energy industry (96.8 percent) and at least 50 percent of the firms in eight of the other 11 industries had cash flow forecasts. According to I/B/E/S representatives, the fairly monotonic increase in the number of analysts' cash flow forecasts over time represents not only an increased rate of production of cash flow forecasts by analysts, but also greater collection efforts of such forecasts by I/B/E/S. Both factors may reflect an increased demand for these forecasts, particularly in recent years due to the wave of accounting scandals in the early 2000s and the questions they raised about the quality of earnings.

Forecasting Performance

Accuracy

Table 3 shows the accuracy of analysts' cash flow forecasts as compared with the accuracy of their earnings forecasts, as well as with the accuracy of the forecasts produced by the time-series model (Equation (5)).[10] The results indicate that analysts' cash flow forecasts are substantially less accurate than their earnings forecasts. For the beginning-of-year forecasts, the mean (median) *squared error* of analysts' cash flow forecasts is 0.890 (0.150), compared with only 0.359 (0.036) for analysts' earnings forecasts. This same pattern is observed when the *absolute errors* of analysts' forecasts are considered. These

[10] The table shows the results for the accuracy measures deflated by the absolute value of the actual numbers. Replicating the accuracy tests using price as a deflator yields qualitatively similar results and inferences.

TABLE 2
Descriptive Statistics on Availability of Analysts' Cash Flow and Earnings Forecasts

Panel A: By Year

	Number of Firms with at Least One One-Year-Ahead Forecast Made During the Year			Analysts' Cash Flow Forecasts				Analysts' Earnings Forecasts			
				Number of Forecasts per Firm		Number of Analysts Issuing Forecasts per Firm		Number of Forecasts per Firm		Number of Analysts Issuing Forecasts per Firm	
Year	Cash Flow Forecasts	Earnings Forecast	% of Firms with a Cash Flow Forecast[a]	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1993	118	4,672	2.5%	3.2	2	3.1	2	21.6	12	7.3	4
1994	579	5,193	11.1%	7.6	2	3.5	2	19.8	11	6.9	4
1995	811	5,684	14.3%	8.0	4	3.7	2	20.0	11	6.6	4
1996	799	6,378	12.5%	15.7	8	5.6	4	18.8	10	6.3	4
1997	965	6,796	14.2%	15.1	8	5.2	3	18.4	10	6.2	4
1998	1,131	6,853	16.5%	15.5	7	5.0	3	19.9	10	6.3	4
1999	1,715	6,587	26.0%	14.1	5	4.0	2	20.3	10	6.6	4
2000	1,689	6,132	27.5%	12.8	6	3.9	2	20.5	10	6.8	4
2001	1,173	5,129	22.9%	13.9	3	4.4	2	25.3	12	7.6	5
2002	1,830	4,890	37.4%	10.2	3	3.3	2	25.1	13	7.5	5
2003	2,504	4,917	50.9%	13.9	7	3.7	2	26.8	14	7.6	5
2004	2,947	5,456	54.0%	14.1	7	3.5	2	27.3	14	7.2	5
2005	3,261	5,706	57.2%	14.3	7	3.3	2	28.0	15	7.3	5
1993–2005	19,522	74,393	26.2%	13.3	6	3.9	2	22.2	11	6.9	4

(*continued on next page*)

TABLE 2 (continued)

Panel B: By Industry Group[b]

	Number of Firms with at Least One One-Year-Ahead Forecast Made During the Year								
	All Years 1993–2005			1995			2005		
Industry Group	CF Forecast	Earnings Forecast	% of Firms with a CF Forecast[a]	CF Forecast	Earnings Forecast	% of Firms with a CF Forecast[a]	CF Forecast	Earnings Forecast	% of Firms with a CF Forecast[a]
Basic Industries	3,213	6,940	46.3%	190	626	30.4%	439	555	79.1%
Capital Goods	1,306	6,256	20.9%	56	540	10.4%	213	396	53.8%
Consumer Durables	607	2,792	21.7%	30	273	11.0%	111	180	61.7%
Consumer Non-Durables	1,020	3,799	26.8%	51	338	15.1%	153	253	60.5%
Consumer Services	3,034	11,857	25.6%	104	883	11.8%	505	839	60.2%
Energy	3,998	5,083	78.7%	224	339	66.1%	461	476	96.8%
Finance	1,590	12,359	12.9%	25	904	2.8%	367	1,064	34.5%
Health Care	1,187	8,076	14.7%	28	560	5.0%	289	680	42.5%
Public Utilities	1,221	3,376	36.2%	26	51	51.0%	23	31	74.2%
Technology	1,654	12,001	13.8%	48	275	17.5%	187	230	81.3%
Transportation	502	1,415	35.5%	17	781	2.2%	412	873	47.2%
Miscellaneous/Undesignated	190	439	43.3%	12	114	10.5%	101	129	78.3%
All Industries	19,522	74,393	26.2%	811	5,684	14.3%	3,261	5,706	57.1%

This table presents descriptive statistics on the availability of cash flow and earnings forecasts in the I/B/E/S detail data files.

Panel A indicates the number of firms for which at least one one-year-ahead forecast of cash flows or earnings was made during the year. Panel B shows the I/B/E/S sector classification for the firms with valid cash flow and earnings forecasts.

[a] Percent of firms with an earnings forecast that also have a cash flow forecast.
[b] Industry groups are based on I/B/E/S sector classifications.

TABLE 3
Comparison of the Accuracy of Analysts' Cash Flow Forecasts, Analysts' Earnings Forecasts, and Cash Flow Forecasts Derived from the Time-Series Model

Panel A: Beginning-of-Year Forecasts (n = 4,766)[a]

	Absolute Error[b]				Squared Error[b]			
Type of Forecast	**Mean**	**Q1**	**Median**	**Q3**	**Mean**	**Q1**	**Median**	**Q3**
(1) Analysts' Cash Flow Forecasts	0.578	0.110	0.261	0.534	0.890	0.027	0.150	0.596
(2) Analysts' Earnings Forecasts	0.535	0.067	0.181	0.459	0.359	0.005	0.036	0.189
(3) Time-Series Model	0.713	0.114	0.256	0.516	0.789	0.027	0.141	0.533
Difference: (1) − (2)	0.043		0.080		0.531		0.114	
(p-value)	(0.083)		(< 0.001)		(< 0.001)		(< 0.001)	
Difference: (1) − (3)	−0.135		0.005		0.100		0.009	
(p-value)	(< 0.001)		(0.461)		(0.053)		(0.235)	

Panel B: End-of-Year Forecasts (n = 6,817)[a]

	Absolute Error[b]				Squared Error[b]			
Type of Forecast	**Mean**	**Q1**	**Median**	**Q3**	**Mean**	**Q1**	**Median**	**Q3**
(1) Analysts' Cash Flow Forecasts	0.502	0.079	0.208	0.482	0.760	0.012	0.080	0.412
(2) Analysts' Earnings Forecasts	0.142	0.012	0.035	0.108	0.042	0.000	0.001	0.009
(3) Time-Series Model	0.744	0.119	0.267	0.548	0.819	0.028	0.147	0.539
Difference: (1) − (2)	0.360		0.173		0.719		0.079	
(p-value)	(< 0.001)		(< 0.001)		(< 0.001)		(< 0.001)	
Difference: (1) − (3)	−0.242		−0.059		−0.059		−0.067	
(p-value)	(< 0.001)		(< 0.001)		(< 0.001)		(< 0.001)	

(*continued on next page*)

TABLE 3 (continued)

Panel C: Beginning-of-Year Forecasts, by Year and Subperiod

		Analysts' Cash Flow Forecasts				Analysts' Earnings Forecasts			
		Absolute Error		Squared Error		Absolute Error		Squared Error	
Year	**n**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
1993	72	0.369	0.104	0.490	0.013	0.260	0.116	0.110	0.006
1994	303	0.394	0.103	0.523	0.017	0.276	0.100	0.088	0.005
1995	459	0.228	0.082	0.313	0.011	0.288	0.086	0.103	0.005
1996	499	0.291	0.085	0.430	0.012	0.231	0.076	0.076	0.004
1997	530	0.359	0.103	0.393	0.017	0.280	0.071	0.078	0.003
1998	472	0.409	0.140	0.673	0.031	0.288	0.090	0.114	0.005
1999	664	0.659	0.250	1.208	0.103	0.249	0.059	0.099	0.003
2000	788	0.596	0.233	1.197	0.115	0.164	0.042	0.049	0.002
2001	434	0.644	0.138	1.103	0.037	0.189	0.040	0.076	0.001
2002	1,044	0.528	0.221	0.941	0.075	0.143	0.035	0.036	0.001
2003	1,609	0.526	0.222	0.871	0.091	0.132	0.034	0.041	0.001
2004	1,775	0.480	0.237	0.768	0.090	0.140	0.035	0.045	0.001
2005	1,903	0.504	0.212	0.992	0.086	0.132	0.038	0.042	0.002
Subperiod:									
1993–1999	2,999	0.405	0.119	0.627	0.022	0.267	0.078	0.093	0.004
2000–2006	7,553	0.524	0.219	0.934	0.086	0.142	0.036	0.044	0.001
Difference across subperiods		0.119	0.100	0.307	0.064	−0.125	0.064	−0.049	−0.003
(t-values for the mean and Z-values for the median)		(5.43)	(15.10)	(4.95)	(16.80)	(−10.91)	(−15.90)	(−6.31)	(−13.20)

This table reports statistics on the accuracy of analysts' cash flow forecasts relative to that of analysts' earnings forecasts and forecasts generated from a time-series model. Accuracy is defined as the absolute and the squared values of the forecast error. The cash flow forecast generated by the time-series model is based on the regression:

$$CF_t = \varphi_0 + \varphi_1 CF_{t-1} + \varphi_2 \Delta AR_{t-1} + \varphi_3 \Delta INV_{t-1} + \varphi_4 \Delta AP_{t-1} + \varphi_5 DEP_{t-1} + \varphi_6 Other_{t-1} + \varepsilon_t.$$

Statistics in Panel A (Panel B) report comparisons based on the consensus forecast issued at the beginning (end) of the year. The analysis in this table is restricted to observations for which all three measures are available. All variables are truncated at the top percentile.

[a] Observations must have all three forecasts available to participate in the analysis.

[b] Absolute Error = $|A_{it} - F_{it}|$ and Squared Error = $(A_{it} - F_{it})^2$; both error terms are standardized by $|A_{it}|$.

differences are significant at the 1 percent significance level (with the exception of the mean absolute error which is significant at the 8 percent significance level).

Panel B of Table 3 shows the accuracy results for the end-of-year forecasts. Analysts' forecasts of both cash flows and earnings are more accurate at year-end than at the beginning of the year, as expected given the additional information available in the interim. However, year-end cash flow forecasts are still significantly less accurate than contemporaneous earnings forecasts. The mean (median) squared error of analysts' cash flow forecasts is 0.760 (0.080), considerably larger than the comparable statistics for analysts' earnings forecasts, 0.042 (0.001). Absolute errors produce comparable results. All differences are significant at the 1 percent level.[11]

While analysts' cash flow forecasts are significantly less accurate than their earnings forecasts, they generally outperform a mechanical time-series model. Note that for both the beginning-of-year and end-of-year forecasts shown in Panels A and B, respectively, analysts' forecasts of cash flows are more accurate than the forecasts produced by the time-series model. This is particularly true for the end-of-year forecasts, where all differences are statistically significant (see the last line of Panel B) because the time-series model's predictions are not updated over the year.

Effect of Learning and Self-Selection on Accuracy

One explanation for the lower accuracy of analysts' cash flow forecasts as compared to their earnings forecasts is that cash flow forecasts are a relatively new product that requires a learning period by analysts. The inaccuracy of analysts' forecasts in the early period, as they were gaining experience in predicting cash flows, may obscure greater accuracy in more recent years.

Another explanation for the lower accuracy of cash flow forecasts is that these forecasts are more likely demanded (and supplied) in cases where the forecasting of cash flows is more difficult. If this "self-selection" explanation holds, then we would expect this effect to be more pronounced in the early years, when cash flow forecasts were available for relatively few firms (presumably those for which cash flow forecasting was most challenging) and less pronounced in recent years when these forecasts are much more widespread.

To test the validity of both explanations, we analyze the accuracy results by year. The results, reported in Panel C of Table 3, do not support either of these explanations. Note that the accuracy of analysts' cash flow forecasts has actually declined over time. In contrast, the accuracy of analysts' earnings forecasts has improved over the same period, making the difference in their relative accuracy even more pronounced in recent years.

Effect of Variability of the Cash Flow and Earnings Series on Forecasting Accuracy

Another possible explanation for the higher error in analysts' cash flow forecasts relative to their earnings forecasts is the greater inherent variability of the cash flow series. We examine this explanation by comparing the variability of the two time-series for a subset of our sample firms that have at least ten years of cash flow and earnings data on Compustat in the 1993–2005 sample period. For each firm, we compute the variance of its cash flow

[11] The relative accuracy of analysts' earnings and cash flow forecasts may be affected by the fact that there are generally more analysts who forecast earnings than who forecast cash flows. Thus, there may be more feedback and benchmarking for earnings forecasters than for cash flow forecasters. We test whether the difference between the accuracy of cash flow and earnings forecasts remains significant for a subsample of firm-years in which the number of analysts forecasting only earnings but not cash flows is small (zero to three analysts). The results (untabulated) show that while the accuracy of both cash flow and earnings forecasts improves as the total number of forecasters increases, the difference in the accuracy of the cash flow and earnings forecasts remains significant for this subsample.

and earnings distribution, deflated, alternatively, by assets and price at year-end. As shown in Table 4, the variance of the cash flow series is generally larger than that of the earnings series. For 56.8 percent (65.6 percent) of the firms, the variance of the cash flow series deflated by assets (price) is higher than the variance of the respective earnings series.[12] When scaled by assets, the median ratio between the cash flow and earnings variance is 1.18, with an inter-quartile range of 0.56 to 2.56. When price is used as the deflator, the median ratio is 1.81 with an inter-quartile range of 0.63 to 4.44. The mean values of the ratios, 5.69 and 8.62 when deflated by assets and price, respectively, are considerably higher than the median values, reflecting the presence of extreme values in the cash flow series.

The greater variability of the actual cash flow series, however, cannot fully explain the lower accuracy of the cash flow forecasts. Granted, the cash flow series is more volatile and, as noted above, the median ratio of the variance of the cash flow series to the variance of the earnings series is 1.18 (1.81) when the series is deflated by assets (price). However, the mean value of the ratio between the squared error of cash flows forecasts to the squared

TABLE 4
Distribution of the Variance of the Time-Series of Cash Flows and Earnings and the Variance-Deflated Forecast Errors

Panel A: Distribution of the Time-Series Variance of the Variables

Variance	Mean	Quartile 1	Median	Quartile 3	% of Firms with a Ratio above 1.0
Standardized by Assets (n = 1,533 firms)					
Cash Flow Per Share	7.02	1.01	2.53	6.35	
Earnings Per Share	13.75	0.58	1.85	7.35	
Ratio of Cash Flow Variance to Earnings Variance	5.69	0.56	1.18	2.56	56.8%
Standardized by Price (n = 1,359)					
Cash Flow Per Share	72.56	1.04	3.11	10.56	
Earnings Per Share	380.80	0.38	1.39	10.26	
Ratio of Cash Flow Variance to Earnings Variance	8.62	0.63	1.81	4.44	65.6%

Panel B: Distribution of the Squared Error Deflated by the Variance of the Variable over Time[a]

	Mean	Quartile 1	Median	Quartile 3
Cash Flow Per Share (n = 5,142 firm-years)	1.15	0.02	0.15	0.78
Earnings Per Share (n = 5,590 firm-years)	0.04	0.00	0.00	0.01

This table reports statistics on the variance of the cash flow per share and earnings per share series, standardized either by assets per share or the year-end price, as well as on the variance-deflated forecast errors. Firms in the main sample must have at least ten years of data on actual cash flows and earnings to participate in the analysis. All variances are multiplied by 1,000.

[a] The squared error deflated by the variance over time is computed as $(A_{it} - F_{it})^2/\text{Variance}$.

[12] For the sample firms, the variance of the cash flow and earnings series are highly correlated. The Spearman correlation coefficients are 0.71 and 0.74, respectively, when scaled by assets and price; comparable Pearson correlation coefficients are 0.56 and 0.38.

error of the earnings forecast is considerably higher.[13] Specifically, the ratio between the median squared errors of these two variables is over 4.0 (0.150/0.036, see Panel A of Table 3) for beginning-of-year forecasts and 80.0 (0.080/0.001, see Panel B of Table 3) for end-of-year forecasts.

We also test the effect of the two series' variance on the forecast errors directly by using the variance-deflated squared errors. As Panel B of Table 4 shows, the mean (median) of the squared errors deflated by the time-series variance is still much higher for the cash flow forecasts, 1.15 (0.15), than for the earnings forecasts, 0.04 (0.00).

Effect of Data Quality on Accuracy

Another explanation for the differential accuracy of analysts' earnings and cash flow forecasts is the possibility of a difference in the measurement errors in the forecasted and actual values of the two variables. In computing the forecast error, the forecast amount and the actual, or realized, values should conform to the same definition. However, analysts' earnings forecasts do not always conform to the GAAP definition of earnings because analysts often exclude from their forecasts certain items that are considered transitory or otherwise unrelated to the "core" earnings of the company. Likewise, analysts' cash flow forecasts may exclude certain items that are included in cash flows from operating activities under GAAP.[14] In reporting the "actual" cash flows, I/B/E/S adheres to the same rule that it applies in reporting actual earnings by excluding from the actual number any item excluded by the majority of the analysts. However, because the number of contemporaneous analysts' cash flow forecasts is much smaller than the number of earnings forecasts (a median of 6 versus 11 forecasts per firm for the sample, as reported in Table 2, Panel A) and the idiosyncratic nature of the exclusions by different analysts, implementing this "majority rule" may result in an I/B/E/S value of actual cash flows that is not comparable with a significant proportion of the individual analysts' forecasts.

Further, in many cases, I/B/E/S actual numbers are unavailable. Table 5 provides statistics on the availability of actual cash flow data and its effects on the accuracy of the cash flow forecasts at the beginning and end of the year. Since most of the conclusions for the two groups of forecasts are similar, we focus on the results in Panel B that pertain to the end-of-year forecasts. Of the 10,884 firm-years for which consensus end-of-year forecasts could be constructed and actual cash flow numbers were available, only 5,748 (52.8 percent) have an actual cash flow number available on I/B/E/S. For the remaining 5,136 (47.2 percent) firm-years, actual cash flow figures are available on Compustat only (data item [308]). In 2,255, or about 21 percent of the 10,884 total available observations, actual cash flow figures are missing from Compustat. This percentage, while high, is similar (and even somewhat lower) to the percentage of missing actual earnings data (24 percent) that we find for the same firms and years on Compustat.

There are 3,493 firm-years for which actual cash flow numbers are available from both sources. However, only in 123 of these cases are the I/B/E/S and Compustat actual amounts identical. That is, a discrepancy exists between the actual values provided by I/B/E/S and by Compustat (GAAP) in more than 96.5 percent of the cases.

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[13] The predictability of a variable and its variability are positively related. To see this, consider for example an autoregressive behavior of earnings over time of the form: $E_t = \alpha + \beta\,(E_{t-1}) + e_t$, where E is the earnings variable. $Var(e)$ can be viewed as a predictability measure. Assuming further that the variance of earnings is stationary over time, earnings variability and predictability are related, $Var(e) = Var(E) * (1 - \beta^2)$. Dichev and Tang (2009) elaborate further on this relation.

[14] A similar lack of uniformity in the definition of the forecasted cash flows is reported by Cao et al. (2007) for *management* cash flow forecasts.

TABLE 5
Accuracy of Analysts' Cash Flow Forecasts Conditional on Availability of Actual Cash Flow Numbers

Panel A: Beginning-of-Year Forecasts

Line		No. of Obs.	Absolute Error[a] Mean	Absolute Error[a] Median	Squared Error[a] Mean	Squared Error[a] Median
1	All Observations	7,543[b]	0.603	0.258	1.143	0.138
	Observations with actual cash flow amount available:					
2	On I/B/E/S	4,146	0.476	0.205	0.768	0.088
3	Only on Compustat but not on I/B/E/S	3,379	0.753	0.340	1.601	0.233
4	Only on I/B/E/S but not on Compustat	1,619	0.440	0.191	0.723	0.061
	On both I/B/E/S and Compustat[c]					
5a	Errors are based on I/B/E/S actual amounts	2,527	0.500	0.211	0.797	0.109
5b	Variance-deflated errors[d]	1,825			1.099	0.206
6	Errors are based on Compustat actual amounts	2,527	0.674	0.272	1.548	0.179
	Earnings forecast errors based on:					
7a	I/B/E/S actual amounts	2,480	0.572	0.176	0.426	0.037
7b	Variance-deflated errors[d]	1,953			0.332	0.047

Panel B: End-of-Year Forecasts

Line		No. of Obs.	Absolute Forecast Error[a] Mean	Absolute Forecast Error[a] Median	Squared Forecast Error[a] Mean	Squared Forecast Error[a] Median
1	All Observations	10,884	0.506	0.191	0.965	0.064
	Observations with actual cash flow amount available:					
2	On I/B/E/S	5,748	0.385	0.120	0.687	0.026
3	Only on Compustat but not on I/B/E/S	5,136	0.641	0.286	1.276	0.146
4	Only on I/B/E/S but not on Compustat	2,255	0.310	0.089	0.506	0.010
	On both I/B/E/S and Compustat[c]					
5a	Errors are based on I/B/E/S actual amounts	3,493	0.434	0.145	0.804	0.044
5b	Variance-deflated errors[d]	2,441			0.910	0.099
6	Errors are based on Compustat actual amounts	3,493	0.591	0.242	1.301	0.116
	Earnings forecast errors based on:					
7a	I/B/E/S actual amounts	3,455	0.140	0.031	0.051	0.001
7b	Variance-deflated errors[d]	2,627			0.036	0.001

(*continued on next page*)

TABLE 5 (continued)

This table reports statistics on the accuracy of analysts' cash flow forecasts for different subsamples based on data availability. Accuracy is defined as the absolute and the squared values of the forecast errors.

[a] Absolute forecast error = $|A_{it} - F_{it}|$, Squared forecast error = $(A_{it} - F_{it})^2$; both error measures are standardized by $|A_{it}|$.

[b] Number of firm-years for which beginning-of-year consensus cash flow forecasts can be constructed and data on the actual cash flow amounts are available. (This restriction reduces the sample below that consisting of firm-years with at least one cash flow forecast, 19,522, as reported in Table 2.)

[c] The actual amounts reported by Compustat and I/B/E/S are identical for only 123 firm-years.

[d] Variance-deflated errors equal the absolute or squared errors divided by the variance of the variable (cash flow or earnings) over time.

Our finding that a discrepancy is present in almost all of the cases is much higher than that documented by past studies of GAAP earnings as compared with I/B/E/S earnings. Dolye et al. (2003) find that a discrepancy due to exclusions of certain items from analysts' earnings forecasts (and hence I/B/E/S) exists in about 20 percent of the firms. For a slightly different time period, Abarbanell and Lehavy (2007) document that a discrepancy in the actual earnings provided by Compustat and I/B/E/S is present in about 48 percent of the firms, still considerably lower than that present for the cash flow data.[15]

Given the discrepancy between the actual values reported by Compustat and I/B/E/S, our use of the Compustat actual amounts to determine the accuracy of the cash flow forecasts when the I/B/E/S actual amounts are missing tends to inflate the magnitude of the measured forecast error. Indeed, as Table 5 shows, for firm-years where I/B/E/S actual amounts are available, their use rather than use of the Compustat actual numbers results in lower forecast errors. For example, for the beginning-of-year forecasts reported in Panel A (lines 5a and 6), the mean (median) squared error when I/B/E/S is used is 0.797 (0.109) as compared with 1.548 (0.179) when actual values are taken from Compustat. However, even for the cases where I/B/E/S actual values are used to determine the cash flow forecast error, the squared error, whose mean (median) is 0.768 (0.088) (line 2), is still higher than the error of analysts' earnings forecasts of 0.426 (0.037) (line 7a).

The finding that earnings forecast errors are considerably smaller than the corresponding cash flow forecast errors even when we control for measurement errors in the data by considering only cases with I/B/E/S actual amounts is also quite pronounced for both error measures for end-of-year forecasts (see Panel B). This suggests that our use of the Compustat actual number for cases where the I/B/E/S actual number is unavailable does not fully explain the higher forecast errors of cash flow forecasts relative to earnings forecasts.

Next, in addition to controlling for possible measurement errors, we control for the variability in the time-series of cash flows and earnings by deflating the forecast errors by the variance of the respective series. The results presented on lines 5b and 7b in Panels A and B of Table 5 show that, after controlling for both data availability (by restricting the examination to cases where I/B/E/S actual values are available) and the inherent variability in the respective variable (by deflating the squared error by the variance of the variable), cash flow forecasts are still less accurate than earnings forecasts. For example, for the beginning-of-year cash flow forecast errors computed using I/B/E/S actual values,

[15] The magnitude of the discrepancy for our sample firms (not tabulated) is quite large. The mean (median) absolute difference between the two actual cash flow values deflated by the absolute value of the Compustat actual amount is 0.534 (0.221).

the mean (median) variance-deflated error is several times larger than its earnings counterpart 1.099 (0.206) versus 0.332 (0.047) (Panel A, lines 5b and 7b).

The greater accuracy of earnings forecasts over that of cash flow forecasts is even more pronounced for end-of-year forecasts (see Panel B of Table 5), suggesting a deterioration in the relative accuracy of cash flow forecasts as compared with earnings forecasts as the year progresses, a finding we explore later in the study.

Accuracy of Cash Flow Forecasts for Select Subsamples

We also examine the accuracy of cash flow forecasts for select subsamples with characteristics that are likely to affect forecasting accuracy. Specifically, we replicate the accuracy tests in Table 3 for: (1) firm-years in which the consensus cash flow forecast is based on at least three analysts' forecasts, (2) only firm-years in which a profit is reported, (3) growth firms (defined as those in the bottom one-third of the distribution of the book-to-market ratio), and (4) larger firms (defined as those in the top one-third of the distribution of the market-value-of-equity ratio). Results (untabulated) suggest that the cash flow forecasts for these subsamples, while still performing well below their earnings forecast counterparts, exhibit a greater, and sometimes considerably greater, accuracy than the universe of cash flow forecasts. For example, the median absolute error (median squared error) for the beginning-of-year cash flow forecasts for the four subsamples are 0.221 (0.125), 0.234 (0.134), 0.237 (0.105), and 0.198 (0.105), respectively, consistently lower than that of the beginning-of-year cash flow forecasts for the full sample of 0.261 (0.150) as reported in Panel A of Table 3.

Bias and Efficiency

The extent of bias in analysts' cash flow forecasts, their earnings forecasts, and the time-series model is shown in Table 6.[16] The table confirms an optimistic bias in analysts' *earnings forecasts* at the beginning of the year. The mean bias, measured as the difference between the actual and forecasted earnings amounts deflated by the absolute value of actual earnings (or by price) is −0.306 (−0.265) (line 2). This bias dissipates considerably by the end of the year to −0.020 (−0.029) (line 5). Interestingly, the median bias (deflated by the absolute value of actual earnings) in analysts' earnings forecasts is close to zero at the beginning of the year (0.003), with errors distributed almost evenly around zero. The median error becomes slightly more positive (0.009) reflecting more pessimistic forecasts or attempts by firms to manage earnings so as to beat expectations at year-end, with 58 percent of the errors being positive (line 5). The results for the cash flow forecasts are less conclusive and depend on the deflator used. When deflated by price, the cash flow forecasts exhibit pessimistic bias both at the beginning and the end of the year. When the absolute value of the actual amount is the deflator, the mean bias indicates optimism, yet the median bias suggests slight pessimism.

Analysts' *cash flow forecasts* suffer as well from a beginning-of-year bias, with a mean error of −0.249. Yet, in contrast to the earnings forecasts, a large proportion of this bias remains at year-end, as evidenced by the mean error of −0.136. This likely indicates less frequent updating of cash flow forecasts relative to earnings forecasts, consistent with the descriptive statistics on the number of earnings versus cash flow forecasts produced, as shown in Table 2, and the findings on the intra-year forecast improvement reported in the

[16] Observations in this analysis were required to have all three forecasts available for a given firm-year. Similar results are obtained when this restriction is lifted and all observations available for each model are examined.

TABLE 6

Bias in Analysts' Cash Flow Forecasts, Analysts' Earnings Forecasts, and Cash Flow Forecasts Derived from the Time-Series Model[a]

			Sign of Forecast Error			Bias Deflated by Absolute Value of the Actual Amount				Bias Deflated by Price (× 100)			
Time of Forecast	**Line**	**Type of Forecast**	**% Pos.**	**% Neg.**	**% Zero**	**Mean**	**Q1**	**Median**	**Q3**	**Mean**	**Q1**	**Median**	**Q3**
Beginning-of-Year[b]	1	Analysts' Cash Flow	55.6	44.2	0.2	−0.249	−0.253	0.048	0.261	0.911	−2.272	0.436	3.312
	2	Analysts' Earnings	50.3	48.7	1.0	−0.306	−0.258	0.003	0.135	−0.265	−1.104	0.017	0.836
	3	Time-Series Model[d]	51.1	48.9	0.0	−0.447	−0.348	0.018	0.218	−0.866	−2.568	0.081	2.074
End-of-Year[c]	4	Analysts' Cash Flow	57.8	41.7	0.5	−0.136	−0.156	0.041	0.235	0.895	−1.293	0.359	2.427
	5	Analysts' Earnings	58.0	33.7	8.3	−0.020	−0.020	0.009	0.045	−0.029	−0.090	0.044	0.226
	6	Time-Series Model[d]	51.7	48.3	0.0	−0.444	−0.362	0.018	0.225	−0.672	−2.480	0.125	2.244

This table reports statistics on the bias in analysts' cash flow forecasts, analysts' earnings forecasts, and forecasts generated from the time-series model. All variables are truncated at the top and bottom percentile.

[a] $Bias_{it} = (A_{it} - F_{it})$. Bias is scaled, alternatively, by the absolute value of the actual value and the price at the beginning of the period.

[b] No. of observations equals 4,697 (4,651) when bias is deflated by the absolute value of the actual amount (price).

[c] No. of observations equals 6,734 (6,680) when bias is deflated by the absolute value of the actual amount (price).

[d] $CF_{it} = \varphi_0 + \varphi_1 CF_{it-1} + \varphi_2 \Delta AR_{it-1} + \varphi_3 \Delta INV_{it-1} + \varphi_4 \Delta AP_{it-1} + \varphi_5 DEP_{it-1} + \varphi_6 Other_{it-1} + \varepsilon_{it}$ (Equation (5)).

next section. The time-series model exhibits a much greater bias than that present in analysts' cash flow or earnings forecasts, with a beginning- (end-) of-year mean error of −0.447 (−0.444) (lines 3 and 6, respectively).

The results of the efficiency tests (untabulated) indicate that both cash flow and earnings forecasts exhibit significant serial correlation. However, the serial correlation between successive cash flow forecast errors is larger than that between successive earnings forecast errors (0.145 versus 0.096). This finding suggests that cash flow forecasts are less efficient than earnings forecasts and could be improved if analysts properly adjusted for past errors.

Intra-Year Improvement

Table 7 shows the rate of reduction in the forecast error over the forecast year, measured from the beginning-of-year to the end-of-year forecast. As the results show, the frequency and rate of improvement are much higher for earnings forecasts than for cash flow forecasts. The accuracy of cash flow forecasts improves over the year for 63.6 percent (64.0 percent) of the cases when considering the absolute (squared) errors, whereas the corresponding percentage of firms with an improvement in their earnings forecasts is 83.5 percent (83.6 percent). Further, the median rate of improvement in cash flow forecasts over the forecast year is 0.250 for the absolute error and 0.448 for the squared error, much lower than the median improvement rates for the earnings forecasts of 0.756 and 0.941, respectively.

These results are consistent with the overall lower quality of cash flow forecasts and suggest that analysts take less care with, and invest fewer resources in, improving their cash flow forecasts during the forecast period as compared with their earnings forecasts. The relative lack of improvement over the year in cash flow forecasts is also consistent with the finding reported earlier that, after controlling for other factors that dampen the accuracy of cash flow forecasts (i.e., the more limited availability of I/B/E/S actual amounts and the higher variability of the cash flow series relative to the earnings series), cash flow forecasts are of a lower accuracy than earnings forecasts.

Sophistication of Analysts' Cash Flow Forecasts

Table 8 compares end-of-year forecast errors of analysts' cash flow forecasts with those of naïve cash flow forecasts (computed as analysts' earnings forecast plus the amount of depreciation and amortization in the forecasted year as specified in Equation (6)). Strikingly, the mean difference in the analysts' and the naïve cash flow forecast errors is small and insignificant (and not always in favor of the analysts), indicating a lack of sophistication of the analysts' forecasts. For example, the mean squared error deflated by the absolute value of the actual cash flow amount is 0.932 for analysts and 0.892 for the naïve model, an insignificant difference.

Table 9 contains the correlation coefficients between the forecast errors of analysts' cash flow forecasts, analysts' earnings forecasts, and naïve cash flow forecasts (computed as specified in Equation (6)).[17] There is a strong positive correlation between the errors of analysts' cash flow forecasts and the errors produced by the naïve cash flow forecasts (Pearson and Spearman correlation coefficients of 0.771 and 0.612, respectively). Since the naïve cash flow forecasts are based on analysts' earnings forecasts, the high correlation between these forecast errors and analysts' cash flow forecasts could reflect commonality in the errors in forecasting earnings and cash flows. However, as shown in the rightmost column of the table, the correlation between the errors in analysts' cash flow and earnings

[17] The results presented are based on the errors deflated by the absolute value of the actual values. Similar results are obtained when the errors are deflated by price.

TABLE 7
Intra-Year Improvement in the Accuracy of Analysts' Cash Flow and Analysts' Earnings Forecasts

Type of Analysts' Forecasts	Error Measure[b]	Percentage of Cases with Improved Forecasts	Rate of Improvement[c] Quartile 1	Rate of Improvement[c] Median	Rate of Improvement[c] Quartile 3
Cash Flow Forecasts	Absolute forecast errors	63.6%	−0.333	0.250	0.713
(n = 7,375[a])	Squared forecast errors	64.0%	−0.742	0.448	0.920
Earnings Forecasts	Absolute forecast errors	83.5%	0.358	0.756	0.917
(n = 9,140[a])	Squared forecast errors	83.6%	0.587	0.941	0.993

This table reports statistics on the intra-year improvement in analysts' cash flow and earnings forecast accuracy. All variables are truncated at the top percentile.

[a] Observations have both beginning-of-year and end-of-year earnings and cash flow forecasts.

[b] Absolute forecast error = $|A_{it} - F_{it}|$, Squared forecast error = $(A_{it} - F_{it})^2$; both error measures are standardized by $|A_{it}|$.

[c] Rate of Improvement = 1 – $(\text{Error}_{i,\text{END}(t)}/\text{Error}_{i,\text{BEG}(t)})$.

forecasts is considerably lower (Pearson and Spearman correlation coefficients of 0.047 and 0.099, respectively), suggesting that the high correlation between analysts' earnings and cash flow forecasts arises because analysts' cash flow forecasts are a naïve extrapolation of their earnings forecasts.

Table 10 shows the results of estimating Regression (7), in which analysts' cash flow forecasts are the dependent variable and the independent variables are analysts' earnings forecasts, depreciation and amortization, the net change in working capital accounts, and other adjustments to income made in deriving cash flow from operations. The regression is estimated alternately for beginning-of-year and end-of-year cash flow and earnings forecasts. The values of the adjustments to income (e.g., depreciation and amortization) are the realized values for the forecast year.[18]

If analysts' cash flow forecasts are consistent with their earnings forecasts and if analysts consider correctly the various adjustments to net income needed to compute cash flow from operations, then we would expect all independent variables to have a positive and significant coefficient that is not significantly different from 1.0. Panel A of Table 10 shows the results using the beginning-of-year forecasts. The cash flow forecasts are consistent with the earnings forecasts as indicated by the coefficients on the earnings forecasts, which are very close to 1.0 and significant. This is also true for the coefficients for depreciation and amortization, suggesting that, in producing their cash flow forecasts, analysts add back depreciation and amortization to their earnings forecasts. The coefficients for the net change in working capital and the other adjustments are also significant and positive. However, their value (ranging from 0.058 to 0.064) is far below 1.0, the level that would be expected if analysts fully and correctly incorporate these adjustments. These low coefficients are consistent with analysts either largely ignoring these adjustments in generating their cash

[18] We implicitly assume perfect foreknowledge of these realized values since they are unknown to the analyst at the time the forecast is made. Estimation of Regression (7) using the current year values for these variables produces very similar results, suggesting that the above assumption is not critical to our findings.

TABLE 8
Performance of Analysts' Cash Flow Forecasts versus Naïve Cash Flow Forecasts

	Absolute Error[a]		Squared Error[a]	
Type of Forecast	**Mean**	**Median**	**Mean**	**Median**
Analysts' Cash Flow Forecasts	0.533	0.217	0.932	0.086
Naïve Cash Flow Forecasts[b]	0.544	0.212	0.892	0.091
Difference[c]	−0.011	0.005	0.040	−0.005

This table compares the absolute and squared errors of analysts' cash flow forecasts to those derived from a naïve forecast model. Analysts' forecasts are based on the consensus cash flow forecast at the end of the year. All variables are truncated at the top percentile. The table is based on 8,010 observations (firm-years) with available data to form the naïve forecast, out of the total 10,884 firm years for which cash flow forecasts and actual cash flow are available.

[a] Absolute forecast error = $|A_{it} - F_{it}|$, Squared forecast error = $(A_{it} - F_{it})^2$; both error measures are standardized by $|A_{it}|$.

[b] The naïve cash flow forecasts are computed as $F(CF_{it}) = F(Earnings_{it}) + DEP_{it}$ where $F(Earnings)$ is analysts' consensus earnings forecast and DEP is the amount of depreciation on a per share basis (Equation (6)).

[c] All differences are statistically insignificant.

TABLE 9
Correlation Coefficients between Forecast Errors[a]

	Analysts' Cash Flow Forecast Errors	Naïve Cash Flow[b] Forecast Errors	Analysts' Earnings Forecast Errors
Analysts' Cash Flow Forecast Errors	1.000	0.771	0.047
Naïve Cash Flow Forecast Errors[c]	0.612	1.000	0.063
Analysts' Earnings Forecast Errors	0.099	0.089	1.000

This table reports the Pearson (above the diagonal) and Spearman (below the diagonal) correlation coefficients between the signed errors deflated by the absolute value of the actual amount for analysts' forecasts of cash flows, naïve cash flow forecasts, and analysts' forecast of earnings, $(A_{it} - F_{it})/|A_{it}|$. All variables are truncated at the top percentile.

[a] The number of observations varies from 6,647 to 10,295 depending on the cell.

[b] The naïve cash flow forecasts are computed as $F(CF_{it}) = F(Earnings_{it}) + DEP_{it}$ where $F(Earnings)$ is analysts' consensus earnings forecast and DEP is the amount of depreciation on a per share basis (Equation (6)).

flow forecasts or significantly under-adjusting for these factors, potentially due to the difficulty in forecasting changes in working capital (relative to forecasting depreciation). The adjusted R^2 values convey the same message. Analysts' beginning-of-year earnings forecasts explain 50.7 percent of the variability in their cash flow forecasts. Including the depreciation and amortization expense in the regression increases the adjusted R^2 significantly, to 76.5 percent. In contrast, the addition of the working capital and the other adjustments leaves the explanatory power of the regression virtually intact.

The same results characterize the end-of-year forecasts, as shown in Panel B of Table 10. Even at year-end, analysts either poorly predict the forthcoming change in working capital and the magnitude of other adjustments, or otherwise do not incorporate this information in their forecasts efficiently.

TABLE 10
Sophistication of Analysts' Cash Flow Forecasts

Panel A: Beginning-of-Year Cash Flow Forecasts (n = 3,719)

Coefficients (t-statistics)					
Intercept	**Analysts' Earnings Forecasts**	***DEP***	**ΔWC**	**Other**	**Adjusted R^2**
0.059 (51.8)	0.907 (61.9)				50.7%
−0.03 (−2.0)	0.951 (93.7)	1.045 (63.8)			76.5%
−0.002 (−1.7)	0.954 (93.6)	1.042 (63.7)	0.058 (3.3)		76.6%
−0.003 (−2.2)	0.952 (93.7)	1.038 (63.5)	0.064 (3.7)	0.060 (4.7)	76.7%

Panel B: End-of-Year Cash Flow Forecasts (n = 5,348)

Coefficients (t-statistics)					
Intercept	**Analysts' Earnings Forecasts**	***DEP***	**ΔWC**	**Other**	**Adjusted R^2**
0.059 (51.0)	0.886 (84.8)				57.3%
0.003 (2.0)	0.911 (109.7)	0.977 (56.1)			73.2%
0.003 (2.4)	0.916 (109.3)	0.974 (56.0)	0.070 (4.1)		73.2%
0.001 (0.8)	0.918 (110.6)	0.968 (56.1)	0.086 (5.0)	0.129 (20.1)	73.7%

This table reports coefficient estimates and t-statistics (in parentheses) of estimating Regression (7):

$$F(CF_{it}) = \gamma_0 + \gamma_1 F(Earnings_{it}) + \gamma_2 DEP_{it} + \gamma_3 \Delta WC_{it} + \gamma_4 Other_{it} + \eta_{it}.$$

Analyst earnings forecasts are the consensus forecasts at the beginning (Panel A) and end of the year (Panel B). Depreciation and amortization (*DEP*) is Compustat data item 125. Change in working capital (ΔWC) is equal to the sum of Compustat data items 302, 303, 304. Other adjustments, *Other*, is equal to Compustat data item 308 minus the sum of Compustat data items 123, 125, 302, 303, 304. All variables are deflated by average total assets and are truncated at the top and bottom percentiles.

The finding that analysts' cash flow forecasts provide little incremental information beyond their earnings forecasts suggests that investors can easily replicate these forecasts. Nonetheless, the finding by previous research that analysts produce these forecasts in response to investor demand (e.g., DeFond and Hung 2003) may still be valid. Our results suggest only that, while analysts might respond to what they perceive to be investor demand, the type of cash flow forecasts they produce does not fully meet this demand.

Similarly, another finding by previous research, namely that the existence of a cash flow forecast affects management reporting behavior (e.g., McInnis and Collins 2008) remains plausible even in the face of the low incremental information contained in these forecasts. By their mere presence, cash flow forecasts, regardless of their inherent quality, could attract investors' attention and thus influence management in determining the firm's reporting policy because, being in the public domain, these forecasts serve as an additional benchmark against which the reported results might be evaluated.

Analysts' Cash Flow Forecasts as a Surrogate for Market Expectations

Using the association between the forecast error and stock price movements as a measure of the information content of the forecast, we compare the information content conveyed by the analysts' consensus cash flow forecasts made at the beginning of the year to that of a mechanical model. Panel A of Table 11 presents the results when cumulative

TABLE 11
Analysts' Cash Flow Forecasts as a Surrogate for Market Expectations

Panel A: Beginning-of-Year Forecasts and Annual Returns (n = 4,485)

Line	Intercept	Analysts' Earnings Forecast Error	Analysts' Cash Flow Forecast Error	Time-Series Model Error[a]	Adjusted R^2
(1)	0.123 (15.6)	0.034 (15.9)			5.31%
(2)	0.105 (13.1)		0.012 (12.2)		3.20%
(3)	0.12 (15.3)			0.010 (9.6)	1.98%
(4)	0.116 (14.3)	0.027 (11.7)	0.006 (6.1)		6.06%
(5)	0.126 (15.9)	0.031 (13.3)		0.047 (4.4)	5.70%
(6)	0.119 (14.8)	0.026 (10.8)	0.006 (5.0)	0.003 (2.8)	6.21%

Panel B: End-of-Year Forecasts and Announcement Period Returns (n = 6,045)

Line	Intercept	Analysts' Earnings Forecast Error	Analysts' Cash Flow Forecast Error	Time-Series Model Error[a]	Adjusted R^2
(1)	0.421 (4.6)	0.262 (3.8)			0.23%
(2)	0.402 (4.4)		0.014 (1.2)		0.01%
(3)	0.427 (4.7)			0.025 (2.2)	0.06%
(4)	0.407 (4.5)	0.262 (3.9)	0.014 (1.2)		0.24%
(5)	0.431 (4.7)	0.251 (3.7)		0.021 (1.8)	0.27%
(6)	0.420 (4.6)	0.251 (3.7)	0.097 (0.8)	0.019 (1.6)	0.26%

This table reports coefficient estimates and t-statistics (in parentheses) of estimating Regression (8):

$$CAR_{it} = \alpha + \beta_1 FE(Earnings_{it}) + \beta_2 FE(CF_{it}) + \varepsilon_{it}.$$

CAR is the cumulative abnormal return for year *t* beginning with the fourth month after the end of fiscal year $t-1$ and ending with the third month following the end of fiscal year *t*. *FE*(*Earnings*) and *FE*(*CF*) are the analysts' forecasts errors for earnings and cash flows, respectively, computed from the beginning-of-the year forecasts deflated by price. The independent variables (the forecast errors) are multiplied by 100 before estimating the regression.

[a] The time-series model is:

$$CF_{it} = \varphi_0 + \varphi_1 CF_{it-1} + \varphi_2 \Delta AR_{it-1} + \varphi_3 \Delta INV_{it-1} + \varphi_4 \Delta AP_{it-1} + \varphi_5 DEP_{it-1} + \varphi_6 Other_{it-1} + \varepsilon_{it}$$

where *CF* is cash flow from operations, ΔAR is the change in accounts receivable, ΔINV is the change in inventory, ΔAP is the change in accounts payable, *DEP* is the amount of depreciation and amortization, and *Other* is all other operating accruals (Equation (5)).

abnormal returns over the year are regressed on the beginning-of-year cash flow and earnings forecast errors deflated by price. The results on line 4 show that the coefficient on $FE(CF_{it})$, the cash flow forecast error, is positive and significant, indicating that, after controlling for unexpected earnings, analysts' cash flow forecasts have information content. However, the incremental information content of cash flow forecasts beyond that of earnings forecasts is marginal, with the adjusted R^2 of the regression increasing only slightly, from 5.31 percent to 6.06 percent, when the cash flow forecast error is included as an additional explanatory variable.

While analysts' cash flow forecasts appear to have greater explanatory power with respect to stock returns relative to the predictions of the mechanical time-series model (an adjusted R^2 of 3.20 percent versus 1.98 percent, see lines 2 and 3, respectively), the incremental information of these forecasts beyond that provided by the earnings forecasts and the mechanical model forecasts is marginal, increasing the adjusted R^2 from 5.70 percent to 6.06 percent (see lines 5 and 4, respectively). Interestingly, even in the presence of the earnings and cash flow forecast error variables, the time-series forecast error coefficient is significant, although its inclusion increases the explanatory power only slightly (the adjusted R^2 increases from 6.06 percent to 6.21 percent, as shown on lines 4 and 6, respectively).

Panel B of Table 11 shows the results regarding the association between the abnormal returns in the short window of the earnings announcement and the end-of-year forecast errors. They indicate that end-of-year analysts' cash flow forecasts are not significantly correlated with stock returns and, in particular, do not have incremental information content beyond that provided by end-of-year earnings forecasts. The results on lines 4 and 5 suggest that, after controlling for earnings information, cash flow information (in the form of forecast errors from either analysts' or the time-series model) is of marginal value.[19]

Use of Analysts' Cash Forecasts to Form an Accruals Expectation Model

As explained in Section IV, we compare the effectiveness of an analyst-based accruals expectation model (whereby expected accruals are inferred from the difference between analysts' earnings and cash flow forecasts) to detect earnings management to that of two commonly used models: the modified Jones model and the Dechow and Dichev (2002) model. The difference between the expected accruals produced by each model and the realized accruals is denoted as "unexpected accruals." We use these values of unexpected accruals to determine the presence of earnings management in two subsamples of observations, one for which earnings management is likely to have occurred and the rest of the sample. Recall that earnings management is assumed to exist when unexpected accruals exceed a multiple (of 1.0, 1.5, or 2.0) times their cross-sectional standard deviation. As noted earlier, three groups comprise the "likely earnings management" observations: firm-years for which there was a downward restatement of earnings, firm-years for which there was a small profit ("just-above zero" earnings defined as those where $0 \leq \text{EPS} \leq 0.02$), and firm-years where there is a small earnings increase relative to the same quarter the previous year ("just-above-zero earnings changes," defined as those where $0 \leq \Delta\text{EPS} \leq 0.01$).[20]

The results on the ability of this analyst-based model to identify earnings management in the form of loss avoidance are presented in Table 12.[21] (For the sake of brevity, we do not tabulate the results for the small earnings increases sample or for the restatement sample since they are quite similar to the small profits sample.) Several findings emerge. First, the performance of all three models is fairly poor. To illustrate, consider the case where earnings management is presumed to exist whenever earnings are just above zero. There are 1,121

[19] The short window results may somewhat understate the incremental value of cash flow information if investors do not have access to this information on the earnings announcement date. However, as noted by DeFond and Hung (2003), evidence suggests that cash flow information is typically revealed as part of the earnings press release and the accompanying conference call. Similarly, Francis et al. (2002) and Frankel et al. (1999) note that cash flow information is often disseminated to investors through conference calls which typically accompany the earnings announcement. Finally, we obtain similar results when we limit the sample to the post-Regulation FD period when disclosure of both earnings and cash flow information in the earnings announcements is more common.

[20] Using other cut-off points around zero earnings or zero earnings changes produces qualitatively similar results.

[21] The results presented are based on using 1.5 standard deviations as the demarcation point. Similar results are obtained when we use 1.0 or 2.0 standard deviations as the demarcation point.

TABLE 12
Ability of Alternative Accruals Expectation Models to Correctly Detect Earnings Management; Earnings Management is Assumed to Exist When Firms Report Small Profits ($0 \le$ EPS ≤ 0.02)

A Priori Determination	% in Sample	Total	Modified Jones Model Classification[a]: Earnings Management	Modified Jones Model Classification[a]: No Earnings Management
Earnings management exists ($0 \le$ EPS ≤ 2 cents)	3.0	1,121 (100.0%)	94 (4.9%)	**1,027 (91.6%)**
Earnings management does not exist	97.0	35,946 (100.0%)	**1,075 (3.0%)**	34,871 (91.6%)
All firm-years	100.0	37,067	1,169	35,898

Improvement over benchmark[c]:
Type I errors: 3.0% under the benchmark; 3.0% generated by the model (difference of 0.0%)
Type II errors: 97.0% under the benchmark; 91.6% generated by the model (difference of 5.4%)

A Priori Determination	% in Sample	Total	Dechow-Dichev Classification[b]: Earnings Management	Dechow-Dichev Classification[b]: No Earnings Management
Earnings management exists ($0 \le$ EPS ≤ 2 cents)	3.0	1,971 (100.0%)	80 (4.1%)	**1,891 (95.9%)**
Earnings management does not exist	97.0	64,328 (100.0%)	**1,034 (1.6%)**	63,294 (98.4%)
All firm-years	100.0	66,299	1,114	65,185

Improvement over benchmark[c]:
Type I errors: 3.0% under the benchmark; 1.6% generaged by the model (difference of 1.4%)
Type II errors: 97.0% under the benchmark; 95.9% generated by the model (difference of 1.1%)

A Priori Determination	% in Sample	Total	Analyst-Based Classification: Earnings Management	Analyst-Based Classification: No Earnings Management
Earnings management exists ($0 \le$ EPS ≤ 2 cents)	0.7	58 (100.0%)	4 (6.9%)	**54 (93.1%)**
Earnings management does not exist	99.3	7,880 (100.0%)	**292 (3.7%)**	7,588 (99.3%)
All firm-years	100.0	7,938	296	7,642

Improvement over benchmark[c]:
Type I errors: 0.7% under the benchmark; 3.7% generated by the model (difference of 3.0%)
Type II errors: 99.3% under the benchmark; 93.1% generated by the model (difference of 6.2%)

(Observations are identified as earnings management cases whenever unexpected accruals exceed 1.5 standard deviations of the unexpected accruals distribution. The amounts shown in bold indicate Type I and Type II errors.)

[a] The modified Jones model for deriving expected accruals is estimated from the following cross-sectional regression for each two-digit SIC code industry (the subscripts *i* and *t* denote the firm and time, respectively):

$$TACC_{it}/TA_{it-1} = a_0 + a_1(1/TA_{it-1}) + a_2[(\Delta REV_{it} - \Delta TR_{it})/TA_{it-1}] + a_3(PPE_{it}/TA_{it-1}) + \varepsilon_{it}$$

(*continued on next page*)

TABLE 12 (continued)

where *TACC* is the firm's total accruals, defined as the difference between income from continuing operations and cash flow from operating activities adjusted for extraordinary items and discontinued operations, ΔREV is the change in the firm's revenues, ΔTR is the change in trade receivables, and *PPE* is the amount of gross property, plant, and equipment. All variables are standardized by total assets at the beginning of the year, TA_{t-1}.

[b] The Dechow and Dichev (2002) model for deriving expected accruals is estimated from the following regression:

$$TCACC_{it}/AvTA_{it} = \beta_0 + \beta_1 CFO_{it-1}/AvTA_{it} + \beta_2 CFO_{it}/AvTA_{it} + \beta_3 CFO_{it+1}/AvTA_{it} + \varepsilon_{it}$$

where *TCACC* is total current accruals (equal to the change in current assets excluding cash and short-term investments minus the change in current liabilities excluding the current portion of long-term debt), *CFO* is cash flow from operations, measured as income from continuing operations less total accruals, and *AvTA* is average total assets.

[c] The benchmark predicts "earnings management" for any given firm-year with a probability of p and "no earnings management" with a probability of $1 - p$, where p is the proportion of earnings management in the sample.

such firm-years out of the 37,067 firm-years for which expected accruals could be computed. Based on their positive abnormal accruals, the modified Jones model identifies only 94 of these cases as earnings management cases. It further classifies 1,075 firm-years as earnings management cases when there is no earnings management. Type I and Type II errors for the model are 3.0 percent and 91.6 percent, respectively (the shaded figures in the table). These errors are only slightly lower than those generated from a benchmark model where the prediction of "earnings management" for a given firm-year is made randomly with a probability of p and the prediction of "no earnings management" is made with a probability of $1 - p$, where p is the proportion of earnings management in the population. This model would produce a Type I error of 3.0 percent and a Type II error of 97.0 percent (see table). The same low predictive ability of all three models is observed when the existence of earnings management is determined by the presence of a small earnings increase and restatements (untabulated).

The second result shown in the table is that the analyst-based accruals model does not perform better than the modified Jones or Dechow-Dichev models and, in fact, performs even worse. This suggests that the measure of unexpected accruals derived from the difference between analysts' earnings forecasts and their own cash flow forecasts does not effectively detect earnings management. One of the reasons for the poor performance of this model could be that, in contrast to the modified Jones model, the analyst-based model fails to relate accruals to the *actual* level of sales. As a result, it misidentifies accruals stemming from an unexpected level of activity as discretionary. The analyst-based estimation of unexpected accruals could be improved by correcting it for unexpected sales. Another explanation for the model's poor performance is that analysts' forecasts may already incorporate earnings management expectations, rendering the unexpected accruals generated by the model devoid of expected earnings management.[22]

[22] Past research provides conflicting evidence on whether analysts incorporate anticipated earnings management in their forecasts. Givoly et al. (2007), Liu (2005), and Burgstahler and Eames (2003) suggest that analysts do incorporate the earnings management component in their earnings forecasts. In contrast, Abarbanell and Lehavy (2003a, 2003b) conclude that analysts either do not anticipate earnings management or they choose to exclude the managed earnings component from their forecasts. Ettredge et al. (1995) find that analysts only partially discount overstated earnings in revising their earnings expectations.

Our conclusions based on the above analysis of "detection ability" are subject to an important caveat. In our methodology, earnings management is detected through the presence of sufficiently large unexpected accruals. Yet, earnings management could be achieved with smaller accruals, particularly if earnings are managed to beat a threshold. Second, our method of identifying likely earnings management cases as those with a small profit, a small earnings increase, or a downward restatement which, while common in the accounting literature, may lead us to identify "innocuous" cases as earnings management. Again, this is particularly true when the identification of earnings management is based on small profits or small earnings increases. Indeed, the notion that earnings management is likely to exist when earnings are "just above" an earnings threshold (e.g., Hayn 1995; Burgstahler and Dichev 1997) has recently been debated in the literature.[23]

VII. IMPLICATIONS FOR THE "DEMAND HYPOTHESIS"

The demand explanation for the time-series and cross-sectional variability in the availability of analysts' cash flow forecasts is supported by the results of some previous studies and is, indeed, quite appealing. Likewise, the related assertion that analysts' cash flow forecasts are sophisticated appears plausible.[24] However, our findings that cash flow forecasts are of low accuracy and easily replicated by investors by adding back the depreciation and amortization expenses to the already available analysts' earnings forecasts raise questions about the validity of the demand hypothesis.

Other indications, beyond low accuracy and lack of sophistication of cash flow forecasts, exist in the data that suggest that investor demand may not be a major factor behind the increase in the availability of these forecasts over time. First, the cross-sectional analysis shows a strong industry concentration in the availability of cash flow forecasts, with firms in the energy industry being the most likely to have cash flow forecasts and firms in industries such as healthcare, finance, and capital goods having the lowest frequency of such forecasts. These concentration patterns have not changed over time (see Panel B of Table 2). Second, for this finding to be consistent with the demand hypothesis, the earnings quality in the industries with a higher availability of cash flow forecasts should be lower than the earnings quality in the industries with the lowest concentration of cash flow forecasts. Our tests (untabulated) using the Dechow and Dichev (2002) approach for gauging accrual (or earnings) quality, show no such difference. A third finding that calls into question the demand explanation for the cross-sectional variability in the availability of cash flow forecasts is the steady upward trend in the frequency of cash flow forecasts over time. This trend continues beyond the sample period. By 2005, cash flow forecasts exist for almost 57.2 percent of the firms with earnings forecasts. If one excludes certain industries, such as financial institutions, for which cash flows are not a particularly meaningful measure of performance, cash flow forecasts are provided fairly universally. The current widespread availability of cash flow forecasts diminishes the plausibility of the demand explanation for the (very limited) cross-sectional variation in availability of cash flow forecasts, although one might still argue that the trend itself is demand-driven, prompted by a gradual impairment in the quality of earnings forecasts over time.

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[23] See Beaver et al. (2007), Dechow et al. (2003), Durtschi and Easton (2005), and Jacob and Jorgensen (2007).

[24] DeFond and Huang (2003, 81) note that, "I/B/E/S documents indicate that the cash flow forecasts submitted by contributing analysts are relatively sophisticated measures of cash flows from operations, and not simply mechanical manipulations of earnings such as EBITDA (a measure that basically involves adding interest, taxes, depreciation, and amortization to net income)." Interestingly, this sophistication "assertion" is relied upon as a "finding" by subsequent research (see, for example, McInnis and Collins 2008; Pae et al. 2007).

Note, however, that the findings of previous studies on the temporal change in the information content of earnings are not conclusive. To shed light on the question of whether earnings over time have fallen out of favor relative to cash flows as a performance measure among investors, we conducted a count of articles in the financial press citing ‘‘earnings’’ and its derivatives (e.g., ‘‘earnings-per-share’’) and those citing ‘‘cash flow’’ and its derivatives. Using the Factiva database for this examination, we find that the ratio of the number of articles that cite cash flow as a percentage of articles citing earnings is fairly constant, at about 11 percent, over the years 1991–2005. While this is indirect, anecdotal evidence, it is nonetheless inconsistent with the notion that cash flows have become more prominent and more demanded over time.

Finally, I/B/E/S representatives whom we contacted attribute the increased availability of cash flow forecasts, at least in part, to that organization's greater collection efforts made in an attempt to provide a broader spectrum of expectation data.

Although revisiting the demand hypothesis is beyond the scope of this study, the evidence presented here suggests the need for a further articulation of this hypothesis and for a reconciliation of the results of this study with the findings of previous research that appear to be supportive of this hypothesis.

VIII. CONCLUDING REMARKS

This study examines the quality of cash flow forecasts, an emerging new product of the analysts' industry that is currently produced for about 60 percent of the firms receiving earnings forecasts. We find that these forecasts are of a considerably lower quality than earnings forecasts. Specifically, cash flow forecasts are much less accurate and are less frequently revised than are earnings forecasts. Further, they appear to involve little more than a naïve extension of the accompanying earnings forecasts, leading us to conclude that the difference between the forecasted earnings and cash flows is not a good estimate of the accrual amount expected by investors.

There are indications that the low quality of these forecasts is due in part to the presence of data-quality issues. In many instances, it appears that the forecasted cash flow variable is defined differently than the actual cash flow variable. Related to this difference is our finding of a high frequency of cases with a discrepancy between the actual cash flow amount reported by I/B/E/S and that reported by Compustat. These discrepancies likely contribute to the documented higher prediction errors of analysts' cash flow forecasts as well as to their poor performance as a proxy for expected accruals. Even though this is an issue of data quality rather than inherent forecast quality, the two are inseparable. Neither investors nor researchers are capable of adjusting the reported cash flows so as to make them consistent with, and therefore a meaningful reference point to, any given cash flow forecast.

One possible explanation for the lower accuracy of cash flow forecasts relative to earnings forecasts is that earnings expectations are more likely than cash flow expectations to be managed by the reporting firms (through management guidance) so as to meet analysts' forecasts, resulting in lower forecast errors for earnings. This explanation applies primarily to forecasts made late in the year. Our results, however, show that the relatively lower accuracy of cash flow forecasts prevails among the initial forecasts made early in the year.

Two comments on the accuracy results are in order. First, while accuracy is not the only dimension of usefulness (e.g., the forecasts also can assist in interpreting other financial information), it is difficult to envision situations in which the presence and content of inaccurate forecasts would help investors. Second, the fact that cash flow forecasts are not universal may raise the issue of self-selection, whereby analysts' cash flow forecasts are demanded (and hence supplied) when the prediction of cash flows is difficult, which may explain the observed high forecast errors for the available cash flow forecasts. Note, however, that cash flow forecasts are now available for the majority of firms, making the self-selection explanation less compelling. Further, our findings show that the accuracy of analysts' cash flow forecasts relative to earnings has not improved over time, even though cash flow forecasts have become more widespread.

The finding of the lower accuracy of cash flow forecasts, the minor improvement in that accuracy during the year, the fact that these forecasts represent in essence a trivial extension of analysts' earnings forecasts, and the evidence on the presence of serious data-quality issues are all relevant for investors who might consider using these forecasts in valuation and investment decisions. They are also relevant in research settings in which analysts' cash flow forecasts are used to proxy for investors' expectations or their presence serves as an indicator variable (e.g., for earnings quality). These findings suggest that further research on the factors affecting the variation in accuracy of cash flow forecasts across analysts would be useful, similar to the study of the cross-sectional variation in earnings forecasts. Exploring analysts' characteristics such as their experience and the number of firms and industries they follow (e.g., Clement 1999; Clement and Tse 2005) might uncover some of the sources of the lower accuracy and shed more light on the demand hypothesis.

The findings also show that analysts' cash flow forecasts have incremental power in explaining contemporaneous annual stock returns (beyond earnings forecasts or a time-series cash flow model). However, this incremental power is marginal, suggesting that in certain research settings researchers may use time-series models instead of analysts' cash flow forecasts without adversely affecting the power of the tests.

Even though analysts' cash flow forecasts are found to be inaccurate, future research could still benefit from using them in various research settings, particularly if the focus is on subsamples of forecasts that exhibit a higher level of accuracy. This study identifies four such subsamples: those comprised of forecasts produced for firms with a greater analyst following and those for more profitable firms, larger firms, and high-growth firms. Finally, the finding that cash flow forecasts are of low quality and in essence a straightforward extension of the earnings forecasts does not necessarily invalidate the notion that cash flow forecasts serve as an indicator of earnings quality and are an outcome of investor demand. However, to substantiate these notions, we need a better understanding of the reasons for the demand for these relatively low-quality forecasts and of the source of the signaling value associated with their presence.

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