Are Analysts' Cash Flow Forecasts Naïve Extensions of Their Own Earnings Forecasts?*

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1. Introduction

Over the last several years, the availability of analysts' forecasts of operating cash flows has risen dramatically, prompting an increase in academic research in this area. Research on analysts' cash flow forecasts began with DeFond and Hung's 2003 examination of the determinants of market participants' demand for cash flow forecasts. Since then, researchers have studied other related issues, including the determinants of analysts' supply of cash flow forecasts (Ertimur and Stubben 2005), the impact of cash flow forecasts on managers' reporting and investors' pricing of earnings (McInnis and Collins 2011; Call 2009), relative earnings forecast accuracy in the presence of cash flow forecasts (Call, Chen, and Tong 2009), the reaction to meeting or beating analysts' cash flow forecasts (Brown, Huang, and Pinello 2010), and the determinants of cash flow forecast accuracy (Pae and Yoon 2011; Yoo and Pae 2011). While the above studies indirectly suggest analysts' cash flow forecasts are meaningful to investors and assist analysts themselves in forecasting earnings, an important study by Givoly, Hayn, and Lehavy 2009 (hereafter GHL) concludes that analysts' cash flow forecasts lack sophistication in that analysts appear to derive their cash flow forecasts by simply adding depreciation and amortization expense back to their own earnings forecasts.

The purpose of this study is to examine the sophistication of analysts' cash flow forecasts by directly investigating the accrual adjustments analysts make when forecasting cash flows.[1] This is an important issue that has significant implications for academic research on or using analysts' cash flow forecasts, for if analysts truly just add depreciation expense to their earnings forecasts, without making any accrual adjustments, the validity of existing research on analysts' cash flow forecasts is called into question. In addition, if analysts' cash flow forecasts are truly trivial extensions of their own earnings forecasts,

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1. Throughout this study, all references to "cash flows" and "cash flow forecasts" refer to cash flow from operations.

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then it poses a significant hurdle for future researchers interested in conducting research based on analysts' cash flow forecasts, such as examining how investors and other stakeholders use analysts' cash flow forecasts or using analysts' cash flow forecasts as a proxy for expected cash flows.

Following GHL, we define a sophisticated cash flow forecast as one that results when the analyst incorporates meaningful estimates of working capital and other accruals when reconciling earnings to cash from operations, whereas a naïve cash flow forecast represents the analyst's own earnings forecast adjusted only for depreciation and amortization expense. We examine the extent to which analysts include these nontrivial adjustments for working capital and other accruals in their cash flow forecasts.

Our analysis of analysts' cash flow forecast sophistication consists of four main parts. First, we reexamine the empirical tests employed by GHL to conclude that analysts' cash flow forecasts lack sophistication. Our tests show that even a "perfect foresight" cash flow forecast (i.e., a cash flow forecast that equals actual cash from operations as reported by I/B/E/S) would not be deemed sophisticated by the regression tests used in GHL. These regression tests are nondiagnostic because of discrepancies between data values (e.g., actual cash flows) reported in I/B/E/S and those reported in COMPUSTAT.

Like GHL, we also compare the accuracy of analysts' cash flow forecasts to the accuracy of naïve cash flow forecasts. However, while GHL compare pooled cash flow forecast errors across all firms in all years, we evaluate the frequency with which analysts' individual and consensus cash flow forecast outperforms the naïve cash flow forecast. We find that the *majority* of analysts' individual and consensus cash flow forecasts are more accurate than the corresponding naïve forecasts.

Second, to better understand the specific adjustments analysts make when forecasting cash flows, we inspect 90 full-text analyst reports that include a forecast of cash from operations. We find that 80 percent of these analysts either explicitly include an adjustment for working capital accruals or explicitly adjust for other accruals (e.g., deferred taxes, stock-based compensation, etc.) when forecasting cash flows. These findings represent direct evidence that analysts' cash flow forecasts constitute more than trivial adjustments for depreciation and amortization expense, and that they attempt to include the more difficult working capital and other accrual forecasts in their cash flow forecasts.

Third, we examine whether analysts' cash flow forecasts include informative adjustments for working capital and other accruals by examining a large sample of analysts' cash flow forecasts from 1993 to 2008. We derive the accrual forecasts implied by analysts' cash flow forecasts as the difference between a naïve cash flow forecast (the analyst's earnings forecast plus depreciation and amortization expense) and the analyst's cash flow forecast. We find that analysts correctly predict the sign of accruals more than 70 percent of the time. We compare these implied accrual adjustments to those implied by a time-series cash flow forecast model (Barth, Cram, and Nelson 2001), and find that analysts' cash flow forecasts are significantly more sophisticated than are these time-series cash flow forecasts. Analysts' cash flow forecasts are more likely to correctly predict not only the *sign* of actual accruals, but also the *magnitude* of actual accruals than are time-series cash flow forecasts. In summary, the accrual estimates embedded in analysts' cash flow forecasts outperform those implied by time-series predictions of operating cash flows. This comparison is meaningful because it constitutes an apples-to-apples comparison of two alternative cash flow forecasts available to investors.

If analysts' cash flow forecasts are sophisticated and superior to time-series predictions of cash flows, we argue that these forecasts should be of value to investors. Thus, in our last analysis we examine the market's perception of analysts' cash flow forecast sophistication by examining stock returns surrounding analysts' cash flow forecast revisions. We find a positive association between analysts' cash flow forecast revisions and the four-day

abnormal returns surrounding these revisions. This association remains positive and significant after controlling for the reaction to concurrent analysts' *earnings* forecast revisions. This finding lends further support to the notion that analysts' cash flow forecasts provide useful information to market participants.

This paper makes several contributions to the literature. First, we extend research investigating the properties of analysts' cash flow forecasts by examining the accrual adjustments analysts make (or do not make) when they forecast cash flows. Understanding the nature of these accrual adjustments is central to understanding the nature of analysts' forecasting activities. We find that the majority of analysts' cash flow forecasts reflect meaningful adjustments for working capital and other accruals, and that these adjustments are superior to those implied by time-series cash flow forecasts. Our evidence of significant investor reaction surrounding analysts' cash flow forecasts revisions further corroborates the usefulness of the information in analysts' cash flow forecasts.

Second, our study helps reconcile what appears to be conflicting evidence in the extant literature on the sophistication of analysts' cash flow forecasts. Specifically, GHL find that analysts derive their cash flow forecasts by simply adding depreciation expense back to their own earnings forecasts, and conclude that analysts' cash flow forecasts lack sophistication.[2] We show that the empirical tests used by GHL to arrive at this conclusion are not diagnostic. More importantly, we provide evidence that analysts make meaningful accrual adjustments when deriving their cash flow forecasts. Thus, our study lends support to and reinforces the inferences of the majority of existing studies that suggest analysts' cash flow forecasts are sophisticated and useful to investors (e.g., DeFond and Hung 2003; Call et al. 2009; McInnis and Collins 2011; Brown et al. 2010; Pae and Yoon 2011; Yoo and Pae 2011).

Our finding that analysts' cash flow forecasts reflect meaningful accrual adjustments should be important to investors, analysts, and researchers. Investors benefit from knowing the extent to which they can rely on analysts' research output when making investment decisions. Our findings suggest analysts' cash flow forecasts are superior to time-series forecasts of future cash flows, and are therefore more likely to be difficult for investors to replicate on their own. Similarly, analysts benefit from knowing the efficacy of their effort to forecast future cash flows. Most importantly, a better understanding of the degree to which analysts' cash flow forecasts are sophisticated is important to academics who wish to employ these forecasts in various research contexts, as well as to those who evaluate research on these issues. The relevance and plausibility of existing and future research on analysts' cash flow forecasts is a function, in part, of the sophistication of these forecasts. The conclusion that analysts' cash flow forecasts are naïve extensions of their own earnings forecasts represents an impediment that would unnecessarily hinder this line of research.

In section 2 we review related literature. We reexamine evidence presented in GHL on the sophistication of analysts' cash flow forecasts in section 3. In section 4 we outline our analysis of full-text analyst reports. In section 5 we present large-sample evidence on the sophistication of analysts' cash flow forecasts. We examine the market's pricing of analysts' cash flow forecast revisions in section 6. We conduct sensitivity tests in section 7 and conclude in section 8.

2. GHL also conclude that analysts' cash flow forecasts (1) are less accurate, more biased, and less efficient than are their earnings forecasts, (2) do not represent proxies for market's expectations of cash flows, and (3) are not useful in detecting earnings management. However, we believe their most fundamental conclusion is that analysts' cash flow forecasts lack sophistication. Therefore, we want to emphasize that the purpose of this paper is not to provide a point-by-point rebuttal of *all* the evidence presented in GHL. Rather, we focus on the conclusion that analysts simply add depreciation to their own earnings forecasts when forecasting cash flows.

2. Background and related research

The availability of analysts' cash flow forecasts through I/B/E/S is a relatively recent and growing phenomenon. Analysts' cash flow forecasts first appeared on I/B/E/S in 1993, when 4.8 percent of firms had at least one cash flow forecast and only 1.8 percent of analysts' earnings forecasts were accompanied by a cash flow forecast. In the years since, these figures have increased dramatically, and by 2008, 56.4 percent of firms had at least one of its analysts issue a cash flow forecast and 23.8 percent of analysts issued cash flow forecasts for the firms they followed (see Table 1). The increasing availability of analysts' cash flow forecasts to market participants makes our understanding of the properties of these forecasts all the more relevant.

Prior research has explored factors that predict the existence of cash flow forecasts. DeFond and Hung (2003) argue that investors demand cash flow information when earnings are difficult to interpret, and find that analysts are more likely to issue cash flow forecasts for firms with large accruals, heterogeneous accounting choices relative to industry peers, volatile earnings, high capital intensity, and poor financial health. Ertimur and Stubben (2005) examine analyst characteristics associated with the supply of cash flow forecasts, and find that analysts from large brokerage houses, who forecast earnings more frequently and who have less accurate prior earnings forecasts, are more likely to issue cash flow forecasts. Below we summarize relevant evidence on the usefulness and sophistication of analysts' cash flow forecasts.

TABLE 1
Availability of analysts' cash flow forecast

Year	# of firms with CFF	% of firms with EF & CFF	% of analysts issuing EF & CFF
1993	233	4.8	1.8
1994	469	8.5	3.9
1995	682	11.5	6.1
1996	848	12.4	9.5
1997	973	13.2	10.2
1998	1,089	15.0	11.0
1999	1,712	24.6	13.4
2000	1,678	26.2	12.7
2001	925	17.2	10.2
2002	1,933	37.4	15.3
2003	2,526	49.0	21.7
2004	2,986	40.3	23.1
2005	3,332	54.8	22.7
2006	3,481	55.3	22.6
2007	3,591	55.9	22.9
2008	3,375	56.4	23.8
Total	29,833	29.9	14.8

Notes:

This table presents descriptive statistics on the availability of analysts' cash flow forecasts in the I/B/E/S detail data file during the period 1993–2008. The first column presents the number of firms with at least one analysts' cash flow forecast (i.e., CFF). The second column presents the percentage of firms with earnings forecasts (i.e., EF) that also have at least one cash flow forecast. The final column presents the percentage of analysts who accompany their earnings forecasts with a cash flow forecast for the same firm.

Evidence suggesting analysts' cash flow forecasts are sophisticated

Various studies provide indirect evidence suggesting analysts' cash flow forecasts are sophisticated and that these forecasts provide information to investors. DeFond and Hung (2003) find a positive association between two-day stock returns around earnings announcements and analysts' cash flow forecast errors, suggesting analysts' forecasts of cash from operations are consistent with investors' expectations of cash from operations. In a similar vein, Brown et al. (2010) find the market reaction to meeting or beating analysts' *earnings* forecasts is stronger when the firm also meets or beats analysts' cash flow forecasts. These findings provide evidence that meeting or beating analysts' cash flow forecasts is incrementally informative about firm performance, and indirectly suggests analysts' cash flow forecasts provide benchmarks that are meaningful to investors. Furthermore, GHL document a positive association between analysts' beginning-of-year cash flow forecast errors and annual returns, which also suggests analysts' cash flow forecasts have information content.[3]

In addition, Call et al. (2009) find that analysts issue more accurate earnings forecasts when they also issue cash flow forecasts. They further find that analysts better understand the persistence of the accrual and cash flow components of earnings when they issue cash flow forecasts. If analysts simply added depreciation and amortization expense to their earnings forecasts when deriving their cash flow forecasts, it is difficult to imagine why this simple process of forecasting cash flows would lead to a better understanding of the persistence of accruals and cash flows, and to more accurate earnings forecasts. As a result, the findings of Call et al. 2009 indirectly suggest analysts incorporate meaningful working capital and other accrual adjustments in their cash flow forecasts, such that forecasting these items is informative to analysts when forecasting earnings.

In summary, while these prior studies provide only indirect evidence on the sophistication of analysts' cash flow forecasts, their combined evidence suggests that investors find such forecasts useful and that analysts better forecast earnings when they also forecast cash flows.

Evidence that analysts' cash flow forecasts are not sophisticated

GHL are the first to directly examine the properties of analysts' cash flow forecasts. They compare analysts' cash flow forecasts to analysts' earnings forecasts on a variety of dimensions, including accuracy, bias, and intra-year improvement. They also examine whether analysts' cash flow forecasts act as a surrogate for market expectations of future cash flows, and whether these forecasts are useful in forming an accrual expectation model. In general, they find that analysts' cash flow forecasts are inferior to analysts' earnings forecast in terms of accuracy, bias, and intra-year improvement. They also find that analysts' cash flow forecasts are of limited use when forming accrual expectations and mixed evidence that analysts' cash flow forecast errors are associated with stock returns.

The most important result documented by GHL, which distinguishes their study from other studies in this area, is that analysts' cash flow forecasts are, in essence, a naïve extension of their earnings forecasts. Specifically, they conclude from their empirical analysis that analysts fail to consider working capital and other accrual adjustments when forecasting operating cash flows. In other words, they argue analysts' cash flow forecasts essentially consist of their own earnings forecasts adjusted for projected depreciation and amortization expense. If this is the case, it constitutes a significant indictment on the qual-

3. Related to these studies on market reactions, McInnis and Collins (2011) hypothesize and find that managers have less incentive to manipulate accruals to meet or beat earnings benchmarks in the presence of analysts' cash flow forecasts because both an earnings forecast and a cash flow forecast provide an implicit forecast of accruals that investors can use to unravel accrual manipulations. Thus, their findings corroborate the inference that accrual forecasts implicit in analysts' cash flow forecasts are sufficiently sophisticated to be of use to investors.

ity and usefulness of analysts' cash flow forecasts, as investors could easily and quickly replicate such trivial cash flow forecasts using analysts' earnings forecasts.

In summary, most prior studies present evidence attesting to the usefulness of analysts' cash flow forecasts to both investors and analysts themselves, which indirectly suggests these forecasts are of reasonable sophistication (DeFond & Hung 2003; Call et al. 2009; Brown et al. 2010; McInnis and Collins 2011). However, GHL conclude that analysts simply add depreciation expense to their own earnings forecasts when forming their cash flow forecasts, which suggests that these forecasts are naïve extensions of analysts' earnings forecasts.

The conclusion reached in GHL is of critical importance, as it presents a powerful indictment on the quality of analyst cash flow forecasts. Given the importance of this conclusion, and given that this conclusion conflicts with the indirect evidence on analyst cash flow forecasts sophistication presented in prior studies, we first reexamine the empirical tests employed by GHL.

3. Reexamining prior evidence

Sample and data

We obtain cash flow forecast data from the I/B/E/S Detail History U.S. Edition database for the period 1993 (the first year I/B/E/S has any record of analysts' cash flow forecasts) to 2008. We identify all analyst-firm combinations where the analyst issued at least one annual cash flow forecast for the firm during the year. We capture each individual analyst's *last* forecast issued before the earnings announcement, and we compute consensus forecasts as the median of all forecasts outstanding immediately prior to the earnings announcement. We gather financial statement information from COMPUSTAT, and returns data from the Center of Research in Security Prices (CRSP).

As discussed at length by GHL and Melendrez, Schwartz, and Trombley 2008, I/B/E/S does not provide the actual value for operating cash flows for all firms where cash flow forecasts are available. GHL find that cash flow forecast errors computed using actual cash flow values from COMPUSTAT are much larger than are cash flow forecast errors computed using actual cash flow values from I/B/E/S. This finding suggests the actual values from I/B/E/S better reflect the cash flow figures analysts are forecasting, and that the actual values from COMPUSTAT represent a poor benchmark against which to evaluate analysts' ability to forecast cash flows. This conclusion is not surprising because it is consistent with the well-documented findings that I/B/E/S actual earnings are different from GAAP earnings reported in COMPUSTAT (e.g., Bradshaw and Sloan 2002; Abarbanell and Lehavy 2002, 2007). As a result, in an effort to capture the most appropriate actual cash flow figures, we only use actual cash flow values from I/B/E/S, where necessary. While this approach reduces the number of usable observations in some analyses, we believe it is important to base our inferences only on the most reliable data available.[4]

In Table 1 we detail the availability of analysts' cash flow forecasts on I/B/E/S since 1993, the first year in which cash flow forecasts were made available. As is evident from Table 1, analysts' cash flow forecasts have become significantly more common in recent years, both in raw number and as a percentage of firms (analysts). In 1993, only 4.8 percent of firms had at least one of their analysts issue a cash flow forecast. Over the last several years, however, that figure has exceeded 50 percent. Similarly, in 1993 less than 2 percent of analysts accompanied their earnings forecasts with cash flow forecasts, whereas

4. We are not suggesting the actual values on COMPUSTAT are unreliable in every research setting. Rather, we are simply pointing out the cash flow values reported on COMPUSTAT do not appear to reflect the cash flow values analysts are forecasting. Given that our goal is to evaluate analysts' ability to forecast cash flows, we rely on the actual values (from I/B/E/S) that are most consistent with what analysts are trying to forecast.

more than 20 percent of analysts do so in more recent years. In general, cash flow forecasts represent an increasingly common research output for analysts, and have become available to capital market participants for more firms over time.

Reexamining prior tests used to assess the sophistication of analysts' cash flow forecasts

In evaluating the sophistication of analysts' cash flow forecasts, GHL examine the extent to which these forecasts incorporate projections of working capital and other adjustments to income. Their primary test of sophistication is presented in their Table 10, where they report the results of estimating the following regression:[5]

$$CFF_{it} = \alpha_0 + \beta_1 EF_{it} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (1),$$

where CFF_{it} and EF_{it} are, respectively, the consensus analysts' forecasts for cash flows and earnings for firm i in year t, obtained from I/B/E/S, and DEP_{it}, ΔWC_{it}, and $OTHER_{it}$ are *actual* values (because forecasted values are unobservable) of depreciation and amortization expense, change in working capital accounts, and all other adjustments needed to reconcile income from continuing operations with cash from operations for firm i in year t, respectively, all obtained from COMPUSTAT.[6]

GHL argue that because (1) can be interpreted as regressing analysts' estimates of an aggregated sum (operating cash flows) on its individual components (earnings, depreciation and amortization expense, working capital accruals, and other adjustments), if analysts correctly adjust their earnings forecasts to arrive at their cash flow forecasts, the coefficients β_1 through β_4 should be positive and should not differ significantly from one. However, while GHL find that β_1 and β_2 are both positive and close to one, β_3 and β_4 are both positive but far below one (usually at or below 0.10). GHL interpret these findings as evidence that analysts' cash flow forecasts are unsophisticated because, while analysts successfully add back depreciation and amortization expense to their own earnings forecasts (β_1 and β_2), they appear to largely ignore or significantly under-adjust for working capital and other accruals when generating their cash flow forecasts (β_3 and β_4).

We begin by replicating these findings with our sample. As reported in panel A of Table 2, we estimate (1) and find that while β_1 and β_2 approach one, β_3 and β_4 are far below one, consistent with the findings of GHL.

In order to evaluate the suitability of this model for assessing the sophistication of analysts' cash flow forecasts, we next replace analysts' cash flow forecasts with the firms' *actual* cash flow values (reported by I/B/E/S) as the dependent variable in (1). Specifically, we estimate the following regression:

$$CFO^{IBES}{}_{it} = \alpha_0 + \beta_1 EF_{it} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (2),$$

where $CFO^{IBES}{}_{it}$ is the actual value of operating cash flows for firm i in year t, as reported by I/B/E/S, and all other variables are as defined previously. In using actual cash flow values as the dependent variable, we are effectively examining the coefficient values (β_1 through β_4) that would result if analysts had perfect foresight of the future cash flow values they are attempting to forecast. In theory, we should find all the coefficients in (2), β_1 through β_4, are significantly positive and close to one because the dependent variable has zero forecast error.

5. GHL also test the sophistication of analysts' cash flow forecasts by (a) comparing analysts' cash flow forecast errors to naïve cash flow forecast errors (their Table 8), and (b) examining the correlation between analysts' cash flow forecast errors and naïve cash flow forecast errors (their Table 9). We discuss these findings in the next section.

6. While *OTHER* captures all remaining adjustments (i.e., both accrual and nonaccrual adjustments) needed to reconcile income from continuing operations and cash from operations, for expositional ease we refer to this variable as "other accruals" throughout this study.

TABLE 2
Reexamining prior regression tests used to assess cash flow forecast sophistication

Panel A: Replicating GHL Table 10 using all possible observations
Model:

$$CFF_{it} = \alpha_0 + \beta_1 EF_{it} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (1)$$

	Coefficients (*t*-statistics)					
Intercept	*EF*	*DEP*	*ΔWC*	*OTHER*	*Adj. R^2*	*n*
0.001 (43.76)	1.106 (120.41)				62.1%	8,869
0.000 (6.05)	0.944 (141.29)	0.912 (95.14)			81.2%	8,869
0.000 (6.18)	0.946 (139.53)	0.912 (95.16)	0.026 (2.00)		81.2%	8,869
0.000 (4.27)	0.951 (142.28)	0.878 (90.93)	0.059 (4.66)	0.177 (16.68)	81.8%	8,869

Panel B: Replicating GHL Table 10 using observations with *I*/*B*/*E*/*S* actual cash flows
Model:

$$CFF_{it} = \alpha_0 + \beta_1 EF_{it} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (1)$$

	Coefficients (*t*-statistics)					
Intercept	*EF*	*DEP*	*ΔWC*	*OTHER*	*Adj. R^2*	*n*
0.001 (20.75)	1.298 (63.76)				61.1%	2,587
0.000 (1.25)	1.030 (83.21)	0.980 (71.56)			87.0%	2,587
0.000 (1.24)	1.029 (80.74)	0.980 (71.55)	−0.007 (−0.32)		87.0%	2,587
0.000 (0.84)	1.028 (81.66)	0.948 (66.86)	0.010 (0.45)	0.145 (7.82)	87.3%	2,587

Panel C: Using I/B/E/S actual cash flows (*CFO*) as the dependent variable
Model:

$$CFO_{it}^{IBES} = \alpha_0 + \beta_1 EF_{it} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (2)$$

	Coefficients (*t*-statistics)					
Intercept	*EF*	*DEP*	*ΔWC*	*OTHER*	*Adj. R^2*	*n*
0.001 (21.25)	1.255 (59.55)				57.8%	2,587
0.000 (2.68)	0.984 (73.29)	0.989 (66.52)			84.5%	2,587
0.000 (2.65)	0.980 (70.89)	0.989 (66.53)	−0.031 (−1.33)		84.5%	2,587
0.000 (1.98)	0.979 (73.72)	0.924 (61.84)	0.001 (0.06)	0.287 (14.63)	85.6%	2,587

(The table is continued on the next page.)

TABLE 2 (Continued)

Panel D: Using actual values for the dependent variable and all independent variables
Model:

$$CFO_{it}^{IBES} = \alpha_0 + \beta_1 EARN_{it}^{IBES} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (3)$$

	Coefficients (*t*-statistics)					
Intercept	*EARN*	*DEP*	*ΔWC*	*OTHER*	*Adj.* R^2	*n*
0.001 (24.43)	1.104 (52.64)				52.0%	2,558
0.000 (4.22)	0.897 (70.68)	1.070 (69.51)			83.4%	2,558
0.000 (4.17)	0.893 (68.39)	1.069 (69.45)	−0.035 (−1.40)		83.4%	2,558
0.000 (3.03)	0.913 (75.05)	0.973 (64.60)	0.013 (0.56)	0.405 (20.26)	85.7%	2,558

Notes:

CFF_{it} is analysts' consensus cash flow forecast for firm i in year t, EF_{it} is analysts' consensus earnings forecast for firm i in year t, $CFO^{IBES}{}_{it}$ is actual cash from operations, as reported by I/B/E/S, for firm i in year t, DEP_{it} is actual depreciation and amortization expense, as reported by COMPUSTAT, for firm i in year t, ΔWC_{it} is the change in working capital, as reported by COMPUSTAT, for firm i in year t, measured as the change in accounts receivable, inventory, and accounts payable, $OTHER_{it}$ is all other adjustments needed to reconcile cash from operations to earnings, as reported by COMPUSTAT, for firm i in year t, and $EARN^{IBES}{}_{it}$ is actual earnings, as reported by I/B/E/S, for firm i in year t. We truncate all variables at the 1 percent and 99 percent levels.

To estimate (2), we need actual cash from operations from I/B/E/S. However, as noted in prior research (GHL; Melendrez et al. 2008), I/B/E/S does not report actual cash flow values for all firms. To make sure our sample for estimating (2) is comparable to that used to estimate (1) (as reported in panel A), we first present the results of estimating (1) using the subsample of firms with actual cash flow values available on I/B/E/S. As reported in panel B of Table 2, we find qualitatively similar results with this subsample of firms (i.e., our inferences remain unchanged).

We present the results of estimating (2) in panel C of Table 2. The most striking finding is that the coefficients resulting from (2) are very similar to those resulting from (1). Specifically, the coefficients on *EF* and *DEP* are about one ($\beta_1 = 0.979$; $\beta_2 = 0.924$), while the coefficients on *ΔWC* and *OTHER* are both far below one ($\beta_3 = 0.001$; $\beta_4 = 0.287$). These results suggest that even cash flow forecasts that are free from any forecast error would not be deemed sophisticated by (1). These findings are puzzling. Why are the coefficients on *ΔWC* and *OTHER* in (2) far below the theoretical value of one, even in the presence of "perfect foresight" cash flow forecasts? We believe this result is driven by differences between COMPUSTAT and I/B/E/S reported actual cash flows values. Specifically, only actual cash flows reported by I/B/E/S correspond to the cash flow number analysts forecast, while the actual cash flow numbers reported by COMPUSTAT are GAAP-based numbers and are not necessarily consistent with what analysts forecast. This difference between I/B/E/S and GAAP-based cash flows is consistent with evidence from the earnings forecasting literature that analysts make various adjustments to the earnings numbers they are forecasting (e.g., Bradshaw and Sloan 2002; Abarbanell and Lehavy 2002, 2007).

To further investigate this issue, we reestimate (2) using all actual values. We run the following regression of I/B/E/S actual cash flows on I/B/E/S actual earnings and the other components of operating cash flows:

$$CFO^{IBES}{}_{it} = \alpha_0 + \beta_1 EARN^{IBES}_{it} + \beta_2 DEP_{it} + \beta_3 \Delta WC_{it} + \beta_4 OTHER_{it} + \varepsilon_{it} \quad (3),$$

where $CFO^{IBES}{}_{it}$ is the actual value of operating cash flows for firm i in year t, as reported by I/B/E/S, $EARN^{IBES}{}_{it}$ is actual earnings for firm i in year t, as reported by I/B/E/S, and all other variables are as defined in (1) and (2), using COMPUSTAT actual realizations, and are as defined by GHL. In the above specification, $CFO^{IBES}{}_{it}$ and $EARN^{IBES}{}_{it}$ are the forecasts analysts would issue with perfect foresight of future cash flow and earnings realizations. In theory, all the coefficients from estimating (3) should equal one, because the independent variables are supposed to sum to operating cash flows and therefore form an identity with the dependent variable.

However, empirically the sum of the explanatory variables as measured in (3) is not equal to the dependent variable, operating cash flows. This is because the measures of *DEP*, ΔWC, and *OTHER* in (3) (and employed by GHL) are all based on COMPUSTAT data, whereas the cash flow and earnings variables in this model (and that analysts are forecasting) are based on I/B/E/S data. This mismatch between COMPUSTAT and I/B/E/S data results in a regression where the independent variables do not sum to the dependent variable, and the expected coefficient on each of these independent variables may not be one.

We report the results of estimating (3) in panel D of Table 2. We find that the coefficients on $EARN^{IBES}{}_{it}$ and *DEP* are about one ($\beta_1 = 0.913$; $\beta_2 = 0.973$), while the coefficients on ΔWC and *OTHER* are both far below one ($\beta_3 = 0.013$; $\beta_4 = 0.405$). These results suggest that (1), the *original* model used by GHL to assess the sophistication of analysts' cash flow forecasts, is not diagnostic because the model assumes analysts are forecasting working capital and other accruals (and therefore cash from operations) as defined by COMPUSTAT, rather than forecasting accruals consistent with their own forecasts of cash from operations.

A plausible alternative explanation for the low coefficient values obtained from (2) and (3) is that I/B/E/S reports actual cash from operations using the same definition of cash flows that analysts are forecasting, and that analysts themselves are not attempting to forecast working capital or other accruals. That is, the coefficients on working capital and other accruals in both equations do not approach the value of one simply because analysts are forecasting a naïve cash flow number and I/B/E/S publishes a similarly naïve actual cash flow value. In such a scenario, the low coefficients on working capital and other accruals would be due to analysts' unsophisticated cash flow forecast efforts, and not due to discrepancies between COMPUSTAT and I/B/E/S cash flow values.

However, our analysis of full-text analyst reports (which we report in the next section) reveals that the majority of analysts include explicit adjustments for working capital and other accruals in their cash flow forecasts. Moreover, we find that the average absolute value of GAAP-based working capital and other accruals (per COMPUSTAT) is 4.4 percent of total assets, while the average absolute value of these accruals implied by the actual cash flow values in I/B/E/S is 4.6 percent of total assets. Therefore, these findings suggest that this alternative explanation is not supported because analysts are explicitly forecasting working capital and other accruals, and these forecasted accruals are, on average, of similar magnitude to that of GAAP-based accruals.

In summary, in spite of the intuitive appeal of (1), discrepancies between actual cash from operations as reported by I/B/E/S and those reported by COMPUSTAT make it difficult to use this equation to assess the sophistication of analysts' cash flow forecasts.

It is important to note, however, that our finding that (1) cannot be used to assess cash flow forecast sophistication cannot be interpreted as evidence that analysts' cash flow forecasts are therefore sophisticated. In order to make inferences about the sophistication of analysts' cash flow forecasts, we turn to subsequent empirical analyses (discussed in the following sections) that examine cash flow forecast sophistication at both the individual analyst and consensus level.

Superiority of analysts' cash flow forecasts over naïve cash flow forecasts

The analysis in the above section suggests that (1), as employed by GHL, cannot be used to evaluate the sophistication of analysts' cash flow forecasts. In this section we examine another test employed by GHL that also leads to their conclusion that analysts' cash flow forecasts lack sophistication. Specifically, GHL compare the accuracy of analysts' cash flow forecasts to that of naïve cash flow forecasts (see their Table 8). They find insignificant differences between the mean (and median) analyst cash flow forecast error and the mean (and median) naïve cash flow forecast error, and therefore conclude that analysts' cash flow forecasts are naïve.

We use GHL's definition of naïve cash flow forecasts and perform a similar analysis, examining the accuracy of analysts' cash flow forecast errors and naïve cash flow forecast errors. Specifically, we calculate an analyst's cash flow forecast error as:

$$CFF\_Error_{it} = |CFF_{it} - CFO^{IBES}{}_{it}| \quad (4),$$

where CFF_{it} is the analyst's cash flow forecast for firm i in year t, and $CFO^{IBES}{}_{it}$ is actual cash from operations for firm i in year t, per I/B/E/S.[7]

Following GHL, we define the naïve cash flow forecast as:

$$Naïve\ CFF_{it} = EF_{it} + DEP_{it} \quad (5),$$

where EF_{it} is the analyst's earnings forecast for firm i in year t and DEP_{it} is the realized depreciation and amortization expense in year t (because forecasted values are unobservable) on a per share basis. The naïve cash flow forecast represents the cash flow forecast an analyst would issue if he/she simply added depreciation and amortization expense to his/her earnings forecast and completely ignored (or failed to account for) any working capital or other accrual adjustments.

We calculate the naïve cash flow forecast error as:

$$Naïve - \ Error_{it} = |Naïve\ CFF_{it} - CFO^{IBES}{}_{it}| \quad (6),$$

where $Naïve\ CFF_{it}$ is the naïve cash flow forecast (EF_{it} + DEP_{it}), as outlined in (5), and $CFO^{IBES}{}_{it}$ is actual cash from operations for firm i in year t, per I/B/E/S. For each individual analyst, we compare the magnitude of his/her cash flow forecast error (from (4)) to the magnitude of the forecast error associated with his/her naïve forecast of cash flows (from (6)). We also perform this analysis for each firm-year, comparing the consensus analyst cash flow forecast error to the consensus naïve cash flow forecast error.

Note that there are two important differences between this analysis and that outlined in Table 8 of GHL. First, while we compare analysts' cash flow forecast errors to naïve cash flow forecast errors at both the analyst and firm level, GHL pool all forecasts across all analysts and all firms and compare the mean (and median) analyst cash flow forecast error to the mean (and median) naïve cash flow forecast error. In contrast, we evaluate the *percentage* of individual analysts (firms) where the analyst's cash flow forecast outperforms the naïve cash flow forecast, an analysis that cannot be conducted when all observations are aggregated to a single mean (or median) value.

Second, when actual cash from operations is not available from I/B/E/S, GHL evaluate cash flow forecast accuracy relative to reported cash flow numbers from COMPUSTAT. However, as explained earlier, replacing I/B/E/S actual values with COMPUSTAT actual values is problematic, given that analysts do not appear to be forecasting cash flows as defined by COMPUSTAT. Furthermore, as reported in Table 5 of GHL, analysts' cash flow forecast errors are much larger when using COMPUSTAT actual values than when

7. To simplify presentation we omit analysts' subscripts in this and the following equations even though we perform these analyses using both consensus and individual cash flow forecasts.

using I/B/E/S actual values, making analysts' cash flow forecast errors appear unnecessarily large when assessed relative to COMPUSTAT actual values. Thus, we restrict our analysis to those observations where actual cash from operations is available from I/B/E/S.

As reported in panel A of Table 3, we find that 62.5 percent of analysts' individual cash flow forecasts are more accurate than the corresponding naïve cash flow forecast. At the firm level, 57.7 percent of analysts' consensus cash flow forecasts outperform the naïve cash flow forecast. These percentages are statistically greater than 50.0 percent (z-statistic = 36.31, p-value < .001 for individual forecasts; z-statistic = 10.49, p-value < .001 for consensus forecasts), which is the expected percentage if analysts' cash flow forecasts are expected to outperform the naïve cash flow forecasts only by chance. These findings are consistent with analysts' making working capital and other accrual adjustments that improve the quality of their cash flow forecasts.

We also evaluate the magnitude of the difference in absolute forecast errors by calculating the ratio of each analyst's cash flow forecast error to the corresponding naïve cash flow forecast error. A ratio less (greater) than 100 percent suggests that the analyst cash flow forecast is more (less) accurate than the corresponding naïve cash flow forecast. We find that analysts' median individual cash flow forecast error is only 69.1 percent of that of the corresponding naïve cash flow forecast, and that at the firm level, the median analysts' cash flow forecast error is 86.5 percent of that of the naïve cash flow forecast. These percentages are significantly lower than 100 percent (z-statistic = 16.10E6, p-value < .001 for individual forecasts; z-statistic = 17.83E4, p-value = 0.048 for consensus forecasts), which is the expected ratio if analysts' cash flow forecasts and the corresponding naïve cash flow forecasts are equally accurate.[8]

Note that, consistent with GHL, we define the naïve cash flow forecast as the sum of the analysts' own earnings forecast (EF_{it}) and actual depreciation and amortization expense for the year being forecasted (DEP_{it}). However, one concern is that while the naïve cash flow forecast is intended to capture the cash flow forecast of an unsophisticated analyst, this definition assumes that the analyst can perfectly predict future depreciation and amortization expense (DEP_{it}). While depreciation and amortization expense is generally considered to be somewhat "sticky", it is difficult to envision a naïve analyst having perfect foresight of a value yet to be reported. Accordingly, using last year's (rather than future) depreciation and amortization expense ($DEP_{it\text{-}1}$) is arguably more consistent with the concept underlying the naïve cash flow forecast. We report the results of using this alternative definition of the naïve cash flow forecast ($EF_{it} + DEP_{it\text{-}1}$) in panel B of Table 3, and find that 66.2 percent of analysts' individual cash flow forecasts outperform the naïve cash flow forecast (z-statistic = 47.06, p-value < .001), with a median absolute forecast error that is only 59.9 percent

8. In untabulated results, we replicate GHL and compare the mean and median values of the analysts' pooled cash flow forecast error to those of the pooled naïve cash flow forecast error. Consistent with GHL, we find no significant difference between these pooled values. However, such an analysis is likely to bias against the accuracy of analysts' cash flow forecasts (and in favor of the naïve cash flow forecasts) because analysts' cash flow forecast errors are more susceptible to outliers of extreme inaccuracy. Specifically, the naïve cash flow forecast error is equal to actual accruals (adjusted for any earnings forecast error), by definition. Therefore, absolute naïve cash flow forecast errors have an upper bound equal to the size of the firm's accruals. Analysts' cash flow forecast errors, on the other hand, have no such upper bound. If an analyst forecasts accruals to be large and of the incorrect sign, the resulting cash flow forecast error will also be large, perhaps much larger than the corresponding naïve cash flow forecast error. Untabulated results confirm this intuition. Specifically, in instances when the naïve cash flow forecasts are superior (e.g., in 37.5 percent of all firm-year comparisons), the median difference in forecast accuracy (between the naïve and analysts' cash flow forecasts) is larger than when analysts' cash flow forecasts are superior (e.g., in 62.5 percent of all firm-year comparisons). In summary, because naïve cash flow forecast errors have an upper bound which limits the magnitude of naïve cash flow forecast errors, the pooling of forecast errors across firms and across years into a single mean (or median) masks the general superiority of analysts' relative to the naïve cash flow forecasts.

of that of the corresponding naïve cash flow forecast (z-statistic = 23.48E6, p-value < .001). At the firm level, we find that 60.8 percent of analysts' consensus cash flow forecasts outperform the naïve cash flow forecast (z-statistic = 14.64, p-value < .001), with a median absolute forecast error that is 77.1 percent of that of the corresponding naïve cash flow forecast (z-statistic = 59.68E4, p-value < .001). In summary, we find that the difference in accuracy between analysts' and naïve cash flow forecasts is not only statistically significant but also economically meaningful, in that the magnitude of analysts' cash flow forecast errors is only a fraction of the forecast errors from the naïve model.[9]

4. Analysis of full-text analyst reports

Our reexamination of GHL's evidence suggests their conclusion that analysts' cash flow forecasts are naïve is premature. In this and the following section, we present new evidence on the issue of cash flow forecast sophistication. We first examine whether analysts explicitly include, in their research reports, forecasts of working capital and other accruals when issuing cash flow forecasts. While the mere inclusion of accrual adjustments does not speak to the sophistication of these forecasts, it is nevertheless an important and necessary first step towards a more well-rounded understanding of how analysts derive their cash flow forecasts.

We retrieve full-text analyst reports that include a cash flow forecast for a firm from the Investext database. We randomly select three to four analyst reports from each industry based on the Fama-French 12-industry classification. We analyze 45 analyst reports issued in 2001 and another 45 analyst reports issued in 2008, for a total of 90 full-text analyst reports.[10] Ex ante, while we know each of these analysts includes a forecast of cash flows in their report, the level of detail involved in these cash flow forecasts (e.g., which accrual adjustments the analyst makes when deriving the cash flow forecast) is unknown. Each report is independently scrutinized by two authors to minimize coding errors. We document the percentage of analysts whose reports reveal an adjustment for depreciation and amortization expense when deriving their cash flow forecast, and the percentage of analysts whose reports reveal an explicit adjustment for working capital and other accruals when forecasting cash flows. We note that while DeFond and Hung (2003) and GHL include some brief discussion of their review of analyst reports, we are the first to carefully present sampling methodology and to formally tabulate findings.[11]

As outlined in Table 4, aggregating across the two sets of analyst reports, we find that 87.8 percent of the reports reveal an adjustment for depreciation and amortization expense. More importantly, 62.2 percent detail explicit adjustments for working capital accruals, and 76.7 percent detail explicit adjustments for other items (e.g., deferred taxes, stock based compensation, etc.). In total, 80.0 percent of these analysts make an adjustment for either working capital accruals or some other accrual, indicating that the majority of analysts' cash flow forecasts are not mechanical. Moreover, only 7.8 percent (7 out of 90) of analyst reports include *only* depreciation and amortization adjustments in the

9. GHL also provide evidence that analysts' cash flow forecast errors are highly correlated with naïve cash flow forecast errors (see their Table 9). However, in untabulated results we find a similarly high correlation between *actual* cash from operations and *actual* earnings plus depreciation and amortization expense. Given the high correlation between the underlying actual values, a high correlation between the associated forecast errors does not suggest analysts' cash flow forecasts lack sophistication.

10. We select 2008, the last year in our sample, because we believe an examination of the most recent analyst reports is relevant to investors considering the use of analyst cash flow forecasts in their investment decisions. We also analyze analyst reports from an earlier year, 2001, to gauge whether there has been any change in analysts' cash flow forecasting behavior. Our results across these two years are very similar.

11. In addition, based on our reading of DeFond and Hung 2003 and GHL, we believe our study differs from both studies in that we restrict our analysis to analyst reports that are known to include a cash flow forecast (of unknown sophistication), rather than looking at all analysts' reports, some of which may not include a cash flow forecast.

TABLE 3
Superiority of analysts' cash flow forecasts over naïve cash flow forecasts

Panel A: Accuracy of analysts' versus naïve cash flow forecasts, using actual depreciation to define the naïve cash flow forecast

	Individual cash flow forecasts		Consensus cash flow forecasts	
	Analysts' cash flow forecasts	Naïve cash flow forecasts	Analysts' cash flow forecasts	Naïve cash flow forecasts
Frequency of superiority[a]	62.5%***	37.5%***	57.7%***	42.3%***
Magnitude of superiority[b]	69.1%***		86.5%**	
n	21,096		4,608	

Panel B: Accuracy of analysts' versus naïve cash flow forecasts, using lagged depreciation to define the naïve cash flow forecast

	Individual cash flow forecasts		Consensus cash flow forecasts	
	Analysts' cash flow forecasts	Naïve cash flow forecasts	Analysts' cash flow forecasts	Naïve cash flow forecasts
Frequency of superiority[a]	66.2%***	33.8%***	60.8%***	39.2%***
Magnitude of superiority[b]	59.9%***		77.1%***	
n	21,126		4,608	

Notes:

Frequency of superiority is the percentage of individual analysts (firms) where the analyst's individual (consensus) cash flow forecast outperforms the naïve cash flow forecast, and vice versa. The naïve cash flow forecast is defined as follows:

$Naïve\ CFF_{it} = EF_{it} + DEP_{it}$,

where EF_{it} is the analyst's own earnings forecast for firm i in year t, and DEP_{it} is actual depreciation and amortization expense, as reported by COMPUSTAT, for firm i in year t. Alternatively, in panel B we use depreciation and amortization expense for firm i in year $t - 1$ to define the naïve cash flow forecast. Magnitude of superiority is the ratio of the analyst's individual (consensus) cash flow forecast error to the naïve cash flow forecast error, expressed as a percentage. Percentages smaller than 100 percent are consistent with analysts' cash flow forecasts being more accurate than the corresponding naïve cash flow forecasts.

*, **, ***: significant at 10 percent, 5 percent, 1 percent levels.

[a] *p*-values are two-sided and are associated with the Binomial test for differences in proportion.

[b] *p*-values are two-sided and are associated with the Wilcoxon signed-rank test for differences in medians.

TABLE 4
Review of 90 full-text analyst reports

	% of 45 analyst reports, 2001	% of 45 analyst reports, 2008	% of 90 analyst reports, 2001 and 2008
Specific accrual adjustments:			
Depreciation and amortization	86.7	88.9	87.8
Working capital	66.7	57.8	62.2
Others	80.0	73.3	76.7
Working capital or others	80.0	80.0	80.0
Only depreciation and amortization	8.9	6.7	7.8
Financial statement forecasts:			
Reconciliation of earnings forecast to cash flow forecast (e.g., operating section of cash flow statement)	73.3	80.0	76.7
Forecasts of the operating, investing and financing cash flows (e.g., full cash flow statement)	62.2	60.0	61.1
Forecasts of the balance sheet, income statement, and cash flow statement (e.g., full set of financials)	53.3	53.3	53.3

Notes:

This table presents descriptive statistics on the existence of analysts' accrual adjustments when forecasting operating cash flows, as well as the extent to which the analyst generates forecasted financial statements. This analysis is based on 45 full-text analyst reports from 2001 and 45 full-text analyst reports from 2008 that are known to include a cash flow forecast. These analyst reports represent firms from all 12 Fama-French industries.

derivation of the cash flow forecasts, suggesting that only a small minority of analysts derive their cash flow forecasts by simply adding depreciation and amortization expense back to their own earnings forecasts. These findings suggest that the vast majority of these analysts attempt to include accrual adjustments when forecasting cash flows.

In addition, we find that 76.7 percent of the reports include a reconciliation of forecasted earnings to forecasted cash flows, with details of various accrual adjustments. In 61.1 percent of the reports analysts include a full-blown forecasted statement of cash flows (including forecasts for operating, investing, and financing cash flows). Lastly, we find that 53.3 percent of the reports include forecasts of a full set of financial statements (e.g., forecasted balance sheet, income statement, and cash flow statement). Taken together, these findings suggest these analysts adopt a structured approach to forecasting, which includes forecasting a full set of financial statements that contain explicit forecasts of various accrual-based line items.

Note that our review of analyst reports represents a lower bound on the percentage of analysts who include working capital and other accrual adjustments in their cash flow forecasts, as some analysts may forecast these items without including them in their formal report. In addition, based on our reading of the analyst reports, we notice that analysts covering firms in the oil and gas industry explicitly forecast working capital accruals but deliberately exclude these working capital accrual estimates from their cash flow forecasts. We further investigate this issue with two PwC partners responsible for auditing oil and gas companies, and they indicate that the vast majority of upstream

firms in the oil and gas industry rely on an alternative measure of cash flow from operations that intentionally excludes working capital accrual adjustments. As a result, in our analysis of these analyst reports, to be conservative we code working capital accrual adjustments as missing for cash flow forecasts of such firms (there are seven such firms in our analysis), even though these analysts explicitly forecast working capital accruals in these reports.[12] Alternatively, if we treat these five reports as having made adjustments for working capital accruals, the resulting percentage of analyst reports with explicit adjustments for working capital accruals increases to 70.0 percent and the percentage of analysts making adjustments for either working capital accruals or other adjustments increases to 81.1 percent.

In addition, our scrutiny of analyst reports reveals that even in cases when analysts do not include a full set of forecasted financial statements in the report, they routinely offer other estimates, such as earnings forecasts for each segment or geographical area, target prices, or abbreviated versions of forecasted financial statements with forecasts of key metrics for each financial statement, or qualitative discussions of the risks and uncertainties faced by the firm. Thus, it appears analysts are fairly comprehensive in their research coverage.

In summary, evidence from this analysis suggests many analysts formally incorporate forecasts of working capital and other accruals into their cash flow forecasts. To examine whether the inclusion of such accrual adjustments leads to more sophisticated cash flow forecasts, we next conduct large sample analyses to address (1) whether the accrual forecasts implied by analysts' cash flow forecasts correctly predict the sign and magnitude of actual accruals, and (2) how these implied accrual forecasts compare to those implied by an alternative cash flow forecast available to investors (a time-series cash flow prediction model (Barth et al. 2001)).

5. Large sample analyses, 1993–2008

We supplement our inspection of analyst reports with new large-sample evidence on the sophistication of analysts' cash flow forecasts. We first examine whether the working capital and other accrual estimates implied by analysts' cash flow forecasts correctly predict the *sign* of actual accruals. Second, we examine the *magnitude* of the accrual forecast errors. In doing so, we compare analysts' cash flow forecasts to alternative cash flow forecasts available to capital market participants (e.g., time-series forecasts).

This comparison of analysts' cash flow forecasts and time-series cash flow forecasts is important because it provides an apples-to-apples comparison of various cash flow forecasts available to market participants. Given that an investor's alternative to relying on an analyst's cash flow forecast to predict future cash flows is to rely on some other cash flow forecast, comparing analysts' cash flow forecasts to time-series cash flow forecasts is informative.

Deriving accrual adjustments embedded in cash flow forecasts

The question of interest is the extent to which analysts correctly incorporate working capital and other accrual forecasts into their cash flow forecasts. We derive the accrual adjustments embedded in a cash flow forecast by taking the difference between the cash flow forecast and a naïve cash flow forecast.

We obtain analysts' cash flow forecasts (*CFF*) directly from I/B/E/S. We calculate time-series cash flow forecasts from the Barth et al. 2001 model, which is based on estimating the following equation for each of the 48 Fama-French 1997 industries in each

12. Oil and gas firms constitute about 10 percent of our total sample. As a sensitivity check, we exclude these firms from all our large sample analyses and find qualitatively similar results.

year with at least 20 useable observations:[13,14]

$$CFO_{it} = \beta_0 + \beta_1 CFO_{it-1} + \beta_2 \Delta AR_{it-1} + \beta_3 \Delta INV_{it-1} + \beta_4 \Delta AP_{it-1} + \beta_5 DEP_{it-1} + \beta_6 OTHER_{it-1} + \varepsilon_{it} \quad (7).$$

The detailed definitions of all variables in (7) are provided in Table 5. Using the coefficients from the above model, we obtain an estimate of next-period cash from operations for each firm-year observation.[15] We label the time-series forecasts of cash flows that result from this model *TS_CFF*.

We identify the accrual forecast implied by each analyst's cash flow forecast (time-series cash flow forecast) by subtracting the naïve cash flow forecast (5) from the analyst's forecast (time-series forecast) of cash flows, as follows:

$$F\_ACC_{it} = CFF\_it - (EF_{it} + DEP_{it}) \quad (8),$$

$$TSF\_ACC_{it} = TS\_CFF_{it} - (EF_{it} + DEP_{it}) \quad (9).$$

F_ACC_{it} is the accrual adjustment implied by the analyst's cash flow forecast, and TSF_ACC_{it} is the accrual adjustment implied by the time-series cash flow forecast.

We measure actual accruals as the difference between reported cash flows and reported earnings plus depreciation and amortization expense as follows:

$$A\_ACC_{it} = CFO^{IBES}{}_{it} - (EARN^{IBES}{}_{it} + DEP_{it}) \quad (10),$$

where $CFO^{IBES}{}_{it}$ is I/B/E/S reported cash from operations for firm i in year t, $EARN^{IBES}{}_{it}$ is I/B/E/S reported earnings for firm i in year t, and A_ACC_{it} is actual working capital and other accruals for firm i in year t.

Sophistication of analysts' cash flow forecasts — sign tests

Our sign test compares the sign of *F_ACC* (*TSF_ACC*) to the sign of actual accruals, *A_ACC*. If *F_ACC* (*TSF_ACC*) is of the same sign as actual accruals, we classify the cash flow forecast as "sophisticated". Alternatively, if the sign of *F_ACC* (*TSF_ACC*) is opposite to that of *A_ACC*, we classify the cash flow forecast as "unsophisticated". If analysts had perfect foresight of future cash flows and earnings, the forecast of working capital and other accruals implied by their cash flow forecasts (i.e., *F_ACC*) would equal *A_ACC*.[16]

13. We estimate (7) across 754 unique industry-year combinations. The average coefficients are all significantly positive, with the exception of β_4 (ΔAP), which is significantly negative. The mean (median) adjusted R^2 from these regressions is 56.0 percent (59.3 percent), suggesting this time-series model does a reasonable job of predicting next-period operating cash flows.
14. We also estimate (7) on a firm-specific basis (using a minimum of 10 prior years of data) and find qualitatively similar results. In the empirical tests that follow, we employ the cross-sectional estimates of cash flows by industry-year rather than firm-specific estimates in an effort to maximize the number of useable observations. It is unclear whether GHL employ a cross-sectional or firm-specific time-series estimate of cash flows in their study.
15. All variables used to generate the time-series cash flow forecasts are scaled by average total assets. As a result, in order to compare the time-series cash flow forecasts to analysts' cash flow forecasts, we multiply the time-series cash flow forecasts that result from (7) by average total assets, and then put these forecasts on a per share basis using the number of shares outstanding, as reported by I/B/E/S.
16. One could argue that if analysts had perfect foresight, their accrual forecasts (*F_ACC*) would equal actual accruals (*A_ACC*) adjusted for any error in the analyst's own earnings forecast. As discussed in section 7, when we conduct these tests using this alternative measure of forecasted accruals (using actual earnings rather than forecasted earnings to derive naïve cash flow forecasts in (5)), our results are unchanged.

We tabulate the percentage of "sophisticated" analyst and time-series cash flow forecasts, as outlined above, based on both individual and consensus forecasts.[17,18] As reported in panel A of Table 5, 73.4 percent of analysts' individual cash flow forecasts and 68.2 percent of analysts' consensus cash flow forecasts reflect working capital and other accrual adjustments of the correct sign. As a comparison, 60.9 percent of individual time-series cash flow forecasts and 59.2 percent of consensus time-series cash flow forecasts reflect accrual adjustments of the correct sign. A chi-square test reveals that the difference in these percentages are significant ($\chi^2 = 202.79$, p-value $< .001$ for comparison of individual forecasts; $\chi^2 = 809.45$, p-value $< .001$ for comparison of consensus forecasts,), which suggests analysts do a better job of incorporating working capital and other accrual adjustments into their cash flow forecasts than do alternative forecasts that are available to investors (e.g., time-series forecasts).

Sophistication of analysts' cash flow forecasts — magnitude tests

We further shed light on the *degree* of sophistication of the accrual adjustments reflected in analysts' cash flow forecasts and time-series cash flow forecasts by focusing on the *magnitude* of these adjustments. For each cash flow forecast classified as "sophisticated" (e.g., for each analyst cash flow forecast and each time-series cash flow forecast with an implied accrual adjustment of the same sign as actual accruals), we calculate an accrual forecast error as follows:

$$FE\_ACC_{it} = |(Forecasted\ ACC_{it} - A\_ACC_{it})/(A\_ACC_{it})| \quad (11),$$

where $Forecasted\ ACC_{it}$ is the accrual estimate implied by the cash flow forecast being evaluated, and A_ACC_{it} is actual accruals for firm i in year t. We calculate FE_ACC using the implied accrual forecasts arising from each cash flow forecast: analysts' cash flow forecasts and the time-series cash flow forecasts.[19] (11) provides accrual forecast errors as a percentage of the actual (i.e., "perfect foresight") accrual adjustment. Smaller values of FE_ACC represent more accurate accrual forecasts, and therefore more sophisticated cash flow forecasts. We compare the median value of FE_ACC for analysts' cash flow forecasts and the time-series cash flow forecasts.[20]

We start by calculating the magnitude of accrual forecast errors for cash flow forecasts that correctly predict the sign of actual accruals. We want to point out that it does not necessarily follow that analysts can better predict the *magnitude* of actual accruals simply because analysts correctly forecast the *sign* of accruals more often than do time-series forecasts. Ex ante, it is entirely possible that analysts are more likely to correctly predict the sign of accruals, but that the time-series forecasts, when of the correct sign, provide

17. Because we benchmark the sophistication of analysts' cash flow forecasts against time-series forecasts of operating cash flows, we restrict our analysis only to firm-year (or analyst-firm-year) observations where both analysts' and time-series cash flow forecasts are available. Doing so allows us to compare both cash flow forecasts using a common sample of firms to mitigate any concern that differences in forecast errors are driven by analysts only issuing cash flow forecasts for firms with cash flows that are easy to predict. As a result, about 19 percent of analysts' cash flow forecasts are excluded from this analysis because there is no corresponding time-series forecast. Our results are unchanged when we do not impose this restriction.

18. While the time-series forecasts of cash flows are the same for all analysts following a given firm, each analyst has a unique *Naïve CFF*. As a result, we are able to perform this analysis at both the firm level and the analysts' level.

19. For example, when evaluating the magnitude of the accrual forecast error implied by analysts' (time-series) cash flow forecasts, *Forecasted ACC* in (11) is *F_ACC* from (8) (*TSF_ACC* from (9)).

20. The mean values of *FE_ACC* are less descriptive than are the median values because of outliers, and therefore, we focus our tests on the median values. However, the results using mean values are qualitatively the same.

TABLE 5
The sign and magnitude of accrual adjustments implied by analysts' cash flow forecasts and time-series cash flow forecasts

Panel A: The sign of accrual adjustments

	The percentage of accruals that are correctly signed		
	Analysts' cash flow forecasts	Time-series cash flow forecasts	Difference in % of sophisticated forecasts
Individual forecasts	73.4% *n* = 21,096	60.9% *n* = 21,096	12.6%*** *n* = 21,096
Consensus forecasts	68.2% *n* = 4,608	59.2% *n* = 4,608	9.1%*** *n* = 4,608

Panel B: The magnitude of accrual adjustments: Cash flow forecasts of the correct sign

	The median accrual forecast error		
	Analysts' cash flow forecasts	Time-series cash flow forecasts	Difference in median accrual forecast error
Individual forecasts	0.368 *n* = 15,485	0.786 *n* = 12,836	0.281*** *n* = 10,126
Consensus forecasts	0.506 *n* = 3,143	0.892 *n* = 2,725	0.300***m *n* = 2,042

(The table is continued on the next page.)

TABLE 5 (Continued)

Panel C: The magnitude of accrual adjustments: All cash flow forecasts

	The median accrual forecast error		
	Analysts' cash flow forecasts	Time-series cash flow forecasts	Difference in median accrual forecast error
Individual forecasts	10.647	1.565	1.763***
	n = 20,944	n = 20,944	n = 20,944
Consensus forecasts	0.856	1.840	0.858***
	n = 4,584	n = 4,584	n = 4,584

Notes:

This table examines the percentage of individual and consensus forecasts that reflect working capital and other accrual estimates of the correct sign (panel A) and the magnitude of these accrual adjustments (panels B and C) for analysts' cash flow forecasts and time-series cash flow forecasts. Analysts' cash flow forecasts are obtained from the I/B/E/S detail file. Time-series cash flow forecasts are computed by estimating the following regression (Barth et al. 2001) for each industry and year with at least 20 useable observations:

$$CFO_{it} = \beta_0 + \beta_1 CFO_{it-1} + \beta_2 \Delta AR_{it-1} + \beta_3 \Delta INV_{it-1} + \beta_4 \Delta AP_{it-1} + \beta_5 DEP_{it-1} + \beta_6 OTHER_{it-1} + \varepsilon_{it},$$

where CFO_{it} is cash from operations for firm i in year t, $\Delta AR_{it\text{-}1}$ is the change in accounts receivable for firm i in year $t-1$, $\Delta INV_{it\text{-}1}$ is the change in inventory for firm i in year $t-1$, $\Delta AP_{it\text{-}1}$ is the change in accounts payable for firm i in year $t-1$, $DEP_{it\text{-}1}$ is depreciation and amortization expense for firm i in year $t-1$, and $OTHER_{it\text{-}1}$ is all other accruals for firm i in year $t-1$. All variables come from COMPUSTAT and are scaled by average total assets.

Actual accruals are computed as the difference between actual cash from operations (per I/B/E/S) and the naïve cash flow forecast (actual earnings (per I/B/E/S) plus depreciation and amortization expense). We measure the magnitude of the accrual adjustment as follows:

$$FE\_ACC_{it} = |(Forecasted - ACC_{it} - A\_ACC_{it})/(A\_ACC_{it})|,$$

where $Forecasted\_ACC_{it}$ is the forecast of accruals for firm i in year t implied by the cash flow forecast in question (analysts' and time-series) and A_ACC_{it} is actual accruals for firm i in year t. We truncate all accrual forecast errors at the 99 percent level.

*, **, ***: significant at 10 percent, 5 percent, 1 percent levels. p-values in panel A are associated with chi-square test for differences in proportion. For panels B and C, p-values (two-sided) are associated with the Wilcoxon signed-rank test for differences in medians.

more accurate accrual adjustments than do analysts. As a result, the magnitude tests reported here represent an additional assessment of the sophistication of analysts' cash flow forecasts.

We report the results of these comparisons in panel B of Table 5. As a frame of reference, the most accurate accrual forecast would have an error (*FE_ACC*) of zero. *FE_ACC* will equal one if the cash flow forecast equals the naïve cash flow forecast (i.e., *Forecasted ACC* in (11) would be zero as the analyst does not make any adjustment for working capital or other accruals). *FE_ACC* will be greater than one if the implied accrual forecast results in a cash flow forecast that is less accurate than even the naïve cash flow forecast. We find that the median individual analysts' accrual forecast error is 0.368, and that the median consensus analysts' accrual forecast error is 0.506. Time-series cash flow forecasts have a median accrual forecast error of 0.786 (individual) and 0.892 (consensus). Both values are economically and statistically larger than the corresponding accrual forecast errors derived from analysts' cash flow forecasts (z-statistic = 15.36E6, p-value < .001 for individual forecasts; z-statistic = 59.10E4, p-value < .001 for consensus forecasts).[21] In panel C of Table 5 we repeat this analysis using all cash flow forecasts, including those with working capital and accrual forecasts of the incorrect sign. While the magnitudes of the accrual forecast errors are larger than in panel C (because forecasts with accruals of the incorrect sign are included in this analysis), the tenor of the results remains unchanged. Specifically, analysts' cash flow forecasts outperform the time-series cash flow forecasts. In general, these results further suggest analysts' cash flow forecasts are more sophisticated than their time-series counterparts.

6. The pricing of analysts' cash flow forecast revisions

While DeFond and Hung (2003) and GHL examine the association between stock returns and cash flow forecast errors derived from analysts' cash flow forecasts, perhaps the most direct test of the market's perception of the sophistication of analysts' forecasts (whether for cash flow or earnings forecasts) is to examine whether investors react to analysts' forecast revisions (e.g., Givoly and Lakonishok 1979; Francis and Soffer 1997; Frankel, Kothari, and Weber 2006). If market participants believe analysts' cash flow forecasts provide meaningful predictions of future cash flow realizations and have information content, revisions in these forecasts will be accompanied by corresponding stock price changes. To examine this issue, we estimate the following regressions for all individual analysts' cash flow forecast revisions:

$$CAR_{ijt} = \alpha_0 + \beta_1 CFF\_REV_{ijt} + \varepsilon_{ijt} \quad (12a),$$

$$CAR_{ijt} = \alpha_0 + \beta_1 CFF\_REV_{ijt} + \beta_2 EF\_REV_{ijt} + \varepsilon_{ijt} \quad (12b),$$

where CAR_{ijt} is the 4-day cumulative abnormal return for firm i, measured beginning the day immediately prior to analyst j's cash flow forecast revision.[22] CFF_REV_{ijt} (EF_REV_{ijt}) is analyst j's cash flow (earnings) forecast revision for firm i, measured as the difference between analyst j's current cash flow (earnings) forecast and analyst j's prior cash flow

21. Rather than classifying as "sophisticated" all cash flow forecasts that incorporate accrual estimates of the correct sign (regardless of the magnitude of the accrual forecast), an alternative (and more restrictive) definition is to classify as "sophisticated" only those cash flow forecasts that are more accurate than the naïve cash flow forecast. This alternative definition essentially requires that the accrual forecast be of the correct sign and of a certain magnitude. When we employ this definition of sophistication, analysts' cash flow forecasts are significantly more sophisticated than time-series cash flow forecasts, both in this more restrictive sign test and in the subsequent magnitude test.

22. Abnormal returns are measured using the market model over the 60 months before the current fiscal year. We use the value-weighted index to proxy for market returns. As a robustness check, we use 3-day (instead of 4-day) cumulative abnormal returns and find qualitatively similar results.

TABLE 6
Market reaction to analysts' cash flow forecast revisions

Models:

$$CAR_{ijt} = \alpha_0 + \beta_1 CFF\_REV_{ijt} + \varepsilon_{ijt} \quad (12a)$$

$$CAR_{ijt} = \alpha_0 + \beta_1 CFF\_REV_{ijt} + \beta_2 EF\_REV_{ijt} + \varepsilon_{ijt} \quad (12b)$$

	Coefficients (*t*-statistics)			
Independent variables	Column 1 (12a)	Column 2 (12b)	Column 3 (12b)	Column 4 (12a)
Intercept	0.002	0.002	0.001	0.003
	(1.159)	(1.266)	(0.563)	(2.761)***
CFF_REV	0.502	0.320	0.270	0.131
	(10.171***)	(7.128***)	(4.462***)	(2.903***)
EF_REV	n/a	1.061	0.859	n/a
	n/a	(9.601***)	(7.751***)	n/a
n	101,001	101,001	55,785	15,033
Adj. R^2	0.4%	0.6%	0.9%	0.1%

Notes:

In this table we examine the 4-day market reaction surrounding analysts' cash flow forecast revisions. CAR_{ijt} is the 4-day cumulative abnormal return for firm *i*, measured beginning the day immediately prior to analyst *j*'s cash flow forecast revision. CFF_REV_{ijt} (EF_REV_{ijt}) is the amount of analyst *j*'s cash flow (earnings) forecast revision for firm *i* at time *t*, measured as the difference between analyst *j*'s current cash flow (earnings) forecast and analyst *j*'s prior cash flow (earnings) forecast for firm *i*, scaled by firm *i*'s stock price two days before the revision. In column 2, when an analyst revises a cash flow forecast without revising her earnings forecast, we set *EF_REV* equal to zero. In column 3, we restrict the analysis to simultaneous cash flow and earnings forecast revision by a given analyst. In column 4, we restrict the analysis to cash flow forecasts revised in isolation (without a simultaneous earnings forecast revision) and with no earnings forecast issued for the same firm by any analyst within the 7-day (−3, +3) period centered around the cash flow forecast revision. Abnormal returns are measured using the market model over the 60 months before the current fiscal year. We use the value-weighted index to proxy for market returns. We truncate all variables at the 1 percent and 99 percent levels. Standard errors are clustered by both firm and time.

*, **, ***: significant at 10 percent, 5 percent, 1 percent levels. *p*-values are two-sided and are associated with *t*-statistics.

(earnings) forecast for firm *i*, scaled by firm *i*'s stock price two days before the revision.[23] All observations in our sample represent an individual analyst's cash flow forecast revision, regardless of whether the analyst also revised her earnings forecast on this date.[24] To mitigate the impact of confounding news events, we omit all cash flow forecast revisions that are made within 5 days (−5, +5) of any earnings announcement made by the firm. (12a) tests whether there is an immediate market reaction to analysts' cash flow forecast revisions. In addition, given that analysts commonly revise their earnings and cash flow forecasts on the same day, we estimate (12b) to examine whether investors react to analysts' cash flow forecast revisions after controlling for their reaction to analysts' earnings forecast revisions.[25] We truncate all variables at the 1 percent and 99 percent levels to mitigate the impact of large outliers and report *t*-statistics clustered by firm and time to account for time series and cross-sectional dependence (Petersen 2009).[26]

In Table 6, we report a positive and significant 4-day stock price reaction surrounding analysts' cash flow forecast revisions (β_1 in column 1 = 0.502, firm-and-time clustered *t*-statistics = 10.171). When we control for the earnings forecast revisions that may have occurred on the same day, we find that, not surprisingly, investors react more to earnings forecast revisions than to cash flow forecast revisions (Dechow 1994; Brown et al. 2010). More importantly, we continue to find a statistically significant positive association between short-window stock returns and analysts' cash flow forecast revisions (β_1 in column 2 = 0.320, firm-and-time clustered *t*-statistics = 7.128).[27]

One concern is that I/B/E/S may not always correctly capture the date of both the earnings forecast revision and the cash flow forecast revision. For example, if an analyst revises both forecasts on the same day, but I/B/E/S codes these forecasts as being revised on consecutive days, we would erroneously attribute investors' reaction to both revisions to just the cash flow forecast revision. This error arises because in such a scenario we would set *EF_REV* to zero, consistent with I/B/E/S not reporting an earnings forecast revision on that date, but would capture the abnormal return caused by both revisions. To mitigate this concern, we perform two additional analyses. First, we reestimate (12b) and restrict our analysis to only those cash flow forecasts that, per I/B/E/S, are revised on the same day as the earnings forecast. Doing so mitigates the concern that we incorrectly attribute any reaction to analysts' earnings forecast revisions to their cash flow forecast revisions. As reported in column 3 of Table 6, we continue to find a significant reaction to analysts' cash flow forecast revisions (β_1 in column 3 = 0.270, firm-and-time clustered *t*-statistics = 4.462), even after controlling for the contemporaneous earnings forecast revision. Second, we reestimate (12a) and restrict our analysis to cash flow forecasts

23. Prior studies (e.g., Stickel 1991; Park and Stice 2000; Gleason and Lee 2003) show that an analyst's own prior forecast is a better benchmark than the consensus forecast for measuring the amount of surprise in an *individual* analyst forecast revision. This is because analysts treat non-recurring items (e.g., restructuring charges and accounting changes) differently and the increased noise as a result of comparing forecasts made by a particular analyst with forecasts made by other analysts may outweigh the increased precision in measuring market expectations using consensus forecasts.

24. In our sample, 55.2 percent of cash flow forecast revisions are accompanied by a corresponding earnings forecast revision.

25. When estimating (12b), we capture any earnings forecast revision (*EF_REV*) the analyst may have made on the same day as the cash flow forecast revision (*CFF_REV*). When an analyst revises the cash flow forecast without making a corresponding earnings forecast revision, we set *EF_REV* to zero (consistent with the analyst making no revision to the earnings forecast). In a subsequent test in this section, we restrict the analysis to analysts who revise both the cash flow and earnings forecast on the same day.

26. When we alternatively cluster by firm and analyst, all results reported in Table 6 remain qualitatively similar.

27. When the market reaction to both the earnings and cash flow forecast revisions are evaluated in the same model, we check for multicollinearity by examining the variance inflation factors (VIF). The VIFs are below 2.0 in all our regressions, suggesting multicollinearity is not a concern.

revised in isolation (e.g., without a contemporaneous earnings forecast revision), and with no earnings forecast issued for the same firm by any analyst in the 7-day (−3, +3) period centered around the cash flow forecast revision (such that the return accumulation period does not overlap with that of any earnings forecast revision issued for the firm). This test isolates investors' immediate response to the news in the cash flow forecast revision. We report the results of this test in column 4 of Table 6, and continue to find a significant reaction to analysts' cash flow forecast revisions (β_1 in column 3 = 0.131, firm-and-time clustered t-statistics = 2.903).[28]

These findings suggest investors behave as if analysts' cash flow forecasts are meaningful and informative predictions of future cash flows, and that they represent something more than simple, mechanical adjustments to earnings. These results also suggest that investors are not replicating analysts' cash flow forecasts, despite claims in prior research (GHL) that it would be easy for them to do so. While evidence that investors respond to analysts' cash flow forecasts revisions only provides indirect evidence on the issue of analysts' cash flow forecast sophistication, these results corroborate our findings that analysts' cash flow forecasts incorporate meaningful predictions of working capital and other accruals, and therefore meaningful predictions of future cash flows.

7. Sensitivity analyses

Measuring naïve cash flow forecasts

In section 3, we follow GHL and define the naïve cash flow forecast as the sum of the analysts' earnings forecast and the firm's actual depreciation and amortization expense (see (5)), and in section 5 we use it to derive analysts' accrual forecast (see (8)). An alternative to using forecasted earnings in (5) is to use reported earnings to derive the naïve cash flow forecast. Specifically, we could measure the naïve cash flow forecast as follows:

$$Naïve\ CFF_{it} = EARN^{IBES}{}_{it} + DEP_{it}, \tag{5}$$

where $EARN^{IBES}{}_{it}$ is actual earnings from I/B/E/S for firm i in year t and DEP_{it} is realized depreciation and amortization expense on a per share basis for firm i in year t. This definition of the naïve cash flow forecast results in an accrual forecast error that is independent of any error in the analyst's earnings forecast. In essence, the definition outlined in (5) allows us to turn just one dial (cash flow forecast error) when developing the accrual forecast error, rather than two dials (cash flow forecast error *and* earnings forecast error).

Ex ante, it is unclear which definition of the naïve cash flow forecast (using forecasted earnings or actual earnings) is most descriptive of analysts' cash flow forecasting process. One advantage of using forecasted earnings (see (5)) is that it assumes analysts first forecast earnings and then derive their cash flow forecasts by making adjustments to this earnings forecast. However, if analysts overestimate earnings because they overestimate cash from operations (rather than because they overestimate accruals), earnings forecast errors may not be associated with accrual forecast errors, suggesting the definition outlined in (5) would be preferred.

Using this alternative measure of naïve cash flow forecasts, we reexamine the sign and magnitude of analysts' accrual forecasts (as outlined in Table 5) using *actual* earnings in the derivation of the naïve cash flow forecast. In untabulated analysis, we find similar results: relative to time-series cash flow forecasts, analysts' cash flow forecasts reflect the correct sign of accruals more often, and that of those forecasts that correctly predict the

28. The adjusted R^2 values reported in Table 4 (0.4 percent to 0.9 percent) are consistent with those reported in prior studies that examine short-term market reactions surrounding analyst forecast revisions. For example, Park and Stice (2000) report an adjusted R^2 of 0.1 percent in a regression of 3-day market-adjusted returns on analysts' earnings forecast revisions, while Stickel (1992) reports adjusted R^2 values that are all less than 1 percent in similar regressions using various windows for market-adjusted returns.

sign of accruals, analysts' accrual forecast errors are significantly smaller. In short, our results are not dependent on the use of forecasted versus actual earnings in the definition of naïve cash flow forecasts.

Using COMPUSTAT versus I/B/E/S actual cash flows to evaluate time-series forecasts

As explained in section 5, we compare analysts' and time-series cash flow forecasts to actual cash flow values obtained from I/B/E/S. One concern is that analysts' cash flow forecasts outperform time-series cash flow forecasts simply because the analysts' cash flow forecasts are also obtained from I/B/E/S, whereas the time-series cash flow forecasts are computed using COMPUSTAT data. Ex ante, it is possible that the time-series cash flow forecasts (based on COMPUSTAT data) appear less sophisticated simply because they are evaluated relative to actual cash flow values from a different database.

To ensure that the superiority of analysts' cash flow forecasts is not driven by the mismatch between COMPUSTAT time-series forecasts and I/B/E/S actual values, we reestimate our analyses and compare the time-series cash flow forecasts to actual cash flow values obtained from COMPUSTAT. In doing so, we ensure that any differences that may exist between the cash flow values the time-series model predicts and the cash flow values I/B/E/S reports are not driving our results. In untabulated results, we find that our results and inferences are unchanged when we compare the time-series cash flow forecasts to actual cash flow from operations obtained from COMPUSTAT.

Alternative measures of analysts' individual and consensus cash flow forecasts

We also evaluate the robustness of our results to three alternative definitions of analysts' cash flow forecasts. First, in our main empirical tests, we examine each individual analyst's *last* cash flow forecast issued before the earnings announcement (i.e., end-of-year forecasts). However, GHL evaluate both beginning-of-year and end-of-year cash flow forecasts. As a sensitivity check, we examine each individual analyst's *first* cash flow forecast at the beginning of the year and find qualitatively similar results (untabulated).

Second, when we examine each individual analyst's last cash flow forecast issued before the earnings announcement, we do not impose any restriction on forecast age. This is done because our purpose is to examine the sophistication of cash flow forecasts issued by *all* analysts. Furthermore, GHL find evidence consistent with less frequently updating of analysts' cash flow forecasts relative to their earnings forecasts, suggesting that a "stale" earnings forecast may not be the same as a "stale" cash flow forecast. Nevertheless, when we retain only forecasts issued within 90 days prior to the earnings announcement date to control for stale forecast, which result in the exclusion of some analysts' last cash flow forecast, our results (untabulated) are qualitatively the same.

Lastly, we compute consensus forecasts as the median of all forecasts outstanding immediately prior to the earnings announcement. As a sensitivity check, we define consensus forecasts as the mean (rather than median) forecast and find qualitatively similar results.

8. Conclusion

We examine the extent to which analysts incorporate meaningful adjustments of working capital and other accruals into their cash flow forecasts. We analyze 90 randomly-sampled full-text analyst reports and document that when deriving their cash flow forecasts, 87.8 percent of these analysts show specific adjustments for depreciation and amortization expense, 62.2 percent show explicit adjustments for working capital accruals, 76.7 percent discuss adjustments for other items, and 80.0 percent reconcile forecasted earnings to forecasted cash flows with various accrual adjustments. Moreover, only 7.8 percent of analyst reports include *only* depreciation and amortization adjustments in the derivation

of the cash flow forecast. In addition, 53.3 percent of the reports include forecasts of all three financial statements, suggesting these analysts explicitly forecast various accrual-based line items. These findings provide direct evidence that analysts are not simply adding depreciation expense to their own earnings forecasts when forming cash flow forecasts, and that they attempt to include the more difficult working capital and other accrual forecasts in their cash flow forecasts.

We also use a large sample of analysts' cash flow forecasts to further examine the extent to which these forecasts of working capital and other accruals correctly predict the sign and magnitude of actual accruals. Rather than comparing analysts' cash flow forecasts to their earnings forecasts, we compare analysts' cash flow forecasts to time-series cash flows forecasts. This comparison is important because when capital market participants desire a forecast of future cash flows, analysts' cash flow forecasts and time-series cash flow forecasts represent alternative (and competing) estimates of next-period cash flows. Even if the properties of analysts' cash flow forecasts are inferior to those of analysts' earnings forecasts, these cash flow forecasts can provide value and information to users if they are superior to alternative cash flow forecasts available to investors.

Our results indicate that accrual forecasts implied by analysts' cash flow forecasts correctly predict the sign of actual accruals more often than do accrual forecasts implied by time-series cash flow forecasts. In addition, analysts' accrual forecast errors are smaller than are time-series accrual forecast errors. These results suggest that analysts' cash flow forecasts are superior to time-series cash flow forecasts.

In addition, we find that in the short-window around analysts' cash flow forecast revisions, investors adjust stock prices in a manner consistent with these cash flow forecast revisions providing new information to the market. This finding holds even when controlling for analysts' earnings forecast revisions that occur on the same day. This result corroborates our main findings and suggests investors view analysts' cash flow forecasts as sufficiently sophisticated to be considered when making resource allocation decisions.

Our findings are contrary to the conclusion reached by GHL (2009) that analysts simply add depreciation and amortization expense to their earnings forecasts when deriving their cash flow forecasts. We reexamine the empirical tests used by GHL to arrive at their conclusion, and find their primary tests to be nondiagnostic, in that even a perfect foresight cash flow forecast with zero forecast error (i.e., a cash flow forecast equal to I/B/E/S actual cash flows) would not be classified as "sophisticated" using their approach. Their tests are nondiagnostic because the cash flow values reported in I/B/E/S (and that analysts are forecasting) are not the same as those reported in COMPUSTAT and used in their model.

The results of this study are important to investors who consider using cash flow forecasts provided by analysts when making investment decisions. Analysts also benefit from knowing the quality of their research output. Most importantly, the results of this study are relevant to researchers interested in evaluating analysts' cash flow forecasts or using these forecasts in various research settings. Prior conclusions that analysts' cash flow forecasts are trivial extensions of their own earnings forecasts call into question the relevance and validity of current and future research in this area. However, we show that such conclusions are unwarranted, and that analysts' cash flow forecasts are actually more sophisticated than alternative cash flow forecasts available to market participants.

We caution that the evidence documented in this paper, that analysts' cash flow forecasts incorporate meaningful adjustments for working capital and other accruals, and that analysts' cash flow forecasts outperform alternative forecasts available to investors, should not be construed as evidence that analysts' cash flow forecasts are the best proxy for expected future cash flows in each and every setting. In addition, these findings do not shed light on whether the cash flow number reported in I/B/E/S (and forecasted by

analysts) is a better measure of firm performance and predictor of future cash flows than is the GAAP-based cash flow number (reported by COMPUSTAT). We leave these important issues to future research.

References

Abarbanell, J., and R. Lehavy. 2002. Differences in commercial database reported earnings: implications for empirical research. Working paper, University of North Carolina and University of Michigan.

Abarbanell, J., and R. Lehavy. 2007. Letting the "tail wag the dog": The debate over GAAP vs. street earnings revisited. *Contemporary Accounting Research* 24 (3): 675–723.

Barth, M. E., D. Cram, and K. Nelson. 2001. Accruals and the prediction of future cash flows. *The Accounting Review* 76 (1): 27–58.

Bradshaw, M., and R. Sloan. 2002. GAAP vs. the street: An empirical assessment of the two alternative definitions of earnings. *Journal of Accounting Research* 40 (1): 41–66.

Brown, L. D., K. Huang, and A. S. Pinello. 2010. To beat or not to beat? The importance of analysts' cash flow forecasts. Working paper, Georgia State University.

Call, A. C. 2009. Analysts' cash flow forecasts and the properties and pricing of operating cash flows. Working paper, University of Georgia.

Call, A. C., S. Chen, and Y. H. Tong. 2009. Are analysts' earnings forecasts more accurate when accompanied by cash flow forecasts? *Review of Accounting Studies* 14 (2–3): 358–91.

Dechow, P. M. 1994. Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of Accounting and Economics* 18 (1): 3–42.

DeFond, M., and M. Hung. 2003. An empirical analysis of analysts' cash flow forecasts. *Journal of Accounting and Economics* 35 (1): 73–100.

Ertimur, Y., and S. Stubben. 2005. Analysts' incentives to issue revenue and cash flow forecasts. Working paper, Duke University and University of North Carolina at Chapel Hill.

Fama, E. F., and K. R. French. 1997. Industry costs of equity. *Journal of Financial Economics* 43 (2): 153–93.

Francis, J., and L. Soffer. 1997. The relative informativeness of analysts' stock recommendations and earnings forecast revisions. *Journal of Accounting Research* 35 (2): 193–211.

Frankel, R., S. P. Kothari, and J. Weber. 2006. Determinants of the informativeness of analysts' research. *Journal of Accounting and Economics* 41 (1–2): 29–54.

Givoly, D., C. Hayn, and R. Lehavy. 2009. The quality of analysts' cash flow forecasts. *The Accounting Review* 84 (6): 1877–911.

Givoly, D., and J. Lakonishok. 1979. The information content of financial analysts' forecasts of earnings: Some evidence on semi-strong inefficiency. *Journal of Accounting and Economics* 1 (3): 165–85.

Gleason, C., and C. Lee. 2003. Analyst forecast revisions and market price discovery. *The Accounting Review* 78 (1): 193–225.

McInnis, J., and D. Collins. 2011. The effect of cash flow forecasts on accrual quality and benchmark beating. *Journal of Accounting and Economics* 51 (3): 219–39.

Melendrez, K. D., W. C. Schwartz, and M. A. Trombley. 2008. Cash flow and accrual surprises: Persistence and return implications. *Journal of Accounting, Auditing, and Finance* 23 (4): 573–92.

Pae, J., and S. Yoon. 2011. Determinants of analysts' cash flow forecast accuracy. *Journal of Accounting, Auditing, and Finance* 27 (1): 123–44.

Park, C. W., and E. K. Stice. 2000. Analyst forecasting ability and the stock price reaction to forecast revisions. *Review of Accounting Studies* 5 (3): 259–72.

Peterson, M. A. 2009. Estimating standard errors in financial panel data sets: Comparing approaches. *Review of Financial Studies* 22 (1): 435–80.

Stickel, S. E. 1991. Common stock returns surrounding earnings forecast revisions: More puzzling evidence. *The Accounting Review* 66 (2): 402–16.

Stickel, S. E. 1992. Reputation and performance among security analysts. *The Journal of Finance* 47 (5): 1811–36.

Yoo, C., and J. Pae. 2011. Estimation and prediction tests of cash flow forecast accuracy. *Journal of Forecasting*. Advance online publication. doi:10.1002/for.1263