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Evidence That Management Earnings Forecasts Do Not Fully Incorporate Information in Prior Forecast Errors

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Abstract: This paper investigates whether managers fully incorporate the implications of their prior earnings forecast errors into their future earnings forecasts and, if not, whether this behavior is related to the post-earnings announcement drift. I find a positive association in consecutive management forecast errors, suggesting that managers underestimate the future implications of past earnings information when forecasting earnings. I also find that managers underestimate the information in their prior forecast errors to a greater extent when they make earnings forecasts with a longer horizon. Finally, I find that, similar to managers, the market also underreacts to earnings information in management forecast errors, which leads to predictable stock returns following earnings announcements.

Keywords: management forecasts, forecast errors, underestimate, post-earnings announcement drift

1. INTRODUCTION

The question of market efficiency with respect to earnings information has attracted substantial attention from accounting researchers. In an influential paper, Ball and Brown (1968) find preliminary evidence of a post-earnings announcement drift; that is, stock prices continue to drift in the direction of the initial price response to an earnings announcement. This finding suggests that the market underreacts to earnings surprises and, subsequently, gradually adjusts to the information in earnings. Rendleman et al. (1987), Freeman and Tse (1989) and Bernard and Thomas (1989 and 1990) collectively show that the post-earnings announcement abnormal returns are consistent with the market acting as if quarterly earnings follow a seasonal random walk process, whereas the actual earnings process might be more accurately described as a seasonally differenced first-order auto-regressive process with a drift. In addition, Ball and Bartov

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(1996) show that although market participants are not entirely naïve in recognizing the time-series properties of quarterly earnings, they systematically underestimate the magnitude of the serial correlation.

Previous research also examines whether sophisticated information intermediaries such as security analysts fully incorporate prior earnings information when forming their forecasts. Mendenhall (1991) finds a serial correlation in analysts' forecast errors, which suggests that analysts underreact to past earnings information (see also Ali et al., 1992; and Mikhail et al., 2003). Furthermore, Abarbanell and Bernard (1992) link analysts' underreaction to the post-earnings announcement drift. They suggest that analysts' inability to incorporate fully the serial correlation in earnings surprises provides at least a partial explanation for the post-earnings announcement drift.

Prior studies, however, provide little evidence on whether managers fully incorporate the implications of prior earnings surprises into their future earnings forecasts and, if not, whether this behavior is related to the post-earnings announcement drift. I use past management forecast errors to proxy for earnings information (i.e., unexpected earnings) available to managers in currently announced earnings; my results are fourfold. First, based on a sample of 11,205 firm-quarter observations, I find a positive association in consecutive management forecast errors, which suggests that managers underestimate the implications of past management forecast errors for future earnings. The results indicate either that managers irrationally underestimate earnings information in their prior forecast errors or that managers fully understand the future implications of their prior forecast errors but intentionally issue forecasts that are either pessimistically or optimistically biased from period to period.

Second, I find that managers underestimate the information in their prior forecast errors to a greater extent when they make earnings forecasts with a longer horizon. This result is consistent with the notion that when managers make forecasts earlier in the quarter, they either have greater difficulty understanding earnings information in their prior forecast errors or have stronger incentives to issue biased forecasts. Third, I find that the anomalous stock returns in the following quarter are positively associated with management forecast errors (= [actual earnings − forecasted earnings]/share price) as well as with analysts' forecast errors. This evidence indicates that, similar to corporate managers, investors in the stock market also underreact to earnings information in management forecast errors, which leads to predictable stock returns following earnings announcements. Lastly, I find that my results are robust to the controls for the nature of the forecast (i.e., good vs. bad news), earnings management, or special items in earnings except that I find no evidence of market underreaction to management forecast errors for firms issuing good news forecasts and for firms relatively free of earnings management.

This study makes at least two contributions to the extant literature. First, my study complements existing studies on the determinants of management forecast errors. Prior management forecast literature finds various factors that may induce management forecast bias, such as litigation risk and forecast horizon (e.g., Johnson et al., 2001; Ajinkya et al., 2005; and Rogers and Stocken, 2005). The literature, however, has not explored whether managers' forecast bias is related to their past forecast bias. I fill this void by providing evidence that managers do not fully incorporate the implications of their last quarter's earnings forecast errors into their future earnings forecasts. In addition, I find that the degree of underestimation is greater when managers make earnings forecasts with a longer horizon.

Second, this study adds to research on post-earnings announcement drift. I find that management forecast errors relate positively to abnormal stock returns following earnings announcements, even when analysts' forecast errors are controlled. This finding—coupled with the finding that managers do not fully incorporate information in their prior forecast errors into future earnings forecasts—suggests that the post-earnings announcement drift anomaly may be related not only to analysts' forecast behavior but also to managers' forecast behavior. That is, if the market is fixated on biased management forecasts at earnings announcements, it will underreact to management forecast errors, resulting in predictable stock returns following earnings announcements. Therefore, a better understanding of management forecast behavior may shed light on the intriguing post-earnings announcement drift anomaly.

The remainder of the paper is organized as follows. Section 2 reviews the literature and develops hypotheses. Section 3 describes the sample. Section 4 discusses research design and empirical results, and Section 5 concludes the study.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

(i) Literature Review

The first stream of related studies investigates whether the market's reaction to earnings announcements is quick and unbiased and finds evidence of a post-earnings announcement drift. Ball and Brown (1968) and Foster et al. (1984) first report, respectively, a positive correlation between currently announced earnings surprises and subsequent stock returns up to two months after annual earnings announcements and up to 60 trading days after quarterly earnings announcements. These results suggest that the market underreacts to earnings surprises and only gradually adjusts to the information in earnings announcements. Rendleman et al. (1987) and Freeman and Tse (1989) conjecture that the underreaction of stock prices to earnings announcements may represent the misperception of the time-series properties of earnings. Furthermore, Bernard and Thomas (1989 and 1990) show that the post-earnings announcement abnormal returns are consistent with the market acting as if quarterly earnings follow a seasonal random walk process, whereas the actual earnings process is a seasonally differenced first-order auto-regressive process with a drift. Ball and Bartov (1996) show that the market is not entirely naïve in recognizing the time-series properties of quarterly earnings. They present evidence suggesting that investors appear to understand the existence and sign of the serial correlation in quarterly earnings surprises, but they systematically underestimate the magnitude of the serial correlation. In addition, Bartov et al. (2000) find that the post-earnings announcement abnormal returns are negatively related to the percentage of ownership of institutional owners, which supports the notion that institutional investors improve the degree to which earnings information is priced. In sum, the post-earnings announcement drift literature suggests that the market fails to incorporate fully the implications of prior earnings for future earnings and underreacts to the serial correlation in earnings surprises.

A second stream of related research examines whether analysts, like the market, also underreact to past earnings information and, if so, whether this behavior is related to the post-earnings announcement drift. Mendenhall (1991), Ali et al. (1992) and Mikhail et al. (2003) report evidence of a serial correlation in analysts' forecast errors using Value Line, I/B/E/S and Zacks forecasts, respectively. They suggest that analysts'

forecasts do not fully incorporate past earnings information available at the time of their forecasts. Mikhail et al. also show that the serial correlation in quarterly earnings forecast errors of experienced analysts is lower than that of inexperienced analysts. They conjecture that more experienced analysts may provide superior earnings forecasts because they are better able to process earnings information contained in their prior quarterly forecast errors. Riahi–Belkaoui (2002) finds that analysts' underreaction to prior earnings information increases with the level of multinationality, a proxy for firm complexity. Moreover, Abarbanell and Bernard (1992) find that analysts' quarterly earnings forecast errors are positively autocorrelated over the first three lags with declining magnitude, which is consistent with the form of underreaction to recent earnings exhibited by a seasonal random walk model. In addition, they find that the magnitude of the autocorrelations in analysts' forecast errors are about half as large as necessary to explain the magnitude of the delayed stock price response to earnings. These findings imply that the anomalous underreaction of stock prices to earnings information may be partially rooted in analysts' behavior.

A third stream of related research examines the information content of, and incentives for, management voluntary disclosures, particularly in the form of earnings forecasts. Early studies show that management earnings forecasts have information content in that the unexpected component of management forecast is positively associated with security returns around the forecast date and management forecasts are superior to analysts' forecasts as a proxy for the market expectations of earnings (e.g., Ajinkya and Gift, 1984; and Waymire, 1984 and 1986). In a more recent study, Kimbrough (2005) finds that the release of additional information by managers during conference calls improves the transparency of the future implications of current earnings surprises and therefore, improves the efficiency of investor and analyst reactions to currently announced earnings. Furthermore, a few studies provide evidence of asymmetries in managers' disclosure behavior of and subsequent market reactions to good versus bad earnings news. For example, Kothari et al. (2008) find that the magnitude of market reaction to bad news management earnings forecasts exceeds that to good news management earnings forecasts, suggesting that managers may delay disclosure of bad news relative to good news. Chan et al. (2006) find a significant negative post-earnings announcement drift following bad news management earnings forecasts but no such drift following good news management earnings forecasts. They interpret these results to be consistent with investor underreaction to bad news management earnings forecasts. Although management forecasts are generally considered an important source of useful information in capital markets, a number of studies suggest that various incentives can motivate managers to bias their earnings forecasts to mislead investors. For example, Rogers and Stocken (2005) document that managers' willingness to bias their forecasts varies with management incentives (e.g., to reduce litigation risk and to increase profit from insider trading) and the market's ability to detect the forecast bias.

In sum, the extant literature reports extensive evidence that the stock market and analysts fail to reflect fully the implications of current earnings for future earnings. It also provides evidence on the information content, properties, and bias of management forecasts. However, the literature provides little evidence on whether managers fully incorporate the implications of prior forecast errors—a proxy of prior earnings information from the perspective of managers—into their future earnings forecasts and, if not, whether this behavior is related to the post-earnings announcement drift.

(ii) Hypothesis Development

Management forecasts, as the name implies, capture expected earnings from the perspective of managers. Thus, management forecast errors can proxy for unexpected earnings contained in currently announced earnings for managers. Compared with other market participants, managers are substantially involved in the business-operating and financial-reporting processes of their companies. This high level of involvement suggests that managers possess superior knowledge of the earnings process of their companies and, thus, are likely to understand better the economic factors for which they overestimate or underestimate earnings in the past. If managers unbiasedly incorporate the future implications of current management forecast errors into their earnings forecasts, no systematical correlation will be found in consecutive management forecast errors. On the other hand, consecutive management forecast errors can exhibit positive correlation for at least two reasons. First, managers, like analysts and investors, may systematically underweight information that current earnings announcements have for future earnings. That is, managers may irrationally underreact to information contained in their prior forecast errors when forming future earnings forecasts. Second, managers may be motivated to consistently issue forecasts that are either pessimistically or optimistically biased. For example, managers with a desire to reduce expected costs of litigation are likely to issue forecasts that are pessimistically biased from period to period. Under either case, a positive association will be found in successive management forecast errors. This reasoning leads to my first hypothesis (expressed in its alternative form):

H_1: A positive association exists in consecutive management forecast errors.

The magnitude of the positive association in consecutive management forecast errors may be dependent on forecast horizon. Baginski and Hassell (1997) suggest that a longer management forecast horizon corresponds to greater uncertainty faced by managers in forecasting earnings. Following this notion, I expect that managers who have difficulty understanding the implications of their prior forecast errors for future earnings will face a lower level of difficulty when making forecasts with a shorter forecast horizon as more earnings information is available. On the other hand, managers who are motivated to issue forecasts that are consistently biased will face more pressure to lower the bias when making forecasts with a shorter forecast horizon as it is more difficult to justify a large forecast bias at a later point in time. Under either of these cases, I expect that the extent to which managers underestimate the information in their prior forecast errors will be greater when they issue forecasts with a longer horizon. Accordingly, my second hypothesis (stated in its alternative form) is:

H_2: The positive association found in consecutive management forecast errors is greater for firms that issue forecasts with longer horizons.

The evidence that analysts underreact to prior earnings information raises the possibility that investors' reliance on analysts might explain stock price underreaction to earnings (i.e., the post-earnings announcement drift anomaly; Abarbanell and Bernard, 1992). A similar reasoning can be extended to managers' underestimation of information in their prior forecast errors. Because investors and analysts rely on managers for earnings information, managers' failure to fully incorporate available information into their forecasts could be one of the original sources of the anomalous

delayed stock price responses to earnings. That is, if the market is fixated on biased management expectations at earnings announcements, a delayed price response to the information contained in management forecast errors will occur following earnings announcements (i.e., the abnormal returns following earnings announcements will have the same sign as management forecast errors). Accordingly, my third hypothesis (stated in its alternative form) is:

H_3: Abnormal returns following earnings announcements are positively related to management forecast errors.

3. SAMPLE

(i) Sample Selection

I obtain from the First Call database point (CIG Code: A or Z) and range (CIG Code: B) quarterly management earnings forecasts issued by companies during the period 1997–2006, which leads to an initial sample of 32,423 observations. I consider only point and range forecasts because they can be clearly compared to actual earnings. My sample period does not cover years before 1997 because the number of forecasts in those years is substantially lower (see Ajinkya et al., 2005). I next eliminate 4,899 forecasts issued prior to the previous quarter's earnings announcement dates. To avoid problems of data interdependence, I further drop 4,246 forecasts from firms that make multiple forecasts for the same fiscal quarter. When a firm issues more than one forecast for a given quarter, I retain only the last forecast.

From the remaining 23,278 observations, I remove observations that do not have accompanying actual earnings on First Call or stock prices at the beginning of the quarter on CRSP to measure scaled management forecast errors for the current quarter. Because my empirical analyses also require management forecast errors for the prior quarter, I further remove observations that do not have available data to measure the prior quarter's management forecast errors. These eliminations result in additional loss of 11,217 observations. Finally, I exclude 819 observations with missing data from CRSP to compute stock returns and 37 observations with more than 180 days between the current quarter's earnings announcement date and the prior/posterior quarter's earnings announcement date. The final sample consists of 11,205 observations from 1,857 unique firms.

(ii) Descriptive Statistics

Panel A of Table 1 describes the distribution of observations for each year of the sample period. As expected, number of observations increase steadily during the sample period because earning forecasts are more pervasive over time.[1] Panel B reports frequency for the 1,857 firms that make at least two forecasts in consecutive quarters from 1997 to 2006. The panel shows that 510 firms make two consecutive forecasts only once over the sample period, and 734 firms do so six or more times.

1 The relatively small number of observations in 2006 is mainly due to sample attrition caused by the requirement of subsequent stock return data.

Table 1
Sample and Descriptive Statistics

Panel A: Number of Observations Per Year

Year	*97*	*98*	*99*	*00*	*01*	*02*	*03*	*04*	*05*	*06*	*Total*
No. of Obs.	62	206	210	217	1,253	1,661	1,927	2,287	2,211	1,171	11,205

Panel B: Frequency for the 1,857 Firms That Make at Least Two Forecasts in Consecutive Quarters

No. of Two Consecutive Forecasts	*1*	*2*	*3*	*4*	*5*	*≥6*	*Total*
No. of firms	510	247	130	113	123	734	1,857

Panel C: Descriptive Statistics

Variable	*Mean*	*Std. Dev.*	*1st Quartile*	*Median*	*3rd Quartile*
MFE_t	0.0009	0.0045	0.0000	0.0005	0.0017
MFE_{t-1}	0.0011	0.0039	0.0000	0.0006	0.0017
$Return_{t-1}$	0.0249	0.2630	−0.1133	0.0198	0.1448
$Horizon_t$	67.2246	32.8661	35.0000	84.0000	91.0000

Notes:
MFE_t (MFE_{t-1}) is measured as actual earnings per share (EPS) of quarter t (quarter $t-1$) less management forecasted EPS for quarter t (quarter $t-1$), deflated by stock price at the end of quarter $t-1$ (quarter $t-2$). $Return_{t-1}$ is the firm's raw buy-and-hold return between 90 days before and 1 day before the management forecast date. $Horizon_t$ is the number of calendar days from the management forecast date to the earnings announcement date of quarter t.

Panel C of Table 1 reports the descriptive statistics for variables in this study. The mean and median values of management forecast errors for quarter t (MFE_t), which is measured as actual earnings per share (EPS) of quarter t less management forecasted EPS for quarter t, deflated by stock price at the end of quarter $t-1$, are 0.0009 and 0.0005, respectively.[2] The positive forecast errors suggest that quarterly management forecasts, on average, are pessimistically biased. This finding is consistent with Choi and Ziebart (2004), who report that short-term (long-term) management forecasts are pessimistically (optimistically) biased. As anticipated, the descriptive statistics for management forecast errors for quarter $t-1$ (MFE_{t-1}), which is measured as actual EPS of quarter $t-1$ less management forecasted EPS for quarter $t-1$, deflated by stock price at the end of quarter $t-2$, are similar to those for MFE_t.[3] The sample firms' mean and median raw buy-and-hold returns between 90 days before and 1 day before the management forecast date ($Return_{t-1}$) are 2.49% ($p < 0.01$) and 1.98% ($p < 0.01$), respectively. In addition, the mean $Horizon_t$, which is the number of calendar days from the management forecast date to the earnings announcement date of quarter t, is 67.2246, suggesting that the forecasts are issued, on average, about 67 days prior to the earnings announcement date.

2 For a range forecast, management forecasted EPS is the midpoint of the range.
3 The extreme values of management forecast error for the current quarter and the prior quarter (i.e., MFE_t and MFE_{t-1}) are winsorized at the 1 and 99 percentiles to avoid problems related to outliers.

4. RESEARCH DESIGN AND EMPIRICAL RESULTS

(i) Association in Consecutive Management Forecast Errors

I test the first hypothesis that consecutive management forecast errors are positively associated using the following pooled cross-sectional time-series regression equation, an approach similar to Ali et al. (1992):

$$\text{MFE}_t = \alpha_0 + \alpha_1 \text{MFE}_{t-1} + \alpha_2 \text{Return}_{t-1} + \varepsilon_t, \quad (1)$$

the variable of primary interest is MFE_{t-1}. If managers fully incorporate the information in last quarter's management forecast errors into their forecasts of the current quarter's earnings, there should be no relation between last quarter's forecast errors and the current quarter's forecast errors (i.e., $\alpha_1 = 0$). On the other hand, if, as hypothesized, managers underweight the information that current earnings announcements have on future earnings levels (i.e., if they underestimate the persistence of their own forecast errors), then consecutive forecast errors will be positively related (i.e., $\alpha_1 > 0$). Return_{t-1} is used to control for prior stock returns. Abarbanell (1991) finds that analysts' forecast errors are positively associated with prior stock returns, suggesting that analysts underreact to prior stock price changes. If managers also underreact to prior stock price changes, the coefficient on Return_{t-1} will be positive (i.e., $\alpha_2 > 0$).

I estimate the pooled cross-sectional time-series regression equation (1) using ordinary least squares.[4] The results are reported in Table 2. When Return_{t-1} is excluded (included) as an independent variable in equation (1), the coefficient on

Table 2

The Association in Consecutive Management Forecast Errors

$$\text{MFE}_t = \alpha_0 + \alpha_1 \text{MFE}_{t-1} + \alpha_2 \text{Return}_{t-1} + \varepsilon_t$$

Variable	*Predicted Sign*	*(1)*	*(2)*	*(3)*
Intercept	?	0.0006	0.0009	0.0006
		(14.17)***	(21.42)***	(13.93)***
MFE_{t-1}	+	0.3203		0.3135
		(30.87)***		(29.92)***
Return_{t-1}	+		0.0014	0.0007
			(8.56)***	(4.40)***
Adj. R^2 (%)		7.83	0.64	7.98
N		11,205	11,205	11,205

Notes:
MFE_t (MFE_{t-1}) is measured as actual earnings per share (EPS) of quarter t (quarter $t-1$) less management forecasted EPS for quarter t (quarter $t-1$), deflated by stock price at the end of quarter $t-1$ (quarter $t-2$). Return_{t-1} is the firm's raw buy-and-hold return between 90 days before and 1 day before the management forecast date. *t*-statistics are in parentheses. *** indicates significance at the 0.01 level, based on a two-tailed *t*-test.

4 When I use Newey-West (1987) procedure to correct the standard errors of the ordinary least squares estimates for potential problems of heteroscedasticity and autocorrelation, my results for equations (1) and (2) (untabulated) are generally not affected.

MFE_{t-1} is 0.3203 (0.3135), positive, and statistically significant at the 0.01 level. These findings support the first hypothesis that managers underweight information in their prior forecast errors when forming future earnings estimates. To gauge the economic significance of the association in managers' forecast errors, consider a firm with share price of \$30.00. The mean management forecast error in the prior quarter for the sample is 0.11% of the share price or \$0.033. An association of 0.31 in the sequential management forecast errors thus implies a predictable error of approximately \$0.0102 in this example (\$30.00 × 0.11% × 0.31). The magnitude of this effect is economically reasonable, given that these forecasts are made for quarterly earnings and are, on average, 67 calendar days before the earnings announcement date when both analysts' and managers' forecast errors are rather small.

In addition, the coefficients on the intercept term are significantly positive, suggesting that, on average, managers' quarterly forecasts are pessimistically biased. When MFE_{t-1} is excluded (included) as an independent variable, the coefficient on $Return_{t-1}$ is 0.0014 (0.0007) and significant at the 0.01 level. These results indicate that managers do not fully use information in past stock returns when formulating their earnings forecasts. Overall, the results in Table 2 support the first hypothesis that consecutive management forecast errors are positively related, which is consistent with the notion that managers do not fully incorporate information contained in their prior forecast errors when forecasting future earnings.

(ii) The Effect of Forecast Horizon on the Association in Consecutive Management Forecast Errors

I use the following regression equation to test the second hypothesis that the positive association shown in Table 2 increases with forecast horizon:

$$MFE_t = \beta_0 + \beta_1 MFE_{t-1} + \beta_2 MFE_{t-1} * DHorizon_t + \beta_3 DHorizon_t + \beta_4 Return_{t-1} + \varepsilon, \quad (2)$$

where $DHorizon_t$ is a firm's decile ranking of $Horizon_t$, which is measured as the number of calendar days from the management forecast date to the earnings announcement date of quarter t. If the positive association in managers' consecutive forecast errors increases with forecast horizon, as suggested by the second hypothesis, β_2 will be positive. Consistent with the results in Table 2, which show that managers underreact to their prior forecast errors and prior stock returns, I also expect β_1 and β_4 will be positive. Prior studies (e.g., Ajinkya et al., 2005; and Rogers and Stocken, 2005) find that management forecasts are more pessimistic when they are issued closer to the end of forecast period, and thus I predict β_3 will be negative.

The regression results for equation (2) are presented in Table 3. The coefficient on MFE_{t-1}*$DHorizon_t$ is 0.0248 (0.0249) when $Return_{t-1}$ is excluded (included) as an independent variable in the regression and is significantly positive at the 0.01 level. These results support the second hypothesis that the positive association in management forecast errors between successive quarters is greater when managers issue longer horizon forecasts. In addition, the estimated coefficients on MFE_{t-1} and $Return_{t-1}$ remain significantly positive, which is consistent with the results in Table 2. As expected, the coefficients on $DHorizon_t$ are significantly negative.

Table 3

The Effect of Forecast Horizon on the Association in Consecutive Management Forecast Errors

$$\mathrm{MFE}_t = \beta_0 + \beta_1 \mathrm{MFE}_{t-1} + \beta_2 \mathrm{MFE}_{t-1} * \mathrm{DHorizon}_t + \beta_3 \mathrm{DHorizon}_t + \beta_4 \mathrm{Return}_{t-1} + \varepsilon_t$$

Variable	*Predicted Sign*	*(1)*	*(2)*
Intercept	?	0.0007	0.0007
		(9.43)***	(9.53)***
MFE_{t-1}	+	0.2001	0.1926
		(9.60)***	(9.22)***
MFE_{t-1}*$\mathrm{DHorizon}_t$	+	0.0248	0.0249
		(6.66)***	(6.71)***
$\mathrm{DHorizon}_t$	−	−0.00003	−0.00001
		(−2.07)**	(−2.33)**
Return_{t-1}	+		0.0007
			(4.51)***
Adj. R^2 (%)		8.18	8.34
N		11,205	11,205

Notes:
MFE_t (MFE_{t-1}) is measured as actual earnings per share (EPS) of quarter t (quarter $t-1$) less management forecasted EPS for quarter t (quarter $t-1$), deflated by stock price at the end of quarter $t-1$ (quarter $t-2$). $\mathrm{DHorizon}_t$ is a firm's decile ranking of $\mathrm{Horizon}_t$, which is measured as the number of calendar days from the management forecast date to the earnings announcement date of quarter t. Return_{t-1} is the firm's raw buy-and-hold return between 90 days before and 1 day before the management forecast date. t-statistics are in parentheses. ** and *** indicate significance at the 0.05 and 0.01 levels, respectively, based on a two-tailed t-test.

In summary, the results in Table 3 support the second hypothesis, which suggests that managers underestimate the information in their prior forecast errors to a greater extent when they make earnings forecasts with longer horizons.

(iii) Management Forecast Errors and Post-Earnings Announcement Drift

I carry out two tests to examine the third hypothesis that the abnormal returns following earnings announcements are positively related to management forecast errors. First, I perform portfolio analyses to obtain descriptive perspective on this issue. Specifically, I rank all observations in the sample into five portfolios (MFE1–MFE5) based on management forecast errors. I then compute the buy-and-hold abnormal returns (BHAR_{t+1}) for firms in each portfolio for the period beginning on the second day after the current quarter's earnings announcement date and ending on next quarter's earnings announcement date. The buy-and-hold abnormal returns for each firm are calculated as the buy-and-hold returns for the sample firm over the return accumulation period less the buy-and-hold returns for the CRSP size-based reference portfolio to which the sample firm belongs over the same return accumulation period. If the market underreacts to information in management forecast errors, then stock prices would continue to drift in the direction of management forecast errors following earnings announcements, That is, the average abnormal return for firms with the highest management forecast errors (i.e., portfolio MFE5) should be positive and the

average abnormal return for firms with the lowest management forecast errors (i.e., portfolio MFE1) should be negative.

Second, I estimate the following regression to examine the extent to which post-earnings announcement drift can be explained by management forecast errors:

$$\text{BHAR}_{t+1} = \gamma_0 + \gamma_1 \text{MFE}_t + \gamma_2 \text{AFE}_t + \varepsilon_t, \quad (3)$$

where BHAR_{t+1} is a firm's buy-and-hold abnormal returns, and AFE_t is analyst forecast error with respect to earnings of quarter t, measured as actual EPS of quarter t less the most recent analysts' consensus forecast for quarter t before the earnings announcement date, deflated by stock price at the end of quarter $t-1$.

If post-earnings announcement drift can be explained by management forecast errors, as suggested by the third hypothesis, γ_1 will be positive. Previous research (e.g., Abarbanell and Bernard, 1992) suggests that post-earnings announcement drift may be partially attributable to analysts' behavior; therefore, I include AFE_t as a control variable and expect its coefficient, γ_2, to be positive. Note that this research design favors finding significant results for analysts' forecast errors, AFE_t, because analysts' forecasts are often updated after management forecasts and thus may better capture market expectations before earnings announcements.

Panel A of Table 4 reports the results of the portfolio analyses. Although the mean BHAR_{t+1} (-0.0055) for firms with the lowest management forecast errors (i.e., portfolio MFE1) is not significant, the median BHAR_{t+1} (-0.0145) is significantly negative at the 0.01 level. For firms with the highest management forecast errors (i.e., portfolio MFE5), both the mean and median BHAR_{t+1} (0.0340 and 0.0102, respectively) are significantly positive at the 0.01 level. Moreover, BHAR_{t+1} appears to increase monotonically across the five portfolios. Taken together, the results from the portfolio analyses provide preliminary evidence that abnormal returns following earnings announcements are greater for firms with greater management forecast errors.

Panel B of Table 4 shows the regression results from estimating equation (3).[5] When AFE_t is excluded (included) as an independent variable in the regression, the coefficient on MFE_{t-1} is 2.7370 (1.7873) and significantly positive at the 0.05 or better level. These results suggest that one-quarter-ahead stock returns following earnings announcements are positively associated with management forecast errors, even when analysts' forecast errors are controlled. In addition, as expected, the coefficients on AFE_t are significantly positive.

In sum, the results in Table 4 support the third hypothesis that abnormal returns following earnings announcements are positively related to management forecast errors. Thus, the market appears to underreact to earnings information in management forecast errors in additional to earnings information in analysts' forecast errors, resulting in predictable stock returns following earnings announcements.

(iv) Sensitivity Analyses

I perform three additional tests to examine the robustness of my results. First, because prior studies (e.g., Skinner, 1994; Chan et al., 2006; and Kothari et al., 2008) find

5 I eliminate from the sample 236 observations with missing AFE_t data.

Table 4

The Association Between Management Forecast Errors and Abnormal Stock Returns Following Earnings Announcements

Panel A: Mean and Median Buy-and-Hold Abnormal Returns ($BHAR_{t+1}$)

	MFE1	*MFE2*	*MFE3*	*MFE4*	*MFE5*
Mean	−0.0055	−0.0048	−0.0023	0.0101	0.0340
p-value	0.2940	0.269	0.522	0.015**	0.000***
Median	−0.0145	−0.0091	−0.0044	0.0051	0.0102
p-value	0.000***	0.008***	0.145	0.180	0.001***
N	2,241	2,241	2,240	2,242	2,241

Panel B: Regression Analyses of Abnormal Returns and Management Forecast Errors

$$BHAR_{t+1} = \gamma_0 + \gamma_1 MFE_t + \gamma_2 AFE_t + \varepsilon_t$$

Variable	*Predicted Sign*	*(1)*	*(2)*	*(3)*
Intercept	?	0.0036	0.0038	0.0033
		(1.63)	(1.73)*	(1.48)
MFE_t	+	2.7370		1.7873
		(5.50)***		(2.52)**
AFE_t	+		2.8312	1.4465
			(5.24)***	(1.88)*
Adj. R^2 (%)		0.27	0.24	0.29
N		10,969	10,969	10,969

Notes:
The 11,205 observations in the sample are assigned into five portfolios (MFE1–MFE5) based on management forecast errors. Observations with the lowest (highest) management forecast errors are placed in portfolio MFE1 (MFE5). Buy-and-hold abnormal returns ($BHAR_{t+1}$) for each firm are calculated as the buy-and-hold returns for the sample firm over the return accumulation period less the buy-and-hold returns for the CRSP size-based reference portfolio to which the sample firm belongs over the same return accumulation period. The return accumulation period begins on the second day after the current quarter's earnings announcement date and ends on next quarter's earnings announcement date. MFE_t is measured as actual earnings per share (EPS) of quarter t less management forecasted EPS for quarter t, deflated by stock price at the end of quarter $t-1$. AFE_t is measured as actual EPS of quarter t less the most recent analysts' consensus forecast for quarter t before the earnings announcement date, deflated by stock price at the end of quarter $t-1$. *t*-statistics are in parentheses. *, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively, based on a two-tailed *t*-test.

asymmetric market reactions to good versus bad earnings news released by managers, I examine whether my findings are different for good news and bad news management earnings forecasts. I define management forecasts as good (bad) news forecasts when managers' earnings forecast for quarter t is greater (less) than analysts' most recent consensus forecast for the same quarter before the management forecast date. Of the 11,205 forecasts in the sample, 3,290 (6,361) are categorized as good (bad) news forecasts.[6] Consistent with prior findings (e.g., Kothari et al., 2008), bad news forecasts outnumber good news forecasts in the sample. I then reestimate the main tests in Tables 2 through 4 separately for firms issuing good news and bad news management forecasts. As shown in Panel A of Table 5, my findings do not seem to be different

6 The remaining 1,554 forecasts are categorized either as neutral forecasts if management forecast is equal to analysts' consensus forecast, or as unknown, if analysts' consensus forecast is not available on First Call.

Table 5

Regression Results of Sensitivity Analyses

Panel A: Regression Results for Good News Versus Bad News Management Earnings Forecasts

	Eq. (1): Dep. = MFE_t		*Eq. (2): Dep. = MFE_t*		*Eq. (3): Dep. = $BHAR_{t+1}$*	
Variable	*Good*	*Bad*	*Good*	*Bad*	*Good*	*Bad*
Intercept	0.0006	0.0006	0.0006	0.0007	−0.0018	0.0052
	(7.14)***	(11.00)***	(4.64)***	(6.65)***	(−0.42)	(1.76)*
MFE_{t-1}	0.2787	0.3493	0.1725	0.2118		
	(15.51)***	(23.74)***	(4.88)***	(7.12)***		
MFE_{t-1} * DHorizon$_t$			0.0215	0.0279		
			(3.45)***	(5.32)***		
DHorizon$_t$			−0.0000	−0.0000		
			(−0.60)	(−0.89)		
$Return_{t-1}$	0.0012	0.0003	0.0012	0.0003		
	(4.88)***	(1.27)	(5.02)***	(1.19)		
MFE_t					0.3644	1.5689
					(0.26)	(1.78)*
AFE_t					4.6236	0.3357
					(2.90)***	(0.35)
Adj. R^2 (%)	8.10	8.36	8.39	8.74	0.63	0.09
N	3,290	6,361	3,290	6,361	3,273	6,337

Panel B: Regression Results After Controlling for the Effect of Earnings Management

Variable	*Eq. (1): Dep. = MFE_t*	*Eq. (2): Dep. = MFE_t*	*Eq. (3): Dep. = $BHAR_{t+1}$*
Intercept	0.0010	0.0016	0.0031
	(11.55)***	(9.03)***	(0.94)
MFE_{t-1}	0.3647	0.2258	
	(23.95)***	(7.02)***	
MFE_{t-1} * DHorizon$_t$		0.0274	
		(4.91)***	
DHorizon$_t$		−0.0001	
		(−4.04)***	
$Return_{t-1}$	0.0007	0.0007	
	(2.46)**	(2.52)**	
MFE_t			1.1906
			(1.31)
AFE_t			2.3513
			(2.16)**
Adj. R^2 (%)	11.51	12.06	0.54
N	4,674	4,674	4,564

Panel C: Regression Results After Controlling for the Effect of Special Items in Earnings

Variable	*Eq. (1): Dep. = MFE_t*	*Eq. (2): Dep. = MFE_t*	*Eq. (3): Dep. = $BHAR_{t+1}$*
Intercept	0.0006	0.0006	−0.0016
	(9.71)***	(5.52)***	(−0.51)
MFE_{t-1}	0.3433	0.2150	
	(22.44)***	(7.24)***	
MFE_{t-1} * DHorizon$_t$		0.0274	
		(5.00)***	
DHorizon$_t$		−0.0000	
		(−0.09)	

Table 5 (Continued)

Panel C: Regression Results After Controlling for the Effect of Special Items in Earnings

Variable	*Eq. (1): Dep.* $= MFE_t$	*Eq. (2): Dep.* $= MFE_t$	*Eq. (3): Dep.* $= BHAR_{t+1}$
Return_{t-1}	0.0004	0.0003	
	(1.61)	(1.55)	
MFE_t			1.8850
			(1.83)*
AFE_t			4.4917
			(3.96)***
Adj. R^2 (%)	9.66	10.10	0.97
N	4,935	4,935	4,793

Notes:
Variables are defined in the previous tables. *t*-statistics are in parentheses. *, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively, based on a two-tailed *t*-test.

across these two subsamples except for those in equation (3). Specifically, the coefficient on MFE_t is significant for firms issuing bad news forecasts but not for firms issuing good news forecasts. Thus, the market underreacts to management forecast errors only when firms issue bad news forecasts. It seems that market underreaction to management forecast errors may be asymmetric across the type of forecast news.

Second, I examine whether my results are driven by earnings management. Kasznik (1999) argues that managers have incentives (e.g., fear legal actions by investors, loss of reputation for accuracy) to manage reported earnings toward their forecasts.[7] To control for the possibility that earnings management affects my results, I eliminate observations with absolute values of management forecast errors that are $0.01 or less and then repeat the main tests in Tables 2 through 4. The results, as summarized in Panel B of Table 5, are similar to those previously reported except that the coefficient on MFE_t loses its significance in equation (3).

Third, although management earnings forecasts and actual earnings are all obtained from First Call, they are not always uniformly measured because First Call adjusts actual earnings to exclude any unusual items that a majority of the contributing analysts deem nonoperating or nonrecurring. To ensure the results are robust to this potential measurement problem, I delete management forecasts in which the firm-quarters record special items (Compustat #32) and then repeat the tests in Tables 2 through 4. As shown in Panel C of Table 5, my main findings are unchanged.

Taken together, the results in Table 5 suggest that the findings in this study are generally not affected by the controls for the nature of the forecast (i.e., good vs. bad news), earnings management, or special items in earnings except that I find no evidence of market underreaction to management forecast errors for firms issuing good news forecasts and for firms relatively free of earnings management.

7 Specifically, Kasznik (1999) finds that managers use income-increasing discretionary accruals to manage reported earnings toward their forecast numbers when they have overestimated earnings. In contrast, he finds no evidence that managers use income-decreasing discretionary accruals to manage reported earnings downward when they have underestimated earnings in their forecasts.

5. CONCLUSION

This paper investigates whether managers fully incorporate the implications of prior forecast errors into their future earnings forecasts, and, if not, whether this behavior is related to the post-earnings announcement drift. I find a positive association in consecutive management forecast errors, suggesting that managers underestimate the implications of past earnings information when forecasting future earnings. I also find that managers' underestimation is not homogenous among firms. That is, managers underestimate earnings information in their prior forecast errors to a greater extent when they make earnings forecasts with a longer horizon. Finally, I find that the market underreacts to earnings information in management forecast errors in additional to earnings information in analysts' forecast errors, which leads to predictable stock returns following earnings announcements. Overall, my results imply that managers fail to incorporate fully the future implications of their prior forecast errors into earnings forecasts and that managers' forecast behavior is a possible source of the post-earnings announcement drift anomaly.

This paper, however, leaves some questions unanswered, which may provide opportunities for future research. First, the reason why managers tend to underestimate the persistence of their prior forecast errors is not yet clearly understood. One possibility is that this propensity reflects cognitive biases that cause persons in certain prediction contexts to place too little weight on recent changes in a series (Andreassen and Kraus, 1990), a theory proposed by Abarbanell and Bernard (1992) to explain analysts' underreaction to their prior forecast errors. Another possibility is that the inefficiency of managers' forecasts is induced by their desire to provide biased forecasts. The answer to this question requires better knowledge of the costs and incentives that drive managers' forecast behavior. Second, although management forecast errors are associated with the anomalous stock price behavior following earnings announcements, as reported in this study, additional research is needed to examine whether managers' forecast inefficiency (intentional or unintentional) can be directly linked to the post-earnings announcement drift anomaly, and, if so, how much managers' forecast inefficiency can explain the intriguing anomaly. Third, the results in this study are based on firms that voluntarily issue earnings forecasts. Systematic differences exist between firms that voluntarily issue earnings forecasts and those that do not forecast (e.g., Ajinkya and Gift, 1984). An issue to be resolved with future research is whether the inferences of this study are generalizable to these nonforecasting firms.

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