

# Analyst Underreaction in the United Kingdom

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*We revisit the debate on the interpretation given to prior-year earnings changes in predicting analysts' future forecast errors. We advance a new specification of this relation that distinguishes between earnings reversion and momentum. For a large UK dataset for the years 1990-1996, we find substantial underreaction, particularly in situations of earnings momentum. We find that underreaction is further increased for cases of downward earnings momentum when the analyst's merchant bank acts as a broker to the company. We interpret this as a reporting bias caused by an analyst's response to bad news being compromised.*

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The inability of stock markets to speedily impound earnings information is one of the most robust research findings to contradict the informational efficiency of security markets (Brennan, 1991; Ball, 1992). There is evidence of post-earnings announcement drift (PEAD) for the US (Bernard and Thomas, 1989, 1990; Bernard, 1993) and, in small firm portfolios for the UK (Hew, Skerratt, Strong, and Walker, 1996; Lui, Strong, and Xu, 2003). Fama (1998) cites PEAD as an anomaly that is “above suspicion”.

Overall, research has not found that the behavior of analysts is a convincing explanation for the PEAD anomaly. Abarbanell and Bernard (1992) find that the extent of underreaction of analysts to prior-year earnings changes is far too modest to explain observed post-earnings announcement drift. In a study of *Value Line* forecasts, Francis and Philbrick (1993) find that Abarbanell and Bernard's underreaction coefficient disappears once they control for the tendency of analysts to boost forecasts for companies which have had sell recommendations issued against them. Francis and Philbrick argue that the properties of the forecast error are associated with a reporting bias, rather than an information processing bias. Furthermore recent evidence by Easterwood and Nutt (1999) suggests that analyst behavior can be characterized as generalized optimism rather than under or overreaction. That is, analysts overemphasize past rising trends in earnings and underplay past falling trends in earnings.

In this paper we suggest that analyst underreaction to prior-year earnings changes has been understated, and that therefore there may still be merit in this explanation of PEAD. We argue that the Abarbanell and Bernard (1992) test for analysts' underreaction to prior-year earnings is mis-specified. We revise the specification of the model by clarifying the nature of analysts' underreaction to recent earnings numbers. The estimates of our revised model show substantial underreaction; in some situations, our coefficient is eight times as large as that reported by Abarbanell and Bernard. Furthermore, contrary to Francis and Philbrick (1993), analysts'

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underreaction is distinct from their boosting of forecasts for sell recommendations. This finding confirms market recognition of the presence of the two separate phenomena reported in Francis and Soffer (1997). Our revised specification also compares favorably with the generalized optimism hypothesis of Easterwood and Nutt (1999).

The paper is structured as follows. Section I discusses earlier research on the topic. Section II introduces our respecification of the Abarbanell and Bernard (1992) model. Section III discusses the factors which might be driving the sell recommendation explanation of apparent forecast inefficiency, as advanced by Francis and Philbrick (1993). Section IV describes our data. Section V presents our results and Section VI concludes the paper.

## I. Earlier Research

Abarbanell and Bernard (1992), investigate the possibility that the underreaction of the stock market to earnings information is explained by analysts' failure to revise their forecasts to fully reflect past changes in earnings. To identify the extent of underreaction, Abarbanell and Bernard use Equation (1).

$$E_t - F_t = \alpha + \beta \cdot \text{PYEC} + u_t \quad (1)$$

where  $E_t$  is the annual earnings per share for period  $t$ ,  $F_t$  is the forecast of annual earnings per share for period  $t$ , PYEC is the prior-year earnings change at the time the forecast is made ( $E_{t-1} - E_{t-2}$ ) and  $u_t$  is the estimation error.

If  $F_t$  is an efficient forecast, then  $\beta$  will be zero. Non-zero values of  $\beta$  mean that analysts do not use information that is available at the time of the forecast to reduce their forecast error. They fail to spot a systematic error in their forecasts.

In addition to the concern about inefficiency, Abarbanell and Bernard advance a second interpretation of their findings, that the sign of the coefficient  $\beta$  has implications for the way in which analysts process information. Abarbanell and Bernard suggest that a finding of  $\beta > 0$  indicates underreaction and a finding of  $\beta < 0$  indicates overreaction to the prior-year earnings change. Using *Value Line* forecasts for 178 firms over the period 1976-1986, they find underreaction to the prior-year earnings change.

Francis and Philbrick (1993) offer a different interpretation. These authors suggest a reporting explanation rather than a processing explanation. They note that *Value Line* analysts who prepare earnings forecasts do not make stock recommendations. *Value Line*'s stock selection strategy is undertaken by a separate group within the organization. When a company faces difficult times and a sell recommendation is prepared by the *Value Line* stock selection group, analysts who make forecasts face a dilemma. They must trade off their reputation with investors against their relationship with management. Hence, they might sacrifice some accuracy to appease managers. To test their ideas, Francis and Philbrick (1993) add the stock recommendation (REC) to the Abarbanell and Bernard (1992) underreaction equation, as follows:

$$E_t - F_t = \alpha + \beta_1 \cdot \text{PYEC} + \beta_2 \cdot \text{REC} + v_t \quad (2)$$

where REC takes a value of -1 if the stock recommendation is a sell, a value of 0 for a hold or a value of 1 for a buy. They estimate Equation (1) and find that  $\beta$  is 0.075 and significant. However, when REC is included as in Equation (2),  $\beta_2$  is positive and significant, but  $\beta_1$  is not. Sell recommendations give rise to an increased upward bias in earnings forecasts. Francis

and Philbrick conclude that analysts correctly infer the future, yet fail to report it. Subsequently, Eames et al. (2002) argue that this reporting interpretation is open to question. Nevertheless, the fact remains that in the Francis and Philbrick sample, the sell recommendation effect displaces the underreaction to the prior-year earnings change.

Easterwood and Nutt (1999) advance a possible reconciliation between reported underreaction and De Bondt and Thaler's (1990) generalized overreaction. Easterwood and Nutt allow the response coefficient to a prior-year earnings change to vary with the level of PYEC, which allows for the possibility of underreaction and overreaction within the same equation, as follows:

$$E_t - F_t = \alpha_1 + \alpha_2 \cdot \text{Low} + \alpha_3 \cdot \text{High} + \beta_1 \cdot \text{PYEC} + \beta_2 \cdot (\text{PYEC} \cdot \text{Low}) + \beta_3 \cdot (\text{PYEC} \cdot \text{High}) + u_t \quad (3)$$

where Low takes a value of one if the firm's prior-year earnings change is in the lowest quartile of the sample and zero otherwise, and High takes a value of one if the firm's prior-year earnings change is in the highest quartile of the sample and zero otherwise.

When PYEC has a low value, Easterwood and Nutt (1999) report that the slope coefficient on PYEC ( $\beta_1 + \beta_2$ ) is positive and analysts underreact. However, if PYEC has a high value, then the coefficient on PYEC ( $\beta_1 + \beta_3$ ) is negative and analysts overreact. Analysts' behavior is characterized as "generalized optimism," rather than under- or overreaction. Nutt, Easterwood, and Easterwood (1999) report that this feature is also observed in the serial correlation of the forecast error. The forecast error exhibits positive serial correlation when there is bad news in the prior forecast error and negative serial correlation when there is good news in the prior forecast error.

## II. Modeling Under- and Overreaction

The rationale that Abarbanell and Bernard (1992) give for their under/overreaction test in Equation (1) seems straightforward. However, the interpretation of  $\beta > 0$  as indicating underreaction makes sense only when earnings are trending upwards or downwards. When the earnings process is reverting to a past value, then  $\beta > 0$  implies overreaction. What Abarbanell and Bernard report is a response coefficient which averages across these two earnings processes.

For example, we consider the case of  $\beta > 0$ , which Abarbanell and Bernard interpret as underreaction. When earnings are rising (PYEC > 0), Equation (1) specifies the forecast error ( $E_t - F_t$ ) as positive (apart from the effect of the constant). The underreaction explanation is that analysts are too cautious about current earnings ( $E_t$ ) rising further, and therefore the forecast is too low. When earnings are falling (PYEC < 0), a value of  $\beta > 0$  means that the forecast error ( $E_t - F_t$ ) is negative. Analysts do not believe that current earnings ( $E_t$ ) will keep on falling. Consequently, too little weight is given to the negative PYEC in the construction of  $F_t$  and the forecasts are optimistic.

This story is fine as far as it goes, and it makes sense in a situation in which the PYEC contains information that confirms a continuation of the current earnings trend. But what if earnings revert to a past value and the information in the positive PYEC relates to the future decline of  $E_t$ ? What interpretation can be given to  $\beta > 0$  in Equation (1) in this scenario? This question is important, because Fama and French (2000) show that reversion is the more prevalent case. In this situation, surprisingly, the correct interpretation of Abarbanell and Bernard's findings is that analysts overreact to the information contained in PYEC.

When a positive PYEC contains information about earnings reversion, underreaction implies that the forecast will exceed actual earnings. However, this outcome is not correctly modeled by a positive  $\beta$  in Equation (1). When  $\beta$  and PYEC are positive, Equation (1) specifies that the forecast error ( $E_t - F_t$ ) will also be positive. When earnings revert, if Equation (1) is to model underreaction correctly,  $\beta$  must be negative.

The Abarbanell and Bernard equation is in truth a test of whether analysts underreact in cases in which earnings follow a trend and overreact when earnings are reverting. Their equation requires that the sign of the forecast error change with the sign of PYEC. However, the sign of the forecast error should also change according to whether earnings are following a trend (that is, have momentum) or are reverting. To make our distinction between momentum and reversion operational, we define the earnings momentum regime as one in which the direction of movement between t-2 and t-1 continues in the next period. We define the reversion regime as that in which the movement between t-2 and t-1 does not continue.

Our approach to adjusting Equation (1) for situations of momentum and reversion is to allow for both the sign and the size of the coefficient  $\beta$  to vary with the earnings process as in Equation (4).

$$E_t - F_t = \alpha + \beta_1 \cdot \text{PYEC}_R + \beta_2 \cdot \text{PYEC}_M + u_t \quad (4)$$

$\text{PYEC}_R$  is PYEC (the prior-year earnings change, previously defined as  $E_{t-1} - E_{t-2}$ ) if PYEC is opposite in sign to the current year earnings change CYEC (defined as  $E_t - E_{t-1}$ ) and zero otherwise.  $\text{PYEC}_M$  is PYEC if PYEC is the same sign as CYEC and zero otherwise.  $\text{PYEC}_R$  captures the case of earnings reversion and  $\text{PYEC}_M$  captures the case of earnings momentum.

This model allows us to estimate the under/overreaction coefficient separately for cases of earnings reversion and earnings momentum. If the Abarbanell and Bernard (1992) model is an adequate specification, then  $\beta_1$  should not be significantly different from  $\beta_2$  in Equation (4). However, if our concerns are justified, we expect that underreaction will give  $\beta_1 < 0$  (since analysts will underestimate the reversion in earnings) and  $\beta_2 > 0$  (since analysts will underestimate the trend in earnings). Also the absolute value of  $\beta_2$  is likely to be larger than the absolute value of  $\beta_1$ . Analysts are likely to underreact more when earnings follow a trend than when they revert since they may recognize that cases of earnings reversion are more widespread than cases of earnings momentum (see Fama and French, 2000).

A further refinement of the Abarbanell and Bernard (1992) equation distinguishes between momentum upwards and momentum downwards regimes as in Equation (5).

$$E_t - F_t = \alpha + \beta_1 \cdot \text{PYEC}_R + \beta_2 \cdot \text{PYEC}_{M\_UP} + \beta_3 \cdot \text{PYEC}_{M\_DN} + u_t \quad (5)$$

$\text{PYEC}_{M\_UP}$  is PYEC for cases of momentum upwards (when PYEC and CYEC have the same sign and are positive) and zero otherwise.  $\text{PYEC}_{M\_DN}$  is PYEC for cases of momentum downwards (when PYEC and CYEC have the same sign and are negative) and zero otherwise.

### III. The Sell Recommendation Effect

The Francis and Philbrick (1993) results arise in the *Value Line* setting. Here, the analyst takes the stock recommendation as given when issuing the earnings forecast. However, it is possible that the reporting bias may also apply to settings in which the analyst prepares both the recommendation and the forecast.

As in the Francis and Philbrick context, the analyst seeks to maintain good relations with both investors and the company. He, or she, will need to identify how to use both the forecast and the recommendation to communicate with the two parties. Since stocks are traded on a daily basis, investors are likely to uncover any bias in the recommendation relatively quickly. In contrast, any bias in the forecast will not be fully apparent until the company announces its earnings. Therefore, the forecast is a more suitable instrument for maintaining managerial relations. To investigate this possibility in our sample, we add the recommendation of the analyst, REC, as an explanatory variable to our Equations (4) and (5).

Eames et al. (2002) suggest an alternative, processing bias, motivation for the sell recommendation effect. They note that earnings forecasts are more optimistic as earnings decline below the mean earnings for all firms on an industry basis. This effect arises because a company experiencing a large positive earnings shock is more likely to have positive earnings. Once forecasts are adjusted for this relation, sell recommendations are not associated with optimistic forecasts, but with pessimistic ones. The explanation they give for this result is that the forecast is constructed out of an unconscious desire to rationalize the recommendation.

The explanation given by Eames et al. (2002) requires that the forecast and the recommendation are made by the same person, a situation which applies to our sample. To discriminate between the processing and reporting bias explanations of the sell recommendation effect, we decompose<sup>1</sup> the recommendation effect into that for affiliated broker firms and unrelated non-broker firms. If the bias arises during the construction of the forecast (a processing bias), then the recommendation effect is unlikely to vary between broker and non-broker companies. However, if the bias results from a failure to reveal a “true” forecast (a reporting bias), then it is likely that the recommendation effect will be larger for companies for whom the analyst’s merchant bank acts as a broker. This situation arises because analysts have greater incentives to maintain good relations with the incumbent managers of client companies.

## IV. Data

We obtain our data from the published monthly UK equity working lists of a major investment bank. The lists cover approximately 500 UK companies quoted on London Stock Exchange, for the period January 1990 to December 1995. The lists give the day on which the information was downloaded from the in-house database and published in the equity working lists. Each forecast is generated by a group of analysts covering an industrial sector for the Merchant bank. We use each forecast generated over a 22 month forecast horizon, so our forecast data runs from 1989-95 for earnings announcements in 1990-5.

We obtain actual earnings from the in-house database and measure them on the same basis as the forecast. Analysts do not always forecast the announced earnings per share, rather an adjusted version of it, because they believe that the adjustment more accurately represents the performance of the company.

In addition to forecasts and realizations of earnings, the lists give the monthly stock recommendations (buy, hold, or sell) for each company. The same analyst issues both a recommendation and a forecast for the same firm. A further attraction of our dataset is the classification of companies according to whether or not the investment bank acts as their

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<sup>1</sup>This decomposition is also used in Lin and McNichols (1998), Dugar and Nathan (1995), and Michaely and Womack (1999).

broker. We exploit this feature to distinguish between competing explanations of the sell recommendation effect.

The companies we select for our sample are those which are followed in each of the monthly lists. This selection procedure yields a balanced panel sample of 420 companies. The companies come from a wide range of industries, with the largest industry, engineering, comprising 7.1% of the sample.

All studies using analysts forecasts of earnings must confront the problem of outliers in the dataset. Here, we scale past earnings changes and forecast errors by the current stock price and then “winsorize” the data. In this procedure, we set values that are more than three standard deviations from their respective means to their mean value plus, or minus three standard deviations. This truncation of forecast error distribution might seem hazardous in the light of the impact of the asymmetry of forecast error distribution on tests of forecast rationality (see Abarbanell and Lehavy, 1999, and Ahmed, Lobo, and Zhang, 2000).

Central to our alternative decomposition of the Abarbanell and Bernard (1992) equation are the relative frequency and intensity of momentum and reversion regimes. This classification results from the relative values of the current and prior-year’s earnings changes. We note that both increases and decreases in prior-year earnings changes are (approximately) just as likely (54.99% and 45.01%, respectively), as are reversion and momentum regimes (47.9% and 52.1%, respectively).

## V. Empirical Results

This section presents our empirical results. To facilitate comparison, Subsection A estimates earlier models on our data. Subsection B presents our results on analysts’ underreaction to prior-year earnings changes. Subsection C explores the reporting and processing explanations for forecast bias.

### A. Earlier Models Estimated on Our Data

To see how our sample compares with previous studies, we estimate the parameters of the original Abarbanell and Bernard (1992) model (Equation 1). Table I shows that they are virtually identical. The constant is negative and significant, and the  $R^2$  is 0.01. More important, the coefficient on prior-year earnings change (PYEC) is significant and has a value of 0.08 which is similar to Abarbanell and Bernard’s result for forecasts made before the first quarter’s results. We note that we follow Easterwood and Nutt (1999) and scale by price. However, Abarbanell and Bernard scale by last year’s earnings and hence our reported intercept of -0.023 is substantially higher than their reported value of -0.44.

Table I also gives our estimates of the Francis and Philbrick (1993) model (Equation 2).<sup>2</sup> Our results are very similar to theirs. The constant is negative, implying that forecasts are mostly optimistic. The coefficient on REC (the recommendation) is positive and significant. However, in our sample, the value is 0.006, but in Francis and Philbrick it is 0.119. This difference may be explained by our scaling of the forecast error and PYEC by price. This result suggests that the recommendation effect is not restricted to the *Value Line* environment in which the analysts who prepare forecasts, do not make stock recommendations. Hence

<sup>2</sup>We re-estimated all key regressions from our paper truncating observations outside the 90<sup>th</sup> and 10<sup>th</sup> percentile, in the manner suggested by Abarbanell and Lehavy (2000). While the significance of our results is eroded, it is not removed. In results available from the authors we show that none of our principal results depend upon any control for extreme observations. When no truncation of any type is undertaken our principal results remain.

**Table I. Estimates of the Abarbanell and Bernard (1992) and Francis and Philbrick (1993) Models of Under/Overreaction to Prior-Year Earnings Change on our UK Sample**

This table shows OLS coefficient estimates of two previous models of under/overreaction to prior-year earnings change on our UK sample. The Abarbanell and Bernard model is given in Equation (1). The Francis and Philbrick model is given in Equation (2).

$$E_t - F_t = \alpha + \beta.PYEC + u_t \quad (1)$$

$$E_t - F_t = \alpha + \beta_1.PYEC + \beta_2.REC + v_t \quad (2)$$

$E_t$  is earnings per share, scaled by price at the date of the forecast.  $F_t$  is the forecast of earnings per share, scaled by price at the date of the forecast. REC is the analyst recommendation at the time of the forecast. The values we use are: Buy (2), Hold (1), Sell (0). PYEC is the prior-year earnings change at the time of the forecast ( $E_{t-1} - E_{t-2}$ ), scaled by price. Adj.  $R^2$  is the  $R^2$  adjusted for degrees of freedom. Figures in parenthesis are White standard errors. The sample consists of 38,626 firm - year observations taken from the 1990-96 equity working lists of a major UK investment bank.

Constant	PYEC	REC	Adj.R <sup>2</sup>
<i>Result 1. The Abarbanell and Bernard Model</i>			
-0.023** (0.0005)	0.08** (0.019)		0.01
<i>Result 2. The Francis and Philbrick Model</i>			
-0.031** (0.0016)	0.08** (0.019)	0.0064** (0.0010)	0.01

\*\*Significant at the 0.01 level using White standard errors.  
\*Significant at the 0.05 level using White standard errors.

the recommendation effect may extend beyond the specific institutional context in which it is originally reported.

Another feature of Table I is that, unlike Francis and Philbrick (1993), the recommendation effect does not eliminate underreaction to the prior-year earnings change. This finding means that Francis and Philbrick's suggestion, that a reporting explanation is the sole source of the forecasting bias, is incomplete. Processing bias, in the form of an underreaction to the prior-year earnings change, plays a part as well.

## B. Our Preferred Specification

Table II shows the effect of distinguishing between earnings momentum and earnings reversion, as we propose in Equations (4) and (5). Result 1 in Table II shows that when the coefficient on PYEC is allowed to vary with the earnings process, it is positive for momentum cases and negative for reversion cases. This result indicates underreaction in both regimes. For example, when the prior-year's earnings change is positive, for momentum cases the forecast is smaller than realized earnings, whilst for reversion cases the forecast is larger than realized earnings.

However, we note that there is a potential bias in our results. We partition the sample by PYEC ( $E_{t-1} - E_{t-2}$ ) and CYEC ( $E_t - E_{t-1}$ ). To the extent that CYEC is correlated with the dependent variable ( $E_t - F_t$ ), then we effectively partition by PYEC and  $E_t - F_t$ . In the limiting case where

**Table II. Estimates of Under/Overreaction to Prior-Year Earnings Change, with Partitioning based on the Current Year's Earnings Change**

This table shows OLS coefficient estimates of Equations (4) and (5). These models of under/overreaction to prior-year earnings have separate coefficients for earnings reversion and earnings momentum. We also estimate these equations with the REC variable added.

$$E_t - F_t = \alpha + \beta_1 \cdot \text{PYEC}_R + \beta_2 \cdot \text{PYEC}_M + u_t \quad (4)$$

$$E_t - F_t = \alpha + \beta_1 \cdot \text{PYEC}_R + \beta_2 \cdot \text{PYEC}_{M\_UP} + \beta_3 \cdot \text{PYEC}_{M\_DN} + u_t \quad (5)$$

$E_t$  is earnings per share, scaled by price at the date of the forecast.  $F_t$  is the forecast of earnings per share, scaled by price at the date of the forecast. REC is the analyst recommendation at the time of the forecast. The values we use are: Buy (2), Hold (1), Sell (0). PYEC is the prior-year earnings change at the time of the forecast ( $E_{t-1} - E_{t-2}$ ), scaled by price.  $\text{PYEC}_R$  is PYEC if PYEC is opposite in sign to the current year earnings change CYEC (defined as  $E_t - E_{t-1}$ ) and zero otherwise.  $\text{PYEC}_M$  is PYEC if PYEC is the same sign as CYEC and zero otherwise.  $\text{PYEC}_{M\_UP}$  is PYEC for cases of momentum upwards (when PYEC and CYEC have the same sign and are positive) and zero otherwise.  $\text{PYEC}_{M\_DN}$  is PYEC for cases of momentum downwards (when PYEC and CYEC have the same sign and are negative) and zero otherwise. Adj.  $R^2$  is the  $R^2$  adjusted for degrees of freedom. Figures in parentheses are White standard errors. The sample consists of 38,626 firm-year observations taken from the 1990-96 equity working lists of a major UK investment bank.

Constant	PYEC <sub>R</sub>	PYEC <sub>M</sub>	PYEC <sub>M_UP</sub>	PYEC <sub>M_DN</sub>	REC	Adj. R <sup>2</sup>
<i>Result 1. Momentum and Reversion - Equation (4)</i>						
-0.023** (0.0005)	-0.12** (0.021)	0.50** (0.026)				0.15
<i>Result 2. Distinguishing between Momentum Upwards and Momentum Downwards - Equation (5)</i>						
-0.019** (0.0007)	-0.12** (0.021)		0.17** (0.012)	0.67** (0.036)		0.17
<i>Result 3. Momentum and Reversion with Recommendation Effect</i>						
-0.028** (0.0015)	-0.13** (0.021)	0.50** (0.026)			0.0038** (0.0009)	0.15
<i>Result 4. Distinguishing between Momentum Upwards and Momentum Downwards with Recommendation Effect</i>						
-0.022** (0.0016)	-0.12** (0.021)		0.17** (0.012)	0.67** (0.036)	0.0026** (0.0009)	0.17

\*\*Significant at the 0.01 level using White standard errors.  
\*Significant at the 0.05 level using White standard errors.

CYEC and  $E_t - F_t$  are perfectly correlated, our estimate of the coefficient on  $\text{PYEC}_R$  will have a negative bias since the data space is confined to where PYEC and  $E_t - F_t$  have opposite signs. Similarly, the coefficient on  $\text{PYEC}_M$  will have a positive bias.

This bias is likely to be small since the correlation between CYEC and the dependent variable ( $E_t - F_t$ ) is likely to be low. This is because CYEC is the forecast error from a random walk prediction model and  $E_t - F_t$  is the analysts forecast error. Analysts are well known to beat a random walk (Brown, 1996). To assess the extent of this bias we also ran Equation (4) again but distinguishing between the two types of reversion, PYEC positive/CYEC negative and PYEC negative/CYEC positive. Both of the coefficients were negative and of a similar size to the coefficient for  $\text{PYEC}_R$  in Result 1 in Table III. Distinguishing between two types of momentum is analysed in Result 2 of Table III.

**Table III. The Easterwood and Nutt (1999) Model**

This table shows OLS estimates of the Easterwood and Nutt model, Equation (3):

$$E_t - F_t = \alpha_1 + \alpha_2 \cdot \text{Low} + \alpha_3 \cdot \text{High} + \beta_1 \cdot \text{PYEC} + \beta_2 \cdot (\text{PYEC} \cdot \text{Low}) + \beta_3 \cdot (\text{PYEC} \cdot \text{High}) + u_t \quad (3)$$

$E_t$  is earnings per share, scaled by price at the date of the forecast.  $F_t$  is the forecast of earnings per share, scaled by price at the date of the forecast. PYEC is the prior-year earnings change at the time of the forecast ( $E_{t-1} - E_{t-2}$ ), scaled by price. Low takes a value of one if PYEC is in the lowest quartile of our sample (equal to or below -0.021) and zero otherwise. High takes a value of one if PYEC is in the highest quartile of our sample (equal to or exceeding 0.0125) and zero otherwise. Adj.  $R^2$  is the  $R^2$  adjusted for degrees of freedom. Figures in parenthesis ( ) are White standard errors. Figures in curly brackets { } are OLS standard errors. Figures in square brackets [ ] are Easterwood and Nutt reported OLS t-statistics. The sample consists of 38,626 firm-year observations taken from the 1990-96 equity working lists of a major UK investment bank.

<i>Panel A. Easterwood and Nutt Original Estimates</i>						
Constant	Low	High	PYEC	PYEC Low	PYEC High	Adj. $R^2$
$\alpha_1$	$\alpha_2$	$\alpha_3$	$\beta_1$	$\beta_2$	$\beta_3$	
-1.03-1.69	-0.48	0.12	0.30	-0.29	0.10	
[-9.66]	[-11.40]	[-3.23]	[0.96]	[24.98]	[-16.59]	
<i>Panel B. Easterwood and Nutt Model on Our Data</i>						
<i>Result 1.</i>						
-0.015	-0.013	-0.0035	0.14	-0.02	-0.210	0.02
{0.0008}	{0.0015}	{0.0014}	{0.091}	{0.091}	{0.092}	
<i>Result 2.</i>						
-0.015**	-0.013**	-0.0035	0.14**	-0.02	-0.210**	0.02
(0.0004)	(0.0024)	(0.0022)	(0.04)	(0.047)	(0.061)	

\*\*Significant at the 0.01 level using White standard errors.

\*Significant at the 0.05 level using White standard errors.

Another feature of Result 1 in Table II is that in the momentum regime the underreaction is now significantly larger, compared with the Abarbanell and Bernard (1992) benchmark results in Table I. The value of the coefficient on  $\text{PYEC}_M$  is 0.5 compared with 0.08 for PYEC reported in Table I. In contrast, the coefficient for the reversion regime ( $\text{PYEC}_R$ ) is -0.12 and indicates a degree of underreaction that is not significantly different from that found in Table I. Overall, the underreaction for cases of momentum is much larger than for cases of reversion. This finding suggests that analysts regard apparent trends as inherently transitory, relative to reversion.

In Result 2 in Table II, we also distinguish between momentum upwards and momentum downwards, as in Equation (5). As mentioned earlier, the background for this distinction is that Abarbanell and Bernard (1992) suggest that their underreaction results are strongly linked to optimistic forecasts following weak earnings performance. Since we find strong underreaction in the momentum regime, we investigate whether this feature too is related to optimism in the context of poor earnings performance. Here, we define poor earnings performance as cases in which both the prior-year and current-year earnings changes are negative.

Result 2 in Table II shows that the coefficient on momentum upwards is 0.17, which is similar in absolute value to that for the reversion regime. In contrast, the coefficient on momentum downwards is much larger (0.67) and significant. This result suggests that optimism in the face of poor earnings performance does play an important role in the interpretation of

our results. Analysts exhibit generalized underreaction to PYEC. However, when PYEC is negative, they seem to be especially surprised when earnings decline further. Our results parallel those already reported by Abarbanell and Bernard (1992). This feature may be explained by analysts' reluctance to recognise downward revisions in corporate fundamentals, as suggested by Cornell (2001). It may also be understandable given the prevalence of earnings reversion in the aggregate economy.

Our final test in Table II (Results 3 and 4) checks whether the recommendation variable eliminates the underreaction as in Francis and Philbrick (1993). Therefore, we estimate Equations (4) and (5) with the addition of the recommendation variable, REC. The recommendation effect is significant but does not eliminate the underreaction of forecasts. This finding is similar to that in Table I.

The above results suggest that analysts' forecasts suffer from a generalized underreaction to the prior-year earnings change. This contrasts with the generalized optimism explanation of Easterwood and Nutt (1999). To explore this discrepancy further, we replicate their specification on our data set. Table III presents our results which show some quantitative differences in the reported coefficients. Easterwood and Nutt's original estimates use OLS standard errors and are shown in Panel A. Our replication of this is reported in Panel B, Result 1. The qualitative interpretation of our results is similar to that of Easterwood and Nutt, yielding a positive, but insignificant response to prior-year earnings change for normal values of PYEC<sup>3</sup> and a significant negative shift for high values. Unlike Easterwood and Nutt, we do not find a positive shift in the coefficient for low values of PYEC.

However, our data strongly reject the assumption of homoskedasticity. Our preferred specification uses the White (1980) correction for heteroskedasticity, reported in Result 2 of Table III. This result shows that analysts overreact to high values of PYEC and underreact in other cases. The finding gives support for Easterwood and Nutt's decomposition. In results which are available from the authors, we test if our preferred specification (Equation 4) is a better representation of the data than that proposed by Easterwood and Nutt (1999) using the Davidson and MacKinnon (1981) J-test. While the results give weak support to our model as a more preferable representation of the data, neither model is able to conclusively reject the other.

### C. Reporting and Processing Sources of Forecast Bias

In this section, we discriminate between some of the possible explanations for the sell recommendation effect (i.e., the systematic decrease in the forecast error ( $E_t - F_t$ ) when a sell recommendation is issued by the analyst). One possibility, described by Abarbanell and Lehavy (1999) and discussed above, is that the decrease reflects a strategic "earnings bath" taken by company management; that is, sell recommendations are associated with a decline in reported (but not true) earnings. We find no evidence of this earnings bath explanation. Indeed, earnings rise in the first year after the sell recommendation is issued, for both the average and median firm, only to begin falling in the following year.

Other explanations for the sell recommendation effect examine the way in which analysts either report or construct their forecasts. For example, as discussed earlier, Francis and Philbrick (2003) suggest that the forecast is increased to maintain good relations with the company. In contrast, Eames et al. (2002) argue that the sell recommendation effect is a product of an omitted variable bias together with an unconscious desire to rationalize the

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<sup>3</sup>Easterwood and Nutt (1999) define normal values of PYEC as embracing the middle two quartiles of the distribution of PYEC. Low and high values are defined to be the top and bottom quartiles.

recommendation. To examine these explanations, we exploit our knowledge of whether the analysts' merchant bank acts as broker to the company. If the bias is a processing one, then the recommendation effect is unlikely to vary between broker and non-broker companies. However, if the bias is a reporting one, then the recommendation effect will be larger for broker companies, because analysts have greater incentives to maintain good relations with the incumbent managers of these companies.

In Table IV, we present our tests which incorporate the broker status of the sample companies. The model that we estimate is Equation (5) with the addition of the recommendation variable (REC). Since the broker status variable is not available for all companies, Result 1 of Table IV is for the full sample, and is copied over from Result 4 of Table II to aid comparison with previous tests. Result 2 of Table IV is for the sub-sample that records information about broker status. Results 3 and 4 give non-broker and broker results respectively. In Table IV, the equation in Panel B estimates the model for broker and non-broker companies together, but uses dummy variables to show whether any changes in the coefficients for broker companies are significant.

Table IV shows that although the coefficient on REC is larger for brokers (Result 4) than for non-brokers (Result 3), Panel B indicates that the difference is not significant. However, it is difficult to interpret this finding as clearly rejecting a reporting bias explanation and supporting a processing bias explanation for the sell recommendation effect. In our sample, we find that analysts almost never issue a sell recommendation when the bank is acting as a broker. Only 0.57% of recommendations issued for broker companies are sell, compared with 11.83% for non-broker companies. Thus, it is hard to distinguish between the strength of the sell recommendation effect as evinced by broker and non-broker firms. Similar evidence is reported by Carleton, Chen, and Steiner (1998), who find that non-brokerage firms are three times more likely to make sell recommendations than are brokerage firms. Thus, these results are not an adequate discriminant between processing and reporting explanations of the sell recommendation bias.

However, this lack of sell recommendations for broker companies represents much stronger evidence of a form of reporting bias than merely shading up the forecast after issuing a sell recommendation, as in Francis and Philbrick (1993). We find that our sample of UK analysts almost never report a sell recommendation for broker companies.

In addition, we interpret another result in Table IV as supporting the existence of a forecast reporting bias when the analyst's merchant bank acts as a broker to a company. Results 3 and 4 show that the underreaction effect for downward momentum is significantly larger for broker companies. In the case of non-broker companies the coefficient is 0.7, whereas for broker companies it is 1.02. Panel B indicates that this difference is significant. That is, when the bank acts as a broker to the company, analysts are more likely to believe that earnings will revert (upwards) following one period's poor performance. Although it is possible that analysts' inside knowledge concerning broker companies makes them more confident in predicting reversion, this confidence appears to be severely misplaced. Our preferred explanation is that analysts find it expedient to ignore clear signs of deteriorating company performance. This explanation accords with our evidence that analysts are reluctant issue sell recommendations for broker companies. Although the reporting bias is not related to the presence of a sell recommendation, the underlying phenomena captured is similar. An analyst's ability to respond to bad news about company performance is compromised when that company is a client of the merchant bank.

## VI. Conclusions

Using data on UK analysts' earnings forecasts, we estimate the extent to which forecasts

**Table IV. Estimates of Underreaction/Overreaction to Prior-Year Earnings Change for Broker and Non-Broker Companies**

This table shows OLS coefficient estimates for Equation (5) with the REC variable added, as follows:

$$E_t - F_t = \alpha + \beta_1 \cdot \text{PYEC}_R + \beta_2 \cdot \text{PYEC}_{M\_UP} + \beta_3 \cdot \text{PYEC}_{M\_DN} + \beta_4 \cdot \text{REC} + u_t$$

Panel A makes separate estimations according to whether or not the analysts merchant bank acts as broker to the company. Panel B uses dummy variables to shift the coefficients for companies where the merchant bank acts as broker.  $E_t$  is earnings per share, scaled by price at the date of the forecast.  $F_t$  is the forecast of earnings per share, scaled by price at the date of the forecast. REC is the analyst recommendation at the time of the forecast. The values we use are: Buy (2), Hold (1), Sell (0). PYEC is the prior-year earnings change at the time of the forecast ( $E_{t-1} - E_{t-2}$ ), scaled by price.  $\text{PYEC}_R$  is PYEC if PYEC is opposite in sign to the current year earnings change CYEC (defined as  $E_t - E_{t-1}$ ) and zero otherwise.  $\text{PYEC}_M$  is PYEC if PYEC is the same sign as CYEC and zero otherwise.  $\text{PYEC}_{M\_UP}$  is PYEC for cases of momentum upwards (when PYEC and CYEC have the same sign and are positive) and zero otherwise.  $\text{PYEC}_{M\_DN}$  is PYEC for cases of momentum downwards (when PYEC and CYEC have the same sign and are negative) and zero otherwise. Adj.  $R^2$  is the  $R^2$  adjusted for degrees of freedom. Figures in parenthesis are White standard errors. The sample consists of 38,626 firm-year observations taken from the 1990-96 equity working lists of a major UK investment bank. In 3,936 cases the bank acted as broker to the company, in 16,529 cases the bank did not act as broker, and in 18,161 cases the information was not recorded by the bank.

<i>Panel A. Partitioning of the Sample According to Broker Status</i>					
<b>Constant</b>	<b>PYEC<sub>R</sub></b>	<b>PYEC<sub>M_UP</sub></b>	<b>PYEC<sub>M_DN</sub></b>	<b>REC</b>	<b>Adj. R<sup>2</sup></b>
<i>Result 1. Full Sample of 38,626 Firm Year Observations</i>					
-0.022** (0.0016)	-0.12** (0.021)	0.17** (0.012)	0.67** (0.036)	0.0026** (0.0009)	0.17
<i>Result 2. Broker and Non-Broker Sample of 20,465 Observations</i>					
-0.015** (0.0027)	-0.12** (0.027)	0.15** (0.013)	0.80** (0.056)	0.0031* (0.0015)	0.20
<i>Result 3. Non-Broker Sample of 16,529 Firm Year Observations</i>					
-0.016** (0.0030)	-0.15** (0.040)	0.14** (0.017)	0.70** (0.071)	0.004* (0.0016)	0.17
<i>Result 4. Broker Sample of 3,936 Firm Year Observations</i>					
-0.030** (0.0085)	-0.07** (0.019)	0.16** (0.021)	1.02** (0.056)	0.0096* (0.0045)	0.30
<i>Panel B. Estimation with Dummy Variables</i>					
Broker and Non-Broker Sample of 20,465 Observations					
Non-Broker Coefficients					
-0.016** (0.0030)	-0.15** (0.041)	0.14** (0.017)	0.70** (0.071)	0.004* (0.0016)	0.21
Coefficient Shifts for Broker Companies					
-0.014 (0.009)	0.08 (0.045)	0.02 (0.027)	0.32** (0.091)	0.005 (0.0048)	

\*\*Significant at the 0.01 level using White standard errors.

\*Significant at the 0.05 level using White standard errors.

suffer from a processing bias in the form of an underreaction to prior-year earnings changes. We build on the work of Abarbanell and Bernard (1992), but recognize divergent signals in the prior-year earnings change.

Earnings increases can imply either that earnings will continue to rise, or that a fall is

imminent. Accordingly, we decompose the Abarbanell and Bernard (1992) overreaction/underreaction coefficient according to cases of earnings reversion and earnings momentum. We report significant underreaction, much larger than the original Abarbanell and Bernard estimates, particularly when earnings decline. Furthermore, our decomposition is distinct from, and is not dominated by, the generalized optimism specification of Easterwood and Nutt (1999).

In addition, we investigate whether analysts' sell recommendations are associated with higher forecasts. Prior US research by Francis and Philbrick (1993) suggests that the sell recommendation effect eliminates the underreaction to the prior-year's earnings change. Francis and Philbrick suggest further that the feature is a reporting bias which arises when analysts try to maintain good relations with company management in difficult times. This explanation contrasts with Eames et al. (2002) who suggest that processing bias is the cause.

In the UK context, we study the forecasts of analysts who prepare both the recommendation and the forecast. Yet, we find a recommendation effect similar to that first reported in the US. However, unlike Francis and Philbrick (1993), we find that the underreaction to the prior-year's earnings change is not displaced by the sell recommendation effect.

To disentangle the reporting and processing bias explanations of the sell recommendation effect, we classify companies according to whether or not the merchant bank is a broker to the company. If reporting bias is the explanation, then the sell effect is likely to be larger for broker companies. We find that the sell effect is the same across broker and non-broker companies. However, this result does not provide unequivocal support for the processing bias explanation, because we also find that analysts almost never issue a sell recommendation for a company when the bank is acting as a broker. Therefore, the broker status of a company cannot be used to discriminate effectively between processing and reporting explanations of the sell recommendation bias.

This lack of sell recommendations for broker companies, however, represents much stronger evidence of a form of reporting bias than merely shading up the forecast after issuing a sell recommendation, as in Francis and Philbrick (1993). Analysts almost never report a sell recommendation for broker companies. Further evidence of reporting bias for broker companies is that the underreaction effect in cases of downward momentum is significantly larger for broker companies. We interpret both of these biases as being caused by an analyst's response to bad news about company performance being compromised when that company is a client of the merchant bank. ■

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