Analyst underreaction to past information about earnings:

reporting, processing or plain old misspecification bias?

by

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Abstract

We revisit the debate concerning the interpretation given to prior year's earnings changes in predicting future earnings as discussed by Abarbanell & Bernard (1992), Francis & Philbrick (1993) and Easterwood and Nutt (1999). We advance a new specification of this relationship which distinguishes between earnings reversion and momentum.

On a large UK dataset, we find there is substantial underreaction, particularly in situations of earnings momentum, approximately six times as large as that identified by Abarbanell & Bernard. This suggests that analysts behaviour is still a candidate to explain post earnings announcement drift. We also show that our model performs well relative to a specification recently proposed by Easterwood and Nutt (1999).

Analyst underreaction to past information about earnings: reporting, processing or plain old misspecification bias?

The inability of stock markets to speedily impound recent earnings information is often regarded as one of the most worrying phenomena for those who believe in the efficient markets hypothesis (Brennan, 1991, Ball 1992). Evidence of post -earnings announcement drift (PEAD) exists for the US (Bernard and Thomas, 1989, 1990, Bernard 1993) and, in small firm portfolios for the UK (Hew *et al*, 1996). Fama (1998) in a review, which is dismissive of many supposed anomalies to the efficient market hypothesis, cites PEAD as an anomaly which is "above suspicion" (1998, p 304).

One potential explanation of this phenomenon is analyst's underreaction to recent changes in earnings. Analysts may simply underweight recent earnings information, which in turn leads to Bayesian underrevision of the earnings forecast. When earnings are subsequently announced, analysts and other market agents take time to adjust. This explanation constitutes a form of processing bias in the formation of earnings forecasts.

Overall, research has not found the behaviour of analysts to be a convincing explanation for the anomaly of PEAD. Abarbanell & Bernard (1992) find that the extent of underreaction of analysts to prior year earnings change is far too modest to explain observed post-earnings announcement drift. In a study of *Value Line* forecasts, Francis & Philbrick (1993) find that Abarbanell & Bernard's underreaction coefficient disappears once we control for the tendency of analysts to boost forecasts for companies which have had sell recommendations issued against them. Francis & Philbrick argue that the properties of the forecast error are associated with a *reporting* bias by analysts, rather than a *processing* bias in the interpretation of the prior years earnings change. Furthermore, using a variation on the Abarbanell & Bernard model, recent evidence by Easterwood and Nutt (1999) suggests that analyst behaviour can be characterised as generalised optimism rather than under or overreaction. That is, analysts over

emphasise past rising trends in earnings and underplay past falling trends in earnings.

Given the lack of association of PEAD with any underreaction by analysts, other explanations for it are now being proffered. For example, Daniel, Hirshleifer & Subrahmanyam (1998) suggest that the apparent finding of PEAD is part of the long run adjustment of prices to fundamental values. That is, the announcements after which there appears to be drift are selective events made to correct, or take advantage of, the market's mispricing.

In this paper we suggest that analysts underreaction to prior year earnings changes has been understated, and therefore there may still be merit in this explanation of PEAD. Specifically, we argue that the Abarbanell & Bernard test for analysts' underreaction to prior year earnings is inadequately specified. We revise the specification of the model by clarifying the nature of analyst's underreaction to recent earnings numbers. Our estimates in our revised model show substantial underreaction; in some situations, our coefficient is eight times as large as that reported by Abarbanell & Bernard. Furthermore we show that, contrary to Francis & Philbrick (1993), analysts' underreaction is robust to the inclusion of the boosting of forecasts for sell recommendations. Hence, the reporting bias found by Francis & Philbrick is, both conceptually and empirically, separable from underreaction to the prior year's earnings change. This confirms market recognition of the presence of the two separate phenomena reported in Francis and Soffer (1997). Our revised specification also compares favourably with the generalised optimism story of Easterwood and Nutt (1999).

The remainder of this paper is structured as follows. The next section discusses earlier work on the topic. We then introduce our suggested respecification of the Abarbanell & Bernard model and the further insights it offers into analysts interpretation of earnings information. We also compare our respecification with that advanced by Easterwood and Nutt. The third section discusses the factors which might be driving the sell recommendation explanation of apparent

forecast inefficiency, as advanced by Francis & Philbrick. Section four gives details of our sample frame and data. Section five presents our results and a final section concludes the paper.

EARLIER RESEARCH

Abarbanell & Bernard

Abarbanell & Bernard (1992), hereinafter A&B, 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. They ask the question: "Can analyst underreaction explain post-earnings announcement drift?" They answer that although analysts do indeed underreact to past changes in earnings, the extent of that underreaction is far too modest to explain observed post-earnings announcement drift.

In order to identify the extent of underreaction to past changes in earnings, they use the following variables to estimate equation (1).

E_t = annual earnings per share for period t

F_t = forecast of annual earnings per share for period t

PYEC = prior year earnings change at the time the forecast is made.

= $E_{t-1} - E_{t-2}$

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

where $u_t \sim N(0,\sigma_u)$

If F_t is an efficient forecast, then β will be zero. Therefore, non zero values of β mean that information, which is available at the time of the forecast, is not being used to reduce the forecast error. Analysts fail to spot a systematic error in their forecasts. In addition to the concern about inefficiency, A&B make a second interpretation of their findings. This is that the

sign of the coefficient β has implications for the way in which analysts process information. They suggest that a finding of $\beta > 0$ indicates underreaction, whilst 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. Their estimate of β is 0.08, which is significantly different from zero, for forecasts made before the 1st quarter report. Forecasts made after the 3rd, but before the 4th quarter, also suffer from underreaction, but less so; β is still significant, but smaller, at 0.03.

Francis & Philbrick

Francis & Philbrick (1993), hereinafter F&P, offer a somewhat different interpretation of the process by which *Value Line* analysts appear to underreact to past changes in earnings. These authors suggest a *reporting* explanation rather than a *processing* explanation for the upward bias in analysts' forecasts. They shift the focus from past changes in earnings to switches in stock recommendation as a driver of earnings forecast revisions. Their explanation is linked to the A&B suggestion that the finding of underreaction is largely associated with poor recent performance (that is with negative values of the prior year earnings change).

F&P note that the *Value Line* analysts who prepare forecasts do not make stock recommendations. *Value Line*'s stock selection strategy is undertaken by a separate group within the organisation. 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 the managers of the corporations they follow. Although investors pay their wages in the form of fees for investment advice, it is the managers of the companies that keep analysts in business by providing them with insights into the company's life. A perfectly accurate forecast, consistent with the sell recommendation, would give the analyst a great reputation amongst investors *for*

one time-period, but would probably be punished by reduced access to management in every subsequent period. So current accuracy and future accuracy (which is a function of degree of access to corporate management) must be traded off[1] in a manner suggested by Figure 1 below. This trade-off is the source of *reporting bias* in the forecast of earnings issued by analysts.

Figure 1 about here

In order to test their ideas, F&P add another variable, the stock recommendation (REC), to the A&B underreaction equation, as follows,

REC = -1 if sell

= 0 if hold

= 1 if buy

and estimate equation (2).

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

where $v_t \sim N(0,\sigma_v)$

They find that β is 0.0755 and significant when PYEC is the only variable; this is very similar to A&B's result. However, when REC is added, θ is positive and significant, but β is not. Their results support the suggestion that sell recommendations (negative REC values) are associated with an increased upward bias in earnings forecasts. They find that when issuing sell recommendations, analyst's forecasts are biassed upwards by about 12 %, whereas when a buy recommendation is issued the resulting bias is only 3%. They interpret their finding to imply a form of reporting bias, in the sense that the analyst correctly infers future earnings but fails

to report it. Note that the F&P claim, that the recommendation effect "explains" perceived analyst underreaction to PYEC, may be interpreted as standing in tension with the later finding of Francis and Soffer (1997) that investors price both the recommendation made by analysts and their forecasts individually.

Easterwood and Nutt

Recently Easterwood and Nutt (1999), hereinafter E&N, have advanced a possible reconciliation between reported underreaction and De Bondt and Thaler's (1990) generalised overreaction. E&N allow the response coefficient of analysts to a prior year earnings change to vary with different past states of nature, namely the level of PYEC. This allows for the possibility of underreaction *and* overreaction within the same equation, as follows.

$$E_t - F_t = \alpha_0 + \alpha_1 \text{Low} + \alpha_2 \text{High} + \alpha_3 \text{PYEC} + \alpha_4 (\text{PYEC. Low}) + \alpha_5 (\text{PYEC. High}) + u_t \quad (3)$$

where

Low = 1, if the firm's prior year earnings change is in the lowest quartile of their sample

= 0, otherwise

High = 1, if the firm's prior year earnings change is in the highest quartile of their sample

= 0, otherwise

and $u_t \sim N(0,\sigma_u)$

E&N find that when PYEC has a low value, then the coefficient on PYEC is positive and therefore analysts underreact. However, if PYEC has a high value then the coefficient on PYEC is negative and therefore analysts overreact. They therefore suggest that analysts' behaviour is characterised as "generalised optimism", rather than under or overreaction. That is, analysts overemphasise past rising trends in earnings and underplay past falling trends in earnings.

MODELLING UNDER/OVERREACTION TO PRIOR YEAR EARNINGS CHANGE

The rationale which A&B give for their underreaction/overreaction test in equation (1) above is very brief (1992, p1201). At first sight, the interpretation of the equation seems straight forward. However, the interpretation of $\beta > 0$ as underreaction makes sense only when earnings are trending; when the earnings process is reverting to a past value, then $\beta > 0$ implies overreaction! What A&B report is a response coefficient which averages across these two states. This is discussed in more detail below and illustrated in Figure 2.

Figure 2 about here

Consider the case of $\beta > 0$, which A&B interpret as underreaction. When earnings are rising (PYEC > 0), equation (1) specifies the forecast error ($E_t - F_t$) as positive[2]. The underreaction explanation is that analysts are too cautious about current earnings (E_t) rising further and therefore the forecast tends to be systematically below the realisation of E_t. Too little weight is given to PYEC in the construction of F_t, resulting in pessimistic forecasts. This situation is illustrated in the top part of Figure 2.

Similarly, when earnings are falling (PYEC < 0), a value of $\beta > 0$ means that the forecast error ($E_t - F_t$) is negative. Analysts are interpreted as being too reticent to 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, which results in the forecast being systematically larger than the realisation of E_t, resulting in optimistic forecasts.

This story is fine as far as it goes, and makes sense in the situation where the PYEC contains information confirming a continuation of the current trend of earnings. But what if earnings revert to a past value[3] 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 is important because Fama & French (2000) show that reversion is the more likely case. Somewhat surprisingly, the correct interpretation to $\beta > 0$ is that analysts, in fact, *overreact* to the information contained in PYEC and exaggerate the decline in earnings. This is explained below.

When a positive PYEC contains information about earnings reversion (for example, when earnings are rising, but at a sharply falling rate), if there is underreaction then we would expect the forecast to lag behind the actual reversion in earnings. This would mean that forecasted change in earnings ($F_t - E_{t-1}$) will be negative but smaller in absolute size than the actual change ($E_t - E_{t-1}$). The forecast error ($E_t - F_t$) will be negative since the forecast will exceed the outcome. This case is illustrated by the lower part of Figure 2. However, this outcome is not correctly modelled by a positive β in equation (1). When β and PYEC are positive, then equation (1) specifies that the forecast error ($E_t - F_t$) will also be positive. In order for equation (1) to model underreaction correctly in the case where earnings revert, β must be negative.

The A&B equation (equation 1 in our paper) is, in reality, a test of whether analysts (a) underreact in cases where earnings trend and (b) *overreact* when earnings are reverting. The A&B equation specifies that the sign of the forecast error will change with the sign of PYEC. However, the sign of the forecast error should also change with the information that is contained in PYEC, that is with the nature of the underlying earnings process. When PYEC > 0, underreaction to the PYEC should lead to $F_t < E_t$ when earnings are trending, but to $F_t > E_t$ when earnings revert. The interpretation of underreaction to the A&B finding of $\beta > 0$ is justified only if earnings follow a trend.

This criticism also applies to the E&N specification who estimate the A&B equation, but allow the β coefficient on the prior year earnings change to vary across different past states of nature: low, moderate and high levels of prior year earnings change. They find that for low levels of PYEC, $\beta > 0$ which is interpreted as underreaction; and $\beta < 0$ for high levels of PYEC which is interpreted as overreaction. Both of these interpretations rely on the assumption that earnings follow a trend.

More generally, the A&B and the E&N equations do not indicate how reported underreaction is related to investors' misunderstanding about the time series properties of the prior year earnings change. Other studies have included this relationship in their analysis. For example, in Bernard and Thomas (1990) underreaction is driven by investors assuming that quarterly earnings follow a seasonal random walk when there is, in fact, an autocorrelation structure within the 4 quarters over which earnings are reported. Conversely, in Barberis, *et al* (1998), investors underreact because they believe that annual earnings are mean reverting when in fact the process is a random walk. Our approach is to follow the logic of these previous studies and explore what interpretations, or misinterpretations, investors are hypothesized to make about the information contained in the prior values of earnings. The earnings change may pass a signal to investors of either a continued rise or fall in earnings (momentum), or an imminent reversal of fortunes (reversion). The prior year earnings change may therefore have varying implications for future earnings that are not captured by the A&B and E&N equations.

Based on our discussion above, we interpret underreaction as giving $\beta > 0$ in cases where earnings are trending and as giving $\beta < 0$ in cases of earnings reversion. For example, if PYEC is negative but earnings display some form of reversion, then underreaction to this information will mean that the forecasted rise in earnings ($F_t - E_{t-1}$) will in fact be smaller than the actual change ($E_t - E_{t-1}$). The forecast error will be positive ($E_t > F_t$).

In order to make these distinctions operational, we define the earnings trend regime to be that in which the direction of movement between t-2 and t-1 continues in the next period. The reversion regime is defined to be that in which the movement between t-2 and t-1 does not continue. This is a simple approximation which uses *ex post* outcomes as a proxy for *ex ante* expectations, as implied by rational expectations. When earnings are reverting and the PYEC > 0, we would expect more outcomes of E_t to be below E_{t-1} than to be above it. Similarly, when earnings are trending and the PYEC > 0 we would expect more outcomes of E_t to be above E_{t-1} than to be below it. Imbuing analysts with some knowledge of future earnings outcomes seems reasonable in the light of evidence that analysts can beat simple time series benchmarks.

One approach to adjusting equation (1) for trending and reversion is to simply allow the sign of the prior year earnings change variable to alter with the earnings process, as follows.

$E_t - F_t = \alpha + \beta.PYEC^* + u_t$

where

PYEC* = (+1). PYEC, if earnings trend

= (-1). PYEC, if earnings revert to a past value

This would allow the sign of β (but not its size) to vary with the assumed earnings process.

Barberis *et. al*.(1998) suggest that the trending of earnings is thought by investors to be less common than mean reversion. This accords with the intuition that every tide must turn. Therefore the degree of underreaction by analysts might vary with the earnings process. In order to accommodate this, we allow for both the sign and the size of the coefficient β to vary with the earnings process as follows.

We define

CYEC = current year earnings change = $E_t - E_{t-1}$

and introduce two dummy variables, $PYEC_R$ and $PYEC_M$. $PYEC_R$ captures the case of earnings reversion, where PYEC and CYEC have the opposite sign. $PYEC_M$ captures the case of earnings momentum, where PYEC and CYEC have the same sign. The revised A&B underreaction/overreaction model is then re-written in this decomposed form as follows.

$$E_t - F_t = \alpha + \beta_0 PYEC_R + \beta_1 PYEC_M + u_t \quad (4)$$

where

$PYEC_R$ = PYEC(prior year earnings change) if

PYEC > 0 and CYEC < 0 or

PYEC < 0 and CYEC > 0

= 0 otherwise

$PYEC_M$ = PYEC (prior year earnings change) if

PYEC > 0 and CYEC > 0, or

PYEC < 0 and CYEC < 0

= 0 otherwise

All this model does is to allow the underreaction/overreaction coefficient to be estimated separately for cases of earnings reversion and earnings momentum. If the A&B model in equation (1) is an adequate specification, then β_0 should not be significantly different from β_1 in equation (4). However, if the misspecifation concerns raised above are justified, then we would expect that underreaction will give $\beta_0 < 0$ (since analysts will underestimate the reversion in earnings) and $\beta_1 > 0$ (since analysts will underestimate the trend in earnings). Also the absolute value of β_1 is likely to be larger than the absolute value of β_0; if earnings reversions are thought to be more widespread than earnings trends, then analysts may underreact more when earnings trend than when they revert.

A further refinement of the A&B equation, which we explore, distinguishes between momentum upwards and momentum downwards, as in equation (5).

$$E_t - F_t = \alpha + \beta_0 PYEC_R + \beta_1 PYEC_{M\_UP} + \beta_2 PYEC_{M\_DN} + u_t \quad (5)$$

where

$PYEC_{M\_UP}$ = PYEC for cases of momentum upwards, when CYEC and PYEC have the same sign and are positive

= 0 otherwise

$PYEC_{M\_DN}$ = PYEC for cases of momentum downwards, when CYEC and PYEC have the same sign and are negative

= 0 otherwise

The background to this is twofold. Firstly, A&B suggest (1992, p1202) that their underreaction results were strongly linked to optimistic forecasts following weak earnings performance. Secondly, E&N find evidence of an asymmetric response of forecasts to good and bad news about PYEC. We model this in the equation by defining poor earnings performance to occur where both the prior year and the current year earnings changes are negative.

One aspect of our specification which warrants further discussion is its apparent susceptibility to look-ahead bias. The β coefficients in equation (4) vary according to the sign of the current year earnings change which is not known at the time of the forecast. This needs to be discussed in the context of the trading rule inefficiency and underreaction interpretations which are placed on the A&B results.

What sort of trading rule is implied by our model ? One rule is that if investors had knowledge of the current year earnings change (CYEC), the forecast error could be reduced. This is likely since previous research (for example, Brown & Rozeff 1978 and Brown 1996) shows that analysts have some knowledge about the sign of next year's earnings change, beating a wide range of benchmarks. This is hardly surprising given their access to extensive information

concerning future corporate performance. Furthermore, for many companies the length of the production run implies that costs and revenues are known for several months in advance.

We argue above that interpreting the A&B results as underreaction assumes that earnings follow a trend. If mean reversion in earnings is perceived to be more common (Barberis *et al*, 1998 and Fama & French, 2000), a more plausible interpretation of the A&B results is, in fact, overreaction. However, earnings are probably not characterised by a single process. Therefore, in order to advance the underreaction/overreaction debate, it is necessary to identify the information about current earnings which is contained in PYEC, and decompose the response coefficient accordingly. In this paper, we use ex post outcomes as a proxy for the underlying process upon which analysts base their expectations when making forecasts.

THE SELL RECOMMENDATION EFFECT

In this section, we explore potential explanations for the recommendation effect. This effect arises from the alleged additional boost to forecast optimism for firms subject to a sell recommendation.

The managerial relations hypothesis

The F&P results, which suggest a reporting bias explanation for the sell recommendation effect, arose in the *Value Line* setting. Here, stock recommendation is taken as given by the analyst who issues 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 F & P context, the analyst seeks to maintain good relations with both investors and the company then he, or she, will need to identify how to use the forecast and the recommendation to communicate with both parties. Given that stocks are traded on a daily

basis, any bias in the recommendation is likely to be uncovered relatively quickly. Furthermore, since the recommendation can take only a restricted set of values (typically, sell, hold or buy) there is little possibility of fine tuning. Therefore there would seem to be little scope for using an enhanced recommendation in order to maintain good relations with management.

In contrast, any bias in the forecast will not be fully apparent until the earnings are announced, and therefore the forecast is a more suitable instrument for maintaining managerial relations. Furthermore, the earnings forecast can be adjusted by relatively small amounts in order to fit the case. These arguments are valid for both the specific *Value Line* context and the more usual setting in which the same analyst issues both a recommendation and a forecast for the same firm. Therefore in order to investigate this in our sample we add the recommendation of the analyst, REC, as an explanatory variable to our equations (4) and (5).

One question which needs to be addressed is how the incremental optimism associated with sell recommendations actually helps the analyst's relationship with the company. Degeorge *et al*, 1999 reports evidence of earnings management towards the consensus earnings forecast. Therefore, surely, more optimistic forecasts are more difficult for the management of the company to meet? Failure to do so may result in a negative "earnings surprise" and a consequent increase in the firm's equity cost of capital. This issue is investigated by Eames, Glover & Kennedy (1999).

A possible explanation for maintaining the forecast, despite the downgrade of the recommendation, is that company management may itself wish to control the release of bad news to the market (Skinner,1994 and Gibbins *et al*, 1990). Thus may be seen as part of maintaining trust with outside stakeholders in the firm, particularly fund managers with whom senior managers regularly meet. Holland (1998) in a case study investigation of investor-management relations states that corporate managers regard speaking with "one voice" to key

fund manager/analysts as being central to disseminating an accurate picture of the corporation's performance. Barker (1998) also emphasises direct contact between fund managers and corporate management, as a source of "raw" information as opposed to receiving information which has been "processed" by analysts. Consequently, fund managers may prefer to receive earnings information associated with an investment recommendation downgrade within the context of a broader information set which is best provided by company management.

The processing bias alternative to the managerial relations hypothesis

In contrast to the managerial hypothesis, the incremental optimism associated with sell recommendations may reflect the differing cognitive processes invoked when issuing a forecast, as opposed to revising a stock recommendation. One notable difference between the forecast and recommendation decision is in the speed with which feedback is made available to the analyst on his or her decision. Specifically, the change in the recommendation to sell may result in a forecast that lags behind the recommendation because the forecast suffers from a relatively sluggish feedback.

Analyst stock-recommendations are met with swift feedback from the market in the form of subsequent price movements. Price rises following a sell, or price falls following a buy, are likely to result in swift censure for an analyst. In contrast, a forecast of earnings is only exposed to the market test several months after the forecast has been made.

Appropriate and timely feedback has a well established role in encouraging improvement in forecasting ability. Murphy & Winkler (1984) interpret the good calibration of probability (confidence-interval) forecasts of weather forecasters in the US National Weather Service as reflecting the efficacy of good and frequent feedback. Similarly, Albert & Raiffa (1982) report that the provision of feedback to a Harvard MBA class between one round of probability

forecasts and another [4] produced marked improvements in the class's second round forecasts. In reviewing the literature on the calibration of probabilities Lichtenstein *et al* (1982, pp. 327) list a number of studies documenting the ability of feedback to make more realistic the degree of confidence agents have in their forecasts.

We attempt to discriminate between these processing and reporting bias explanations by decomposing the recommendation effect into that for affiliated broker firms and unrelated non-broker firms. Lin & McNichols (1998), Dugar and Nathan (1995) and Michaely and Womack (1999) investigate the forecasts and recommendations of analysts for which their employer is acting as broker or is affiliated, that is undertaking IPOs, seasoned offerings and giving advice on mergers & acquisitions.

Exactly how analysts will trade off their reputation with investors against their relationship with company managers will depend on their preferences, and the relative shadow prices of these two goods. In particular, we expect the benefit of good relations with management to be particularly high for firms for which the analyst's organisation is a broker. If the relationship with corporate management is too ruffled they may look elsewhere for advice on mergers and acquisitions, issuing equity, and other matters.

This means that we can discriminate between the managerial relations and the processing bias rationalisations. If the reporting/managerial relations explanation is accurate, then we would expect optimism to increase when the analyst's employer acts as broker to the company. If the processing alternative is correct, then the broker variable will make little difference to the size of the sell recommendation effect.

The earnings bath hypothesis

But what if the earnings analysts seek to predict are themselves a moving target? Abarbanell

& Lehavy (1999) argue that the upward bias in the forecast error for sell recommendations reported by F&P is driven by an adjustment in earnings, rather than in the forecast. Abarbanell & Lehavy document convincing evidence of earnings manipulation by corporate management with respect to market perceptions of the firm's performance, as embedded in the average outstanding stock recommendation for the firm. Specifically, firms attracting sell recommendations display an unusually high incidence of "earnings baths", with large negative discretionary accruals being shifted into the current year. This earnings management by company managers results in strong optimism bias in forecasts for firms with outstanding sell recommendations. Analysts forecasts are accurate *when issued*, but subsequent earnings management makes them appear optimistic.

Other research suggests that the determination of announced earnings and analysts expectation of it may be jointly determined. Degeorge *et al* (1999) finds that managers of firms will smooth earnings towards is the consensus analyst forecast. Myers and Skinner (1999) focus on firms with earnings processes which exhibit momentum. They report strong evidence of earnings management designed to prolong runs of earnings increases.

This hypothesis constitutes an important alternative rationalisation of any apparent recommendation effect. Therefore, we investigate the distribution of actual earnings changes around recommendation switches, in order to clarify the interpretation of our tests.

DATA & VARIABLES EMPLOYED

The data selected are taken from the published monthly UK equity working lists of a major investment bank, covering approximately 500 UK companies quoted on London Stock Exchange, for the period January 1990 to December 1995 inclusive. The lists give the day on which the information was downloaded from the in-house database and published in the equity

working lists. Hence we believe the data to be more timely than forecasts from other frequently used sources.

Another advantage of this database is actual earnings are measured on the same basis as the forecast. Analysts do not always forecast the announced earnings per share, but their adjusted version of it, because they believe that the adjusted version more accurately represents the performance of the company.

In addition to forecasts and realisations of earnings, the lists give the monthly stock recommendations (buy, hold or sell) for each company. Therefore our data provides an important opportunity to examine the F&P *Value Line* sell recommendation effect outside of the specific institutional context in which it was first reported. Our setting is the more usual one, in which 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 by whether or not the investment bank acts as their broker. We exploit this feature to distinguish between competing explanations of the sell recommendation effect reported by F&P.

The companies selected for the sample were those which were followed in each of the monthly lists and this selection procedure yielded a balanced panel sample of 420 companies. The industry groupings (devised by the investment bank) of the 420 companies are given in Table 1.

Table 1 about here

The variables used in the study are as follows:

F_t = forecast of earnings per share, scaled by share price at the date of the forecast

E_t = earnings per share, scaled by share price at the date of the forecast

REC = analyst recommendation at the time of the forecast. The values taken are: Buy (2), Hold (1), Sell (0)

PYEC = prior year earnings change scaled by the share price at the date the forecast is issued.

When the forecast, F_t, is made after the announcement of annual earnings per share at t-1, then PYEC = $E_{t-1} - E_{t-2}$

When the forecast, F_t, is made before the announcement of annual earnings per share at t-1, but after the announcement of annual earnings per share at t-2, then PYEC = $E_{t-2} - E_{t-3}$

CYEC = current year earnings change = $E_t - E_{t-1}$

$PYEC_M$ = PYEC for cases of momentum, when CYEC and PYEC have the same sign

= 0 otherwise

$PYEC_{M\_UP}$ = PYEC for cases of momentum upwards, when CYEC and PYEC have the same sign and are positive

= 0 otherwise

$PYEC_{M\_DN}$ = PYEC for cases of momentum downwards, when CYEC and PYEC have the same sign and are negative

= 0 otherwise

$PYEC_R$ = PYEC for cases of reversion, when CYEC and PYEC have the opposite sign

= 0 otherwise

All studies using analysts forecasts of earnings have to confront the problem of outliers in the

dataset. Without correction for the effects of outliers the results of our study might display considerable bias. In the present study we simply follow the procedure suggested by Bernard and Thomas (1990, pp 311) and A&B (1992, pp 1186) and ”winsorize” our data. This procedure sets values of past earnings changes and forecast errors (where both are scaled by the current stock price) which are more than three standard deviations from their respective means to their mean value plus, or minus three standard deviations.

Figure 3 about here

Central to our alternative decomposition of the A&B equation are the relative frequency and intensity of momentum and reversion regimes. This results from the relative values of the current and prior years earnings changes. We summarise the transition of earnings between time t-2 and time t in Figure 3. Note that both increases and decreases in prior year earnings changes are equally likely (54.99% and 45.01% respectively), as are reversion and momentum regimes (47.9% and 52.1% respectively). Figure 3 shows one outlier for current years earnings change of -31.5. This observation is classified as part of the momentum regime; however, it is the value of the prior years earnings change which is included in our tests, not the value of the current years earnings change.

EMPIRICAL RESULTS

Benchmarking: the Abarbanell & Bernard and Francis & Philbrick models

In order to see if our sample is comparable with previous studies, we estimate the parameters of the original A&B model (equation 1) which are given in Table 2. They are practically identical to A&B’s (1992, page 1202) results. The constant is negative and significant, and the R^2 is

0.01. More importantly, the coefficient on prior year earnings change (PYEC) is significant and has a value of 0.08 which is the exactly same as A&B's result for forecasts made before the first quarter's results[5].

Table 2 about here

Table 2 also gives our estimates of the F&P model (equation 2) [6]. Our results are very similar to those of F&P. The constant is negative, implying that forecasts are optimistic on the whole. More importantly, the coefficient on REC (the recommendation) is positive and significant. However, in our sample, the value is 0.0064 whereas in F&P it is 0.1192. This may be explained by our scaling of the forecast error and PYEC by price.

This result supports our contention that the recommendation effect may not be restricted to the *Value Line* environment in which the analysts, who prepare forecasts, do not make stock recommendations. Hence the recommendation effect reported by F & P may extend beyond the specific institutional context in which it was originally reported. An important aspect of our results is that the recommendation effect does not eliminate apparent underreaction. In the UK at least, it appears that analysts underreact to the prior year earnings change *and* increase their forecast when downgrading the recommendation.

Underreaction in earnings momentum and reversion regimes

Table 3 shows the effect of distinguishing between earnings momentum and earnings reversion, as we suggest above in equations (4) and (5) above. The improved fit of the revised model is captured by the significant rise in the adjusted R^2, from 1% for A&B's original model

in Table 2 to 15% or more in Table 3.

Table 3 about here

Result 1 in Table 3 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.[7] As we suggest above, this indicates underreaction in both regimes. For example, when the prior year's earnings change is positive, this means that the forecast is smaller than realised earnings for momentum cases. Similarly, where earnings revert, the forecast is larger than realised earnings. These results suggest *generalised underreaction*, as opposed to the *generalised optimism* reported by Easterwood and Nutt.

Another important feature of Result 1 in Table 3 is that in the momentum regime the underreaction is now significantly larger, compared with the A&B benchmark results in Table 2. The value of the coefficient on $PYEC_M$ is 0.50 compared with 0.08 for PYEC reported in Table 2. In contrast, the coefficient for the reversion regime ($PYEC_R$) is -0.12 and indicates a degree of underreaction which is not significantly different from that found in Table 2. Overall therefore, the underreaction for cases of momentum is much larger than that for cases of reversion suggesting that investors regard apparent trends as inherently transitory, relative to reversion. The results are consistent with the assumption made in Barberis *et al*, (1998) that earnings reversion is thought by investors to be a more likely state of nature than earnings trending. Furthermore, investors may be correct in believing earnings reversion to be the more common state in light of recent evidence reported by Fama and French (2000).

This suggests that A&B's conclusion, that analysts' behaviour is at best only a partial explanation of stock price underreaction, may be premature. For a subset of firms (where earnings follow a trend), the underreaction may, in fact, be large enough to explain reported post earnings announcement drift.

In the second result of Table 3, we also distinguish between momentum upwards and momentum downwards, as in equation (5). As mentioned earlier, the background to this is that A&B suggest (1992, p1202) that their underreaction results are strongly linked to optimistic forecasts following weak earnings performance. Given that we find strong underreaction in the momentum regime, we investigate whether this too is related to optimism in the context of poor earnings performance. Here, poor earnings performance is defined to be where both the prior year and the current year earnings changes are negative.

Result 2 in Table 3 shows that the coefficient on momentum downwards is 0.67 and significant. In contrast, the coefficient on momentum upwards is 0.17, very similar to that for the reversion regime in absolute value . This is suggests that optimism in the face of poor earnings performance does play an important role in the interpretation of our results. Analysts exhibit generalised underreaction to PYEC; however, when PYEC is negative, they seem to be surprised when earnings decline further. This is understandable given the prevalence of reversion in the aggregate economy. Here our results parallel those already reported by A&B.

A final test in Table 3 (results 3 & 4) is to check whether the recommendation variable eliminates the underreaction as in F&P. Therefore, we estimate equations (4) & (5) with the addition of the recommendation variable, REC. The recommendation effect is significant, as with the results in Table 2, and does not eliminate the underreaction of forecasts. However, the size of the coefficient is now about half the value in Table 2.

The relationship with Easterwood and Nutt

We begin by a direct replication of the E & N specification. The results are given in Table 4 and show some quantitative differences in the reported coefficients. E&N's original estimates use OLS standard errors, and our replication of this is reported in result 1. The qualitative interpretation of our results is similar to those of E&N, yielding a positive but insignificant response to prior year earnings change in the base (normal) case[8] and a significant negative shift for high values of PYEC. Unlike E&N, we do not find a positive shift in the coefficient for low values of PYEC.

However, our data strongly rejects the assumption of homoscedasticity and our preferred specification uses the White (1980) correction for heteroscedasticity, reported in result 2 of Table 4. This shows that analysts overreact to high values of PYEC and underreact in other cases, which gives support for E&N's decomposition.

Table 4 about here

Table 5 about here

In order to try and distinguish between E&N's model and our own, Table 5 reports a Davidson and MacKinnon (1981) J-test[9]. The version of our model used is equation (5), in which we decompose earnings momentum in to that for continuing rises and falls in earnings, $PYEC_{M\_UP}$ and $PYEC_{M\_DN}$. Intuitively the Davidson and MacKinnon test compares two models by importing

the predicted values of one specification into the other, even though the two alternatives are not nested. If one specification dominates the other we would expect the coefficient on the predicted values from the "true" model to be equal to one and the remaining coefficients in the regression to be equal to zero. The "false" model's predicted values would carry a coefficient of zero, with all remaining coefficients being left unaffected in the reported regression.

To undertake these tests, we import the predicted values of the E & N specification (denoted PEN) into our revised model and, conversely, we import the predicted values of our own model (denoted P) into the E & N specification. As is evident from Table 5, our findings lie somewhere between the two possible extreme outcomes.

We suggest that the results tend to favour our revised specification over the E & N decomposition. When the predicted values of our revised decomposition are inserted into E & N equation, the reported coefficient is very close to one and strongly significant from zero. However, none of the E&N PYEC variables remain significant. Reversing the process (to include E&N's predicted values in our own specification) the predicted values of their model carry a coefficient which is smaller than 1, but not significantly so. But all the coefficients of our model remain highly significant.

Sell recommendations and the broker effect

In this section, we try to discriminate between some of the possible explanations for the sell recommendation effect, discussed in section I, and found in our sample. This effect consists of a 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 it reflects a strategic "earnings bath" taken by company management; that is, sell

recommendations are associated with a decline in reported (but not true) earnings. Figure 4 shows the path of earnings-per-share for 161 firm/years when companies were downgraded from hold to sell by the merchant bank. We find no evidence of the earnings bath as discussed above. Indeed earnings rise in the first year after the switch, for both the average and median firm, only to begin falling in the following year.

Figure 4 about here

Other explanations for the sell recommendation effect are concerned with the way analysts construct or report their forecasts. In this section, we exploit the presence of information concerning whether the analysts' merchant bank acts as broker to the company in order to distinguish between competing explanations. 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 is because analysts have greater incentives to retain good relations with the incumbent managers of the companies.

Table 6 analyses our sample according to whether the recommendation is buy-hold-sell and whether or not the analysts organisation acts as broker to the company. Only 0.57% (0.11% ÷ 19.23%) of recommendations issued by broker analysts are sell, compared 11.83% (9.56% ÷ 80.77%) for non broker analysts. We conclude that sell recommendations are far less likely to be issued by the broker analysts in our sample. Hence it is hard to distinguish between the strength of the sell recommendation effect as evinced by broker and non-broker firms. Firms

for which the merchant bank acts as broker simply do not attract sell recommendations. This represents much stronger evidence of a form of reporting bias than merely shading up the forecast after issuing a sell recommendation.

Table 6 about here

Our tests of equation (5) with the addition of the recommendation variable (REC) are given in Table 7. For comparison with previous tables, the first result is for the full sample, and is repeated from Table 3. The second result is for the sub-sample which records information about broker status. Results 3 and 4 give non broker and broker results respectively. The equation in the second panel estimates the model for brokers and non brokers, but uses dummy variables to show whether any changes in the coefficients for broker companies are significant.

Table 7 about here

Although the coefficient on REC is larger for brokers (result 4) than for non brokers (result 3) the lower panel indicates that the difference is not significant. This might suggest a processing bias explanation for the recommendation effect. However, Table 6 indicates that analysts hardly ever issue a sell recommendation when the bank is acting as broker. So the estimated coefficients in result 4 and the lower panel simply obscure the underlying reluctance of broker analysts to issue a sell recommendation in any circumstances. Thus we do not consider these results to be an adequate discriminant between processing and reporting explanations of the observed sell bias. However, another test based on analysts' reaction to the time series

properties of earnings is, we believe, more useful.

Results 3 & 4 show that the underreaction effect for downward momentum is significantly larger for brokers. In the case of non broker companies the coefficient is 0.70, whereas for broker companies it is 1.02. The lower panel 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 following one period's poor performance. Whilst it is possible that inside knowledge that analysts have concerning broker companies makes them more confident in predicting reversion, this confidence would appear to be severely misplaced. Our preferred explanation is that analysts find it expedient to ignore clear signs of deteriorating company performance. This would accord with our evidence in Table 6 concerning the reluctance of brokers to issue sell recommendations [10]. Overall then, we interpret our results as implying the existence of reporting bias.

CONCLUSIONS

Using data on UK analysts' forecasts, we estimate the extent to which forecast errors are systematically determined by prior year earnings change and the downgrading of analysts' buy-hold-sell recommendations. We refine Abarbanell and Bernard's original equation by recognising divergent signals in the prior year earnings change. A positive value of prior year earnings change this period can imply either that earnings will continue to rise (momentum) or that a fall is imminent (reversion).

Our basic observation is that the Abarbanell and Bernard specification does not indicate how underreaction is related to investors' misunderstanding about the time series properties of the prior year earnings change; such links are discussed in Bernard and Thomas (1990) and Barberis, *et al* (1998). A key property of earnings according to Fama and French (2000) is that

mean reversion is the more common earnings process in the aggregate economy. Furthermore, it is well known that analysts (on average) can beat a random walk; that is, they successfully anticipate the sign of the earnings change. Therefore, models of underreaction should try and incorporate these stylised facts. This is what we have tried to do in this paper.

What information in the prior year earnings change is then being ignored by analysts? This matters because it affects the sign of the forecast error. If the information in the prior year earnings change is that earnings are likely to rise(fall), then if analysts underreact to this, the forecast is likely to be smaller(larger) than the outcome. When we estimate our revised model we find significant underreaction, much larger than in the original Abarbanell and Bernard equation, particularly when earnings repeatedly decline.

Our reversion/momentum decomposition of the response of forecast errors to prior year earnings changes is both conceptually and empirically distinct from that reported by Easterwood and Nutt (1999). Easterwood and Nutt report coefficients decomposed according to the level of prior years earnings change. In contrast, our model decomposes according to the relation between the current and prior year's earnings changes. A nonnested test confirms that our model is not dominated by that of Easterwood and Nutt. Indeed, there is some weak evidence that our model dominates previous specifications when estimated on a common dataset.

We also investigate whether sell recommendations are associated with higher forecasts as reported in Francis & Philbrick (1993). They suggest that this is a reporting bias which arises when analysts are trying to maintain relations with the company in difficult times. Furthermore, they find that the sell recommendation effect eliminates the underreaction to the prior year's earnings change, indicating the absence of processing bias. Although our setting is different in that our analysts prepare both the recommendation and the forecast, we find a similar recommendation effect. However, unlike Francis & Philbrick, we find the sell recommendation

effect is distinct from underreaction to the prior year's earnings change.

In order to distinguish between reporting and processing bias explanations of the sell recommendation effect, we appeal to a broker variable. This distinguishes between forecasts issued when the merchant bank has an existing prior commercial relationship with the company, and those where no such prior relationship exists. Overall, we interpret our results as implying that the existence of reporting bias in both types of company. This means that analysts forecasts are subject to both processing and reporting bias. Modelling the interaction of these two types of bias awaits further research.

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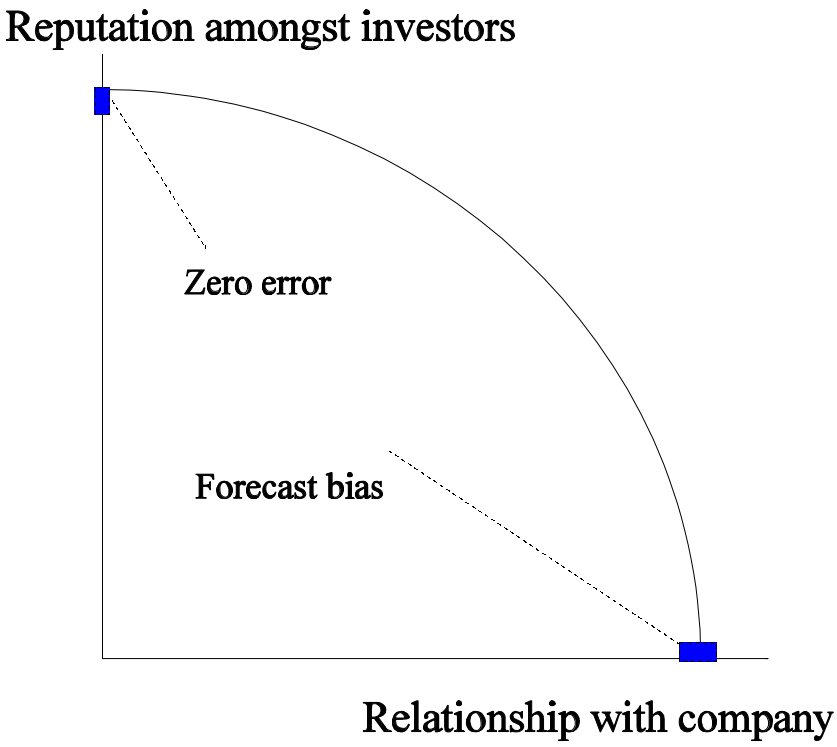
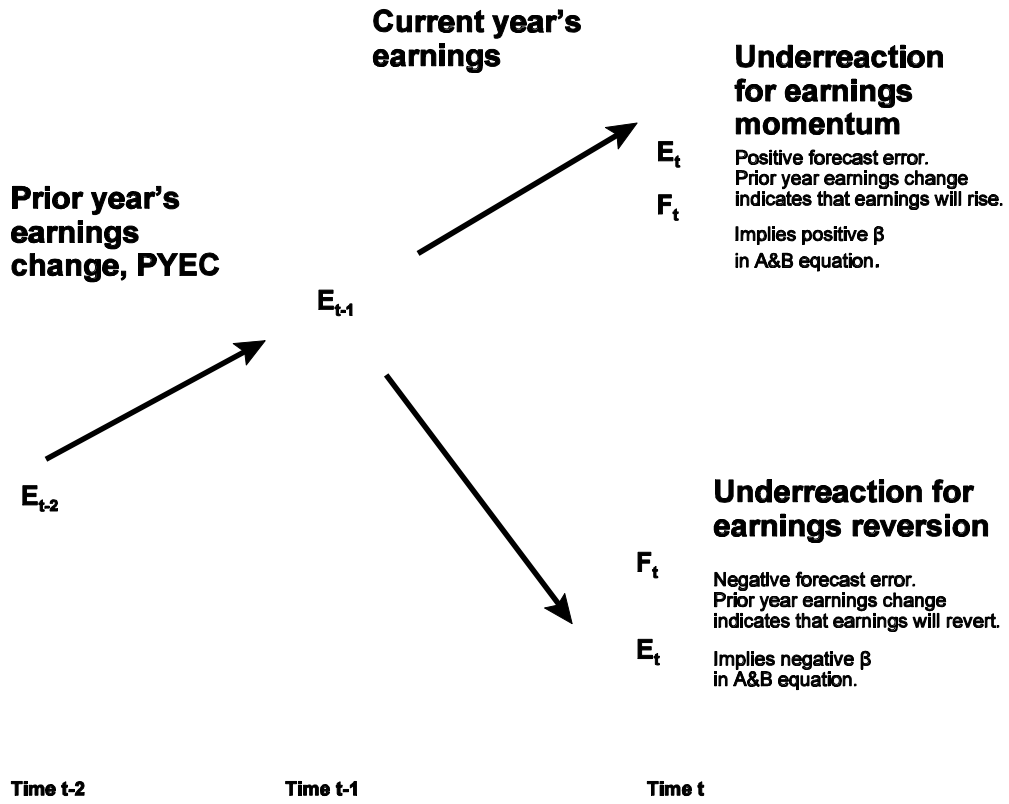
Figure 1



Note:
This figure represents the trade off analysts face between gaining reputation with investors for accurate forecasts and maintaining ease of access to management by optimistic forecasts (or pessimistic forecasts if management value positive earnings surprises.

FIGURE 2

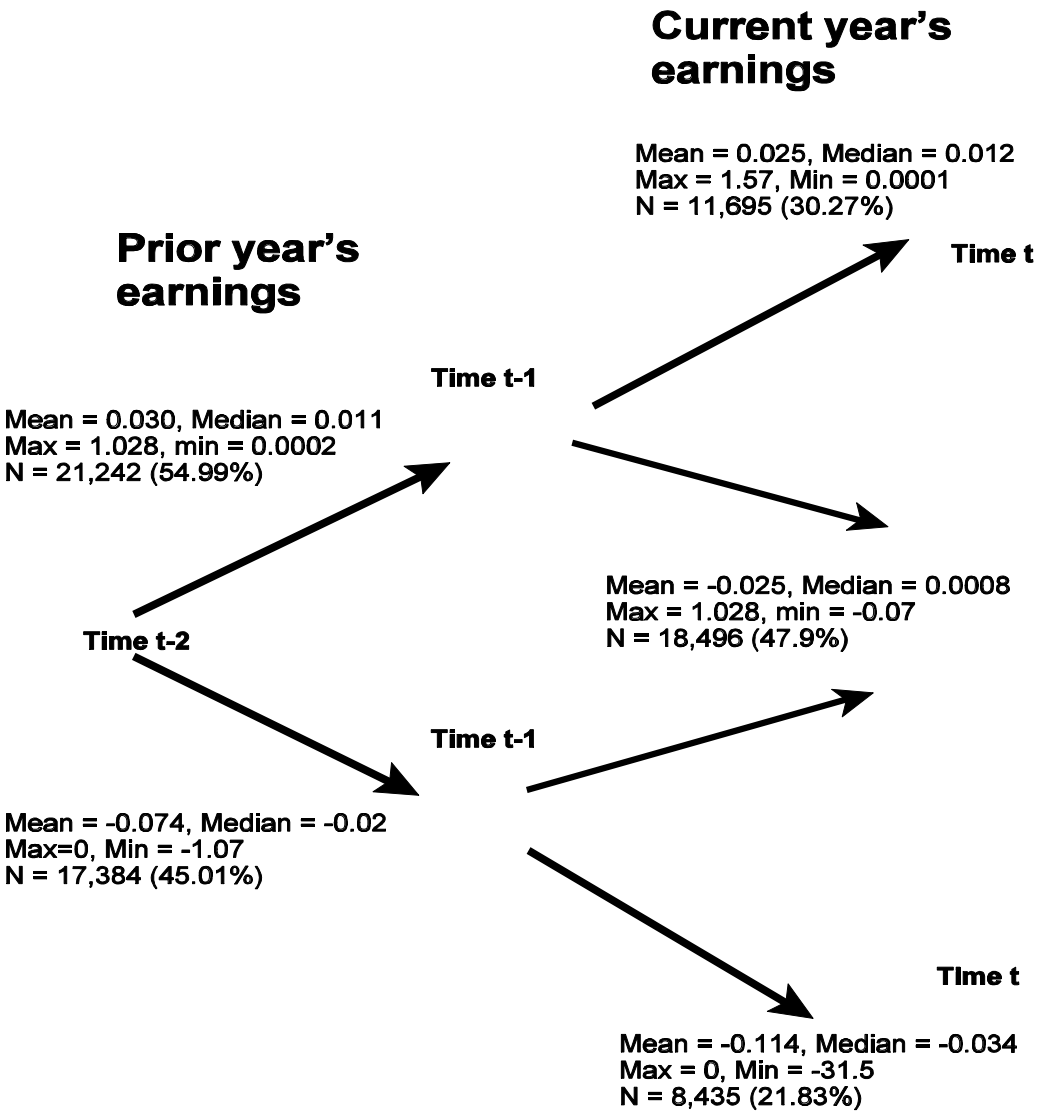
Underreaction to positive prior year earnings change for earnings momentum and earnings reversion



Abarbanell & Bernard (1992) model

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

Figure 3: The path of earnings in our sample



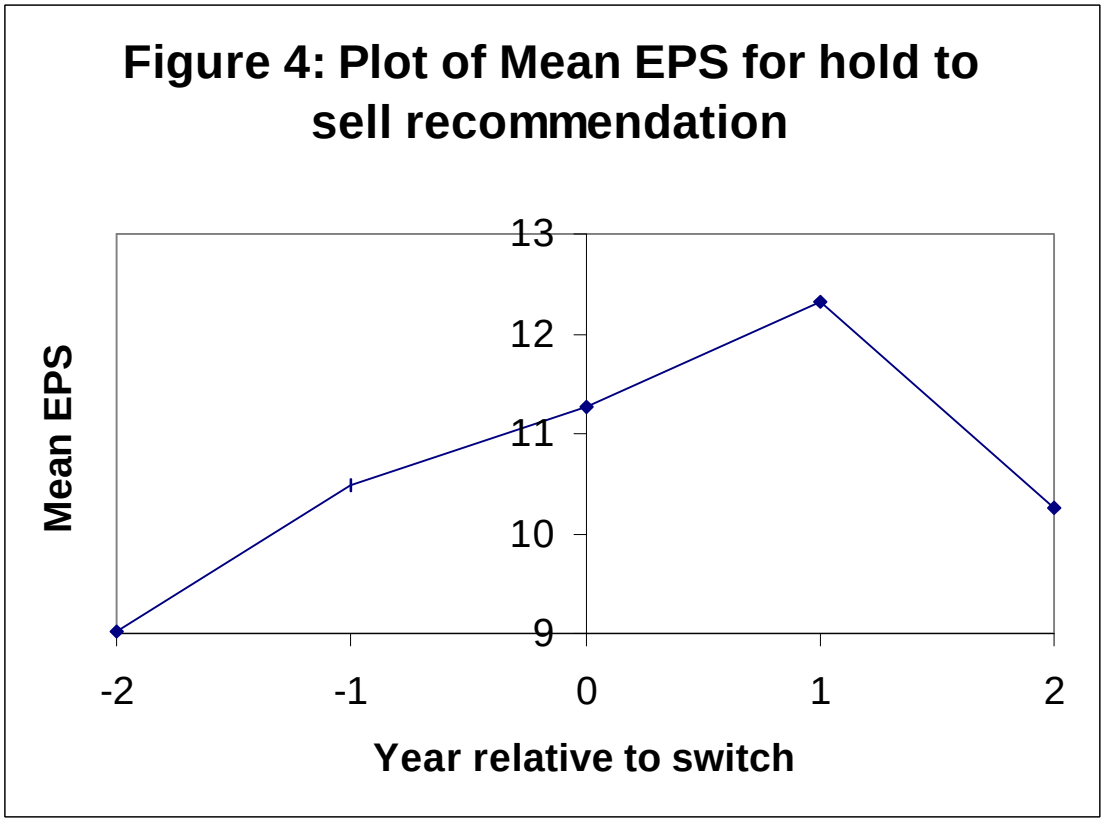


Figure 4: Plot of Mean EPS for hold to sell recommendation
Mean EPS
13
12
11
10
9
-2
-1
0
1
2
Year relative to switch

Table 1: Industry Classification of Sample Firms		
Industry Name	**Number of Sample Firms**	**Percentage(%)**
Extractive Industries	4	1.0%
Oil, Integrated	3	0.7%
Oil Exploration & Production	7	1.7%
Building & Construction	26	6.2%
Building Materials & Merchants	21	5.0%
Chemicals	18	4.3%
Diversified Industrials	13	3.1%
Electronic & Electrical Equipment	17	4.0%
Engineering	30	7.1%
Engineering, Vehicles	6	1.4%
Paper, Packaging & Printing	9	2.1%
Textiles & Apparel	18	4.3%
Breweries, Pubs & Restaurants	8	2.0%
Alcoholic Beverages	8	2.0%
Food Producers	15	3.6%
Household Goods	4	1.0%
Health Care	9	2.1%
Pharmaceuticals	6	1.4%
Tobacco	1	0.2%
Distributors	17	4.1%
Leisure & Hotels	14	3.3%
Media	18	4.3%
Retailers, Food	12	2.9%
Retailers, General	19	4.5%
Support services	16	3.8%
Transport	12	2.9%
Electricity	15	3.6%
Gas Distribution	1	0.2%
Telecommunications	6	1.4%
Water	10	2.4%
Banks, Retail	10	2.4%
Banks, Merchant	5	1.2%
Insurance	7	1.7%
Life Assurance	7	1.7%
Other Financial	11	2.6%
Property	16	3.8%
TOTAL	**420**	**100%**

Note: The classification of industries is from the analyst's equity working list for the month of December 1995.

Table 2: Estimates of Abarbanell & Bernard and Francis & Philbrick models of underreaction/overreaction to prior year earnings change on UK sample.

The dependent variable is forecast error, $E_t - F_t$, scaled by share price at the date of the forecast.

Constant	PYEC	REC	Adj.R^2
Abarbanell & Bernard model - equation (1)			
-0.023**	0.08**		0.01
(0.0005)	(0.019)		
Francis & Philbrick model - equation (2)			
-0.031**	0.08**	0.0064**	0.01
(0.0016)	(0.019)	(0.0010)	

Definitions:

E_t	=	earnings per share, scaled by price at the date of the forecast
F_t	=	forecast of earnings per share, scaled by price at the date of the forecast
REC	=	analyst recommendation at the time of the forecast. The values taken are: Buy (2), Hold (1), Sell (0)
PYEC	=	prior year earnings change at the time of the forecast, scaled by price.

Notes:
Adj.R^2 is the R^2 adjusted for degrees of freedom.
Figures in parenthesis are White standard errors.
** (*) indicates significance of the coefficients at the 1% (5%) level using 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.

Table 3: Estimates of underreaction/overreaction to prior year earnings change, with partitioning based on the current year's earnings change.

The dependent variable is forecast error, $E_t - F_t$, scaled by share price at the date of the forecast.

Constant	$PYEC_R$	$PYEC_M$	$PYEC_{M\_UP}$	$PYEC_{M\_DN}$	REC	Adj.R^2
Result 1:						
Momentum & reversion - equation (4)						
-0.023**	-0.12**	0.50**				0.15
(0.0005)	(0.021)	(0.026)				
Result 2:						
Distinguishing between momentum upwards and momentum downwards - equation (5)						
-0.019**	-0.12**		0.17**	0.67**		0.17
(0.0007)	(0.021)		(0.012)	(0.036)		
Result 3:						
Momentum & reversion with recommendation effect						
-0.028**	-0.13**	0.50**			0.0038**	0.15
(0.0015)	(0.021)	(0.026)			(0.0009)	
Result 4:						
Distinguishing between momentum upwards and momentum downwards with recommendation effect						
-0.022**	-0.12**		0.17**	0.67**	0.0026**	0.17
(0.0016)	(0.021)		(0.012)	(0.036)	(0.0009)	

Definitions:

E_t	=	earnings per share, scaled by price at the date of the forecast
F_t	=	forecast of earnings per share, scaled by price at the date of the forecast
REC	=	analyst recommendation at the time of the forecast. The values taken are: Buy (2), Hold (1), Sell (0)
PYEC	=	prior year earnings change at the time of the forecast, scaled by price.
CYEC	=	current year earnings change, scaled by price
$PYEC_R$	=	prior year earnings change for cases of earnings reversion
	=	PYEC when PYEC & CYEC have the opposite sign; 0 otherwise
$PYEC_M$	=	prior year earnings change for cases of earnings momentum
	=	PYEC when PYEC & CYEC have the same sign; 0 otherwise
$PYEC_{M\_UP}$	=	prior year earnings change for cases of earnings momentum upwards
	=	$PYEC_M$ when PYEC is positive; 0 otherwise
$PYEC_{M\_DN}$	=	prior year earnings change for cases of earnings momentum downwards
	=	$PYEC_M$ when PYEC is negative; 0 otherwise

Notes:
Adj.R^2 is the R^2 adjusted for degrees of freedom.
Figures in parenthesis are White standard errors.
** (*) indicates significance of the coefficients at the 1% (5%) level using 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.

Table 4: The Easterwood and Nutt model

$E_t - F_t = \alpha_0 + \alpha_1 \text{ Low} + \alpha_2 \text{ High} + \alpha_3 \text{ PYEC} + \alpha_4 \text{ (PYEC. Low)} + \alpha_5 \text{ (PYEC. High)} + u_t$

Constant Normal α_0	Constant Low α_1	Constant High α_2	PYEC Normal α_3	PYEC Low α_4	PYEC High α_5	Adj.R^2
Easterwood & Nutt original estimates						
-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]	
Easterwood & Nutt model on our data						
Result 1:						
-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}	
Result 2:						
-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)	

Definitions:

E_t	=	earnings per share, scaled by price at the date of the forecast
F_t	=	forecast of earnings per share, scaled by price at the date of the forecast
PYEC	=	prior year earnings change at the time of the forecast, scaled by price.
Low	=	1, if PYEC is in the lowest quartile of our sample, equal to or below -0.021
	=	0, otherwise
High	=	1, if PYEC is in the highest quartile of our sample, equal to or exceeding 0.0125
	=	0, otherwise

Notes:
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 & Nutt reported OLS t statistics

** (*) indicates significance of the coefficients at the 1% (5%) level using 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.

Table 5: Davidson & MacKinnon J test for nonnested hypotheses

Inserting the predicted values from the Easterwood & Nutt model in to our model
Inserting the predicted values from our model in to the Easterwood & Nutt model

Panel A: Predicted values from our model (P) added to E & N's model

$E_t - F_t = \alpha_0 + \alpha_1 \text{Low} + \alpha_2 \text{High} + \alpha_3 \text{PYEC} + \alpha_4 (\text{PYEC. Low}) + \alpha_5 (\text{PYEC. High}) + \alpha_6 P + u_t$

α_0	α_1	α_2	α_3	α_4	α_5	α_6	Adj.R^2
0.0036**	-0.0021	-0.0068**	-0.045	0.075	-0.013	0.98**	0.18
(0.0010)	(0.0020)	(0.0022)	(0.040)	(0.045)	(0.059)	(0.050)	

Panel B: Predicted values from E&N's model (PEN) added to our model

$E_t - F_t = \beta_0 + \beta_1 \text{PYEC}_R + \beta_2 \text{PYEC}_{M\_UP} + \beta_3 \text{PYEC}_{M\_DN} + \beta_4 \text{PEN} + u_t$

β_0	β_1	β_2	β_3	β_4	Adj.R^2
-0.0055	-0.18**	0.20**	0.58**	0.62**	0.18
(0.0052)	(0.041)	(0.020)	(0.054)	(0.26)	

Definitions:

E_t	=	earnings per share, scaled by price at the date of the forecast
F_t	=	forecast of earnings per share, scaled by price at the date of the forecast
PYEC	=	prior year earnings change at the time of the forecast, scaled by price.
Low	=	1, if PYEC is in the lowest quartile of our sample, equal to or below -0.021
	=	0, otherwise
High	=	1, if PYEC is in the highest quartile of our sample, equal to or exceeding 0.0125
	=	0, otherwise
CYEC	=	current year earnings change, scaled by price
PYEC_R	=	prior year earnings change for cases of earnings reversion
	=	PYEC, when PYEC & CYEC have the opposite sign; 0 otherwise
PYEC_M	=	prior year earnings change for cases of earnings momentum
	=	PYEC when PYEC & CYEC have the same sign; 0 otherwise
PYEC_{M_UP}	=	prior year earnings change for cases of earnings momentum upwards
	=	PYEC_M when PYEC is positive; 0 otherwise
PYEC_{M_DN}	=	prior year earnings change for cases of earnings momentum downwards
	=	PYEC_M when PYEC is negative; 0 otherwise

Notes:
Adj.R^2 is the R^2 adjusted for degrees of freedom.
Figures in parenthesis () are White standard errors
** (*) indicates significance of the coefficients, from zero, at the 1% (5%) level using 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.

Table 6:	**The % of the sample for each broker relationship and stock recommendation classification**			
	Sell	**Hold**	**Buy**	**Total**
The analyst's firm is **not broker**	9.56%	42.40%	28.21%	80.77%
The analyst's firm is **the broker**	0.11%	6.67%	12.45%	19.23%
Total	9.67%	49.07%	41.26%	100%

The Chi-square test for no relationship between stock recommendations made by analysts and the broker variable rejects the null, with a value of 1274.01

Note: The sample size is reduced to 20,465 for tests based on broker status, because for early years of the data, the broker status is not reported.

Table 7: Estimates of underreaction/overreaction to prior year earnings change for broker and non-broker companies, with partitioning based on the current year's earnings change.

The dependent variable is forecast error, $E_t - F_t$, scaled by share price at the date of the forecast.

Constant	$PYEC_R$	$PYEC_{M\_UP}$	$PYEC_{M\_DN}$	REC	Adj.R^2
Result 1: Full sample of 38,626 firm year observations					
-0.022**	-0.12**	0.17**	0.67**	0.0026**	0.17
(0.0016)	(0.021)	(0.012)	(0.036)	(0.0009)	
Result 2: Broker and non-broker sample of 20,465 observations					
-0.015**	-0.12**	0.15**	0.80**	0.0031*	0.20
(0.0027)	(0.027)	(0.013)	(0.056)	(0.0015)	
Result 3: Non broker sample of 16,529 firm year observations					
-0.016**	-0.15**	0.14**	0.70**	0.004*	0.17
(0.0030)	(0.040)	(0.017)	(0.071)	(0.0016)	
Result 4: Broker sample of 3,936 firm year observations					
-0.030**	-0.07**	0.16**	1.02**	0.0096*	0.30
(0.0085)	(0.019)	(0.021)	(0.056)	(0.0045)	
Broker and non-broker sample of 20,465 observations					
Non-broker coefficients					
-0.016**	-0.15**	0.14**	0.70**	0.004*	0.21
(0.0030)	(0.041)	(0.017)	(0.071)	(0.0016)	
coefficient shifts for broker companies					
-0.014	0.08	0.02	0.32**	0.005	
(0.009)	(0.045)	(0.027)	(0.091)	(0.0048)	

Definitions:

E_t	=	earnings per share, scaled by price at the date of the forecast
F_t	=	forecast of earnings per share, scaled by price at the date of the forecast
REC	=	analyst recommendation at the time of the forecast. The values taken are: Buy (2), Hold (1), Sell (0)
PYEC	=	prior year earnings change at the time of the forecast, scaled by price.
CYEC	=	current year earnings change, scaled by price
$PYEC_R$	=	prior year earnings change for cases of earnings reversion
	=	PYEC when PYEC & CYEC have the opposite sign; 0 otherwise
$PYEC_M$	=	prior year earnings change for cases of earnings momentum
	=	PYEC when PYEC & CYEC have the same sign; 0 otherwise
$PYEC_{M\_UP}$	=	prior year earnings change for cases of earnings momentum upwards
	=	$PYEC_M$ when PYEC is positive; 0 otherwise
$PYEC_{M\_DN}$	=	prior year earnings change for cases of earnings momentum downwards
	=	$PYEC_M$ when PYEC is negative; 0 otherwise

Notes:

Adj.R^2 is the R^2 adjusted for degrees of freedom.

Figures in parenthesis are White standard errors.

** (*) indicates significance of the coefficients at the 1% (5%) level using 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.

ENDNOTES

1 For each unit of decrease in reputation amongst investors, the relationship with the company improves at a decreasing rate.

2 apart from the effect of the constant

3 The case of earnings following a random walk seem to be ruled out, since in this model the earnings change is random and therefore does not contain any information about future earnings.

4 Specifically, they were told “Remember: Spread out those distributions”, following the production of a very tight distribution of probability forecasts in the first round.

5 Following E & N we scale by price, while A & B do not and so. Hence our reported intercept of -0.023 is substantially higher than A & B’s reported value of -0.44 (see E & N, pp 1783, footnote 6).

6 We re-estimated all key regressions from our paper truncating observations outside the 90^{th} and 10^{th} percentile, in the manner suggested by Abarbanell and Lehavy (2000, p24). While the significance of our results is eroded, it is not removed.

7 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 are effectively partitioning by PYEC and $E_t - F_t$. Therefore our estimate of the coefficient on $PYEC_M$ will be based on data points located in the top-right and bottom-left in the space, around the origin, of ($E_t - F_t$) on the vertical axis and ($E_{t-1} - E_{t-2}$) on the horizontal axis. Even if the data are scattered randomly within each quadrant, the coefficient on $PYEC_M$ will tend to be positive. Similarly, the coefficient on $PYEC_R$ will be based on data points located in the top-left and bottom-right quadrants, giving rise to a negative bias.

However, 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).

In order 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 $PYEC_R$ in result 1 in Table 3. Distinguishing between two types of momentum is analysed in Result 2 of Table 3.

8 E&N 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.

9 See also Maddala (1992) pp515-517.

10 An alternative explanation is that companies which might be the subject of a sell recommendation are not attracted to the merchant bank as clients. That is, the sell recommendation and broker status need to be modelled as endogenous variables.