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Stock Returns and Accounting Earnings

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1. Introduction

In this paper we derive and test a relation between current-period unexpected returns and unexpected earnings that incorporates revisions in forecasts of future earnings. Our motivation is to emphasize the misspecification in returns/earnings regressions that omit information currently available about future earnings and offer a solution. Since changes in expectations of future earnings are related strongly to unexpected returns, those regressions have low explanatory power. More important, coefficient estimates are biased because the omitted and included variables are correlated, and explanatory power is even lower when that correlation varies within the sample.

The relation we derive extends the simple regression of unexpected returns on unexpected earnings, often used in studies examining the value relevance of accounting earnings (beginning with Ball and Brown [1968]), to a multiple regression. The additional regressors, which reflect information contained in forecast revisions and discount rate changes occurring during the year, are identified using the abnormal earnings valuation model.[1] Relative to the simple regression, the multiple regression improves explanatory power significantly (R^2 values increase from

[1] That is, stock price equals equity book value plus the present value of future abnormal earnings (e.g., Preinreich [1938], Edwards and Bell [1961], and Peasnell [1982]). This

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below 5% to over 30%) and decreases the across-sample variation in estimated earnings response coefficients (*ERC*): all coefficients converge to the value of one predicted by our relation. While similar increases in explanatory power can be achieved by simply adding revisions in "capitalized earnings" (representing the ratio of near-term forecasted earnings to the prevailing discount rate), the coefficient estimates obtained are harder to interpret and not as well behaved as those from the more complex abnormal earnings specification.

To illustrate how the simple regressions are associated with biased *ERC*s and low explanatory power, we select subsamples with extreme correlations between unexpected earnings and forecast revisions (the omitted variables). We also show how these effects drive three unusual features of the returns/earnings relation documented in the literature: (*a*) lower *ERC* for extreme and/or negative values of unexpected earnings (nonlinearity), (*b*) lower R^2 and *ERC* for loss firms, and (*c*) lower R^2 and *ERC* for high-growth and high-tech firms. Incorporating omitted information via our multiple regression causes the anomalous behavior to disappear for all three cases.

Our results add to prior findings on the sensitivity of the simple regression results to alternative measures of unexpected returns and earnings, and the sample selection process. For example, replacing the actual earnings measure from *Compustat* with that from *I/B/E/S* (which tends to exclude one-time items) increases *ERC* and explanatory power, especially for certain subsamples. A similar affect is observed when the prior year's earnings, a measure of expected earnings, are replaced by consensus forecasts from *I/B/E/S*. Turning to examples of different results from different samples, we find that the unusual behavior of firms reporting losses currently is driven largely by a subset of firms that reported profits in the previous year; the majority of loss firms, which report losses in the prior year also, do not exhibit lower *ERC* and R^2.

The main implication of our study is that inferences based on the simple regressions estimated in prior literature should be reexamined. The magnitude of the *ERC* and the level of R^2 have been used often to make comparisons of the value relevance of accounting earnings across firms (e.g., high and low managerial ownership, qualified/unqualified audit opinions, and different accounting choices) and over time (e.g., across different reporting regimes and around macroeconomic changes). Not only are those results sensitive to the implementation issues mentioned above (e.g., variable selection), they are affected by the omission of future earnings information. That is, high (low) *ERC*s could be observed because the correlation between unexpected earnings and future-period

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approach has recently been employed to address a number of issues relating to equity valuation (e.g., Bernard [1994], Abarbanell and Bernard [forthcoming], and Frankel and Lee [1997; 1998]).

earnings revisions is high (low) in that sample, and high (low) values of R^2 could be observed because that correlation is fairly homogeneous (heterogeneous) within that sample.

A related implication is that the ability of accounting earnings to explain stock returns in our multiple regression is unaffected by accounting choices, since efficient earnings forecasts compensate for differences in current-period earnings numbers due to accounting differences. Given that the multiple regression produces the same results in all cases, discussions of accounting quality, or good and bad accounting, need to be carefully framed.[2] If high-quality earnings are expected to have large value implications, our results suggest that earnings quality can be measured by the observed relation between current-period unexpected earnings and revisions of forecasts for future-period earnings: a stronger relation implies higher quality.

Our results also offer some evidence on whether or not stock prices exhibit excess volatility (e.g., Shiller [1981], Kothari and Shanken [1992], and Abarbanell and Bernard [forthcoming]). The increased explanatory power we document, as well as proximity of the coefficient estimates to their predicted value of one, is consistent with our maintained assumption that stock prices (and analyst forecasts) are generally efficient.[3]

The next section discusses the links to prior literature. The model is derived in section 3, the sample is described in section 4, the results are reported in section 5, and our conclusions are offered in section 6.

2. Links to Prior Research

Many possible misspecifications in the traditional returns/earnings regression have been noted in the literature. A problem cited frequently is that reported earnings contain different components with different value implications; it is therefore inappropriate to combine unexpected earnings from different sources (e.g., Lipe [1986]).[4] Researchers have attempted to improve the specification by breaking down reported earnings into its components, each with its own valuation multiple (e.g., Ohlson and Penman [1992] and Subramanyam [1996]).

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[2] Accounting choices could still be relevant because they affect other desirable properties, such as the smoothness and predictability of future earnings streams.

[3] Although we are aware of evidence indicating that analyst forecasts miss some information in stock prices (e.g., Abarbanell [1991]) and stock prices miss some information in analyst forecasts (e.g., Stickel [1991]), we believe this evidence indicates marginal deviations from efficiency, not gross inefficiencies.

[4] Another source of misspecification often suggested is that current accounting principles and the ability to select alternative accounting choices cause reported earnings to measure "economic" earnings with error. One reason accounting earnings are said to deviate from economic earnings is that they are designed to serve a variety of purposes and therefore cannot be expected to measure value changes alone.

Some researchers have improved the specification by adding proxies for "other" information used by the market to the simple returns/earnings regression. This approach is related to the earnings components approach, since the other information effectively parses reported earnings into components with different value implications.[5] The proxies considered include measures of the quality of current-period earnings (e.g., Lev and Thiagarajan [1993]), observed changes in earnings growth from future periods (e.g., Collins et al. [1994]), and current-period revisions of analysts' earnings forecasts for future periods (e.g., Brown, Foster, and Noreen [1985], Cornell and Landsman [1989], and Abarbanell and Bushee [1997]).

This paper follows the approach of incorporating other information and uses analysts' forecast revisions and discount rate changes to generate that information. In contrast to the intuitive consideration of other information in prior research, we introduce it in a more complex way to allow a test of the model's efficacy: the coefficient on current-period unexpected earnings and the coefficients on terms representing future-period forecast revisions are all predicted to equal one. As in prior work, the increase in R^2 is also used as an indicator of improved specification.[6]

While a predicted value of one for the coefficient on unexpected earnings might appear unusually low, especially compared to the higher coefficient values expected for permanent earnings, it is a value that arises naturally in a valuation context (e.g., Easton, Harris, and Ohlson [1992]) and offers the most general description of price response to a dollar of unexpected earnings. Controlling for all future-period effects, a dollar of unexpected earnings this period should generate a dollar of unexpected returns.

Prior research has identified even greater misspecification in the simple returns/earnings regression for three sets of subsamples. Nonlinearities in the returns/earnings relation have been studied by Freeman and Tse [1992], Cheng, Hopwood, and McKeown [1992], Das and Lev [1994], and Lipe, Bryant, and Widener [1998]. The unusual behavior of loss firms has been documented by Hayn [1995] and others. Many (e.g., Amir and Lev [1996] and Lev [1996]) have argued that earnings are less informative for high-growth firms and firms in high-tech industries, where a substantial proportion of value relates to future prospects

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[5] To see the link, consider a dollar of unexpected earnings consisting of two components: one representing core earnings and the other being nonrecurring. Earnings forecasts (a proxy for other information) would be revised upward only by the amount of the first component.

[6] Of course, high R^2 values have been achieved before by aggregating earnings across years (e.g., Lev [1989] and Easton, Harris, and Ohlson [1992]) or by aggregating firms into portfolios (e.g., Collins et al. [1994]). For studies examining firm-specific stock returns over annual periods, corresponding to the focus in our study, R^2 values are more modest: only about 20%. Little attention is paid in these studies, however, to the proximity of estimated coefficients to their theoretical values, given the focus on increasing R^2.

and those future prospects are at best weakly related to current-period earnings.

3. Model

The abnormal earnings valuation approach relates current-period stock prices to current and future accounting numbers as follows.

$$p_t = bv_t + \sum_{s=1}^{\infty} \frac{E_t(eps_{t+s} - k_t bv_{t+s-1})}{(1+k_t)^s} = bv_t + \sum_{s=1}^{\infty} \frac{E_t(ae_{t+s})}{(1+k_t)^s} \quad (1)$$

where:

p_t = share price at the end of period t,
bv_t = book value per share at the end of period t,
eps_t = earnings per share for period t,
k_t = the discount rate for equity at time t, assumed to be the expected rate of return for future periods, $E_t[r_{t+s}]$,[7] and
ae_t = abnormal earnings earned in period t, defined as $eps_t - k_t bv_{t-1}$.

The main assumption required to generate the abnormal earnings expression is the expected clean surplus relation: future book values of equity are expected to increase by expected earnings and decrease by expected net dividends.[8]

We use I/B/E/S consensus forecasts in this paper as proxies for market expectations of future earnings. Note that future book values can be inferred from forecasted earnings under clean surplus based on an assumed dividend payout policy. We assume that analysts expect firms to maintain the current dividend payout policy. Since earnings forecasts are available (or can be imputed) from the I/B/E/S data set only for the upcoming five years, we adapt (1) and use the five-year out price-to-book premium to represent the terminal value (abnormal earnings past year +5).[9]

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[7] While the empirical literature has assumed that the discount rate, a constant which equates the present value of future dividends to the current price, is approximately equal to the expected rate of return, they could differ for two reasons. First, the term structure of risk-free rates might not be flat, resulting in different expected rates of return at different horizons (different $t + s$). Empirically, the forward one-year rates plateau rather quickly (within five years), and assuming a constant long-term rate for these early years has a minor impact, because of the small proportion of total value represented by abnormal earnings in these years. Second, even for flat term structures, the expected rate of return would exceed the discount rate, if it is stochastic (see Ohlson [1990] and Samuelson [1965]). We are unable to estimate the impact on our results of this second difference between the two rates.

[8] The clean surplus relation can also be stated in an ex post version, and that version will be assumed later in the paper.

[9] Writing out (1) for the price at $t + 5$ shows why the value of abnormal earnings beyond year +5 can be replaced by the excess of price over book value in year +5.

$$p_t = bv_t + \sum_{s=1}^{5} \frac{E_t(eps_{t+s} - k_t bv_{t+s-1})}{(1+k_t)^s} + \frac{E_t(p_{t+5} - bv_{t+5})}{(1+k_t)^5}$$

$$= bv_t + \sum_{s=1}^{5} \frac{E_t(ae_{t+s})}{(1+k_t)^s} + \frac{E_t(p_{t+5} - bv_{t+5})}{(1+k_t)^5}. \tag{2}$$

To relate the abnormal earnings valuation approach to the traditional unexpected returns/earnings regressions, we write out the abnormal earnings expression for period $t-1$ as in (3), project the expected increase in price over period t as in (5), and compare with the observed price at the end of period t as in (8).

The abnormal earnings valuation expression at the end of period $t-1$ is given by:

$$p_{t-1} = bv_{t-1} + \sum_{s=1}^{5} \frac{E_{t-1}(ae_{t+s-1})}{(1+k_{t-1})^s} + \frac{E_{t-1}(p_{t+4} - bv_{t+4})}{(1+k_{t-1})^5}. \tag{3}$$

If we assume the clean surplus relation holds ex post for period t ($s = 0$), we can write the change in book value in terms of earnings and dividends and rearrange terms to get:

$$p_t + d_t = bv_{t-1} + eps_t + \sum_{s=1}^{5} \frac{E_t(ae_{t+s})}{(1+k_t)^s} + \frac{E_t(p_{t+5} - bv_{t+5})}{(1+k_t)^5}. \tag{4}$$

Multiply (3) by the expected return in $t-1$, $(1 + k_{t-1})$, and rearrange the right-hand side to get:

$$(1 + k_{t-1})p_{t-1} = bv_{t-1} + E_{t-1}(eps_t) + (1 + k_{t-1}) \sum_{s=2}^{5} \frac{E_{t-1}(ae_{t+s-1})}{(1+k_{t-1})^s}$$

$$+ (1 + k_{t-1}) \frac{E_{t-1}(p_{t+4} - bv_{t+4})}{(1+k_{t-1})^5}. \tag{5}$$

To simplify the notation, let the present values of future abnormal earnings and terminal values be represented by AE and $term$, as defined below:

$$E_t[AE_{t+s}] = \frac{E_t(ae_{t+s})}{(1+k_t)^s}. \tag{6}$$

$$E_t[term_{t+s}] = \frac{E_t(p_{t+s} - bv_{t+s})}{(1+k_t)^s}. \tag{7}$$

Subtract (5) from (4) and divide both sides of the equation by p_{t-1} to get the following relation between unexpected returns in period t

($UR_t = r_t - E_{t-1}[r_t]$) and unexpected earnings in period t and revisions of future earnings during period t.

$$
\begin{aligned}
UR_t &= r_t - E_{t-1}[r_t] = \frac{(p_t + d_t - p_{t-1})}{p_{t-1}} - k_{t-1} \\
&= \frac{[eps_t - E_{t-1}(eps_t)]}{p_{t-1}} \\
&\quad + \sum_{s=2}^{5} \frac{[E_t(AE_{t+s-1}) - (1 + k_{t-1})E_{t-1}(AE_{t+s-1})]}{p_{t-1}} \quad (8) \\
&\quad + \frac{[E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]}{p_{t-1}} .
\end{aligned}
$$

The terms on the right-hand side of (8) are labeled *UE*, the sum of *RAE2* to *RAE5*, and *RTERM*, respectively, and are defined as follows:

$$
UE = \frac{[eps_t - E_{t-1}(eps_t)]}{p_{t-1}} \quad (8a)
$$

$$
RAEj = \frac{[E_t(AE_{t+j-1}) - (1 + k_{t-1})E_{t-1}(AE_{t+j-1})]}{p_{t-1}} \quad (8b)
$$

$$
RTERM = \frac{[E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]}{p_{t-1}} . \quad (8c)
$$

Note that the forecast revisions underlying the terms in (8b) and (8c) have been restated in present value terms, as defined in (6) and (7), to make them comparable across periods.

We estimate the relation between unexpected returns (*UR*) and unexpected earnings (*UE*) in period t with and without the revisions of earnings forecast for periods $t + 1$ and beyond (*RAE$_j$* and *RTERM*), and contrast the empirical fit (R^2) and estimated coefficients. The simple regression that excludes the forecast revisions is given by (9) and the regression that includes those revisions is given by (10). An intercept is included in both regressions to allow comparison with prior research.

$$
UR_{it} = \alpha_0 + \alpha_1 UE_{it} + \varepsilon_{it}. \quad (9)
$$

$$
\begin{aligned}
UR_{it} = \beta_0 &+ \beta_1 UE_{it} + \beta_2 RAE2_{it} + \beta_3 RAE3_{it} + \beta_4 RAE4_{it} \\
&+ \beta_5 RAE5_{it} + \beta_6 RTERM_{it} + \varepsilon_{it}. \quad (10)
\end{aligned}
$$

While the coefficient α_1 depends on various factors, such as the persistence of unexpected earnings, the coefficients β_1 through β_6 are predicted to equal one. The intercept, β_0, is expected to be zero, except for possible biases in analyst forecasts unrelated to *UE* and errors caused by our approximations.

4. Sample and Methodology

We conduct our analysis at the annual level and collect data from three sources: book values and earnings from *Compustat* (1995 edition), annual returns from *CRSP* (1994 edition), and earnings forecasts from *I/B/E/S*. Since we use only December year-end firms, the period between April of year t and April of year $t + 1$ represents the window corresponding to year t.[10] We obtained 7,708 data points, between 1981 and 1994, that satisfy the following requirements: (1) actual *eps* for that year, forecasted *eps* for the next two years, and a long-term growth forecast in the *I/B/E/S* summary file; (2) the two-year out earnings forecast is positive;[11] (3) the long-term growth forecast is less than 50%; and (4) the current and implied five-year-ahead market-to-book ratios lie between 0.1 and 10. (Estimation of the implied five-year-ahead market-to-book ratio is discussed later in this section.) These last two conditions are imposed to reduce measurement error.[12] Our final sample contains 6,743 firm-years.

All per share numbers are adjusted for stock splits and stock dividends using *I/B/E/S* adjustment factors. If *I/B/E/S* indicates that the majority of forecasts for that firm-year are on a fully diluted basis, we use *I/B/E/S* dilution factors to convert those numbers to a primary basis.

Unexpected return ($UR_t = r_t - E_{t-1}[r_t]$) is determined by subtracting from the 12-month observed return (r_t) an expected return ($E_{t-1}[r_t]$) equal to the risk-free rate plus *MBETA* times the expected equity risk premium. The risk-free rate is proxied by the ten-year Treasury bond yields as of April 1 of each year t, the equity risk premium is assumed to be 5%,[13] and *MBETA* is the median beta of all firms in the same beta decile as that firm. Betas are estimated for all firms in the sample using the prior 60 monthly returns and the value-weighted *CRSP* market return as of April of year t and are ranked into beta deciles each year to generate *MBETA*. We use decile median betas to reduce estimation error.

Unexpected earnings (*UE*) for year t are equal to the actual *eps* for t, as reported by *I/B/E/S*, less the *eps* forecast in $t - 1$ for t. To allow comparisons with prior work, two other measures of unexpected earnings are also considered: (*a*) the first difference in primary earnings per share before extraordinary items and discontinued operations reported by the firm (taken from *Compustat* data item #58) and (*b*) the first difference in

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[10] We assume that all relevant information relating to year t is available to the market by April 1 of year $t + 1$.

[11] This condition is imposed to prevent the application of a positive growth rate to a negative two-year out forecast when projecting earnings for years beyond +2. If, however, we did not need to make these projections because we were able to obtain forecasts for years beyond +2, we did not require that the two-year out forecast be positive. Only two firms that satisfied all other conditions were deleted because of this requirement.

[12] We deleted 280 observations because of conditions 3 and 4. Including these observations had almost no impact on the results, probably because most of these observations are affected by the Winsorization (at 1% and 99% of the distribution) that we impose.

[13] Results are not affected materially by risk premium estimates between 3% and 8%.

actual primary earnings per share as reported by *I/B/E/S*. These two al-
ternative measures, labeled Δeps_{CMPST} and Δeps_{IBES}, are based on earn-
ings following a random walk. While prior work has used the *Compustat*
measure, the *I/B/E/S* measure would better reflect a random walk ex-
pectation to the extent that *I/B/E/S* excludes nonrecurring items from
reported earnings.

To estimate the revision terms *RAE2* through *RAE5*, we use forecasted
earnings for each year in the five-year horizon (eps_{t+s}) and correspond-
ing beginning book values (bv_{t+s-1}). For about 5% of the sample, we
were able to obtain mean *I/B/E/S* forecasts for all five years. For all other
firm-years, we filled in missing forecasts for years +3, +4, and +5 by ap-
plying the mean long-term growth forecast (g) to the mean forecast for
the prior year in the horizon; i.e., $eps_{t+s} = eps_{t+s-1} \times (1 + g)$.

Future book values corresponding to these earnings forecasts are de-
termined by assuming the ex ante clean surplus relation; we assume that
the current dividend payout ratio will be maintained (dividend payout
ratio is *I/B/E/S* indicated annual dividends divided by *I/B/E/S* earnings
forecast for year $t + 1$). If the $t + 1$ earnings forecast was negative, we as-
sume that the dollar amount of the indicated dividend (rather than the
payout ratio) remained constant over the five-year horizon. To minimize
potential biases from extreme dividend payout ratios (caused by forecast
$t + 1$ earnings that are close to zero), we Winsorize payout ratios at 10%
and 50%.[14]

To compute the revision in terminal values, *RTERM*, we estimate the
five-year out market-to-book premium (the excess of price over book
value). To do so, we assume that the five-year out *ratio* of price-to-book
remains unchanged between $t - 1$ and t and apply this ratio to estimated
book value five years out.

To estimate the five-year out ratio of price-to-book as of $t - 1$, we first
rewrite (3) as in (11) below, to replace the implied terminal price-to-
book premium ($p_{t+4} - bv_{t+4}$) with a term that contains the implied
price-to-book ratio (p_{t+4}/bv_{t+4}).

$$
p_{t-1} = bv_{t-1} + \sum_{s=1}^{5} \frac{E_{t-1}\left[ae_{t+s-1} \right]}{(1 + k_{t-1})^s}
$$

$$
+ \frac{E_{t-1}\left[\left(p_{t+4}/bv_{t+4} - 1 \right) \times bv_{t+4} \right]}{(1 + k_{t-1})^5}. \tag{11}
$$

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[14] The impact of altering the dividend payout assumptions on the results is negligible, be-
cause it has a very small impact on future book value and an even smaller impact on the
computed abnormal earnings. Also, the assumption of a constant five-year-ahead price-to-
book ratio (discussed next) compensates for any systematic errors in the estimated dividend
payout ratio.

Rearranging terms, the five-year out price-to-book ratio implied by market prices at $t-1$ can be stated in terms of known quantities, as in (12).

$$PB_5 = E_{t-1}\left(p_{t+4}/bv_{t+4}\right) = \left(p_{t-1} - bv_{t-1} - \sum_{s=1}^{5}\frac{E_{t-1}[ae_{t+s-1}]}{(1+k_{t-1})^s}\right)$$

$$\times \frac{(1+k_{t-1})^5}{E_{t-1}(bv_{t+4})} + 1. \tag{12}$$

We then compute the five-year out price-to-book premium as of t, using the relation $E_t(p_{t+5} - bv_{t+5}) = E_t(bv_{t+5}) \times (PB_5 - 1)$.[15]

Relative to other approaches used in recent valuation studies, which assume constant growth in abnormal earnings for all firm-years, our assumption allows for abnormal earnings growth rates to vary across firms and time. In addition, systematic errors in our earnings measures will be compensated for by the estimated five-year out price-to-book ratio. That is, although our estimate of the implied five-year out price-to-book ratio in $t-1$ will be systematically higher or lower than the true ratio, these errors tend to mitigate the effect of errors in earnings estimates, since *the two sets of errors are negatively related*.

All regressors are scaled by price at the end of year $t-1$, p_{t-1}, and Winsorized to the values at the 1st and 99th percentiles of their respective pooled distributions.

5. Results

Table 1, panel A contains descriptive characteristics of the primary variables (before Winsorization). Examination of the means and medians reported in panel A reveals that although the actual return was less than our proxy for market expectations for most firms, indicated by a median unexpected return of −0.5% per year, a few observations had very positive unexpected returns, indicated by a mean of 2.8%.

The distributions for the two alternative measures of unexpected earnings based on first differences, Δeps_{IBES} and Δeps_{CMPST}, appear to be slightly positive, indicating positive earnings growth overall. The primary measure of unexpected earnings (UE) has a negative mean (median) of −2.2% (−0.5%) of lagged price, which confirms the well-known optimism bias in analyst forecasts.

The distributions for the four revision terms, *RAE2* through *RAE5*, are centered close to zero, suggesting that any optimism bias in analyst forecasts remains unchanged during the sample period. There is a slight

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[15] Evidence in Claus and Thomas [1998] suggests that the implied five-year out price-to-book ratio increased consistently throughout our sample period, at the market level. Therefore, we expect our measure of *RTERM* to be understated on average for our sample period.

TABLE 1
Descriptive Characteristics of Variables

Panel A: Distributional Statistics

Variable	Mean	Standard Deviation	1st Percentile	25th Percentile	Median	75th Percentile	99th Percentile
UR	0.028	0.333	-0.614	-0.175	-0.005	0.186	1.052
Δeps_{IBES}	0.001	0.112	-0.279	-0.012	0.006	0.018	0.252
Δeps_{CMPST}	0.001	0.125	-0.351	-0.015	0.006	0.019	0.333
UE	-0.002	0.082	-0.322	-0.023	-0.005	0.003	0.076
RAE2	-0.002	0.036	-0.106	-0.014	-0.001	0.011	0.089
RAE3	0.004	0.034	-0.076	-0.010	0.001	0.015	0.104
RAE4	0.005	0.032	-0.068	-0.009	0.002	0.016	0.098
RAE5	0.006	0.034	-0.065	-0.010	0.002	0.017	0.113
RAE2_5	0.011	0.120	-0.280	-0.040	0.004	0.055	0.352
RTERM	-0.007	0.110	-0.253	-0.056	-0.012	0.029	0.359
RAE	0.004	0.180	-0.385	-0.093	-0.009	0.087	0.566
RPSTAR	-0.017	0.196	-0.520	-0.117	-0.020	0.076	0.547

Panel B: Pooled Cross-Sectional Correlation. All Variables Other Than *UR* Are Winsorized (at 1% and 99% of Distribution) (Pearson Correlation above the Main Diagonal and Spearman Correlation below the Main Diagonal)

Variable	UR	Δeps_{IBES}	Δeps_{CMPST}	UE	RAE2_5	RTERM	RAE	RPSTAR
UR	1.000	0.200	0.194	0.230	0.459	0.386	0.528	0.561
Δeps_{IBES}	0.223	1.000	0.806	0.695	0.045	0.126	0.107	0.348
Δeps_{CMPST}	0.228	0.823	1.000	0.567	-0.005	0.128	0.074	0.272
UE	0.302	0.711	0.612	1.000	0.053	0.150	0.121	0.463
RAE2_5	0.494	0.135	0.102	0.202	1.000	0.319	0.827	0.750
RTERM	0.430	0.246	0.244	0.353	0.415	1.000	0.778	0.725
RAE	0.552	0.107	0.201	0.328	0.851	0.778	1.000	0.939
RPSTAR	0.574	0.379	0.336	0.524	0.779	0.760	0.921	1.000

The sample contains 6,743 firm-years between April 1981 and April 1994, representing December year-end firms on *I/B/E/S* with available data on the 1994 *CRSP* and 1995 *Compustat* files. We require that (*a*) the two-year out earnings forecast is positive, (*b*) the long-term growth forecast is less than 50%, and (*c*) the current and implied five-year-ahead market-to-book ratios lie between 0.1 and 10. For each firm-year *t*, annual stock returns (r_t) are computed over April of year *t* to April of year *t* + 1 and are compared with expected returns (k_t) over the same window to get unexpected returns (*UR*). Expected returns are equal to *MBETA* × 5% plus the expected risk-free rate (government ten-year treasury-bond yields), where *MBETA* is the median market-model beta of firms in the same beta decile as that firm. Unexpected earnings for year *t* are computed three different ways: Δeps_{IBES} = $(eps_t - eps_{t-1})/p_{t-1}$ (based on actual *eps* from *I/B/E/S*), Δeps_{CMPST} = $(eps_t - eps_{t-1})/p_{t-1}$ (based on actual *eps* from *Compustat*, annual data item #58), and *UE* = $(eps_t - E_{t-1}[eps_t])/p_{t-1}$, or actual eps_t less expected eps as of April 1 of that year (from *I/B/E/S*). Analysts' earnings forecasts are converted to forecasted book values, $E_t[bv_{t+s}]$, and abnormal earnings, $E_t[ae_{t+s}]$, and forecast revisions are incorporated via the following terms:

$$RAE_i = [E_t(AE_{t+i-1}) - (1 + k_{t-1})E_{t-1}(AE_{t+i-1})]/p_{t-1} \quad (i = 2, 3, 4, 5), \quad RAE2\_5 = \sum_{i=2}^{5} RAE_i,$$

$$RTERM = [E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]p_{t-1}, \quad RAE = RAE2\_5 + RTERM, \text{ and } RPSTAR = UE + RAE,$$

where:

$$E_t[AE_{t+s}] = \frac{E_t(ae_{t+s})}{(1 + k_t)^s}, \quad E_t[term_{t+s}] = \frac{E_t(p_{t+s} - bv_{t+s})}{(1 + k_t)^s}, \text{ and forecasted abnormal earnings } E_t[ae_{t+s}] = E_t[eps_{t+s}] - k_t \times E_t[bv_{t+s-1}].$$

tendency for the distributions for these revisions to shift to the right as the horizon increases. This suggests that analysts on average revised their growth estimates upward. The cumulative effect of those upward growth revisions is more visible in the combined term, $RAE2\_5$, which exhibits a positive mean (median) of 1.1% (0.4%) of lagged price.

The terminal value revision, $RTERM$, has a negative mean (median) of −0.7% (−1.2%), which is consistent with the five-year out price-to-book ratio increasing on average during our sample period (causing us to underestimate terminal value) and/or too high an assumed discount rate. The mean and median values of RAE, representing the impact of all future-period revisions, and $RPSTAR$, representing the sum of current surprise and future-period revisions, are all negative because of the large impact of $RTERM$. Even though the mean value of UR, the left-hand side of (10), is positive, the mean value of $RPSTAR$, the combined effect of the regressors in (10), is negative. Again, this result is consistent with our measure of $RTERM$ being negatively biased and/or the assumed discount rate being overstated.[16]

Pooled cross-sectional correlations among the primary variables (after Winsorization of the independent variables) are reported in panel B; Pearson (Spearman) correlations are reported above (below) the main diagonal. To save space, only the combined term $RAE2\_5$ is retained (its components, $RAE2$ to $RAE5$, are dropped). The correlations between unexpected returns and the future earnings terms are higher than those between unexpected returns and measures of current-period unexpected earnings (UE, Δeps_{CMPST}, and Δeps_{IBES}). In essence, current-period price movements can be explained better by current revisions of future-period earnings than by the current-period earnings surprise. Of the three measures of unexpected earnings, the primary measure (UE) exhibits the highest correlation with unexpected returns. The positive correlation observed between UE and the terms capturing revisions in future-period earnings causes the traditional simple regression of UR on UE to suffer from an omitted correlated variables problem.

5.1 POOLED RESULTS

The results of estimating the earnings response regressions with and without the revision terms are reported in table 2. The slope coefficients and associated White-adjusted standard errors for the simple regressions corresponding to (9) are reported in the first three columns (A, B, and C). The corresponding statistics for the multiple regression, described by (10), are reported in D. Sample sizes and adjusted R^2 values for the four regressions are reported in the last five columns.

Each row corresponds to a different measure of unexpected return (UR). In the first six rows, expected return is measured by 3×2 different expectation models: 3 measures of beta, times 2 measures of the risk

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[16] Assuming a 3% risk premium, instead of 5%, produces positive mean and median values for UR, RAE, and $RTERM$.

TABLE 2

Incremental Ability of Analysts' Revisions of Long-Term Forecasts, over Current-Period Unexpected Earnings, to Explain Contemporaneous Returns

| Row # | Measure of Expected Return | Coefficients and White-Adjusted Standard Errors in Parentheses | | | | | | No. of Observations, and Adjusted R^2, in % | | | | |
| | | Simple Regressions | | | Multiple Regressions (D) | | | | Regression | | | |
		Δeps_{IBES} (A)	Δeps_{CMPST} (B)	UE (C)	Intercept	UE	RAE	No. of Obs.	A	B	C	D
1	$R_f + 3\%$	1.111 (0.089)	0.824 (0.066)	1.414 (0.099)	0.039 (0.004)	0.979 (0.093)	1.172* (0.039)	7,345	4.51	4.20	5.45	33.55
2	$R_f + 5\%$	1.117 (0.089)	0.829 (0.066)	1.420 (0.099)	0.043 (0.004)	0.991 (0.093)	1.174* (0.039)	7,346	4.57	4.24	5.57	33.49
3	$R_f + 3\% BETA$	1.033 (0.094)	0.779 (0.071)	1.364 (0.105)	0.042 (0.004)	0.970 (0.098)	1.146* (0.039)	6,743	3.96	3.75	5.11	32.88
4	$R_f + 5\% BETA$	1.037 (0.094)	0.782 (0.071)	1.389 (0.105)	0.045 (0.004)	1.012 (0.097)	1.065 (0.037)	6,743	3.97	3.76	5.27	30.91
5	$R_f + 3\% MBETA$	1.033 (0.093)	0.779 (0.071)	1.363 (0.105)	0.042 (0.004)	0.973 (0.098)	1.143* (0.039)	6,743	3.96	3.75	5.10	32.74
6	$R_f + 5\% MBETA$	1.037 (0.094)	0.781 (0.071)	1.387 (0.105)	0.046 (0.004)	1.017 (0.097)	1.061 (0.037)	6,743	3.97	3.76	5.26	30.67
7	13%	1.098 (0.089)	0.815 (0.067)	1.369 (0.099)	0.064 (0.004)	0.949 (0.095)	1.023 (0.045)	7,346	4.50	4.00	4.98	22.72
8	CAR_t	1.079 (0.089)	0.832 (0.067)	1.589 (0.105)	0.018 (0.011)	1.293* (0.096)	0.905* (0.033)	6,078	4.99	5.14	7.90	27.04

Each row corresponds to a different measure of unexpected return (UR). For rows 1 to 6, expected return (k_t) is measured by 3×2 different expectation models: 3 measures of beta times 2 measures of the risk premium. The three estimates of beta used are 1.0, betas estimated by firm-specific market model regressions of 60 monthly returns on the value-weighted market returns, and betas equal to the median beta ($MBETA$) of all firms in each firm's beta decile. The two estimates of risk premium are 3% and 5%. In row 7, the expected return is a constant, equal to 13%. In row 8, CAR_t is the cumulative abnormal return estimated using the market model over the past 60 months. Simple regressions of unexpected returns on three measures of unexpected earnings (Δeps_{IBES}, Δeps_{CMPST}, and UE) are estimated, and multiple regressions are estimated on UE and revisions of earnings forecast for future years that occur during the same period. The variables are defined as follows: $\Delta eps_{IBES} = (eps_t - eps_{t-1})/P_{t-1}$ (based on actual eps from $I/B/E/S$), $\Delta eps_{CMPST} = (eps_t - eps_{t-1})/P_{t-1}$ (based on actual eps from *Compustat*, annual data item #58), and $UE = (eps_t - E_{t-1}[eps_t])/P_{t-1}$, or actual eps_t less expected eps as of April 1 of that year (from $I/B/E/S$). Analysts' earnings forecasts are converted to forecasted book values, $E_t[bv_{t+s}]$, and abnormal earnings, $E_t[ae_{t+s}]$, and forecast revisions are incorporated via the following terms:

where:

$$RAE = RAE2\_5 + RTERM = \sum_{i=2}^{5} RAE_i + [E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]/P_{t-1}$$

$$RAE_i = [E_t(AE_{t+i-1}) - (1 + k_{t-1})E_{t-1}(AE_{t+i-1})]/P_{t-1}(i = 2, 3, 4, 5), \quad E_t[AE_{t+s}] = \frac{E_t(ae_{t+s})}{(1+k_t)^s}, \text{ and } E_t[term_{t+s}] = \frac{E_t(p_{t+s} - bv_{t+s})}{(1+k_t)^s}.$$

*Indicates that the coefficient on UE/RAE in column D is significantly different from one, at the 5% level (two-tailed test).

premium. The three estimates of beta used are 1.0, beta estimated by firm-specific market model regressions of 60 monthly firm returns on the value-weighted market returns, and beta equal to the median beta (*MBETA*) of all firms in each firm's beta decile. The two estimates of risk premium are 3% and 5%.

We focus on the results in the sixth row based on *MBETA* and a risk premium of 5% (this measure of expected return is used in the remainder of the paper); the other expected returns in the rows above provide the same general results.[17] Comparing the three simple regressions, *UE* appears to be slightly better than the other two measures of unexpected earnings (R^2 of 5.26% versus 3.97% and 3.76%). This result was expected, given the correlations reported in panel B of table 1. Including the future-period revisions increases the explanatory power to 30.67%, also consistent with the pattern of correlations between *UR* and the different earnings terms reported in table 1. Revisions of future earnings forecasts are more important than current unexpected earnings in explaining returns.

The coefficients in the sixth row for the multiple regression are 0.046, 1.017, and 1.061, corresponding to the intercept, current-period unexpected earnings (*UE*), and revisions of future-period earnings (*RAE*). The positive intercept represents the better than expected performance of the stock market over the sample period and/or measurement errors. The coefficients on *UE* and *RAE* are not reliably different from one at the 5% significant level.[18] This result is heartening, given the potential for biased coefficients due to the considerable measurement error associated with the forecast revisions terms (see section 5.2).

While the results are generally not sensitive to different measures of expected returns based on different estimates for beta and the risk premium, controlling for changes over time in the risk-free rate has a substantial impact. In row 7, we adopt a constant expected return (equal to the mean ten-year risk-free rate of 8% plus a 5% premium), and the R^2 declines to below 23%.

The results in row 8 illustrate the impact of replacing *unexpected* returns as the dependent variable with *abnormal* returns, the variable that is most often used in *ERC* studies.[19] The multiple regression R^2 values fall and the coefficients for *UE* and *RAE* deviate from one. Although the

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[17] Relative to the sixth row, the R^2 values are generally higher for the rows above, but the coefficient values on *UE* and *RAE* are slightly farther from their predicted value of one.

[18] To test the coefficient estimates against a hypothesized value, the associated *t*-statistic is the difference between the estimate and the hypothesized value, scaled by the standard error. Given the large sample sizes, *p*-values can be approximated from the standard normal distribution; i.e., *p*-value = 5% for *t*-statistic = 1.96, and so on.

[19] It has been noted (e.g., Beaver [1987]) that using abnormal returns removes market-wide movements from the left-hand side of the regressions but not from the right-hand side. While abnormal returns may be appropriate in event-study methodologies, where the focus is on idiosyncratic or unsystematic returns, we see no reason to remove the market return in our context.

R^2 values for the *simple* regressions are all *higher* in row 8 than in the rows above, the multiple regression results and the logical inconsistency of removing market-wide effects from only the dependent variable suggest that the abnormal returns specification is inferior to the unexpected returns specification. Why the simple regression R^2 values are higher for abnormal returns remains unexplored.[20]

Estimating the regressions in table 2 separately for individual years in the sample period provides results similar to the pooled results reported here.

5.2 POTENTIAL MEASUREMENT ERROR IN FORECAST REVISIONS

To gauge the measurement error in the forecast revision measures, we aggregate the information contained in the different revision terms and then progressively separate that information into components. Observing the pattern of changes in coefficient estimates during this process indicates the extent of measurement error. We recognize that the impact of measurement error on coefficient bias extends beyond the simple case of "noise" and includes (1) correlation across measurement errors and (2) correlation among measurement errors and included regressors (both types of correlations are likely to exist in our sample). Our objective is to suggest that measurement error exists in our data and could bias the coefficients away from the predicted value of one.

Regression 1 in table 3, panel A compares unexpected returns with *RPSTAR*, the combined effect of all independent variables in (10): current-period earnings and the impact of revisions for all future periods. The coefficient on *RPSTAR* is 1.057 and that value is only slightly higher than one (the difference is not statistically significant at the 5% level). Regression 2 is identical to the multiple regression estimated in table 2, where *UE* and *RAE* are considered separately. Each subsequent regression (regressions 3 to 6) breaks up the information in *RAE* into components; although the R^2 values remain relatively unchanged, the coefficients stray further away from the predicted value of one as the number of components increases. We interpret this pattern as suggesting considerable measurement error in our variables.[21]

5.3 SOURCE OF IMPROVEMENT IN SPECIFICATION FOR MULTIPLE REGRESSION

Our next analysis separates the improvement observed for the multiple regression that is due to the information in each of the future-period

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[20] Ramakrishnan and Thomas [1998] find that the abnormal returns specification performs worse than the unexpected returns specification for time-series regressions, where *ERC*s are allowed to vary across firms. That is, the abnormal returns specification for the simple regression generates higher R^2 values only for cross-sectional regressions, where all firms are assumed to have the same *ERC*.

[21] Observing higher R^2 for a subset of firm-years with greater analyst following (more than ten forecasts) suggests that revisions for observations with fewer forecasts are likely to contain more measurement error.

TABLE 3

Explaining Contemporaneous Returns: Measurement Errors and Incremental Explanatory Power of Independent Variables

Panel A: Explaining Contemporaneous Returns: Measurement Error among Revisions in Future-Period Analyst Earnings Forecasts

Coefficients and White-Adjusted Standard Errors in Parentheses

	Intercept	Var 1	Var 2	Var 3	Var 4	Var 5	Var 6	Adjusted R^2, in % (6,743 Firm-Years)
Regression 1	0.048 (0.004)	RPSTAR 1.057 (0.032)						31.50
Regression 2	0.046 (0.004)	UE 1.017 (0.097)	RAE 1.061 (0.037)					30.67
Regression 3	0.042 (0.004)	UE 1.049 (0.099)	RAE2_5 1.251* (0.064)	RTERM 0.860* (0.071)				30.39
Regression 4	0.046 (0.004)	UE 0.95 (0.110)	RAE2_3 1.796* (0.189)	RAE4_5 1.628* (0.126)	RTERM 0.899 (0.071)			30.47
Regression 5	0.043 (0.004)	UE 1.010 (0.115)	RAE2 1.529 (0.279)	RAE3_5 1.160 (0.105)	RTERM 0.861 (0.071)			30.49
Regression 6	0.044 (0.004)	UE 1.057 (0.118)	RAE2 0.942 (0.321)	RAE3 3.605* (0.494)	RAE4 0.356 (0.471)	RAE5 −0.084* (0.411)	RTERM 0.879 (0.071)	30.96

Panel B: Explaining Returns Using Revisions in Analyst Earnings Forecasts: Incremental Explanatory Power of Independent Variables

Coefficients and White-Adjusted Standard Errors in Parentheses

	Intercept	UE	RAE2	RAE3	RAE4	RAE5	RTERM	REPS2	RGROW	Adjusted R^2, in % (6,743 Firm-Years)
Regression 1	0.055 (0.004)	1.387* (0.105)								5.26
Regression 2	0.051 (0.004)	0.673* (0.106)	4.756 (0.225)							21.05

Regression 3	0.038 (0.004)	1.434* (0.097)		5.521 (0.228)					25.20
Regression 4	0.040 (0.004)	1.251* (0.116)	1.160 (0.305)	4.540 (0.323)					25.50
Regression 5	0.038 (0.004)	1.269* (0.116)	1.199 (0.307)	3.341 (0.476)	1.294 (0.419)				25.63
Regression 6	0.038 (0.004)	1.268* (0.118)	1.198 (0.308)	3.348 (0.495)	1.312 (0.477)	−0.025 (0.419)			25.62
Regression 7	0.044 (0.004)	1.057 (0.118)	0.942 (0.321)	3.605 (0.494)	0.356 (0.471)	−0.084 (0.411)	0.879 (0.071)		30.96
Regression 8	0.082 (0.004)	−0.124* (0.159)						3.749 (0.288)	13.49
Regression 9	0.057 (0.004)	1.334* (0.103)							0.200 (0.020)	7.08
Regression 10	0.081 (0.005)	−0.085* (0.158)						3.561 (0.289)	0.138 (0.019)	14.33

Unexpected returns (UR) are defined as observed annual returns (April to April) less expected returns (k_t), as measured by the ten-year treasury bond rate plus $MBETA \times 5\%$. Panel A analyzes measurement error in independent variables based on analysts' forecast revisions, by estimating multiple regressions on unexpected earnings (UE) and different combinations of variables. Panel B analyzes the incremental explanatory power of different independent variables, by including each variable progressively to the simple regression of UR on UE. UE equals $(eps_t - E_{t-1}[eps_t])/P_{t-1}$, where eps_t and $E_{t-1}[eps_t]$ are the actual and expected earnings per share from $I/B/E/S$. $REPS2$ is the revision in the EPS forecast for $t + 1$, deflated by lagged stock price, $(E_t[eps_{t+1}] - E_{t-1}[eps_{t+1}])/P_{t-1}$, and $RGROW$ is the percentage revision in the five-year earnings growth forecast. Analysts' earnings forecasts are converted to forecasted book values, $E_t[bv_{t+s}]$, and abnormal earnings, $E_t[ae_{t+s}]$, and the other forecast revision measures are computed as follows:

$$RAE_{-j} = \sum_{s=i}^{j} RAE_s, \quad RAE_i = [E_t(AE_{t+i}) - (1 + k_{t-1})E_{t-1}(AE_{t+i})]/P_{t-1} \ (i = 2, 3, 4, 5),$$

$$RTERM = [E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]/P_{t-1},$$

$$RAE = RAE2\_5 + RTERM, \quad RPSTAR = UE + RAE,$$

where:

$$E_t[AE_{t+s}] = \frac{E_t(ae_{t+s})}{(1+k_t)^s} \quad \text{and} \quad E_t[term_{t+s}] = \frac{E_t(P_{t+s} - bv_{t+s})}{(1+k_t)^s}.$$

*Indicates that the slope coefficient is significantly different from one, at the 5% level (two-tailed test). $REPS2$ and $RGROW$ are not tested.

revisions from that due to the specific relation imposed by the abnormal earnings model. To identify the former effect, we begin with the simple regression of UR on UE and note the improvement in R^2 as we include, one at a time, the revisions for years $t + 1$ through $t + 4$ ($RAE2$ through $RAE5$) and the terminal value ($RTERM$). To identify the importance of the abnormal earnings specification, we examine the improvement gleaned by adding this information to the simple regression in a more direct way than that specified in (10).

Regression 1 in table 3, panel B reports the simple regression of UR on UE, already reported in table 2, and regression 2 includes $RAE2$. The large increase in R^2, from 5.45% to 21.05%, suggests that there is considerable information in this term. Replacing $RAE2$ with $RAE3$ yields an R^2 of 25.20%, indicating that the forecast revision for $t + 2$ is more value relevant than that for $t + 1$. Adding $RAE2$ to $RAE3$, in regression 4, has little impact on R^2, as is the case with adding $RAE4$ and $RAE5$ to the earlier-period forecast revisions. Adding $RTERM$, in regression 7, increases R^2 from 25.62% to 30.96%, indicating there is separate information in our terminal value proxy (probably represented by the firm-specific five-year out P/B ratio) that is not captured by the annual revision terms.

With regard to coefficient estimates, the coefficients on forecast revisions exceed substantially their predicted value of one (e.g., the coefficient on $RAE2$ in regression 2 is 5.317) as long as some terms are excluded, because the coefficient on the included term captures a portion of the effect of the excluded terms. As more future periods are introduced, the coefficient estimates decrease toward their predicted value of one.

We also adapted these regressions to include a redefined terminal value expression that captures all remaining terms. For example, regression 2 is re-estimated using a terminal value that considers all terms beyond $RAE2$; we assume that the implied two-year out price-to-book ratio remains unchanged between $t - 1$ and t, similar to the procedure based on (11) and (12). In general, the estimated coefficient and R^2 values for these modified regressions (not reported) are similar to those for the corresponding regressions in table 3. That is, $RAE3$ and $RAE2$ contribute much of the incremental information added by the forecast revision terms.[22]

To identify the importance of specification, we contrast the results in regression 2 (based on adding $RAE2$ alone) with the fit obtained when the forecast revision for $t + 1$ is included, without the adjustments described in (6) and (8b), using the variable $REPS2 = (E_t[eps_{t+1}] - E_{t-1}[eps_{t+1}])/p_{t-1}$. Recall that $RAE2$ incorporates the revision between $t - 1$ and t in fore-

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[22] A related approach is to combine the $RAEj$ terms and corresponding adapted terminal value terms to get one term, as in regression 2 of table 3 (panel A). These specifications result in R^2 values similar to those described above, but the coefficient estimate on RAE tends toward one. Again, the general conclusion remains unchanged: much of the incremental information in revisions of future-period forecasts is conveyed by $RAE2$ and/or $RAE3$.

casted earnings for $t + 1$ by converting forecasted earnings to forecasted abnormal earnings and then finding the present values of those forecasted abnormal earnings using the appropriate discount rates, k_{t-1} and k_t. The simpler specification represented by *REPS2* has been followed recently by Brous and Shane [1997], and a related construct is used in Easton and Zmijewski [1989]. We also consider the improvement obtained by adding the revision in the five-year growth term, *RGROW*, without all of the adjustments required to convert that information into *RAE3*, *RAE4*, *RAE5*, and *RTERM*. This approach has been considered recently in Dechow, Sloan, and Sweeney [1999].

The results are reported in the last three regressions in table 3, panel B: *REPS2* is added to *UE* in regression 8, *RGROW* is added to *UE* in regression 9, and both *REPS2* and *RGROW* are added in regression 10. Our results suggest that while these two revision variables are informative, as indicated by the increase in R^2 over that for the simple regression, properly specifying that information is quite important. For example, although the R^2 for regression 8 (13.49%) is greater than that for regression 1 (5.26%), it is less than that for regression 2 (21.05%). Similarly, introducing the revision in five-year earnings growth forecasts by itself, as in regression 9, or in combination with *REPS2*, as in regression 10, results in R^2 values that are substantially below the R^2 obtained by incorporating that same information in the abnormal earnings specification.

We reconsider the question of proper specification by adding the information in forecast revisions using a different direct approach (see, e.g., Brown, Foster, and Noreen [1985] and Abarbanell and Bushee [1997]). We add the revision in one-year-ahead and two-year-ahead forecasted earnings, defined as follows: $\Delta fy1 = (E_t[eps_{t+1}] - E_{t-1}[eps_t])/p_{t-1}$ and $\Delta fy2 = (E_t[eps_{t+2}] - E_{t-1}[eps_{t+1}])/p_{t-1}$. This specification can be derived from a valuation model that equates current stock price to be a multiple of one-year out or two-year out earnings.

Note the difference between *REPS2* and $\Delta fy1$ or $\Delta fy2$. *REPS2* is based on the revision in forecasted earnings for period $t + 1$, which results in comparing a two-year out forecast made in $t - 1$ with a one-year out forecast made in t. In contrast, $\Delta fy1$ and $\Delta fy2$ are based on forecasts that are always one and two years out and therefore relate to different periods. For example, in $\Delta fy1$ the forecast for t made in $t - 1$ is compared to the forecast for $t + 1$ made in t.

The results of including $\Delta fy1$ in the simple *ERC* regression are reported in the first row of table 4. To maintain consistency with prior research, we use the first difference in actual *eps* (Δeps_{IBES}) as the proxy for unexpected earnings. The R^2 value of 20.68% is comparable to the R^2 value of 21.05% reported for *RAE2* (see regression 2 in table 3, panel B). In other words, simply introducing the revision in fixed-horizon forecasts by itself results in R^2 values that are comparable to those achieved by making the more complex transformations prescribed by the abnormal earnings approach.

TABLE 4

Explaining Returns Using Revisions in Analyst Earnings Forecasts: Other Specifications

	Intercept	UE	RAE	Δeps_{IBES}	$\Delta fy1$	$\Delta fy2$	$\Delta capfy1$	$\Delta capfy2$	RGROW	Adjusted R^2, in % (6,743 Firm-Years)
				Coefficients and White Adjusted Standard Errors in Parentheses						
Regression 1	0.013 (0.003)			-0.301 (0.087)	5.343 (0.232)					20.68
Regression 2	0.012 (0.003)			0.069 (0.091)		5.462 (0.237)				24.36
Regression 3	0.012 (0.003)			-0.136 (0.084)	1.728 (0.437)	4.092 (0.435)			0.056 (0.017)	25.14
Regression 4	-0.006 (0.003)			-0.213 (0.080)			0.657 (0.039)			29.15
Regression 5	-0.009 (0.005)			0.257 (0.139)				0.634 (0.063)		31.15
Regression 6	-0.011 (0.004)			-0.080 (0.077)			0.320 (0.122)	0.395 (0.130)	0.082 (0.018)	33.89
Regression 7	0.010 (0.005)	0.374 (0.015)	0.547 (0.085)				0.273 (0.096)	0.183 (0.136)	0.057 (0.016)	37.00

Unexpected returns (UR) are defined as observed annual returns (April to April) less expected returns (k_t), proxied by the ten-year treasury bond rate plus $MBETA \times 5\%$. Simpler specifications that capture the information in analysts' forecast revisions are compared with the full specification based on abnormal earnings. Unexpected earnings (UE) equal $(eps_t - E_{t-1}[eps_t])/p_{t-1}$, where eps_t and $E_{t-1}[eps_t]$ are the actual and expected earnings per share from $I/B/E/S$, and $\Delta eps_{IBES} = (eps_t - eps_{t-1})/p_{t-1}$. Analysts' earnings forecasts are either used as is or converted to forecasted book values, $E_t[bv_{t+s}]$, and abnormal earnings, $E_t[ae_{t+s}]$, and forecast revisions are incorporated via the following terms:

$$\Delta fy1 = (E_t(eps_{t+1}) - E_{t-1}(eps_t))/p_{t-1}; \Delta fy2 = (E_t(eps_{t+2}) - E_{t-1}(eps_{t+1}))/p_{t-1}; \Delta capfy1 = \left(\frac{E_t(eps_{t+1})}{k_t} - \frac{E_{t-1}(eps_t)}{k_{t-1}} \right)/p_{t-1},$$

$$\Delta capfy2 = \left(\frac{E_t(eps_{t+2})}{k_t} - \frac{E_{t-1}(eps_{t+1})}{k_{t-1}} \right)/p_{t-1}, \text{ and } RGROW \text{ is the percentage revision in the five-year earnings growth forecast.}$$

$$RAE = \sum_{s=2}^{5} RAE_s + RTERM, RAE_i = [E_t(AE_{t+i}) - (1 + k_{t-1})E_{t-1}(AE_{t+i-1})]/P_{t-1} (i = 2, 3, 4, 5),$$

$$RTERM = [E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]/P_{t-1}, E_t[AE_{t+s}] = \frac{E_t(ae_{t+s})}{(1+k_t)^s} , \text{ and } E_t[term_{t+s}] = \frac{E_t(P_{t+s} - bv_{t+s})}{(1+k_t)^s} .$$

   The explanatory power can be increased even further by incorporat-
ing discount rate changes using a capitalized earnings model (price
equals forecasted earnings scaled by the discount rate). Dividing the
forecasts at $t - 1$ and t by the corresponding discount rates results in R^2
values that exceed those obtained from including $RAE2$. In regression 4
of table 4, we replace $\Delta fy1$ with $\Delta capfy1$, defined as $(E_t[eps_{t+1}]/k_t - E_{t-1}$
$[eps_t]/k_{t-1})/p_{t-1}$, and the R^2 increases to 29.15%.
   The other regressions in table 4 examine other variants of these sim-
pler specifications. Similar to $\Delta fy1$ and $\Delta capfy1$, which capture one-year
out forecast revisions, we construct $\Delta fy2$ and $\Delta capfy2$ to represent two-
year out forecast revisions. The two-year out revision terms have slightly
higher explanatory power than those for the one-year out revisions (re-
gressions 4, 5, and 6). We also consider the revision in five-year growth
rate forecasts ($RGROW$). Similar to our results in table 3, panel B, the
revision in growth term adds only a small improvement to the R^2 al-
ready provided by the information in forecast revisions and discount
rate changes. Finally, we combine the variables UE and RAE from the ab-
normal earnings specification and the three forecast revision variables
from the simple specification in regression 6 to get an overall R^2 of
37%, higher than any of the other specifications.
   While the simpler specifications generate more explanatory power,
relative to the abnormal earnings specification, the coefficient values are
harder to interpret. The coefficient on Δeps_{IBES} in regressions 1 and 4
is significantly negative, and in other regressions it is insignificantly dif-
ferent from zero at the 5% level. (Similar results are observed when
Δeps_{IBES} is replaced by the other two proxies for unexpected earnings.)
These results are not expected since stock returns at earnings announce-
ments are positively related to unexpected earnings. Similarly, the ob-
served coefficients on the forecast revisions are not easily linked to
predictions from the simple valuation models.
   The results in tables 3 and 4 suggest a trade-off: the simpler specifi-
cations offer higher in-sample R^2 values, whereas our complete specifi-
cation offers coefficients that are easier to interpret and close to their
predicted values.[23] Apparently, the transformations to the underlying in-
formation required by our specification induce substantial measure-
ment error. Given our interest in the proximity of estimated coefficients
to their predicted value of one, we focus hereafter on the complete
specification. However, in other studies that focus more on R^2 the sim-
pler specifications may be preferred.

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   [23] We emphasize that the higher explanatory power offered by the simple specification
is only observed in-sample. For example, the coefficients vary substantially when those re-
gressions are estimated separately for each year. Within each annual sample, the coefficients
adjust to best fit the data in that year, but the relation fitted in one year may not be appro-
priate in another year.

5.4 SUBSAMPLES BASED ON CONSISTENCY OF CURRENT AND FUTURE EARNINGS INFORMATION

Table 5, panel A provides the results of an analysis designed to show the relative improvement between the simple and multiple regressions that can be obtained for subsamples with consistent and inconsistent values of the explanatory variables (when the signs of *UE* and *RAE* are the same they are considered consistent). We predict that the consistent and inconsistent subsamples should exhibit different results in the simple regressions; for example, the *ERC* values and R^2 should be substantially higher for the consistent subsamples. Any differences among the different subsamples observed in the simple regressions should, however, reduce in the multiple regressions.

Since the variance of the dependent variable varies across subsamples, R^2 values are not easily compared across samples. For example, the standard deviation of unexpected returns for the inconsistent subsample is lower than that for the consistent subsample (0.306 versus 0.345), and a lower R^2 could reasonably be expected for the inconsistent subsample, ceteris paribus. Our R^2 comparisons are therefore strictly for illustrative purposes. Another intuitive way to contrast subsamples is to compare the relative improvement in R^2 for the multiple regression over the simple regression.

As predicted, the *ERC*s and R^2 values for the simple regression are substantially higher when the *UE* and *RAE* terms are consistent (2.615% and 14.38%) than when they are inconsistent (0.190% and 0.11%). Moving to the multiple regression causes the coefficient on *UE* to tend toward one and the R^2 values to increase for both subsamples. The improvement in R^2 is more dramatic for the inconsistent subsample (0.11% to 13.76% versus 14.38% to 37.79% for the consistent subsample).

We also examine a "very consistent" subsample with each revision term in (10) having the same sign as *UE* and a "very inconsistent" subsample with each revision term in (10) having the opposite sign as *UE*. Again, the general patterns observed for the consistent and inconsistent subsamples are repeated for these two extreme subsamples.

Although the patterns observed in table 5, panel A are generally as predicted, many of the multiple regression coefficient values differ from their predicted value of one, especially for the consistent subsamples. We believe the coefficient estimates for these subsamples are biased due to correlation (among *RAE*, *UE*, and measurement errors in *RAE* and *UE*) induced by the sample selection process.

5.5 SUBSAMPLES BASED ON REPORTED PROFIT OR LOSS

To examine the low explanatory power of earnings documented for loss firms, we split the sample into loss and profitable firms based on *Compustat* earnings for year *t*. We split the loss subsample into two groups based on whether a loss was reported in year $t - 1$. Firms with losses in both periods are "consistent" loss firms and loss firms reporting a profit

TABLE 5

Ability of Unexpected Earnings and Analysts' Revisions of Long-Term Forecasts to Explain Contemporaneous Returns

Panel A: The Overall Sample Is Partitioned into Subsamples Based on the Consistency of Signs of *UE* and *RAE* in the Multiple Regression

Coefficients and White-Adjusted Standard Errors in Parentheses

Subsample	Simple Regression (C)		Multiple Regression (D)			Standard Deviation of *UR*, No. of Observations, and Adjusted R^2, in %			
	Intercept	*UE*	Intercept	*UE*	*RAE*	*UR* s.d.	No. of Obs.	C R^2	D R^2
Consistent	0.041	2.615	0.041	0.640*	1.169*	0.345	4,131	14.38	37.79
UE Is of the Same Sign as *RAE*	(0.006)	(0.158)	(0.005)	(0.123)	(0.005)				
Inconsistent	0.086	0.190	0.056	1.107	0.948	0.306	2,611	0.11	13.76
UE Is of the Opposite Sign as *RAE*	(0.006)	(0.144)	(0.006)	(0.137)	(0.076)				
Very Consistent	0.041	3.875	0.036	0.591*	1.201*	0.361	2,665	19.59	44.61
UE Is of the Same Sign as All Other Revision Terms	(0.008)	(0.276)	(0.007)	(0.163)	(0.056)				
Very Inconsistent	0.088	0.196	0.041	1.630*	1.075	0.309	1,329	0.05	22.79
UE Is of the Opposite Sign as All Other Revision Terms	(0.008)	(0.203)	(0.007)	(0.213)	(0.076)				

TABLE 5 — *continued*

Panel B: Partition by Loss/Profit Firm-Years

	Simple Regressions			Multiple Regressions (D)		UR s.d.	No. of Obs.	Standard Deviation of UR, No. of Observations, and Adjusted R^2, in %			
Subsample	Δeps_{IBES} (A)	Δeps_{CMPST} (B)	UE (C)	UE	RAE			A	B	C	D
Consistent Loss	0.503 (0.276)	0.444 (0.218)	0.739 (0.293)	1.083 (0.251)	0.999 (0.196)	0.466	223	1.71	2.21	2.70	29.19
One-Time Loss	0.153 (0.161)	−0.235 (0.192)	0.335 (0.160)	0.734 (0.159)	0.868 (0.084)	0.349	461	0.00	0.25	0.74	24.37
All Loss	0.311 (0.155)	0.158 (0.140)	0.476 (0.148)	0.864 (0.134)	0.925 (0.098)	0.391	684	0.80	0.23	1.50	26.56
Consistent Profitable	1.516 (0.172)	1.536 (0.156)	2.243 (0.212)	0.623* (0.159)	1.139* (0.039)	0.310	5,686	3.38	3.87	4.75	31.58
One-Time Profitable	1.033 (0.308)	0.909 (0.257)	4.176 (0.749)	3.215* (0.801)	0.663* (0.170)	0.458	370	4.36	3.52	14.86	22.22
All Profitable	1.318 (0.140)	1.036 (0.105)	2.497 (0.211)	0.933 (0.176)	1.092* (0.040)	0.321	6,057	3.84	3.61	5.82	29.85

Coefficients and White-Adjusted Standard Errors in Parentheses

Panel C: Partition by High-Technology Firms versus All Other Firms

Slope Coefficients and White-Adjusted
Standard Errors in Parentheses

Industry Subsample	Simple Regressions			Multiple Regressions (D)		Standard Deviation of UR, No. of Observations, and Adjusted R^2, in %						
	Δeps_{IBES} (A)	Δeps_{CMPST} (B)	UE (C)	UE	RAE	UR s.d.	No. of Obs.	A	B	C	D
High-Technology	0.957 (0.284)	0.531 (0.232)	1.672 (0.455)	0.918 (0.460)	1.023 (0.341)	0.373	158	3.57	1.76	6.79	37.48
Others	1.040 (0.095)	0.791 (0.071)	1.375 (0.107)	1.017 (0.099)	1.062 (0.039)	0.332	6,584	3.97	3.82	5.18	30.42

In panel A, the sample is partitioned by consistency of information in current unexpected earnings and revisions in future earnings. In panel B, the sample is partitioned by loss/profit firm-years. In panel C, the sample is partitioned by high-technology firms versus all other firms. Unexpected returns (UR) are defined as observed annual returns (April to April) less expected returns (k_t), proxied by the ten-year treasury bond rate plus $MBETA \times 5\%$. Simple regressions are estimated on UE and revisions of earnings forecast for future years that occur during the same period. The variables are defined based on $I/B/E/S$ data as follows. UE equals $(eps_t - E_{t-1}[eps_t])/P_{t-1}$. Analysts' revisions of forecasted earnings for future years ($t + 1$ and beyond) during the window are incorporated in RAE, which is defined as follows:

$$RAE = RAE2\_5 + RTERM = \sum_{i=2}^{5} RAE_i + [E_t(AE_{t+5}) + E_t(term_{t+5}) - (1 + k_{t-1})E_{t-1}(term_{t+4})]/P_{t-1}$$

where:

$$RAE_i = [E_t(AE_{t+i-1}) - (1 + k_{t-1})E_{t-1}(AE_{t+i-1})]/P_{t-1}(i = 2, 3, 4, 5), \quad E_t[AE_{t+s}] = \frac{E_t(ae_{t+s})}{(1 + k_t)^s}, \text{ and } E_t[term_{t+s}] = \frac{E_t(P_{t+s} - bv_{t+s})}{(1 + k_t)^s}.$$

Loss and profit is based on eps_t, as reported by *Compustat* (data item #58). Consistent loss (profitable) firms report a loss (profit) in years t and t-1. One-time loss (profitable) firms report a loss (profit) in year t but not in t-1. All loss (profitable) firms include all firms reporting a loss (profit) in year t. High-technology firms are identified using $I/B/E/S$'s industry classification codes. Three industries are included in the high-technology subsample: biotech, computers, and semiconductors.

*Indicates that the slope coefficient in column D is significantly different from one, at the 5% level (two-tailed test).

in $t - 1$ are "one-time" loss firms. We expect that for one-time loss firms, period t earnings are unrepresentative of their true profitability, and their unexpected earnings would therefore exhibit low explanatory power in simple ERC regressions. We also split the profitable firms into those with and without positive reported earnings in year $t - 1$ (the consistent profitable firms and the one-time profitable firms). The abnormal earnings model predicts that regardless of the results observed in the simple regressions, all subsamples should be similar at the level of the multiple regressions.

The results for these partitions based on the sign of reported earnings are provided in table 5, panel B. In the simple ERC regressions, all loss firms' earnings exhibit lower value relevance, relative to all profitable firms (compare the third row with the sixth row). This result is most evident for regressions based on earnings differences derived from reported earnings, Δeps_{CMPST}. Apparently, deleting some one-time items in actual earnings as reported by $I/B/E/S$ (column A results) improves the value relevance of earnings slightly, and moving to UE (column C results) increases it even more. In contrast, the multiple regression results for the all profit and all loss groups are fairly similar.

Examination of the two loss subgroups suggests that the weak results observed in the simple regressions for all loss firms are due to the one-time loss subsample (compare the first and second row with the third row). The results for the consistent loss firms are more similar to those observed for profitable firms. To our knowledge, this is the first study to document that the weak results observed for loss firms are due to the few loss firms (only about a third of all loss firms) that had reported a profit in the prior year. Again, as predicted by the abnormal earnings model, differences across subsamples observed for the simple regressions are reduced considerably when multiple regressions are estimated. The multiple regressions uniformly exhibit higher explanatory power and coefficients that tend toward one, particularly for the one-time loss subsample.

Examination of the results for the two profitable subgroups suggests that the differences observed between the two loss subgroups are not simply due to the differences in the sign of the prior year's earnings. Specifically, the one-time profitable subgroup (about 5% of all profitable firms) exhibits coefficients and explanatory power that are not weaker than those observed for the consistent profitable subgroup. In fact, the ERC and R^2 values for the simple regression based on UE, reported in the columns labeled C, are considerably higher for the one-time profitable group.

There are two aspects of the results in table 5, panel B which suggest that firms going from reporting losses to reporting profits are more likely to be recovering firms that surprise the market positively, relative to the likelihood that firms going from reporting profits to reporting losses are declining firms which surprise the market negatively: (*a*) the

proportion of profitable firms that are one-time profitable is smaller than the proportion of loss firms that are one-time loss firms and (*b*) the simple regression results observed for the one-time profitable (loss) firms are stronger (weaker) relative to those for the consistent profitable (loss) firms. Some firms in the one-time loss subsample may be taking a one-time write-off that is ignored by investors. It is this greater likelihood of observing transitory or price-irrelevant earnings in one-time loss firms, relative to one-time profitable firms, that drives the weak results observed in the prior literature for all loss firms.

5.6 SUBSAMPLES BASED ON EXPECTED FUTURE GROWTH IN EARNINGS

We turn next to the issue of the information content of earnings for firms in the high-tech industries (also called high-growth firms). It has been argued that a considerable portion of value lies in future earnings for such firms and current earnings are not informative about future earnings (low correlation) because they are distorted by the requirement to write off investments in intangible assets.

We predict that differences between high- and low-growth firms in the simple regressions should be mitigated when multiple regressions that include revisions in future earnings are estimated. To examine this issue, we designate all firms in the computer, semiconductor, and biotechnology industry groups (as defined by *I/B/E/S*) as high-tech firms and all remaining firms as "other." The results of our analysis are reported in table 5, panel C. The results for high-tech firms are considerably weaker than those for other firms for simple regressions using first differences in *Compustat* earnings (column B). However, the results for high-tech firms improve considerably when unexpected earnings are defined as the first differences in actual earnings according to *I/B/E/S* or as *UE* (columns A and C). Apparently, the removal of one-time items from the reported earnings of high-tech firms improves their value relevance, at the level of the simple regression. Moving to the multiple regressions, the R^2 values increase dramatically and the coefficient estimates tend toward one for both subsamples.[24]

We also identify high- and low-growth firms using price–earnings ratios and the five-year earnings growth rate forecast by *I/B/E/S* analysts.[25] For each growth measure, we use the distribution as of year $t-1$ for that measure and split the sample into quintiles. Overall, the results (not reported) are generally supportive of the view that observed differences in

the value relevance of earnings observed in the simple regression are reduced considerably at the level of the multiple regressions.

5.7 EVIDENCE OF NONLINEAR RETURNS/EARNINGS RELATION

To the extent that the nonlinearity in the unexpected returns/earnings relation documented in the literature is caused by variation within the sample in the persistence of earnings, any observed nonlinearity should be removed when revisions of future-period earnings are included in the regression.

To probe any nonlinearity in our sample, we partition the sample into ventiles (20 equal-size groups), ranked on *UE*, and then plot the mean unexpected returns for each ventile against the mean values of *UE*. Examination of that series, reported in figure 1, panel A indicates the extent of nonlinearity in the data. While this portfolio-level analysis provides a less detailed picture than the nonlinear regressions estimated in the literature, the *S*-shape and the lower slope for negative earnings surprises that has been documented elsewhere are clearly evident here.

To incorporate future-period revisions, we compute the values of *RPSTAR* (equal to the sum of *UE* and all future-period revision terms) for the same 20 groups of firms and report in figure 1, panel B a plot of mean *UR* on mean *RPSTAR*. Although there is still some residual asymmetry in that plot (the slope for the negative *UE* groups appears to be less steep than that for the positive *UE* firms), much of the nonlinearity observed in panel A appears to be removed in panel B. The 20 *UE* ventiles in this plot lie fairly close to the 45-degree line passing through the origin (representing *UR* = *RPSTAR*). We view these results as illustrating that nonlinearities observed at the level of simple regressions are less of a problem for the multiple regressions.

6. *Conclusions*

This paper extends previous research which uses information other than current-period unexpected earnings to explain stock returns (e.g., Lev and Thiagarajan [1993] and Abarbanell and Bushee [1997]). We focus in particular on analysts' forecasts as have Brown, Foster, and Noreen [1985], Cornell and Landsman [1989], and Brous and Shane [1997]. We derive a specification that allows researchers to incorporate that information more effectively and document the resulting improvement in fit and reduction in misspecification.

Our main finding is that inferences about the value relevance of accounting earnings made from simple regressions of unexpected returns on current unexpected earnings are potentially misleading. While such regressions have often been used to make comparisons across firms, and more recently to document changes in value relevance over time (e.g., Collins, Maydew, and Weiss [1997], Francis and Schipper [1999], Ely
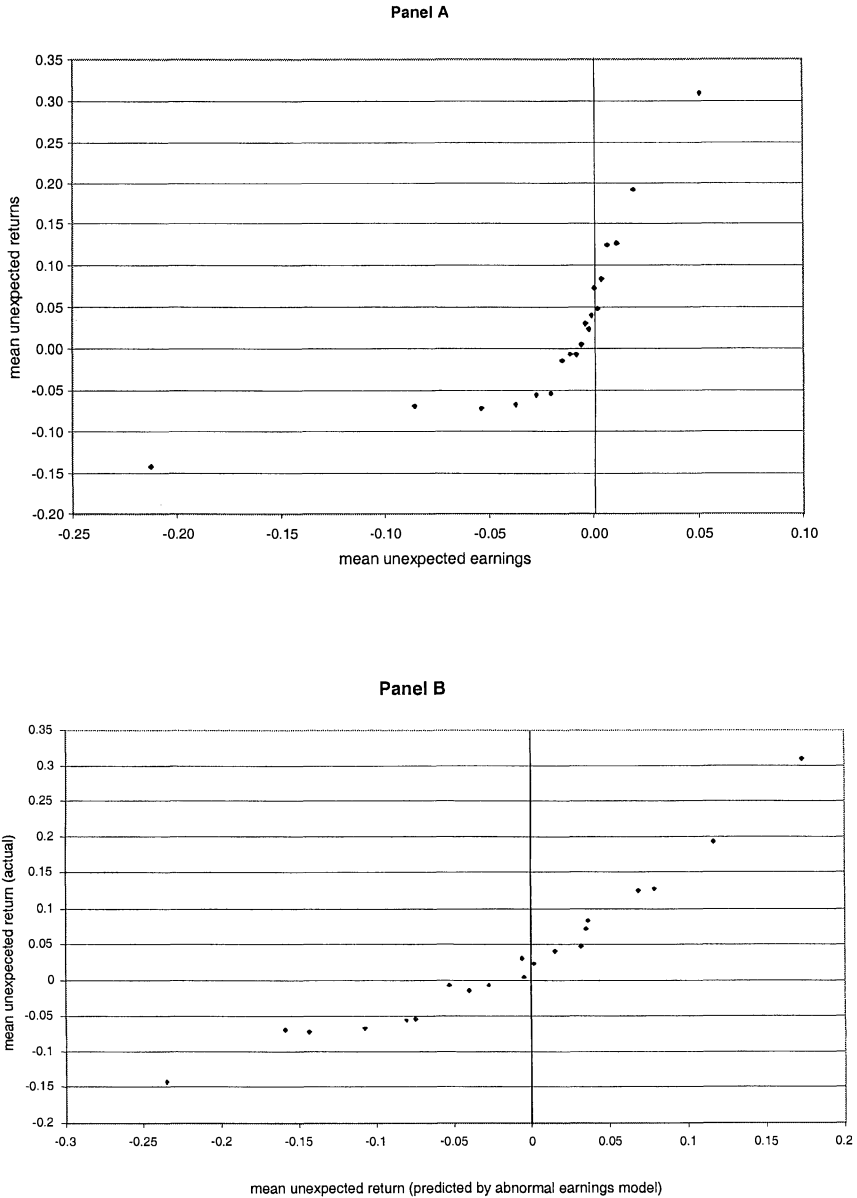
Panel A

Panel B

FIG. 1.—Nonlinearity in returns/earnings relation is mitigated when revisions in future earnings are incorporated. Twenty portfolios are formed based on unexpected earnings (*UE*), and the mean unexpected returns (*UR*) are plotted against mean unexpected earnings in panel A and against mean unexpected returns as predicted by the abnormal earnings model, obtained by setting the coefficient = 1 on *UE* and the present value of revisions in forecasts of future abnormal earnings (*RAE*), in panel B.

and Waymire [1999], and Lev [1996]), the coefficients and R^2 values are affected by the misspecifications we document.

Although adding analyst forecast revisions and discount rate changes helps to explain better the relation between stock returns and reported earnings, our results cannot be used to infer the value relevance of accounting statements, since the information used in our multiple regression is obtained directly from analyst forecasts, and the link between those forecasts and accounting statements remains largely unexplored. Also, our approach is unable to help select desirable accounting policies, since the same results are obtained for different accounting policies (because efficient analyst forecasts adjust completely for differences in reported numbers).

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