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Fundamental Analysis, Future Earnings, and Stock Prices

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1. *Introduction*

In this paper, we investigate how detailed financial statement data (fundamental signals) enter the decisions of market participants by examining whether current changes in the signals are informative about subsequent earnings changes. Our approach is consistent with the view expressed by Penman [1992] and others that predicting accounting earnings, as opposed to explaining security returns, should be the central task of fundamental analysis. Studying the links between fundamental signals and future earnings changes allows us to test directly the validity of the economic intuition that underlies the original construction of the signals. An alternative, and less direct, approach, followed by Lev and Thiagarajan [1993] (henceforth LT), is based on an examination of the relations between the fundamental signals and contemporaneous returns.

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In examining the relations between the fundamental signals and future earnings, we also establish a benchmark for assessing how efficiently analysts use the signals. The issue of how efficiently analysts use information cannot be investigated by examining the associations between the signals and contemporaneous abnormal returns. Our approach is designed to determine which of the signals that analysts profess to use (or researchers purport that analysts use) actually affect their earnings forecasts. By comparing the relations between the signals and earnings changes to the analogous relations between the signals and forecast revisions (and the signals and forecast errors), we are able to evaluate whether the information contained in fundamental signals about future earnings is fully exploited in analysts' revisions. Our results suggest that analysts' forecast revisions fail to impound all the information about future earnings contained in the fundamental signals, and tests based on stock returns indicate that investors appear, on average, to recognize this fact.

Our results support the validity of much of the economic intuition that has been used to link current accounting information to earnings changes. Some notable exceptions, however, suggest caution in implementing mechanical rules of fundamental analysis. Similarly, we find that analysts' revisions of earnings forecasts are associated with many, but not all, of the signals that predict future earnings.

Tests based on contemporaneous security returns reveal that the fundamental signals convey value-relevant information orthogonal to forecast revisions. One possible explanation is that the signals contain value-relevant information that is not earnings-related: e.g., indications of risk that are omitted from analysts' short-horizon forecasts. This explanation runs contrary to the future-earnings-based logic that LT used to motivate the fundamental signals' construction and represents an alternative interpretation of their findings.

It is also possible that investors do not believe analysts' forecast revisions subsume the information in the signals. Relations we observe among analysts' forecast revisions, financial statement data, and future earnings changes are consistent with analysts' failure to perform completely efficient fundamental analyses, providing a justification for such beliefs. Our examination of analysts' forecast errors suggests a generalized underreaction to detailed accounting information, which, if eliminated, would also eliminate analysts' apparent underreaction to annual earnings news (see, e.g., Abarbanell and Bernard [1992]).

The next section reviews the fundamental signals compiled by LT and describes our data. In section 3 we examine the ability of the fundamental signals to predict future earnings. Section 4 presents tests of whether analysts' forecast revisions are influenced by the fundamental signals in a manner consistent with the signals' relation to future profitability. In section 5 we provide evidence on how the market reacts to the fundamental signals conditional on analysts' forecast revisions and consider the question of analyst efficiency. Section 6 reexamines the fundamental

relations, giving consideration to firm-specific, industry, and macroeconomic contexts. Section 7 contains a summary and conclusions.

2. *Variable Definitions and Data Description*

LT identify 12 accounting-related fundamental signals referred to repeatedly in analysts' reports and financial statement analysis texts. We focus on the nine variables included in LT's full sample, described in panel A of table 1. These signals are calculated so that the association between each signal and returns is negative. In the case of *INV*, for example, an increase in finished goods inventory that outstrips sales demand is predicted to indicate bad news for earnings and vice versa. General earnings quality arguments motivate the inclusion of the *LIFO* dummy variable, *EQ*, and an indicator variable which identifies an auditor qualification, *AQ*. LT also include nonaccounting variables believed to provide information about future earnings. For example, a reduction in the effective tax rate (*ETR*) is said to reflect less persistent earnings, boding poorly for future economic performance.

Data to compute the fundamental signals are taken from the 1992 *Compustat PST Active File*. To test for the effects of survivorship biases, we used the *Compustat Research File* to calculate the fundamental signals for delisted firms. The source of return data is the 1992 *CRSP* monthly *NYSE/AMEX* file. Analysts' forecasts are taken from the 1991 *I/B/E/S Summary Estimates* tape. This data restricts our sample to the period 1983 to 1990.

3. *Future Earnings Performance and the Fundamental Signals*

3.1 TESTING THE INDIVIDUAL SIGNAL'S RELATIONS TO FUTURE EARNINGS

In this section, we examine the relation between the fundamental signals and the one-year-ahead earnings change, denoted *CEPS1*. Designating year t as the year for which the fundamental signals are calculated, *CEPS1* is $EPS_{t+1} - EPS_t$, deflated by stock price at the end of year $t - 1$. We also calculate earnings growth between year t and year $t + 5$, denoted *CEPSL* and defined as the geometric mean rate of growth between year t and $t + 5$. A summary of dependent variables is provided in panel B of table 1.

Table 2 presents the results of regressions of future earnings changes on the current year's earnings change and fundamental signals, calculated so that each is expected to be negatively associated with future earnings.[1] To be included in this analysis, we require an analyst forecast

[1] Unlike LT, who include before-tax earnings changes as an explanatory variable, we use after-tax earnings changes. This approach facilitates comparison of our results to those reported in related research on forecasts of after-tax earnings changes. Also, LT's approach introduces complexity because they define *ETR* as a function of pretax earnings and, therefore, a component of earnings. Thus, even if the earnings component is transitory, as they argue, a positive relation between the *ETR* variable and returns should have been hypothesized for their regressions.

TABLE 1
Definitions of Variables

Panel A: Definitions of Fundamental Signals

Signal	Measurement[a]
Inventory (*INV*)[b]	Δ Inventory (78 or 3)[c] − Δ Sales (12)
Accounts Receivable (*AR*)	Δ Accounts Receivable (2) − Δ Sales
Capital Expenditures (*CAPX*)	Δ Industry *CAPX* − Δ Firm *CAPX* (30)[d]
Gross Margin (*GM*)	Δ Sales − Δ Gross Margin (12−41)
Selling and Administrative Expenses (*S&A*)	Δ *S&A* (189) − Δ Sales
Effective Tax Rate (*ETR*)	$\left[\left(\frac{1}{3}\sum_{\tau=1}^{3} ETR_{t-\tau}\right) - ETR_t\right] \times CHGEPS_t$, where $ETR_t = \frac{TaxExpense(16)_t}{EBT(170+65)_t}$
Earnings Quality (*EQ*)	0 for *LIFO*, 1 for *FIFO* or other (59)
Audit Qualification (*AQ*)	0 for Unqualified, 1 for Qualified or other (149)
Labor Force (*LF*)	$\left(\frac{Sales_{t-1}}{\#Employees_{t-1}} - \frac{Sales_t}{\#Employees_t}\right) \Big/ \frac{Sales_{t-1}}{\#Employees(29)_{t-1}}$

Panel B: Definitions of Dependent Variables

Variables	Measurement[e]
One-Year-Ahead Earnings (*CEPS1*)	[Adj. $EPS_{t+1} - EPS_t$] / P_{t-1}
Long-Term Growth in Earnings (*CEPSL*)	Five-Year Geometric Mean Growth in Earnings
One-Year-Ahead Forecast Revision ($FY1^{+1}$)	$\left\{\left[F_{t+1}^{+1} - EPS_t\right] - \left[F_{t+1}^{-11} - F_t^{-11}\right]\right\} / P_{t-1}$[f]
Long-Term Growth Forecast Revision (LTG^{+1})	$F_{ltg}^{+1} - F_{ltg}^{-11}$
Cumulative Abnormal Returns	$CAR_i = \prod_{j=1}^{13}(1 + AR_{ij}) - 1$, where $AR_{ij} = R_{ij} - \left[\hat{\alpha} + \hat{\beta} R_{mj}\right]$[g]
One-Year-Ahead Forecast Error ($FERR1^{+1}$)	$\left[\text{Adj. } EPS_{t+1} - F_{t+1}^{+1}\right] / P_{t-1}$

[a]The definitions of all of the fundamental signals (except *ETR*) come from Lev and Thiagarajan [1993]. The Δ operator represents a percentage change in the variable based on a two-year average expectation model; e.g., $\Delta Sales = [Sales_t - E(Sales_t)] / E(Sales_t)$, where $E(Sales_t) = (Sales_{t-1} + Sales_{t-2}) / 2$.

[b]The *Inventory* variable is finished goods when available, total inventory otherwise.

[c]Numbers in parentheses represent *Compustat* item numbers.

[d]Industry Capital Expenditures were calculated by aggregating firm figures for all firms with the same two-digit *SIC* code.

[e]Adj. $EPS_{t+\tau} = EPS_{t+\tau} \times (Adjustment\ Factor_{t+\tau-1} / Adjustment\ Factor_{t+\tau})$.

[f]F_t^{+m} is the consensus analysts' forecast of earnings for year t (or long-term growth, *ltg*) issued m months after the earnings announcement for year t.

[g]R_{ij} is the return for firm i in month j, R_{mj} is the return for the value-weighted market portfolio in month j, and $\hat{\alpha}$ and $\hat{\beta}$ are market model parameter estimates from a 36-month estimation period.

pertaining to the respective earnings change horizon one month after an earnings announcement for the reference year. Because firms followed by analysts' may differ systematically from those not followed, this restriction facilitates comparisons with tests of relations between the fundamental signals and forecast revisions/errors.

For one-year-ahead earnings changes, row 1 of table 2 reports the mean fundamental signal coefficients from the individual yearly regressions,

TABLE 2

Regressions of Future Changes in EPS on Prior Changes in EPS and Fundamental Signals (Rows include mean coefficients from yearly regressions and the number of positive and negative yearly coefficients, with the number of significant yearly coefficients in parentheses) [a]

$$\Delta EPS^{b}_{t+\tau,\,i} = \alpha + \beta_0\, CHGEPS^{c}_{i} + \sum_{j=1}^{9} \beta_{ij}\, Signals^{d}_{ij} + u_i$$

Dependent Variables	Independent Variables										
	INT	*CHGEPS*	*INV*	*AR*	*CAPX*	*GM*	*S&A*	*ETR*	*EQ*	*AQ*	*LF*
CEPS1[e]	0.005	−0.224‡	−0.017*	0.009‡	0.005‡	−0.031*	−0.010	−0.594*	−0.006*	0.014	−0.026*
Positive	4 (3)	0 (0)	0 (0)	7 (0)	8 (1)	2 (0)	4 (0)	1 (0)	2 (0)	6 (1)	0 (0)
Negative	*4 (1)*	*8 (7)*	*8 (4)*	*1 (0)*	*0 (0)*	*6 (3)*	*4 (2)*	*7 (7)*	*6 (4)*	*2 (0)*	*8 (3)*
CEPSL	0.067‡	−0.366	0.004	−0.029	0.008	0.029	0.091	−1.362*	−0.007	−0.027	−0.069*
	5 (5)	1 (0)	3 (0)	1 (0)	4 (0)	3 (1)	3 (2)	0 (0)	1 (0)	2 (0)	1 (0)
	0 (0)	*4 (2)*	*2 (0)*	*4 (1)*	*1 (0)*	*2 (1)*	*2 (0)*	*5 (3)*	*4 (1)*	*3 (0)*	*4 (2)*

*Significant at or below the 0.05 level (one-tailed) based on a *t*-statistic calculated as the ratio of the mean coefficient to a standard error based on the distribution of the individual yearly coefficients.

‡More than two standard deviations from zero.

[a]All tests of the fundamental signal coefficients are one-tailed. When a coefficient is positive we indicate whether it is more than two standard deviations from zero.

[b]*CEPS1* is the change in one-year-ahead earnings (adjusted earnings in year $t-1$ less year t earnings), deflated by stock price at the end of year $t-1$. *CEPSL* is the imputed annual growth rate in earnings over the five years subsequent to year t.

[c]*CHGEPS* is the change in earnings per share between years $t-1$ and t (contemporaneous with the fundamental signals), deflated by stock price at the end of year $t-1$.

[d]See table 1 for signal definitions. Because small denominators in the measurement of the signals can lead to extreme values, we followed the same truncation and outlier analysis procedures as Lev and Thiagarajan [1993].

[e]The *CEPS1* regression has 4,180 observations between 1983 and 1990. The *CEPSL* regression has 1,619 observations between 1983 and 1987.

their significance, and the number of positive and negative individual-year coefficients.[2] The results reveal that the *INV, GM, ETR, EQ,* and *LF* signals are significantly related to one-year-ahead earnings in the direction anticipated; the *S&A* and *AQ* signal coefficients are not.[3] Our results thus reinforce the findings of Ou and Penman [1989], with the difference that the relations we study are drawn from economic intuition rather than from a statistical process.

The *CAPX* signal coefficient is unexpectedly positive, suggesting that an increase in capital expenditures in excess of the industry average is actually bad news for one-year-ahead earnings. On the one hand, new capital projects do not usually affect earnings immediately but the related depreciation charges do. On the other hand, if the *CAPX* signal is negatively related to security returns as hypothesized by LT, then the sign of the relation between the *CAPX* signal and future earnings changes should eventually reverse. There is no evidence of such a reversal in our data as the mean *CAPX* signal coefficients are positive for one-, two-, three-, four-, and five-year-ahead earnings changes (not reported in the tables). In most cases the mean coefficients are over two standard deviations from zero. This suggests that the *CAPX* variable may not capture the theoretical relation LT had hypothesized.[4]

The *AR* signal coefficient is also unexpectedly positive. This result is surprising because this signal is constructed to mirror analysts' statements (e.g., O'Glove [1987] devotes half a chapter to the heuristic underlying the *AR* signal). This signal is often promoted as a portent of imminent earnings problems; however, it can also reflect situations where growth in sales and earnings is promoted and/or supported by the expansion of credit. We present evidence consistent with this explanation in section 6.

The results for five-year earnings growth, reported in row 2 of table 2, indicate a strong negative association between both the *ETR* and *LF* signals and long-term earnings growth, possibly because these signals capture unidentified risk factors or structural changes. The evidence

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[2] The *t*-tests are based on the ratio of the mean fundamental signal coefficients to a standard error based on the individual yearly coefficients. This test overcomes bias in standard errors caused by cross-sectional correlation among the observations within a year (see Bernard [1987]). We use the .05 level (one-sided tests) for judging significance unless otherwise stated.

[3] The tests described in table 2 were also performed on data covering 1974–90 (similar to LT's sample period) without the restriction of analyst coverage. The *INV, GM,* and *ETR* signals are also reliably negative for this substantially longer period, and the mean *EQ* coefficient was insignificant.

[4] This relation could be driven by poorly performing firms attempting to "catch up" with firms in their industry that recently made large, successful capital investments. The results suggest that even if these firms are able to reduce some earnings erosion with capital expenditures, it is not sufficient to cause earnings to recover to "average" levels even after five years.

reported for the *ETR* signal, in particular, indicates that this variable captures more than transitory effects, as suggested by LT.[5]

While these results support the use, by analysts and investors, of fundamental signals in forecasting earnings, our results do not support the arguments used to motivate a number of signals, raising doubts that their observed associations with security returns are robust and/or entirely based on their ability to predict future earnings.[6]

3.2 THE INCREMENTAL EXPLANATORY POWER OF THE SET OF FUNDAMENTAL SIGNALS

We find that the fundamental signals have incremental explanatory power, relative to current-year earnings. The average R^2 of the regressions of future earnings on the signals and current earnings is approximately .16, compared to an average R^2 of .07 for regressions of one-year-ahead earnings changes on current earnings changes (not reported in the table). Partial *F*-tests of the incremental explanatory power of the fundamental signals are highly significant in each year. However, these results are overstated because we have allowed the individual signal coefficients to take on values of either sign, even though all predicted relations are negative (inspection of tables 2 and 3 in LT reveals that the same critique applies to their R^2s from regressions of contemporaneous returns on the fundamental signals).

To set a sense of the ex ante predictive power of the signals we combined them into an index similar to that described in LT. The value of the index for a given firm-year observation is calculated by first assigning a value of zero (one) to negative (positive) values of each signal and then summing these assigned values.[7] Low (high) values of the index are hypothesized to be good (bad) news for future earnings.

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[5] The results are qualitatively similar for the 1974–87 period except that the mean *CAPX* and *EQ* coefficients, which do not exceed the .05 cutoff level for the years 1983–87, are positive and negative, respectively, for this longer period and more than two standard deviations from zero.

[6] The fact that some of the fundamental signals are not significantly related to future earnings in our sample but are related to contemporaneous abnormal returns (as reported by LT) suggests that fundamental signals may provide information about the quality of contemporaneous earnings changes. Alternatively, there may be nonlinearities in the relations between the fundamental signals and future earnings. We tested for nonlinearities by regressing *CEPS1* and *CEPSL* on the fundamental signals and their squared values (with the exception of the *AQ* and *EQ* dummy variables). None of the coefficients on the squared terms was significant. We also interacted each fundamental signal with the level of current earnings in the future earnings regressions and again found no significant nonlinearities. Finally, we reran all of our tests including selected interactions between pairs of fundamental signals: *INV–GM*, *CAPX–LF*, *INV–S&A*, *GM–S&A*, and *INV–EQ*. None of the average coefficients on these interaction variables proved to be significant.

[7] We also examined an alternative index based on yearly decile rankings of each signal. To form the index, each observation is assigned a decile rank based on the prior year's distribution of signal values, where lower ranks apply to lower values of the signal. The

In regressions of future earnings on current earnings and the index (results not reported), the coefficient on the index is reliably negative, below the .01 level, for both the one-year-ahead earnings change and five-year earnings growth. The average R^2 of this model is .075, which is not substantially larger than the average from regressions of one-year-ahead earnings on current earnings. This result is likely to be caused by equally weighting the signals in the index even though some signals are more strongly related to future earnings than others, and by the noise induced by incorrectly assuming certain signals are negatively related to future earnings. These results highlight the importance of establishing the validity of each of the fundamental signals' relation to future earnings.[8]

4. The Relation between the Fundamental Signals and Analysts' Forecasts

In this section, we examine whether the fundamental signals are associated with analysts' forecast revisions in the same way they are related to future earnings changes. Unless analysts anticipate the information in the signals over a year prior to their realizations, an efficient use of the signals by analysts, on average, requires this type of symmetry. Although the definitions of the fundamental signals were drawn from analysts' writings, these sources represent only anecdotal evidence, while our results provide direct evidence on analysts' use of the signals.[9]

We calculate analysts' forecast revisions using *I/B/E/S* consensus forecasts of one-year-ahead earnings and five-year earnings growth. For compatibility with the earnings change variable, one-year-ahead forecast revisions, denoted $FY1^{+m}$, are defined as the difference between the forecast of *CEPS1* outstanding m months subsequent to the announcement of year t earnings and the forecast of *CEPS1* that was outstanding

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firm-year signal ranks are then summed to yield an index value. Lower (higher) values of the index are predicted to be associated with good (bad) earnings news. The results we observed using this index were qualitatively similar to those reported.

[8] This issue is of direct relevance to Abarbanell and Bushee [1996] who examine a trading strategy to earn abnormal returns based on the ex ante predictive power of the fundamental signals. Like the index used to predict future earnings here, this trading strategy is based on a hypothesized negative relation between each of the fundamental signals and future earnings. The trading strategy is found to be successful and a substantial portion of the returns earned are shown to be associated with the signals' ability to predict future earnings. It is also shown that a strategy that exploits only the fundamental signals that display a significant negative association with future earnings during the early part of the sample period yields the highest abnormal returns in the later sample period.

[9] It is also possible that analysts' writings reflect a selective, and not very descriptive, interpretation of their forecasting experience. The behavioral literature has provided ample evidence that professional market participants can lack "self-insight" when asked to identify the cues (and cue weights) they employ in their judgments (see Slovic, Fleissner, and Bauman [1972] for an example).

12 months earlier (see table 1). We based the revisions on forecasts issued a month after the earnings report to ensure that it was possible to calculate the fundamental signals at the date of the revisions.

We also studied 12-month revision periods that end two, three, four, and five months after an earnings announcement to allow for late filings. Results for the revisions issued five months after the earnings announcement should ensure that our evidence is not attributable to the lack of public availability of financial statement information or to the use of stale *I/B/E/S* forecasts. The five-month revisions are also the least affected by missing data in the 1991 *I/B/E/S* data tape.

To illustrate, we represent one-year-ahead forecast revisions as $FY1^{+1} = [F_{t+1}^{+1} - EPS_t] - [F_{t+1}^{-11} - F_t^{-11}]$, where F_t^m represents the forecast of earnings issued in month m relative to the year t earnings announcement (firm subscripts omitted).[10] Because year t earnings have not been observed in month −11, we use analysts' expectations of year t earnings at this time to calculate revisions. One-year-ahead forecast revisions are deflated by stock price at the end of year $t - 1$. We refer to forecast variables by the month relative to the earnings announcement in which the forecast takes place. For example, $FY1^{+1}$ is the "plus one" forecast revision of one-year-ahead earnings. Similarly, LTG^{+1} is the plus one five-year earnings growth revision defined as the difference between forecasted earnings growth issued one month after the year t earnings announcement and the forecasted earnings growth as of 12 months earlier.

Table 3 presents estimates of the relations between analysts' forecast revisions and the individual fundamental signals. Row 1 reports results for regressions of $FY1^{+1}$ on the most recent earnings change and the fundamental signals.[11] We find that *GM*, *ETR*, and *LF* are negatively related to one-year-ahead forecast revisions, consistent with the negative relations between these fundamental signals and one-year-ahead earnings changes, *CEPS1*, reported in table 2. Given that actual one-year-ahead earnings changes are significantly related to the *INV* signal, it is surprising that this variable is not similarly related to forecast revisions of one-year-ahead earnings changes. Finally, the strong negative relation between current year's earnings changes, *CHGEPS*, and forecast revisions mirrors the analogous relation between actual earnings changes in consecutive years reported in table 2. Thus, our sample displays mean

[10] For example, if the fundamental signals for 1989 were calculated for a typical December year-end firm, the revision of one-year-ahead earnings one month after an announcement would refer to the difference between the forecast of 1990 earnings issued at the end of March 1990 and actual earnings for 1989, less the difference between the forecasts of 1990 and 1989 earnings issued in April of 1989.

[11] The number of $FY1^{+1}$ observations in table 3 is smaller than the number of *CEPS1* observations in table 2 because we require a forecast 11 months before the announcement of earnings for the reference year. While a similar decline applies to the number of forecast revisions of five-year earnings growth, the difference is more than offset by our inability to calculate actual five-year growth after 1987.

reversion in annual earnings changes and analysts appear to understand this phenomenon. Similar evidence is reported in Abarbanell and Bernard [1992] which analyzes forecast data from the *Value Line Investment Survey.*

Turning to the results for five-year earnings growth forecast revisions in row 2 of table 3, we see that the signals *EQ* and *LF* have significantly negative mean coefficients. Moreover, when there is a significant relation between a fundamental signal and five-year growth forecasts, the relation between that signal and one-year-ahead forecasts is never both significant and of the opposite sign. Thus, on average, analysts appear to construe negative (positive) current values of the fundamental signals as good (bad) or neutral news for each earnings horizon we consider.

Our results indicate that analysts' forecast revisions issued one month after the earnings announcement are associated with the information contained in the fundamental signals. This is not surprising, given the existence of interim reports and personal contact between management and analysts. However, because financial statements may not be released for several months after earnings are announced, it is possible that some forecast revisions issued one month after the earnings announcement do not completely impound the information in the fundamental signals. Therefore, we reexamined the relations in table 3 using forecast revisions issued five months after the most recent earnings announcement; this approach also avoids problems caused by stale forecasts.

Results for the plus five forecast revisions of *CEPS1* are shown in row 3 of table 3. The *INV* and *S&A* coefficients are significantly negative at the .05 level. The *ETR* and *LF* variables continue to be significantly related to forecast revisions in the directions indicated in row 1 and the positive *CAPX* coefficient increases in significance. The *GM* signal, however, no longer meets the .05 significance cutoff. The incidence of positive and negative yearly coefficients when plus five forecast revisions are used is similar to the incidence when using plus one forecast revisions for all variables except *INV.*

Apart from the effects of mild multicollinearity, increases in the significance levels of mean coefficients could indicate that analysts had not observed the final values of the fundamental signals when the plus one forecast was issued or that they responded to the information with a delay. Similarly, decreases in the significance of other coefficients might be attributable to excluding forecasts made early in the fiscal year that first contained information about future earnings changes.[12] Finally, shifts in results may be due to the change in firm-year observations across samples.

Results based on plus five long-term growth forecast revisions are presented in row 4. The *EQ* coefficient continues to be reliably negative, and the negative *ETR* mean coefficient now exceeds the .05 significance

[12] For example, when the forecast revision window extends from month −11 to month +5 the *GM* signal coefficient retains its significance.

TABLE 3

Regressions of Analysts' Forecast Revisions on Changes in EPS and Fundamental Signals (Rows include mean coefficients from yearly regressions and the number of positive and negative yearly coefficients, with the number of significant yearly coefficients in parentheses)[a]

$$REV_i^{b} = \alpha + \beta_0\, CHGEPS_i^{c} + \sum_{j=1}^{9} \beta_{ij}\, Signals_{ij}^{d} + u_i$$

Dependent Variables	Independent Variables										
	INT	*CHGEPS*	*INV*	*AR*	*CAPX*	*GM*	*S&A*	*ETR*	*EQ*	*AQ*	*LF*
$FY1^{+1}$[e]	0.001	−0.356*	0.002	−0.003	0.002	−0.016*	−0.004	−0.729*	0.001	0.002	−0.011*
Positive	4 (1)	0 (0)	5 (1)	4 (0)	6 (2)	2 (0)	3 (0)	0 (0)	6 (0)	6 (2)	1 (0)
Negative	*4 (1)*	*8 (8)*	*3 (1)*	*4 (1)*	*2 (0)*	*6 (3)*	*5 (1)*	*8 (8)*	*2 (1)*	*2 (1)*	*7 (1)*
LTG^{+1}	−0.378*	5.809‡	−0.453	0.296	−0.127	0.187	0.493	2.595	−0.329*	−0.054	−1.645*
	1 (0)	8 (5)	2 (0)	7 (1)	2 (0)	5 (1)	4 (3)	6 (2)	1 (0)	3 (1)	0 (0)
	7 (5)	*0 (0)*	*6 (2)*	*1 (1)*	*6 (2)*	*3 (2)*	*4 (1)*	*2 (1)*	*7 (4)*	*5 (0)*	*8 (4)*
$FY1^{+5}$	−0.006‡	−0.299*	−0.004*	0.004	0.003‡	−0.016	−0.007*	−0.648*	−0.000	−0.002	−0.014*
	1 (0)	0 (0)	3 (0)	6 (1)	7 (2)	2 (0)	3 (0)	0 (0)	5 (0)	6 (2)	1 (0)
	7 (5)	*8 (8)*	*5 (2)*	*2 (1)*	*1 (0)*	*6 (2)*	*5 (1)*	*8 (8)*	*3 (1)*	*2 (1)*	*7 (2)*
LTG^{+5}	−0.392‡	2.146‡	−0.171	0.518	0.103	0.679	−0.297	−3.062*	−0.248*	−0.141	−0.412
	2 (0)	7 (2)	3 (1)	5 (1)	5 (1)	5 (3)	3 (0)	3 (0)	1 (0)	4 (0)	3 (0)
	6 (4)	*1 (0)*	*5 (2)*	*3 (0)*	*3 (1)*	3 (0)	*5 (1)*	*5 (0)*	*7 (3)*	*4 (1)*	*5 (0)*

*Significant at or below the 0.05 level (one-tailed) based on a *t*-statistic calculated as the ratio of the mean coefficient to a standard error based on the distribution of the individual yearly coefficients.

‡More than two standard deviations from zero.

[a]All tests of the fundamental signal coefficients are one-tailed. When a coefficient is positive we indicate whether it is more than two standard deviations from zero.

[b]$FY1^{+m}$ is the forecast revision of one-year-ahead earnings, deflated by stock price at the end of year $t-1$. LTG^{+m} is the forecast revision of the long-term growth rate in earnings. The +1 (+5) superscript indicates that the revision horizon is from −11 (−7) to +1 (+5).

[c]*CHGEPS* is the change in earnings per share between years $t-1$ and t (contemporaneous with the fundamental signals), deflated by stock price at the end of year $t-1$.

[d]See table 1 for signal definitions. Because small denominators in the measurement of the signals can lead to extreme values, we followed the same truncation and outlier analysis procedures as Lev and Thiagarajan [1993].

[e]The number of observations for each regression is as follows: $FY1^{+1}$ (2,609), LTG^{+1} (3,098), $FY1^{+5}$ (3,369), and LTG^{+5} (3,191). All regressions span the years 1983 to 1990.

level. There is a substantial change in the incidence of positive and negative yearly *ETR* coefficients between the two forecast horizons.

To summarize our results, we find that several of the fundamental signals identified by LT are associated with analysts' one-year-ahead earnings forecasts and five-year earnings growth forecasts. However, the *AR* signal which has been described by analysts as a red flag for impending earnings changes is not associated with short-term forecast revisions. Thus, the economic intuition that motivated the use of the *AR* signal by LT does not appear to apply in our sample.

Despite discrepancies between actual and hypothesized signal/forecast revision relations, the combined explanatory power of the signals for revisions is substantial. The yearly R^2s (not reported) range from .42 to .69 with an average of .54. Partial *F*-tests of the explanatory power of the fundamental signals beyond contemporaneous earnings changes are significant in all but one year.

The evidence presented in this section supports the view that analysts are aware of the future earnings information embedded in some of the fundamental signals and respond to it, at least partially, by revising their forecasts. The results also identify a potential link between investor expectations and accounting information that is established through analysts' reports.[13]

5. *Do Analysts' Revisions Convey to the Market the Information in the Fundamental Signals?*

In this section we investigate the extent to which information in the fundamental signals that is priced in the market is actually contained in analysts' forecast revisions. Because the fundamental signals appear to have both long-term and short-term earnings implications, we include in the sample only firm-year observations with both one-year-ahead and long-term earnings growth forecast revisions. As a result, the number of observations drops to 2,353.

Table 4 presents regressions of 13-month abnormal returns on the fundamental signals, contemporaneous changes in earnings, and analysts' near-term and long-term earnings forecast revisions. Following LT, monthly abnormal returns are calculated using the value-weighted market portfolio. Market model parameters were estimated from the 36 monthly returns ending six months before the beginning of the fiscal year

[13] The link between analysts' forecasts and market reactions is well established (e.g., Abdel-khalik [1982] and Brown, Foster, and Noreen [1985]). Price reactions to analysts' forecasts may represent an efficient response to new information. On the other hand, analysts' forecasts appear to be inefficient with respect to prior stock price (see, e.g., Abarbanell [1991], Klein [1990], and Lys and Sohn [1990]), which suggests that analysts' forecast revisions may be untimely and incomplete. In this case, the observed market reaction to forecast revisions may be a secondary response to already public information by sluggish or fixated elements of the market.

TABLE 4

Regressions of 13-Month Cumulative Abnormal Returns on Changes in EPS, Fundamental Signals, and Analysts' Forecast Revisions (Rows include mean coefficients from yearly regressions and the number of positive and negative yearly coefficients, with the number of significant yearly coefficients in parentheses)[a]

$$CAR_i^{b} = \alpha + \beta_0\, CHGEPS_i^{c} + \sum_{j=1}^{9} \beta_{ij}\, Signals_{ij}^{d} + \beta_{10}\, FY1^{+m}{}_i^{e} + \beta_{11} LTG_i^{+m} + u_i$$

Dependent Variables	Independent Variables											
	INT	*CHGEPS*	*INV*	*AR*	*CAPX*	*GM*	*S&A*	*ETR*	*EQ*	*AQ*	*LF*	$FY1^{+m}$[f]	LTG^{+m}
CAR(−11, +1)[g]	−0.060‡	1.170‡	−0.049**	0.000	0.031	−0.334*	−0.131*	−0.908*	−0.016	−0.023	0.011		
Positive	1 (0)	8 (6)	2 (0)	5 (0)	6 (2)	0 (0)	3 (0)	1 (0)	2 (0)	3 (0)	3 (1)		
Negative	*7 (5)*	*0 (0)*	*6 (2)*	*3 (0)*	*2 (0)*	*8 (6)*	*5 (4)*	*7 (2)*	*6 (1)*	*5 (1)*	*5 (1)*		
CAR(−11, +1)	−0.053‡	1.144‡	−0.043**	0.000	0.031	−0.338*	−0.134*	−0.081	−0.011	−0.042	0.068	1.255*	0.022*
	1 (0)	8 (6)	2 (0)	5 (0)	6 (3)	0 (0)	2 (0)	3 (0)	4 (0)	3 (0)	5 (1)	7 (5)	8 (7)
	7 (5)	*0 (0)*	*6 (2)*	*3 (0)*	*2 (0)*	*8 (6)*	*6 (4)*	*5 (1)*	*4 (1)*	*5 (1)*	*3 (0)*	*1 (0)*	*0 (0)*
CAR(−7, +5)	−0.074‡	0.668‡	−0.073**	0.052	0.027	−0.238*	−0.091	−1.099*	−0.017**	−0.058	−0.008		
	0 (0)	8 (6)	2 (0)	6 (1)	7 (2)	2 (0)	3 (0)	1 (0)	3 (0)	3 (0)	4 (0)		
	8 (6)	*0 (0)*	*6 (3)*	*2 (0)*	*1 (1)*	*6 (4)*	*5 (3)*	*7 (3)*	*5 (1)*	*5 (1)*	*4 (0)*		
CAR(−7, +5)	−0.060‡	1.034‡	−0.071*	0.040	0.022	−0.237*	−0.082	−0.087	−0.007	−0.071**	0.029	1.383*	0.021*
	0 (0)	8 (8)	2 (0)	6 (1)	7 (1)	2 (0)	4 (0)	3 (1)	4 (0)	3 (0)	5 (0)	8 (6)	8 (7)
	8 (4)	*0 (0)*	*6 (2)*	*2 (0)*	*1 (1)*	*6 (4)*	*4 (3)*	*5 (0)*	*4 (1)*	*5 (2)*	*3 (0)*	*0 (0)*	*0 (0)*

*(**)Significant at or below the 0.05 (0.10) level (one-tailed) based on a *t*-statistic calculated as the ratio of the mean coefficient to a standard error based on the distribution of the individual yearly coefficients.

‡More than two standard deviations from zero.

[a]All tests of the fundamental signal coefficients are one-tailed. When a coefficient is positive we indicate whether it is more than two standard deviations from zero.

[b]To calculate cumulative abnormal returns, monthly abnormal returns were generated by a value-weighted market model and compounded over a 13-month accumulation period. For the column headed *CAR*(−11, +1) [*CAR* (−7, +5)], the accumulation period begins 11 (7) months before the earnings announcement date and ends 1 (5) months after the earnings announcement date. The market model parameters were estimated from the 36 monthly returns prior to the 6th month of the preceding fiscal year.

[c]*CHGEPS* is the change in earnings per share between years $t-1$ and t (contemporaneous with the fundamental signals), deflated by stock price at the end of year $t-1$.

[d]See table 1 for signal definitions. Because small denominators in the measurement of the signals can lead to extreme values, we followed the same truncation and outlier analysis procedures as Lev and Thiagarajan [1993].

[e]$FY1^{+m}$ is the forecast revision of one-year-ahead earnings, deflated by stock price at the end of year $t-1$. LTG^{+m} is the forecast revision of the long-term growth rate in earnings. The +1 (+5) superscript indicates that the revision horizon is from −11 (−7) to +1 (+5).

[f]The forecast revision horizon used in each regression corresponds to the return accumulation period used.

[g]The number of observations for each regression is as follows: *CAR*(−11, +1) (2,353), *CAR*(−7, +5) (2,913). All regressions span the years 1983 to 1990.

to which the fundamental signals apply. Returns are compounded over approximately the period used to define the forecast revision horizon in the previous section.[14]

As a benchmark for comparison to LT, row 1 of table 4 reports the mean coefficients and related tests of significance for regressions of abnormal returns on the fundamental signals and contemporaneous earnings changes.[15] Similar to results in table 3 of LT, the *GM*, *S&A*, and *ETR* signal coefficients are reliably negative at the .05 level; the *INV* variable is significant at the .10 level; and the *AQ* and *EQ* variables are insignificant. However, while LT report that the *AR*, *CAPX*, and *LF* variables are also reliably negative, we do not find this result. Because firms followed by analysts might differ from randomly selected firms in ways that affect our inferences, we replicated our tests for a sample that was not restricted to firms with an analyst following on the *I/B/E/S* tape. The only qualitative difference observed for this substantially larger sample is that the *AQ* signal is now significantly negative at the .05 level.[16]

To assess investors' reliance on analysts to communicate information contained in the fundamental signals, we regressed abnormal returns on both the one-year-ahead and long-term growth forecast revisions. Both forecast revision coefficients are reliably positive and the tests yield an average adjusted R^2 of about .18 over the sample period (not reported in tables). The average adjusted R^2 from the returns–fundamental signals regressions over the same period is .145. To determine whether this similarity in overall explanatory power means that the two sets of explanatory variables convey identical information, row 2 of table 4 reports results for regressions of contemporaneous returns on both the funda-

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[14] Forecasts that comprise the revisions in the last section are dated approximately 12 months apart. *I/B/E/S* typically designates the middle of the month as the consensus forecast date. Because forecasts included in the monthly consensus can be issued before this date, and because some time is required to disseminate a forecast, we include returns from the entire month in which a forecast is issued, yielding a 13-month return period. This period differs from LT, who cumulated abnormal returns from the fourth month after the beginning of fiscal year t to the third month after the end of the fiscal year. These two periods should be very similar for most firm-year observations.

[15] To facilitate this comparison, we indicate when coefficients meet a .10 significance cutoff in tables 4 and 5.

[16] To probe the differences in results reported in our study and LT, we performed sensitivity tests using data from their 1974–88 sample period and for the 1974–90 period. Differences in the return cumulation period, additional years of data, and the inclusion of delisted firm observations in our sample were found to be inconsequential. We referred to the results in Lev and Thiagarajan [1992] in which earnings changes were calculated on an after-tax basis as we calculate them here. Consistent with our results in row 1 of table 4, they report that the *CAPX* coefficient is insignificant. The alternative definition of earnings changes, however, does not explain differences in our findings for the *AR* and *LF* signal coefficients. The presence of nonoverlapping firms in the samples and intertemporal instability in the coefficients appear to contribute to these differences. Controls for "contextual variables" such as level of inflation and *GDP* described later do not eliminate the sensitivity of the results to coefficient instability.

mental signals and analysts' forecast revisions. As indicated by partial *F*-tests, the explanatory power of this model (about .20 on average) is significantly greater than the fundamental-signals-only model in every year. Furthermore, the fundamental signals provide significant incremental explanatory power relative to forecast revisions in five of eight years. This evidence suggests both overlap in the information embedded in the fundamental signals and analysts' forecast revisions, and orthogonal information components. The inclusion of analysts' forecast revisions in the returns–fundamental signals regressions changes the significance of only the *ETR* coefficient, which now drops to a value of nearly zero.

If the fundamental signals convey only earnings information, then it is not surprising that analysts' forecasts have incremental explanatory power because analysts are able to access other information sources. We propose three explanations for the incremental explanatory power of the fundamental signals. First, the fundamental signals may capture value-relevant nonearnings information, e.g., about risk. This explanation runs contrary to the original "earnings-based" rationales used to motivate the construction of the fundamental signals and provides an alternative explanation for the abnormal return–fundamental signal relations reported here and in LT.

Second, investors and analysts may not have seen the financial statements within one month of the earnings announcement. To explore this possibility we performed the regressions described in rows 1 and 2 using plus five forecast revisions and 13-month cumulative abnormal returns beginning seven months prior and ending five months subsequent to the date of the earnings announcement. The results, reported in rows 3 and 4 of table 4, suggest that investors' inability to observe financial statement data for several months after the earnings announcement does not explain the results.

A third explanation for the results in table 4 is that analysts use financial statement information inefficiently, revising their forecasts in response to the information in the fundamental signals with a delay, or failing altogether to incorporate the information. If the market is efficient, the association between the signals and returns incremental to revisions could reflect the market's "correction" of these forecasts. More direct tests of analyst efficiency that do not rely on the assumption of market efficiency are presented next.

Specifically, we test whether the fundamental signals have incremental explanatory power for future earnings changes beyond forecast revisions by regressing earnings changes on the fundamental signals and analysts' forecast revisions. The mean coefficients of yearly regressions of one-year-ahead earnings changes on the fundamental signals and one-year-ahead forecast revisions are reported in row 1 of table 5. A comparison of the first rows of tables 2 and 5 indicates that adding the forecast revision does little to alter the relations between one-year-ahead earnings changes and the fundamental signals. The results are similar except that

TABLE 5

Regressions of Future Changes in EPS and Analysts' Forecast Errors on Prior Changes in EPS, Fundamental Signals, and Analysts' Forecast Revisions (Rows include mean coefficients from yearly regressions and the number of positive and negative yearly coefficients, with the number of significant yearly coefficients in parentheses) [a]

$$Y_i^{b} = \alpha + \beta_0\, CHGEPS_i^{c} + \sum_{j=1}^{9} \beta_{ij}\, Signals_{ij}^{d} + \beta_{10}\, REV_i^{e} + u_i$$

Dependent Variables	Independent Variables											
	INT	*CHGEPS*	*INV*	*AR*	*CAPX*	*GM*	*S&A*	*ETR*	*EQ*	*AQ*	*LF*	*REV*[f]
CEPS1[g]	0.002	−0.004	−0.014*	0.001	0.002	−0.032*	−0.011**	−0.409*	−0.004*	0.001	−0.032*	0.661*
Positive	4 (3)	4 (2)	1 (0)	4 (0)	7 (0)	2 (0)	2 (0)	0 (0)	1 (0)	4 (0)	0 (0)	8 (8)
Negative	*4 (2)*	*4 (2)*	*7 (3)*	*4 (0)*	*1 (0)*	*6 (5)*	*6 (2)*	*8 (5)*	*7 (1)*	*4 (0)*	*8 (3)*	*0 (0)*
CEPSL	0.070‡	−0.425*	0.014	0.015	0.008	0.076	0.088	−1.404*	−0.010	−0.120*	−0.132*	−0.002‡
	5 (4)	0 (0)	3 (0)	3 (0)	3 (0)	3 (0)	5 (1)	0 (0)	1 (0)	1 (0)	0 (0)	5 (0)
	0 (0)	*5 (1)*	*2 (0)*	*2 (0)*	*2 (0)*	*2 (0)*	*0 (0)*	*5 (1)*	*4 (0)*	*4 (2)*	*5 (1)*	*0 (0)*
FERR1^{+1}	−0.015‡	0.011	−0.009‡	−0.001	0.000	−0.048‡	−0.012	0.054	−0.003‡	−0.005	−0.025‡	
	0 (0)	4 (4)	2 (0)	3 (0)	4 (0)	0 (0)	2 (0)	4 (1)	1 (0)	3 (0)	0 (0)	
	8 (7)	*4 (2)*	*6 (0)*	*5 (0)*	*4 (0)*	*8 (5)*	*6 (2)*	*4 (1)*	*7 (1)*	*5 (1)*	*8 (2)*	
FERR1^{+5}	−0.007‡	0.026	−0.012‡	−0.001	0.001	−0.031‡	−0.015	0.161‡	−0.005‡	0.003	−0.009	
	1 (0)	4 (2)	0 (0)	5 (1)	4 (0)	1 (0)	2 (0)	6 (2)	0 (0)	3 (2)	3 (0)	
	7 (4)	*4 (0)*	*8 (3)*	*3 (1)*	*4 (0)*	*7 (4)*	*6 (2)*	*2 (0)*	*8 (2)*	*5 (1)*	*5 (1)*	

*(**)Significant at or below the 0.05 (0.10) level (one-tailed) based on a *t*-statistic calculated as the ratio of the mean coefficient to a standard error based on the distribution of the individual yearly coefficients.

‡More than two standard deviations from zero.

[a]All tests of the fundamental signal coefficients are one-tailed. When a coefficient is positive we indicate whether it is more than two standard deviations from zero.

[b]*CEPS1* is the change in one-year-ahead earnings (adjusted earnings in year $t-1$ less year t earnings), deflated by stock price at the end of year $t-1$. *CEPSL* is the imputed annual growth rate in earnings over the five years subsequent to year t. *FERR1*$^{+m}$ is the analysts' forecast error of one-year-ahead earnings, based on the consensus forecast outstanding at month m, deflated by stock price at the end of year $t-1$.

[c]*CHGEPS* is the change in earnings per share between years $t-1$ and t (contemporaneous with the fundamental signals), deflated by stock price at the end of year $t-1$.

[d]See table 1 for signal definitions. Because small denominators in the measurement of the signals can lead to extreme values, we followed the same truncation and outlier analysis procedures as Lev and Thiagarajan [1993].

[e]*FY1*$^{+m}$ is the forecast revision of one-year-ahead earnings, deflated by stock price at the end of year $t-1$. *LTG*$^{+m}$ is the forecast revision of the long-term growth rate in earnings. The +1 (+5) superscript indicates that the revision horizon is from −11 (−7) to +1 (+5).

[f]*REV* is *FY1*$^{+m}$ in the *CEPS1* model and *LTG*$^{+m}$ in the *CEPSL* model.

[g]The number of observations for each regression is as follows: *CEPS1* (2,353), *CEPSL* (1,194), *FERR1*$^{+1}$ (2,353), *FERR1*$^{+5}$ (2,913). The *CEPS1* and *FERR*$^{+m}$ regressions span the years 1983 to 1990. The *CEPSL* regressions span 1983 to 1987.

the large positive *CAPX* and *AR* signals reported earlier are attenuated. Partial *F*-statistics indicate that the fundamental signals have significant incremental explanatory power relative to a benchmark model of the prior year's earnings change and the forecast revision in five of eight years. The basic conclusion is similar for the results generated with $FY1^{+5}$ revisions (not reported in the table).

Row 2 reports the results of regressing five-year earnings growth on the fundamental signals.[17] Comparing these results to row 2 of table 2, we can see that the only qualitative change from including the LTG^{+1} forecast revision in the *CEPSL* regressions is that the negative *AQ* mean is now significant at the .05 level. Furthermore, as in the case of one-year-ahead revisions, the mean coefficient of the long-term earnings growth forecast revision is reliably positive. We also performed tests using plus five forecasts of long-term growth with no qualitative change in our inferences (not reported in the tables).

Overall, the results suggest that the information about future earnings changes contained in the fundamental signals is not subsumed by the information in analysts' forecast revisions. These findings suggest that even though analysts use the fundamental signals in revising their forecasts, they do not use the information in all of the signals efficiently.

To isolate the impact of inefficient information use, the last two rows of table 5 present evidence on the relations between analysts' forecast errors (as defined in table 1) and the fundamental signals. Because previous research indicates that analysts' forecast errors are associated with the prior year's earnings change (e.g., Abarbanell and Bernard [1992], Ali, Klein, and Rosenfeld [1992], and DeBondt and Thaler [1990]), we include the change in year t earnings to determine whether the fundamental signals have incremental explanatory power for forecast errors. Row 3 presents the results of regressing analysts' forecast errors (based on plus one forecasts) on the fundamental signals. Given the way we have defined the dependent variable, it appears that analysts underreact to the information in the fundamental signals in generating earnings forecasts.[18] Given the evidence in table 3 that analysts' forecast revisions are associated with the fundamental signals, it appears that analysts do not completely ignore the information in these signals.

Underreaction to financial statement information is consistent with the findings of Abarbanell and Bernard [1992], who examine *Value Line* data, and Ali, Klein, and Rosenfeld [1992], who examine *I/B/E/S* data.

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[17] The five-year earnings growth regressions in table 5 contain fewer observations than the regressions shown in table 4 because actual earnings growth can be calculated only for reference years up to 1987.

[18] When a fundamental signal is associated with a forecast error in the same direction it is associated with an earnings change, this implies that analysts fail to adjust their forecasts sufficiently high when a signal conveys good news and sufficiently low when a signal conveys bad news. When the coefficients are of opposite signs, on average, analysts overreact. Because either case is possible, significance tests reported in this table are two-sided.

Both report that analysts generally underreact to the information in the prior year's earnings changes. Our sample is also characterized by underreaction to aggregate earnings information. Univariate regressions of plus one forecast errors on prior years' earnings changes yield a significant coefficient of .079 (not reported in the table). However, the mean coefficient on the prior year's earnings change (reported in table 5) drops to .024 and is insignificant when the fundamental signals are included. That is, once we control for the fundamental signals, there is no evidence of analyst underreaction to aggregate earnings. It appears that if analysts extracted all the information in the fundamental signals at the time their forecasts were issued, it would suffice to eliminate their previously documented underreaction to prior earnings news.[19]

Row 4 of table 5, where forecast errors are based on plus five forecasts, indicates that analyst inefficiency persists well into the year. The mean *INV*, *GM*, and *EQ* signal coefficients continue to be significantly negative as long as five months following the earnings announcement. As in the case of univariate regressions of plus one forecast errors on the prior year's earnings changes, forecast errors based on forecasts issued five months from an earnings announcement yield a positive mean coefficient of .078. Once again, when the fundamental signals are included in the regressions, there is no reliable evidence of analysts' underreaction to prior earnings news.

6. *Contextual Analysis*

6.1 FIRM-SPECIFIC EARNINGS NEWS CONTEXT

To explore the possibility that current performance affects the interpretation of some signals, we partitioned the data of the 1983–90 sample years into good news (an earnings increase relative to the prior year) and bad news (an earnings decline from the prior year) portfolios and performed our tests again.

The *AR* signal is positive and more than two standard deviations from zero in only the good news partition (not reported), supporting an interpretation of this signal as indicating that management expands credit to increase sales and earnings. In addition, the *GM* and *S&A* signals are informative in only the bad news partition. It would appear that cost increases and/or stickiness in output prices are more informative about future earnings during periods when the firm is performing poorly. Interestingly, these two signals are significant for explaining analysts' one-year-ahead forecast revisions only in the bad news partition, that is, where they are also informative about actual future earnings changes. Further-

[19] We emphasize the "on average" nature of this result as *F*-statistics indicate that the fundamental signals explain an incrementally significant portion of the variation in forecast errors in only half of the sample years.

more, analysts' one-year-ahead forecast errors are, in part, explained by these two signals only in the bad news partition, which suggests analysts underutilize the information in the signal when it is preceded by bad news.

Differing interpretation of fundamental signals conditional on prior earnings news might reflect the fact that some signals are most informative for firms experiencing persistent earnings trends or they might reflect transitory prior earnings news observations where some mean reversion is likely. We attempted to differentiate between these possibilities by partitioning the sample based on a proxy for expected earnings growth. Following arguments in Ohlson [1995] and evidence provided in Fairfield [1994], we partitioned the yearly observations in the sample at the median price-to-earnings ratio into a low *P/E* portfolio (weak or negative expected earnings growth) and a high *P/E* portfolio (strong expected earnings growth). Firm *P/E*s are calculated as price at the end of the year prior to that to which the fundamental signals apply, divided by earnings for the prior year.

The *AR* coefficient in the future earnings regression is positive and two standard deviations from zero in the high *P/E* partition (not reported), reinforcing the notion that expanding accounts receivables are a portent of earnings improvements. A positive *CAPX* signal is observed in the low *P/E* partition only, suggesting that capital expenditures in excess of industry averages are perceived negatively for firms without expected earnings growth, consistent with poor performers taking on excessively risky projects in hopes of reversing their fortunes. Finally, the *GM* signal is negatively related to future earnings in only the high *P/E* partition. Combined with a similar result for the bad prior earnings news sample, the evidence suggests that the *GM* signal is likely to be most informative about future earnings for firms with temporarily low earnings.

6.2 INDUSTRY CONTEXT

We examined a number of fundamental relations conditional on membership in broadly defined industry sectors to determine if some general conclusions could be drawn from a coarse fundamental analysis. The sectors include manufacturing (*SIC* codes beginning with the number 3), primary products (*SIC* codes beginning with number 2), service (*SIC* codes beginning with numbers 7 and 8), and wholesale/retail (*SIC* codes beginning with number 5). Defining the sectors in this way ensures sufficient data in each year of our sample while still allowing for some basic industry differences that may translate into differential informativeness of some of the fundamental signals.

For this analysis we concentrated on the *INV*, *GM*, and *LF* signals. The *INV* signal should be informative only when inventories represent a substantial investment, i.e., in manufacturing, primary production, and wholesale/retail. The results in table 6 provide partial support for this prediction as only the manufacturing and primary production sectors

TABLE 6

Regressions of Future Changes in EPS, Forecast Revisions, and Analysts' Forecast Errors on Selected Fundamental Signals by Industry Sector (Row include mean coefficients from yearly regressions)

$$Y_i^{a} = \alpha + \beta_0\ CHGEPS_i^{b} + \sum_{j=1}^{3} \beta_{ij}\ SIGNALS_{ij}^{c} + u_i$$

	Industry Sectors and Independent Variables											
Dependent	Manufacturing			Primary Production			Services			Wholesale/Retail		
Variables	*INV*	*GM*	*LF*	*INV*	*GM*	*LF*	*INV*	*GM*	*LF*	*INV*	*GM*	*LF*
CEPS1	−0.017*	−0.027	−0.021	−0.014*	−0.029	−0.029*	−0.014	0.005	−0.029	0.000	−0.083*	−0.012
$FY1^{+1}$	0.000	−0.023	−0.008	0.002	−0.024*	−0.024*	−0.010	−0.026	−0.015	−0.010	−0.263	0.074
$FERR1^{+1}$	0.003	−0.047*	−0.035*	−0.012*	−0.046*	−0.011	−0.021	−0.008	0.011	−0.022	−0.002	−0.006

*Significant at or below the 0.05 level (one-tailed) based on a t-statistic calculated as the ratio of the mean coefficient to a standard error based on the distribution of the individual yearly coefficients.

[a] *CEPS1* is the change in one-year-ahead earnings (adjusted earnings in year $t-1$ less year t earnings), $FY1^{+1}$ is the forecast revision of one-year-ahead earnings over the horizon −11 to +1, and $FERR1^{+1}$ is the analysts' forecast error of one-year-ahead earnings, based on the consensus forecast outstanding at month +1. All variables are deflated by stock price at the end of year $t-1$.

[b] *CHGEPS* is the change in earnings per share between years $t-1$ and t (contemporaneous with the fundamental signals), deflated by stock price at the end of year $t-1$.

[c] See table 1 for signal definitions. Because small denominators in the measurement of the signals can lead to extreme values, we followed the same truncation and outlier analysis procedures as Lev and Thiagarajan [1993].

generate a significant inventory signal.[20] Somewhat puzzling is the lack of significance of the *INV* signal for analysts' one-year-ahead forecasts revisions in any of the sectors. In the case of primary production, the failure of analysts to revise forecasts for the information in the *INV* signal accounts for an association between one-year-ahead earnings forecast errors and this signal.

In principal, the *GM* signal should be informative for all sectors, and most informative for firms operating at thin margins. The prediction is based on the assumption that margin changes have a nontransitory component. The sector with the lowest average profit margins in our sample is wholesale/retail (food stores, durable and nondurable wholesale, and department stores). The sector with the highest margins over our sample period is primary products (chemicals, textiles, apparel, and paper products). The average margin of the manufacturing sector lies between these two.

The evidence in table 6 pertaining to the *GM* signal is also mixed. As predicted, the signal is most informative about future changes in the wholesale/retail sector, but the coefficients for the remaining sectors are all insignificant. Analysts' forecast revisions were significantly related to the *GM* signal only in the primary products sector although, on average, future earnings in this sector are not related to *GM*. Analysts' revisions (or failures to revise) contributed to forecast errors for one-year-ahead earnings in both the primary products and manufacturing sectors. Apart from randomness, we have no explanation for these results.

Finally, we expect the *LF* variable to be most informative in the manufacturing and primary products sectors where restructurings were common during our sample period. The *LF* signal is negative and significant in the primary products sector and just above the .05 significance cutoff in the manufacturing sector. While the average coefficients were negative for the other sectors, they were not significant. Analysts' forecasts revisions were unrelated to the *LF* signal in the manufacturing sector but significant for revisions in primary products. The significant relation between forecast errors and the *LF* signal in this sector indicates analyst underreaction to the information about future earnings contained therein.

6.3 MACROECONOMIC CONTEXT

LT present evidence that the relations between some of the fundamental signals and stock returns are affected by economic growth and inflation. To gauge the impact of these contextual variables on relations between future earnings changes and the fundamental signals, we drop the requirement of an analyst following and expand the sample period

[20] The insignificant *INV* coefficient in the wholesale/retail sector is probably due to our use of annual data. Short operating cycles and seasonality in this sector work in favor of swift resolution of inventory buildups and shortages, making it less likely that annual signals will be informative about future earnings.

to cover 1974–90 to allow for meaningful variation in these variables. We split the sample into high and low inflation and *GDP* years and re-estimated the regressions of future earnings on signals in each of the four partitions.

Overall, macroeconomic trends have little effect on the informativeness (or lack thereof) of the fundamental signals for future earnings, with the exception of the *GM* and *AR* variables. In the high-inflation partition, the *GM* signal is significantly negative and the *AR* signal is significantly positive (not reported). Neither of the signals, however, is reliably different from zero in the low-inflation partition. The *GM* signal may be more informative about future earnings in periods of high inflation because differences in firms' ability to pass on or resist input price increases during inflationary periods take on greater importance. As alluded to earlier, one explanation for the unexpected sign of the *AR* coefficient is that accounts receivable growth precedes or accompanies increases in sales and earnings growth which is more likely to occur during high-inflation years.

The *GM* and *S&A* signal coefficients are significantly negative in the low-*GDP* partition but both are insignificant in the high-*GDP* partition, consistent with the results conditioned on firm-specific bad earnings news. The average positive *AR* signal is only significant in the high-*GDP* partition, consistent with the results in the good earnings news partition described previously. Once again, this indicates that the increases (decreases) in the *AR* signal are good (bad) news about future earnings when sales and earnings are on the rise.

7. *Summary and Conclusions*

In this paper, we examine the underlying relations between accounting-based fundamental signals and security prices. Based on associations between the individual signals and future earnings changes, there is an economic justification for analysts and investors to rely on many, but not all, of the fundamental signals identified by Lev and Thiagarajan [1993] when assessing future firm performance. In addition, some fundamental signals explain only long-term earnings growth, suggesting the possibility that they reflect both structural shifts and transitory profitability changes.

We also found that analysts' forecasts do not completely impound the information that investors *perceive* is contained in the fundamental signals. Because analysts' forecast revisions are strongly associated with many of these signals in the same way as returns, a question arises as to why these revisions fail to subsume value-relevant information. One explanation for this result is that the signals may capture information about the firm that has little to do with near-term earnings, e.g., shifts in firm risk. Because analysts' forecasts are constrained to convey information about earnings over a short horizon, value-relevant information related

to remaining future earnings will be omitted from their estimates while it may be reflected in price.

A second explanation supported by the data is that analysts' forecast revisions fail to completely impound the information in the fundamental signals about future earnings changes. Hence investors may benefit by exploiting the signals even when analysts' forecasts are available. Our results cast doubt on the efficiency of analysts' forecasts with respect to the information in the fundamental signals. An examination of analysts' forecast errors reveals that analyst inefficiency takes the form of generalized underreaction, and that this underreaction to the specific fundamental signals appears to account for analyst underreaction to the prior year's earnings news observed in forecasts issued early in the year.

Our findings on analyst underreaction to financial statement information raise the possibility that investors in general may be inefficient in their fundamental analyses. Previous research has demonstrated that investors are inefficient in their use of earnings information (see, e.g., Bernard and Thomas [1990]). Abarbanell and Bushee [1996] explore the question of whether investors fully use the information in the fundamental signals and find evidence consistent with underreaction. Because previous research also indicates that investors' underreaction to information in prior earnings is not fully explained by analysts' inefficient use of this information (e.g., Jacob and Lys [1993] and Abarbanell and Bernard [1992]), it is not clear to what extent the analyst underreactions reported in this study contribute to sluggish price movements.

Finally, we showed that macroeconomic variables such as inflation and *GDP*, as well as firm-specific variables such as prior earnings news and expected earnings growth, condition some of the relations between the fundamental signals and future earnings, revisions, and forecast errors. Preliminary evidence on the influence of industry membership suggests that further refinements to the fundamental analysis performed in this study can be achieved with the aid of additional theory (see, e.g., Bernard and Noel [1991] and Stober [1993]).

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