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Fundamental Information Analysis

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1. Introduction

Fundamental analysis is aimed at determining the value of corporate securities by a careful examination of key value-drivers, such as earnings, risk, growth, and competitive position. In the context of such analysis, we identify below a set of financial variables (fundamentals) claimed by analysts to be useful in security valuation and examine these claims by estimating the incremental value-relevance of these variables over earnings. Our findings support the incremental value-relevance of most of the identified fundamentals; in fact, for the 1980s, the fundamentals add approximately 70%, on average, to the explanatory power of earnings with respect to excess returns. We also show that the returns–fundamentals relation is considerably strengthened when it is conditioned on macroeconomic variables, thereby demonstrating the importance of a contextual capital market analysis. For example, several fundamentals that appear only weakly value-relevant or even irrelevant in the unconditional analysis exhibit strong association with returns under specific economic conditions (e.g., the accounts receivable and the provision for doubtful receivables signals during high inflation).

From a general examination of the role of fundamentals in security valuation we turn to the related issues of earnings persistence, growth, and the earnings response coefficient. We hypothesize that the funda-

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mental signals identified in this study are used by investors to assess the persistence (sometimes referred to as "quality") and growth of reported earnings. We provide support for this hypothesis by demonstrating a significant relation between an aggregate score reflecting the information in the fundamentals and two indicators of persistence: the earnings response coefficient and future earnings growth. In fact, this fundamental ("quality of earnings") score is more strongly associated with the response coefficient than a time-series-based persistence measure, suggesting that the former is more effective in capturing the permanent component of earnings than the latter, which is commonly used by researchers.

We identify candidate fundamentals to be included in the empirical tests from the written pronouncements of financial analysts. This *guided* search procedure is different from the statistical search used in previous research, such as Ou and Penman [1989]. A directed search for fundamentals, guided by theory or by experts' judgment, is a natural extension of the statistical search procedure.[1]

This study thus extends the search for value-relevant fundamentals both by using a guided choice of candidate variables and by conditioning the returns–fundamentals relation on macroeconomic variables (a contextual analysis). We also link our fundamental analysis findings with the persistence/response coefficient literature by demonstrating that the identified fundamentals capture important characteristics of earnings persistence.

2. *The Search for Fundamentals*

To identify a set of fundamentals used to evaluate firms' performance and estimate future earnings, we searched the *Wall Street Journal* and *Barron's* for 1984–90;[2] *Value Line* publications on "quality of earnings" [1973*a*; 1973*b*]; professional commentaries on corporate financial reporting and analysis, such as the *Quality of Earnings* publications;[3] and newsletters of major securities firms commenting on the value-relevance of financial information.

The following example, from the *Quality of Earnings Report* on Harris Corporation (March 27, 1989), illustrates how analysts use fundamentals to draw inferences about the firm's current performance and its future earnings:

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[1] A guided search for fundamentals also yields variables that can be intuitively motivated to students and practitioners, while a statistical search might identify unknown and hard-to-justify variables (e.g., Ou and Penman's Sales to Total Cash ratio or Holthausen and Larcker's [1992] Percent Change in Sales over Total Assets ratio), which probably proxy for other underlying constructs.

[2] The key phrases used for search in the *Dow Jones News Service Text* data base were "Quality of Earnings" and "Quality of Assets."

[3] Published by the Reporting Research Corporation, Englewood Cliffs, N. J. See also the book by this firm's CEO, Thornton O'Glove, *Quality of Earnings* [1987]. A similar commentary is provided by Mr. David Tice in his newsletter, *Behind the Numbers*.

HARRIS CORPORATION

	Six Months Ended				
	12/31/88	change	12/31/87	change	12/26/86
Net Sales ($000)	$1,041,693	4.2%	$999,472	0.5%	$994,553
Trade Receivables ($000)	558,790	13.9%	490,497	35.3%	362,644
Inventories ($000)	331,481	26.1%	262,850	-2.4%	269,410

The above table illustrates that for the first half of the 1988/89 fiscal year [i.e., the six months ending 12/31/1988], Harris' trade receivables and inventories advanced more rapidly than sales. This adverse trend figures to compromise Harris' share earnings in the second half of the 1988/89 fiscal year ending June 30th.

Thus, the disproportionate (to sales) increase in two fundamentals—receivables and inventories—is used as a leading indicator for future earnings.

Our search yielded 12 fundamental signals (a signal refers to a specific configuration of several fundamental variables). The only selection procedure applied during the search process was to choose one of several alternative configurations of the same fundamental, such as for the *R&D* signal, where some analysts used the contemporaneous change in the firm's sales as a benchmark, while others used the corresponding industry *R&D* change. Our choices among such alternatives were guided by economic theory and empirical evidence. We ignored analysts' recommendations that did not pertain to fundamentals (e.g., O'Glove's [1987] prescription to search for discrepancies between the 10-K and the annual report).

Analysts generally attach a unique interpretation to a fundamental signal (e.g., a disproportionate increase in inventory conveys bad news). This, of course, is not always the appropriate interpretation. For example, a disproportionate (to sales) inventory increase might sometimes provide a positive signal about managers' expectation of sales increases. Nevertheless, initially, in the noncontextual part of this study, we follow a *parsimonious* approach of examining the extent to which a single interpretation of a fundamental (i.e., the one used by analysts) is valid for a large cross-section of firms. The fundamental signals examined in this study are described below and summarized in table 1.

2.1 INVENTORIES

Inventory increases that outrun cost of sales increases are frequently considered a negative signal because such increases suggest difficulties in generating sales. Furthermore, such inventory increases suggest that earnings are expected to decline as management attempts to lower inventory levels (e.g., car manufacturers' periodic price concessions).

TABLE 1

Definition and Measurement of Candidate Fundamental Signals Examined in This Study for Value Relevance (The Signals Were Derived from a Search of Analysts' Pronouncements during 1984–90, Particularly Those Concerning the Quality and Adequacy of Reported Financial Data. The Values of the Variables for Each Signal Are Annual Numbers Derived from Compustat. Compustat Item Numbers Are Given in Parentheses. Δ Refers to Percentage Annual Change in the Variable from the Average of Prior Two Years.)

	Signal	Measured as:
1	Inventory[a]	Δ Inventory (78 or 3) − Δ Sales (12)
2	Accounts Receivable	Δ Accounts Receivable (2) − Δ Sales (12)
3–4	Capital Expenditure, *R&D*	Δ Industry Capital Expenditures or *R&D* (30(46)) − Δ Firm Capital Expenditures (*R&D*)[b]
5	Gross Margin	Δ Sales − Δ Gross Margin (12–41)
6	Sales and Administrative Expenses (*S&A*)	Δ *S&A* (189) − Δ Sales
7	Provision for Doubtful Receivables	Δ Gross Receivables (2+67) − Δ Doubtful Receivables (67)
8	Effective Tax	$PTE_t\,(T_{t-1} - T_t)$ PTE_t = pretax earnings (170) at t, deflated by beginning price T = effective tax rate[c]
9	Order Backlog	Δ Sales − Δ Order Backlog (98)
10	Labor Force	$\dfrac{\left(\dfrac{\text{Sales}_{t-1}}{\text{No. of Employees}_{t-1}} - \dfrac{\text{Sales}_t}{\text{No. of Employees}_t}\right)^{d}}{\dfrac{\text{Sales}_{t-1}}{\text{No. of Employees}_{t-1}}}$
11	*LIFO* Earnings	0 for *LIFO*; 1 for *FIFO* (59)
12	Audit Qualification	1 for Qualified; 0 for Unqualified (149)

[a]The inventory variable we used is "finished goods," when this item is available, and "total inventories" otherwise.

[b]Industry capital expenditure (*R&D*) was measured by aggregating this item for all firms at the two-digit SIC code level.

[c]The effective tax rate is measured as follows, using *Compustat* data items 63/(18+63+49–48–55). See also n. 7 in the text.

[d]*Compustat* data item for number of employees is 29.

Disproportionate inventory increases may also suggest the existence of slow-moving or obsolete items that will be written off in the future. Another point, not mentioned by analysts, is that inventory buildups increase *current* earnings at the expense of future earnings by absorbing overhead costs. Inventory decreases, though infrequently noted by analysts, generally suggest higher than expected sales and a decrease in overhead cost absorption, boding well for current and future earnings.

Because there are many inventory-holding motives, such as smoothing production in the face of fluctuating sales, minimizing stock-out costs, and speculating or hedging against future price movements, an inventory increase might sometimes convey a positive rather than a negative signal. Nevertheless, viewing a disproportionate inventory increase as a negative signal is consistent with the major inventory-holding motive—production smoothing: "Economists have singled out

the production-smoothing/buffer-stock motive for attention" (Blinder and Maccini [1991, p. 78]).

When production varies less than sales, a disproportionate inventory increase may result from an unexpected sales decrease, loss of production or inventory control, or growth of obsolete inventory items—all reflecting negatively on future earnings. Since these arguments apply particularly to the "finished goods" component of inventory, our empirical tests are based on this component when it is available on *Compustat*, and on "total inventories" otherwise.

We computed for each sample firm and year the following inventory signal:

$$\text{Percentage Change in Inventory} - \text{Percentage Change in Sales.}^4 \quad (1)$$

The annual percentage change in inventory (and correspondingly for sales) is defined as:

$$[\text{Inventory}_t - E(\text{Inventory}_t)] \,/\, E(\text{Inventory}_t), \quad (2)$$

where $E(.)$ denotes expected value. Since we regress unexpected returns on the fundamental signals, the signals should reflect the unexpected component of the fundamental variable. We used two expectation models: a random walk and a two-year averaging model ($E(\text{Inventory}_t) = 1/2(\text{Inventory}_{t-1} + \text{Inventory}_{t-2})$). The empirical tests indicated that the two expectation models yield very similar results; the findings reported below are those based on the two-year average model for all the fundamental signals. Since a positive value of the inventory signal is a priori perceived as "bad news," the signal is expected to be *negatively* correlated with stock returns.

2.2 ACCOUNTS RECEIVABLE

Disproportionate (to sales) increases in accounts receivable are mentioned by analysts as conveying a negative signal almost as often as inventory increases. Disproportionate accounts receivable increases may suggest difficulties in selling the firm's products (generally triggering credit extensions), as well as an increasing likelihood of future earnings decreases from increases in receivables' provisions. A disproportionate receivables increase might also suggest earnings manipulation, as yet unrealized revenues are recorded as sales. These underlying reasons for receivables increases indicate low persistence of current earnings and future earnings decreases. The accounts receivable signal was measured similarly to the inventory signal (1).

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[4] Strictly speaking, the benchmark in expression (1) should be cost of sales. Empirically, the two benchmarks yielded virtually identical results. The sales benchmark was preferred because it is consistent with the signals suggested by analysts.

2.3 CAPITAL EXPENDITURES
2.4 R&D

Relative decreases in capital expenditures and *R&D* intensities are often perceived negatively by analysts. The largely discretionary nature of these expenditures makes disproportionate decreases a priori suspect. A decrease in capital expenditures may indicate managers' concerns with the adequacy of current and future cash flows to sustain the previous investment level. Similarly, a cut in *R&D* may indicate management's concern about the adequacy of reported earnings and suggest attempts to boost earnings by decreasing *R&D* expenses. In general, capital expenditures and *R&D* decreases are equated by analysts with a short-term managerial orientation, while increases in these items appear to bode well for future earnings and cash flows.

Unlike the preceding inventory and accounts receivable cases, the theoretical relation between capital expenditures (or *R&D*) and sales is tenuous. For example, recent research (e.g., Fazzari, Hubbard, and Peterson [1988]) suggests that liquidity position and cash flow are stronger determinants of investment (capital expenditure, *R&D*) decisions than are current sales. Absent a clear theoretical guidance, we used an industry benchmark for the capital expenditures and *R&D* innovations (signals), defining them as the annual percentage change in total two-digit industry capital expenditures (or *R&D*) minus the annual percentage change in the corresponding firm's items.[5] As with other signals, the measures were defined to yield an expected negative response coefficient with stock returns: a positive value of the two signals (i.e., industry growth larger than the firm's) implies, a priori, bad news, and therefore a negative relation with returns.

2.5 GROSS MARGIN

A disproportionate (to sales) decrease in the gross margin balance (sales minus cost of sales) is viewed negatively by analysts (e.g., Graham et al. [1962, p. 244] and Hawkins [1986]). Gross margin is, in general, a less noisy indicator than earnings of the relation between the firm's input and output prices. This relation is driven by underlying factors, such as intensity of competition and the relation between fixed and variable expenses (operating leverage). Variations in these fundamental factors (indicated by disproportionate changes in gross margin) obviously affect the long-term performance of the firm and are therefore informative with respect to earnings persistence and firm values. The gross margin signal was defined as the difference between the percentage change in sales and that of the gross margin.

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[5] Both analysts and researchers often compare a given firm's *R&D* and capital expenditure levels to those of similar firms within the industry. For example, see the *Wall Street Journal* (September 17, 1990, p. C2) on Digital Equipment Corp. and Grabowski [1978].

2.6 SELLING AND ADMINISTRATIVE (S&A) EXPENSES

Most administrative costs are approximately fixed, therefore, a disproportionate (to sales) increase is considered a negative signal suggesting, among other things, a loss of managerial cost control or an unusual sales effort (Bernstein [1988, p. 692]). This signal was defined as the difference between the annual percentage change in *S&A* expenses and the percentage change of sales.

2.7 PROVISION FOR DOUBTFUL RECEIVABLES

This provision is largely discretionary, so unusual changes (relative to accounts receivable) are generally suspect by analysts (McNichols and Wilson [1988] and O'Glove [1987, p. 83]). Firms with inadequate provisions for doubtful receivables are expected to suffer future earnings decreases from provision increases. Our sources frequently referred to the adverse implications of inadequate bad debt provisions (in recent years particularly for loan losses of financial companies) for the persistence and growth of earnings.

The provision for doubtful receivables signal was measured relative to the change in gross accounts receivable:

$$\text{Percentage Change in Gross Accounts Receivable} - \text{Percentage Change in Provision for Doubtful Receivables.} \quad (3)$$

Positive values of this measure are perceived as a negative signal. However, there may be cases where the credit-worthiness of customers improved, on average, and a decrease in the relative level of the provision was warranted. As noted earlier, we follow in the first (noncontextual) part of this study the modus operandi of analysts and attach a single interpretation to a fundamental signal.

2.8 EFFECTIVE TAX RATE

A significant change in the firm's effective tax rate which is not caused by a statutory tax change is generally considered transitory by analysts (see, e.g., a *Wall Street Journal* [January 26, 1990] story on Lotus Development Corporation). Accordingly, an unusual decrease in the effective tax rate is generally considered a negative signal about earnings persistence.

To focus on the impact of the effective tax rate change on earnings, we decomposed the annual change in earnings, $\Delta E_t = E_t - E_{t-1}$, into two components: (*a*) the change in pretax earnings (ΔPTE_t), at last year's effective tax (T_{t-1}) level—$\Delta PTE_t(1 - T_{t-1})$, and (*b*) the effect of the tax rate change on current pretax earnings—$PTE_t(T_{t-1} - T_t)$:

$$\Delta E_t = \Delta PTE_t(1 - T_{t-1}) + PTE_t(T_{t-1} - T_t). \quad (4)$$

In expression (4), $PTE_t(T_{t-1} - T_t)$, which indicates the part of the net earnings change due to the effective tax rate change, is our measure of

the tax signal (after deflation by beginning price).[6] The effective tax rate was measured as the current federal tax expense divided by pretax earnings (minus equity income from unconsolidated subsidiaries plus income from minority interests).[7]

2.9 ORDER BACKLOG

This leading indicator of future sales and earnings is generally defined as the dollar amount of firm unfilled orders at year-end. Changes in order backlog relative to the level of operations are frequently used by analysts to indicate future performance, particularly in the high technology and heavy industries (e.g., software, semiconductors, steel and aircraft manufacturers).[8] In addition to indicating genuine changes in the demand for the firm's products, a relative (to sales) decrease in order backlog may suggest that yet unrealized sales were recorded in the current period, an "earnings management" procedure prevalent among high-tech companies (see the Treadway Commission Report [1987]). The order backlog signal was defined as the difference between the percentage change in sales and that of order backlog.

2.10 LABOR FORCE

Financial analysts generally comment favorably on announcements of corporate restructuring, particularly labor force reductions. This provides yet another example of analysts' use of fundamental signals to estimate the persistence of earnings, since in the year of a significant labor force reduction wage-related expenses (e.g., severance pay) generally increase.[9] Reported earnings, in such cases, do not reflect the future benefits from restructuring, and fundamentals, such as the labor force signal, are used to provide a better assessment of future earnings.

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[6] A simple hypothetical example will provide intuition to this measure. Assume:

	Period: t	$t-1$
Earnings before tax	120	100
Effective tax rate	0.25	0.40
Net earnings	90	60

The net earnings change, 30, consists according to (4) of the before tax earnings change, $20 \times 0.60 = 12$, and the impact of the tax rate change, $120\ (0.40 - 0.25) = 18$. The latter (price-deflated) component of the total earnings change is our tax signal.

[7] This measure is used by Porcano [1986] and examined in Omer, Molloy, and Ziebart [1991]. *Compustat* item numbers for this measure are 63 / (18 + 63 + 49– 48 – 55). Firms having both a negative numerator and a negative denominator were excluded from the sample. Following Omer, Molloy, and Ziebart [1991], firms with a positive numerator and negative denominator were coded to represent the statutary rate (48% before 1986, 46% in 1986, and 34% starting in 1987).

[8] The relative (to sales) change in order backlog is, for example, the measure most closely watched in the computer (particularly semiconductor) industry, where it is known as the "Book to Bill" ratio, relating order backlog (Book) to sales (Bill).

[9] For example, Exxon laid off almost 40% of its work force in 1986, yet total wages and salaries increased that year by 3%.

We defined the labor force signal as the annual percentage change in sales-per-employee (the ratio of annual sales to the number of employees at year-end). Scaling sales by the number of employees is aimed at both capturing changes in the efficiency of labor and accounting for changes in the number of employees. As before, this variable is defined to yield an expected negative coefficient sign.

2.11 LIFO EARNINGS

When input prices are increasing, *LIFO* earnings are regarded as more sustainable or closer to "economic earnings" than *FIFO* earnings, since *LIFO* cost-of-sales is a closer proxy to current (replacement) cost than *FIFO* cost-of-sales (see Hawkins [1986, p. 208] and Bernstein [1988, p. 147]). The use of the *LIFO* inventory method is, therefore, considered a positive signal, depicted here by a dummy variable: 0 for *LIFO* or replacement cost, and 1 for *FIFO*, average cost, or other inventory methods.[10] Although *LIFO* valuation subsequent to the adoption year is not unexpected by investors, we wished to examine whether its mere use commands higher returns.

2.12 AUDIT QUALIFICATION

A qualified, disclaimed, or adverse audit opinion obviously sends a negative message to investors. To capture this signal we used a dummy variable: 1 if the auditor's opinion was qualified or adverse, and 0 for an unqualified opinion.

3. Methodology, Sample Selection, and Findings

To examine empirically the incremental value-relevance over earnings of our 12 candidate fundamentals, we ran the following two cross-sectional regressions. First, the conventional returns–earnings regression:

$$R_i = a + b\Delta E_i + u_i;\ i = 1,2,\ldots,n, \text{ number of firms} \qquad (5)$$

where:

R_i = 12 months excess stock return of firm i, where the return cumulation starts with the fourth month after the beginning of the fiscal year. The excess return is determined by subtracting from the realized return the "market model" expected return.[11]

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[10] We also experimented with a "slope dummy," multiplying the *LIFO–FIFO* dummy by the earnings change. This variable, however, had a very high correlation with the earnings change variable (over 0.90), yielding statistically insignificant estimates. Carroll, Collins, and Johnson [1991] examine such a slope effect and find the response coefficient of *LIFO* firms to be higher than that of *FIFO* firms.

[11] The "market model" α and β coefficients used to derive the expected returns were estimated using a value-weighted index from 36 monthly returns ending with the sixth

ΔE_i = the annual change in *EPS* (primary, excluding extraordinary items), deflated by beginning-of-year share price.

The second regression includes the fundamentals:

$$R_i = a + b_0 \Delta PTE_i + \sum_{j=1}^{12} b_j S_{ji} + v_i. \tag{6}$$

ΔPTE_i = the annual change in pretax earnings times one minus last year's effective tax rate. This is the first component on the right side of expression (4); the second component is the tax signal. The sum of these two components is ΔE_i.

S_{ji} = fundamental signals outlined in table 1; $j = 1, \ldots, 12$.

Expression (5) is used as a benchmark against which expression (6) is evaluated. Sample firms were selected by the following criteria:

(*i*) Availability of "primary earnings per-share excluding extraordinary items" data on the *Compustat* tape (item #58) and data required for the fundamental signals (see table 1), for the sample period, 1970–88.

(*ii*) Availability on the *CRSP* tape of monthly stock returns starting at least 36 months prior to the return cumulation period for year "*t*." (All relevant variables were adjusted for stock splits and stock dividends. Firms which changed fiscal years during the sample period were eliminated.)

Table 2 presents *OLS* estimates of the 1974–88 year-by-year cross-sectional regressions (5) and (6) and an across-years significance test.[12] Table 2 estimates are for firms having data for all 12 fundamental signals (roughly 140–180 firms per year). This restricted sample is not representative; for example, it includes only companies with *R&D* expenditures. In table 3 we report estimates from a much larger sample, roughly 500–600 firms per year, where the data requirements for *R&D*, Provision for Doubtful Receivables, and Order Backlog were removed. These three fundamentals caused the largest loss of firms in the restricted sample (e.g., Order Backlog was reported by only 35% of the sample firms). This larger sample is quite representative, including

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month of the preceding fiscal year. Some sample firms (less than 5% of total sample) had less than 36 monthly returns. The minimum number of returns used for these firms was 10. The resulting monthly returns were compounded to obtain annual returns.

[12] Given some extreme values of the fundamental signals, mainly due to small denominators in the percentage change computation, we eliminated the extreme 1% of each fundamental signal. Analysis of the regression residuals indicated existence of some outliers. Based on an analysis of studentized residual (greater than 3) and Cook's *D* statistic (greater than 1), these were removed. To examine the sensitivity of our findings to this elimination, we reran regressions (5) and (6) on the original (nontruncated) data and found that the elimination marginally increased the significance of some coefficients. However, none of our conclusions depends on the elimination.

TABLE 2

Value-Relevance of Fundamental Signals: Restricted Sample
(Coefficient Estimates of Year-by-Year Regressions, 1974–88, of Annual Excess Stock Returns (R_i) on Price-Deflated, Pretax Earnings Change (ΔPTE_i), and the 12 Fundamental Signals (S_{ji}) Defined in Table 1. The Sample is Restricted to Firms Having Data for All 12 Signals, as Well as for Earnings. Number of Sample Firms Ranges between 140–180 per Year.)

$$R_i = a + b_0 \Delta PTE_i + \sum_{j=1}^{12} b_j S_{ji} + v_i$$

Year	Intercept	ΔPTE	Inventory	Receivables	Capital Expenditures	*R&D*	Gross Margin	*S&A* Expenses
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1974	0.080	0.559[2]	−0.150[2]	−0.263[1]	−0.007	0.078	−0.516[1]	0.021
1975	−0.032	0.480[2]	−0.125[1]	−0.117	−0.036	0.060	−0.839[2]	−0.410[1]
1976	0.014	1.182[2]	−0.017	0.011	−0.049	0.180	−0.489[2]	−0.407[1]
1977	−0.045	0.309	0.020	−0.305[2]	−0.002	−0.058	−0.996[2]	−0.461[2]
1978	−0.080[2]	0.527[2]	−0.242[2]	−0.271[2]	−0.038[1]	−0.161[2]	−0.750[2]	−0.729[2]
1979	−0.192[2]	0.824[2]	−0.065	−0.116	−0.059[2]	−0.069[1]	−0.806[2]	−0.188
1980	−0.222[2]	0.455[2]	−0.218[2]	−0.182	−0.015	−0.057	−0.535[2]	−0.163
1981	0.033	0.404[2]	−0.192[2]	−0.301[2]	−0.038	0.195	−1.064[2]	−0.291
1982	0.097[2]	0.571[2]	−0.078	−0.013	0.049	0.126	−0.595[2]	−0.399[1]
1983	−0.015	0.808[2]	−0.102	−0.127	−0.005	0.063	−0.680[2]	−0.319
1984	−0.134[2]	0.653[2]	−0.092[2]	−0.006	−0.040[2]	−0.117[2]	0.014	−0.254
1985	−0.076[2]	0.391[2]	−0.013	0.150	−0.007	−0.005	−0.265[1]	−0.187
1986	−0.104[2]	0.386[2]	−0.061[1]	0.018	0.009	0.039	−0.490[2]	−0.125
1987	0.015	0.673[2]	−0.160[2]	0.189	−0.009	0.013	−0.420[2]	−0.342[1]
1988	0.099[1]	0.245	−0.158[1]	−0.248	−0.138[2]	0.009	−0.547[1]	−0.988[2]
Across-Years Means	−0.038	0.565	−0.111	−0.106	−0.030	0.020	−0.599	−0.350
(t-value)	(−1.50)[1]	(9.13)[2]	(−5.55)[2]	(−2.56)[2]	(−2.43)[2]	(0.74)	(−8.42)[2]	(−5.46)[2]

firms from practically every four-digit industry on *Compustat*, except electrical utilities and finance companies.

When the data in both tables 2 and 3 are considered, all but one of the yearly coefficients of the Gross Margin, *S&A* Expenses, Inventory, and Order Backlog are negative—as expected. For most years, these coefficients are also statistically significant. The across-years significance test indicates that the Inventory, Receivables, Capital Expenditures, Gross Margin, *S&A* Expenses, Order Backlog, and Labor Force (only in table 3) signals are statistically significant at the 0.05 level, whereas the Effective Tax signal is significant at the 0.10 level (table 3).[13] The *FIFO–LIFO* signal exhibits an unexpected pattern: all the coefficients of the 1970s are positive, while those of the 1980s (except

[13] We use the 15 estimated slope coefficients from the yearly regressions to obtain an across-year mean, standard error, and a t-statistic for each variable. This procedure, suggested by Bernard [1987], mitigates potential cross-sectional dependence in the regression residuals.

TABLE 2 — *continued*

Year	Doubtful Receivables	Effective Tax	Order Backlog	Labor Force	*LIFO/ FIFO*	Audit Qualific.	Adjusted R^2	Adjusted R^2 Benchmark[a]	Partial F
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1974	−0.076	−1.061	−0.108	−0.133	0.093	0.045	0.15	0.17	1.313
1975	−0.016	0.224	−0.098	−0.442[2]	0.117	0.178	0.15	0.14	1.775[1]
1976	0.020	−1.621	−0.136[1]	0.231	0.055	−0.063	0.19	0.12	1.442
1977	−0.002	−1.893[2]	−0.168[2]	−0.333[1]	0.046	0.046	0.18	0.08	3.243[2]
1978	−0.050	0.476	−0.069	−0.205	0.086	−0.279[2]	0.30	0.19	5.452[2]
1979	0.037	−0.276	−0.026	−0.270[1]	0.068	−0.083	0.25	0.16	2.743[2]
1980	0.007	−0.420	−0.165[2]	0.210	−0.001	0.106	0.14	0.04	2.068[2]
1981	0.098	0.741	−0.033	0.026	−0.133[2]	0.062	0.23	0.14	2.694[2]
1982	0.104	0.363	−0.137[2]	−0.011	−0.177[2]	−0.172[1]	0.35	0.19	4.064[2]
1983	0.010	−1.433	0.081	−0.145	−0.077[1]	0.537	0.19	0.21	2.202[2]
1984	−0.003	1.927	−0.191[2]	0.350	−0.027	−0.207[1]	0.17	0.13	1.841[2]
1985	0.090	0.056	−0.075	−0.177	−0.075[2]	−0.094	0.13	0.05	1.814[2]
1986	−0.001	1.345	−0.100[1]	0.080	−0.057[1]	−0.073	0.15	0.17	1.934[2]
1987	−0.117[2]	2.628	−0.271[2]	−0.226	−0.078[2]	−0.154	0.18	0.13	2.642[2]
1988	−0.003	−0.841	−0.099	0.028	0.116	−0.259[1]	0.39	0.10	3.452[2]
Across-Years Means	0.007	0.014	−0.107	−0.068	−0.003	−0.028			
(t-value)	(0.41)	(0.04)	(−5.06)[2]	(−1.17)	(−0.13)	(−0.52)			

[1,2]Statistically significant at the 0.10 and 0.05 alpha levels, respectively, based on one-tail t-test on the means of the yearly coefficients.

[a]These are the adjusted R^2s of benchmark model (5), the regression of excess returns on price-deflated earnings changes.

1988) are negative.[14] Note that most of the negative coefficients in the 1980s are statistically significant, and the across-1980s mean coefficient is also significant at the 0.05 level. The Audit Qualification signal has the expected negative sign in most years examined but is statistically significant in a few years only. This is probably due to low power, since only about 5% of the sample firms had qualified audit reports.

This leaves two signals—the Provision for Doubtful Receivables and *R&D*—unsupported by the data. The contextual analysis (section 5) indicates that the provision signal is under certain economic conditions—high inflation—statistically significant in the expected direction. The results for the *R&D* signal may be due to misspecification of our measure—failure to capture the *R&D* innovation, or to investors' assessment that industry-relative cuts in *R&D* will not adversely affect the future performance of many firms. The latter conjecture is consistent with Hall's [1992] empirical findings that investors' valuation of *R&D* capital has continually decreased over the 1980s, from a ratio of roughly 1.00 (i.e., $1 of *R&D* capital equals $1 of tangible capital) to 0.2–0.3 in 1990.

[14] This might be due to the relatively small number of *LIFO* cases in our sample for the 1970s (roughly .33 of the sample, compared with .50 in the 1980s) or to an increased investor awareness of the positive *LIFO* implications for cash flows during the high-inflation years 1978–81.

TABLE 3

Value-Relevance of Fundamental Signals: Full Sample

(Coefficient Estimates of Year-by-Year Regressions, 1974–88, of Annual Excess Stock Returns (R_i) on the Price-Deflated Pretax Earnings Change (ΔPTE_i) and the Nine Fundamental Signals (S_{ij}) Defined in Table 1. The Sample Includes Firms Having Data on all the Signals Except R&D, Order Backlog, and Provision for Doubtful Receivables. Number of Sample Firms Ranges between 500–600 per Year. Regression Equation Same as in Table 2.)

Year	Intercept	ΔPTE	Inventory	Receivables	Capital Expenditures	Gross Margin	*S&A* Expenses	Effective Tax
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1974	0.065[1]	0.611[2]	−0.165[2]	−0.149[1]	0.006	−0.150	−0.044	−1.033[1]
1975	−0.009	0.787[2]	−0.141[2]	−0.092	−0.014	−0.239[1]	−0.113	1.130
1976	−0.050[1]	1.048[2]	−0.037	−0.041	−0.026[1]	−0.379[2]	−0.108	−1.375[1]
1977	−0.067[2]	0.431[2]	−0.021	−0.067	−0.023[1]	−0.568[2]	−0.161[1]	−2.133[2]
1978	−0.097[2]	0.953[2]	−0.117[2]	−0.162[2]	−0.020[1]	−0.422[2]	−0.027	−0.229
1979	−0.161[2]	0.593[2]	−0.056[1]	−0.013	−0.001	−0.392[2]	−0.290[2]	−0.859[1]
1980	−0.122[2]	0.563[2]	−0.049	−0.158[2]	0.009	−0.403[2]	−0.075	−0.024
1981	0.023	0.636[2]	−0.104[2]	−0.094	0.007	−0.607[2]	−0.193[1]	−0.479
1982	0.123[1]	0.683[2]	−0.169[2]	0.141	−0.012	−0.390[2]	−0.646[2]	−0.122
1983	−0.035	0.667[2]	−0.098[2]	−0.014	−0.022	−0.239[1]	−0.078	−0.587
1984	−0.124[2]	0.233[2]	−0.038[1]	0.074	−0.001	−0.067	−0.067	0.447
1985	−0.089[2]	0.277[2]	−0.047[1]	0.155	−0.013	−0.507[2]	−0.323[2]	0.173
1986	−0.054[2]	0.065	0.007	0.005	0.014	−0.455[2]	−0.315[2]	−0.477
1987	−0.019	0.342[2]	−0.084[2]	−0.008[1]	−0.000	−0.518[2]	−0.410[2]	1.054
1988	0.050	0.504[2]	−0.016	−0.171[2]	−0.044[1]	−0.359[2]	−0.439[2]	−1.002
Across-Years Means	−0.038	0.560	−0.076	−0.039	−0.009	−0.380	−0.219	−0.368
(*t*-value)	(−1.87)[1]	(8.20)[2]	(−5.33)[2]	(−1.46)[1]	(−2.28)[2]	(−9.70)[2]	(−4.74)[2]	(−2.17)[1]

Comparison of the adjusted R^2s of the "full model" (6) with those of the benchmark, model (5)—reported in columns 15 and 16—indicates that the examined signals contributed significantly to the "explanation" of excess return variance, *beyond reported earnings*. In almost every year, the adjusted R^2 of the "full model" is larger than that of the benchmark, and in some years substantially so. Most of the large R^2 differences between the full and benchmark models occur in the 1980s, where the average improvement in R^2 is about 70%. The partial-F test (column 17) indicates that the combined incremental contribution of the fundamental signals over earnings to the explanation of cross-sectional return variability is statistically significant (.05 level) in every year (except 1974 in table 2).

4. *Robustness Checks*

We subjected our results to the following validity checks.

4.1 THE RETURNS–FUNDAMENTALS SPECIFICATION

Expression (6) combines earnings and fundamentals additively. Absent a well-defined valuation theory, a case for alternative specifications can be made. We examined one such alternative where the

TABLE 3—*continued*

Year	Labor Force	*LIFO/FIFO*	Audit Qualifications	Adjusted R^2	Adjusted R^2 Benchmark[a]	Partial F
	(9)	(10)	(11)	(12)	(13)	(14)
1974	−0.261[2]	0.062	0.029	0.15	0.17	3.519[2]
1975	−0.146	0.037	−0.001	0.15	0.14	2.071[2]
1976	−0.000	0.060	−0.060	0.19	0.12	3.075[2]
1977	−0.114	0.101	−0.036	0.18	0.08	7.067[2]
1978	−0.189[2]	0.039	−0.012	0.30	0.19	5.027[2]
1979	−0.185[2]	−0.008	−0.037	0.25	0.16	3.732[2]
1980	0.186	−0.099[2]	0.048	0.14	0.04	6.096[2]
1981	0.007	−0.038[1]	−0.010	0.23	0.14	3.593[2]
1982	−0.077[2]	−0.132[2]	−0.188[2]	0.35	0.19	10.139[2]
1983	−0.304[2]	−0.006	0.134	0.19	0.21	2.892[2]
1984	0.087	−0.048[2]	−0.149[2]	0.17	0.13	2.141[2]
1985	−0.151[2]	−0.038[1]	−0.177[2]	0.13	0.05	6.298[2]
1986	0.020	−0.056[2]	0.103	0.15	0.17	4.358[2]
1987	−0.011	−0.026	0.042	0.18	0.13	5.734[2]
1988	0.018	0.084	−0.057	0.39	0.10	2.649[2]
Across-Years Means	−0.075	−0.005	−0.025			
(*t*-value)	(−2.15)[2]	(−0.26)	(−1.02)			

[1,2]Statistically significant at the 0.10 and 0.05 alpha levels, respectively, based on one-tail *t*-test on the means of the yearly coefficients.

[a]These are the adjusted R^2 of benchmark model (5), the regression of excess returns on price-deflated earnings changes.

message of the fundamentals is assumed to depend on the size of the earnings surprise. Specifically, regression (6) is modified to include 12 fundamentals and earnings change interaction terms:

$$R_i = a + b_0 \Delta PTE_i + \sum_{j=1}^{12} b_j S_{ji} + \sum_{k=1}^{12} b_k (\Delta PTE_i \times S_{ki}) + u_i. \qquad (6a)$$

Across-years mean coefficient estimates of expression (6*a*) are reported in table 4. All the fundamentals that were statistically significant in table 2 are also significant in table 4. The multiplicative term of the Audit Qualification signal is statistically significant here while its additive counterpart was not in table 2. The multiplicative *R&D* and Doubtful Receivables variables have the expected sign and are significant, yet their additive counterparts (left column) have the "wrong" sign and are also significant. We cannot explain this finding. The multiplicative specification (6*a*) thus supports the additive one; given that expression (6) is more parsimonious, we decided to use it in the following contextual analysis reported in section 5.

4.2 EARNINGS LEVEL, DRIFT, AND CASH FLOWS

Ohlson [1988] and Trueman [1992] argue that the theoretically correct returns–earnings specification includes both the *level* of earnings and earnings *change* as independent variables. Accordingly, we reran expressions (5) and (6), adding the deflated (by beginning price) level

TABLE 4

Value-Relevance of Fundamental Signals from a Combined Additive-Multiplicative Model (Across-Years (1974–88) Mean Coefficient Estimates of Year-by-Year Regressions of Annual Excess Stock Returns (R_i) on Price-Deflated, Pretax Earnings Change (ΔPTE), and the 12 Fundamental Signals (S_{ji}) Defined in Table 1. The Signal Variables in the Regression Are Represented in Both Additive and Multiplicative Form.)

$$R_i = a + b_0 \Delta PTE_i + \sum_{j=1}^{12} b_j S_{ji} + \sum_{k=1}^{12} b_k (\Delta PTE_i \times S_{ki}) + u_i$$

Variables	Coefficient of Additive Term (Fundamental)	Coefficient of Multiplicative Term (ΔPTE × Fundamental)
Intercept	−0.038[1]	—
Earnings change	0.416[2]	—
Inventory	−0.084[2]	−0.099
Receivables	−0.041[1]	0.544[1]
Capital expenditures	−0.010[1]	0.009
R&D	0.037[1]	−0.400[1]
Gross margin	−0.349[2]	−0.593
S&A expenses	−0.173[2]	−1.229[2]
Doubtful receivables	0.025[1]	−1.106[1]
Effective tax	−0.384[1]	—[a]
Order backlog	−0.110[2]	0.474
Labor force	−0.080[2]	−0.233
FIFO–LIFO	−0.017	0.578[2]
Audit qualification	−0.014	−0.814[2]

[1,2]Statistically significant at the 0.10 and 0.05 alpha levels, respectively. Based on one-tail *t*-test.

[a]Since our definition of the Tax Rate signal is in a multiplicative form (see table 1), we do not have a multiplicative term for this variable.

of earnings to the independent variables. The only noticeable effect of incorporating the earnings level was to enhance the statistical significance of two fundamentals: Labor Force ($p = 0.01$) and Tax ($p = 0.05$).

We also modified the earnings change variable in expression (6) to include a *drift* term:

$$\Delta PTE_t = PTE_t - (PTE_{t-1} + Drift_{t-1}) \qquad (7)$$

where: $Drift_{t-1} = (PTE_{t-1} - PTE_1)/t\text{–}2$,

1 = 1974, the beginning year of the sample period.

Estimates of regression (6) including the earnings-change-with-drift term are somewhat weaker than those in table 2; in particular, both the Accounts Receivable and the Capital Expenditures signals are insignificant in the drift case.

Financial analysts often contend that cash flows are more value-relevant than earnings. To examine the value-relevance of the fundamental signals over cash flows, we reran regressions (5) and (6), substituting the price-deflated change in cash-flow-per-share for the earnings change variables.[15] Regression estimates indicate no appreciable change in the

[15] We used the variable "cash flows from operations," namely, earnings plus noncash items plus changes in working capital items. *Compustat* items for this variables are: [18 + 14 + 50 + 49] + [(5 − 34) − (lagged 5 − lagged 34)] − [(4–1) − (lagged 4 − lagged 1)].

statistical significance of the fundamentals or in their contribution to R^2 when cash flows are substituted for earnings.

4.3 RAW RETURNS

The regression analysis described above was replicated with raw returns substituting for excess returns. Overall, the value-relevance of the fundamental signals with respect to raw returns appears somewhat stronger than that for excess returns. For example, the average R^2 of the full model (6) over the 1980s, 0.17, is 140% higher than the "earnings alone" R^2, 0.07. With respect to the individual fundamentals, the *R&D* and the Audit Qualification signals are statistically significant at the 0.05 level (across all years), whereas they were insignificant with respect to excess returns (table 2).

4.4 SIZE EFFECTS

To examine whether the fundamentals proxy for firm size, we reran regression (6) adding a size variable—market value of equity (total capitalization) at year-end. While the firm size coefficient was statistically significant (0.08 level across years), none of the findings and conclusions reported above was affected.

4.5 ECONOMETRIC DIAGNOSTICS

Examination of the correlation matrix (Pearson and Spearman) for all the variables considered in this study reveals only four relatively large correlation coefficients. The change in earnings before tax is correlated with its components, Gross Margin (−0.35) and *S&A* Expenses (−0.24). The negative signs of these correlations result from the definition of the latter two signals as sales minus gross margin or *S&A* expenses. The other relatively large correlations are Gross Margin and *S&A* Expenses (−0.21), and Receivables with the Provision for Doubtful Receivables (0.35). Overall, then, multicollinearity does not seem to pose a serious problem in our analysis. White's [1980] heteroscedasticity test indicated that homoscedasticity cannot be rejected at conventional levels (alpha level of 0.05) for any year analyzed.

5. Conditioning the Analysis on Macroeconomic Variables

Previous research on the value-relevance of earnings and other fundamentals was generally conducted in an unconditioned (noncontextual) mode.[16] We now extend the preceding analysis to allow for different economic conditions, the importance of which is demonstrated by the following example.

Following analysts, we conjectured above that a disproportionate (to sales) increase in receivables conveys bad news. Yet, for a given receivables

[16] Wilson [1986] and Bernard and Stober [1989], on the value-relevance of cash flows vs. earnings, are among the few exceptions.

increase, the negative message is likely to be more pronounced as the rate of inflation increases. The reason is that since receivables' carrying costs increase with inflation, firms are expected to respond by decreasing the receivables level. Given an expectation of reduced receivables during inflation, an observed disproportionate increase of this item naturally conveys a stronger negative signal than an identical receivables change during a low-inflation period.

Three economic variables were chosen for the contextual analysis: (*a*) the annual change in the Consumers' Price Index (an inflation indicator), (*b*) the annual change in real *GNP* (a state-of-the-economy variable), and (*c*) the annual change in the level of Business Inventories (a business activity indicator). The 15 years examined (1974–88) were ranked by each economic variable and classified into three groups of five years each. Thus, for example, for the inflation variable, "group one" includes the five years with the lowest inflation rates during 1974–88, followed by "group two" with the five years of medium inflation, and "group three" with the five years having the highest inflation rates. The same low-medium-high classification of sample years was performed for the *GNP* and the business inventories variables (for details, see table 5, n. 1). We then ran regression (6) for each economic regime.

Table 5 presents coefficient estimates for the fundamental signals in the various inflation and *GNP* growth regimes.[17] If we consider the inflation classification first, the Accounts Receivable signal is, as predicted above, statistically significant only in high-inflation years, as is the Provision for Doubtful Receivables signal.[18] This inflation-specific value-relevance explains the relatively weak performance of the Receivables and the Doubtful Receivables signals in the *unconditioned* analysis (table 2). It also demonstrates the hazards of drawing inferences from an unconditioned (noncontextual) analysis, such as that the Doubtful Receivables signal is not value-relevant.

The inventory signal has a substantially larger (absolute) coefficient during high and medium inflation than in low inflation. This is expected since the carrying cost of inventories (e.g., interest) rises with inflation and firms are therefore expected to lower inventory levels. Thus, a disproportionately large inventory increase during inflation conveys a strong negative message to investors. The Order Backlog coefficient is

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[17] The fundamental signals exhibited only a few significant differences across inventory growth regimes, so they are not reported in table 5. We comment in the text on these differences.

[18] The analysis reported in table 5, pooled data for each economic regime, was also conducted over the pooled 15-year data with slope dummies for each of the 15 years examined. These "yearly" regressions corroborate the findings reported in table 5. The Accounts Receivable coefficient is negative and statistically significant (0.05 level) in *each* of the five high-inflation years, while it is significant in only three of the remaining ten years. The Doubtful Receivables coefficient is significant in three of the five high-inflation years, and in only one of the remaining ten years.

TABLE 5

Value-Relevance of Fundamental Signals Conditioned on Macroeconomic Variables (Coefficient Estimates from Regressions of Excess Stock Returns (R_i) on Price-Deflated Pretax Earnings Change (ΔPTE), and the 12 Fundamental Signals (S_{ji}) Defined in Table 1. For Each Economic Variable—Inflation, GNP Growth, and Business Inventories—the Fifteen Years Examined, 1974–88, Were Ranked and Classified into Three Groups of Five Years Each: High Values of the Variable, Median, and Low Values. The Regressions Were Run on the Pooled, Five-Year Data of Each Group. The Estimates for Business Inventories Are Not Presented in the Table, but Are Commented on in the Text.)

$$R_i = a + b_0 \Delta PTE_i + \sum_{j=1}^{12} b_j S_{ji} + v_i$$

	Inflation Rate[a]			*GNP* Growth[a]		
Independent Variable	High	Medium	Low	High	Medium	Low
Intercept	−0.026[2]	−0.068[2]	−0.038[2]	−0.080[2]	−0.070[2]	0.030[2]
ΔPTE	0.641[2]	0.623[2]	0.322[2]	0.587[2]	0.335[2]	0.684[2]
Inventory	−0.067[2]	−0.089[2]	−0.036[2]	−0.053[2]	−0.062[2]	−0.098[2]
Receivables	−0.142[2]	−0.016	0.012	−0.055[2]	0.017	−0.060[2]
Capital expenditures	0.007	−0.009[1]	−0.008	−0.012[2]	−0.002	0.006
R&D	−0.028	0.020	0.032	−0.019	−0.006	0.029
Gross margin	−0.306[2]	−0.307[2]	−0.458[2]	−0.297[2]	−0.479[2]	−0.369[2]
S&A expenses	−0.232[2]	−0.027	−0.361[2]	−0.028	−0.274[2]	−0.299[2]
Doubtful receivables	−0.042[1]	0.034	0.019	−0.006	0.024	−0.016
Effective tax	−0.459[2]	−0.614[2]	−0.240	−0.782[2]	−0.737[2]	−0.298
Order backlog	−0.081[2]	−0.109[2]	−0.150[2]	−0.116[2]	−0.112[2]	−0.124[2]
Labor force	−0.008	−0.130[2]	−0.077[2]	−0.077[2]	−0.109[2]	−0.004
FIFO–LIFO	−0.006	0.021[2]	−0.210[2]	0.052	−0.031[2]	−0.027[2]
Audit qualification	0.018	−0.045[2]	0.050	−0.035[1]	0.013	0.001

[1,2]Statistically significant at the 0.10 and 0.05 alpha levels, respectively. Based on one-tail *t*-test.

[a]The classification of years examined, 1974–88, into groups of High, Medium, and Low inflation rates and *GNP* growth is shown below. Annual percentage changes in parentheses.

	Low	Medium	High
Inflation	1983(3.2), 1985(3.6), 1986(1.9), 1987(3.6), 1988(4.1).	1976(5.8), 1977(6.5), 1978(7.6), 1982(6.2), 1984(4.3).	1974(11.0), 1975(9.1), 1979(11.3), 1980(13.5), 1981(10.3).
GNP Growth	1974(−0.5), 1975(−1.3), 1980(−0.2), 1981(1.9), 1982(−2.5).	1979(2.5), 1983(3.6), 1985(3.4), 1986(2.7), 1987(3.7).	1976(4.9), 1977(4.7), 1978(5.3), 1984(6.8), 1988(4.4).

The values of the economic variables were obtained from the *Economic Report of the President* (Washington, D.C.: United States Government Printing Office, January 1992).

increasing (absolute) with the decrease in inflation rate; the difference between the coefficients in the high- and low-inflation environments (−0.081 and −0.150) is statistically significant at the 0.05 level. This is expected; during high inflation, a given increase in the dollar value order backlog will reflect, among other things, a large inflationary component and therefore relatively low *real* sales growth relative to a similar backlog increase reported during low-inflation years. The latter, therefore, sends a stronger signal about future real performance to investors.

Regarding *GNP* growth regimes, the data in table 5 indicate that the coefficient of the inventory signal is lowest (absolute) in the high-growth years (the difference between the high- and low-growth inventory

coefficients, −0.053 and −0.098, is statistically significant at the 0.05 level). Apparently, during economic booms investors are more tolerant of disproportionate inventory increases. The capital expenditures signal is significant only in the high-growth years, suggesting that during economic expansion firms are expected to increase capital expenditures, and when this fails to materialize investors react negatively.[19] The regression coefficients of *S&A* Expenses decrease with the growth in *GNP* (the difference between the low- and high-growth regression coefficients, −0.299 and −0.028, is statistically significant at the 0.01 level). This probably reflects expectations about tight controls over expenses during recessions; when some firms fail to exercise such controls (as evidenced by the *S&A* signal), investors' reaction is particularly negative. The Labor Force signal is significant in the medium- and high-growth periods. These periods include the years 1983–88 (see bottom of table 5) which were characterized by numerous corporate acquisitions and restructurings, often accompanied by substantial employee layoffs.

The regressions for the inventory growth regimes (not reported in table 5) exhibit a few interesting regularities. The inventory signal coefficient is lowest (absolute) in the high inventory growth years (−0.044) and highest during low inventory growth (−0.080); the difference is statistically significant at the 0.01 level. This indicates the fact that during periods of high inventory growth, investors are more lenient toward inventory overruns. The coefficient of order backlog is higher in the high inventory growth years (−0.136) than during low inventory growth (−0.084); the difference is significant at the 0.05 level. Apparently, during periods of inventory growth, investors expect future business, reflected by order backlog, also to increase. When the Order Backlog signal fails to indicate such an increase, investors' negative reaction is particularly pronounced.

Finally, we examine *interactions* among economic regimes. Nine economic states were considered for the inflation and the *GNP* classifications: low inflation–low *GNP*, low inflation–medium *GNP*, . . . , high inflation–high *GNP*. Regression (6) was run on the 1974–88 pooled data with the fundamental signals having slope dummies for each of the nine states. In some cases this regression provided sharper results than the separate regressions reported in table 5. For example, the only state in which the Inventory signal was not statistically significant was the high *GNP*–low inflation state. The probable reason is that inventory overruns are tolerated (i.e., do not trigger a negative price response) only when the economy is expanding and the inflation rate is low (i.e., the carrying costs of inventory are small).

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[19] In the yearly analysis, we found three years with significant capital expenditures coefficients during the five high *GNP* growth years (in 1977, 1978, and 1988), while there was only one case of a significant coefficient during the remaining ten years (in 1975).

The high *GNP*–low inflation state also yields the largest and most significant Capital Expenditures coefficient. Apparently, when the economy is booming and the cost of capital is low, investors penalize firms that fail to keep up their capital expenditures with other firms in the industry. Medium *GNP*–high inflation is the only state where the *R&D* signal is significant. The Doubtful Receivables coefficient is largest and most statistically significant for the low *GNP*–high inflation state, probably because recession and high inflation lead to bankruptcies and loan defaults, so firms are expected to increase their doubtful receivables' provisions.

6. *Linking Research Strands: Fundamentals-Persistence-Response Coefficient*

The persistence of earnings has received considerable attention (e.g., Kormendi and Lipe [1987], Easton and Zmijewski [1989], Collins and Kothari [1989], and Thiagarajan [1989]). The main objective of the persistence research is to gain insight into differential investor reaction to earnings announcements. Indeed, estimates of earnings persistence, often derived from the time series of earnings or from revisions of analysts forecasts around earnings announcements, were found to be correlated with the size of the earnings response coefficient. Still unexplored, however, is the question of how investors operationally determine earnings persistence. It seems unlikely, for example, that they use *ARIMA* models for this purpose.

Our search of analysts' sources revealed repeated references to "quality of earnings," which seems to reflect in general analysts' perceptions of the degree of earnings persistence.[20] For example, *Value Line* [1973*a*] proposed to adjust reported earning to "quality earnings" by removing one-time (transitory) items and accounting for questionable items, such as interest capitalization. Our discussion in section 2 indicates that analysts use fundamentals to draw explicit inferences about the persistence of earnings. Thus, for example, an earnings increase accompanied by an order backlog buildup enhances confidence in the continuation of the earnings improvement, while an earnings increase brought about by a one-time effective tax rate decrease is unlikely to persist. Thus, a major use of the fundamentals is to allow investors to assess earnings persistence and growth.[21] The following tests are aimed at

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[20] On quality of earnings, see, for example, Bernstein and Siegel [1979], Siegel [1982], Comiskey [1982], Fabozzi [1978], Imhoff [1989], and Imhoff and Thomas [1989].

[21] There is, of course, a distinction between earnings persistence—the continuation of earnings at the current level—and growth. It is doubtful, however, whether at this stage we could clearly discriminate between fundamentals indicating persistence and those suggesting growth. The message in the fundamentals appears to reflect a combination of both patterns.

examining this conjecture, thereby linking our fundamental analysis to the earnings persistence and response coefficient literature.

6.1 FUNDAMENTAL SIGNALS AND THE RESPONSE COEFFICIENT

If the fundamental signals help to assess earnings persistence, then an aggregate "fundamental score," reflecting the combined message in the signals, should be associated with the earnings response coefficient: firms characterized by "high-quality" fundamental scores should exhibit large response coefficients relative to firms with "low-quality" scores. Accordingly, we constructed an *aggregate fundamental score* for each sample firm and year as follows: each of the fundamental signals listed in table 1 was computed for every firm and assigned a value of 1 for a positive signal and 0 for a negative signal. These numbers were then summed for each firm and year and standardized by the number of available fundamentals, to yield an aggregate fundamental score.[22] Recall that a positive value for a signal (e.g., an inventory growth larger than sales) implies "bad news," and vice versa for a negative number. Thus, low fundamental scores (0 at the limit) indicate high quality of earnings (persistence), while large fundamental scores imply low quality.

We divided the sample firms for each year into five groups, based on their aggregate fundamental scores. We then ran for each year the conventional, cross-sectional returns–earnings regression (expression 5) with slope dummies for each of the five score groups, to estimate the earnings response coefficient for each score (earnings quality) group. Table 6 presents the yearly earnings response coefficients for each score group, in descending order of earnings quality (i.e., in an increasing order of the aggregate score). For 12 of the 15 years examined the highest-quality (group 1) response coefficient is larger than the lowest-quality (group 5) response coefficient, and in 10 of the 12 years the difference is statistically significant (see *t*-values). Even more striking, in *each* of the 15 years examined, the response coefficient of the firms in group 5—the lowest-quality scores—is lower than the coefficients of either quality group 1 or 2.

The tendency of the earnings response coefficients in table 6 to decrease from the highest earnings quality group to the lowest is not strictly monotonic. This is probably due to the rather coarse nature of the aggregate fundamental score, in particular to the fact that the individual fundamental signals constituting the score are equally weighted. Thus, for example, the highly value-relevant order backlog signal (table 2) is equally weighted in the total score with the less value-relevant accounts receivables signal. Nevertheless, a clear association

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[22] All the conclusions drawn on the basis of the dummy-based score hold for a parametric aggregate score, based on the *actual values* of the signals, rather than on a 0, 1 dummy.

TABLE 6

Fundamental Signals and Earnings Response Coefficients
(Estimated Coefficients of Price-Deflated Annual Earnings Changes, from Regressions of Annual Excess Returns (R_i) on Earnings Changes (ΔE_i). Regressions Were Run for Each Sample Year (1974–88), with Slope Dummies (Response Coefficients) for Each of Five Groups of Firms Classified by the Aggregate Fundamental Score (AS_i). The Aggregate Fundamental Score Combines the 12 Signals Defined in Table 1 and Reflects the Quality-Persistence of Earnings.[a])

$$R_i = a + b_1\Delta E_i AS_{1i} + \ldots + b_5\Delta E_i AS_{5i} + u_i$$

Fundamental Score Group	1974	1975	1976	1977	1978	1979	1980	1981
1 (highest quality)	1.181	1.179	1.212	1.737	1.162	0.980	0.695	1.543
2	2.015	0.478	0.787	2.392	1.301	1.393	2.265	1.027
3	0.995	0.318	1.161	1.132	1.451	0.520	1.051	1.267
4	0.982	0.968	1.136	2.210	1.441	0.845	0.962	0.761
5 (lowest quality)	1.545	0.288	0.545	0.621	0.992	0.557	0.408	0.972
t-value of "high" minus "low"	−1.40	4.82[2]	3.20[2]	3.84[2]	0.87	2.21[1]	1.66[1]	2.61[2]

Fundamental Score Group	1982	1983	1984	1985	1986	1987	1988
1 (highest quality)	1.513	0.757	0.436	0.559	0.495	0.623	1.944
2	0.863	1.354	1.237	0.696	0.315	1.094	2.528
3	0.807	1.056	0.658	0.805	0.782	0.773	1.669
4	1.251	0.396	0.400	1.145	0.448	0.955	0.264
5 (lowest quality)	0.442	0.324	0.848	0.500	0.109	0.653	0.578
t-value of "high" minus "low"	5.60[2]	2.02[1]	−2.01	0.40	2.82[2]	−0.19	4.13[2]

[1,2]Statistically significant at the 0.05 and 0.01 alpha levels, respectively.
[a]Total number of observations in the yearly regressions ranges between 681 and 1,495.

exists between the message conveyed by the fundamentals and the earnings response coefficient, indicating that the fundamentals are used by investors to assess the persistence of earnings.

Given that earnings persistence is sometimes estimated from the time series of earnings, we wished to compare the ability of the fundamentals to indicate persistence with that of time-series measures. Accordingly, the Kormendi and Lipe [1987] time-series persistence measure was computed for each sample firm over the period 1970–88. The aggregate fundamental score is, however, year-specific, so we chose the median yearly score to represent the fundamentals during the 1970–88 period for each sample firm. We then ranked the sample firms first by their median fundamental score, reflecting the quality of earnings, and then by their time-series persistence measure, and formed four groups of firms: High Quality–High Time-Series persistence (*HQ–HT*),[23] High

[23] "High" refers to the top 20% of the firms in the quality persistence dimension and "low" refers to the bottom 20%. The choice of the top/bottom 20% to represent high/low quality was made to improve the power of the tests. The analysis was repeated by redefining high/low as the top/bottom third with no change in results.

Quality–Low Time-Series (*HQ–LT*), Low Quality–High Time-Series (*LQ–HT*), and Low Quality–Low Time-Series (*LQ–LT*). The returns–earnings regression (5) was then run for each of these four groups (pooling the data over 1974–88), yielding four earnings response coefficients presented in table 7.

The differences between the earnings response coefficients of the high- and low-quality (fundamental scores) groups (3.241 vs. 0.662 and 2.663 vs. 0.492) are large and statistically significant (at the 0.01 level), whereas the differences along the high–low time-series persistence dimension (3.241 vs. 2.663 and 0.662 vs. 0.492) are much smaller and statistically insignificant (at the 0.05 level). This suggests that the fundamental signals, as reflected by the quality scores, capture more fully investors' assessment of the persistence of earnings (indicated by the response coefficient) than does the time-series persistence measure. Furthermore, the fundamental signals can be estimated on a timely basis—quarterly or annually—rather than from a long and sometimes unstable time series of earnings.

6.2 FUNDAMENTAL SIGNALS AND FUTURE EARNINGS

The tests performed so far in this study related fundamentals to stock returns. We conclude with a test relating the fundamental-based quality scores to subsequent earnings changes. This is yet another test of the extent to which the fundamental signals reflect the quality of earnings in terms of persistence and growth. For this test we classified the sample firms (pooled over all years) into five portfolios according to the size of the most recent earnings change (year $t - 1$).[24] We thus condition on earnings surprise (change) holding it approximately constant, and partition the observations within each earnings surprise portfolio into three earnings quality classes (high, median, and low), where quality is measured by the aggregate fundamental score described above. For each earnings surprise and quality group, we compute the *subsequent* earnings growth over one, two, and three years. If the fundamental quality scores reflect earnings persistence and growth, one should observe a higher subsequent growth in the high-quality groups than in the low-quality groups. In fact, if low quality indicates that current earnings are largely transitory, we should observe a reversal of earnings growth in the subsequent periods.

The data in table 8 generally confirm these expectations. In each row of the table, the earnings growth of the high-quality (*HQ*) groups is larger (more positive) than that of the low-quality (*LQ*) growth (except for the three-year growth for the low earning change group). In most of the cases, the difference between the high- and low-quality

[24] The earnings change was measured as $(E_t - E_{t-1})/|E_{t-1}|$, where E = annual *EPS*. While in the previous tests we used stock price to deflate the earnings change, we use here $|E_{t-1}|$ to abstract from any effects of the stock market.

TABLE 7

Response Coefficients for Firms Classified by Fundamental Scores and Time-Series Persistence Measures (The Pooled Sample Firms (1974–88) Were First Ranked on a Time-Series Measure of Earnings Persistence and Then Ranked on Their Aggregate Fundamental Quality Score Measure. The Firms Were Then Classified into Four Groups According to High–Low Time-Series Persistence and Quality Score Measures (High and Low Refers to Top/Bottom 20% of the Ranking). The Numbers in the Table Are the Earnings Response Coefficients from Regressing Excess Stock Returns on Annual Earnings Changes for Firms within Each of the Four Groups.)

		Fundamental Earnings Quality	
		High	Low
Time-Series Persistence	High	3.241	0.662
		(3.63)[a]	(7.48)
	Low	2.663	0.492
		(4.63)	(4.39)

[a]*t*-values.

TABLE 8

Fundamental Signals and Subsequent Earnings Changes (Sample Firms, Pooled over Years (1974–88), Were Classified into Five Groups according to the Size of Current Year's Earnings Change (Relative to Last Year). Within Each of These Five Groups, the Firms Were Classified into Three Earnings Quality Groups according to the Firms' Aggregate Fundamental Score: High, Medium, and Low Quality. The Numbers in the Table Are the Average One- to Three-Year-Ahead Earnings Changes for Each Group of Current Earnings Change and Earnings Quality.)

Current Year's Earnings Change	Subsequent Earnings Changes[a]								
	One Year Ahead			Two Years Ahead			Three Years Ahead		
	HQ[b]	*MQ*[b]	*LQ*[b]	*HQ*	*MQ*	*LQ*	*HQ*	*MQ*	*LQ*
Low	2.08	1.33	1.86	−0.80[2]	−1.11	−1.77	−0.61	−0.76	−0.36
Medium 1	0.20[2]	−0.37	−0.46	0.12[2]	−0.43	−0.56	0.04[2]	−0.30	−0.49
Medium 2	−0.03[2]	−0.04	−0.26	0.10[1]	0.10	−0.10	0.17	0.12	0.08
Medium 3	0.12[2]	−0.09	−0.38	0.36[2]	0.18	−0.03	0.48[2]	0.29	0.21
High	0.07	−0.16	−0.26	2.78	2.02	2.43	1.63	1.76	1.06
All cases	0.49[2]	0.13	0.10	0.51[1]	0.15	−0.01	0.34	0.22	0.10

[1,2]The difference between the *HQ* and the *LQ* growth rates is statistically significant at the 0.05 and 0.01 alpha levels, respectively.

[a]The earnings change is defined as the change in subsequent earnings divided by the absolute value of the prior period's earnings, see n. 24 in the text.

[b]*HQ*, *MQ*, and *LQ* are high, medium, and low quality of earnings, respectively, measured by the aggregate fundamental score obtained from aggregating for each firm the signals defined in table 1. *HQ*, *MQ*, and *LQ* include one-third each of the sample firms.

growth rates is statistically significant, at the .05 level or better. For example, for "all cases" (bottom line of table 8), the one-year growth rate of firms with high-quality scores, 0.49, is significantly larger than the growth rate of the low-quality firms, 0.10.[25] Also as expected, the earnings changes of the low-quality (transitory earnings) groups are in most

[25] The grouping of firms in table 8 into five classes of earnings change and three quality classes is, of course, arbitrary. Experimentation with several alternative number of classes yielded results similar to those in the table.

cases negative (earnings reversals), indicating that the fundamental score captures the transitory component of earnings. The fundamental signals are thus associated in the expected direction with future earnings changes, and as such reflect the persistence of earnings.

7. *Concluding Remarks*

This study is aimed at extending and linking several lines of investigation in capital markets accounting research. In particular, we focus on the areas of value-relevant fundamentals, contextual (conditioned) returns–fundamentals analysis, and the relation among fundamentals, earnings persistence, and the earnings response coefficient. Our identification of value-relevant fundamentals in this study differs from previous attempts in that it was guided by analysts' descriptions rather than by a statistical search procedure. This study also differs from others in conditioning the fundamentals on macrovariables. As expected, such a contextual analysis provides several insights which go unnoticed in an unconditioned analysis. Essentially, we find most of the examined fundamentals to be value-relevant during the period 1974–88.

The fundamentals identified as value-relevant in the first stage of the study were used to link the research on nonearnings information with that on the persistence of earnings and the response coefficient. This was done by hypothesizing that investors use the fundamentals to assess the extent of earnings persistence and growth. We validated this hypothesis by demonstrating a statistically significant relation between an aggregate fundamental score, indicating the quality of earnings, and the earnings response coefficient. The hypothesis was further corroborated by demonstrating a relation between firms' fundamental scores and subsequent earnings growth.

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