Modeling Sustainable Earnings and P/E Ratios with Financial Statement Analysis

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Abstract

This paper provides a structured financial statement analysis that informs about the sustainability (or persistence) of earnings and the P/E ratio. The P/E ratio measures the amount that investors pay for a dollar of current earnings. Investors buy future earnings, so should pay less for current earnings if the earnings cannot be sustained in the future. If earnings are temporarily high, investors should pay less per dollar of earnings than if earnings were temporarily depressed. While income statements identify some transitory items, the investor is still left with uncertainty as to whether the remaining earnings are sustainable. This paper estimates a model that supplies probabilities of the sustainability of earnings. The model aggregates information in the financial statements into a composite score that serves as a "red flag" about the sustainability of earnings. In out-of-sample prediction tests, the scoring reliably identifies non-sustainable earnings, and also explains cross-sectional differences in P/E ratios. The paper also finds that stock returns are predictable when traded P/E ratios differ from a line fitted to sustainable earnings scores. So, the analysis either points investors to stocks with different risk (and thus different expected returns) or to stocks where earnings are mispriced given the information about their sustainability.

Modeling Sustainable Earnings and P/E Ratios Using Financial Statement Information

When analysts talk of sustainable earnings, they presumably have forecasting in mind; they question whether current earnings will persist in the future. Researchers, too, attempt to distinguish persistent and transitory earnings, and test whether the two are priced differentially. Yet the identification of sustainable (or persistent) earnings, as a practical matter, is not at all clear. Various measures of "pro forma" earnings have been proposed to indicate sustainable earnings, but each measure draws criticisms. This paper presents an empirical model of sustainable earnings based on information in financial statements. If, by "quality earnings," one means earnings that can be sustained in the future, our analysis is an exercise in developing diagnostics for assessing the quality of earnings.

Investors buy earnings, it is said. But investors pay less for current earnings if they are not sustainable, for it is future earnings that they are really buying. When earnings are temporarily high, so are expected to decline in the future, P/E ratios should be lower than if earnings were sustainable. When earnings are temporarily depressed, so are expected to increase, P/E ratios should be higher than if earnings were to be sustained at their current level. So a model of sustainable earnings also models the P/E ratio. Indeed, we find that sustainable earnings indicated by our model explain cross-sectional differences in P/E ratios. However, we also find that deviations of traded (market) P/E ratios from those implied by our model predict future stock returns, indicating that the stock market does not correctly price the information in financial statements about the sustainability of earnings.

Financial statement presentation provides some help in identifying sustainable earnings. In the United States, extraordinary items and discontinued operations are reported on a separate line, and some transitory gains and losses are differentiated as "other comprehensive income." Diligent reading of financial statement footnotes discovers other (presumably) one-time items such as gains and losses from assets sales, restructuring charges, reversals of restructuring charges, asset write-downs and impairments, currency gains and losses, and changes in estimates included in pension expense. The analyst, with some confidence, identifies these items as unsustainable. But, after excluding these items from sustainable earnings, he still has doubts about whether remaining earnings will persist. He may observe a reduction in allowances for bad debts (that increases earnings), but is the reduction a temporary or permanent change? Is a decrease in research and development expenses relative to sales (that increases earnings) temporary or permanent? What is the investor to make of increasing profit margins on slowing sales growth? A decrease in the deferred tax valuation allowance? These features are often considered "red flags" but their interpretation is usually unclear. Faced with these uncertainties, the investor takes on additional risk in relying on current earnings. With the quality of earnings so in doubt these days, the issue takes on particular importance.

Risk is reduced by information. The analyst can perhaps resolve these red flag questions by a more contextual analysis, by getting closer to the business (to understand credit problems with accounts receivable or to evaluate the R&D program, for example). To the extent that issues cannot be resolved, he takes a probabilistic approach and assesses the likelihood of earnings being unsustainable given the information available to him. He then builds these probabilities into his assessment of risk and into his investment decisions: he pays less for a dollar of earnings, the higher the probability that the earnings will not persist. We build a model based of financial statement information that supplies the probabilities. We then examine how these elicited probabilities help in determining the price paid per dollar of earnings, the P/E ratio. But we take it a step further, and ask whether the information about the sustainability of earnings predicts stock returns. The answer is in the affirmative. So, either that information leads investors to take on different risks (with different expected returns) or leads investors to stocks where the risk of paying too much (or selling for too little) is not appropriately assessed in the market.

1. Background and Point of Departure

The paper builds on previous research, so it is important to distinguish its point of departure. The paper involves earnings forecasting. The paper models the P/E ratio. And the paper uses fundamentals as screens in stock investing. All three have been a preoccupation of both researchers and practitioners. So we introduce the paper under these three headings.

1.1 Earnings Forecasting and Earnings Persistence

Assessing earnings persistence is a form of earnings forecasting that takes current earnings as a starting point to develop forecasts. Research on earnings forecasting in the modern era begins with Ball and Watts (1970) where current earnings are seen as the starting point for forecasting, but are depicted as following a martingale process, and thus sustainable. Subsequent research modifies this view. Some papers take the path of estimating persistence parameters from earnings time series, in the mode of Komendi and Lipe (1987). Other papers defer to accounting information beyond past earnings for indications of persistence. Our paper is in the latter tradition.

Freeman, Ohlson and Penman (1982) showed that by adding just one line item – book value – to current earnings, future earnings changes are probabilistically predictable; if earnings are high relative to book value, earnings are likely to be temporarily high, and if earnings are low relative to book value, they are likely to be temporarily low. Ou and Penman (1989a) involved further financial statement ratios in forecasting changes in earnings. Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997) consider fundamental measures popular with analysts. Lipe (1986) and Fairfield Sweeney and Yohn (1996) showed that line-item analysis of the income statement improves forecasts. Sloan (1996) showed that accrual earnings have a different persistence than cash earnings and Richardson, Sloan Soliman and Tuna (2002) extend that analysis to various components of accruals. Chan, Chan, Jagadeesh and Lakonishok (2001) report similar findings. Fairfield and Yohn (2001) report that a Du Pont decomposition of operating profitability improves forecasts of changes in profitability in the future, and Fairfield, Whisenant and Yohn (2001) applied financial statement measures of growth to the assessment of persistence. Penman and Zhang (2002) designed metrics to identify temporary earnings that result from the creation and release of hidden reserves from applying conservative accounting.

Our paper builds in elements of these papers in a synthesizing effort to build a parsimonious model of sustainable earnings, and to bring financial statement analysis to the evaluation of P/E ratios. However the modeling is not just an exercise in discovering what works in the data, as in Ou and Penman (1989a), for example. Nor does it defer to what analysts are using as a test of expert systems, as in Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997). Rather, the paper is a structured exercise in financial statement analysis.

First, the modeling exploits the structure of financial statements. Fixed accounting relations tie line items to each other, so transitory effects in earnings affect other elements of the financial statements, leaving a trail to be analyzed. Utilizing these relations, we try to supply an answer to the question: How would one use the structure of the financial statements to elicit information about the sustainability of earnings in a systematic way?

Second, by imbedding accounting relations that tie the financial statements together, we examine items jointly, as a composite, and show that the interpretation of particular items depends on other items in the statements. Financial statements are to be read as a whole. So, for example, changes in profit margins and asset turnovers yield different signals depending on the joint realization of the two; the interpretation of growth in assets depends on reported sales growth; as growth in operating assets is always equal to cash investment plus accruals, the implication of asset growth for the sustainability of earnings depends on cash investment and accruals, and the interpretation of both cash investment and accruals is conditional upon the growth in sales. Accordingly, disputes as to the relative importance of variables that must be correlated because of the way that accounting measurement works -- accruals and growth in the discussion between Sloan (1996), Fairfield, Whisenant and Yohn (2001), and Richardson, Sloan, Soliman and Tuna (2002), for example -- are resolved.

The output of our modeling is a composite score regarding the sustainability of earnings. The modeling is rewarding. Even though we estimate models on data pooled over firms (without allowance for differences between industries and other conditions) we find that, for firms initialized on their rate of return on operating assets (after removing extraordinary and special items), the average difference between the one-year-ahead rate of return for firms with the highest and lowest 33⅓% of scores is 4.1%.

1.2 Price-Earnings Ratios

A considerable amount of research has evaluated how the pricing of earnings is related to the persistence of earnings. In the tradition of Komendi and Lipe (1987) and Easton and Zmijewski (1989), the metric has been the "earnings response coefficient," that is, the relationship between earnings innovations and stock returns. Investors, however, talk in terms of price-earnings ratios, not earnings response coefficients, so we investigate the relationship between the persistence of earnings – as determined by financial statement analysis – and P/E ratios.

It is fair to say that there has not been much research into how financial statement analysis aids in the determination of P/E ratios. The P/E ratio is commonly viewed as indicating expected earnings growth, but is also affected by transitory current earnings, an effect that fundamental analysts once referred to as the "Molodovsky effect" from Molodovsky (1953). Indeed, Beaver and Morse (1978) and Penman (1996) have shown that P/E ratios, while positively related to future earnings growth, are also negatively related to current earnings growth, demonstrating empirically that transitory current earnings affect the P/E ratio. Ou and Penman (1989b) found that accounting fundamentals explain P/E ratios, but only by dredging data. Here we approach the question more formally and build a structured model of the P/E ratio that incorporates the idea that one should pay less for unsustainable earnings.

1.3 Fundamental Screening

Screening on price multiples is common investment practice for identifying under- and over-priced stocks. Low multiples are considered "buys," high multiples, "sells." Academic studies provide some justification, although warn that such screening may simply be trading on risk. Basu (1977) was the first study, we believe, to document the "P/E effect."

Trading on simple multiples not only runs the risk of loading up on a risk factor, but also runs the risk of paying too much for a stock. Simple screens ignore information, so trading on simple screens runs the risk of trading with someone who has analyzed more information. A low P/E might indicate an underpriced stock, but a low P/E stock can also be overpriced (because earnings have non-sustainable components that are not recognized, for example). Our analysis adds information to the simple P/E screen. We first estimate the appropriate P/E that is implied by an estimate of sustainable earnings and then, for the purpose of a trading strategy, identify P/E ratios where the pricing differs from that implied by this estimate.

Recent studies (Lakonishok, Shleifer and Vishny 1994, for example) entertain screening on more than one fundamental characteristic. Our analysis, in effect, develops a screen based on a variety of financial statement characteristics: the P/E ratio is combined with financial statement information to screen stocks. The paper not only indicates how relevant information might be identified from financial statements, but also how pieces of information are combined in a composite screen. A score summarizes the information, so the paper also contributes to research on financial statement scoring, in a similar way to Altman (1968) (scoring the likelihood of bankruptcy), Beneish (1999) (scoring the likelihood of earnings manipulation), Piotroski (2000) (scoring financial distress for high book-to-market firms), and Penman and Zhang (2002) (scoring the effects of conservative accounting on earnings). We then assess the contribution of each piece of information to predicting stock returns.

2. Characterizing Sustainable Earnings

Earnings are composed of operating income and income and expenses from financing activities. Financing components of earnings are sustained by the amount of net debt reported on the balance sheet and the effective borrowing rate. As both are readily available in financial reports, or can be approximated, issues of sustainability are readily resolved. So we focus our attention on the sustainability of operating income.

Operating income is sustained by investment in assets, and operating income is expected to increase with new investment. So, in assessing the sustainability of operating income, one needs to adjust for changes in income arising from changes in investment. Asset growth is reported in a comparative balance sheet. Growth in operating income (OI) in any year, t+1 from the prior year, t is determined by additions to net operating assets (operating assets minus operating liabilities) in the balance sheet for the prior year t and the change in the profitability of net operating assets from year t to t+1:

$$OI_{t+1} = OI_t + RNOA_{t+1} \cdot NOA_t - RNOA_t \cdot NOA_{t-1}, \qquad (1)$$

where NOA_t and NOA_{t-1} are ending and beginning net operating assets for the period ending date t, $RNOA_t$ is return on net operating assets in place at the beginning of period t, OI_t/NOA_{t-1}, and $RNOA_{t+1}$ is one-year-ahead return on net operating assets in place at the end of the period t, OI_{t+1}/NOA_t.

We represent sustainable income as follows. Set the current date as date 0. Current operating income, OI_0 is sustainable if, for all future periods, operating income is forecasted as

$$OI_{t+1} = OI_t + RNOA_0 \cdot \Delta NOA_t, \qquad (2)$$

where $\Delta NOA_t = NOA_t - NOA_{t-1}$. That is, current income is sustainable if expected future additions to net operating assets are expected to earn at the same rate as current RNOA. When current income is sustainable, forecasting future operating income involves forecasting only growth in net operating assets.

Ideally one would like to model profitability for many years in the future. However, when estimating expectations from (ex post) data, survivorship is likely to be a problem for more distant future periods. We limit our investigation to indicating changes in RNOA just one year ahead. If current income is sustainable one year ahead, expected operating income is given by

$$OI_1 = OI_0 + RNOA_0 \cdot \Delta NOA_0. \qquad (2a)$$

That is, current income is sustainable if current additions to net operating assets are the only reason for an expected increase in income. In this case, growth in net operating assets, ΔNOA_0, is observed (in the current comparative balance sheet), so does not have to be forecasted. Indeed it is information to aid forecasting. Unsustainable income is ascertained by forecasting that $\Delta RNOA_1 = RNOA_1 - RNOA_0$ is different from zero. So $\Delta RNOA_1$ is the variable we model.

Identifying the current change in net operating assets as information has an important bearing on the modeling. Provided that no operating income, operating assets, or operating liabilities are booked to equity, the clean surplus relation for operating activities holds:

$$OI_0 = \text{Free Cash Flow}_0 + \Delta NOA_0.$$

So, by the principles of accounting measurement, the current change in net operating assets determines the sustainability of current operating income and current profitability, $RNOA_0$. Sustainable income in (2a) is a particular choice of accounting for ΔNOA_0 that, for a given free cash flow, produces an $RNOA_0$ and the interaction, $RNOA_0 \cdot \Delta NOA_0$ that yields sustainable income. And, for a given free cash flow, income is made unsustainable by the measurement of ΔNOA_0. So our analysis brings a focus to the comparative balance sheet.

3. A Model of the P/E Ratio

Trailing P/E ratios are determined by expected growth in earnings from current earnings.[1] The amount of that growth – and the amount that an investor should pay for earnings, the (intrinsic) P/E ratio -- is affected by the sustainability of current earnings. The logic runs as follows. If current earnings are temporarily high because of transitory components, earnings are expected to decline, so the P/E ratio is lower than if earnings were sustainable; the investor pays less for the earnings. Correspondingly the P/E ratio is higher if current earnings are temporarily depressed, because growth in earnings is then expected; the investor pays more for earnings.[2]

In defining sustainable income, we have distinguished earnings growth that comes from changes in the rate of return on net operating assets from earnings growth that comes from growth in net operating assets. Our analysis forecasts changes in the rate of return and incorporates the effect of current growth in net operating assets, ΔNOA_0. However, P/E ratios (and long-term earnings growth) are also determined by expected asset growth for future periods as well. We have no forecast of future asset growth. Recognizing, from Nissim and Penman (2001), that growth in net operating assets is mean reverting, we model the average future growth rate in net operating assets as a weighted average of the current observed growth rate and an expected long-term growth rate: average growth rate of NOA = k$\cdot$current growth rate of NOA + (1-k)$\cdot$long-term growth rate of NOA.

Accordingly, rather that identifying sustainable earnings with a forecast of growth in net operating assets for each period in the future, as in (2), sustainable earnings are identified as the current profitability applied to this expected average growth rate in net operating assets. We model the E/P as determined by sustainable profitability, $RNOA_0$ applied to this average growth rate and an instrument for unsustainable profitability, $\widehat{\Delta RNOA_1}$ determined from the financial statement analysis:

$$\text{Unlevered } (E/P)_0 = a + b_1 \widehat{\Delta RNOA_1} + b_2 RNOA_0 \cdot [kG_0^{NOA} + (1-k)\cdot G_L^{NOA}] + e_0 \qquad (3)$$

The second term is the sustainable income forecast that applies current profitability, $RNOA_0$ to the average expected growth rate in net operating assets. G_0^{NOA} is the current growth rate in net operating assets, $\Delta NOA_0/NOA_{-1}$, and G_L^{NOA} is the corresponding long-term forecasted growth rate. We estimate the model in E/P ratios rather than P/E ratios to avoid difficulties with small and negative denominators. We model the unlevered P/E ratio, price-to-operating income, rather than the standard (levered) P/E, price-to-net earnings, because our analysis of sustainable income applies to operating income (without leverage effects) and the standard P/E is affected by leverage. Formulas tie the levered P/E to the unlevered P/E (see Penman 2001, chapter 16); the analysis extends to one of the unlevered P/E by straightforward application of those formulas.

The E/P model (3) requires a measure of the long-term growth rate. However, the model can be restated as

$$\text{Unlevered } (E/P)_0 = a + b_1 \, \Delta\widehat{\mathbf{RNOA}}_{\mathbf{1}} + b_2 RNOA_0 \cdot G_0^{NOA} + b_3 RNOA_0 + e_0 \quad (4)$$

where $b_3 = b_2(1\text{-}k) \cdot G_L^{NOA}$. So, in estimating the model with observed E/P ratios, the forecasted long-term growth rate implicit it market prices, is estimated in the b_3 coefficient.

After developing the financial statement instrument for sustainable earnings in the next section, we estimate model (4) in the cross section in Section 5. As P/E ratios vary, in principle, with the cost of capital (see the references in footnote 1), one might also include the cost of capital as a determinant of cross-sectional differences in E/P ratios. However, there are good reasons not to. First, reliable estimates of the cost of capital are not available. Second, we know of no empirical study that has documented a relationship between P/E ratios and the cost of capital. This is presumably so, not only because cost of capital estimates are imprecise, but because the variation in P/E ratios due to differences in the cost of capital is small relative to the variation due to differences in earnings expectations. We estimate the model within industries where the differences in the cost of capital are likely to be even smaller. Third, Beaver and Morse (1978) document that the relationship between CAPM beta and P/E ratios varies from year to year, depending on up markets and down markets. They argue persuasively that one expects this because of a relationship between beta and transitory earnings: “Stocks’ earnings move together because of economy-wide factors. In years of transitorily low earnings, the market-wide P/E will tend to be high, but stocks with high betas will tend to have even higher P/E ratios because their earnings are most sensitive to economy-wide events. Conversely, in years of transitorily high earnings, high beta stocks will have even lower P/E ratios than most. Therefore we expect a positive correlation (between beta and P/E) in ‘high’ P/E years and a negative correlation in ‘low’ years” (page 70 and appendix). We wish to identify transitory earnings through financial statement analysis rather than beta. Fourth, beta might be related to over or under pricing of transitory earnings: high beta firms might be those where the market overreacts to transitory earnings (in up and/or down markets).

The residual in the E/P model, e_0, represents information outside our analysis about sustainable earnings, as well as differences in E/P ratios due to the cost of capital. Fitting to traded P/E ratios, errors from the line will also include market mispricing, so observed errors can be a basis for taking positions in stocks. We therefore investigate whether deviations from the line predict stock returns. As expected stock returns are determined by the cost of capital and the specified model omits the cost of capital, our return prediction tests are sensitive to this omission.

4. Developing and Estimating the Model of Sustainable Earnings

Return on net operating assets (RNOA) is a summary measure of profitability that aggregates all line items in the financial statements that deal with operations, both operating income and net operating asset items. We view the financial statements as reporting earnings (and RNOA), but also further line item information that provides a commentary of whether earnings can be sustained. So our *modus operandi* is to investigate how analysis of the line items involved in (current) $RNOA_0$ informs about the persistence of $RNOA_0$ into the future, and to develop an instrument that summarizes financial statement information about that persistence. Our modeling is developed step by step, adding features of the financial statements one at a time so that the contribution of each feature to forecasting changes in RNOA can be identified at each step. We estimate models using all firms; estimating models for specific industries (where operating characteristics are similar) would be an enhancement. Accordingly, our models are coarse first cuts at the problem.

Models are estimated each year, 1976 - 1999 from the cross-section of NYSE, AMEX and NASDAQ firms on COMPUSTAT files, including non-survivors. Financial firms, firms with "unclassified" industries on COMPUSTAT, and firms listed outside the United States are excluded, as are firms with negative net operating assets. To avoid firms with extreme growth due to large acquisitions, we excluded firms in a given year that had sales increases or decreases larger than 50%. The number of remaining firms in each year ranges from 2,232 in 1980 to 3,592 in 1996. Firms with the highest one percent and lowest one percent of variables in the analysis are excluded, though our results are not particularly sensitive to this truncation point. A number of models (with differing numbers of variables) are estimated in the paper, but with the same firms in a given year in each case, for comparability. Results are similar when models are estimated from all firms having data for the variables in a particular model.

We measure net operating assets from COMPUSTAT data following procedures in the appendix of Nissim and Penman (2001). Operating income is after tax (with an allocation of taxes between operating and financing activities), but before items classified by COMPUSTAT as interest income, non-operating income and expense, special items, and extraordinary items and discontinued operations.[3] We also excluded operating items in "other comprehensive income" (such as foreign currency translations gains and losses and unrealized gains and losses on equity investments) because we deemed them transitory. We would like to have made a more comprehensive exclusion of identifiable transitory items, but COMPUSTAT classifications are not refined enough for that purpose.

We employ two estimation techniques, ordinary least squares (OLS) and LOGIT. The former uses all the information in the variation of $\Delta RNOA_1$ and delivers a forecast that is a point estimate, but relies on normality, a doubtful assumption with accounting data; one can observe sizable t-statistics in sample but poor predictive ability out of sample. The LOGIT binary response model fits to two outcomes, $RNOA_1$ increases and $RNOA_1$ decreases, and delivers a score between zero and one that has the simple interpretation of the probability of an increase in profitability. For sustainable earnings, that probability is 0.5. We refer to this probability as an S score (an earnings sustainability score).

Our out-of-sample prediction tests involve assessing how this S score forecasts changes in RNOA. Predictions are made for 21 years, 1979 –1999, based on average coefficients estimated over the three prior years.

4.1 Benchmark Models of Persistence of RNOA

As our approach is cross-sectional, sustainability is assessed by reference to averages in the cross section. We first estimate models that use the RNOA summary measure alone, to provide a benchmark against which to evaluate the additional information in financial statements.

The model building begins with the observation (in Beaver 1970 and Freeman, Ohlson and Penman 1982, for example) that accounting rates of return are typically mean reverting in the cross section. The following model captures typical regression over time to a long-run level of profitability, $RNOA^*$. It mirrors the fade diagrams for RNOA in Nissim and Penman (2001):

$$RNOA_1 - RNOA^* = \alpha + \beta(RNOA_0 - RNOA^*) + \varepsilon_1. \quad (5)$$

(Firm subscripts are understood.) This mean reversion has been attributed to both economic factors (competition drives abnormally high profits down and adaptation improves poor profitability) and to accounting factors. Similar to Fama and French (2000) who also model the evolution of accounting rates of return, we combine cross-sectional and time-series aspects of RNOA in a model of partial adjustment to long run profitability:

$$\Delta RNOA_1 = \alpha + \beta_1(RNOA_0 - RNOA^*) + \beta_2\Delta RNOA_0 + \varepsilon_1. \quad (6)$$

We estimate models (5) and (6), with RNOA* assumed to be the same for all firms. Including industry effects would presumably improve the specification for long-run profitability is likely to be similar within an industry. Fama and French estimate long-run profitability using non-accounting information (including stock price information), but we wish to confine ourselves to accounting information (and certainly do not want to include price information!). Fama and French also estimate a model with long-run profitability set to zero, and it is this benchmark that we adopt here. (Later we allow for differences in long-run profitability that are due to accounting factors.) In estimating model (6), Fama and French include terms that allow for nonlinearities in the reversion dynamics, so the table reports results for model (6) estimated with and without the Fama and French variables for modeling nonlinearities. Those variables are an indicator, ncp_0 ("negative change in profitability") that takes a value of 1 if $\Delta RNOA_0$ is negative and zero otherwise, $sncp_0$ ("squared negative change in profitability") which equals $\Delta RNOA^2$ when $\Delta RNOA$ is negative and is zero otherwise, and $spcp_0$ ("squared positive change in profitability") which equals $\Delta RNOA^2$ when $\Delta RNOA$ is positive and is zero otherwise.

Table 1 gives coefficient estimates from estimating models (5) and (6), the latter with and without the Fama and French nonlinearity variables added. The results for OLS estimations are in Panel A, those for LOGIT in Panel B. Reported coefficients are means of estimates for each of the 24 years in the sample period. The t-statistics are these mean coefficients relative to their standard error estimated from the time series of estimated coefficients. Any autocorrelation in coefficients would bias these standard errors, but reliably estimating the serial correlation from 24 observations is problematical. Fama and French (2001) suggest that, if the first-order serial correlation is 0.5, requiring a t-statistic of 2.8 rather than the conventional 2.0 is appropriate to infer reliability. Mean goodness-of-fit statistics, R^2 for OLS and the likelihood ratio index for LOGIT estimation, are also reported in the table, along with mean rank correlations of in-sample and out-of-sample actual values of $\Delta RNOA_1$ with fitted values for OLS and S scores for LOGIT.

The negative coefficient estimates on $RNOA_0$ confirm the mean reversion in RNOA. Adding $\Delta RNOA_0$ improves the fit somewhat, as do the nonlinearity terms, but the in-sample and out-of-sample predictive rank correlations are quite similar for the three models. Panel B reports (in the third last row) the percentage of correct out-of-sample predictions of one-year ahead $\Delta RNOA_1$, with S > 0.5 predicting an increase and S < 0.5 predicting a decrease. The second last row gives the percentage of firms with S > 0.6 and S < 0.4, and the last row gives the prediction success for these firms. One expects 50% correct predictions if there is no prediction success. Chi-square statistics for a two-by-two comparison of predictions with outcomes are significant at the 0.01 level. The prediction success varies little over the three models.

4.2 Modeling Persistence of RNOA with Financial Statement Analysis

Fama and French limit the information to past RNOA and bring the modeling of nonlinearities to bear on forecasting. We, rather, expand the information set to include financial statement measures beyond RNOA to model the RNOA dynamics. Accordingly we assess whether financial statement variables added to model (6) explain the persistence of RNOA beyond that explained by the central tendency in the cross section and the typical time-series persistence of changes in RNOA.

Separating the Persistence in Sales from Persistence in Expenses: Decomposing ΔRNOA

The analysis of line items starts with an elementary decomposition of the income statement. Operating income (in the numerator of RNOA) is determined by sales (revenue) minus operating expenses, so the persistence of operating income is determined by the persistence of sales (revenue) and the persistence of operating expenses. The Du Pont decomposition separates these two components. The decomposition breaks out $RNOA_0$ (OI_0/NOA_{-1}) into operating income relative to sales, the profit margin ($PM_0 = OI_0/Sales_0$) and sales relative to net operating assets, the asset turnover ($ATO = Sales_0/NOA_{-1}$). Correspondingly, $\Delta RNOA_0$ (for which we wish to determine persistence) can be decomposed into a change in profit margin (ΔPM_0) and a change in asset turnover (ΔATO_0).

In the profit margin, operating income is standardized for the sales component of operating income to isolate the expense component. Correspondingly, because ΔPM_0 measures the growth rate in operating income relative to the growth rate in sales, it controls for the growth in sales in evaluating growth is operating income. Two interpretations are possible. Higher growth in operating income relative to sales indicates lower expenses that are likely to persist, and thus a positive relationship between ΔPM_0 and $\Delta RNOA_1$. This is more likely when costs are fixed, for fixed expenses decline as a percentage of sales as sales increase. Alternatively, ΔPM can indicate abnormal (unsustainable) operating expenses that cannot be justified by the growth in sales, and thus a negative relationship between ΔPM_0 and $\Delta RNOA_1$. If operating income grows at a rate that is greater than that for sales, for example, a red flag is waived: recorded expenses might be too low.

In the asset turnover, sales are viewed as generated by net operating assets; growth in net operating assets (plant, inventories, and so on) begets growth in sales. The ΔATO_0 measures growth in sales relative to (prior period) growth in net operating assets that begets current period sales, so controls for growth in net operating assets while evaluating sales growth. Two interpretations are possible. Higher growth in sales relative to growth net operating assets indicates the ability to make sales for a given investment that will persist, so improving future profitability, and lower growth in sales relative to prior growth in net operating assets indicates persistently lower sales from investment (that might require write downs of the over-investment in net operating assets), so damaging future profitability. This interpretation sees the ΔATO as an indicator of the future efficiency of generating sales from assets, and suggest a positive relationship between ΔATO_0 and $\Delta RNOA_1$. Alternatively, ΔATO can indicate abnormal (unsustainable) growth in sales that is not justified by the growth in assets, so indicating that current RNOA that will not persist. This suggests a negative relationship between ΔATO_0 and $\Delta RNOA_1$.

Fairfield and Yohn (2001) find that the decomposition does forecast changes in profitability (although, by using average net operating assets in denominators, they do not distinguish current from prior period growth in net operating assets in the same way as we do). We estimate the following model:

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \varepsilon_1 \qquad (7)$$

Sales and operating income will not grow proportionally when there are fixed cost components in operating expenses, nor will sales and net operating assets grow proportionally when there are some assets (with excess capacity) that are not variable with sales. Ideally one would incorporate these features, but financial statements do not disclosure fixed and variable components. However, PM and ATO tend to move together: with fixed components, an increase in sales increases both the PM and the ATO. Accordingly, the mean correlation between ΔPM and ΔATO in our sample is 0.23. Questions of sustainability arise when the two measures move in the opposite direction. If, for example, PM increases while ATO decreases, the quality of the operating income is called into question: why are expenses declining per dollar of sales when sales are declining? We capture the violation of the normal condition of corroborating ΔPM and ΔATO by including dummy variables for interaction in the model.

Table 2 present the results from estimating model (7) and applying the estimates to forecasting out of sample. The goodness-of-fits statistics and the predictive associations improve over those for the benchmark models in Table 1, but only marginally. The first OLS regression in Panel A shows that the change in asset turnover provides most of the predictive power, as in Fairfield and Yohn (2001), but the LOGIT results in Panel B indicate that the decomposition adds little to the aggregated $\Delta RNOA_0$. The positive coefficient on ΔATO indicates that improvement in asset turnover (efficiency in using capacity) projects persistent profitability. The change in profit margin adds little.

However, the second regression shows that the interaction of the ΔPM with ΔATO is informative. Holding $\Delta RNOA_0$ constant (in the regression), an increase in profit margin means that asset turnover must decrease and a decrease in profit margin means that asset turnover must increase. The coefficients on the interaction dummy variables indicate that the first case is noteworthy: if a firm increases profit margin while sales are decreasing relative to changes in net assets, earnings are typically not sustainable. This situation raises an earnings quality flag, particularly when fixed costs are involved: reducing expenses borrows earnings from the future. The third regression indicates that, conditional upon ΔATO (now included in the regression), profit margin decreases associated with turnover increases also raises a flag: the drop in margin is likely to be temporary. This fits the picture of banking earnings for the future by booking more expenses currently. We caution that the LOGIT results are not strong.

Clearly one can extend the decomposition further by looking at changes in individual expense ratios (for cost of good sold and selling, general and administrative expenses, for example) and changes in asset turnovers for specific net assets (receivable and inventory, for example), as in Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997).

Using the Information in the Change in Net Operating Assets

The second step in the analysis of line items moves from the income statement to the comparative balance sheet. The ΔATO_0 variable compares current sales growth with growth in net operating assets in the prior period, ΔNOA_{-1}, but does not utilized the information in the current growth in net operating assets, $\Delta NOA_{0.}$ Current growth in NOA begets future sales, a determinant of future operating income, the numerator in $RNOA_1$. However, current growth in net operating assets determines NOA_0, the denominator of $RNOA_1$, so growth reduces $RNOA_1$, all else constant. Growth in the prior period, ΔNOA_{-1}, begets current sales growth but, if current sales are persistent, current sales growth may beget further investment in ΔNOA_0 to maintain sales growth. If current sales growth comes with idle capacity, further investment may not be needed, improving profitability. If further investment is needed, profitability will not be as high. If firms over-invest in response to sales growth, future profitability will be damaged.

However, there is another reason why ΔNOA_0 may affect the dynamics of operating income and the persistence of RNOA: ΔNOA_0 interacts with $RNOA_0$ in (2a) in determining sustainable income. Provided that operating income is comprehensive of all operating items, and net operating assets are inclusive of all operating assets and liabilities (so that no operating income or net operating assets are included in equity), the following accounting identity holds:

$OI_0 = \text{Free Cash Flow}_0 + \Delta NOA_0$,

This identity says that current operating income in the numerator of $RNOA_0$ is determined in part by the contemporaneous change in NOA. Indeed, the mean Spearman rank correlation between RNOA and the growth rate in net operating assets is our sample is 0.38. For a given free cash flow, accountants create unsustainable income by booking more net operating assets (with more receivables and inventories or lower allowances and depreciation, for example). So, for example, an increasing profit margin on declining sales (investigated in Table 2) requires booking more net operating assets. $RNOA_0$ and ΔNOA_0 interact in determining the sustainability of income. An unsustainable increase in operating income leaves a trail in observable increases in net operating assets in the current comparative balance sheet. The case of a sustainable income forecast (2a) is one where the accounting measurement is such as to produce an interaction that supports sustainable income.

Further, a higher change in net operating assets in the current period amounts to a higher end-of period NOA_0. This had two effects on the subsequent $RNOA_1$. First, ending NOA_0 is the base for subsequent $RNOA_1$ (OI_1/NOA_0), so a higher NOA_0 leads to lower $RNOA_1$, all else constant. Second, all else is not constant, as non-monetary assets must be written off as expenses, so a higher NOA_0 results in lower subsequent operating income in the so-called reversal effect. In short, abnormal increases in net operating assets indicate operating income is not sustainable. In support of these accounting imperatives, Fairfield, Whisenant and Yohn (2001) find that, among a set of predictors, growth in both short-term and long-term net operating assets performs well in the cross section in forecasting changes in return on assets.

The following model is estimated:

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \varepsilon_1, \quad (8)$$

where G_0^{NOA} is the growth rate in net operating assets in the current period, $\Delta NOA_0/NOA_{t-1}$.
Current growth in sales is included in the regression (in the ΔATO). Persistent sales beget

concurrent growth in net operating assets to maintain sales in the future, so growth in net operating assets is evaluated given the contemporaneous growth in sales.

The first regression in Table 3 indicates that growth in net operating assets is indeed informative, and the sign is negative, with a large t-statistic: higher growth in net operating assets indicates lower subsequent income. The improvement in the in-sample and predictive fits over Table 2 is considerable. Not only is the prediction success for cases of $S > 0.6$, and $S < 0.4$ improved, the percentage of firms screened into this group is considerably greater: the model better indicates the probability of earnings being sustainable. Further, in contrast to Table 2, ΔATO is now significant in the LOGIT results: controlling for current growth in net operating assets, current sales growth adds information.

The second and third regressions in Table 3 involve dummy variables for cases where asset turnover increases but net operating assets decline and where asset turnover declines but net operating assets increase. Again, the change in asset turnover measures the growth rate in sales relative to the growth rate in net operating assets in the prior period. Growth in sales with a decline in the net operating assets that maintain the sales might indicate temporary sales growth, implying a negative coefficient. But it may also indicate increased efficiency from the use of idle capacity, or lower net operating assets that will result in lower expenses per dollar of sales, implying a positive coefficient. The estimated coefficient is positive. Correspondingly, the estimated coefficient for the case of decreasing sales with increasing net operating assets is negative; this case implies lower future profitability.

Analyzing Information in ΔNOA_0: Investment and Accruals

Providing, again, that no part of operating income or net operating assets is booked to equity, the ΔNOA_0 that determines current operating income, is measured as

ΔNOA_0 = Cash $Investment_0$ + Operating $Accruals_0$.

That is, growth in net operating assets is determined by cash investment (booked to the balance sheet) and operating accruals (also booked to the balance sheet). Investment does not affect operating income, but accruals do. So there is a reason for isolating operating accruals. Indeed, Sloan (1996) shows that accrual components of earnings have different persistence than cash flow components. Investment, of course, produces subsequent earnings, but does not necessarily change the profitability of investment. One might conjecture that higher investment in the cross section is more profitable investment. However, conservative accounting is typically practiced such that investments are expensed excessively relative to the revenues they produce, reducing subsequent profitability.

The following model adds operating accruals (deflated by beginning net operating assets), $Accr_0$ to model (8):

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \varepsilon_1. \quad (9)$$

Accruals are measured as the difference between cash from operations and operating income.[4] As G_0^{NOA} = (Investment + Operating $Accruals)_0/NOA_{-1}$, separately identifying accruals means that growth in net operating assets now captures the additional explanatory power of investment. Further, OI = Free Cash Flow + ΔNOA_0 = Cash from Operations – Cash Investment + Cash Investment + Operating Accruals = Cash from Operations + Operating Accruals. So, by explicitly recognizing investment and accruals (deflated by NOA_{t-1}), the specification decomposes $RNOA_0$ (operating income deflated by NOA_{t-1}) in a different way to the Du Pont scheme: $RNOA_0$ is decomposed into cash flow and accrual components. So accruals and cash flow are distinguished, as in Sloan (1996), but with the inclusion of possibly correlated investment.

Table 4 indicates that accruals provide additional predictive power, both with respect to investments and with respect to cash from operations. Holding other variables in the model constant (including cash from operations), higher accruals imply lower future income. And, holding accruals constant, higher investment implies lower future income. The goodness-of-fit and prediction results show only slight improvement over those in Table 3, however. Net operating assets is an aggregate measure, of course, and further decomposition of the change in net operating assets – into changes in inventories, plant, deferred taxes, pension liabilities, and so on -- may improve the scoring. Indeed, Richardson, Sloan, Soliman and Tuna carry out a decomposition along these lines, and Nissim and Penman (2002) show that distinguishing changes in operating liabilities from changes in operating assets explains changes in profitability.

Incorporating Unrecorded Reserves

The change in net operating assets includes cash investments that are booked to the balance sheet. However, as an application of conservative accounting, firms expense some cash investments – such as research and development (R&D) and brand building (advertising) expenditures – in the income statement. With growth in these investments, this accounting treatment depresses income and creates hidden reserves. These reserves can be released into earnings (by reducing growth in investment) to report temporary, unsustainable earnings. Penman and Zhang (2002) develop a score, C, that estimates the amount of hidden reserves created by the accounting for R&D, advertising, and by LIFO accounting for inventories. They also develop a score, Q, to indicate temporary effects on earnings in building up reserves or releasing reserves, and find that this measure forecasts ΔRNOA one year ahead.[5] The following model adds the Q score to model (9):

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \varepsilon_1. \qquad (10)$$

The C score is also added for the following reason. This score measures the degree of conservative accounting. As conservative accounting reduces the denominator of RNOA (by not booking net assets), it creates persistently high RNOA if it is persistently practiced, as modeled by Feltham and Ohlson (1995) and Zhang (2000). A firm with a high $RNOA_0$ induced by conservative accounting is likely to have a more persistent RNOA than one with a high $RNOA_0$ without conservative accounting. As a measure of the effect of conservative accounting on recorded net operating assets and on RNOA, the C score may thus indicate persistence. The inclusion of the C score also partly remedies our failure to specify a long-run $RNOA^*$ for, while one might expect economic profitability to converge to the same level for all firms, on expects a different long-run levels for accounting profitability, depending on the degree of conservative accounting.

Table 5 indicates that the C score does not add explanatory power. $RNOA_0$, of course, reflects conservative accounting, and adding a further measure of conservatism adds little. However, the Q score identifies further transitory earnings from the build up and release of reserves. Note, at this point, that the $\Delta RNOA_0$ variable is no longer significant: our financial analysis subsumes all the information in the aggregate $\Delta RNOA_0$.

Figure 1 displays the discriminating ability of S scores estimated from model (10). To construct this figure, we ranked firms each year on their $RNOA_0$ and formed ten portfolios from the ranking. Then, within each RNOA portfolio, we divided firms into three equal-sized groups based on their S scores. With the implied control for $RNOA_0$, we then tracked mean RNOA for each S group for the five years before and after the ranking year, year 0. Figure 1 plots the average results from ranking in all sample years, for the top third of S scores ("high" S scores) and bottom third ("low" S scores). In year 0, mean RNOA for both high and low S scores are the same (by construction), but in subsequent years they are very different – a spread of 4.1% one year ahead. The t-statistic on the mean spread is 12.90. The size of the number is remarkable, given that we are working with data pooled over industries, accounting methods, and other conditions. The difference, indeed, appears to persist beyond one year ahead (although we caution that survivorship bias could be a problem for the more distant years ahead). There was little difference in the before and after profitability for the firms in the third S group around the median S score. Note that in year –1, low S firms have higher average RNOA than high S firms, after increasing RNOA prior to that. The pattern for high S firms is a mirror image. Low S firms are those that have had increasing RNOA is the past which reverses in the future (on average), while high S firms have decreasing RNOA in the past which also reverses in the future.

Average coefficients for Model (10) for three sub-periods, 1976-1983, 1984-1991, and 1992-1999 were similar. Further, similar patterns to those in Figure 1 were observed for three sub-periods. For 1976-1983, the difference in RNOA for year +1 between high and low S groups was 3.1%, 4.0% for 1984-1991, and 4.5% for 1992-1999.[6]

Building in Recursive Information

A final step builds in recursive information. Table 6 adds ΔRNOA predicted for year 0 ($\Delta\widehat{RNOA}_0$), and the S score for year 0 to the OLS and LOGIT versions, respectively, of model (10). Both are predicted at the end of year –1. So this model adds the estimate of whether RNOA in period –1 will be sustained in period 0, as additional information about whether RNOA in period 0 will be sustained in period +1. As actual $\Delta RNOA_0$ is already in the OLS regression, the addition of $\Delta R\hat{N}OA_0$ compares actual with predicted values. The extent of the surprise in this difference may have information for the further sustainability of earnings.

Table 6 indicates that realizations relative to forecasts have information for the further sustainability of income. The coefficients on $\Delta R\hat{N}OA_0$ and the S score indicate negative autocorrelation: if the change in profitability is higher (lower) than predicted, it is likely to be lower (higher) subsequently.

Adding the Fama and French nonlinearity variables (in Table 1) to model (10) does not improve the fit, and the non-linear variables are not significantly different from zero. The financial statement analysis subsumes the information captured by their modeling, and adds further information. We investigated further, however, to see whether the financial statement model can be refined by recognizing that coefficients differ over different levels of RNOA. Results were similar over deciles groups for RNOA, but more markedly in the extremes.

5. Explaining Cross-sectional Differences in Unlevered P/E Ratios

The instrument for sustainable earnings is developed in part to explain P/E ratios. Panel A of Table 7 estimates the E/P model specified in equation (4), with $\Delta R\hat{N}OA_1$ estimated from the OLS regression for Model (10) as an indicator of sustainable of earnings. The E/P model is estimated for all firms and then for firms with positive and negative earnings. Panel B of Table 7 substitutes the S score from the LOGIT model as an indicator of sustainable earnings. As the modeling of sustainable earnings applies to operating income, E/P ratios modeled are unlevered (enterprise) E/P ratios.[7] Estimations are made for each year, 1979-1999, with the top and bottom one percent of E/P observations deleted, and mean coefficients over the 21 years are reported.

The model is estimated within industries; residuals from the model are applied in the second stage for predicting stock returns (below) and, as P/E ratios tend to be grouped by industry, we do not want those residuals to be primarily an expression of industry. Industries also control for risk and the cost of capital which determines cross-sectional difference in E/P ratios. We used the 48 industry groupings identified by Fama and French (1997) to differentiate risk factors.

The reported coefficients in Table 7 are means estimates for all industries over the 21 years. The t-statistics are based on standard errors estimated from these coefficients that are probably not independent. In any case, the t-statistics are large, with considerable R^2 values. The current profitability and growth variable, $RNOA_0 \cdot G_0^{NOA}$ that project sustainable income, is negatively correlated with E/P ratios. Higher growth in net operating assets (producing more growth in operating income) implies a higher P/E, but higher current profitability combined with that growth indicates an even higher P/E ratio, as the discussion in Section 3 suggests. However, the inclusion of the instrument for sustainable earnings further modifies the P/E ratio: the higher $\Delta \widehat{RNOA}_1$ forecasted, the higher the P/E ratio, although not so for loss firms. Panel B indicates that the S score from the LOGIT modeling also explains cross-sectional difference in industry P/E ratios. In short we have modeled not only the sustainability of earnings, but also the P/E ratio.

6. Forecasting Stock Returns

Given market efficiency, residuals from estimating the E/P model capture additional information about cross-sectional differences in profitability and growth and also differences in E/P ratios due to differences in the cost of capital. However, those residuals may also reflect mispricing of the information we have examined about the sustainability of current income.

Panel A of Table 8 reports one-year stock returns from investing in stocks on the basis of traded E/P ratios relative to those fitted by the E/P model in Panel A of Table 7. In each year from 1979 to 1999, we ranked the firms into 10 equal-sized portfolios based on their residuals from the E/P model at that date. The portfolio formation date is three months after fiscal year-end, by which time the firm must file its annual reports with the SEC. We then calculated mean buy-and-hold returns for the following twelve months. The computed returns include delisting returns for nonsurvivors. The table reports mean raw returns and size-adjusted returns for each portfolio over the 21 years that the positions were taken. The estimation of the E/P model within industry controls for operating risk (to some degree), and the size adjustment controls for the "size effect" in stock returns that researchers (e.g., Fama and French 1992) conjecture is a premium for risk. We computed the size-adjusted returns by subtracting the raw (buy-and-hold) return on a size-matched, value-weighted portfolio formed from size-decile groupings supplied by CRSP.[8]

The mean returns in Panel A of Table 8 are positively related to E/P model residuals. "High" residuals indicate underpricing of P/E ratios and "low" residuals indicate overpricing. Returns for portfolios 1 and 2 are, in particular, considerably lower than those for portfolios 9 and 10. The difference between the mean twelve-month raw return for portfolio 10 and that for portfolio1 is 12.69%, with a t-statistic estimated from the time series of 21 returns of 3.98.[9] The relative frequency of observing a return of 12.69% or higher in 5,000 replications of randomly assigning stocks to the high and low portfolios was 0%. The corresponding return difference for size-adjusted returns is 8.22%, with a t-statistic of 3.54. The relative frequency of observing a return of 8.22% or higher in 5,000 replications of randomly assigning stocks to the high and low portfolios was 0.06%. (The return to size, subtracted here, is conjectured as a return to risk, but may well capture mispricing of financial statement information.) These return differences are the those, before transactions costs, of zero net investment from canceling long and short investments in the lowest and highest residual portfolios, respectively. We obtained similar results from ranking firms on residuals from the E/P model based on S scores (estimated in Panel B of Table 7). Panel A of Figure 2 gives differences in one-year, size-adjusted returns between portfolio10 and portfolio 1, for each year in the sample period. The return differences are positive for 15 years, but negative for five years.[10]

Positions taken on the basis of E/P residuals run the risk of being overwhelmed in momentum markets, for high P/E ratios imply a long position in a momentum investing whereas a high P/E ratio (relative to the fitted line) implies short position in our analysis. Panels B and C of Figure 2 report differences in returns between portfolios 10 and 1 from a ranking of firms onto portfolios on $\Delta \widehat{RNOA}_1$ and S scores, respectively, rather than E/P model residuals. The mean size-adjusted return difference (over years) to the $\Delta \widehat{RNOA}_1$ positions is 14.56%, with a t-statisitc of 6.44, and that to S score positions is 14.48% with a t-statisitic of 4.63. In only one year is the return negative in Panel B, and in two years in Panel C.

6.1 Controls for Potential Risk Proxies

The observed returns in Panel A of Table 8 are consistent with the efficient pricing of P/E ratios if they reflect different returns to risk. They also are, however, consistent with the market's mispricing information about the sustainability of earnings. The industry and size controls mitigate against a risk explanation. Nevertheless, the risk question remains, particularly because we have not modeled risk in the cross-sectional E/P model, and risk affects E/P ratios.

Panel B of Table 8 gives the results of estimating return regressions annually with the inclusion, along with the E/P residual, of factors that have been nominated as risk proxies (by Fama and French 1992, in particular): CAPM beta, size, book-to-market ratio, leverage, and E/P.[11] Reported coefficients are, again, means of cross-sectional estimates for each of the 21 years, 1979 to 1999. The coefficient on the E/P residual remains significant after identifying the portion of returns that are explained by these factors. If metrics like size and book-to-market are interpreted as predictors of abnormal returns rather than risk factors, the results indicate that E/P residuals have additional information for predicting abnormal returns. Note that the ability of E/P residuals to predict stock returns is incremental to the E/P, that is, to the "P/E effect."[12]

6.2 Disaggregating Return Predictions

The estimated models weight several pieces of financial statement information to yield a composite indicator of the sustainability of earnings and the P/E ratio. We have built up the model gradually to indicate the incremental information in each piece of information. We then used the model as a composite screen to predict stock returns. It remains to be seen which pieces of information play a particular role in predicting returns.

Table 10 gives the result of regressions of future stock returns on the financial statement components of the sustainable earnings model. Separate regressions are reported for annual returns for one, two, three, four, and five years ahead. The table indicates that none of the information, except perhaps $RNOA_0$ itself, forecasts stock returns beyond the immediate year ahead, year +1, although R^2 values for years +2 onwards indicate some joint predictive power. This provides more persuasion that the information does indicate persistent expected returns from risk factors. For the one-year-ahead returns, predictive power comes from growth in net operating assets (effectively representing the investment component of growth in net operating assets), the accrual component of growth in net operating assets, and the Q score capturing the effect of changes in hidden reserves. Neither the $\Delta RNOA_0$ nor its decomposition into ΔPM or ΔATO add predictive power given these variables. One concludes that the market does not understand the implications of growth in net operating assets, accruals and conservative accounting for the pricing of earnings.

In recent years, a distressing number of return "anomalies" have been documented using fundamental data. One expects that they are not independent. Our analysis reports an average 14.5% annual size-adjusted return from a composite financial statement measure (in the trading positions taken in Panels B and C of Figure 2). These returns are higher than those using pieces of the composite score in a similar trading strategy– accruals in Sloan (1996) and Q scores in Penman and Zhang (2002), for example – but not by large amounts. Table 9 does indicate some incremental explanatory power for some variables. Accruals and the Q score add to the prediction of year-ahead stock returns, controlling for the other included variables. The negative return to cash investment (associated with G^{NOA}) confirms the finding in Titman, Wei and Xie (2001), with added controls. However, the R^2 values for the regressions in Table 9 are low. Our results indicate that the returns to various fundamental strategies are not additive, as Zach (2002) also finds for selected anomalies. We caution, however, that our analysis uses pooled data and our financial statement measures are aggregate measures. Financial statement analysis is contextual, so partitioning on conditioning circumstances may improve the results, along with further decomposition of profit margins, assets turnovers, growth in net operating assets, and accruals into component line items.[13]

7. Conclusion

This paper takes the following perspective. The P/E ratio embeds the notion that investors "buy earnings." Investors buy future earnings, but look to current earnings as an indication of future earnings. They are concerned that earnings may not be sustained in the future, and pay less for earnings if they are not sustainable. While investors can adjust earnings for nonrecurring items specifically identified in the financial statements, they still remain uncertain about the sustainability of earnings, and look for a way to quantify that uncertainty. As well as reporting earnings, the financial statements supply additional line item information that provides a commentary on the "quality" of earnings for forecasting, and so aids in the evaluation of the uncertainty. Financial statement analysis elicits that information.

This paper reports a financial statement analysis that supplies probabilities as to the sustainability of earnings, and so reduces investors' uncertainty. The financial statement analysis follows an ordered approach that recognizes that fixed accounting relations structure the financial statements, so should also structure the analysis of those statements. The analysis incorporates features from earlier papers on using financial statements for forecasting, but in such a way that considers the financial statements as a whole, to develop a composite score that summarizes the information that various elements in the financial statements jointly convey about the persistence of earnings.

The analysis is at a coarse level, the aim being to demonstrate an overall architecture that directs further detailed analysis of the financial statements. The empirical analysis is on data pooled over all firms, without consideration of conditions under which a more contextual analysis might be carried out. Even so, the scoring reliably indicates differences between current and future earnings. The scoring also explains cross-sectional difference in P/E ratios, the amount paid by investors for earnings.

Further, the scoring predicts stock returns. This finding may mean that the financial statement scores capture risk in investing, although tests for risk explanations do not suggest so. Scoring earnings reduces the risk of paying too much for earnings so, as an alternative interpretation, the finding suggests that investors in the past paid too much for earnings (or sold for too little) by ignoring information in the financial statements about the sustainability of earnings.

TABLE 1

Benchmark Models of Earnings Persistence Based on Current RNOA and Change in RNOA

Panel A: OLS estimation

$\Delta \mathbf{RNOA_1} = \alpha + \beta_1 \mathbf{RNOA_0} + \beta_2 \Delta \mathbf{RNOA_0} + \beta_3\, \mathbf{ncp_0} + \beta_4\, \mathbf{sncp_0} + \beta_4\, \mathbf{spcp_0} + \varepsilon_1$

Intercept	0. 019 (4.34)	0.021 (4.67)	0.023 (4.90)
$RNOA_0$ coefficient	-0.176 (-8.18)	-0.186 (-8.60)	-0.185 (-8.85)
$\Delta RNOA_0$ coefficient		0.046 (2.50)	0.063 (1.07)
ncp coefficient			-0.004 (-1.03)
sncp coefficient			0.125 (0.84)
spcp coefficient			-0.085 (-0.28)
R^2	0.066	0.070	0.096
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.209	0.202	0.209
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.233	0.237	0.218

TABLE 1 (continued)

Panel B: LOGIT estimation

$Prob(\Delta RNOA_1>0) = e^k/(1+e^k)$, $k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3\, ncp_0 + \beta_4\, sncp_0 + \beta_4\, spcp_0 + \varepsilon_1$

Intercept	0. 354 (4.53)	0.384 (4.64)	0.441 (4.58)
$RNOA_0$ coefficient	-2.753 (-9.54)	-2.955 (-9.63)	-3.042 (-9.63)
$\Delta RNOA_0$ coefficient		0.853 (4.19)	0.495 (0.73)
ncp coefficient			-0.105 (-2.22)
sncp coefficient			0.529 (0.17)
spcp coefficient			2.514 (0.52)
Log likelihood ratio	0.023	0.025	0.028
Rank correlation of in-sample $\Delta RNOA_1$ and fitted S scores	0.189	0.196	0.203
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted S scores	0.193	0.198	0.191
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5	0.548	0.552	0.550
Frequency of firms with S<0.4 or S>0.6	0.260	0.270	0.280
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6	0.632	0.631	0.629

Cross-sectional OLS and Logistic regression coefficients are estimated each year from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ΔRNOA is the change in RNOA; ncp_0 is a dummy variable which equals one when $\Delta RNOA_0$ is negative, and zero otherwise; $sncp_0$ equals $\Delta RNOA_0^2$ when $\Delta RNOA_0$ is negative, and zero otherwise; $spcp_0$ equals $\Delta RNOA0^2$ when $\Delta RNOA_0$ is positive, and zero otherwise; S is estimated $Prob(\Delta RNOA_1>0)$.

TABLE 2

Models Separating the Persistence in Sales from Persistence in Expenses: Decomposing ΔRNOA

Panel A: OLS estimation

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_4 pi\_ad_0 + \beta_5 pd\_ai_0 + \varepsilon_1$$

Intercept	0. 021 (4.78)	0.022 (4.72)	0.022 (5.11)
$RNOA_0$ coefficient	-0.180 (-9.10)	-0.185 (-8.47)	-0.183 (-9.03)
$\Delta RNOA_0$ coefficient	0.016 (0.37)	0.047 (2.58)	0.018 (0.42)
ΔPM coefficient	-0.025 (-0.31)		-0.015 (-0.19)
ΔATO coefficient	0.008 (2.80)		0.009 (2.75)
PM increases & ATO decreases		-0.004 (-2.07)	0.002 (1.05)
PM decreases & ATO increases		-0.002 (-0.87)	-0.006 (-2.71)
R^2	0.085	0.074	0.087
Rank correlation of in-sample $\Delta RNOA_1$and fitted values	0.197	0.200	0.198
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.225	0.232	0.223

TABLE 2 (continued)

Panel B: LOGIT estimation

$Prob(\Delta RNOA_1>0) = e^k/(1+e^k)$, $k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_4 pi\_ad_0 + \beta_5 pd\_ai_0 + \varepsilon_1$

Intercept	0.387 (4.62)	0.407 (4.90)	0.411 (4.92)
$RNOA_0$ coefficient	-2.964 (-9.48)	-2.947 (-9.37)	-2.970 (-9.34)
$\Delta RNOA_0$ coefficient	0.960 (2.68)	0.846 (4.34)	0.968 (2.68)
ΔPM coefficient	-0.129 (-0.17)		-0.172 (-0.21)
ΔATO coefficient	0.004 (0.16)		0.004 (0.13)
PM increases & ATO decreases		-0.073 (-1.59)	-0.067 (-1.24)
PM decreases & ATO increases		-0.055 (-1.33)	-0.059 (-1.30)
Log likelihood ratio	0.026	0.027	0.029
Rank correlation of in-sample actual $\Delta RNOA_1$ and fitted S scores	0.198	0.200	0.204
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted S scores	0.196	0.191	0.188
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5	0.550	0.549	0.550
Frequency of firms with S<0.4 or S>0.6	0.269	0.280	0.277
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6	0.633	0.631	0.631

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ΔRNOA is the change in RNOA; ΔPM is the change in profit margin; ΔATO is the change in asset turnover; pi_ad_0 is a dummy variable which equals one when profits margin increases and asset turnover decreases; pd_ai_0 is a dummy variable which equals one when profit margin decreases and asset turnover increases; S is estimated $Prob(\Delta RNOA_1>0)$.

TABLE 3

Modeling Information in the Change in Net Operating Assets

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 ai\_nd_0 + \beta_7 ad\_ni_0 + \varepsilon_1$$

Intercept	0. 026 (6.21)	0.019 (4.58)	0.025 (6.35)
$RNOA_0$ coefficient	-0.109 (-5.28)	-0.161 (-7.95)	-0.108 (-5.28)
$\Delta RNOA_0$ coefficient	-0.018 (-0.44)	0.011 (0.38)	-0.017 (-0.43)
ΔPM coefficient	-0.034 (-0.46)	-0.035 (-0.55)	-0.040 (-0.53)
ΔATO coefficient	0.011 (4.01)		0.010 (3.44)
G^{NOA} coefficient	-0.121 (-21.03)		-0.117 (-18.57)
ATO increases & NOA decreases		0.033 (9.40)	0.006 (1.82)
ATO decreases & NOA increases		-0.017 (-7.11)	-0.001 (-0.61)
R^2	0.142	0.095	0.145
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.351	0.265	0.354
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.354	0.289	0.357

TABLE 3 (continued)

$Prob(\Delta RNOA_1>0) = e^k/(1+e^k)$, $k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 ai\_nd_0 + \beta_7 ad\_ni_0 + \varepsilon_1$

Intercept	0.510 (6.14)	0.357 (4.31)	0.510 (5.85)
$RNOA_0$ coefficient	-1.258 (-5.53)	-2.397 (-8.81)	-1.212 (-5.49)
$\Delta RNOA_0$ coefficient	-0.084 (-0.22)	-0.476 (-1.85)	-0.113 (-0.28)
ΔPM coefficient	-0.737 (-0.88)	0.419 (0.55)	-1.049 (-1.16)
ΔATO coefficient	0.097 (4.17)		0.027 (1.01)
G^{NOA} coefficient	-3.019 (-17.25)		-2.751 (-14.39)
ATO increases & NOA decreases		0.753 (16.00)	0.220 (3.76)
ATO decreases & NOA increases		-0.430 (-16.29)	-0.193 (-6.02)
Log likelihood ratio	0.086	0.046	0.090
Rank correlation of in-sample $\Delta RNOA_1$ and fitted S scores	0.334	0.252	0.339
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted S scores	0.322	0.249	0.324
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5	0.631	0.594	0.632
Frequency of firms with S<0.4 or S>0.6	0.525	0.398	0.553
Frequency correct out-of-sample predictions with S<0.4 or S>0.6	0.697	0.663	0.694

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ΔRNOA is the change in RNOA; ΔPM is the change in profit margin; ΔATO is the change in asset turnover; G_0^{NOA} is the current growth rate in net operating assets; ai_nd_0 is a dummy variable which equals one when asset turnover increases and net operating asset decreases; ad_ni_0 is a dummy variable which equals one when asset turnover decreases and net operating asset increases; S is estimated $Prob(\Delta RNOA_1>0)$.

TABLE 4

Modeling Information in Operating Accruals and Cash Investment

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \varepsilon_1$$

$$Prob(\Delta RNOA_1 > 0) = e^k/(1+e^k),\ k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \varepsilon_1$$

	OLS estimation	**LOGIT estimation**
Intercept	0. 024 (6.17)	0.482 (5.77)
$RNOA_0$ coefficient	-0.105 (-5.24)	-1.245 (-5.47)
$\Delta RNOA_0$ coefficient	-0.020 (-0.50)	-0.111 (-0.29)
ΔPM coefficient	-0.019 (-0.26)	-0.537 (-0.65)
ΔATO coefficient	0.011 (3.94)	0.096 (4.10)
G^{NOA} coefficient	-0.111 (-20.70)	-2.881 (-15.47)
$Accr_0$ coefficient	-0.039 (-2.31)	-0.604 (-4.02)
R^2	0.149	
Log likelihood ratio		0.089
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.357	0.341
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.362	0.327
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5		0.633
Frequency of firms with S<0.4 or S>0.6		0.529
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6		0.700

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ΔRNOA is the change in RNOA; ΔPM is the change in profit margin; ΔATO is the change in asset turnover; G_0^{NOA} is the current growth rate in net operating assets; current operating accruals ($Accr_0$) are measured as the difference between cash from operations and operating income, deflated by the beginning net operating assets; S is estimated Prob($\Delta RNOA_1$>0).

TABLE 5

Modeling Unrecorded Reserves

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \varepsilon_1$$

$$Prob(\Delta RNOA_1 > 0) = e^k/(1+e^k),\ k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \varepsilon_1$$

	OLS estimation	LOGIT estimation
Intercept	0. 021 (6.48)	0.448 (5.45)
$RNOA_0$ coefficient	-0.105 (-5.25)	-1.364 (-5.93)
$\Delta RNOA_0$ coefficient	-0.009 (-0.23)	-0.008 (-0.02)
ΔPM coefficient	-0.017 (-0.24)	-0.553 (-0.63)
ΔATO coefficient	0.011 (3.76)	0.084 (3.78)
G^{NOA} coefficient	-0.100 (-13.76)	-2.734 (-16.45)
$Accr_0$ coefficient	-0.034 (-1.97)	-0.632 (-4.28)
Q_0 coefficient	0.109 (3.39)	2.226 (2.35)
C_0 coefficient	0.005 (0.61)	0.153 (1.39)
R^2	0.164	
Log likelihood ratio		0.094
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.364	0.349
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.358	0.326
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5		0.631
Frequency of firms		0.534

with S<0.4 or S>0	
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6	0.696

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ΔRNOA is the change in RNOA; ΔPM is the change in profit margin; ΔATO is the change in asset turnover; G_0^{NOA} is the current growth rate in net operating assets; current operating accruals ($Accr_0$) are measured as the difference between cash from operations and operating income, deflated by the beginning net operating assets; Q_0 is a score that measures the extent to which income is affected by creating or releasing hidden reserves from practicing conservative accounting; C_0 is a measure of the effect of conservative accounting (for inventory, advertising and research and development) on the balance sheet; S is estimated Prob($\Delta RNOA_1$>0).

TABLE 6

Models with Recursive Information

$$\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \beta_9 \widehat{\Delta RNOA_0} + \varepsilon_1$$

$$Prob(\Delta RNOA_1>0) = e^k/(1+e^k),\ k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \beta_9 S_0 + \varepsilon_1$$

	OLS estimation	LOGIT estimation
Intercept	0. 015 (4.34)	0.855 (6.97)
$RNOA_0$ coefficient	-0.064 (-3.63)	-1.476 (-5.37)
$\Delta RNOA_0$ coefficient	0.042 (1.09)	0.082 (0.09)
ΔPM coefficient	-0.126 (-2.14)	-1.840 (-1.06)
ΔATO coefficient	0.010 (3.19)	0.290 (4.22)
G^{NOA} coefficient	-0.107 (-11.95)	-3.496 (-13.23)
$Accr_0$ coefficient	-0.052 (-3.88)	-1.112 (-4.49)
Q_0 coefficient	0.112 (2.29)	2.355 (1.72)
C_0 coefficient	-0.003 (-0.59)	0.097 (0.79)
$\widehat{\Delta RNOA_0}$ coefficient (OLS) or S score (LOGIT)	-0.076 (-1.53)	-0.726 (-3.30)
R^2	0.138	
Log likelihood ratio		0.101
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.388	0.357

Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.365	0.326
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5		0.573
Frequency of firms with S<0.4 or S>0.6		0.574
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6		0.699

Cross-sectional OLS and Logistic regression coefficients are estimated from 1980 to 1999. The mean estimated coefficients from the 20 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ΔRNOA is the change in RNOA; ΔPM is the change in profit margin; ΔATO is the change in asset turnover; G_0^{NOA} is the current growth rate in net operating assets; current operating accruals ($Accr_0$) are measured as the difference between cash from operations and operating income, deflated by the beginning net operating assets; Q_0 is a score that measures the extent to which income is affected by creating or releasing hidden reserves from practicing conservative accounting; C_0 is a measure of the effect of conservative accounting (for inventory, advertising and research and development) on the balance sheet; $\Delta \widehat{RNOA}_0$ is the predicted change in RNOA for the current year, from model (10) in Table 5 estimated in the prior year; S is estimated Prob($\Delta RNOA_1$>0).

TABLE 7

Estimation of the E/P model

Panel A: **Unlevered $E/P_0 = \alpha + \beta_1 \Delta \widehat{RNOA}_1 + \beta_2 RNOA_0 * G_0^{NOA} + \beta_3 RNOA_0 + e_1$**

	Pooled sample	*Positive E/P*	*Negative E/P*
Intercept	0.021 (8.59)	0.047 (34.70)	-0.039 (-1.97)
Forecasted $\Delta RNOA_1$	-0.485 (-5.52)	-0.223 (-6.16)	0.259 (0.73)
$RNOA_0 * G_0^{NOA}$	-0.566 (-9.78)	-0.225 (-5.73)	-0.716 (-1.62)
$RNOA_0$	0.424 (21.34)	0.220 (17.97)	0.879 (5.59)
R^2	0.545	0.342	0.605

Panel B: **Unlevered $E/P_0 = \alpha + \beta_1 S_0 + \beta_2 RNOA_0 * G_0^{NOA} + \beta_3 RNOA_0 + e_1$**

	Pooled sample	*Positive E/P*	*Negative E/P*
Intercept	0.081 (9.34)	0.080 (9.90)	-0.248 (-1.93)
S score	-0.126 (-5.79)	-0.064 (-4.84)	0.316 (1.55)
$RNOA_0 * G_0^{NOA}$	-0.706 (-8.62)	-0.325 (-5.99)	-2.336 (-2.45)
$RNOA_0$	0.471 (12.70)	0.228 (18.28)	0.792 (4.99)
R^2	0.548	0.341	0.597

Cross-sectional OLS regression coefficients are estimated for 525 year-industry groups for years, 1979-1999. Industry classifications are the 48 industries identified in Fama and French (1997). Year-industry groups that have less than 10 observations are not used in the estimation. The mean estimated coefficients appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; G_0^{NOA} is the current rate of growth in net operating assets; $RNOA_0 * G_0^{NOA}$ is the sustainable income forecast; $\mathbf{\Delta \widehat{RNOA}_1}$ is the one-year-ahead change in RNOA forecasted by the OLS model of sustainable income; S score is the predicted probability of an RNOA increase one year ahead.

TABLE 8

Returns to Modeling E/P Ratios with Financial Statement Information

Panel A

One-Year-Ahead Stock Returns for Portfolios Formed on E/P Model Residuals

	Low residuals	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*High residuals*	*High minus Low*	*t-statistics*
Raw return	18.30	21.99	20.00	20.15	22.92	21.27	23.46	23.64	27.70	30.99	12.69	3.98
Size-adj. ret	4.28	5.09	4.37	4.52	6.72	4.52	6.67	6.14	9.84	12.49	8.22	3.54

Panel B

Return Regressions with Controls for Risk Proxies

$$\mathbf{Return_1 = \alpha_0 + \alpha_1\beta_0 + \alpha_2 ln(Size)_0 + \alpha_3 ln(B/M)_0 + \alpha_4 ln(LEV)_0 + \alpha_5(E(+)/P)_0 + \alpha_6 E/P\ dummy + \alpha_7 Res_0 + e_1}$$

Variable	Definition	With E/P model residual		Without E/Pmodel residual	
		Coefficients	t-statistics	Coefficients	t-statistics
Constant	Intercept	0.321	5.61	0.326	5.63
β	Estimated CAPM Beta	-0.004	-0.13	-0.001	-0.04
Ln(Size)	Size	-0.024	-2.40	-0.027	-2.59
Ln(B/M)	Book-to-market	-0.015	-0.56	-0.013	-0.54
Ln(LEV)	Leverage	0.006	0.21	-0.005	-0.19
E(+)/P	Earnings/price	0.249	1.45	0.399	2.92
E(-)/P dummy	Negative earnings dummy	0.021	0.47	0.055	1.27
Res	Unlevered E/P regression residual	0.523	2.34		

For Panel A, ten portfolios are formed each year, 1979-1999, from a ranking of firms on E/P model residuals (actual E/P minus fitted E/P) for year 0, using the E/P model estimated using OLS in Panel A of Table 7. Stocks enter the portfolios three months after fiscal year end (for year 0). Portfolios are held for the subsequent 12 months (year +1). The 12-month portfolio returns are buy-and-hold returns. Size-adjusted returns are those returns minus buy-and-hold returns on size-matched portfolios. Panel A reports mean returns for each of the ten portfolios over the 21 years. "High minus Low" is the difference between mean returns for the high residual portfolio (portfolio 10) and the low residual portfolio (portfolio 1); the associated t-statistic is estimated from the time series of differences. Panel B reports the mean cross-sectional OLS regression coefficients from estimating the model at the head of the panel for each year, 1979 to 1999. $Return_1$ is the 12-month (year +1) buy and hold return. Mean estimated coefficients from the 21 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard error. Size is the market value of equity and leverage (LEV) is the book value of total assets divided by book value of equity.

TABLE 9

Disaggregated Return Predictions

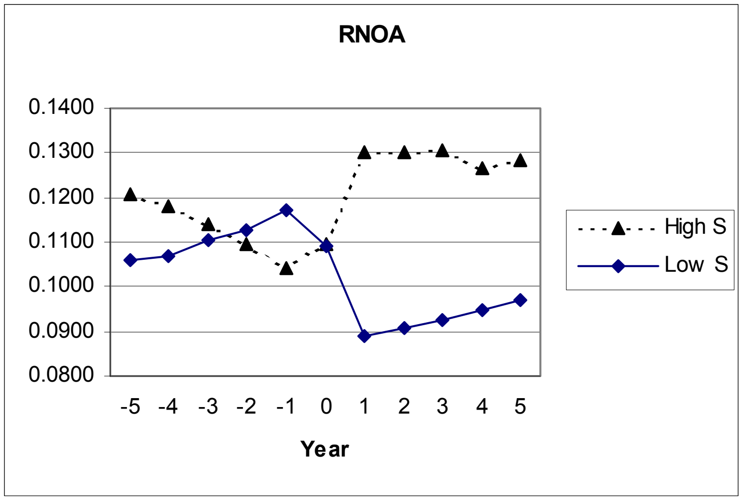
$$\textbf{Return}_t = \alpha_0 + \alpha_1\textbf{RNOA}_0 + \alpha_2\Delta\textbf{RNOA}_0 + \alpha_3\Delta\textbf{PM}_0 + \alpha_4\Delta\textbf{ATO}_0 + \alpha_5\textbf{G}_0^{\textbf{NOA}} + \alpha_6\textbf{Accr}_0 + \alpha_7\textbf{Q}_0 + \alpha_8\textbf{C}_0 + \textbf{e}_t$$
(t = 1, 5)

Year, t	*Year+1*	*year+2*	*Year+3*	*Year+4*	*Year+5*
Intercept	0.064	0. 076	0.062	0.047	0.043
	(5.48)	(6.22)	(6.33)	(2.62)	(2.73)
$RNOA_0$ coefficient	0.007	-0.120	-0.024	-0.034	-0.091
	(0.18)	(-2.53)	(-0.78)	(-0.67)	(-3.34)
$\Delta RNOA_0$ coefficient	0.014	0.055	-0.037	-0.021	0.081
	(0.25)	(1.12)	(-0.41)	(-0.35)	(0.86)
ΔPM coefficient	0.321	-0.185	-0.126	0.284	-0.055
	(2.25)	(-1.07)	(-0.56)	(1.81)	(-0.43)
ΔATO coefficient	0.006	-0.001	-0.002	-0.001	-0.004
	(1.93)	(-0.24)	(-0.33)	(-0.48)	(-0.43)
G^{NOA} coefficient	-0.117	-0.043	0.005	0.007	0.010
	(-3.95)	(-1.69)	(0.17)	(0.19)	(0.38)
$Accr_0$ coefficient	-0.036	0.005	-0.015	-0.013	0.029
	(-2.06)	(0.18)	(-0.42)	(-1.04)	(1.58)
Q_0 coefficient	0.207	0.146	0.127	-0.067	0.114
	(2.16)	(1.53)	(0.81)	(-0.52)	(0.86)
C_0 coefficient	0.013	0.038	-0.060	0.042	0.071
	(0.35)	(1.13)	(-1.53)	(0.99)	(1.32)
R^2	0.03	0.03	0.03	0.03	0.02

The dependent variable, $Return_t$, t =1,5 is, alternatively, the one- to five-year ahead size-adjusted returns. Cross-sectional OLS regression coefficients are estimated for returns from 1979 to 1999. The table reports mean estimated coefficients over the 21, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. $RNOA_0$ is the current change in RNOA; ΔPM_0 is change in profit margin; ΔATO_0 is change in asset turnover; G_0^{NOA} is the current growth rate in net operating assets; accruals ($Accr_0$) are measured as the difference between cash from operations and operating income, deflated by the beginning net operating assets; Q_0 is a score measuring the extent to which income is affected by creating or releasing hidden reserves from practicing conservative accounting; C_0 is a measure of the effect of conservative accounting (for inventory, advertising and research and development) on the balance sheet.

FIGURE 1

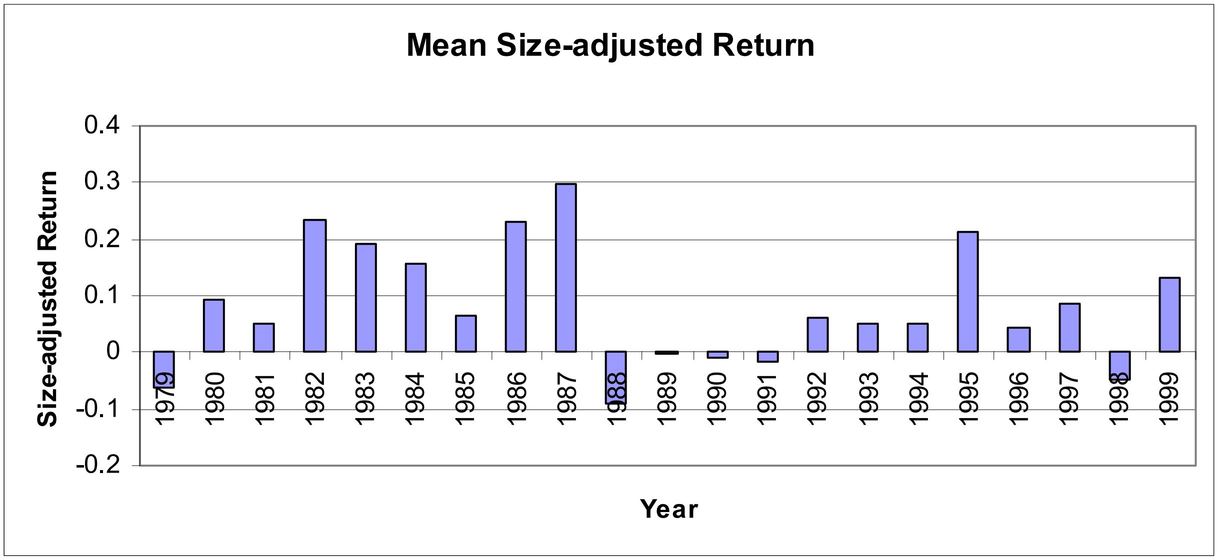
Mean return on net operating assets (RNOA) for high and low S-score groups over five years before and after the S-scoring year, Year 0.



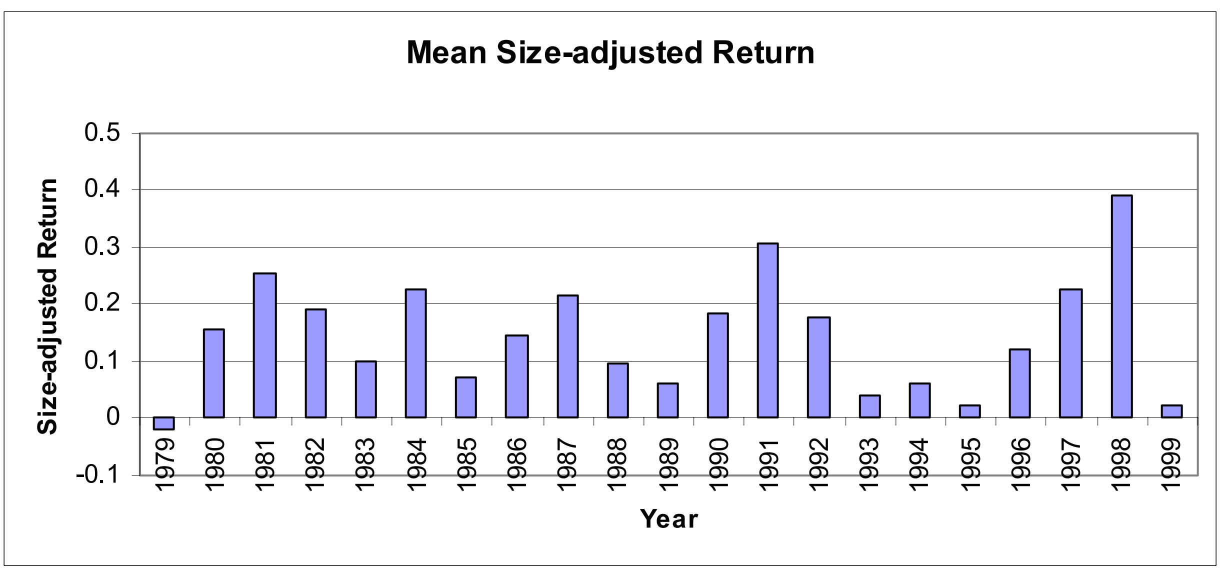
The S-score groups are based on a ranking of firms each year on S-scores, within RNOA groups. The high S-score group is the top third of firms in that ranking and the low S-score group is the bottom third of firms in the ranking on S-scores. The RNOA values reported in the figure are the means of 21 yearly median RNOAs computed over the years 1979 to 1999.

FIGURE 2

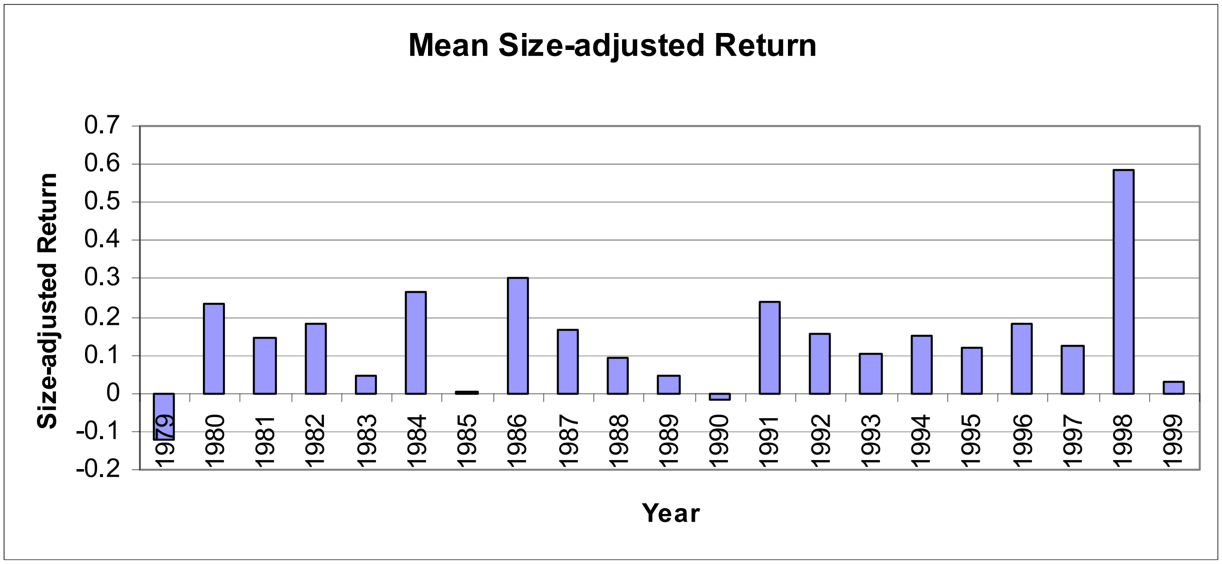
Panel A: Differences in Mean Size-Adjusted Returns between High and Low E/P Residual Portfolios, for the Year Following the S Scoring Year, 1979 – 1999



Panel B: Differences in Mean Size-Adjusted Returns between High and Low $\Delta \widehat{RNOA}_1$ Portfolios, for the Year Following the $\Delta \widehat{RNOA}_1$ Estimation Year, 1979 – 1999



Panel C: Differences in Mean Size-Adjusted Returns between High and Low S-score Portfolios, for the Year Following the S-scoring Year, 1979 - 1999



Endnotes

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[1] Theoretical research has articulated this idea more rigorously. Based on the work of Ohlson (1995), it is now appreciated that P/E ratios are determined by expected growth of residual earnings, rather than earnings growth; that is, growth in earnings must cover a charge against book value of the new investments required to grow the earnings if growth is to add value and add to the P/E ratio. Penman (2001, Chapter 16) derives a constant growth residual income P/E formula. More recently, Ohlson and Juettner-Nauroth (2001) provide an explicit model of the forward P/E based on expected cum-dividend earnings growth charged with required growth to determine whether growth adds to the P/E. But, being a model in the forward P/E, this model does not bear upon the effect of unsustainable current earnings on the trailing P/E (based on current earnings).

[2] Penman (1996) models the effect of transitory earnings on the P/E ratio.

[3] Special items includes adjustments applicable to prior years, nonrecurring items, gains and losses on asset sales, transfer of reserves provided in prior years, and write-downs of assets, among other items, so to the extent that firms and COMPUSTAT identify these items, they are excluded from the income measure whose sustainability we are assessing.

[4] For years prior to 1987 (when firms reported funds from operations rather than cash flow from operations), we calculated accruals as funds from operations adjusted for changes in operating working capital.

[5] Penman and Zhang (2002) develop two Q scores, Q^A and Q^B. We use Q^A in this paper.

[6] We prepared an analysis similar to that in Figure 1 for firms in each $RNOA_0$ decile in each year. The S score differentiated $\Delta RNOA_1$ for all deciles. For low $RNOA_0$ firms (in the bottom two deciles with mean $RNOA_0$ of -12.8% and 1.8%, respectively), RNOA declined for both high and low S groups prior to year 0, and increased for both groups in year +1; yet the S score forecasted differences in that increase. For high $RNOA_0$ (in the top 3 deciles with mean $RNOA_0$ of 17.8%, 22.5%, and 37.5%, respectively), RNOA increased for both high and low S groups prior to year 0, but increased further in year +1 for high S firms while decreasing for low S firms.

[7] The unlevered P/E ratio is defined as (Market Value of Common $Equity_0$ + Net Financial $Obligations_0$ + Free Cash $Flow_0$)/Operating $Income_0$. See Penman (2001, p. 542). Net financial obligations are financing debt (including preferred stock) minus financial assets, all measured at book value as an approximation of market value. Free cash flow is operating income minus the change in net operating assets. Free cash flow (FCF) added to the numerator in the calculation is calculated as $FCF_0(1 - r)/2)$, where r is the required return for operations, set at 10%. This calculation adjusts for free cash flow being generated throughout the period rather than at the end of the period.

[8] The mean size-adjusted return over all portfolios in Table 8 is positive. This is due, partly, to portfolio returns being equally weighted average returns whereas CRSP size-decile returns are value weighted. Also, our sample covers only NYSE, AMEX, and NASDAQ firms, whereas

CRSP cover smaller OTC firms also. Restricting the sample to these three exchanges increases the mean size-adjusted annual return from 0.06% to 5.89%.

[9] As firms in a particular calendar year may not have the same fiscal year end, mean returns from which t-statistics were calculated involve some returns that are overlapping in calendar time, and may thus not be independent. However, similar results were found when we included only December 31 fiscal year end firms in the analysis: the mean difference between portfolio 10 and portfolio 1 size-adjusted returns was 9.13%, with a t-statistic of 2.22. The ranking only on December 31 firms also removes any peeking ahead bias that may arise from ranking all firms as if they had a common fiscal year end. While firms are required to report to the SEC within three months of fiscal year end, some do not. We repeated the analysis taking positions four months after fiscal year end. The mean six-adjusted return difference dropped to 5.98%, with a t-statistic of 2.03.

[10] E/P residuals are (of course) correlated with E/P ratios, so we compared these returns from ranking firms on E/P residuals with those from ranking firms on E/P. The mean difference in size-adjusted returns between portfolio 10 (high E/P) and portfolio 1 was 4.56%, with a t-statistic of 1.03. The return for 1991 was –30.6% and that for 1998 was –56.9%, due, we suspect, to the effects of momentum investing discussed in the next paragraph. For the low E/P portfolio, firms with positive E/P residuals earned an average return of 11.83%, compared with 5.25% for firms with negative residuals. For the high E/P portfolio, the respective numbers were 12.6% and 10.9%.

[11] Average cross-sectional Pearson correlations between E/P model residuals and estimated CAPM beta, ln(size), ln(book-to-market), and ln(leverage), are –0.064, 0.035, 0.091, and -0.093, respectively. So E/P residuals are not strongly related to any of these so-called risk proxies.

[12] Similar results to those in Panel B of Table 8 were obtained when $\Delta \mathbf{R\hat{N}OA_1}$ and S scores were included in the regressions, rather than the E/P model residual. The t-statistic on mean estimated coefficient on $\Delta \mathbf{R\hat{N}OA_1}$ was 4.75 and that on the S score was 5.28.

[13] Thomas and Zhang (2002) show that changes in inventory predict stock returns (and earnings), for example, and largely explain returns forecasted by accruals. Chan, Chan, Jagadeesh, and Lakonishok (2001), Hribar (2001), and Richardson, Sloan, Soliman, and Tuna (2002) disaggregate accruals for forecasting returns.

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