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

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ABSTRACT: This paper yields a summary score that informs about the sustainability (or persistence) of earnings and about the trailing P/E ratio. The score is delivered from a model that identifies unsustainable earnings from the financial statements by exploiting accounting relations that require that unsustainable earnings leave a trail in the accounts. The paper also builds a P/E model that recognizes that investors buy future earnings, so should pay less for current earnings if those earnings cannot be sustained in the future. In out-of-sample prediction tests, the analysis reliably identifies unsustainable 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 those indicated by our P/E model.

Keywords: sustainable earnings, earnings quality, financial statement analysis, price-earnings ratios

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When analysts talk of sustainable earnings, they presumably are concerned about the extent to which reported earnings will persist into the future. However, it is not clear how one identifies sustainable (or persistent) earnings. Measures of "pro forma earnings" and "core earnings" have been proposed, but each has drawn criticism. This paper develops an analysis that reliably identifies unsustainable earnings using financial statement information. At the heart of the analysis is the recognition that financial statement numbers are codetermined, by the rules of accounting; earnings measurement affects other numbers in the financial statements, providing a trail that can be followed to identify unsustainable earnings.

Unsustainable earnings, so obtained, are then applied to explain the pricing of earnings. Analysts are interested in the sustainable component of earnings because they (presumable) understand that equity values are based on expected future earnings rather than current earnings. Accordingly, investors should pay less for current earnings if those earnings are not sustainable; if earnings are temporarily high, so are expected to decline in the future, P/E ratios should be lower than if earnings were sustainable. Correspondingly, if 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. Thus, a measure of sustainable earnings gives an indication of the trailing P/E ratio. The paper builds a model of the P/E ratio that incorporates our measure of sustainable earnings ascertained from financial statements, and finds that the model has considerable power in explaining cross-sectional variation of P/E ratios. This result indicates that the financial statement information that supplements earnings is considerably effective in explaining the pricing of those earnings.

Traded P/E ratios, to which our model is fitted, incorporate information about the sustainability of earnings only if the market prices earnings efficiently. Given this caveat, we also investigate whether information in financial statements about the sustainability of earnings predicts future stock returns, with an affirmative answer. Further, we find that deviations of traded (market) P/E ratios from those implied by our estimated P/E model also predict stock returns. While one cannot rule out risk explanations – which we attempt to control for – this result questions whether the market efficiently prices the information in the financial statements about the sustainability of earnings.

Section 1 of the paper provides a precise characterization of sustainable earnings and lays out our approach for identifying unsustainable earnings. Section 2 specifies a P/E model that incorporates this sustainable income measure. The empirical analysis is in Section 3 and 4. Section 3 estimates the model that identifies unsustainable earnings, and Section 4 estimates the P/E model. Section 5 deals with the prediction of stock of returns.

1. Financial Statement Information and Sustainable Earnings

Assessing earnings persistence is a form of earnings forecasting that takes current earnings as a starting point and asks whether future earnings are expected to continue at the same level. Research on earnings forecasting in the modern era began with this perspective; Lintner and Glauber (1967) and Ball and Watts (1972) saw current earnings as the basis for predicting subsequent earnings, and depicted earnings as following a martingale process -- with earnings changes unpredictable, beyond a drift -- and thus sustainable. Subsequent research modified this view by showing that future earnings changes are readily predictable and that line-item financial statement information aids in that prediction.[1] Some of the same accounting information has also been shown to predict stock returns. This paper builds on that research.

The previous papers identify a variety of financial statement predictors, many of which are likely to be correlated, and thus contain similar information. This paper develops a model to diagnose the sustainability of earnings that summarizes the information that financial statements items convey jointly, as a whole. However, while the resultant parsimony is a virtue, it is not the main point of the exercise. This could be achieved simply by sequentially fitting all variables with explanatory power to a model, but out-of-sample performance is likely to be improved by incorporating the accounting structure involved in earnings measurement. Some accounting numbers are necessarily correlated, by the construction of the accounting, and this structural correlation can be exploited. Because earnings are computed under the discipline of double entry, the accounting leaves a trail. Temporarily increasing earnings by reducing deferred revenues, accrued expenses, or allowances for bad debts are just three examples. "Cookie jar accounting" that reduces current earnings and increases future earnings also affects balance sheet accounts. Unsustainable earnings affect the balance sheet, holding all else constant, and those effects can be observed.

All else is not constant, however, making the trail more difficult to follow. Increases in the balance sheet could be indicative of unsustainable earnings, but increases in the balance sheet are also necessary to produce sustainable or increasing earnings; investment and (forward-looking) accruals lead sales, for example. Further, current changes in the balance sheet and current earnings are also determined by the accounting for the balance sheet in the past; past assets becomes current expenses, and lower net assets (higher expenses) in the past mean lower expenses now, as the "cookie jar accounting" scenario describes.

This paper develops a sustainable earnings model that "follows the trail," and incorporates the intra-period and inter-period accounting relationships that bear on the sustainability of earnings. Accordingly, the model mirrors the structure of the accounting system that jointly produces earnings and a variety of other accountings numbers that inform about the sustainability of earnings. The structured approach contrasts to the specification of predictors based on what works in the data, as in Ou and Penman (1989), for example, or by reference to analysts' expert rules, as in Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997).

Some of the relationships we incorporate have been recognized in previous research and utilized in practical "quality of earnings" analysis so, to that extent, the modeling here unifies previous endeavors. However, there are extensions. For example, Sloan (1996) recognizes the inter-period feature of accounting implies that extreme accruals must reverse. Fairfield, Whisenant and Yohn (2003) recognize that accruals are correlated with changes in net operating assets which also bear on the persistence of earnings. However, while accruals and net operating assets are negatively correlated with future earnings changes (and stock returns), on average, a complete treatment accommodates conditions where, to the contrary, forward-looking accruals and investments in net operating assets sustain or increase sales and earnings. In another example, Fairfield and Yohn (2001) identify unsustainable profit margins by recognizing that, holding all else constant (including sales), an increase in operating profit margin (operating income-to-sales), due to accounting that yields a lower expense number, must be accompanied by a decrease in asset turnover (sales-to-net operating assets) as expenses that might have been charged to the income statement remain on the balance sheet. However, all else is not constant (including sales) and thus the correlations are conditional. Pertinent to both examples, an increase in net operating assets and/or a decrease in asset turnover can be interpreted only in conjunction with an assessment of the sustainability of sales, but sales are increased by growth in net operating assets that are also affected by the accruals. We build in these considerations.

The modeling in this paper also responds to the uncertainty that the investor has in assessing sustainable earnings and articulates an approach that an analyst might take to resolving that uncertainty. Some unsustainable income is readily identified from disclosures in the financial statements; extraordinary items and discontinued operations are reported on a separate line. Diligent reading of financial statement footnotes discovers other (presumably) transitory 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. The investor, with some confidence, identifies these items as unsustainable. Indeed calculations of "core income" and "pro forma" income proceed along these lines. But, after excluding these items from sustainable earnings, the investor still has doubts about whether remaining earnings will persist. What is the investor to make of increasing profit margins on slowing sales growth? Is this indicative of temporarily low expenses or permanent cost cutting? What is be to make of increasing accruals with declining investment? At a more detailed level, 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? These features are often considered "red flags" but their interpretation is usually unclear. To the extent that these questions cannot be resolved, he must take a probabilistic approach and assesses the likelihood of earnings being unsustainable. Core income and pro forma income calculations, with their pretense of providing a deterministic number, do not incorporate this probabilistic feature of the problem.

The paper builds a model of sustainable earnings that not only identifies the red flags but also supplies these probabilities. Indeed, it delivers a composite score ranging between zero and one that indicates the probability that earnings are sustainable. With a composite that reduces a set of information to a scalar, the paper 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).

The performance of the composite scores is quite impressive. Even though we estimate models on data pooled over all firms (with no allowance for differences between industries or other conditions) we find in out-of-sample prediction tests, that, for firms initialized on their rate of return on net operating assets (before identifiable extraordinary and special items), the average difference between the one-year-ahead rate of return for firms with the highest third and lowest third of scores is 4.1%.

The point that financial statement information must be considered as a whole applies also to the prediction of stock returns. The many purported anomalies documented in trading strategies built around accounting numbers cannot be cumulative, given the correlation between those numbers. The paper examines how accounting numbers (that identify unsustainable earnings) jointly forecast stock returns, and documents the incremental contribution of individual numbers to explaining those returns.

1.1 Characterizing (Un)Sustainable Earnings

Earnings is the sum of operating income and net interest expense from financing activities, after tax. Net interest is 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, to specify the target for our empirical analysis, we focus our attention on the sustainability of after-tax operating income (that is, income before net interest).

Operating income is sustained by investment in assets, and operating income is expected to increase with additional assets. So, in assessing the sustainability of operating income, one must adjust for changes in income arising from changes in assets. 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:

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

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

Accordingly, 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, $t > 0$, operating income is forecasted as

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

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

$$OI_1 = OI_0 + RNOA_0 \cdot \Delta NOA_0. \tag{2a}$$

That is, current income is sustainable if the current addition to net operating assets is 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. Unsustainable income is ascertained by forecasting that $\Delta RNOA_1 = RNOA_1 - RNOA_0$ is different from zero.

The target variable for our empirical is thus identified. Note that the calibration is to return on *net* operating assets, not the more common measure of return on assets, for the accounting for operating liabilities (like deferred revenues and accrued expenses) also determines the sustainability of earnings and financial assets (included on return-on-asset calculations) do not. Further, the metric is not affected by the classification of allowances (for warranties, for example) as contra assets or liabilities.

2. A Model of the P/E Ratio

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, even though it is the prime multiple that analysts refer to. The P/E ratio is commonly viewed as indicating expected earnings growth, but is also affected by transitory (unsustainable) current earnings, an effect that fundamental analysts once referred to as the "Molodovsky effect," from Molodovsky (1953): a P/E ratio can be high because of anticipated long-run earnings growth, but a firm with anticipated long-run earnings growth can have a low trailing P/E because current earnings are temporarily high.[2] 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 unsustainable current affect the P/E ratio. In this section we specify a model of the trailing P/E ratio that incorporates expectations of earnings growth but which also incorporates the "Molodovsky effect" of unsustainable current earnings on the P/E ratio.

Equation (1) recognizes that expected growth in income – and thus the P/E ratio -- is determined by both expected changes in profitability, ΔRNOA, and expected growth in net operating assets, ΔNOA. Sustainable income concerns the former. Thus an empirical model of the P/E ratio that isolates the effect of unsustainable earnings must also control for expected growth in net operating assets. The residual income valuation model describes equity valuation is terms of both expected profitability and growth is the book value of assets, so we develop the empirical P/E model by utilizing that model.[3] With a focus on the sustainability of operating income, we are concerned with the value of the operations (otherwise called enterprise value or firm value), with the understanding that the value of the equity equals the value of operations minus the value of debt.

We develop the model in three steps. First we identify the P/E ratio for the case of no growth (from either profitability or growth in net operating assets). Second, we establish the P/E for the case where profitability is sustained at the current level and growth comes from growth in net operating assets. Third, we introduce the effect of unsustainable current profitability.

The constant-growth residual income model expresses (intrinsic) enterprise price as

$$Enterprise\ P_0 = NOA_0 + \frac{E_0\left[OI_1 - (\rho - 1)NOA_0\right]}{\rho - g}$$

$$= NOA_0 + \frac{E_0\left[RNOA_1 - (\rho - 1)\right]NOA_0}{\rho - g}$$

where E_0 indicates expectation at time 0, ρ is one plus the required rate of return for operations, the numerator is expected residual income one year ahead, and g is one plus the growth rate of expected residual income after year 1. If there is no expected growth in residual income after the current year, it is easily shown that the enterprise P/E ratio = $\frac{P_0 + FCF_0}{OI_0} = \frac{\rho}{\rho - 1}$, the "normal" P/E ratio[4]. FCF_0 is free cash flow generated in the current year.

For the case of sustainable income where expected $RNOA_1 = RNOA_0$,

$$Enterprise\ P_0 = NOA_0 + \frac{\left[RNOA_0 - (\rho - 1)\right]NOA_0}{\rho - g},$$

and a non-normal P/E is implied if $\Delta NOA_0 \neq 0$ or $g \neq 1$. As growth in residual income is due to changes in expected profitability and/or expected growth in NOA, growth in one-year-ahead residual income in this case is determined solely by current growth in NOA (in addition to the required return), as in (2a), and the P/E ratio for the sustainable earnings case adds to the normal P/E as follows:

$$\frac{P_0 + FCF_0}{OI_0} = \frac{\rho}{\rho - 1} + \frac{(\rho - g)^{-1} G_0^{NOA}[RNOA_0 - (\rho - 1)] - (\rho - 1)^{-1}[RNOA_0 - (\rho - 1)]}{RNOA_0} \qquad (3)$$

where G_0^{NOA} is the current growth rate for NOA.[5] The P/E ratio increases with $G_0^{NOA} * RNOA_0$ and decreases with $RNOA_0$. The interaction term, $G_0^{NOA} * RNOA_0$ captures how subsequent residual earnings are expected to differ from current residual earnings given the current growth in NOA and profitability sustained at the current level; in short, it captures the effect of the sustainable income forecast in (2a) on the P/E ratio. The interaction recognizes that NOA growth increases growth in operating income, and thus the P/E ratio, but the higher the profitability, the higher the P/E if that profitability can be sustained. The negative relation between the P/E and $RNOA_0$ recognizes that current residual income is subtracted in assessing growth in residual income, consistent with current income being in the denominator of the P/E ratio.

For the unsustainable earnings case, expected $RNOA_1 \neq RNOA_0$, so a forecast of $\Delta RNOA_1$ also affects the P/E ratio. So, for the estimation of an empirical model from the cross section, we specify the following regression equation that includes $G_0^{NOA} * RNOA_0$ and $RNOA_0$ for the case of sustainable earnings in (3), but also an estimate of unsustainable earnings, $\Delta RNOA_1$:

$$\text{Enterprise } (E/P)_0 = a + b_1 \widehat{\Delta \mathbf{RNOA}}_{\mathbf{1}} + b_2 RNOA_0 \cdot G_0^{NOA} + b_3 RNOA_0 + e_0 \qquad (3a)$$

We specify an E/P model rather than a P/E model to avoid difficulties with small and negative denominators. Fitted to traded E/P ratios in the cross section, estimated coefficients on last two terms incorporate the market's average assessment of the required return and growth parameters in (3), ρ and g. The firm disturbance, e_0 captures cross-sectional differences in ρ and g, information about sustainable income not captured by $\widehat{\Delta \mathbf{RNOA}}_{\mathbf{1}}$ and (as we will later entertain), market inefficiencies in pricing earnings. We estimate model (3a) in the cross section in Section 4 after estimating $\widehat{\Delta \mathbf{RNOA}}_{\mathbf{1}}$ in Section 3. Given that the $\widehat{\Delta \mathbf{RNOA}}_{\mathbf{1}}$ indicator captures unsustainable income, the estimate of b_1 should be negative. Model (3) implies that the estimate of b_2 should be negative, while that of b_3 should be positive.

We model the enterprise (unlevered) E/P ratio, operating income-to-price, rather than the standard (levered) E/P, net earnings-to-price, 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 enterprise P/E (see Penman 2007, chapter 13); the analysis extends to the levered P/E by straightforward application of those formulas.

3. Developing and Estimating the Model of Sustainable Earnings

This section develops and estimates a model for forecasting $\Delta RNOA_1$, the target variable established in Section 2. We employ two estimation techniques, ordinary least squares (OLS) and LOGIT. The former delivers a point estimate of $\Delta RNOA_1$ and utilizes all the information in the variation of $\Delta RNOA_1$ in the estimation. The technique relies on normality, however, 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 indicates the probability of an increase in profitability, appropriate for a probabilistic approach to identifying sustainable earnings. For sustainable earnings, that probability is 0.5. We refer to this probability as an S score (an earnings sustainability score).

Our approach is cross-sectional, so sustainability is assessed by reference to averages in the cross section. Cross-sectional models are estimated each year 1976–2002, with out-of-sample prediction tests for the 24 years, 1979–2002 using average coefficients estimated over the three prior years. The analysis covers all NYSE, AMEX and NASDAQ firms on COMPUSTAT files, including non-survivors, except financial firms, firms with "unclassified" industries on COMPUSTAT, firms listed outside the United States, and firms with negative net operating assets. To avoid firms with extreme growth due to large acquisitions, we excluded firms in a given year with sales increases or decreases larger than 50%. The number of remaining firms in each year ranges from 2,188 in 1980 to 3,534 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. LOGIT results are similar when models are estimated from all firms having data for the variables in a particular model. OLS results report lower t-statistics (as expected with more observations), but similar out-of-sample results.

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.[6] We would like to have made a more comprehensive exclusion of identifiable non-recurring items, but COMPUSTAT classifications are not refined enough for that purpose. We calculate net operating assets from COMPUSTAT data following procedures in the appendix of Nissim and Penman (2001).

The emphasis in the modeling is on design – on developing a model that incorporates the accounting involved in determining earnings – rather than finalizing a model that uses every piece of accounting information. The reader will see possible extensions that involve disaggregation of the summary measures we introduce to the model. In that vein, we estimate models using all firms in the cross section; estimating models for specific industries where operating characteristics are similar would presumably provide an enhancement.

3.1 Benchmark Models of Persistence of RNOA

Return on net operating assets, RNOA is the summary measure of operating profitability that aggregates all financial statement line items that pertain to operations. We first estimate models that use RNOA alone, to provide a benchmark against which to evaluate additional information in financial statement line items. Accordingly, our analysis asks how financial statement analysis of the line items adds to the assessment of the sustainability of earnings over that indicated by RNOA alone.

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

$$RNOA_1 - RNOA^* = \alpha + \beta(RNOA_0 - RNOA^*) + \varepsilon_1. \tag{4}$$

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

$$\Delta RNOA_1 = \alpha + \beta_1(RNOA_0 - RNOA^*) + \beta_2\Delta RNOA_0 + \varepsilon_1. \tag{5}$$

We estimate models (4) and (5), with $RNOA^*$ assumed to be the same for all firms.[7] We also include terms, specified by Fama and French, that allow for nonlinearities in the reversion dynamics. 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 for models (4) and (5), 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 27 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, adjusted for autocorrelation in the regression coefficients (as explained in the footnotes to the table). 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, 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 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. Also reported is the percentage of firms with $S > 0.6$ and $S < 0.4$, and (in the last row) 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. These prediction metrics are the benchmark for assessing the performance of the extended modeling that follows.

These Fama and French models 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.

3.2 Modeling Persistence of RNOA with Financial Statement Analysis

Provided that no operating income or net operating assets are booked to equity, the clean surplus relation for operating activities is satisfied such that,

$$OI_0 = \text{Free Cash Flow}_0 + \Delta NOA_0. \tag{6}$$

Free cash flow is the net cash from operations, after investment (cash flow form operations minus cash investment), considered the "hard" aspect of the income calculation. Equation (6) says that, by the principles of accounting measurement, the current change in net operating assets also determines current operating income and the sustainability of current profitability, $RNOA_0$. It is on this "soft" aspect of income (where measurement and estimation is involved) upon which we focus. $RNOA_0$ can be increased by increasing $\Delta NOA_{0,}$ through a reduction of unearned revenue or a reduction of allowances for bad debts and warranties, for example. However, the higher NOA_0 is the base for the following year's profitability, $RNOA_1 = OI_1/NOA_0$, inducing a subsequent drop in $RNOA_1$ and thus unsustainable income. In addition, increasing NOA_0 can also reduce the numerator of $RNOA_1$ as the net assets are written off to future expenses (or reduced revenues). Sustainable income in equation (2a) is a particular choice of accounting for the change in net operating assets that, for a given free cash flow, produces an $RNOA_0$ and the interaction, $RNOA_0 \cdot \Delta NOA_0$ that yields $\Delta RNOA_1 = 0$.

Accordingly, our modeling focuses on ΔNOA_0, the trail left in the balance sheet by unsustainable earnings. The modeling proceeds in three steps. In the first, we control for variables that determine ΔNOA_0 other than through the accounting relation (6). Essentially this step estimates a normalized ΔNOA_0 (that yields sustainable income) so that deviations from normal indicate unsustainable income. In the second step, we introduce reported $\Delta NOA_{0.}$ The third step completes the model with a more detailed analysis of the accounting that determines ΔNOA_0.

The final OLS and LOGIT models are highlighted at the top of Panels A and B of Table 2, and estimates for the model are given in the last column of those panels (Step 3). To be clear about the purpose and contribution of variables in the model, we report, in the other columns, estimates after successively adding those variables to the benchmark model (5).

Step1. *Controls for Analyzing the Change in Net Operating Assets*. As well as being determined by the intra-period relation (6), ΔNOA_0 is determined by inter-period relations. ΔNOA_0 begets future sales that sustain operating income, so ΔNOA_0 must be normalized for anticipated sales. In addition, ΔNOA_0 can be affected by the accounting for net operating assets in prior periods for higher NOA booked in the past means lower current NOA, ceteris paribus, (as assets become expenses, for example).

We defer to the current change in asset turnover to infer normal ΔNOA_0. Just as current ΔNOA begets future sales, so lagged ΔNOA begets current sales. The realization of current sales, $Sales_{0,}$ relative to the prior year's increase in net operating assets, $\Delta NOA_{-1,}$ forecasts subsequent sales: We expect that high increases in current sales, relative to the prior period change in NOA that generates them, to indicate higher sales in the future. Higher expected sales, in turn, require increases in NOA_0 such that ATO_1, a determinant of $RNOA_1$, is sustained at the level of $ATO_{0.}$ (Unlike the deterministic relation (6), the relation is probabilistic, and our estimations allow for less than perfectly persistent sales). Accordingly, the current change in asset turnover, $\Delta ATO_0 = Sales_0/NOA_{-1} - Sales_{-1}/NOA_{-2}$, is included on the model. This effectively measures the growth rate in sales in the current period relative to the growth rate in NOA in the prior period.

As ΔATO_0 is a component of a Du Pont decomposition of $\Delta RNOA$, its addition to the benchmark model means that $\Delta RNOA_0$ now captures the change in profit margin, $\Delta PM_0 = OI_0/Sales_0 - OI_{-1}/Sales_{-1}$, the complement of ΔATO in the Du Pont calculation, along with the interaction between ΔATO_0 and ΔPM.[8] The ΔPM_0 measures growth rate in current operating expenses relative to the sales growth rate. We explicitly add ΔPM_0 to the model, however, for two reasons. First, given current sales growth (in ΔATO_0), changes in operating expenses may provide an indication of the sustainability of operating income, without reference to ΔNOA_0:

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, but the variable also captures improved cost efficiencies more generally.) Second, if in the prior period the NOA_{-1} is due to booking NOA that reverse in NOA_0 (in the current period), the ΔATO_0 that has been introduced to sales-normalize NOA_0 will reflect an expected decrease in NOA_0 rather than NOA_0 required to sustain sales. But current operating income is affected, so introducing ΔPM_0 (in conjunction with ΔATO_0) controls for this effect while introducing ΔNOA_0 (in Steps 2 and 3). The Step 1 analysis most closely resembles that of Farifield and Yohn (2001), but with differences in the construction for the purpose at hand, and consequently a different interpretation.[9] Note that, if prior period's ATO implies a constraint of earnings management – as indicted by Barton and Simko (2002) – we have initialized for this in the cross section.

In the OLS estimates for Step 1 in Table 2, $\Delta RNOA_0$ is no longer significant (but not the LOGIT estimation). The ΔPM_0 variable does not add any explanation of $\Delta RNOA_1$ but ΔATO_0 does: Higher sales relative to the additions to NOA in the prior period indicates higher $\Delta RNOA_1$.[10] The goodness-of-fits statistics and the predictive associations improve over those for the benchmark models in Table 1, but only marginally.

Step 2. *Adding Changes in Net Operating Assets*. We now introduce ΔNOA_0 as prompted by the accounting relation (6). To the benchmark profitability variables and the Step 1 variables, we add the current growth rate in net operating assets, $G_0^{NOA} = \Delta NOA_0/NOA_{t-1.}$ The Step 2 results in Table 2 indicate 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 benchmark model (in Table

1) and the Step1 model is considerable. Further, in contrast to the Step 1 model, ΔATO is now significant in both the OLS and the LOGIT results: controlling for current growth in net operating assets, current sales growth adds information. Further, the coefficient on $\Delta RNOA_0$ is no longer significant: The financial statement analysis to this point renders the aggregate uninformative.[11]

Step 3. *Analyzing the Accounting for the Change in Net Operating Assets*. The final step incorporates accounting principles for recording ΔNOA_0. Providing that no part of operating income or net operating assets is booked to equity, a further accounting relation demands that the ΔNOA_0 that determines current operating income in equation (6), is measured as

$$\Delta NOA_0 = \text{Cash Investment}_0 + \text{Operating Accruals}_{0.} \tag{7}$$

That is, growth in net operating assets is determined by cash investment and new operating accruals.

This decomposition corresponds to that in Fairfield, Whisenant and Yohn (2003) and isolates the accruals that Sloan (1996) shows have different persistence than cash flow components of earnings. However cash investment is also due to accounting measurement that can introduce unsustainable earnings. While “cash investment” would appear to be a cash notion, it is actually an accrual measure, because “cash investment” booked to the balance sheet is that part of cash outflows that are judged, under inter-period allocation rules of accrual accounting, to apply to future period revenues rather than the current period, with the residual of cash outflows booked to earnings. Accordingly, booking investment to the balance sheet (rather than the income statement) bears on the sustainability of earning, for excess recorded investment (that increases current earnings) must, like excess accruals, reverse into future expenses, and also increase the denominator of $RNOA_1$. In this sense, “over investment” is a phenomenon of accounting measurement. Such investment (in the denominator of $RNOA_1$) leads to expected $\Delta RNOA_1 < 0$, that is, unsustainable earnings. Investment begets sales and earnings, of course, just as forward-looking accruals may indicate more future earnings. However, investment sustains earnings only if the new investment is expected to have the same profitability as existing investment, and thus $\Delta RNOA_1 = 0$, as Fairfield, Whisenant and Yohn (2003) point out.

The Step 3 model in Table 2 incorporates the decomposition of ΔNOA_0 into investment and operating accruals. Accruals are measured as the difference between cash from operations and operating income, deflated by NOA_{-1}.[12] 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 recognizing investment and accruals (deflated by NOA_{-1}), the specification decomposes $RNOA_0$ (operating income deflated by NOA_{-1}) into cash flow and accrual components. So accruals and cash flow are evaluated, as in Sloan (1996), but with the inclusion of correlated investment and the other conditioning variables.

Another feature of the accounting for net operating assets bears on the analysis. Investments booked to the income statement rather than the balance sheet – like R&D expenditures and advertising (brand building) expenditures – do not affect NOA at all. However, growth in these expenditures depresses operating income and slowing growth increases operating income. In effect, this application of conservative accounting builds hidden reserves that can be released into earnings by slowing investment. If the change in growth is temporary, the accounting reports temporary, unsustainable earnings, as documented in Penman and Zhang

(2002). Penman and Zhang 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.[13]

Both the C and Q scores are added to the Step 3 model. While the Q score captures temporary effects on earnings from conservative accounting, the C score (that measure the degree of conservative accounting) is also added for the following reason. 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. 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.

The Step 3 results in Table 2 indicate that accruals provide additional predictive power, both with respect to investments and with respect to cash from operations (now identified in $RNOA_0$). 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 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.

3.3 Summary of Sustainable Earnings Modeling

The goodness-of-fit and prediction results in Step 3 compare favorably with those for the benchmark model in Table 1: The structured financial statement analysis adds to the information in RNOA aggregates. Not only is the prediction success for cases of $S > 0.6$, and $S < 0.4$ improved (70% versus 64%), but the percentage of firms screened into this group is also considerably greater (52% versus 26%): The model better identifies cases where earnings are likely to be unsustainable and has better predictive success in those cases. Additionally we found that adding the Fama and French nonlinearity variables (in Table 1) to the Step 3 model does not improve the fit, and the non-linear variables are not significantly different from zero. With non-linearities in mind, we tested whether model coefficients differ over different levels of RNOA. Results were similar over deciles groups for RNOA, but more emphatic in the extremes.[14]

Table 3 demonstrates that the composite indicator of unsustainable earnings subsumes the information in the components, supporting the approach of using financial statement information jointly. The LOGIT estimations were repeated with all Step 3 variables included along with the fitted value of the S score. The S score is highly significant, but none of the components are. In the case of OLS, the fitted value is a linear combination of the composite numbers, so each variable is added one at a time. Again the predicted value is an important predictor of $\Delta RNOA_1$ but, with the exception of $RNOA_0$, none of the components are significant.

The goodness-of-fit and prediction results in Step 3 show only slight improvement over those in Step 2. Note, however, that the emphasis in the modeling is on design, and the model only includes aggregates. Net operating assets can be decomposed into changes in inventories, plant, deferred taxes, pension liabilities, and so on, to improve the scoring, as can ΔATO, ΔPM, and the C and Q measures. Indeed, Nissim and Penman (2003) show that distinguishing changes in operating liabilities from changes in operating assets explains changes in profitability, and

Richardson, Sloan, Soliman, and Tuna (2005) disaggregate accruals to similar effect. Footnotes above describe some extension we embarked upon. To the point, the structured analysis provides cohesion to what might otherwise appear to be an arbitrary selection of financial statement ratios.

Figure 1 displays the discriminating ability of S scores estimated from the final model. 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 15.48. 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 middle 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 model coefficients were similar for three sub-periods, 1976-1984, 1985-1993, and 1994-2002. Further, similar patterns to those in Figure 1 were observed for three sub-periods. For 1976-1984, the difference in RNOA for year +1 between high and low S groups was 3.7%, 3.9% for 1985-1993, and 4.5% for 1994-2002.[15]

4. Explaining Cross-sectional Differences in Enterprise P/E Ratios

The instrument for sustainable earnings is developed in part to explain P/E ratios. In this section we estimate the E/P model (3a) from firms in the cross section.

As P/E ratios vary, in principle, with the cost of capital, as model (3) prescribes, one might also include the cost of capital in model (3a) 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) show 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.[16] 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.

Panel A of Table 4 estimates the enterprise E/P model specified in equation (3a), with $\widehat{\Delta RNOA}_1$ estimated from the OLS regression for Step 3. The E/P model is estimated for all firms and then for firms with positive and negative earnings. Panel B substitutes the S score from the

LOGIT model.[17] Estimations are made for each year, 1979-2002, with the top and bottom one percent of E/P observations deleted. The model is estimated within industries to control for risk that also determines cross-sectional difference in E/P ratios, with a requirement that each industry have at least 20 firms from which to estimate the four coefficients. We used the 48 industry groupings identified by Fama and French (1997) for the purpose of differentiating risk premiums.

The reported coefficients in Table 4 are means of estimates for all industries over the 24 years. The accompanying t-statistics are large, with considerable R^2 values overall. Estimated b_2 coefficients on the current profitability and growth variable that project sustainable income, $RNOA_0 \cdot G_0^{NOA}$, are negative, as predicted by the modeling in Section 2: 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. Estimated b_3 coefficients are positive, as predicted: Given forecasts of sustained profitability with growth, a higher current RNOA implies a lower P/E ratio. However, the inclusion of the unsustainable earnings estimate further modifies the P/E ratio: The higher $\widehat{\Delta RNOA}_1$, the higher the P/E ratio, although not significantly 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, except again for loss firms.

5. Forecasting Stock Returns

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. Accordingly, we investigate whether deviations from the fitted line for the E/P model 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. We also investigate whether the unsustainable earning indicators, $\Delta \widehat{\mathbf{RNOA}}_1$ and the S score, predict stock returns directly.

Panel A of Table 5 reports one-year-ahead 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 4. In each year from 1979 to 2002, we ranked the firms into 10 equal-sized portfolios based on these residuals. 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, including delisting returns for nonsurvivors. The table reports mean raw returns and size-adjusted returns for each portfolio over the 24 years that the positions were held. 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.[18]

The mean returns in Panel A of Table 5 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 12.49%, with a t-statistic estimated from the time series of 24 returns of 4.51.[19] The corresponding return difference for size-adjusted returns is 7.92%, with a t-statistic of 3.53. The relative frequency of observing a return of 12.49% or higher in 5,000 replications of randomly assigning stocks to the high and low portfolios was 0%. The corresponding number for the size-adjusted return of 7.92% 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 those, before transactions costs, from a zero net investment involving 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 4. 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 19 years, but negative for five years.[20]

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 strategy whereas a high P/E ratio (relative to the fitted line) implies short position in our analysis. Accordingly, Panels B and C of Figure 2 report differences in returns between portfolios 10 and 1 from a ranking of firms onto portfolios on $\Delta \widehat{\mathbf{RNOA}}_1$ and S scores, respectively, rather than E/P model residuals. The mean size-adjusted return difference (over years) to the $\Delta \widehat{\mathbf{RNOA}}_1$ positions is 13.05%, with a t-statistic of 5.03, and that to S score positions is 15.54% with a t-statistic of 3.93. The return is negative in two years in Panel B, and in four years in Panel C.

5.1 Controls for Potential Risk Proxies

The observed returns in Panel A of Table 5 are consistent with the efficient pricing of P/E ratios if they reflect different returns to risk. 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 5 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): estimated CAPM beta, size, book-to-market ratio, leverage, and E/P.[21] Reported coefficients are, again, means of cross-sectional estimates for each of the 24 years, 1979 to 2002. 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."[22]

As a further check, Panel C of Table 5 reports intercepts for the Fama and French four-factor model, estimated in time series with annual returns from 1970-2002, for each E/P residual portfolio in Panel A. The intercepts – returns not explained by the factors – are increasing over these portfolios, with a difference of 10.04% between the high and low portfolios.

5.2 Disaggregating Return Predictions

The estimated models weight several pieces of financial statement information to yield a composite indicator that indicates unsustainable earnings and predicts stock returns. We now ask which components in the composite are particularly important to predicting returns, and whether the composite subsumes information about returns in its individual components.

The first three columns of Table 6 reports regressions of future stock returns on the components. Separate regressions are reported for annual returns for one, two, and three years ahead. The table indicates that none of the variables, except perhaps $RNOA_0$, incrementally forecasts stock returns beyond the immediate year ahead, year +1, although R^2 values for years

+2 onwards indicate some joint predictive power. For the one-year-ahead returns, predictive power comes from the 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.

The last two columns of Table 6 investigate whether individual components of the composite scores have any incremental ability to predict one-year-ahead returns over the composite itself. The fourth column adds the S score and the last column adds the residual from the E/P model with $\widehat{\Delta RNOA}_1$ as the indicator of unsustainable earnings. For the latter, none of individual items bears a significant coefficient, except G^{NOA} (marginally so). The coefficient on the E/P model residual is positive and significant. The coefficient on the S score in the companion regression is similarly so, but so are the coefficients on $RNOA_0$, ΔATO, and G^{NOA} in that regression. Table 3 indicated that the summary measures subsume information in the components for predicting earnings. The evidence with respect to the prediction of stock returns here is mixed.

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 annual size-adjusted return from the composite measures in the range of 13% - 15% (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 similar trading strategies– accruals in Sloan (1996) and Q scores in Penman and Zhang (2002), for example – but not by large amounts.[23] Table 6 does indicate some incremental explanatory power, over the composites, for some variables. However, our results indicate that the returns to various fundamental strategies are not additive, as Zach (2003) 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.[24]

6. 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 thus 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 information that reduces their uncertainty. The financial statements supply additional line item information that provides a commentary on the earnings as an indicator of future earnings. An appropriate financial statement analysis elicits that information.

The financial statement analysis in the paper is incorporated in a model that supplies probabilities of the sustainability of earnings, and so reduces investors' uncertainty. The financial statement analysis in also built in to a model of the P/E ratio. The modeling follows a structured approach that recognizes intra-temporal relations between numbers in the financial statements – such that unsustainable earnings leave a trail to be followed – and also inter-period relations that determine the evolution on the accounting numbers over time. Some features in earlier papers are incorporated, but in such a way that considers the financial statements as a whole. Accordingly, the paper develops 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, and without a complete disaggregation to capture all the detail in financial statements. The scoring is constrained to be linear in the information. 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. Information 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 (4.15)	0.021 (4.55)	0.022 (4.15)
$RNOA_0$ coefficient	-0.177 (-8.18)	-0.182 (-10.39)	-0.187 (-9.06)
$\Delta RNOA_0$ coefficient		0.039 (2.33)	0.021 (0.37)
ncp coefficient			-0.005 (-1.10)
sncp coefficient			0.214 (1.31)
spcp coefficient			0.124 (0.44)
R^2	0.068	0.074	0.106
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.210	0.202	0.201
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.233	0.237	0.224

TABLE 1 (continued)

Panel B: LOGIT estimation

Prob(ΔRNOA$_1$>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. 330 (3.82)	0.361 (3.99)	0.405 (3.92)
$RNOA_0$ coefficient	-2.492 (-4.39)	-2.694 (-4.06)	-2.812 (-9.55)
$\Delta RNOA_0$ coefficient		0.874 (4.17)	0.420 (0.68)
ncp coefficient			-0.087 (-1.98)
sncp coefficient			1.313 (0.47)
spcp coefficient			3.554 (0.83)
Log likelihood ratio	0.022	0.025	0.029
Rank correlation of in-sample $\Delta RNOA_1$ and fitted S scores	0.220	0.229	0.230
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted S scores	0.233	0.238	0.235
Frequency of correct out-of-sample predictions for S<0.5 and S>0.5	0.548	0.553	0.551
Frequency of firms with S<0.4 or S>0.6	0.237	0.247	0.261
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6	0.641	0.646	0.637

Cross-sectional OLS and Logistic regression coefficients are estimated each year from 1976 to 2002. The mean estimated coefficients from the 27 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. To adjust for autocorrelation in the regression coefficients, estimated standard errors are multiplied by $k = \sqrt{\frac{1+\phi}{1-\phi} - \frac{2\phi(1-\phi^n)}{n(1-\phi)^2}}$ where φ is the estimated first order autocorrelation coefficient and n equals the number of annual regressions (Abarbanell and Bernard 2000). The adjustment is not made when φ is negative (i.e., when k<1).

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 $\Delta RNOA_0^2$ when $\Delta RNOA_0$ is positive, and zero otherwise; S is estimated Prob($\Delta RNOA_1$>0).

TABLE 2

Models for Indicating Unsustainable Earnings Using Financial Statement Line Item Information

Panel A: OLS estimation

$$\boxed{\Delta RNOA_1 = \alpha + \beta_1 RNOA_0 + \beta_2 RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \in_1}$$

	Step 1	Step 2	Step 3
Intercept	0.020	0.026	0.019
	(4.410)	(4.740)	(4.870)
$RNOA_0$ coefficient	-0.180	-0.121	-0.115
	(-10.11)	(-6.92)	(-6.15)
$\Delta RNOA_0$ coefficient	0.019	-0.016	-0.027
	(-0.61)	(-0.50)	(-0.92)
ΔPM coefficient	-0.036	-0.062	-0.005
	(-0.59)	(-1.03)	(-0.07)
ΔATO coefficient	0.009	0.012	0.012
	(3.45)	(5.03)	(4.83)
G^{NOA} coefficient		-0.104	-0.087
		(-7.92)	(-9.96)
$Accr_0$ coefficient			-0.033
			(-1.78)
Q_0 coefficient			0.099
			(2.34)
C_0 coefficient			0.012
			(1.11)
R^2	0.086	0.134	0.164
Rank correlation of in-sample $\Delta RNOA_1$ and fitted values	0.203	0.333	0.346
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted values	0.223	0.342	0.347

Panel B: LOGIT estimation

$$\Pr ob(\Delta RNOA_1 > 0) = e^k/(1+e^k), k = \alpha + \beta_1 RNOA_0 + \beta_2 \Delta RNOA_0 + \beta_3 \Delta PM_0 + \beta_4 \Delta ATO_0 + \beta_5 G_0^{NOA} + \beta_6 Accr_0 + \beta_7 Q_0 + \beta_8 C_0 + \in_1$$

	Step 1	Step 2	Step 3
Intercept	0.366	0.498	0.436
	(4.1)	(5.58)	(4.31)
$RNOA_0$ coefficient	-2.717	-1.331	-1.404
	(-4.26)	(-6.13)	(-5.1)
$\Delta RNOA_0$ coefficient	0.784	-0.205	-0.247
	(2.05)	(-0.53)	(-0.62)
ΔPM coefficient	0.308	-0.076	0.252
	(0.39)	(-0.09)	(-0.3)
ΔATO coefficient	0.014	0.102	0.095
	(0.55)	(3.59)	(3.51)
G^{NOA} coefficient		-2.78	-2.598
		(-9.32)	(-12.97)
$Accr_0$ coefficient			-0.726
			(-2.74)
Q_0 coefficient			1.498
			(1.25)
C_0 coefficient			0.139
			(1.49)
Log likelihood ratio	0.027	0.082	0.092
Rank correlation of in-sample $\Delta RNOA_1$ and fitted S scores	0.228	0.373	0.39
Rank correlation of out-of-sample $\Delta RNOA_1$ and fitted S scores	0.235	0.361	0.369
Frequency of correct out-of-sample predictions for S<0.5 or S>0.5	0.552	0.627	0.631
Frequency of firms with S<0.4 or S>0.6	0.245	0.511	0.522
Frequency of correct out-of-sample predictions with S<0.4 or S>0.6	0.646	0.696	0.697

Cross-sectional OLS and Logistic regression coefficients are estimated for each year from 1976 to 2002. The mean estimated coefficients from the 27 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as described in the notes to Table 1.

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 3

Regressions of $\Delta RNOA_1$ on Fitted Values from the Composite Score and Individual Components of the Score

OLS estimation:

$$\Delta RNOA_1 = \alpha + \beta_1 \widehat{\Delta RNOA}_1 + \beta_2 Component + \varepsilon_1$$

LOGIT estimation:

$$Prob(\Delta RNOA_1 > 0) = e^k/(1+e^k),\ k = \alpha + \beta_1 S_0 + \beta_2 RNOA_0 + \beta_3 \Delta RNOA_0 + \beta_4 \Delta PM_0 + \beta_5 \Delta ATO_0 + \beta_6 G_0^{NOA} + \beta_7 Accr_0 + \beta_8 Q_0 + \beta_9 C_0 + \varepsilon_0$$

	OLS: Adding components to fitted value one at a time								***LOGIT***
Intercept	0. 005 (1.20)	-0.001 (-0.25)	-0.002 (-0.46)	-0.001 (-0.38)	-0.000 (-0.01)	-0.003 (-0.89)	-0.001 (-0.32)	-0.003 (-0.79)	-3.365 (-6.04)
Fitted value	0.719 (5.35)	0.854 (10.57)	0.856 (11.05)	0.853 (10.44)	0.775 (7.74)	0.827 (10.00)	0.836 (11.67)	0.836 (10.17)	
S score									6.290 (7.75)
$RNOA_0$	-0.053 (-2.49)								0.300 (1.01)
$\Delta RNOA_0$		0.006 (0.24)							0.307 (0.85)
ΔPM			-0.013 (-0.24)						-0.476 (-0.61)
ΔATO				0.000 (0.09)					-0.039 (-1.03)
G^{NOA}					-0.017 (-1.02)				0.626 (1.69)
$Accr_0$						-0.024 (-1.23)			0.152 (0.37)
Q_0							0.029 (0.68)		-0.372 (-0.54)
C_0								0.006 (0.47)	-0.025 (-0.23)

Variables are defined in the notes to Table 2. The calculation of the mean coefficients and t-statistics is described in the notes to Table 1.

TABLE 4

Estimation of the E/P model

Panel A: **Enterprise** $\mathbf{E/P_0 = a + b_1 \widehat{\Delta RNOA}_1 + b_2 RNOA_0{*}G_0^{NOA} + b_3 RNOA_0 + e_0}$

	Pooled sample	***Positive E/P***	***Negative E/P***
Intercept	0.048 (11.59)	0.051 (12.36)	-0.011 (-0.34)
Forecasted $\Delta RNOA_1$	-0.210 (-4.97)	-0.192 (-4.67)	-0.236 (-0.66)
$RNOA_0{*}G_0^{NOA}$	-0.210 (-4.79)	-0.181 (-4.21)	-0.531 (-1.08)
$RNOA_0$	0.178 (8.88)	0.162 (5.78)	1.252 (2.65)
R^2	0.278	0.268	0.499

Panel B: **Enterprise** $\mathbf{E/P_0 = \alpha + b_1 S_0 + b_2 RNOA_0{*}G_0^{NOA} + b_3 RNOA_0 + e_0}$

	Pooled sample	***Positive E/P***	***Negative E/P***
Intercept	0.080 (7.81)	0.080 (7.24)	-0.003 (-0.03)
S score	-0.063 (-3.31)	-0.056 (-3.63)	-0.049 (-0.24)
$RNOA_0{*}G_0^{NOA}$	-0.261 (-7.91)	-0.235 (-8.37)	-0.446 (-1.25)
$RNOA_0$	0.190 (9.89)	0.173 (5.88)	1.060 (4.78)
R^2	0.279	0.268	0.517

Cross-sectional OLS regression coefficients are estimated for each industry in years, 1979-2002. Industry classifications are the 48 industries identified in Fama and French (1997). Year-industry groups that have less than 20 observations are not used in the estimation. Mean coefficients are first calculated across industries for each year. The final mean coefficients across sample years are reported in the table, along with the t-statistics (in parentheses), calculated as described in the notes to Table 1. 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 5

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	19.75	18.88	20.10	20.63	21.86	22.25	27.55	26.87	29.13	32.25	12.49	4.51
Size-adj. ret	4.52	4.34	4.86	5.30	5.31	5.60	10.06	8.91	10.76	12.44	7.92	3.53

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	0.312	3.88	0.307	3.90
β	Estimated CAPM Beta	0.014	0.21	0.014	0.22
Ln(Size)	Size	-0.026	-2.87	-0.026	-2.93
Ln(B/M)	Book-to-market	0.004	0.16	0.010	0.43
Ln(LEV)	Leverage	0.027	0.79	0.028	0.80
E(+)/P	Earnings/price	0.215	0.51	0.424	1.05
E(-)/P dummy	Negative earnings dummy	0.094	2.36	0.101	2.49
Res	E/P regression residual	0.555	2.39		

Panel C

Intercepts from Fama and French Factor Model Regressions using 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*
Raw return	1.87	1.09	1.91	2.28	1.34	4.60	5.94	4.47	10.15	11.91
t-stat	0.43	0.22	0.44	0.61	0.34	124	1.20	1.06	2.43	2.16

For Panel A, ten portfolios are formed each year, 1979-2002, 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 4. 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 24 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 2002. $Return_1$ is the 12-month (year +1) buy and hold return. 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. Size is the market value of equity and leverage (LEV) is the book value of total assets divided by book value of equity.

Panel C reports mean estimated intercepts from annual cross-sectional regression for the years 1979-2002 of one-year-ahead stock returns on the Fama and French factors (excess market return over the risk-free rate, size, book-to-market, and momentum), for each E/P model portfolio in Panel A. The t-statistics are calculated as in Panel B. The Fama and French factor returns were obtained from the Kenneth French website at:

http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html

TABLE 6

Returns to Disaggregated Financial Statement Measures

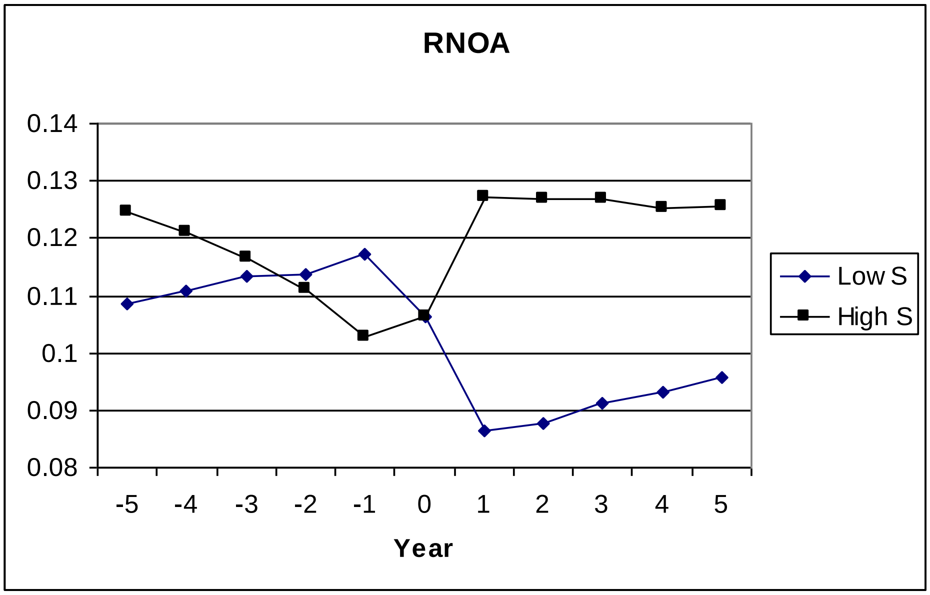
$$\textbf{Return}_t = \alpha_0 + \alpha_1\textbf{RNOA}_0 + \alpha_2\Delta\textbf{RNOA}_0 + \alpha_3\Delta\textbf{PM}_0 + \alpha_4\Delta\textbf{ATO}_0 + \alpha_5\textbf{G}_0^{\textbf{NOA}} + \alpha_6\textbf{Accr}_0 + \alpha_7\textbf{Q}_0 + \alpha_8\textbf{C}_0 + \textbf{e}_t$$
(t = 1, 3)

	Regressions using all variables			**Regressions using variables one at a time**	
				Added to S-Score	**Added to E/P residual**
Year, t	*Year+1*	*Year+2*	*Year+3*	*Year+1*	*Year+1*
Intercept	0.055 (1.81)	0. 076 (3.20)	0.087 (3.05)	-1.130 (-2.74)	0.059 (1.67)
$RNOA_0$ coefficient	0.013 (0.15)	-0.099 (-1.36)	-0.254 (-2.13)	0.614 (2.13)	-0.018 (-0.20)
$\Delta RNOA_0$ coefficient	0.323 (1.22)	-0.034 (-0.17)	0.131 (0.43)	0.521 (1.31)	0.308 (1.09)
ΔPM coefficient	-0.744 (-0.78)	0.574 (1.04)	-0.369 (-0.45)	-0.897 (-1.03)	-0.836 (-0.78)
ΔATO coefficient	-0.011 (-0.81)	-0.004 (-0.23)	-0.017 (-0.90)	-0.054 (-2.17)	-0.007 (-0.50)
G^{NOA} coefficient	-0.156 (-2.94)	-0.055 (-0.87)	-0.020 (-0.39)	0.907 (2.06)	-0.147 (-2.08)
$Accr_0$ coefficient	-0.103 (-2.12)	-0.025 (-0.49)	0.033 (0.65)	0.165 (1.08)	-0.095 (-1.48)
Q_0 coefficient	0.527 (2.01)	-0.085 (-0.25)	-0.330 (-1.83)	-0.623 (-0.80)	0.618 (1.92)
C_0 coefficient	0.057 (0.83)	0.055 (0.62)	0.059 (0.89)	-0.073 (-0.75)	0.076 (0.96)
S score				1.927 (3.04)	
E/P residual					1.253 (3.37)
R^2	0.06	0.06	0.06	0.06	0.07

The dependent variable for the first three columns, $Return_t$, t =1,3 is the size-adjusted return for one, two and three years ahead, respectively, and that for the fourth and fifth columns is the one-year-ahead size-adjusted return. The return regressions in the first three columns involve predicting returns with all variables in the regression, as in the equation at the top of the table. The regressions in the last two columns add variables, one at a time, to regressions containing either S scores (in column four) or residuals from the OLS E/P regression model (in column five). Cross-sectional OLS regression coefficients are estimated for returns from 1979 to 2002. The table reports mean estimated coefficients over the 24 years, along with the t-statistics (in parentheses) calculated as the mean of the estimated coefficients relative to their estimated standard errors. Variables are defined on the notes to Table 2.

FIGURE 1

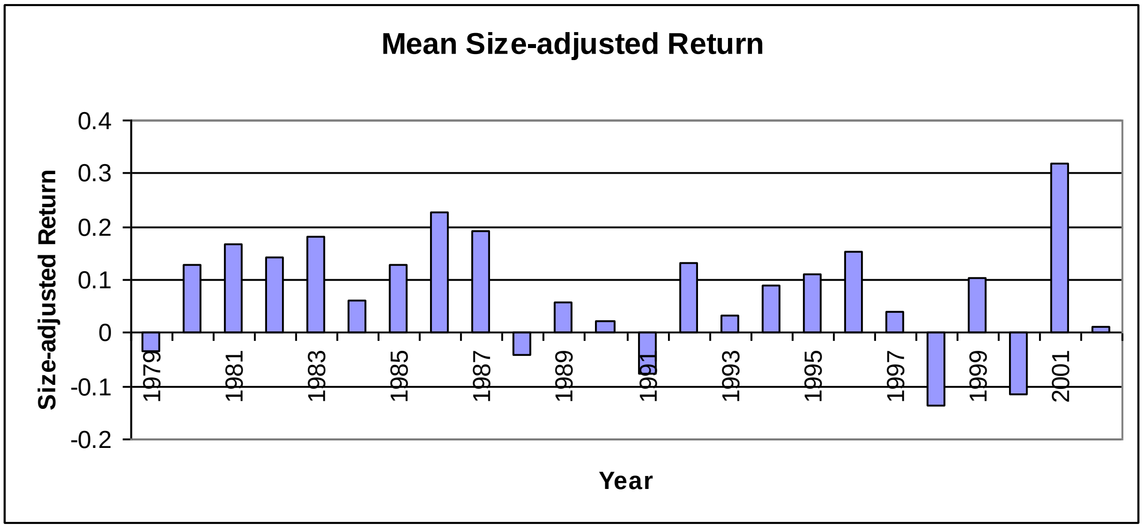
Mean return on net operating assets (RNOA) for high and low S-score groups over five years before and after the S-scoring year, Year 0.



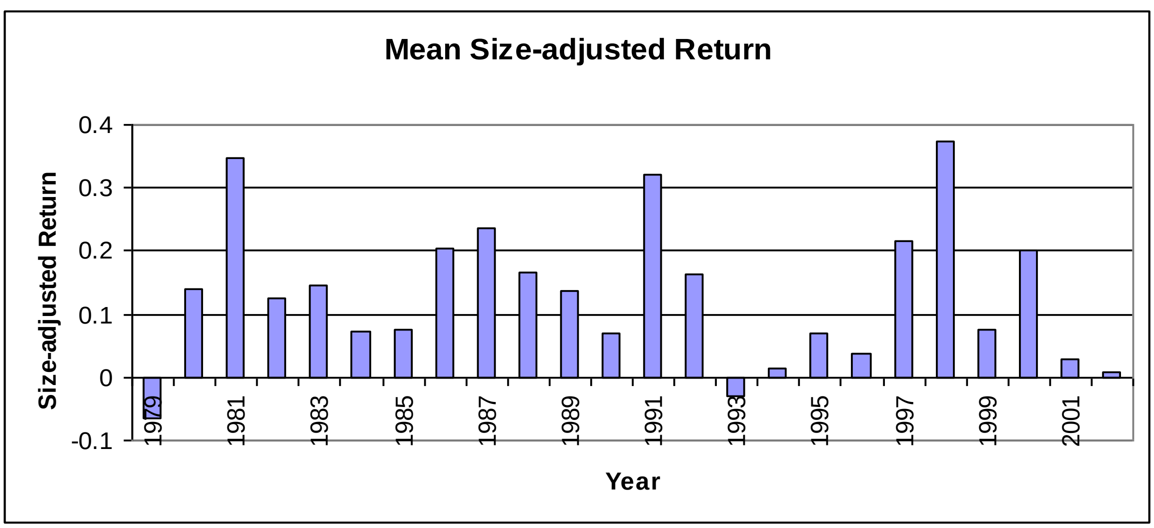
The S-score groups are based on a ranking of firms each year on S-scores, within RNOA groups. The high S-score group is the top third of firms in that ranking and the low S-score group is the bottom third of firms in the ranking on S-scores. The RNOA values reported in the figure are the means of 24 yearly median RNOAs computed over the years 1979 to 2002.

FIGURE 2

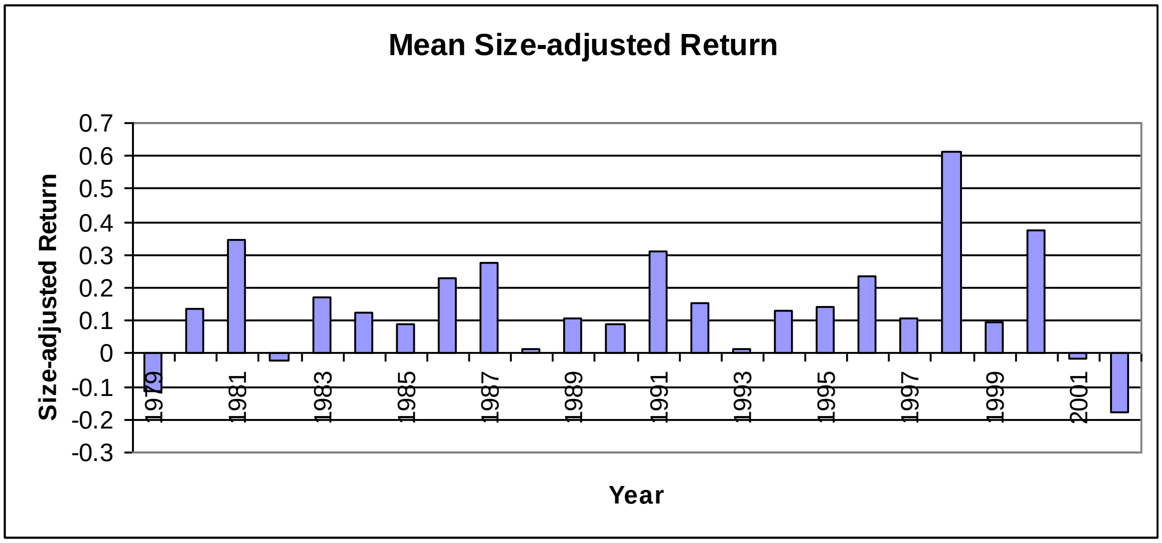
Panel A: Differences in Mean Size-Adjusted Returns between High and Low E/P Residual Portfolios, for the Year Following the E/P residual estimation Year, 1979 – 2002



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 – 2002



Panel C: Differences in Mean Size-Adjusted Returns between High and Low S-score Portfolios, for the Year Following the S-scoring Year, 1979 - 2002



Endnotes

[1] For example, Brooks and Buckmaster (1976) show that extreme current earnings changes are not sustainable. Freeman, Ohlson and Penman (1982) show that, by adding just one line item – book value – to current earnings, future earnings changes are probabilistically predictable. Ou (1990) and Ou and Penman (1989) involve further financial statement ratios in forecasting earnings changes. Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997) consider fundamental measures popular with analysts. Lipe (1986) and Fairfield Sweeney and Yohn (1996) show that line-item analysis of the income statement improves forecasts. Sloan (1996) shows that accrual earnings have a different persistence than cash earnings, and Richardson, Sloan Soliman and Tuna (2005) extend that analysis to various components of accruals. Fairfield and Yohn (2001) report that a Du Pont decomposition of operating profitability improves forecasts of changes in profitability in the future, while Fairfield, Whisenant and Yohn (2003) apply financial statement measures of growth to the assessment of persistence. Penman and Zhang (2002) design metrics to identify temporary earnings that result from the creation and release of hidden reserves from applying conservative accounting.

[2] Figure 2 in Penman (1996, p. 247) is helpful in understanding the effect of transitory current earnings and expected future earnings growth on the P/E ratio.

[3] Ohlson and Juettner-Nauroth (2005) provide an alternative formulation of the (forward) P/E based on expected abnormal earnings growth, that is, cum-dividend earnings growth in excess of growth at a rate equal to the required return. Abnormal earnings growth is equal to the change in residual income (under clean-surplus accounting), so the analysis here is consistent with the Ohlson and Juettner-Nauroth model.

[4] If residual income is expected to be the same as current residual income in all future periods, the premium over book value is calculated by capitalizing current residual income:

$$Enterprise\ P_0 = NOA_0 + \frac{OI_0 - (\rho - 1)NOA_{-1}}{\rho - 1}$$

$$= NOA_0 + \frac{OI_0 - (\rho - 1)\left[NOA_0 - OI_0 + FCF_0\right]}{\rho - 1},$$

by the clean surplus relation (6). It follows that

$$Enterprise\ \ P_0 = OI_0\left(\frac{1}{\rho - 1} + 1\right) - FCF_0,$$

and thus the enterprise P/E ratio is

$$\frac{P_0 + FCF_0}{OI_0} = \frac{\rho}{\rho - 1}.$$

Free cash flow in the current year, FCF_0 is in effect the cash dividend from the enterprise (to be paid to shareholders and debtholders), so this P/E ratio is effectively a cum-dividend P/E ratio.

[5] Suppose $RNOA_t = RNOA_0$ for all t>0. When $\Delta NOA_0 \neq 0$ and/or $g \neq 1$ the P/E ratio will differ from the "normal" level of $\rho(\rho-1)^{-1}$. The difference depends on how future residual incomes are expected to differ from the current residual income. More specifically,

$$\frac{P_0 + FCF_0}{OI_0} = \frac{\rho}{\rho - 1} + \frac{\sum_{t=1}^{\infty}[(G_0^{NOA} g^{t-1} - 1)(RNOA_0 - (\rho - 1))NOA_{-1}]/\rho^t}{OI_0}$$

Substituting $OI_0 = RNOA_0 * NOA_{-1}$ into the above equation and rearranging terms,

$$\frac{P_0 + FCF_0}{OI_0} = \frac{\rho}{\rho - 1} + \frac{(\rho - g)^{-1} G_0^{NOA}[RNOA_0 - (\rho - 1)] - (\rho - 1)^{-1}[RNOA_0 - (\rho - 1)]}{RNOA_0}.$$

[6] Special items include adjustments applicable to prior years, nonrecurring items, gains and losses on assets sales, transfers 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 whose sustainability we are forecasting.

[7]Fama and French estimate long-run profitability using non-accounting information, including stock price information. We wish to confine ourselves to accounting information (and, with a model of the P/E ratio on mind, 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.

[8] $\Delta RNOA_0 = (\Delta ATO_0 \times PM_{-1}) + (\Delta PM_0 \times ATO_{-1}) + (\Delta ATO_0 \times \Delta PM_0)$. See Fairfield and Yohn (2001).

[9]By using (average) current net operating assets in the denominator of the asset turnover, the Fairfield and Yohn (2001) measure of ΔATO_0 incorporates ΔNOA_0 whose separate effect we wish to identify (in Step 2) and which we are attempting to normalize (in Step 1). That is, their ΔATO_0 measures the change in sales relative to the change in current NOA whereas our ATO measures the change in sales relative to prior change in NOA, as a control for evaluating ΔNOA_0. Further, their ΔATO_0 measure is normalized by prior period's profit margin, so does not have the interpretation of growth in sales relative to (prior) growth in NOA for the purpose at hand here. Fairfield and Yohn include ΔNOA_0 in their analysis, but as a "control for growth" for their examination of turnovers and margins rather than the primary focus that our characterization of sustainable earnings and equation (6) directs for our endeavor.

[10] Sales and operating income do not grow proportionally when there are fixed-cost components in operating expenses, and thus ΔPM is expected. Nor do sales and net operating assets grow proportionally when assets are not variable with sales, and thus ΔATO is expected. Ideally one would incorporate this non-proportionality, 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 0.22. 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? In an extension, we included dummy variables for the interaction and found that conditions of increasing PM with increasing ATO and decreasing PM with increasing ATO both added explanation to the model. See the working paper version of this paper at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=318967.

[11]In an extension, we included dummy variables for cases where asset turnover increases but net operating assets decline and where asset turnover declines but net operating assets increase. Growth in sales with a decline in the net operating assets that maintain the sales might indicate temporary sales growth, but may also indicate excessive expenses booked to the income statement, both explanations implying a positive coefficient. The estimated coefficient was indeed positive. Correspondingly, the estimated coefficient for the case of decreasing sales with increasing net operating assets is negative; this case implies lower future profitability. Results are available in the working paper. Hirshleifer, Hou, Teoh, and Zhang (2004) report that the "level" of net operating assets predicts future earnings and returns. However, their scaled level variable, NOA_t/TA_{t-1} is a growth variable, not the level of NOA_t at all, and the same as G^{NOA} here but for the omission of operating liabilities from TA_{t-1}.

[12] 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.

[13] The C-score is the estimated reserves, ER, created by applying conservative accounting to R&D investments, advertising, and inventory, relative to net operating assets:

$$C_t = \frac{ER_t}{NOA_t}.$$

Estimated reserves are the difference between the NOA that would have been booked had conservative accounting not been applied and actual NOA booked, that is, missing NOA that results from conservative accounting. See Penman and Zhang (2002) for details of the estimation. The Q-score is the change is C scores, measuring how balance sheets and earnings are affected by changes in investment growth. Penman and Zhang (2002) develop two Q scores, Q^A and Q^B. We use Q^A in this paper.

[14] In an enhancement, we built in a recursive feature, adding ΔRNOA predicted for year 0 ($\Delta \widehat{RNOA}_0$) and the S score for year 0 to the OLS and LOGIT versions of the model, respectively. Both are predicted at the end of year –1. This 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 $\Delta \widehat{RNOA}_0$ compares actual with predicted values. The extent of the surprise in this

difference may have information for the further sustainability of earnings. Estimated coefficients on $\Delta \widehat{RNOA}_0$ 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.

[15] 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 -64.9% and -0.85%, 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 17.4%, 21.9%, and 40.0%, 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.

[16] "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" (Beaver and Morse 1978, p. 70 and appendix).

[17] The enterprise P/E ratio is calculated as (market value of common $equity_0$ + net financial $obligations_0$ + free cash $flow_0$)/operating $income_0$. 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, by (3) 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.

[18] The mean size-adjusted return over all portfolios in Table 5 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%.) Our sample may not be representative of the CRSP universe because of requirements for certain accounting items to be available.

[19] 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 10.70%, with a t-statistic of 3.13. 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 size-adjusted return difference dropped to 7.32%, with a t-statistic of 3.54.

[20] 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 4.21%, with a t-statistic of 0.97. The return for 1991 was –37.0% and that for 1998 was –64.2%, due, we suspect, to the effects of momentum investing discussed in the text below. Within the low E/P portfolio, firms with positive E/P residuals earned an average return of 18.47%, compared with 4.87% for firms with negative residuals. Within the high E/P portfolio, the respective numbers were 9.66% and 9.43%.

[21] Average cross-sectional Pearson correlations between E/P model residuals and estimated CAPM beta, ln(size), ln(book-to-market), and ln(leverage), are 0.022, -0.059, 0.106, and 0.001, respectively. So E/P residuals are not strongly related to any of these so-called risk proxies.

[22] Similar results to those in Panel B of Table 5 were obtained when $\Delta\widehat{\mathbf{RNOA}}_{\mathbf{1}}$ and S scores were included in the regressions, rather than the E/P model residual. The t-statistic on mean estimated coefficient on $\Delta\widehat{\mathbf{RNOA}}_{\mathbf{1}}$ was 3.28 and that on the S score was 6.09.

[23] Fairfield, Whisenant and Yohn (2003) show that growth in net operating assets also predict stock returns, but their methodology does not permit a direct comparison with the returns here. Titman, Wei and Xie (2001) also show that investment is negatively related to future stock returns.

[24] Thomas and Zhang (2002) indicate that changes in inventory predict stock returns (and earnings), for example, and largely explain returns forecasted by accruals. Richardson, Sloan, Soliman, and Tuna (2005) disaggregate accruals when forecasting returns. Whether these correlations survive with the conditioning variables here is open to question.

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