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

Stephen H. Penman
Graduate School of Business
Columbia University

and

Xiao-Jun Zhang
Haas School of Business
University of California, Berkeley

March, 2004

Stephen Penman's research is supported by the Morgan Stanley Scholarship Fund at Columbia University.

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

**ABSTRACT:** The financial statement analysis in this paper yields a summary number that informs about the sustainability (or persistence) of earnings and the trailing P/E ratio. The P/E ratio is the amount paid for a dollar of current earnings. Investors buy future earnings, so should pay less for current earnings if the earnings cannot be sustained in the future. While income statements identify some transitory items, the investor remains uncertain about whether earnings are sustainable. This paper specifies and estimates a model that employs financial statement information to indicate the probability of earnings being sustainable. The paper also specifies and estimates a P/E model that incorporates that information. In out-of-sample prediction tests, the analysis reliably identifies unsustainable earnings and explains cross-sectional differences in P/E ratios. Further, stock returns can be predicted when the market's P/E ratio differs from that indicated by the model.

**Keywords:** *sustainable earnings; price-earnings ratios; financial statement analysis*

**Data Availability:** *All data employed in this study are commercially available from sources identified in the text.*

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

When analysts talk of sustainable earnings, they presumably are concerned about the extent to which reported earnings will persist into the future. However, identifying sustainable (or persistent) earnings is problematical. Measures of "pro forma" earnings and "core" earnings have been proposed, but each has drawn criticism. This paper identifies sustainable earnings from information in financial statements. The analysis exploits the structural features of the accounting for earnings: In calculating earnings under the discipline of double entry, the accounting leaves a trail such that (unsustainable) earnings cannot be booked without also affecting the balance sheet. Reducing deferred revenues or accrued expenses in order to temporarily increase earnings ("cookie jar accounting") are just two examples where a trail is left in the balance sheet. The paper produces a measure of sustainable earnings by following the trail that earnings measurement leaves in the financial statements.

Measures of sustainable earnings, so obtained, are then applied to the question of how reported earnings are priced. Equity analysts are interested in the sustainability of earnings because they understand that equity values are based on expected future earnings, not current earnings; investors buy future earnings, so it is said. Yet it is common to refer to the trailing P/E ratio which prices current earnings that may not be sustainable. 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, and so are expected to increase, P/E ratios should be higher than if earnings were to be sustained at their current level. Accordingly, a measure of sustainable earnings informs about the P/E ratio. The paper builds an empirical model of the P/E ratio that incorporates financial statement information about the sustainability of earnings, and finds that this model has considerable power in explaining cross-sectional differences in traded P/E ratios; line item information that supplements earnings in the financial statements is considerably effective in explaining how those earnings are priced in the market.

Market P/E ratios to which our model is fitted incorporate information about the sustainability of earnings only if the market prices earnings efficiently. In light of this caveat, we investigate whether information in financial statements about the sustainability of earnings predicts future stock returns, with an affirmative answer. We also 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 raises questions about whether the market efficiently prices the information in financial statements about the sustainability of earnings.

## 1. Laying out the Issues.

The paper builds on previous research, so it is important to distinguish its point of departure. Like other papers, the paper involves earnings forecasting; it models the P/E ratio; and it uses fundamentals as screens to predict stock returns. We introduce the paper under headings that pertain to the three topics.

### *1.1 Earnings Forecasting and Earnings Persistence*

Assessing earnings persistence is a form of earnings forecasting that takes current earnings as a starting point. Research on earnings forecasting in the modern era begins with Ball and Watts (1972) where current earnings are depicted as following a martingale process, and thus sustainable. Subsequent research modifies this view. Some papers take the path of estimating persistence parameters from earnings time series, in the mode of Komendi and Lipe

(1987). Other papers defer to accounting information beyond past earnings for indications of persistence. Our paper is in the latter tradition.

Freeman, Ohlson and Penman (1982) show that by adding just one line item – book value – to current earnings, future earnings changes are probabilistically predictable; if earnings are high relative to book value, earnings are likely to be temporarily high, and if earnings are low relative to book value, they are likely to be temporarily low. Ou and Penman (1989a) utilize further financial statement ratios in forecasting changes in earnings. Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997) consider fundamental measures popular with analysts. Lipe (1986) and Fairfield Sweeney and Yohn (1996) 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 (2002) extend that analysis to various components of accruals. Chan, Chan, Jagadeesh and Lakonishok (2001) report similar findings. Fairfield and Yohn (2001) report that a Du Pont decomposition of operating profitability improves forecasts of changes in profitability in the future, and Fairfield, Whisenant and Yohn (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.

The paper builds a model of sustainable earnings that incorporates many of the predictors used in previous papers; indeed, the exercise is a structured synthesis of those papers, with the aim of producing a summary measure of sustainable earnings. The modeling is quite formal; rather than recognizing predictors on the basis of what works in the data (as in Ou and Penman 1989a, for example), the model is structured around the accounting relations that tie line items in financial statements to each other. These accounting relations demand that transitory earnings affect other items in the financial statements, leaving a trail to be analyzed. Further, they demand that a particular predictor in the financial statements cannot be considered in isolation, but in conjunction with other line items with which it is jointly determined – and thus necessarily correlated -- by construction of the accounting. For example, the interpretation of a change is sales depends on changes in accounts receivable, inventory and unearned revenue; the interpretation of a change in profit margin depends on changes in prepaid and accrued expenses in the balance sheet; profit margins and asset turnovers may yield different signals depending on the joint realization of the two; as growth in operating assets is always equal to cash investment plus accruals, the implication of asset growth for the sustainability of earnings depends on cash investment and accruals; and the interpretation of both cash investment and accruals is conditional upon the growth in sales. A number of these points have been recognized in previous research and indeed utilized in practical "quality of earnings" analysis. Recognizing that all are in play, we construct a composite and ask how the financial statements, as a whole, inform about the sustainability of earning.

The modeling attempts to come to terms with the practical problems that the investor has in assessing sustainable earnings. Some unsustainable income is readily identified from disclosures in the financial statements; extraordinary items and discontinued operations are reported on separate lines, while diligent reading of 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 analyst, with some confidence, identifies these items as unsustainable. But, after excluding these items from sustainable earnings, the analyst still has doubts about whether remaining earnings will persist. He or she may observe a reduction in allowances for bad debts (that increases earnings), but is the reduction a temporary or permanent change? Is a decrease in research and development expenses relative to sales (that increases earnings) temporary or permanent? What is the investor to make of increasing profit margins on slowing sales growth? These features are often considered “red flags” but their interpretation is usually unclear. To the extent that these questions cannot be resolved, he or she must take a probabilistic approach and assesses the likelihood of earnings being unsustainable.

The paper builds a model of sustainable earnings that not only identifies the red flags but also supplies these probabilities. The modeling produces composite measures of sustainable earnings from the full set of financial statement information, along with a composite score that indicates the probability that earnings are sustainable. 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 and other conditions) we find in out-of-sample prediction tests that, for firms initialized on their rate of return on operating assets (after removing identifiable extraordinary and special items), the average difference between the one-year-ahead rates of return for firms with the highest third and lowest third of scores is 4.1%.

With the emphasis on a composite score 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).

### *1.2 Price-Earnings Ratios*

It is fair to say that there has not been much research into how financial statement analysis aids in the evaluation of the P/E ratio, even though it is the prime multiple that analysts refer to. The trailing 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.[1] Beaver and Morse (1978) and Penman (1996) have shown that P/E ratios, while positively related to future earnings growth, are also negatively related to current earnings growth, demonstrating empirically that transitory current earnings affect the P/E ratio. This paper specifies and estimates a P/E model, based solely on financial statement information, that captures both expected future growth and transitory current earnings. The model explains the cross-sectional variation of P/E ratios within industries with an average $R^2$ of 54 %. Financial statement information, considered as a whole, has considerable information for the pricing of earnings.

***1.3 Fundamental Screening***

Screening on price multiples is a common investing strategy for identifying under- and over-priced stocks. Basu (1977) appears to be the first study to document that buying low P/E stocks and selling high P/E stocks yields relatively high returns – the so-called "P/E effect." However, trading on a simple multiple uses only one piece of information – earnings in this case – so involves the risk of ignoring other information pertinent to the evaluation of the multiple. A low P/E might indicate an underpriced stock, but a low P/E stock can also be overpriced (if its earnings have unsustainable components that are not recognized, for example). Our analysis adds information to the simple P/E screen. We first estimate the appropriate P/E that is implied by our model and then, for the purpose of a trading strategy, identify P/E ratios where the pricing differs from that implied by the model.

## 2. Characterizing Sustainable Earnings

Earnings is the sum of operating income (earnings before net interest) and net interest expense from financing activities, all net of 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 we deal with the sustainability of after-tax operating income.

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

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

where $NOA_t$ and $NOA_{t-1}$ are ending and beginning net operating assets for the period ending date t, $RNOA_t = OI_t/NOA_{t-1}$ 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

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

where ÄNOA$_t$ = 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

$$OI_1 = OI_0 + RNOA_0 \quad \text{ÄNOA}_0. \qquad (2a)$$

That is, current income is sustainable if current additions to net operating assets are the only reason for an expected increase in income. In this case, growth in net operating assets, ÄNOA$_0$, is observed (in the current comparative balance sheet), so does not have to be forecasted. Unsustainable income is ascertained by forecasting that ÄRNOA$_1$ = RNOA$_1$ – RNOA$_0$ is different from zero.

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

$$OI_0 = \text{Free Cash Flow}_0 + \text{ÄNOA}_0. \qquad (3)$$

So, by the principles of accounting measurement, the current change in net operating assets determines current operating income and the sustainability of current profitability, RNOA$_0$. RNOA$_0$ can be increased, for example, by increasing ÄNOA$_0$ through a reduction of unearned revenue or a reduction of allowances for bad debts and warranties. However, the higher NOA$_0$ that results is the base for the following year's profitability, RNOA$_1$ = OI$_1$/NOA$_0$, inducing a subsequent drop in RNOA if the income booked in the current period is unsustainable. In short, sustainable income in (2a) is a particular choice of accounting for the change in net operating assets that, for a given free cash flow, produces an $\text{RNOA}_0$ and the interaction, $\text{RNOA}_0$   $\text{ÄNOA}_0$ that yields sustainable income. So our analysis brings a focus to the comparative balance sheet.

**3. A Model of 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, ÄRNOA, and expected growth in net operating assets, ÄNOA. Sustainable income, defined in equation (2), concerns the former. Thus a P/E model 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 in the book value of assets, so we utilize that model.[2] As we are concerned with the sustainability of operating income, we focus on enterprise price (the price of the operations) and the enterprise P/E ratio (the pricing of operating income).

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

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

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

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

where $E_0$ indicates expectation at the current date 0, $\boldsymbol{r}$ 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 = $\frac{P_0 + FCF_0}{OI_0}$ = $\frac{\boldsymbol{r}}{\boldsymbol{r} - 1}$, the "normal" P/E ratio[3]. $FCF_0$ is free cash flow generated in the current year.

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

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

and a non-normal P/E is implied if Ä$NOA_0 \neq 0$ or g $\neq 1$. In this case, growth in one-year-ahead residual income 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:

$$\frac{P_0 + FCF_0}{OI_0} = \frac{\boldsymbol{r}}{\boldsymbol{r} - 1} + \frac{(\boldsymbol{r} - g)^{-1} G_0^{NOA}[RNOA_0 - (\boldsymbol{r} - 1)] - (\boldsymbol{r} - 1)^{-1}[RNOA_0 - (\boldsymbol{r} - 1)]}{RNOA_0} \quad (4)$$

where $G_0^{NOA}$ is the current growth rate for NOA.[4] 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 is assessing growth in residual income, consistent with current income being on the denominator of the P/E ratio.

For the unsustainable earnings case, expected $RNOA_1 \neq RNOA_0$ further determines the P/E ratio. Our empirical model is

$$\text{Enterprise } (E/P)_0 = a + b_1 \overset{U}{\mathbf{DRNOA_1}} + b_2 RNOA_0 \;\; G_0^{NOA} + b_3 RNOA_0 + e_0 \qquad (4a)$$

We estimate an E/P model rather than a P/E model to avoid difficulties with small and negative denominators. The last two terms capture the effect of growth for the case of sustained profitability; fitted to traded P/E ratios, the coefficients estimate the market's assessment of the required return and growth expectations in (4), ***r*** and *g*. The first term, $\overset{U}{\mathbf{DRNOA_1}}$ is an indicator estimated from financial statement information that completes the specification of the E/P ratio to capture the effect of unsustainable earnings. After developing the indicator of unsustainable earnings, $\overset{U}{\mathbf{DRNOA_1}}$ in the next section, we estimate model (4a) in the cross section in Section 5. Given that indicator captures unsustainable income, the estimate of $b_1$ should be negative. Model (4) 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 2004, chapter 13); the analysis extends to the levered P/E by straightforward application of those formulas.

As P/E ratios vary, in principle, with the cost of capital, as in (4), one might also include the cost of capital as a determinant of cross-sectional differences in E/P ratios. However, there are good reasons not to. First, reliable estimates of the cost of capital are not available. Second, we know of no empirical study that has documented a relationship between P/E ratios and the cost of capital. This is presumably so, not only because cost of capital estimates are imprecise, but because the variation in P/E ratios due to differences in the cost of capital is small relative to the variation due to differences in earnings expectations. We estimate the model within industries where the differences in the cost of capital are likely to be even smaller. Third, Beaver and Morse (1978) document that the relationship between CAPM beta and P/E ratios varies from year to year, depending on up markets and down markets. They argue persuasively that one expects this because of a relationship between beta and transitory earnings.[5] We wish to identify transitory earnings through financial statement analysis rather than beta. Fourth, beta might be related to over or under pricing of transitory earnings: high beta firms might be those where the market overreacts to transitory earnings in up and/or down markets.

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

## 4. Developing and Estimating the Model of Sustainable Earnings

Return on net operating assets (RNOA) is a summary measure of profitability that aggregates line items involved in both operating income and net operating asset items. Our *modus operandi* is to investigate how these line items jointly inform about the persistence of $RNOA_0$ one year ahead, that is, about Ä$RNOA_1$. The modeling is developed step-by-step, adding features of the financial statements one at a time so that the contribution of each to forecasting changes in RNOA can be identified. We estimate models using all firms, pooled; estimating models for specific industries where operating characteristics are similar (as in the DuPont analysis in Soliman (2003) would presumably be an enhancement. Accordingly, our modeling is a coarse first cut at the problem.

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

We measure net operating assets from COMPUSTAT data following procedures in the appendix of Nissim and Penman (2001). Operating income is after tax (with an allocation of taxes between operating and financing activities), but before items classified by COMPUSTAT as interest income, non-operating income and expense, special items, and extraordinary items and discontinued operations.[6] We also exclude operating items in “other comprehensive income” (such as foreign currency translations gains and losses and unrealized gains and losses on equity investments) because we deem them transitory. We would like to have made a more comprehensive exclusion of identifiable transitory items, but COMPUSTAT classifications are not refined enough for that purpose.

We employ two estimation techniques, ordinary least squares (OLS) and LOGIT. The former uses all the information in the variation of $ÄRNOA_1$ and delivers a forecast that is a point estimate, but relies on normality, a doubtful assumption with accounting data; one can observe sizable t-statistics in sample but poor predictive ability out of sample. The LOGIT binary response model fits to two outcomes, $RNOA_1$ increases and $RNOA_1$ decreases, and delivers a score between zero and one that has the simple interpretation of the probability of an increase in profitability. For sustainable earnings, that probability is 0.5. We refer to this probability as an S score (an earnings sustainability score).

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

***4.1 Benchmark Models of Persistence of RNOA***

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

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

$$RNOA_1 - RNOA^* = á + â(RNOA_0 - RNOA^*) + å_1. \quad (5)$$

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

$$ÄRNOA_1 = á + â_1(RNOA_0 - RNOA^*) + â_2ÄRNOA_0 + å_1. \quad (6)$$

We estimate models (5) and (6), with RNOA* assumed to be the same for all firms. Including industry effects would presumably improve the specification, for long-run profitability is likely to be similar within an industry. Fama and French estimate long-run profitability using non-accounting information, including stock price information, but we wish to confine ourselves to accounting information (and, 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.) In estimating model (6), Fama and French include terms that allow for nonlinearities in the reversion dynamics, so the table reports results for model (6) estimated with and without the Fama and French variables for modeling nonlinearities. Those variables are an indicator, $ncp_0$ ("negative change in profitability") that takes a value of 1 if $ÄRNOA_0$ is negative and zero otherwise, $sncp_0$ ("squared negative change in profitability") which equals ÄRNOA$^2$ when ÄRNOA is negative and is zero otherwise, and spcp$_0$ ("squared positive change in profitability") which equals ÄRNOA$^2$ when ÄRNOA is positive and is zero otherwise.

Table 1 gives coefficient estimates from estimating models (5) and (6), the latter with and without the Fama and French nonlinearity variables added. The results for OLS estimations are in Panel A, those for LOGIT in Panel B. Reported coefficients are means of estimates for each of the 24 years in the sample period. The t-statistics are these mean coefficients relative to their standard error estimated from the time series of estimated coefficients. Any autocorrelation in coefficients would bias these standard errors, but reliably estimating the serial correlation from 24 observations is problematical. Fama and French (2001) suggest that, if the first-order serial correlation is 0.5, requiring a t-statistic of 2.8 rather than the conventional 2.0 is appropriate to infer reliability. Mean goodness-of-fit statistics, $R^2$ for OLS and the likelihood ratio index for LOGIT estimation, are also reported in the table, along with mean rank correlations of in-sample and out-of-sample actual values of ÄRNOA$_1$ with fitted values for OLS and S scores for LOGIT.

The negative coefficient estimates on RNOA$_0$ confirm the mean reversion in RNOA. Adding ÄRNOA$_0$ improves the fit somewhat, as do the nonlinearity terms, but the in-sample and out-of-sample predictive rank correlations are quite similar for the three models. Panel B reports (in the third last row) the percentage of correct out-of-sample predictions of one-year ahead ÄRNOA$_{1,}$ with $S > 0.5$ predicting an increase and $S < 0.5$ predicting a decrease. The second last row gives the percentage of firms with $S > 0.6$ and $S < 0.4$, and the last row gives the prediction success for these firms. One expects 50% correct predictions if there is no prediction success. Chi-square statistics for a two-by-two comparison of predictions with outcomes are significant at the 0.01 level. The prediction success varies little over the three models.

### *4.2 Modeling Persistence of RNOA with Financial Statement Analysis*

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

*Separating the Persistence in Sales from Persistence in Expenses: Decomposing ÄRNOA*

The analysis of line items starts with an elementary decomposition of the income statement. Operating income (in the numerator of RNOA) is determined by sales (revenue) minus operating expenses, so the persistence of operating income is determined by the persistence of sales (revenue) and the persistence of operating expenses. The Du Pont decomposition separates these two components. The decomposition breaks out $RNOA_0$ ($OI_0/NOA_{-1}$) into operating income relative to sales, the profit margin ($PM_0 = OI_0/Sales_0$) and sales relative to net operating assets, the asset turnover ($ATO = Sales_0/NOA_{-1}$). Correspondingly, Ä$RNOA_0$ (for which we wish to determine persistence) can be decomposed into a change in profit margin (Ä$PM_0$) and a change in asset turnover (Ä$ATO_0$).

In the profit margin, operating income is standardized for the sales component of operating income to isolate the expense component. Correspondingly, because Ä$PM_0$ measures the growth rate in operating income relative to the growth rate in sales, it controls for the growth in sales in evaluating growth is operating income. Two interpretations are possible. Higher growth in operating income relative to sales indicates lower expenses that are likely to persist, and thus a positive relationship between Ä$PM_0$ and Ä$RNOA_1$. This is more likely when costs are fixed, for fixed expenses decline as a percentage of sales as sales increase. Alternatively, ÄPM can indicate abnormal (unsustainable) operating expenses that cannot be justified by the growth in sales, and thus a negative relationship between ÄPM$_0$ and ÄRNOA$_1$. If operating income grows at a rate that is greater than that for sales, for example, a red flag is waived: recorded expenses might be too low.

In the asset turnover, sales are viewed as generated by net operating assets; growth in net operating assets (plant, inventories, and so on) begets growth in sales. The ÄATO$_0$ measures growth in sales relative to (prior period) growth in net operating assets that begets current period sales, so controls for growth in net operating assets while evaluating sales growth. Two interpretations are possible. Higher growth in sales relative to growth net operating assets indicates the ability to make sales for a given investment that will persist, so improving future profitability, and lower growth in sales relative to prior growth in net operating assets indicates persistently lower sales from investment (that might require write downs of the over-investment in net operating assets), so damaging future profitability. This interpretation sees the ÄATO as an indicator of the future efficiency of generating sales from assets, and suggest a positive relationship between ÄATO$_0$ and ÄRNOA$_1$. Alternatively, ÄATO can indicate abnormal (unsustainable) growth in sales that is not justified by the growth in assets, so indicating that current RNOA that will not persist. This suggests a negative relationship between ÄATO$_0$ and ÄRNOA$_1$.

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

$$ÄRNOA_1 = á + â_1RNOA_0 + â_2ÄRNOA_0 + â_3ÄPM_0 + â_4ÄATO_0 + å_1 \qquad (7)$$

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

Table 2 present the results from estimating model (7) and applying the estimates to forecasting out of sample. The goodness-of-fits statistics and the predictive associations improve over those for the benchmark models in Table 1, but only marginally. The first OLS regression in Panel A shows that the change in asset turnover provides most of the predictive power, as in Fairfield and Yohn (2001), but the LOGIT results in Panel B indicate that the decomposition adds little to the aggregated $ÄRNOA_0$. The positive coefficient on ÄATO indicates that improvement in asset turnover (efficiency in using capacity) projects persistent profitability. The change in profit margin adds little.

However, the second regression shows that the interaction of the ÄPM with ÄATO is informative. Holding $ÄRNOA_0$ constant (in the regression), an increase in profit margin means that asset turnover must decrease and a decrease in profit margin means that asset turnover must increase. The coefficients on the interaction dummy variables indicate that the first case is noteworthy: if a firm increases profit margin while sales are decreasing relative to changes in net assets, earnings are typically not sustainable. This situation raises an earnings quality flag, particularly when fixed costs are involved: reducing expenses borrows earnings from the future. The third regression indicates that, conditional upon ÄATO (now included in the regression), profit margin decreases associated with turnover increases also raises a flag: the drop in margin is likely to be temporary. This fits the picture of banking earnings for the future by booking more expenses currently. We caution that the LOGIT results are not strong.

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

*Using the Information in the Change in Net Operating Assets*

The second step in the analysis of line items moves from the income statement to the comparative balance sheet. The ÄATO$_0$ variable compares current sales growth with growth in net operating assets in the prior period, ÄNOA$_{-1}$, but does not utilize this information in the current growth in net operating assets, ÄNOA$_{0.}$ Current growth in NOA begets future sales, a determinant of future operating income, the numerator in RNOA$_1$. However, current growth in net operating assets determines NOA$_0$, the denominator of RNOA$_1$, so growth reduces RNOA$_1$, all else constant. Growth in the prior period, ÄNOA$_{-1}$, begets current sales growth but, if current sales are persistent, current sales growth may beget further investment in ÄNOA$_0$ to maintain sales growth. If current sales growth comes with idle capacity, further investment may not be needed, improving profitability. If further investment is needed, profitability will not be as high. If firms over-invest in response to sales growth, future profitability will be damaged.

However, there is another reason why Ä$NOA_0$ may affect the dynamics of operating income and the persistence of RNOA: Ä$NOA_0$ interacts with $RNOA_0$ in (2a) in determining sustainable income. Further, the clean-surplus equation (3) says that current operating income in the numerator of $RNOA_0$ is determined in part by the contemporaneous change in NOA. Indeed, the mean Spearman rank correlation between RNOA and the growth rate in net operating assets is our sample is 0.38. For a given free cash flow, accountants create unsustainable income by booking more net operating assets (with more receivables and inventories or lower allowances and depreciation, for example). So, for example, an increasing profit margin on declining sales (investigated in Table 2) requires booking more net operating assets. $RNOA_0$ and Ä$NOA_0$ interact in determining the sustainability of income. An unsustainable increase in operating income leaves a trail in net operating assets; a sustainable income forecast (2a) is one where the accounting measurement is such as to produce an interaction that renders sustainable income.

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

The following model is estimated:

$$\text{ÄRNOA}_1 = \text{á} + \text{â}_1\text{RNOA}_0 + \text{â}_2\text{ÄRNOA}_0 + \text{â}_3\text{ÄPM}_0 + \text{â}_4\text{ÄATO}_0 + \text{â}_5\, G_0^{NOA} + \text{å}_1, \quad (8)$$

where $G_0^{NOA}$ is the growth rate in net operating assets in the current period, $\text{ÄNOA}_0/\text{NOA}_{t-1.}$ Current growth in sales is included in the regression (in the ÄATO). Persistent sales beget concurrent growth in net operating assets to maintain sales in the future, so growth in net operating assets is evaluated given the contemporaneous growth in sales.

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

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

*Analyzing Information in Ä$NOA_0$: Investment and Accruals*

Providing that no part of operating income or net operating assets is booked to equity, the Ä$NOA_0$ that determines current operating income, is measured as

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

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

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

$$\text{Ä}RNOA_1 =$$

$$\text{á} + \text{â}_1 RNOA_0 + \text{â}_2\text{Ä}RNOA_0 + \text{â}_3\text{Ä}PM_0 + \text{â}_4\text{Ä}ATO_0 + \text{â}_5 G_0^{NOA} + \text{â}_6 Accr_0 + \text{å}_1. \qquad (9)$$

Accruals are measured as the difference between cash from operations and operating income.[7] 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 + Ä$NOA_0$ = Cash from Operations – Cash Investment + Cash

Investment + Operating Accruals = Cash from Operations + Operating Accruals. So, by explicitly recognizing investment and accruals (deflated by $NOA_{t-1}$), the specification decomposes $RNOA_0$ (operating income deflated by $NOA_{t-1}$) in a different way to the Du Pont scheme: $RNOA_0$ is decomposed into cash flow and accrual components. So accruals and cash flow are distinguished, as in Sloan (1996), but with the inclusion of possibly correlated investment.

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

*Incorporating Unrecorded Reserves*

The change in net operating assets includes cash investments that are booked to the balance sheet. However, as an application of conservative accounting, firms expense some cash investments – such as research and development (R&D) and brand building (advertising) expenditures – in the income statement. With growth in these investments, this accounting treatment depresses income and creates hidden reserves. These reserves can be released into earnings (by reducing growth in investment) to report temporary, unsustainable earnings.

Penman and Zhang (2002) develop a score, C, that estimates the amount of hidden reserves created by the accounting for R&D, advertising, and by LIFO accounting for inventories. They also develop a score, Q, to indicate temporary effects on earnings in building up reserves or releasing reserves, and find that this measure forecasts ÄRNOA one year ahead.[8] The following model adds the Q score to model (9):

$$\text{ÄRNOA}_1 = \text{á} + \text{â}_1\text{RNOA}_0 + \text{â}_2\text{ÄRNOA}_0 + \text{â}_3\text{ÄPM}_0 + \text{â}_4\text{ÄATO}_0 + \text{â}_5\text{G}_0^{\text{NOA}}$$

$$+ \text{â}_6\text{Accr}_0 + \text{â}_7\text{Q}_0 + \text{â}_8\text{C}_0 + \text{å}_1. \qquad (10)$$

The C score is also added for the following reason. This score measures the degree of conservative accounting. As conservative accounting reduces the denominator of RNOA (by not booking net assets), it creates persistently high RNOA if it is persistently practiced, as modeled by Feltham and Ohlson (1995) and Zhang (2000). A firm with a high $\text{RNOA}_0$ induced by conservative accounting is likely to have a more persistent RNOA than one with a high $\text{RNOA}_0$ without conservative accounting. As a measure of the effect of conservative accounting on recorded net operating assets and on RNOA, the C score may thus indicate persistence. The inclusion of the C score also partly remedies our failure to specify a long-run $\text{RNOA}^*$ for, while one might expect economic profitability to converge to the same level for all firms, on expects a different long-run levels for accounting profitability, depending on the degree of conservative accounting.

Table 5 indicates that the C score does not add explanatory power. $\text{RNOA}_0$, of course, reflects conservative accounting, and adding a further measure of conservatism adds little. However, the Q score identifies further transitory earnings from the build up and release of reserves. Note, at this point, that the $\text{ÄRNOA}_0$ variable is no longer significant: our financial analysis subsumes all the information in the aggregate $\text{ÄRNOA}_0$.

Model (10) is the final model. Adding the Fama and French nonlinearity variables (in Table 1) to this model does not improve the fit, and the non-linear variables are not significantly different from zero. The financial statement analysis subsumes the information captured by their modeling, and adds further information. 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.[9]

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

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

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

The instrument for sustainable earnings is developed in part to explain P/E ratios. Panel A of Table 6 estimates the enterprise E/P model specified in equation (4a), with

$\overset{U}{DRNOA_1}$ estimated from the OLS regression for model (10) as the indicator of sustainable of earnings. The E/P model is estimated for all firms and then for firms with positive and negative earnings. Panel B of Table 6 substitutes the S score from the LOGIT model as an indicator of sustainable earnings.[11] Estimations are made for each year, 1979-1999, with the top and bottom one percent of E/P observations deleted, and mean coefficients over the 21 years are reported. The model is estimated within industries to control for risk and the cost of capital that also determines cross-sectional difference in E/P ratios. We use the 48 industry groupings identified by Fama and French (1997) for the purpose of differentiating risk factors.

The reported coefficients in Table 6 are means of estimates for all industries over the 21 years. The t-statistics are based on standard errors estimated from these coefficients that are probably not independent. In any case, the t-statistics are large, with considerable $R^2$ values. The estimated $b_2$ coefficients on the current profitability and growth variable that project sustainable income, $RNOA_0 \;\; G_0^{NOA}$, are negative, as predicted in Section 3: 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 $\overset{\mathbf{U}}{\mathbf{DRNOA_1}}$, the higher the P/E ratio, although not so for loss firms. Panel B indicates that the S score from the LOGIT modeling also explains cross-sectional difference in industry P/E ratios, except again for loss firms.

**6. Forecasting Stock Returns**

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

Panel A of Table 7 reports one-year stock returns from investing in stocks on the basis of traded E/P ratios relative to those fitted by the E/P model in Panel A of Table 6. In each year from 1979 to 1999, we rank the firms into 10 equal-sized portfolios based on their residuals from the E/P model at that date. The portfolio formation date is three months after fiscal year-end, by which time the firm must file its annual reports with the SEC. We then calculate mean buy-and-hold returns for the following twelve months. The computed returns include delisting returns for nonsurvivors. The table reports mean raw returns and size-adjusted returns for each portfolio over the 21 years that the positions were taken. The estimation of the E/P model within industry controls for operating risk (to some degree), and the size adjustment controls for the "size effect" in stock returns that researchers (e.g., Fama and French 1992) conjecture is a premium for risk. We compute 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.[12]

The mean returns in Panel A of Table 7 are positively related to E/P model residuals. "High" residuals indicate underpricing of P/E ratios and "low" residuals indicate overpricing.

Returns for portfolios 1 and 2 are, in particular, considerably lower than those for portfolios 9 and 10. The difference between the mean twelve-month raw return for portfolio 10 and that for portfolio1 is 12.69%, with a t-statistic estimated from the time series of 21 returns of 3.98.[13] The relative frequency of observing a return of 12.69% or higher in 5,000 replications of randomly assigning stocks to the high and low portfolios was 0%. The corresponding return difference for size-adjusted returns is 8.22%, with a t-statistic of 3.54. The relative frequency of observing a return of 8.22% or higher in 5,000 replications of randomly assigning stocks to the high and low portfolios was 0.06%. (The return to size, subtracted here, is conjectured as a return to risk, but may well capture mispricing of financial statement information.) These return differences are those, before transactions costs, from a zero net investment involving canceling long and short investments in the lowest and highest residual portfolios, respectively. We obtain similar results from ranking firms on residuals from the E/P model based on S scores (estimated in Panel B of Table 6).

Panel A of Figure 2 gives differences in one-year, size-adjusted returns between portfolio10 and portfolio 1, for each year in the sample period. The return differences are positive for 15 years, but negative for five years.[14] 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. Panels B and C of Figure 2 report differences in returns between portfolios 10 and 1 from a ranking of firms onto portfolios on $\dot{\mathbf{U}}_{\mathbf{DRNOA_1}}$ and S scores, respectively, rather than E/P model residuals. The mean size-adjusted return difference (over years) to the $\dot{\mathbf{U}}_{\mathbf{DRNOA_1}}$ positions is 14.56%, with a t-statistic of 6.44, and that to S score positions is 14.48% with a t-statistic of 4.63. In only one year is the return negative in Panel B, and in two years in Panel C.

### *6.1 Controls for Potential Risk Proxies*

The observed returns in Panel A of Table 8 are consistent with the efficient pricing of P/E ratios if they reflect different returns to risk. However, they also are consistent with the market's mispricing information about P/E ratios. 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 7 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.[15] Reported coefficients are, again, means of cross-sectional estimates for each of the 21 years, 1979 to 1999. The coefficient on the E/P residual remains significant after identifying the portion of returns that are explained by these factors. If metrics like size and book-to-market are interpreted as predictors of abnormal returns rather than risk factors, the results indicate that E/P residuals have additional information for predicting abnormal returns. Note that the ability of E/P residuals to predict stock returns is incremental to the E/P, that is, to the "P/E effect."[16]

### *6.2 Disaggregating Return Predictions*

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

Table 8 gives the result of regressions of future stock returns on the financial statement components of the sustainable earnings model. Separate regressions are reported for annual returns for one, two, three, four, and five years ahead. The table indicates that none of the information, except perhaps $RNOA_0$ itself, forecasts stock returns beyond the immediate year ahead, year +1, although $R^2$ values for years +2 onwards indicate some joint predictive power. This provides more persuasion that the information does indicate expected returns from risk factors that one expects to be persistent. For the one-year-ahead returns, predictive power comes from the change in the profit margin, growth in net operating assets (effectively representing the investment component of growth in net operating assets), the accrual component of growth in net operating assets, and the Q score capturing the effect of changes in hidden reserves. Neither $RNOA_0$ nor $ÄRNOA_0$ add predictive power to these variables that amount to the analysis of RNOA.

In recent years, a distressing number of return “anomalies” have been documented using fundamental data. One suspects that they are not independent. Our analysis reports an average 14.5% annual size-adjusted return from a composite financial statement measure (in the trading positions taken in Panels B and C of Figure 2). These returns are higher than those using pieces of the composite score in a similar trading strategy– accruals in Sloan (1996) and Q scores in Penman and Zhang (2002), for example – but not by large amounts. Table 8 does indicate some incremental explanatory power for some variables. Accruals and the Q score add to the prediction of year-ahead stock returns, controlling for the other included variables. The negative return to cash investment (associated with $G^{NOA}$) confirms the finding in Titman, Wei and Xie

(2001), with added controls. However, the $R^2$ values for the regressions in Table 8 are low. Our results indicate that the returns to various fundamental strategies are not additive, as Zach (2002) also finds for selected anomalies. We caution, however, that our analysis uses pooled data and our financial statement measures are aggregate measures. Financial statement analysis is contextual, so partitioning on conditioning circumstances may improve the results, along with further decomposition of profit margins, assets turnovers, growth in net operating assets, and accruals into component line items.[17]

**7. Conclusion**

The P/E ratio embeds the notion that investors “buy earnings.” Investors buy future earnings, but look to current earnings as an indication of future earnings. They are concerned that earnings may not be sustained in the future, and pay less for earnings if they are not sustainable. Financial statements supply additional line items that provide a commentary on the “quality” of earnings as an indicator of future earnings. Financial statement analysis elicits that information.

This paper develops a financial statement analysis that indicates the probability of earnings being sustainable. The analysis recognizes the accounting relations that structure the statements and tie line items to each other such that unsustainable earnings cannot be booked without leaving a trail. The analysis incorporates features from earlier papers that use line items in forecasting, but in a way that considers the financial statements as an interlocking whole. Consequently, the paper delivers a composite score that summarizes the information that financial statement items jointly convey about the likely persistence of earnings.

The analysis is at a coarse level, the aim being to demonstrate an overall architecture that points the way to further detailed analysis of financial statements. The empirical analysis is on data pooled over all firms, without consideration of conditions under which a more contextual analysis might be carried out. Even so, the scoring reliably predicts differences between current and future earnings. The scoring also explains cross-sectional differences in P/E ratios, indicating that the analysis is helpful in determining the amount to be paid per dollar of 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. Evaluating whether earnings are sustainable 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

**ÄRNOA$_1$ = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ ncp$_0$ + â$_4$ sncp$_0$ + â$_4$ spcp$_0$ + å$_1$**

| | | | |
|---|---|---|---|
| Intercept | 0. 019<br>(4.34) | 0.021<br>(4.67) | 0.023<br>(4.90) |
| RNOA$_0$ coefficient | -0.176<br>(-8.18) | -0.186<br>(-8.60) | -0.185<br>(-8.85) |
| ÄRNOA$_0$ coefficient | | 0.046<br>(2.50) | 0.063<br>(1.07) |
| ncp coefficient | | | -0.004<br>(-1.03) |
| sncp coefficient | | | 0.125<br>(0.84) |
| spcp coefficient | | | -0.085<br>(-0.28) |
| $R^2$ | 0.066 | 0.070 | 0.096 |
| Rank correlation of in-sample ÄRNOA$_1$ and fitted values | 0.209 | 0.202 | 0.209 |
| Rank correlation of out-of-sample ÄRNOA$_1$ and fitted values | 0.233 | 0.237 | 0.218 |

## TABLE 1 (continued)

*Panel B*: LOGIT estimation

**Prob(ÄRNOA$_1$>0) = e$^k$/(1+e$^k$), k = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ ncp$_0$ + â$_4$ sncp$_0$ + â$_4$ spcp$_0$ +å$_1$**

| | | | |
|---|---|---|---|
| Intercept | 0. 354<br>(4.53) | 0.384<br>(4.64) | 0.441<br>(4.58) |
| RNOA$_0$ coefficient | -2.753<br>(-9.54) | -2.955<br>(-9.63) | -3.042<br>(-9.63) |
| ÄRNOA$_0$ coefficient | | 0.853<br>(4.19) | 0.495<br>(0.73) |
| ncp coefficient | | | -0.105<br>(-2.22) |
| sncp coefficient | | | 0.529<br>(0.17) |
| spcp coefficient | | | 2.514<br>(0.52) |
| Log likelihood ratio | 0.023 | 0.025 | 0.028 |
| Rank correlation of in-sample ÄRNOA$_1$ and fitted S scores | 0.189 | 0.196 | 0.203 |
| Rank correlation of out-of-sample ÄRNOA$_1$ and fitted S scores | 0.193 | 0.198 | 0.191 |
| Frequency of correct out-of-sample predictions for S<0.5 and S>0.5 | 0.548 | 0.552 | 0.550 |
| Frequency of firms with S<0.4 or S>0.6 | 0.260 | 0.270 | 0.280 |
| Frequency of correct out-of-sample predictions with S<0.4 or S>0.6 | 0.632 | 0.631 | 0.629 |

Cross-sectional OLS and Logistic regression coefficients are estimated each year from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ÄRNOA is the change in RNOA; ncp$_0$ is a dummy variable which equals one when ÄRNOA$_0$ is negative, and zero otherwise; sncp$_0$ equals ÄRNOA$_0^2$ when ÄRNOA$_0$ is negative, and zero otherwise; spcp$_0$ equals ÄRNOA0$^2$ when ÄRNOA$_0$ is positive, and zero otherwise; S is estimated Prob(ÄRNOA$_1$>0).

## TABLE 2

### *Models Separating the Persistence in Sales from Persistence in Expenses:*

### *Decomposing ÄRNOA*

*Panel A*: OLS estimation

$$\textbf{ÄRNOA}_1 = \textbf{á} + \textbf{â}_1\textbf{RNOA}_0 + \textbf{â}_2\textbf{ÄRNOA}_0 + \textbf{â}_3\textbf{ÄPM}_0 + \textbf{â}_4\textbf{ÄATO}_0 + \textbf{â}_4\textbf{pi\_ad}_0 + \textbf{â}_5\textbf{pd\_ai}_0 + \textbf{å}_1$$

| | | | |
|---|---|---|---|
| Intercept | 0. 021<br>(4.78) | 0.022<br>(4.72) | 0.022<br>(5.11) |
| $RNOA_0$ coefficient | -0.180<br>(-9.10) | -0.185<br>(-8.47) | -0.183<br>(-9.03) |
| $ÄRNOA_0$ coefficient | 0.016<br>(0.37) | 0.047<br>(2.58) | 0.018<br>(0.42) |
| ÄPM coefficient | -0.025<br>(-0.31) | | -0.015<br>(-0.19) |
| ÄATO coefficient | 0.008<br>(2.80) | | 0.009<br>(2.75) |
| PM increases & ATO decreases | | -0.004<br>(-2.07) | 0.002<br>(1.05) |
| PM decreases & ATO increases | | -0.002<br>(-0.87) | -0.006<br>(-2.71) |
| $R^2$ | 0.085 | 0.074 | 0.087 |
| Rank correlation of in-sample $ÄRNOA_1$ and fitted values | 0.197 | 0.200 | 0.198 |
| Rank correlation of out-of-sample $ÄRNOA_1$ and fitted values | 0.225 | 0.232 | 0.223 |

## TABLE 2 (continued)

*Panel B*: LOGIT estimation

**Prob(ÄRNOA$_1$>0) = e$^k$/(1+e$^k$), k = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ÄPM$_0$ + â$_4$ÄATO$_0$ + â$_4$pi_ad$_0$ + â$_5$pd_ai$_0$ + å$_1$**

| | | | |
|---|---|---|---|
| Intercept | 0.387<br>(4.62) | 0.407<br>(4.90) | 0.411<br>(4.92) |
| RNOA$_0$ coefficient | -2.964<br>(-9.48) | -2.947<br>(-9.37) | -2.970<br>(-9.34) |
| ÄRNOA$_0$ coefficient | 0.960<br>(2.68) | 0.846<br>(4.34) | 0.968<br>(2.68) |
| ÄPM coefficient | -0.129<br>(-0.17) | | -0.172<br>(-0.21) |
| ÄATO coefficient | 0.004<br>(0.16) | | 0.004<br>(0.13) |
| PM increases & ATO decreases | | -0.073<br>(-1.59) | -0.067<br>(-1.24) |
| PM decreases & ATO increases | | -0.055<br>(-1.33) | -0.059<br>(-1.30) |
| Log likelihood ratio | 0.026 | 0.027 | 0.029 |
| Rank correlation of in-sample actual ÄRNOA$_1$ and fitted S scores | 0.198 | 0.200 | 0.204 |
| Rank correlation of out-of-sample ÄRNOA$_1$ and fitted S scores | 0.196 | 0.191 | 0.188 |
| Frequency of correct out-of-sample predictions for S<0.5 and S>0.5 | 0.550 | 0.549 | 0.550 |
| Frequency of firms with S<0.4 or S>0.6 | 0.269 | 0.280 | 0.277 |
| Frequency of correct out-of-sample predictions with S<0.4 or S>0.6 | 0.633 | 0.631 | 0.631 |

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ÄRNOA is the change in RNOA; ÄPM is the change in profit margin; ÄATO is the change in asset turnover; pi_ad$_0$ is a dummy variable which equals one when profits margin increases and asset turnover decreases; pd_ai$_0$ is a dummy variable which equals one when profit margin decreases and asset turnover increases; S is estimated Prob(ÄRNOA$_1$>0).

# TABLE 3

## *Modeling Information in the Change in Net Operating Assets*

**ÄRNOA$_1$ = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ÄPM$_0$ + â$_4$ ÄATO$_0$ + â$_5$G$_0^{NOA}$ + â$_6$ai_nd$_0$ + â$_7$ad_ni$_0$ + å$_1$**

| | | | |
|---|---|---|---|
| Intercept | 0. 026<br>(6.21) | 0.019<br>(4.58) | 0.025<br>(6.35) |
| RNOA$_0$ coefficient | -0.109<br>(-5.28) | -0.161<br>(-7.95) | -0.108<br>(-5.28) |
| ÄRNOA$_0$ coefficient | -0.018<br>(-0.44) | 0.011<br>(0.38) | -0.017<br>(-0.43) |
| ÄPM coefficient | -0.034<br>(-0.46) | -0.035<br>(-0.55) | -0.040<br>(-0.53) |
| ÄATO coefficient | 0.011<br>(4.01) | | 0.010<br>(3.44) |
| G$^{NOA}$ coefficient | -0.121<br>(-21.03) | | -0.117<br>(-18.57) |
| ATO increases & NOA decreases | | 0.033<br>(9.40) | 0.006<br>(1.82) |
| ATO decreases & NOA increases | | -0.017<br>(-7.11) | -0.001<br>(-0.61) |
| $R^2$ | 0.142 | 0.095 | 0.145 |
| Rank correlation of in-sample ÄRNOA$_1$ and fitted values | 0.351 | 0.265 | 0.354 |
| Rank correlation of out-of-sample ÄRNOA$_1$ and fitted values | 0.354 | 0.289 | 0.357 |

## TABLE 3 (continued)

**Prob(ÄRNOA$_1$>0) = e$^k$/(1+e$^k$), k = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ÄPM$_0$ + â$_4$ÄATO$_0$ + â$_5$G$_0^{NOA}$ + â$_6$ai_nd$_0$ + â$_7$ad_ni$_0$ + å$_1$**

| | | | |
|---|---|---|---|
| Intercept | 0.510 | 0.357 | 0.510 |
| | (6.14) | (4.31) | (5.85) |
| RNOA$_0$ coefficient | -1.258 | -2.397 | -1.212 |
| | (-5.53) | (-8.81) | (-5.49) |
| ÄRNOA$_0$ coefficient | -0.084 | -0.476 | -0.113 |
| | (-0.22) | (-1.85) | (-0.28) |
| ÄPM coefficient | -0.737 | 0.419 | -1.049 |
| | (-0.88) | (0.55) | (-1.16) |
| ÄATO coefficient | 0.097 | | 0.027 |
| | (4.17) | | (1.01) |
| G$^{NOA}$ coefficient | -3.019 | | -2.751 |
| | (-17.25) | | (-14.39) |
| ATO increases & NOA decreases | | 0.753 | 0.220 |
| | | (16.00) | (3.76) |
| ATO decreases & NOA increases | | -0.430 | -0.193 |
| | | (-16.29) | (-6.02) |
| Log likelihood ratio | 0.086 | 0.046 | 0.090 |
| Rank correlation of in-sample ÄRNOA$_1$ and fitted S scores | 0.334 | 0.252 | 0.339 |
| Rank correlation of out-of-sample ÄRNOA$_1$ and fitted S scores | 0.322 | 0.249 | 0.324 |
| □ Frequency of correct out-of-sample predictions for S<0.5 and S>0.5 | 0.631 | 0.594 | 0.632 |
| Frequency of firms with S<0.4 or S>0.6 | 0.525 | 0.398 | 0.553 |
| □ Frequency correct out-of-sample predictions with S<0.4 or S>0.6 | 0.697 | 0.663 | 0.694 |

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ÄRNOA is the change in RNOA; ÄPM is the change in profit margin; ÄATO is the change in asset turnover; G$_0^{NOA}$ is the current growth rate in net operating assets; ai_nd$_0$ is a dummy variable which equals one when asset turnover increases and net operating asset decreases; ad_ni$_0$ is a dummy variable which equals one when asset turnover decreases and net operating asset increases; S is estimated Prob(ÄRNOA$_1$>0).

## TABLE 4

### *Modeling Information in Operating Accruals and Cash Investment*

**ÄRNOA$_1$ = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ÄPM$_0$ + â$_4$ÄATO$_0$ + â$_5$G$_0^{NOA}$ + â$_6$Accr$_0$ + å$_1$**

**Prob(ÄRNOA$_1$>0) = e$^k$/(1+e$^k$), k = á + â$_1$RNOA$_0$ + â$_2$ÄRNOA$_0$ + â$_3$ÄPM$_0$ + â$_4$ÄATO$_0$ + â$_5$G$_0^{NOA}$ + â$_6$Accr$_0$ + å$_1$**

| | **OLS estimation** | **LOGIT estimation** |
|---|---|---|
| Intercept | 0. 024 | 0.482 |
| | (6.17) | (5.77) |
| RNOA$_0$ coefficient | -0.105 | -1.245 |
| | (-5.24) | (-5.47) |
| ÄRNOA$_0$ coefficient | -0.020 | -0.111 |
| | (-0.50) | (-0.29) |
| ÄPM coefficient | -0.019 | -0.537 |
| | (-0.26) | (-0.65) |
| ÄATO coefficient | 0.011 | 0.096 |
| | (3.94) | (4.10) |
| G$^{NOA}$ coefficient | -0.111 | -2.881 |
| | (-20.70) | (-15.47) |
| Accr$_0$ coefficient | -0.039 | -0.604 |
| | (-2.31) | (-4.02) |
| $R^2$ | 0.149 | |
| Log likelihood ratio | | 0.089 |
| Rank correlation of in-sample ÄRNOA$_1$ and fitted values | 0.357 | 0.341 |
| Rank correlation of out-of-sample ÄRNOA$_1$ and fitted values | 0.362 | 0.327 |
| □ Frequency of correct out-of-sample predictions for S<0.5 and S>0.5 | | 0.633 |
| Frequency of firms with S<0.4 or S>0.6 | | 0.529 |
| □ Frequency of correct out-of-sample predictions with S<0.4 or S>0.6 | | 0.700 |

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ÄRNOA is the change in RNOA; ÄPM is the change in profit margin; ÄATO is the change in asset turnover; $G_0^{NOA}$ is the current growth rate in net operating assets; current operating accruals ($Accr_0$) are measured as the difference between cash from operations and operating income, deflated by the beginning net operating assets; S is estimated Prob(ÄRNOA$_1$>0).

# TABLE 5

## *Modeling Unrecorded Reserves*

**$ÄRNOA_1$ = á + $â_1RNOA_0$ + $â_2ÄRNOA_0$ + $â_3ÄPM_0$ + $â_4ÄATO_0$ + $â_5G_0^{NOA}$ + $â_6Accr_0$ + $â_7Q_0$ + $â_8C_0$ + $å_1$**

**Prob($ÄRNOA_1$>0) = $e^k/(1+e^k)$, k = á + $â_1RNOA_0$ + $â_2ÄRNOA_0$ + $â_3ÄPM_0$ + $â_4ÄATO_0$ + $â_5G_0^{NOA}$ + $â_6Accr_0$ + $â_7Q_0$ + $â_8C_0$ + $å_1$**

| | **OLS estimation** | **LOGIT estimation** |
|---|---|---|
| Intercept | 0. 021<br>(6.48) | 0.448<br>(5.45) |
| $RNOA_0$ coefficient | -0.105<br>(-5.25) | -1.364<br>(-5.93) |
| $ÄRNOA_0$ coefficient | -0.009<br>(-0.23) | -0.008<br>(-0.02) |
| ÄPM coefficient | -0.017<br>(-0.24) | -0.553<br>(-0.63) |
| ÄATO coefficient | 0.011<br>(3.76) | 0.084<br>(3.78) |
| $G^{NOA}$ coefficient | -0.100<br>(-13.76) | -2.734<br>(-16.45) |
| $Accr_0$ coefficient | -0.034<br>(-1.97) | -0.632<br>(-4.28) |
| $Q_0$ coefficient | 0.109<br>(3.39) | 2.226<br>(2.35) |
| $C_0$ coefficient | 0.005<br>(0.61) | 0.153<br>(1.39) |
| $R^2$ | 0.164 | |
| Log likelihood ratio | | 0.094 |
| Rank correlation of in-sample $ÄRNOA_1$ and fitted values | 0.364 | 0.349 |
| Rank correlation of out-of-sample $ÄRNOA_1$ and fitted values | 0.358 | 0.326 |
| Frequency of correct out-of-sample predictions for S<0.5 and S>0.5 | | 0.631 |
| Frequency of firms | | 0.534 |

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

Cross-sectional OLS and Logistic regression coefficients are estimated from 1976 to 1999. The mean estimated coefficients from the 24 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; ÄRNOA is the change in RNOA; ÄPM is the change in profit margin; ÄATO 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(ÄRNOA$_1$>0).

# TABLE 6

## *Estimation of the E/P model*

*Panel A*: **Enterprise** $E/P_0 = a + b_1 \text{Û DRNOA}_1 + b_2 RNOA_0 * G_0^{NOA} + b_3 RNOA_0 + e_1$

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

*Panel B*: **Enterprise** $E/P_0 = \text{á} + b_1 S_0 + b_2 RNOA_0 * G_0^{NOA} + b_3 RNOA_0 + e_1$

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

Cross-sectional OLS regression coefficients are estimated for 525 year-industry groups for years, 1979-1999. Industry classifications are the 48 industries identified in Fama and French (1997). Year-industry groups that have less than 10 observations are not used in the estimation. The mean estimated coefficients appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. RNOA is return on net operating assets; $G_0^{NOA}$ is the current rate of growth in net operating assets; $RNOA_0 * G_0^{NOA}$ is the sustainable income forecast; $\widehat{\Delta \mathbf{RNOA}}_\mathbf{1}$ 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 7

***Returns to Modeling E/P Ratios with Financial Statement Information***

*Panel A*

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

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

*Panel B*

**Return Regressions with Controls for Risk Proxies**

**Return$_1$ = á$_0$ + á$_1$â$_0$ + á$_2$ln(Size)$_0$ + á$_3$ln(B/M)$_0$ + á$_4$ln(LEV)$_0$ + á$_5$(E(+)/P)$_0$ + á$_6$E/P dummy + á$_7$Res$_0$ + e$_1$**

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

For Panel A, ten portfolios are formed each year, 1979-1999, from a ranking of firms on E/P model residuals (actual E/P minus fitted E/P) for year 0, using the E/P model estimated using OLS in Panel A of Table 6. Stocks enter the portfolios three months after fiscal year end (for year 0). Portfolios are held for the subsequent 12 months (year +1).

The 12-month portfolio returns are buy-and-hold returns. Size-adjusted returns are those returns minus buy-and-hold returns on size-matched portfolios. Panel A reports mean returns for each of the ten portfolios over the 21 years. “High minus Low” is the difference between mean returns for the high residual portfolio (portfolio 10) and the low residual portfolio (portfolio 1); the associated t-statistic is estimated from the time series of differences. Panel B reports the mean cross-sectional OLS regression coefficients from estimating the model at the head of the panel for each year, 1979 to 1999. $Return_1$ is the 12-month (year +1) buy and hold return. Mean estimated coefficients from the 21 regressions appear in the table, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard error. Size is the market value of equity and leverage (LEV) is the book value of total assets divided by book value of equity.

## TABLE 8

### *Returns to Disaggregated Financial Statement Measures*

$$\textbf{Return}_t = \text{á}_0 + \text{á}_1\text{RNOA}_0 + \text{á}_2\text{ÄRNOA}_0 + \text{á}_3\text{ÄPM}_0 + \text{á}_4\text{ÄATO}_0 + \text{á}_5 G_0^{NOA} + \text{á}_6\text{Accr}_0 + \text{á}_7 Q_0 + \text{á}_8 C_0 + e_t$$

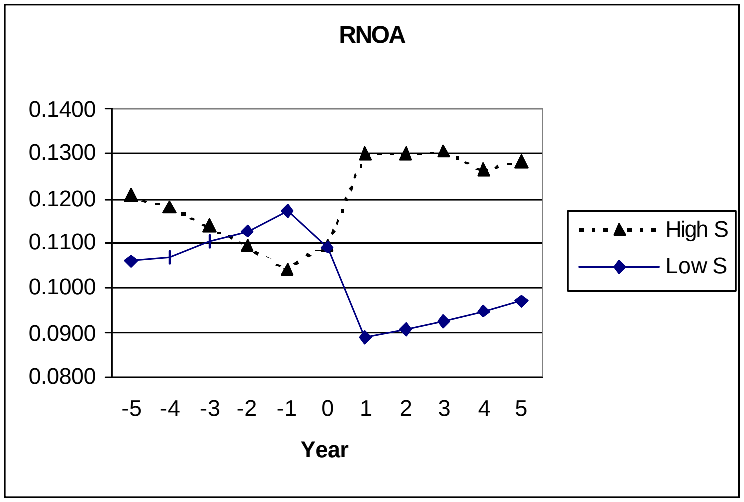
(t = 1, 5)

| Year, t | *Year+1* | *year+2* | *Year+3* | *Year+4* | *Year+5* |
|---|---|---|---|---|---|
| Intercept | 0.064 | 0. 076 | 0.062 | 0.047 | 0.043 |
| | (5.48) | (6.22) | (6.33) | (2.62) | (2.73) |
| $RNOA_0$ coefficient | 0.007 | -0.120 | -0.024 | -0.034 | -0.091 |
| | (0.18) | (-2.53) | (-0.78) | (-0.67) | (-3.34) |
| $ÄRNOA_0$ coefficient | 0.014 | 0.055 | -0.037 | -0.021 | 0.081 |
| | (0.25) | (1.12) | (-0.41) | (-0.35) | (0.86) |
| ÄPM coefficient | 0.321 | -0.185 | -0.126 | 0.284 | -0.055 |
| | (2.25) | (-1.07) | (-0.56) | (1.81) | (-0.43) |
| ÄATO coefficient | 0.006 | -0.001 | -0.002 | -0.001 | -0.004 |
| | (1.93) | (-0.24) | (-0.33) | (-0.48) | (-0.43) |
| $G^{NOA}$ coefficient | -0.117 | -0.043 | 0.005 | 0.007 | 0.010 |
| | (-3.95) | (-1.69) | (0.17) | (0.19) | (0.38) |
| $Accr_0$ coefficient | -0.036 | 0.005 | -0.015 | -0.013 | 0.029 |
| | (-2.06) | (0.18) | (-0.42) | (-1.04) | (1.58) |
| $Q_0$ coefficient | 0.207 | 0.146 | 0.127 | -0.067 | 0.114 |
| | (2.16) | (1.53) | (0.81) | (-0.52) | (0.86) |
| $C_0$ coefficient | 0.013 | 0.038 | -0.060 | 0.042 | 0.071 |
| | (0.35) | (1.13) | (-1.53) | (0.99) | (1.32) |
| $R^2$ | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 |

The dependent variable, $Return_t$, t =1,5 is, alternatively, the one- to five-year ahead size-adjusted returns. Cross-sectional OLS regression coefficients are estimated for returns from 1979 to 1999. The table reports mean estimated coefficients over the 21, along with the t-statistics (in parentheses) that are calculated as the mean of the estimated coefficients relative to their estimated standard errors. $RNOA_0$ is the current change in RNOA; $ÄPM_0$ is change in profit margin; $ÄATO_0$ is change in asset turnover; $G_0^{NOA}$ is the current growth rate in net operating assets; accruals ($Accr_0$) are measured as the difference between cash from operations and operating income, deflated by the beginning net operating assets; $Q_0$ is a score measuring the extent to which income is affected by creating or releasing hidden reserves from practicing conservative accounting; $C_0$ is a measure of the effect of conservative accounting (for inventory, advertising and research and development) on the balance sheet.

## FIGURE 1

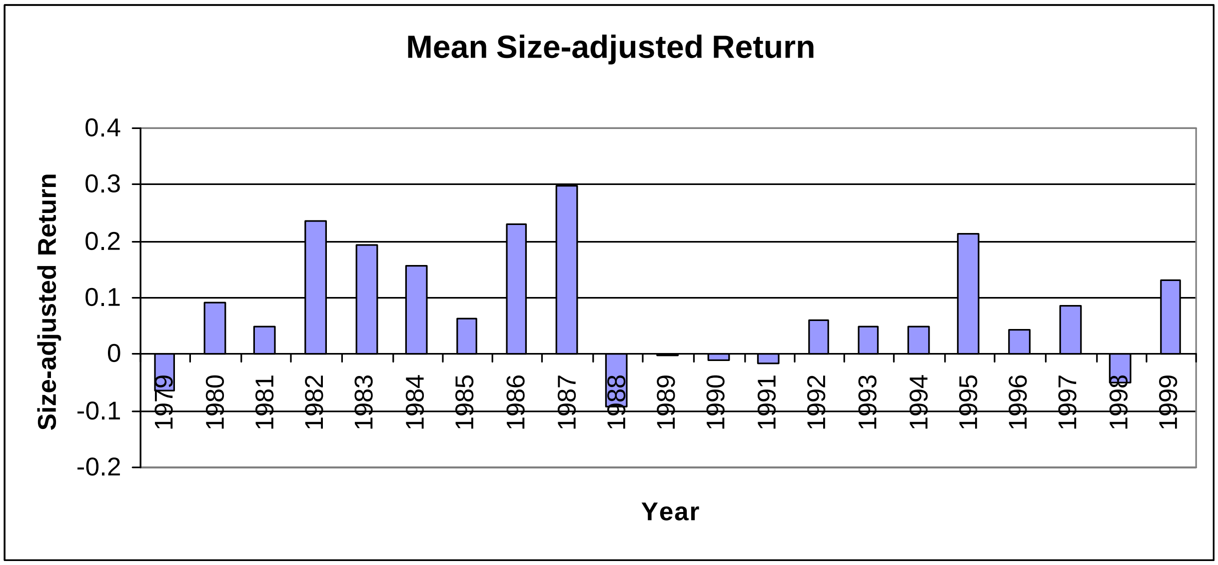
Mean return on net operating assets (RNOA) for high and low S-score groups over five years before and after the S-scoring year, Year 0.



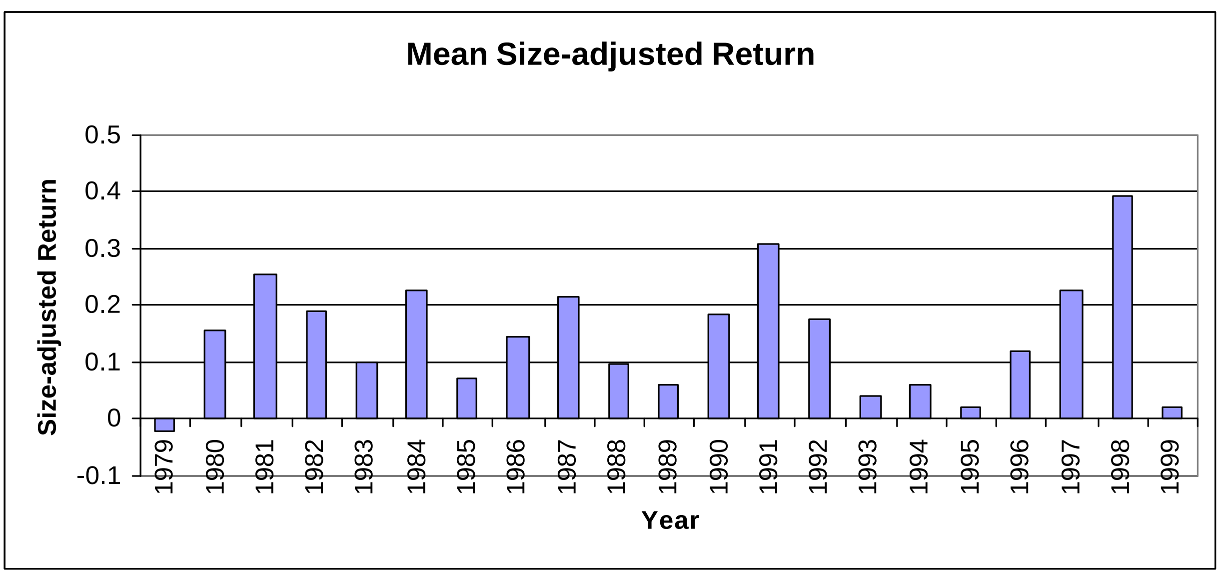

The S-score groups are based on a ranking of firms each year on S-scores, within RNOA groups. The high S-score group is the top third of firms in that ranking and the low S-score group is the bottom third of firms in the ranking on S-scores. The RNOA values reported in the figure are the means of 21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

## FIGURE 2

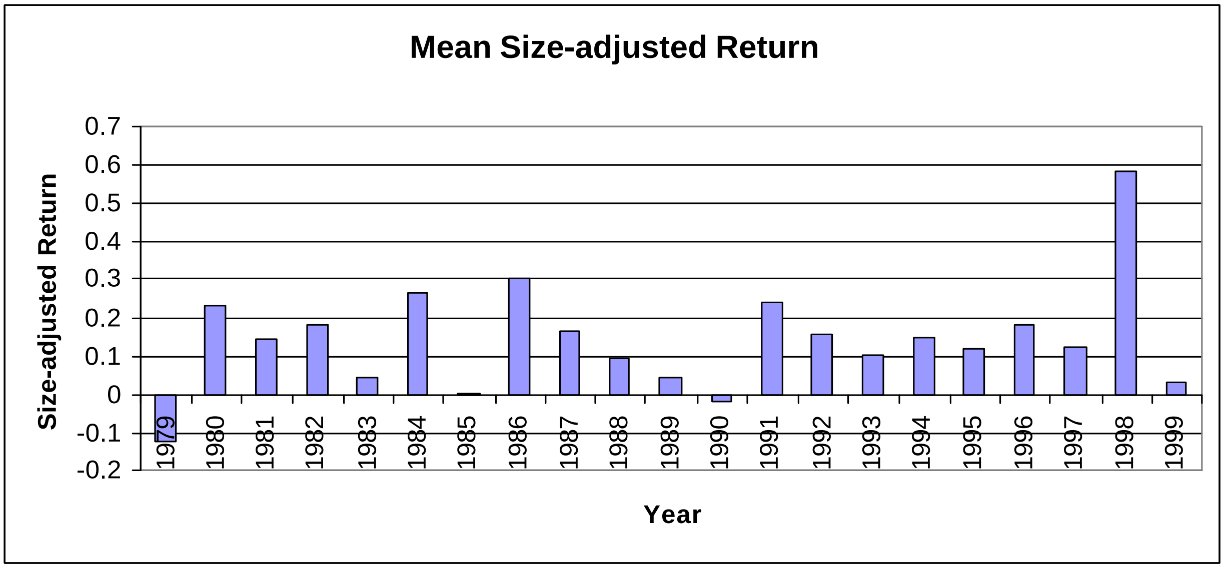
Panel A: Differences in Mean Size-Adjusted Returns between High and Low E/P Residual Portfolios, for the Year Following the S Scoring Year, 1979 – 1999




Panel B: Differences in Mean Size-Adjusted Returns between High and Low $\widehat{DRNOA_1}$ Portfolios, for the Year Following the $\widehat{DRNOA_1}$ Estimation Year, 1979 – 1999



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



## Endnotes

[1] 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.

[2] Expected profitability t periods ahead, as applied in residual income valuation, is $E_0(OI_t)/E_0(NOA_{t-1})$, not $E_0(OI_t/NOA_{t-1})$, and this is implied in the discussion; however, for one period ahead (on which we focus), the two are the same. The residual income model yields an equivalent valuation to the discounted cash flow model, provided the accounting honors the clean-surplus relation (3). See Penman (1997). Ohlson and Juettner-Nauroth (2001) 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, so the analysis here is consistent with the Ohlson and Juettner-Nauroth model.

[3] 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:

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

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

by the clean surplus relation (3). It follows that

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

and thus the enterprise P/E ratio is

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

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.

[4] If $RNOA_t = RNOA_0$ for all t>0, $ÄNOA_0 \neq 0$ and/or $g \neq 1$, the P/E ratio will differ from the "normal" level of $\rho(\rho\text{-}1)^{-1}$. The difference depends on how future residual incomes are expected to differ from the current residual income. More specifically,

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

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

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

[5] "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).

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

[7] 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.

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

[9] In an enhancement, we built in recursive information, adding ÄRNOA predicted for year 0 ( $\Delta\widehat{RNOA}_0$ ) and the S score for year 0 to the OLS and LOGIT versions, respectively, of model (10). Both are predicted at the end of year –1. 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 $ÄRNOA_0$ 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.

[10] We prepared an analysis similar to that in Figure 1 for firms in each $RNOA_0$ decile in each year. The S score differentiated $ÄRNOA_1$ for all deciles. For low $RNOA_0$ firms (in the bottom two deciles with mean $RNOA_0$ of -12.8% and 1.8%, respectively), RNOA declined for both high and low S groups prior to year 0, and increased for both groups in year +1; yet the S score forecasted differences in that increase. For high $RNOA_0$ (in the top 3 deciles with mean $RNOA_0$

of 17.8%, 22.5%, and 37.5%, respectively), RNOA increased for both high and low S groups prior to year 0, but increased further in year +1 for high S firms while decreasing for low S firms.

[11] 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.

[12] The mean size-adjusted return over all portfolios in Table 7 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 specific accounting items to be available.

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

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

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

[16] Similar results to those in Panel B of Table 7 were obtained when $\overset{\text{Ù}}{\mathbf{DRNOA}_1}$ and S scores were included in the regressions, rather than the E/P model residual. The t-statistic on mean estimated coefficient on $\overset{\text{Ù}}{\mathbf{DRNOA}_1}$ was 4.75 and that on the S score was 5.28.

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

## REFERENCES


Abarbanell, J. and B. Bushee. 1997. Fundamental Analysis, Future Earnings, and Stock Prices. *Journal of Accounting Research* 35 (1): 1-24.

Altman, E. 1968. Financial Ratios, Discriminant Analysis, and the Prediction of Corporate Bankrupcy. *Journal of Finance* 23 (September): 589-609.

Ball, R., and R. Watts. 1972. Some Time Series Properties of Accounting Income. *Journal of Finance* 27(3): 663-682.

Basu, S.1977. Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis. *Journal of Finance* 32: 663-682.

Beaver, W. 1970. The Time Series Behavior of Earnings. *Journal of Accounting Research* 8 (Supplement): 62-99.

Beaver, W., and D. Morse. 1978. What Determines Price-Earnings Ratios? *Financial Analysts Journal* 28: 65-76.

Beneish, M. 1999. The Detection of Earnings Manipulation. *Financial Analysts Journal* 55(5): 24-36.

Chan, K., L.Chan, N. Jagadeesh, and J. Lakonishok. 2001. Earnings Quality and Stock Returns: The Evidence from Accruals. Working paper, National Taiwan University and University of Illinois at Urbana-Champaign.

Easton, P., and M. Zmijewski. 1989. Cross-sectional Variation in the Stock Market Response to Accounting Earnings Announcements. *Journal of Accounting and Economics* 11 (July): 195-228.

Fairfield, P., R. Sweeney, and T. Yohn. 1996. Accounting Classification and the Predictive Content of Earnings. *The Accounting Review* 71 (3): 337-355.

Fairfield, P., J. Whisenant, and T. Yohn. 2003. Accrued Earnings and Growth: Implications for Earnings Persistence and Market Mispricing. *The Accounting Review*

Fairfield, P., and T. Yohn. 2001. Using Asset Turnover and Profit Margin to Forecast Changes in Profitability. *Review of Accounting Studies* 6 (4): 371-385.

Fama, E., and K. French. 1992. The Cross-section of Expected Stock Returns. *Journal of Finance* 47: 427-465.

Fama, E., and K. French. 1997. Industry Costs of Equity. *Journal of Financial Economics* 43: 153-193.

Fama, E., and K. French. 2000. Forecasting Profitability and Earnings. *Journal of Business* 73 (2): 161-175.

Fama, E, and J. Macbeth. 1973. Risk, Return and Equilibrium-Empirical Tests. *Journal of Political Economy* 81 (May/June): 607-636.

Feltham, J., and J. Ohlson. 1995. Valuation and Clean Surplus Accounting for Operating and Financial Activities." *Contemporary Accounting Research* 11 (2): 689-731.

Freeman, R., Ohlson, J., and S. Penman. 1982. Book Rate-of-Return and Prediction of Earnings Changes: An Empirical Investigation." *Journal of Accounting Research* (Autumn): 639-653.

Hribar, P. 2001. The Market Pricing of Components of Accruals. Working paper, Cornell University.

Kormendi, R., and R. Lipe. 1987. Earnings Innovations, Earnings Persistence, and Stock Returns. *Journal of Business* 60 (3): 323-345.

Lev, B., and S. Thiagarajan. 1993. Fundamental Information Analysis. *Journal of Accounting Research* 31 (2): 190-215.

Lipe, R. 1986. The Information Contained in the Components of Earnings. *Journal of Accounting Research* 24: 37-64.

Molodovsky, N. 1953. A Theory of Price-Earnings Ratios. *Financial Analysts Journal* (November): 65-80.

Nissim, D., and S. Penman. 2001. Ratio Analysis and Equity Valuation: From Research to Practice. *Review of Accounting Studies* 6 (1): 109-154.

Nissim, D., and S. Penman. 2002. Financial Statement Analysis of Leverage and How It Informs About Profitability and Price-to-book Ratios. Working paper, Columbia University.

Ohlson, J. 1995. Earnings, Book Values, and Dividends in Equity Valuation. *Contemporary Accounting Research* 11 (2):661-687.

Ohlson, J., and Juettner-Nauroth. 2001. Expected EPS and EPS Growth as Determinants of Value. Working paper, New York University and Johannes Gutenberg University.

Ou J., and S. Penman. 1989a. Financial Statement Analysis and the Prediction of Stock Returns. *Journal of Accounting and Economics* 11 (4): 295-329.

Ou J., and S. Penman. 1989b. Accounting Measurement, Price Earnings Ratio, and the Information-Content of Security Prices. *Journal of Accounting Research* 27: 111-144.

Penman, S. 1996. The Articulation of Price-Earnings Ratios and Market-to-Book Ratios and the Evaluation of Growth. *Journal of Accounting Research* 34 (2): 235-259.

Penman, S. 1997. A Synthesis of Equity Valuation Techniques and the Terminal Value Calculation for the Dividend Discount Model. *Review of Accounting Studies*: 303-323.

Penman, S. 2004. *Financial Statement Analysis and Security Valuation*, 2nd ed. New York: The McGraw-Hill Companies.

Penman, S., and X. Zhang. 2002. Accounting Conservatism, Quality of Earnings, and Stock Returns. *The Accounting Review* 77(2): 237-264.

Piotroski, J. 2000. Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research* 38 (Supplement): 1-41.

Richardson, S., R. Sloan, M. Soliman, and I. Tuna. 2002. Information in Accruals About Earnings Persistence and Future Stock Returns. Working paper, University of Michigan.

Sloan, R. 1996. Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings? *The Accounting Review* 71 (3): 289-315.

Soliman, M. 2003. Using Industry-adjusted DuPont Analysis to Predict Future Profitability. Working paper, Stanford University.

Thomas, J., and H. Zhang. 2002. Inventory Changes and Future Returns. Forthcoming, *Review of Accounting Studies.*

Titman, S., K. Wei, and F. Xie. 2001.Capital Investments and Stock Returns. Working paper, University of Texas at Austin.

Zach, T. 2002. Inside the 'Accrual Anomaly'. Working paper, University of Rochester.

Zhang, X. 2000. Conservative Accounting and Equity Valuation. *Journal of Accounting and Economics* 29: 125-149.