The Internet Appendix: "The Economics of Security Analysis" (for Online Publication Only)

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May 2022

Abstract

This Internet Appendix details derivations, variable definitions, and supplementary results for our manuscript titled "The Economics of Security Analysis."

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A Derivations

We follow Liu, Whited, and Zhang (2009) in proving equation (1) in the main text. Let q_t be the Lagrangian multiplier for the capital accumulation equation $A_{t+1} = (1-\delta)A_t + I_t$. Form the Lagrangian function:

$$\mathcal{L} = \ldots + X_t A_t - \frac{a}{2}\left(\frac{I_t}{A_t}\right)^2 A_t - I_t - q_t(A_{t+1} - (1-\delta)A_t - I_t)$$
$$+E_t\left[M_{t+1}\left[X_{t+1}A_{t+1} - \frac{a}{2}\left(\frac{I_{t+1}}{A_{t+1}}\right)^2 A_{t+1} - I_{t+1} - q_{t+1}(A_{t+2} - (1-\delta)A_{t+1} - I_{t+1})\right]\right] + \ldots \quad \text{(S1)}$$

The first-order conditions with respect to I_t and A_{t+1} are, respectively,

$$q_t = 1 + a\frac{I_t}{A_t}; \quad \text{(S2)}$$
$$q_t = E_t\left[M_{t+1}\left[X_{t+1} + \frac{a}{2}\left(\frac{I_{t+1}}{A_{t+1}}\right)^2 + (1-\delta)q_{t+1}\right]\right]. \quad \text{(S3)}$$

We start with $P_t + D_t = V_t$ and expand V_t:

$$P_t + X_tA_t - \frac{a}{2}\left(\frac{I_t}{A_t}\right)^2 A_t - I_t = X_tA_t - a\frac{I_t}{A_t}I_t + \frac{a}{2}\left(\frac{I_t}{A_t}\right)^2 A_t - I_t$$
$$- q_t(A_{t+1} - (1-\delta)A_t - I_t) + E_t\left[M_{t+1}\left(X_{t+1}A_{t+1} - a\frac{I_{t+1}}{A_{t+1}}I_{t+1}\right.\right.$$
$$\left.\left.+\frac{a}{2}\left(\frac{I_{t+1}}{A_{t+1}}\right)^2 A_{t+1} - I_{t+1} - q_{t+1}(A_{t+2} - (1-\delta)A_{t+1} - I_{t+1}) + \ldots\right)\right]. \quad \text{(S4)}$$

Substituting equations (S2) and (S3), and using the linear homogeneity of adjustment costs:

$$P_t = \left(1 + a\frac{I_t}{A_t}\right) I_t + q_t(1-\delta)A_t = q_tA_{t+1}. \quad \text{(S5)}$$

Finally, the cost of capital (the stock return):

$$r_{t+1} = \frac{P_{t+1} + X_{t+1}A_{t+1} - (a/2)\left(I_{t+1}/A_{t+1}\right)^2 A_{t+1} - I_{t+1}}{P_t}$$
$$= \frac{q_{t+1}(I_{t+1} + (1-\delta)A_{t+1}) + X_{t+1}A_{t+1} - (a/2)\left(I_{t+1}/A_{t+1}\right)^2 A_{t+1} - I_{t+1}}{q_tA_{t+1}}$$
$$= \frac{(1-\delta)q_{t+1} + X_{t+1} + (a/2)\left(I_{t+1}/A_{t+1}\right)^2}{q_t}, \quad \text{(S6)}$$

in which the second equality follows from equation (S2), and the third equality follows from the linear homogeneity of the adjustment costs function.

B Measurement and Supplementary Results

B.1 Piotroski's (2000) Fundamental Score

Piotroski (2000) chooses nine fundamental signals to measure three areas of a firm's financial condition, profitability, liquidity, and operating efficiency. Each signal is classified as either good or bad (one or zero), depending on its implications for future stock prices and profitability. The aggregate signal, denoted F, is the sum of the nine binary signals.

Four profitability variables: (i) Roa is income before extraordinary items (Compustat annual item IB) scaled by 1-year-lagged assets (item AT). If the firm's Roa is positive, the indicator variable F_{Roa} equals one and zero otherwise. (ii) Cf/A is cash flow from operation scaled by 1-year-lagged assets. Cash flow from operation is net cash flow from operating activities (item OANCF) if available, or funds from operation (item FOPT) minus the annual change in working capital (item WCAP). If the firm's Cf/A is positive, the indicator variable $F_{\text{Cf/A}}$ equals one and zero otherwise. (iii) dRoa is the current year's Roa less the prior year's Roa. If dRoa is positive, the indicator variable F_{dROA} is one and zero otherwise. (iv) The indicator F_{Acc} equals one if Cf/A $>$ Roa and zero otherwise.

Three variables measure changes in capital structure and a firm's ability to meet debt obligations. An increase in leverage, a deterioration of liquidity, or the use of external financing is assumed to be a bad signal. (i) dLever is the change in the ratio of total long-term debt (Compustat annual item DLTT) to the average of current and 1-year-lagged total assets. F_{dLever} is one if the firm's leverage ratio falls, dLever < 0, and zero otherwise. (ii) dLiquid measures the change in a firm's current ratio from the prior year, in which the current ratio is the ratio of current assets (item ACT) to current liabilities (item LCT). An improvement in liquidity (ΔdLiquid > 0) is a good signal about the firm's ability to service current debt obligations. The indicator F_{dLiquid} equals one if the firm's liquidity improves and zero otherwise. (iii) The indicator, Eq, equals one if the firm does not issue common equity in the current year and zero otherwise. The issuance of common equity is sales of common and preferred stocks (item SSTK) minus any increase in preferred stocks (item PSTK). Issuing equity is a bad signal (inability to generate sufficient internal funds to service future obligations).

Two signals measure changes in a firm's operation efficiency. (i) dMargin is the firm's current gross margin ratio, measured as gross margin (Compustat annual item SALE minus item COGS) scaled by sales (item SALE), less the prior year's gross margin ratio. An improvement in margins signifies a potential improvement in factor costs, a reduction in inventory costs, or a rise in the price of the firm's product. The indictor F_{dMargin} equals one if dMargin > 0 and zero otherwise. (ii) dTurn is the firm's current year asset turnover ratio, measured as total sales scaled by 1-year-lagged total assets (item AT), minus the prior year's asset turnover ratio. An improvement in asset turnover ratio signifies greater productivity from the asset base. The indicator, F_{dTurn}, equals one if dTurn > 0 and zero otherwise. The composite score, F, is the sum of the individual binary signals:

$$F \equiv F_{\text{Roa}} + F_{\text{dRoa}} + F_{\text{Cf/A}} + F_{\text{Acc}} + F_{\text{dMargin}} + F_{\text{dTurn}} + F_{\text{dLever}} + F_{\text{dLiquid}} + \text{Eq}. \tag{S7}$$

At the end of June of each year t, we sort stocks based on F-score for the fiscal year ending in calender year $t-1$ to form 7 portfolios: low (F = 0, 1, 2), 3, 4, 5, 6, 7, and high (F = 8, 9). Because extreme F-scores are rare, we combine scores 0, 1, and 2 into the low portfolio and scores 8 and 9 into the high portfolio. Monthly portfolio returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June of $t+1$. For two-way sorts, at the end of June of each year t, we sort stocks on F-score to form quintiles: low (F = 0, 1, 2, 3), 4, 5, 6, and high (F

= 7, 8, 9). Independently, we sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the June-end market equity. Taking intersections yields 15 portfolios. For sufficient data coverage, the F-score portfolio returns start in July 1972.

Panel A of Table S1 shows that the F-score predictability is mixed in our extended sample. The high-minus-low portfolio earns on average only 0.2% per month ($t = 0.8$).[1] The evidence is stronger in quintiles. Across micro, small, and big stocks, the quintile spreads are 0.36%, 0.3%, and 0.2% ($t =$ 2.21, 2.08, and 1.31), respectively. The q-factor and q^5 models largely explain this predictability. The q-factor alphas of the quintile spreads are 0.11%, 0.07%, and 0.07% ($t = 0.64$, 0.51, and 0.48), and the q^5 alphas 0.28%, 0.14%, and 0.04% ($t = 2.19$, 1.04, and 0.22), respectively. The GRS test cannot reject the q-factor model with the 15 testing portfolios ($p = 0.05$) or the q^5 model ($p = 0.19$).

The Roe factor is the key driving force behind the explanatory power. In the q^5 regressions, the Roe factor loadings of the high-minus-low quintiles are 0.62, 0.47, and 0.4 ($t = 6.37$, 5.68, and 3.98) across micro, small, and big stocks, respectively. The investment factor also plays a role, with significant loadings for micro and small stocks but not for big stocks.

Intuitively, F-score contains four fundamental signals that measure a firm's profitability, including return on assets (Roa), cash flow-to-assets (Cf/A), the change of Roa, and an indicator on whether Cf/A > Roa. F-score also contains two operating efficiency measures, the change in gross margin and the change in asset turnover. All these signals are closely related to return on equity underlying our Roe factor. F-score also contains an equity issuance indicator, which is positively correlated with investment. Finally, Piotroski (2000) only works with binary indicators, with two values (1 and 0). Doing so likely understates the heterogeneity across firms and dampens the predictive power relative to the Roe factor, which is built on continuous Roe values.

B.2 Asness, Frazzini, and Pedersen's (2019) Quality Score

We closely follow the variable definitions in Aseness, Frazzini, and Pedersen (2019), who consider two versions of quality score. The benchmark score is the average of the profitability, growth, and safety scores, and the alternative score is the average of these three measures as well as a payout score. The profitability score is based on six variables:

1. Gross profitability, measured as total revenue (Compustat annual item REVT) minus costs of goods sold (item COGS) scaled by (current, not lagged) total assets (item AT).

2. Return on equity, measured as income before extraordinary items (item IB) scaled by (current, not lagged) book equity. Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities

[1] In untabulated results, we show that restricting the sample to the top book-to-market quintile per Piotroski (2000) yields even weaker evidence, as the high-minus-low portfolio earns only −0.04% per month ($t = -0.1$). Sampling variation plays an important role. If we end the sample in December 1998, which is close to Piotroski's original sample, the average high-minus-low return for the top book-to-market quintile is 0.73%, albeit still insignificant ($t = 1.61$). From January 1999 onward, the average return is −0.96% ($t = -1.59$). Sampling variation is less extreme in our full sample, which includes all book-to-market quintiles. The average high-minus-low return is 0.51% ($t = 1.67$) and −0.17% ($t = -0.41$) before and after December 1998, respectively.

(item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

3. Return on assets, measured as income before extraordinary items (item IB) scaled by (current, not lagged) total assets (item AT).

4. Cash flow over assets, measured as income before extraordinary items plus depreciation minus changes in working capital and capital expenditure, all scaled by current total assets, (IB + DP − △ WC − CAPX)/AT. Working capital, WC, is current assets minus current liabilities minus cash and short-term instruments plus short-term debt and income taxes payable (item ACT − LCT − CHE + DLC + TXP). Missing changes in income taxes payable are set to zero.

5. Gross margin, measured as total revenue minus costs of goods sold scaled by current total sales, (RETV − COGS)/SALE.

6. Negative accrual, measured as the depreciation minus changes in working capital scaled by current total assets, −(△WC − DP)/AT.

Each month we first convert each of the six variables into cross-sectional rankings and then take the z-score of the rankings. Taking the z-score means that we divide the cross-sectionally demeaned value of the rankings by the cross-sectional standard deviation of the rankings. The profitability z-score is the average z-score across the six variables.

The growth z-score is the average of the z-scores of the rankings of the 5-year per share growth of residual gross profitability, residual return on equity, residual return on assets, residual cash flow over assets, and residual gross margin. The 5-year per share growth in residual gross profitability is defined as $[(\mathrm{gp}_t - r^f_{t-1,t}\mathrm{at}_{t-1}) - (\mathrm{gp}_{t-5} - r^f_{t-6,t-5}\mathrm{at}_{t-6})]/\mathrm{at}_{t-5}$, in which GP = REVT − COGS, and lowercase names indicate per share quantity (e.g., gp = GP/S, at = AT/S, with S being the split-adjusted number of shares outstanding, item CSHO times AJEX) and $\mathrm{gp}_t - r^f_{t-1,t}\mathrm{at}_{t-1}$ is the residual profit in fiscal year t. $r^f_{t-1,t}$ is the 12-month risk-free rate from the end of fiscal year $t-1$ to the end of fiscal year t from accumulating 1-month T-bill rates for the corresponding 12 months. Analogously, 5-year per share growth in residual return on equity is $[(\mathrm{ib}_t - r^f_{t-1,t}\mathrm{be}_{t-1}) - (\mathrm{ib}_{t-5} - r^f_{t-6,t-5}\mathrm{be}_{t-6})]/\mathrm{be}_{t-5}$, 5-year growth in residual return on assets is $[(\mathrm{ib}_t - r^f_{t-1,t}\mathrm{at}_{t-1}) - (\mathrm{ib}_{t-5} - r^f_{t-6,t-5}\mathrm{at}_{t-6})]/\mathrm{at}_{t-5}$, 5-year growth in residual cash flow over assets is $[(\mathrm{cf}_t - r^f_{t-1,t}\mathrm{at}_{t-1}) - (\mathrm{cf}_{t-5} - r^f_{t-6,t-5}\mathrm{at}_{t-6})]/\mathrm{at}_{t-5}$, in which CF = IB + DP − △WC − CAPX, and 5-year growth in residual gross margin is $(\mathrm{gp}_t - \mathrm{gp}_{t-5})/\mathrm{sale}_{t-5}$.

The safety z-score is the average of the z-scores of the rankings of low beta, low leverage, low bankruptcy risk (O-score and Z-score), and low earnings volatility. Beta is the minus Frazzini-Pedersen beta. We estimate the beta for stock i as $\hat{\rho}\hat{\sigma}_i/\hat{\sigma}_m$, in which $\hat{\sigma}_i$ and $\hat{\sigma}_m$ are the estimated return volatilities for the stock and the market, and $\hat{\rho}$ is their return correlation. To estimate return volatilities, we compute the standard deviations of daily log returns over a 1-year rolling window (with at least 120 daily returns). To estimate return correlations, we use overlapping 3-day log returns, $r^{3d}_{it} = \sum_{k=0}^{2} \log(1 + r^i_{t+k})$, over a 5-year rolling window (with at least 750 daily returns).

Leverage is minus total debt (the sum of long-term debt, short-term debt, minority interest, and preferred stock) over current total assets, −(DLTT+DLC+MIBT+PSTK)/AT. We take the minus Ohlson's O-score. We follow Ohlson (1980, Model 1 in Table 4) to construct O-score:

$$\begin{aligned} \mathrm{O} \equiv & -1.32 - 0.407\log(\mathrm{TA}) + 6.03\mathrm{TLTA} - 1.43\mathrm{WCTA} + 0.076\mathrm{CLCA} \\ & -1.72\mathrm{OENEG} - 2.37\mathrm{NITA} - 1.83\mathrm{FUTL} + 0.285\mathrm{IN2} - 0.521\mathrm{CHIN}, \end{aligned} \tag{S8}$$

in which TA is total assets (Compustat annual item AT). TLTA is the leverage ratio, measured as total debt (item DLC plus DLTT) divided by total assets. WCTA is working capital (item ACT minus LCT) divided by total assets. CLCA is current liability (item LCT) divided by current assets (item ACT). OENEG is one if total liabilities (item LT) exceeds total assets and zero otherwise. NITA is net income (item NI) divided by total assets. FUTL is the fund provided by operations (item PI plus DP) divided by total liabilities. IN2 is equal to one if net income is negative for the last two years and zero otherwise. CHIN is $(\text{NI}_s - \text{NI}_{s-1})/(|\text{NI}_s| + |\text{NI}_{s-1}|)$, in which NI_s and NI_{s-1} are the net income for the current and prior years.

Z-score is Altman's Z-Score, which is the weighted sum of working capital, retained earnings, earnings before interest and taxes, market equity and sales, scaled by current total assets: $\text{Z} = (1.2\text{WC} + 1.4\text{RE} + 3.3\text{EBIT} + 0.6\text{ME} + \text{SALE})/\text{AT}$. Earnings volatility is the minus standard deviation of quarterly return on equity over the prior 60 quarters (12 minimum), in which quarterly return on equity is income before extraordinary items (Compustat quarterly item IBQ) divided by current quarter book equity. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity.

The payout z-score is the average of the z-scores of the rankings of equity net issuance, debt net issuance, and total net payout over profits. Equity net issuance is the minus of the natural log of the ratio of the split-adjusted shares outstanding at the fiscal year ending in calendar year $t-1$ to the split-adjusted shares outstanding at the fiscal year ending in $t-2$. The split-adjusted shares outstanding is shares outstanding (Compustat annual item CSHO) times the adjustment factor (item AJEX). Debt net issuance is the minus of the natural log of the ratio of total debt (the sum of items DLTT, DLC, MIBT, and PSTK) at the fiscal year ending in calendar year $t-1$ to the total debt at the fiscal year ending in $t-2$. The total net payout-to-profits ratio is the sum of total net payout (income before extraordinary items (item IB) minus the change in book equity) over the past five years divided by total profits (REVT $-$ COGS) over the past five years.

The benchmark quality score is the average across the profitability, growth, and safety z-scores. The alternative quality score is the average across the profitability, growth, safety, and payout z-scores. To determine when each component signal is known publicly, we use annual Fama-French (1993) timing (i.e., variables in fiscal year ending in year $t-1$ are known publicly at the June-end of year t), except for beta and earnings volatility. We consider beta as known publicly at the end of estimation month and earnings volatility as known publicly four months after the fiscal quarter when it is estimated. We use monthly sorts on the quality scores and their components to construct portfolios with NYSE breakpoints, value-weighted returns, and 1-month holding period.

B.3 Penman and Zhu's (2020) Expected-return Measure

We construct the Penman-Zhu ER8 measure using the following eight anomaly variables:

1. Earnings-to-price, Ep: Income before extraordinary items (Compustat annual item IB) for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the same fiscal year end. For firms with more than one share class, we merge the market equity for all share classes before computing Ep.

2. Book-to-market equity, Bm: The book equity for the fiscal year ending in calendar year $t-1$ divided by the market equity (from CRSP) at the same fiscal year end. For firms with more than one share class, we merge the market equity for all share classes before computing Bm. Following Davis, Fama, and French (2000), we measure book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. We keep only firms with positive book equity.

3. Return on assets, Roa: Income before extraordinary items (Compustat annual item IB) divided by lagged assets (item AT).

4. Accruals, Acc: Accruals for the current fiscal year divided by average total assets (Compustat annual item AT) over the current and last fiscal years. We measure accruals as the sum of change in accounts receivable (item RECT), change in inventory (item INVT), and change in other current assets (item ACO), minus the sum of change in accounts payable (item AP) and change in other current liabilities (item LCO), minus depreciation and amortization expense (item DP). Missing ACO, AP, LCO, and DP are set to zero.

5. Investment, dPia: The annual change in gross property, plant, and equipment (Compustat annual item PPEGT) plus the annual change in inventory (item INVT) scaled by 1-year-lagged total assets (item AT).

6. Growth in net operating assets, dNoa: We measure net operating assets as operating assets minus operating liabilities. Operating assets are total assets (Compustat annual item AT) minus cash and short-term investment (item CHE). Operating liabilities are total assets minus debt included in current liabilities (item DLC, zero if missing), minus long-term debt (item DLTT, zero if missing), minus minority interests (item MIB, zero if missing), minus preferred stocks (item PSTK, zero if missing), and minus common equity (item CEQ). dNoa, is the annual change in net operating assets scaled by 1-year-lagged total assets.

7. Net external financing, Nxf: Net external financing for the fiscal year ending in calendar year $t-1$ scaled by the average of total assets for fiscal years ending in $t-2$ and $t-1$. Net external financing is the sum of net equity financing, Nef, and net debt financing, Ndf. Nef is the proceeds from the sale of common and preferred stocks (Compustat annual item SSTK) less cash payments for the repurchases of common and preferred stocks (item PRSTKC) less cash payments for dividends (item DV). Ndf is the cash proceeds from the issuance of long-term debt (item DLTIS) less cash payments for long-term debt reductions (item DLTR) plus the net changes in current debt (item DLCCH, zero if missing). The data on financing activities start in 1971.

8. Net share issues, Nsi: we measure Nsi as the natural log of the ratio of the split-adjusted shares outstanding at the fiscal year ending in calendar year $t-1$ to the split-adjusted shares outstanding at the fiscal year ending in $t-2$. The split-adjusted shares outstanding is shares outstanding (Compustat annual item CSHO) times the adjustment factor (item AJEX).

B.4 The Profitability Premium

Because intangible investments forecast return with a positive sign, conservative accounting can cause Roe to predict returns with a negative sign in the data. Penman and Zhang (2020a, b) interpret this evidence as contradicting the investment CAPM underlying the q models.

While acknowledging the importance of conservative accounting on Roe, we emphasize that its impact is not mutually exclusive from the economic forces underlying the profitability premium postulated by the investment CAPM. Intuitively, high expected profitability relative to low investment must imply high discount rates, which are required to offset the high expected profitability to yield low net present values of new capital and low investment (Hou, Xue, and Zhang 2015). Hou et al. then use quarterly Roe, which provides the most up-to-date information about future Roe, as their expected profitability proxy. Also, Roe is arguably the most common measure of profitability.

Empirically, the negative Roe-return relation in Penman and Zhang (2020a, b) and the positive Roe-return relation in Hou, Xue, and Zhang (2015) can easily be reconciled. The crux is that the former uses annual sorts but the latter uses monthly sorts. Monthly sorts are natural in light of Hou et al.'s reasoning. Because profitability follows a persistent process, exploiting up-to-date information in quarterly Roe via monthly sorts yields the most accurate proxy of expected profitability.

Table S10 details the profitability-return relation with different measures of profitability. In Panel A, annual Roe (RoeA) is income before extraordinary items (Compustat annual item IB) divided by 1-year-lagged book equity.[2] To form the RoeA deciles, at the end of June of year t, we sort stocks into deciles on the NYSE breakpoints of RoeA for the fiscal year ending in calendar year $t-1$. Monthly value-weighted decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June of $t+1$. Consistent with Penman and Zhang (2020a, b), the high-minus-low decile earns on average only -0.08% per month ($t = -0.45$).

However, consistent with Hou, Xue, and Zhang (2015), the high-minus-low decile from monthly sorts on quarterly Roe with a 1-month hold period (Roe1) earns on average 0.63% per month ($t = 3.03$). Section B.5 details the measurement of quarterly Roe and its monthly sorts, which follow Hou, Xue, and Zhang (2020). The Roe premium drops to 0.37% ($t = 1.85$) at the 6-month horizon and further to 0.18% ($t = 0.99$) at the 12-month horizon. From Panel B, book leverage plays only a minor role. Monthly sorts on quarterly return on assets with the 1-month holding period (Roa1) still yield a large return spread of 0.53% per month ($t = 2.54$).

Panels C and D explore two alternative profitability measures, operating cash flow-to-lagged assets (Cla) and operating profits-to-lagged equity (Ole). Sections B.8 and B.9 detail their measurement and portfolio construction, respectively. Because both mitigate the impact of conservative accounting on Roe, both yield positive return spreads in annual sorts. For Cla, which adds back, for example, R&D expenses, its profitability premium in annual sorts is 0.55% per month ($t = 3.16$). For Ole, its profitability premium is positive but small, 0.1% ($t = 0.52$).

More important, despite conservative accounting, Roe performs well in monthly sorts relative to the alternative profitability measures. At the 1-month horizon, for example, the high-minus-low

[2]Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

Cla decile earns on average 0.52% per month ($t = 3.24$), and the high-minus-low Ole decile earns 0.57% ($t = 2.84$). Both are lower than 0.63% ($t = 3.03$) for Roe. Indeed, the Roe factor is so strong that it fully subsumes the momentum factor, UMD, in head-to-head factor spanning tests between the q-factor model and the Fama-French (2018) 6-factor model (Hou et al. 2019).

The crux is the unique information advantage for quarterly earnings data, which become available in the months immediately after quarterly earnings announcement dates (Compustat quarterly item RDQ). For other quarterly accounting items, we must impose a 4-month lag between the fiscal quarter end and subsequent returns to avoid look-ahead bias.[3] More stale information weakens the predictive power of the alternative profitability measures in monthly sorts. In addition, Roe allows one to start the sample in January 1967 because only quarterly earnings data are required in the numerator. In contrast, because quarterly Cla and Ole require more data items, their samples start later, January 1976 and January 1972, respectively, to ensure at least ten stocks in each decile.

Penman and Zhang (2020a) propose an alternative approach of packaging accounting information into a factor model. Their 3-factor model includes the market factor, an investment factor formed on change in total asset scaled by lagged market equity, and a "grand' portfolio that summarizes conservative accounting. In spanning tests, the q^5 model fully subsumes their 3-factor model, but the converse is not true (Section B.10). Their "grand" factor earns on average 0.52% per month ($t = 2.57$), but the q^5 alpha is insignificant, 0.2% ($t = 1.09$). Conversely, their 3-factor alphas of our investment, Roe, and expected growth factors are highly significant, 0.27%, 0.65%, and 0.93% ($t = 4.45$, 7.37, and 13.58), respectively. The evidence is robust to their alternative constructions.

B.5 Return on Equity (Roe)

Annual Roe (RoeA) is income before extraordinary items (Compustat annual item IB) divided by 1-year-lagged book equity. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. To form the RoeA deciles, at the end of June of year t, we sort stocks into deciles on the NYSE breakpoints of RoeA for the fiscal year ending in calendar year $t-1$. Monthly value-weighted decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June of $t+1$.

We measure quarterly Roe per Hou, Xue, and Zhang (2020). Roe is income before extraordinary items (Compustat quarterly item IBQ) divided by 1-quarter-lagged book equity. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity. Before 1972, the sample coverage is limited for quarterly book equity in Compustat quarterly files. We expand the coverage by using book equity from Compustat annual files as well as by imputing quarterly book equity with clean surplus accounting. Whenever available we first

[3] Firms typically announce earnings for a given quarter through press release and file SEC reports several weeks later. Easton and Zmijewski (1993) report a median lag of 46 days for NYSE/Amex firms and 52 days for NASDAQ firms. Chen, DeFond, and Park (2002) show only 37% of quarterly announcements include balance sheet information.

use quarterly book equity from Compustat quarterly files. We then supplement the coverage for fiscal quarter four with annual book equity from Compustat annual files. Following Davis, Fama, and French (2000), we measure annual book equity as stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if available. If not, stockholders' equity is the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock.

If both approaches are unavailable, we apply the clean surplus relation to impute the book equity. First, if available, we backward impute the beginning-of-quarter book equity as the end-of-quarter book equity minus quarterly earnings plus quarterly dividends. Quarterly earnings are income before extraordinary items (Compustat quarterly item IBQ). Quarterly dividends are zero if dividends per share (item DVPSXQ) are zero. Otherwise, total dividends are dividends per share times beginning-of-quarter shares outstanding adjusted for stock splits during the quarter. Shares outstanding are from Compustat (quarterly item CSHOQ supplemented with annual item CSHO for fiscal quarter 4) or CRSP (item SHROUT), and the share adjustment factor is from Compustat (quarterly item AJEXQ supplemented with annual item AJEX for fiscal quarter 4) or CRSP (item CFACSHR). If data are unavailable for the backward imputation, we impute the book equity for quarter t forward based on book equity from prior quarters. Let BEQ_{t-j}, $1 \leq j \leq 4$ denote the latest available quarterly book equity as of quarter t, and $\text{IBQ}_{t-j+1,t}$ and $\text{DVQ}_{t-j+1,t}$ be the sum of quarterly earnings and quarterly dividends from quarter $t-j+1$ to t, respectively. BEQ_t can then be imputed as $\text{BEQ}_{t-j} + \text{IBQ}_{t-j+1,t} - \text{DVQ}_{t-j+1,t}$. We do not use prior book equity from more than 4 quarters ago (i.e., $1 \leq j \leq 4$) to reduce imputation errors.

At the beginning of each month t, we sort all stocks into deciles based on their most recent past Roe. Before 1972, we use the most recent Roe computed with quarterly earnings from fiscal quarters ending at least 4 months prior to the portfolio formation. Starting from 1972, we use Roe computed with quarterly earnings from the most recent quarterly earnings announcements (Compustat quarterly item RDQ). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Roe to be within 6 months prior to the portfolio formation. This restriction is imposed to exclude stale earnings information. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for the current month t (Roe1), from month t to $t+5$ (Roe6), and from month t to $t+11$ (Roe12). The deciles are rebalanced monthly. Holding periods longer than one month like in Roe6 mean that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We average the subdecile returns as the monthly return of the Roe6 decile.

B.6 Expected Growth (Eg)

We measure expected growth, Eg, per Hou, Mo, Xue, and Zhang (2019). At the beginning of each month t, we measure current investment-to-assets as total assets (Compustat annual item AT) from the most recent fiscal year ending at least four months ago minus the total assets from one year prior, scaled by the 1-year-prior total assets. The left-hand side variable in the cross-sectional regressions is 1-year-ahead investment-to-assets changes, denoted $\text{d}^1\text{I/A}$, which is investment-to-assets from the first fiscal year after the most recent fiscal year end minus the current investment-to-assets.

The right-hand side variables include the log of Tobin's q, $\log(q)$, operating cash flows, Cop, and the change in Roe, dRoe. At the beginning of each month t, current Tobin's q is the market equity (price per share times the number of shares outstanding from CRSP) plus long-term debt (Compustat annual item DLTT) and short-term debt (item DLC) scaled by book assets (item AT), all from the most recent fiscal year ending at least four months ago. For firms with multiple share classes, we merge the market equity for all classes. Following Ball et al. (2016), we measure Cop as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), plus research and development expenditures (item XRD, zero if missing), minus change in accounts receivable (item RECT), minus change in inventory (item INVT), minus change in prepaid expenses (item XPP), plus change in deferred revenue (item DRC plus item DRLT), plus change in trade accounts payable (item AP), and plus change in accrued expenses (item XACC), scaled by book assets, all from the fiscal year ending at least four months ago. Missing annual changes are set to zero. Finally, dRoe is Roe minus the 4-quarter-lagged Roe, with missing dRoe values set to zero in the cross-sectional forecasting regressions. We winsorize the left- and right-hand side variables each month at the 1–99% level. To control for the impact of microcaps, we use weighted least squares with the market equity as the weights.

At the beginning of each month t, we construct the expected growth, Eg, which is the expected 1-year-ahead investment-to-assets change, by combining the most recent winsorized predictors with the average slopes estimated from the prior 120-month rolling window (30 months minimum). The most recent predictors, $\log(q)$ and Cop, in calculating Eg are from the most recent fiscal year ending at least four months ago as of month t, and dRoe is computed using the latest announced earnings, and if not available, the earnings from the most recent fiscal quarter ending at least four months ago. The average slopes in calculating Eg are estimated from the prior rolling window regressions, in which $\mathrm{d}^1\mathrm{I/A}$ is from the most recent fiscal year ending at least four months ago as of month t, and the regressors are further lagged accordingly.

B.7 Return on Assets (Roa)

Annual Roa (RoaA) is income before extraordinary items (Compustat annual item IB) divided by 1-year-lagged total assets (item AT). To form the RoaA deciles, at the end of June of year t, we sort stocks into deciles on the NYSE breakpoints of RoaA for the fiscal year ending in calendar year $t-1$. Monthly value-weighted decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June of $t+1$.

Quarterly return on assets, Roa, is income before extraordinary items (Compustat quarterly item IBQ) divided by 1-quarter-lagged total assets (item ATQ). At the beginning of each month t, we sort all stocks into deciles based on Roa computed with quarterly earnings from the most recent earnings announcement dates (item RDQ). For a firm to enter the portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Roa to be within 6 months prior to the portfolio formation. We also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for month t (Roa1), from month t to $t+5$ (Roe6), and from month t to $t+11$ (Roe12). The deciles are rebalanced at the beginning of $t+1$. Holding periods longer than one month like in Roa6 mean that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We average the subdecile returns as the monthly return of the Roa6 decile. For sufficient data coverage, the Roa portfolios start in January 1972.

B.8 Operating Cash Flow-to-lagged Assets (Cla)

Annual operating cash flow-to-lagged assets, ClaA, is total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), plus research and development expenditures (item XRD, zero if missing), minus change in accounts receivable (item RECT), minus change in inventory (item INVT), minus change in prepaid expenses (item XPP), plus change in deferred revenue (item DRC plus item DRLT), plus change in trade accounts payable (item AP), and plus change in accrued expenses (item XACC), all scaled by 1-year-lagged book assets (item AT). All changes are annual changes in balance sheet items and we set missing changes to zero. At the end of June of each year t, we sort stocks into deciles based on ClaA for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

Quarterly operating cash flow-to-lagged assets, Cla, is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ), minus selling, general, and administrative expenses (item XSGAQ), plus research and development expenditures (item XRDQ, zero if missing), minus change in accounts receivable (item RECTQ), minus change in inventory (item INVTQ), plus change in deferred revenue (item DRCQ plus item DRLTQ), and plus change in trade accounts payable (item APQ), all scaled by 1-quarter-lagged book assets (item ATQ). All changes are quarterly changes in balance sheet items and we set missing changes to zero.

At the beginning of each month t, we split stocks on Cla for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for month t (Cla1), from month t to $t+5$ (Cla6), and from month t to $t+11$ (Cla12). The deciles are rebalanced at the beginning of $t+1$. Holding periods longer than one month like in Cla6 mean that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior six months. We average the subdecile returns as the monthly return of the Cla6 decile. For sufficient data coverage, these portfolios start in January 1976.

B.9 Operating Profits-to-lagged Equity (Ole)

Annual operating profits-to-lagged equity (OleA) is total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS, zero if missing), minus selling, general, and administrative expenses (item XSGA, zero if missing), and minus interest expense (item XINT, zero if missing), scaled by 1-year-lagged book equity. We require at least one of the three expense items (COGS, XSGA, and XINT) to be nonmissing. Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if it is available. If not, we measure stockholders' equity as the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. At the end of June of each year t, we sort stocks into deciles on OleA for the fiscal year ending in calendar year $t-1$. Monthly decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$.

Quarterly operating profits-to-lagged equity (Ole) is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ, zero if missing), minus selling, general, and administrative expenses (item XSGAQ, zero if missing), and minus interest expense (item XINTQ, zero if missing), scaled by 1-quarter-lagged book equity. We require at least one of the three expense items (COGSQ, XSGAQ, and XINTQ) to be nonmissing. Book equity is shareholders' equity, plus balance sheet deferred taxes and investment tax credit (item TXDITCQ) if available, minus the book value of preferred stock (item PSTKQ). Depending on availability, we use stockholders' equity (item SEQQ), or common equity (item CEQQ) plus the book value of preferred stock, or total assets (item ATQ) minus total liabilities (item LTQ) in that order as shareholders' equity.

At the beginning of each month t, we split stocks on Ole for the fiscal quarter ending at least 4 months ago. Monthly decile returns are calculated for month t (Ole1), from month t to $t+5$ (Ole6), and from month t to $t+11$ (Ole12). The deciles are rebalanced at the beginning of $t+1$. Holding periods longer than one month like in Ole6 mean that for a given decile in each month there exist 6 subdeciles, each initiated in a different month in the prior six months. We average the subdecile returns as the monthly return of the Ole6 decile. For sufficient data coverage, these portfolios start in January 1972.

B.10 The Penman-Zhang (2020a) 3-factor Model

While maintaining that our accounting treatment underlying the q models is sensible, we are open to further improvement. Penman and Zhang (2020a) propose a different approach of packaging accounting information into a factor model. While our treatment is conceptually congruent with their accounting, we show that their 3-factor model does not improve on the q models. In practice, their factors are fully subsumed by the q models in head-to-head factor spanning tests.

The Penman-Zhang 3-factor model includes the market factor, an investment factor (INV) formed on change in total assets scaled by lagged market equity, and a "grand" portfolio (SUM) that summarizes the salient accounting properties. At the end of June of each year t, we split stocks into terciles based on the NYSE breakpoints of annual change of total assets (Compustat annual item AT) for the fiscal year ending in calendar year $t-1$ scaled by 1-year-lagged market equity (share price times shares outstanding from CRSP). Monthly value-weighted returns are calculated from July of year t to June of $t+1$, and the terciles are rebalanced at the June-end of $t+1$. INV is the returns of the high-minus-low tercile.

The SUM factor is from sequential $4 \times 3 \times 3$ sorts on earnings-to-price (E/P), annual Roe (RoeA), and expensed investment-to-lagged price (ExpInv/P). E/P is income before extraordinary items (Compustat annual item IB) scaled by the CRSP market equity. RoeA is item IB scaled by 1-year-lagged book equity (footnote 2). ExpInv/P is R&D expenses (item XRD) plus advertising expenses (item XAD) plus 30% of SG&A (item XSGA minus item XAD minus item XRD if positive, otherwise just item XSGA), all scaled by 1-year-lagged market equity from CRSP. If any of the items, XRD, XAD, and XSGA, is missing, we set its missing value to be zero.

At the end of June of each year t, we split stocks into 4 E/P groups based on negative E/P and NYSE breakpoints of positive E/P terciles, in which item IB is from the fiscal year ending in calendar year $t-1$ and the market equity from the December-end of $t-1$. Within each E/P group, we split stocks further into RoeA terciles based on its NYSE breakpoints of RoeA for the fiscal year ending in calendar year $t-1$. Finally, within each E/P-RoeA portfolio, we split stocks further into ExpInv/P terciles based on the NYSE breakpoints of ExpInv/P, in which expensed investment is for the fiscal year ending in calendar year $t-1$, and the market equity for the fiscal year ending in $t-2$. Monthly value-weighted portfolio returns are calculated from July of year t to June of $t+1$, and all the portfolios are rebalanced at the June-end of $t+1$. The SUM factor is the high E/P-low RoeA-high ExpInv/P portfolio minus the low E/P-high RoeA-low ExpInv/P portfolio.

Panel A of Table S11 shows that SUM earns on average 0.52% per month ($t = 2.57$). The q models do a good job in describing the 36 portfolios from the $4 \times 3 \times 3$ sequential sorts. Only 3 out of 36 individual alphas are significant in the q-factor model, and only one in the q^5 model. Neither model can be rejected by the GRS test on the null that the 36 alphas are jointly zero.

Panel B shows head-to-head factor spanning tests. On the one hand, the Penman-Zhang 3-factor model fails to explain the investment, Roe, and expected growth factors, with alphas of 0.27%, 0.65%, and 0.93% per month ($t = 4.45, 7.37$, and 13.58), respectively. The alphas for the Roe and expected growth factors are even larger than their average returns. The GRS test strongly rejects the Penman-Zhang model on the null that the investment and Roe factor alphas, with and without the alpha of the expected growth factor, are jointly zero ($p = 0.00$). On the other hand, both q models reduce the SUM factor to alphas about 0.2% per month, with t-values slightly above one. SUM rides heavily on our investment factor, with a loading of 1.1 and t-values above 11. The Roe factor loading is significantly negative, -0.4, but the expected growth factor loading is tiny. The Penman-Zhang (high-minus-low) investment factor earns only -0.13% ($t = -1.34$), and its q and q^5 alphas are less than 0.07% with t-values below one. The GRS test on the null that the SUM and INV alphas are jointly zero cannot reject the q-factor model ($p = 0.34$) or the q^5 model ($p = 0.49$).

Penman and Zhang (2020a) report that the q models cannot subsume their factors, which, conversely, cannot subsume the q models. In contrast, Table S11 shows that the q models fully subsume their factors. Crucially, Penman and Zhang form their factors on NYSE-Amex-NASDAQ breakpoints and equal-weighted returns, whereas we form ours on NYSE breakpoints and value-weighted returns. Table S12 in the Internet Appendix largely replicates their results. The equal-weighted SUM factor earns on average 1.04% per month ($t = 5.17$), and its q and q^5 alphas are 0.85% ($t = 4.79$) and 0.64% ($t = 3.41$), respectively. The equal-weighted INV factor earns on average -0.53% ($t = -5.42$), and its q and q^5 alphas are -0.57% ($t = -5.16$) and -0.49% ($t = -5.37$), respectively.

However, in our view, this evidence must be interpreted with extreme caution. While sorts with NYSE breakpoints and value-weighting assign modest weights to microcaps (less than 10%), sorts with NYSE-Amex-NASDAQ breakpoints and equal-weighting assign disproportionately large weights (more than 60%) to microcaps (Hou, Xue, and Zhang 2020). Microcaps are tiny, not just small, representing only slightly over 3% of the total market capitalization but accounting for more than 60% of the total number of stocks. Because of the extreme nature of microcaps, equal-weighted factor returns are more apparent than real, with little economic importance. In contrast, value-weighting mitigates the impact of microcaps and reflects the wealth effect experienced by investors. Value-weighting also ensures that we compare apples with apples in factor spanning tests.

We report additional robustness checks, including an alternative measure of expensed investment without SG&A (Table S13) and two alternative measures of earnings-to-price with earnings replaced by operating cash flow (Table S14) and operating profits (Table S15). Without going into the details, we can report that the q models continue to do a good job in subsuming the SUM factor (the INV factor is unchanged from Table S11). The only exception is the q-factor alpha of 0.42% per month ($t = 2.72$) for the SUM factor in Table S13, but its q^5 alpha is 0.19% ($t = 1.13$). The GRS test rejects the q-factor model ($p = 0.01$) but not the q^5 model ($p = 0.43$) (untabulated). The corresponding p-values are 0.57 and 0.7 in Table S14 and 0.45 and 0.67 in Table S15. The GRS test strongly rejects the Penman-Zhang model in all the tables ($p = 0.00$).

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Table S1 : The Piotroski (2000) F-score Portfolios, July 1972–December 2020

The Internet Appendix details the measurement of F-score. In Panel A, at the end of June of each year t, we sort stocks on F for the fiscal year ending in calender year $t-1$ to form seven portfolios: low ($F = 0, 1, 2$), 3, 4, 5, 6, 7, and high ($F = 8, 9$). Monthly value-weighted decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced in June of $t+1$. In Panel B, at the end of June of year t, we sort stocks on F for the fiscal year ending in calendar year $t-1$ to form quintiles: low (F = 0–3), 4, 5, 6, and high (F = 7–9). Independently, we sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the June-end market equity. Taking intersections yields 15 portfolios. The "All" rows report results from one-way sorts on F into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\text{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. For sufficient data coverage, the F portfolio returns start in July 1972. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the seven portfolios are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 testing portfolios are jointly zero.

Panel A: Portfolios from one-way sorts on F-score

	L	2	3	4	5	6	H	H−L				p_{GRS}
$\overline{R}$	0.58	0.44	0.61	0.63	0.63	0.63	0.78	0.20				
$t_{\overline{R}}$	1.69	1.67	3.11	3.33	3.36	3.49	3.84	0.80				
α_q	0.12	−0.07	0.12	0.10	0.02	0.08	0.07	−0.05				0.08
t_q	0.59	−0.65	1.67	1.90	0.30	1.22	0.69	−0.22				
α_{q^5}	0.18	−0.08	0.01	0.08	0.01	0.06	0.08	−0.10				0.55
t_{q^5}	0.72	−0.73	0.19	1.67	0.13	0.79	0.69	−0.36				
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	−0.18	−0.33	0.24	0.71	0.07		−2.72	−2.58	1.68	4.69	0.39	0.26

Panel B: Quintiles from two-way independent sorts on size and F-score

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
			$\overline{R}$							$t_{\overline{R}}$			
All	0.45	0.61	0.63	0.63	0.67	0.22		1.65	3.11	3.33	3.36	3.70	1.48
Micro	0.67	0.81	0.81	0.94	1.03	0.36		1.91	2.61	2.84	3.45	3.87	2.21
Small	0.59	0.72	0.76	0.87	0.89	0.30		1.86	2.68	3.07	3.63	3.73	2.08
Big	0.45	0.62	0.62	0.61	0.65	0.20		1.68	3.16	3.30	3.27	3.64	1.31
			α_q ($p_{\text{GRS}} = 0.05$)							t_q			
All	−0.03	0.12	0.10	0.02	0.08	0.11		−0.30	1.67	1.90	0.30	1.35	0.85
Micro	0.08	0.16	0.10	0.18	0.19	0.11		0.65	1.54	1.43	2.03	2.03	0.64
Small	−0.07	−0.04	−0.03	0.02	−0.01	0.07		−0.68	−0.65	−0.57	0.32	−0.08	0.51
Big	0.01	0.15	0.11	0.01	0.08	0.07		0.11	2.00	1.93	0.23	1.33	0.48
			α_{q^5} ($p_{\text{GRS}} = 0.19$)							t_{q^5}			
All	−0.04	0.01	0.08	0.01	0.06	0.10		−0.33	0.19	1.67	0.13	0.84	0.65
Micro	−0.06	0.13	0.12	0.19	0.23	0.28		−0.53	1.27	1.56	2.27	2.60	2.19
Small	−0.11	−0.04	−0.02	0.08	0.03	0.14		−1.00	−0.63	−0.34	1.05	0.44	1.04
Big	0.03	0.03	0.09	0.00	0.06	0.04		0.20	0.45	1.73	0.06	0.85	0.22
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	−0.14	−0.18	0.08	0.42	0.03		−3.67	−2.88	0.95	4.58	0.27		0.28
Micro	−0.13	−0.21	0.35	0.62	−0.26		−4.06	−2.44	3.15	6.37	−2.48		0.38
Small	−0.15	−0.15	0.43	0.47	−0.10		−3.86	−2.92	5.04	5.68	−1.04		0.36
Big	−0.14	−0.05	0.07	0.40	0.05		−3.16	−0.75	0.73	3.98	0.46		0.18

Table S2 : The Asness-Frazzini-Pedersen (2019) Alternative Quality Score (with the Payout Component) Portfolios, January 1967–December 2020

The Internet Appendix details the measurement of the alternative quality score. In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the quality score. To align the timing between component signals and subsequent returns, we use the Fama-French (1993) timing, which assumes that accounting variables in fiscal year ending in calendar year $y-1$ are publicly known at the June-end of year y, except for beta and the volatility of return on equity. We treat beta as known at the end of estimation month and the volatility of return on equity as known four months after the fiscal quarter when it is estimated. Monthly value-weighted decile returns are calculated from the current month t, and the deciles are rebalanced at the beginning of month $t+1$. In Panel B, at the beginning of each month t, we sort stocks into quintiles based on the NYSE breakpoints of the quality score and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the beginning of month t. Taking intersections yields 15 portfolios. The "All" rows report results from one-way quality-minus-junk sorts into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\mathrm{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the ten deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 testing portfolios are jointly zero.

Panel A: Deciles from one-way sorts on quality-minus-junk

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.27	0.46	0.47	0.53	0.53	0.66	0.58	0.65	0.72	0.70	0.43	
$t_{\overline{R}}$	0.95	1.91	2.20	2.67	2.83	3.40	3.08	3.54	4.11	3.91	2.32	
α_q	−0.20	−0.05	−0.04	−0.04	−0.04	−0.06	−0.04	0.05	0.18	0.24	0.44	0.00
t_q	−1.80	−0.64	−0.42	−0.52	−0.48	−0.82	−0.66	0.82	3.25	3.51	3.22	
α_{q^5}	−0.01	0.10	0.05	−0.02	0.08	−0.05	−0.04	0.07	0.15	0.06	0.08	0.20
t_{q^5}	−0.11	1.17	0.56	−0.21	1.15	−0.63	−0.57	1.11	2.27	0.96	0.61	
	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	−0.21	−0.49	−0.25	0.51	0.54		−6.54	−10.37	−2.58	6.41	6.21	0.62

Panel B: Quintiles from two-way independent sorts on size and quality-minus-junk

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
	$\overline{R}$							$t_{\overline{R}}$					
All	0.36	0.50	0.58	0.62	0.70	0.35		1.38	2.54	3.11	3.46	4.06	2.40
Micro	0.31	0.93	0.98	1.06	0.97	0.66		0.87	3.04	3.52	3.92	3.86	4.05
Small	0.57	0.80	0.80	0.92	0.96	0.40		1.82	3.18	3.32	3.79	4.10	2.94
Big	0.37	0.48	0.55	0.60	0.69	0.32		1.50	2.47	3.03	3.37	3.99	2.31
	α_q ($p_{\mathrm{GRS}}=0.00$)							t_q					
All	−0.13	−0.04	−0.05	0.02	0.21	0.34		−1.63	−0.64	−0.99	0.43	4.45	3.45
Micro	−0.15	0.24	0.23	0.31	0.27	0.42		−0.90	2.00	1.86	2.99	2.52	3.27
Small	0.00	0.09	−0.02	0.12	0.20	0.20		−0.02	1.48	−0.19	1.95	2.26	1.75
Big	−0.07	−0.03	−0.06	0.01	0.21	0.28		−0.79	−0.50	−0.95	0.23	4.27	2.59
	α_{q^5} ($p_{\mathrm{GRS}}=0.00$)							t_{q^5}					
All	0.03	0.00	0.02	0.03	0.09	0.05		0.44	0.08	0.33	0.55	1.84	0.56
Micro	−0.07	0.36	0.26	0.36	0.26	0.33		−0.39	2.61	2.27	3.72	2.44	2.50
Small	0.12	0.16	0.03	0.16	0.20	0.08		1.50	2.55	0.41	2.64	2.54	0.77
Big	0.09	0.01	0.02	0.02	0.08	−0.01		1.01	0.12	0.32	0.39	1.67	−0.12
	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	−0.15	−0.39	−0.18	0.40	0.43		−5.77	−10.16	−2.57	6.75	6.55		0.65
Micro	−0.22	−0.18	0.20	0.65	0.14		−7.22	−3.92	2.29	7.81	1.82		0.52
Small	−0.21	−0.15	0.21	0.54	0.17		−6.00	−1.73	2.59	6.11	2.18		0.50
Big	−0.13	−0.25	−0.20	0.37	0.44		−4.35	−6.35	−2.60	5.81	6.05		0.51

Table S3 : The Asness-Frazzini-Pedersen (2019) Profitability Score Portfolios, January 1967–December 2020

The profitability score is detailed in the Internet Appendix. In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the profitability score. To align the timing between component signals and subsequent returns, we assume that accounting variables in fiscal year ending in calendar year $y-1$ are publicly known at the June-end of year y. Monthly value-weighted decile returns are calculated from the current month t, and the deciles are rebalanced at the beginning of month $t+1$. In Panel B, at the beginning of each month t, we sort stocks into quintiles based on the NYSE breakpoints of the profitability score and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the beginning of month t. Taking intersections yields 15 portfolios. The "All" rows report results from one-way profitability sorts into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\mathrm{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the ten deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 testing portfolios are jointly zero.

Panel A: Deciles from one-way sorts on the profitability score

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.39	0.53	0.52	0.51	0.56	0.48	0.61	0.62	0.60	0.75	0.36	
$t_{\overline{R}}$	1.47	2.49	2.63	2.58	2.90	2.41	3.26	3.37	3.24	3.99	2.01	
α_q	0.00	0.01	−0.07	−0.08	−0.07	−0.06	−0.01	0.03	0.06	0.27	0.27	0.02
t_q	0.00	0.14	−0.93	−1.10	−0.85	−0.78	−0.09	0.50	0.99	3.78	2.06	
α_{q^5}	0.14	0.13	0.04	0.01	−0.01	0.10	−0.02	0.03	−0.01	0.10	−0.04	0.25
t_{q^5}	1.29	1.29	0.53	0.08	−0.14	1.20	−0.27	0.40	−0.16	1.37	−0.30	
	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	−0.08	−0.46	−0.30	0.60	0.46		−2.25	−9.39	−3.87	8.05	4.82	0.56

Panel B: Quintiles from two-way independent sorts on size and the profitability score

	L	2	3	4	H	H−L	L	2	3	4	H	H−L
	$\overline{R}$						$t_{\overline{R}}$					
All	0.45	0.52	0.51	0.61	0.69	0.24	1.94	2.69	2.70	3.39	3.77	1.82
Micro	0.42	0.78	0.97	1.04	1.06	0.63	1.23	2.57	3.38	3.62	3.78	4.54
Small	0.61	0.70	0.82	0.89	1.01	0.40	2.08	2.90	3.27	3.52	3.97	3.14
Big	0.47	0.51	0.49	0.58	0.67	0.20	2.16	2.69	2.63	3.30	3.71	1.53
	α_q ($p_{\mathrm{GRS}} = 0.00$)						t_q					
All	0.00	−0.06	−0.08	0.01	0.19	0.19	0.02	−1.12	−1.33	0.15	3.52	1.85
Micro	0.00	0.11	0.24	0.23	0.30	0.30	−0.02	0.85	2.08	2.09	2.79	2.22
Small	0.13	−0.04	0.04	0.05	0.20	0.08	1.67	−0.53	0.50	0.61	2.73	0.66
Big	0.05	−0.04	−0.09	0.00	0.19	0.14	0.53	−0.76	−1.32	0.03	3.43	1.18
	α_{q^5} ($p_{\mathrm{GRS}} = 0.00$)						t_{q^5}					
All	0.12	0.03	0.02	0.00	0.05	−0.08	1.46	0.54	0.40	−0.01	0.87	−0.77
Micro	0.06	0.21	0.33	0.30	0.32	0.26	0.35	1.86	2.96	2.78	3.14	1.77
Small	0.20	0.06	0.09	0.10	0.20	0.00	2.60	0.85	1.37	1.51	2.67	0.01
Big	0.18	0.05	0.02	−0.01	0.05	−0.13	1.67	0.73	0.36	−0.11	0.80	−1.09

	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}	t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}	R^2
All	−0.03	−0.33	−0.32	0.41	0.40	−1.00	−9.25	−5.39	7.07	5.45	0.56
Micro	−0.05	−0.05	0.14	0.63	0.07	−1.50	−0.86	1.41	7.55	0.68	0.33
Small	−0.05	−0.01	0.08	0.62	0.11	−1.60	−0.13	0.88	7.19	1.30	0.37
Big	−0.01	−0.21	−0.36	0.37	0.41	−0.30	−4.97	−5.15	5.34	4.94	0.40

Table S4 : The Asness-Frazzini-Pedersen (2019) Growth Score Portfolios, January 1967–December 2020

In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the growth score. To align the timing between component signals and subsequent returns, we assume that accounting variables in fiscal year ending in calendar year $y-1$ are publicly known at the June-end of year y. Monthly value-weighted decile returns are calculated from the current month t, and the deciles are rebalanced at the beginning of month $t+1$. In Panel B, at the beginning of each month t, we sort stocks into quintiles based on the NYSE breakpoints of the growth score and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the beginning of month t. Taking intersections yields 15 portfolios. The "All" rows report results from one-way growth score sorts into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\mathrm{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the ten deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 testing portfolios are jointly zero.

Panel A: Deciles from one-way sorts on the growth score

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.46	0.48	0.64	0.61	0.56	0.60	0.63	0.60	0.63	0.71	0.25	
$t_{\overline{R}}$	2.02	2.63	3.59	3.57	3.36	3.47	3.47	3.43	3.48	3.27	1.49	
α_q	−0.13	−0.19	−0.12	−0.02	0.00	−0.06	−0.05	−0.04	0.00	0.35	0.48	0.00
t_q	−1.40	−1.85	−1.56	−0.24	0.02	−0.76	−0.66	−0.56	0.00	4.14	3.76	
α_{q^5}	−0.14	−0.20	−0.11	−0.06	−0.02	0.01	−0.01	−0.01	0.05	0.19	0.33	0.44
t_{q^5}	−1.37	−1.87	−1.32	−0.67	−0.33	0.08	−0.09	−0.19	0.62	2.31	2.40	
	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	0.01	−0.36	−1.08	0.37	0.23		0.20	−6.40	−11.93	4.44	2.30	0.43

Panel B: Quintiles from two-way independent sorts on size and the growth score

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
			$\overline{R}$							$t_{\overline{R}}$			
All	0.47	0.62	0.57	0.62	0.68	0.21		2.43	3.67	3.45	3.59	3.42	1.54
Micro	0.75	0.98	1.02	1.09	0.93	0.18		2.43	3.66	3.73	3.95	3.21	1.69
Small	0.74	0.87	0.95	0.92	0.92	0.18		2.78	3.88	4.13	3.86	3.52	1.68
Big	0.45	0.60	0.55	0.61	0.67	0.21		2.43	3.62	3.36	3.56	3.38	1.52
			α_q ($p_{\mathrm{GRS}} = 0.00$)							t_q			
All	−0.17	−0.07	−0.03	−0.03	0.24	0.41		−2.12	−1.08	−0.61	−0.63	3.96	3.72
Micro	0.07	0.22	0.22	0.32	0.22	0.15		0.58	2.38	1.87	2.94	2.22	1.54
Small	−0.02	0.03	0.14	0.04	0.15	0.16		−0.17	0.48	1.38	0.52	1.84	1.56
Big	−0.16	−0.07	−0.04	−0.03	0.24	0.40		−1.81	−1.00	−0.71	−0.58	3.94	3.41
			α_{q^5} ($p_{\mathrm{GRS}} = 0.02$)							t_{q^5}			
All	−0.18	−0.08	−0.02	0.00	0.14	0.31		−2.09	−1.18	−0.45	−0.07	2.25	2.77
Micro	0.13	0.26	0.28	0.37	0.19	0.06		1.03	2.79	2.59	3.59	1.93	0.59
Small	0.05	0.08	0.17	0.07	0.16	0.11		0.47	1.04	1.91	0.98	2.04	0.96
Big	−0.18	−0.08	−0.03	0.00	0.14	0.32		−1.90	−1.09	−0.52	−0.04	2.24	2.58
	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	0.02	−0.21	−0.98	0.31	0.14		0.67	−4.97	−12.30	4.17	1.72		0.46
Micro	−0.01	0.01	−0.39	0.29	0.14		−0.45	0.30	−5.41	5.61	1.81		0.20
Small	−0.06	0.06	−0.47	0.36	0.08		−1.89	1.39	−7.23	5.74	1.17		0.25
Big	0.04	−0.16	−1.00	0.30	0.12		0.96	−3.67	−11.50	3.82	1.45		0.42

Table S5 : The Asness-Frazzini-Pedersen (2019) Safety Score Portfolios, January 1967–December 2020

In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the safety score. To align the timing between component signals and subsequent returns, we assume that accounting variables in fiscal year ending in calendar year $y-1$ are publicly known at the June-end of year y, except for beta and the volatility of return on equity. We treat beta as known at the end of estimation month and the volatility of return on equity as known four months after the fiscal quarter when it is estimated. Monthly value-weighted decile returns are calculated from the current month t, and the deciles are rebalanced at the beginning of month $t+1$. In Panel B, at the beginning of each month t, we sort stocks into quintiles based on the NYSE breakpoints of the safety score and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the beginning of month t. Taking intersections yields 15 portfolios. The "All" rows report results from one-way safety score sorts into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\text{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 portfolios are jointly zero.

Panel A: Deciles from one-way sorts on the safety score

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.45	0.60	0.63	0.52	0.56	0.59	0.64	0.70	0.64	0.57	0.12	
$t_{\overline{R}}$	1.43	2.28	2.81	2.49	3.08	3.15	3.52	3.81	3.49	3.37	0.54	
α_q	−0.24	−0.01	0.04	−0.08	0.02	0.07	0.09	0.14	0.16	0.07	0.31	0.00
t_q	−1.99	−0.12	0.56	−1.05	0.30	1.01	1.42	2.30	2.45	1.14	1.99	
α_{q^5}	−0.06	0.19	0.14	−0.01	0.01	0.08	0.03	0.12	0.02	0.03	0.09	0.19
t_{q^5}	−0.54	1.55	1.71	−0.16	0.18	1.06	0.42	1.72	0.31	0.41	0.58	
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	−0.44	−0.48	−0.26	0.46	0.33		−9.33	−7.42	−2.51	4.53	3.45	0.59

Panel B: Quintiles from two-way independent sorts on size and the safety score

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
	$\overline{R}$							$t_{\overline{R}}$					
All	0.53	0.56	0.56	0.67	0.61	0.08		1.89	2.62	3.13	3.75	3.57	0.43
Micro	0.50	0.91	0.86	0.97	0.82	0.33		1.33	2.92	3.03	3.58	3.36	1.94
Small	0.68	0.84	0.83	0.93	0.83	0.15		2.13	3.26	3.34	3.86	3.64	1.08
Big	0.54	0.53	0.54	0.66	0.60	0.06		1.97	2.51	3.09	3.71	3.55	0.35
	α_q ($p_{\text{GRS}} = 0.00$)							t_q					
All	−0.11	−0.03	0.04	0.12	0.12	0.22		−1.06	−0.46	0.70	2.70	2.43	1.72
Micro	−0.06	0.29	0.13	0.29	0.21	0.27		−0.41	2.46	1.09	2.30	1.67	2.31
Small	−0.02	0.09	0.11	0.16	0.16	0.19		−0.30	1.20	1.64	2.19	2.19	1.72
Big	−0.07	−0.04	0.04	0.12	0.12	0.19		−0.58	−0.52	0.72	2.60	2.36	1.29
	α_{q^5} ($p_{\text{GRS}} = 0.00$)							t_{q^5}					
All	0.09	0.06	0.03	0.08	0.02	−0.08		0.90	0.99	0.58	1.59	0.36	−0.62
Micro	0.03	0.39	0.19	0.31	0.23	0.20		0.19	2.82	1.66	2.55	1.82	1.74
Small	0.12	0.17	0.18	0.15	0.17	0.05		1.68	2.14	2.57	2.19	2.29	0.51
Big	0.15	0.05	0.03	0.08	0.02	−0.13		1.18	0.84	0.56	1.55	0.31	−0.92
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	−0.30	−0.38	−0.30	0.34	0.45		−8.37	−6.52	−4.07	4.26	5.26		0.59
Micro	−0.32	−0.29	0.01	0.62	0.10		−9.20	−6.09	0.12	9.03	1.31		0.57
Small	−0.30	−0.23	−0.08	0.41	0.20		−8.56	−3.12	−0.98	4.61	2.58		0.51
Big	−0.30	−0.21	−0.30	0.27	0.49		−7.30	−3.69	−3.72	3.26	5.00		0.45

Table S6 : The Asness-Frazzini-Pedersen (2019) Payout Score Portfolios, January 1967–December 2020

In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the payout score. To align the timing between component signals and subsequent returns, we assume that accounting variables in fiscal year ending in calendar year $y-1$ are publicly known at the June-end of year y. Monthly value-weighted decile returns are calculated from the current month t, and the deciles are rebalanced at the beginning of month $t+1$. In Panel B, at the beginning of each month t, we sort stocks into quintiles based on the NYSE breakpoints of the payout score and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the beginning of month t. Taking intersections yields 15 portfolios. The "All" rows report results from one-way payout score sorts into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\text{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 portfolios are jointly zero.

Panel A: Deciles from one-way sorts on the payout score

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.35	0.65	0.54	0.52	0.61	0.67	0.62	0.74	0.60	0.75	0.41	
$t_{\overline{R}}$	1.31	2.87	2.55	2.56	3.33	3.86	3.52	4.51	3.74	4.49	2.43	
α_q	−0.04	0.26	0.11	0.01	0.02	0.04	−0.01	0.06	−0.04	0.02	0.06	0.12
t_q	−0.47	2.65	1.50	0.08	0.25	0.58	−0.22	0.87	−0.59	0.37	0.59	
α_{q^5}	0.02	0.23	0.10	−0.03	0.08	0.05	−0.04	−0.05	−0.10	−0.10	−0.12	0.27
t_{q^5}	0.22	2.41	1.29	−0.47	0.87	0.75	−0.52	−0.66	−1.48	−1.39	−0.92	
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	−0.13	−0.20	1.04	0.17	0.27		−4.69	−3.98	16.13	2.88	3.25	0.56

Panel B: Quintiles from two-way independent sorts on size and the payout score

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
	$\overline{R}$							$t_{\overline{R}}$					
All	0.50	0.53	0.63	0.66	0.67	0.17		2.12	2.63	3.62	4.03	4.22	1.22
Micro	0.39	0.90	1.05	1.17	1.07	0.69		1.13	2.92	3.66	4.11	4.26	4.47
Small	0.60	0.90	0.95	0.93	0.95	0.35		2.05	3.45	3.90	4.03	4.43	2.42
Big	0.54	0.51	0.61	0.64	0.65	0.11		2.32	2.56	3.52	3.94	4.11	0.82
	α_q ($p_{\text{GRS}} = 0.00$)							t_q					
All	0.14	0.07	0.02	0.01	−0.01	−0.15		1.91	1.25	0.40	0.12	−0.15	−1.59
Micro	−0.11	0.22	0.22	0.36	0.25	0.36		−0.74	1.88	2.03	2.50	2.59	2.69
Small	0.02	0.16	0.05	0.02	0.09	0.07		0.33	2.70	0.81	0.24	1.02	0.62
Big	0.21	0.07	0.02	0.00	−0.02	−0.22		2.60	1.29	0.35	−0.01	−0.34	−2.30
	α_{q^5} ($p_{\text{GRS}} = 0.00$)							t_{q^5}					
All	0.14	0.04	0.06	−0.08	−0.10	−0.24		1.97	0.67	1.05	−1.44	−1.89	−2.54
Micro	−0.04	0.31	0.27	0.55	0.27	0.32		−0.30	2.55	2.58	2.37	2.94	2.31
Small	0.10	0.18	0.13	0.09	0.09	−0.01		1.36	2.82	2.00	1.31	1.14	−0.09
Big	0.20	0.03	0.06	−0.08	−0.11	−0.31		2.54	0.58	0.97	−1.55	−2.00	−3.05
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	−0.10	−0.17	0.94	0.18	0.14		−4.88	−4.21	16.20	3.30	2.03		0.59
Micro	−0.20	−0.13	0.73	0.46	0.06		−5.74	−3.14	8.52	4.60	0.68		0.52
Small	−0.20	−0.21	0.95	0.24	0.11		−5.89	−2.96	11.60	2.59	1.32		0.60
Big	−0.09	−0.11	0.97	0.15	0.13		−4.01	−2.54	15.74	2.84	1.76		0.54

Table S7 : The Bartram-Grinblatt (2015, 2018) Agnostic Fundamental Portfolios, with the $5 Price Screen, January 1977–December 2020

The agnostic measure, $(V-P)/P$, is the deviation of the estimated intrinsic value from the market equity as a fraction of the market equity. In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the agnostic measure constructed with firm-level variables from at least four months ago. Monthly value-weighted decile returns are calculated from the current month t, and the deciles are rebalanced at the beginning of month $t+1$. In Panel B, at the beginning of each month t, we sort stocks into quintiles based on the NYSE breakpoints of the agnostic measure constructed with firm-level variables from at least four months ago and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the beginning of month t. Taking intersections yields 15 portfolios. The "All" rows report results from one-way agnostic sorts into quintiles. For each testing portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we also report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, denoted β_{Mkt}, β_{Me}, $\beta_{\text{I/A}}$, β_{Roe}, and β_{Eg}, respectively. All the t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the ten deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 testing portfolios are jointly zero.

Panel A: Deciles from one-way agnostic sorts

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.59	0.73	0.59	0.66	0.82	0.85	0.89	0.90	0.96	1.12	0.53	
$t_{\overline{R}}$	2.20	3.05	3.03	3.82	4.15	4.23	3.86	3.84	3.59	3.84	2.75	
α_q	−0.01	0.07	−0.06	0.12	0.14	0.15	0.12	0.08	0.12	0.26	0.27	0.10
t_q	−0.10	0.54	−0.82	1.33	1.65	1.56	0.82	0.63	0.77	1.59	1.30	
α_{q^5}	0.11	−0.01	−0.11	0.06	0.09	0.19	0.22	0.19	0.26	0.42	0.31	0.07
t_{q^5}	0.87	−0.06	−1.57	0.56	0.95	2.00	1.47	1.52	1.87	3.08	1.66	
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	0.00	0.39	0.67	−0.03	−0.07		0.02	3.43	5.17	−0.23	−0.48	0.19

Panel B: Quintiles from two-way independent sorts on size and the agnostic measure

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
			$\overline{R}$							$t_{\overline{R}}$			
All	0.72	0.63	0.82	0.89	1.02	0.29		2.96	3.53	4.32	3.93	3.75	1.43
Micro	0.43	0.66	0.78	0.87	1.14	0.71		1.17	1.70	2.48	3.04	4.13	3.15
Small	0.66	0.90	0.87	1.04	1.08	0.43		2.00	3.26	3.31	3.99	3.75	2.10
Big	0.75	0.63	0.83	0.89	1.03	0.28		3.09	3.57	4.42	3.96	3.75	1.24
			α_q ($p_{\text{GRS}}=0.00$)							t_q			
All	0.10	0.05	0.14	0.11	0.17	0.07		0.87	0.81	2.02	0.84	1.10	0.29
Micro	−0.14	−0.07	−0.10	−0.08	0.23	0.37		−0.75	−0.23	−0.54	−0.58	1.72	1.62
Small	0.00	0.07	−0.02	0.10	0.14	0.14		−0.04	0.86	−0.22	0.91	0.93	0.61
Big	0.14	0.06	0.16	0.16	0.28	0.13		1.19	0.96	2.30	1.06	1.49	0.48
			α_{q^5} ($p_{\text{GRS}}=0.00$)							t_{q^5}			
All	0.07	−0.03	0.12	0.22	0.31	0.24		0.74	−0.47	1.67	1.66	2.41	1.15
Micro	−0.12	0.21	−0.16	−0.09	0.34	0.47		−0.64	0.51	−0.78	−0.72	2.99	2.17
Small	0.04	0.08	0.02	0.18	0.28	0.24		0.35	0.79	0.18	1.75	2.25	1.21
Big	0.13	−0.02	0.14	0.27	0.40	0.27		1.16	−0.36	1.85	1.80	2.38	1.08
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	0.06	0.34	0.75	−0.14	−0.26		0.86	1.66	4.06	−0.81	−1.72		0.22
Micro	−0.03	−0.15	0.57	0.48	−0.15		−0.47	−1.52	3.70	3.21	−0.93		0.15
Small	0.01	−0.30	0.98	0.19	−0.16		0.16	−1.76	5.74	0.96	−0.93		0.23
Big	0.10	0.13	0.66	−0.22	−0.21		1.45	0.66	3.54	−1.22	−1.26		0.13

Table S8 : Book-to-market Portfolios, January 1967–December 2020

Book equity is stockholders' book equity, plus balance sheet deferred taxes and investment tax credit (Compustat annual item TXDITC) if available, minus the book value of preferred stock. Stockholders' equity is the value reported by Compustat (item SEQ), if available. If not, we use the book value of common equity (item CEQ) plus the par value of preferred stock (item PSTK), or the book value of assets (item AT) minus total liabilities (item LT). Depending on availability, we use redemption (item PSTKRV), liquidating (item PSTKL), or par value (item PSTK) for the book value of preferred stock. In Panel A, at the end of June of year t, we sort stocks into deciles based on the NYSE breakpoints of book equity for the fiscal year ending in calendar year $t-1$ scaled by its December-end market equity (from CRSP). Monthly value-weighted decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June of $t+1$. In Panel B, at the end of June of year t, we sort stocks into quintiles based on the NYSE breakpoints of book equity for the fiscal year ending in calendar year $t-1$ scaled by its December-end market equity and, independently, sort stocks into micro, small, and big portfolios based on the NYSE 20th and 50th percentiles of the market equity from the June-end of year t. Taking intersections yields 15 portfolios. The "All" rows report one-way quintiles. For each portfolio, we report average excess return, $\overline{R}$, the q-factor alpha, α_q, and the q^5 alpha, α_{q^5}. For each high-minus-low portfolio, we report the q^5 loadings on the market, size, investment, Roe, and expected growth factors, β_{Mkt}, β_{Me}, $\beta_{\text{I/A}}$, β_{Roe}, and β_{Eg}, respectively. The t-values are adjusted for heteroscedasticity and autocorrelations. In Panel A, p_{GRS} is the p-value of the GRS test on the null that the alphas of the deciles are jointly zero. In Panel B, p_{GRS} is the p-value of the GRS test on the null that the alphas of the 3×5 portfolios are jointly zero.

Panel A: Deciles from one-way sorts on book-to-market

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.55	0.62	0.67	0.60	0.58	0.63	0.66	0.67	0.73	0.85	0.30	
$t_{\overline{R}}$	2.51	3.19	3.54	3.06	3.28	3.51	3.65	3.69	3.77	3.59	1.45	
α_q	0.12	0.00	0.00	−0.10	−0.09	0.01	0.05	−0.05	0.09	0.08	−0.03	0.44
t_q	1.62	0.04	0.02	−1.31	−1.15	0.16	0.58	−0.62	0.96	0.63	−0.20	
α_{q^5}	0.12	−0.02	−0.10	−0.11	−0.11	0.07	0.06	0.02	0.07	0.11	−0.01	0.33
t_{q^5}	1.67	−0.30	−1.53	−1.34	−1.50	0.92	0.72	0.27	0.70	0.90	−0.05	
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}	R^2
H−L	0.02	0.46	1.41	−0.53	−0.04		0.56	5.52	12.42	−5.67	−0.24	0.46

Panel B: Quintiles from two-way independent sorts on size and book-to-market

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
			$\overline{R}$							$t_{\overline{R}}$			
All	0.57	0.63	0.60	0.65	0.78	0.21		2.78	3.41	3.43	3.70	3.89	1.33
Micro	0.34	0.86	0.90	0.99	1.05	0.71		0.96	2.83	3.22	3.65	3.60	3.71
Small	0.55	0.87	0.88	0.85	0.95	0.39		1.85	3.42	3.80	3.83	3.86	2.05
Big	0.59	0.62	0.57	0.61	0.67	0.08		2.93	3.44	3.33	3.57	3.46	0.52
			α_q ($p_{\text{GRS}}=0.00$)							t_q			
All	0.08	−0.04	−0.04	0.00	0.10	0.02		1.50	−0.79	−0.62	−0.01	1.16	0.15
Micro	−0.18	0.31	0.23	0.27	0.22	0.40		−1.28	2.79	3.16	3.93	2.27	2.34
Small	−0.04	0.12	0.01	0.02	0.03	0.07		−0.44	2.11	0.13	0.26	0.32	0.45
Big	0.12	−0.05	−0.05	−0.03	0.05	−0.07		2.13	−0.85	−0.74	−0.32	0.49	−0.55
			α_{q^5} ($p_{\text{GRS}}=0.00$)							t_{q^5}			
All	0.08	−0.11	−0.04	0.04	0.08	0.01		1.40	−1.95	−0.57	0.59	0.89	0.04
Micro	−0.14	0.25	0.17	0.24	0.28	0.42		−1.04	2.54	2.35	3.12	2.83	2.60
Small	0.03	0.12	0.05	0.07	0.07	0.04		0.37	1.88	0.81	0.96	0.80	0.29
Big	0.11	−0.12	−0.04	0.03	0.03	−0.08		1.97	−2.00	−0.60	0.41	0.32	−0.59
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}		R^2
All	−0.05	0.30	1.08	−0.43	0.02		−1.57	4.28	11.73	−5.36	0.17		0.47
Micro	−0.09	−0.17	1.19	0.04	−0.03		−1.98	−1.63	9.33	0.31	−0.20		0.38
Small	−0.05	−0.15	1.38	−0.15	0.04		−0.96	−1.37	12.27	−1.33	0.32		0.44
Big	−0.06	0.16	1.07	−0.42	0.01		−1.55	2.03	9.96	−4.65	0.10		0.39

Table S9 : Buffett's Alpha, Using Compustat's Berkshire Returns Prior to September 1988, February 1968–December 2020

Prior to September 1988, we use monthly Berkshire returns from Compustat. From September 1988 onward, we mostly rely on CRSP, following the same sample construction in the main text. Panel A shows average excess return, $\overline{R}$, the q-factor alpha, the q^5 alpha, the q-factor and q^5 loadings on the market, size, investment, Roe, and expected growth factors, β_{Mkt}, β_{Me}, $\beta_{\text{I/A}}$, β_{Roe}, and β_{Eg}, respectively, and the R-squares of the q-factor and q^5 regressions. Panel B reports the AQR 6-factor regressions of Berkshire Hathaway's excess returns. We use the QMJ factor downloaded from the AQR Web site. The t-values in the rows beneath the estimates are adjusted for heteroscedasticity and autocorrelations.

Panel A: The q-factor and q^5 regressions

Sample	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}	R^2
2/68–12/20	1.45	0.63	0.76	−0.01	0.57	0.40		0.18
	4.96	2.38	8.54	−0.09	3.58	3.48		
		0.74	0.74	−0.03	0.60	0.45	−0.17	0.18
		2.59	8.40	−0.17	3.73	3.31	−0.96	
11/76–3/17	1.57	0.53	0.86	−0.10	0.69	0.50		0.26
	4.77	1.78	9.67	−0.78	4.06	4.65		
		0.65	0.84	−0.12	0.73	0.57	−0.20	0.26
		2.00	9.36	−0.89	4.12	4.26	−1.01	

Panel B: The AQR 6-factor regressions

Sample	α_{AQR}	β_{Mkt}	β_{SMB}	β_{HML}	β_{UMD}	β_{BAB}	β_{QMJ}	R^2
2/68–12/20	0.63	0.79	−0.10	0.35	0.01	0.22	0.30	0.19
	2.13	8.75	−0.67	2.62	0.20	2.25	2.03	
11/76–3/17	0.51	0.92	−0.16	0.42	−0.03	0.24	0.38	0.27
	1.75	10.03	−1.26	3.37	−0.49	2.63	2.58	

Table S10 : The Profitability-return Relation

The Internet Appendix details the measurement of quarterly Roe and Roa as well as operating cash flow-to-lagged assets and operating profits-to-lagged equity, both annual and quarterly. In Panel A, RoeA is annual Roe, and Roe1, Roe6, and Roe12 are quarterly Roe in monthly sorts with 1-, 6-, and 12-month holding period, respectively. The notations in other panels are analogous. In Panel A, for the RoeA deciles, at the end of June of year t, we sort stocks into deciles on the NYSE breakpoints of RoeA for the fiscal year ending in calendar year $t-1$. Monthly value-weighted decile returns are calculated from July of year t to June of $t+1$, and the deciles are rebalanced at the end of June of $t+1$. The Internet Appendix details the annual sorts on RoaA, ClaA, and OleA as well as the monthly sorts on quarterly Roe, Roa, Cla, and Ole. For each variable, the first row reports average excess returns, and the second row their autocorrelation-and-heteroscedasticity-adjusted t-values.

	Low	2	3	4	5	6	7	8	9	High	H−L
	Panel A: Return on equity (Roe) deciles (January 1967–December 2020)										
RoeA	0.69	0.63	0.58	0.68	0.50	0.60	0.53	0.66	0.61	0.61	−0.08
	2.29	2.81	3.22	4.18	2.80	3.42	2.87	3.61	3.25	2.91	−0.45
Roe1	0.20	0.43	0.46	0.49	0.60	0.52	0.67	0.64	0.63	0.83	0.63
	0.65	1.76	2.14	2.77	3.41	2.73	3.69	3.44	3.44	4.18	3.03
Roe6	0.38	0.45	0.50	0.53	0.62	0.52	0.59	0.63	0.63	0.75	0.37
	1.26	1.89	2.49	3.00	3.61	2.86	3.30	3.45	3.42	3.83	1.85
Roe12	0.50	0.56	0.53	0.54	0.60	0.56	0.60	0.62	0.61	0.68	0.18
	1.70	2.46	2.71	3.14	3.54	3.14	3.38	3.41	3.35	3.48	0.99
	Panel B: Return on assets (Roa) deciles (January 1972–December 2020)										
RoaA	0.57	0.80	0.70	0.58	0.65	0.62	0.74	0.58	0.63	0.64	0.07
	1.87	3.22	3.55	3.21	3.46	3.28	4.01	3.16	3.22	2.95	0.36
Roa1	0.20	0.40	0.52	0.59	0.52	0.63	0.63	0.65	0.66	0.73	0.53
	0.63	1.56	2.22	2.92	2.72	3.15	3.20	3.44	3.31	3.50	2.54
Roa6	0.38	0.45	0.58	0.64	0.55	0.65	0.61	0.67	0.59	0.73	0.35
	1.19	1.73	2.61	3.23	2.93	3.51	3.30	3.55	3.00	3.53	1.75
Roa12	0.47	0.61	0.64	0.64	0.58	0.64	0.63	0.64	0.61	0.69	0.22
	1.55	2.43	3.03	3.18	3.19	3.43	3.44	3.49	3.08	3.37	1.17
	Panel C: Operating cash flow-to-lagged assets (Cla) deciles (January 1976–December 2020)										
ClaA	0.25	0.65	0.53	0.72	0.65	0.85	0.77	0.75	0.78	0.80	0.55
	0.85	2.44	2.26	3.16	3.42	4.14	3.92	3.97	4.07	3.69	3.16
Cla1	0.43	0.33	0.45	0.42	0.69	0.73	0.73	0.84	0.84	0.95	0.52
	1.50	1.27	1.89	1.76	3.27	3.66	3.64	4.25	4.47	4.19	3.24
Cla6	0.45	0.49	0.53	0.60	0.64	0.74	0.76	0.78	0.78	0.91	0.46
	1.72	2.04	2.31	2.66	3.09	3.81	3.94	3.99	4.11	4.06	3.51
Cla12	0.47	0.47	0.54	0.63	0.61	0.73	0.74	0.80	0.79	0.91	0.44
	1.84	1.91	2.41	2.84	2.98	3.81	3.79	4.17	4.19	4.19	3.53
	Panel D: Operating profits-to-lagged equity (Ole) deciles (January 1972–December 2020)										
OleA	0.50	0.54	0.56	0.61	0.66	0.65	0.70	0.60	0.76	0.60	0.10
	1.67	2.47	3.03	3.24	3.63	3.37	3.68	3.28	3.93	2.79	0.52
Ole1	0.22	0.42	0.55	0.52	0.47	0.45	0.77	0.69	0.79	0.79	0.57
	0.69	1.81	2.55	2.62	2.46	2.31	3.98	3.51	4.04	3.73	2.84
Ole6	0.39	0.50	0.48	0.54	0.54	0.56	0.74	0.66	0.73	0.74	0.35
	1.29	2.20	2.40	2.80	2.84	2.99	3.85	3.53	3.75	3.46	1.83
Ole12	0.44	0.55	0.56	0.52	0.55	0.59	0.66	0.60	0.74	0.69	0.26
	1.47	2.43	2.87	2.69	2.91	3.21	3.39	3.19	3.91	3.25	1.41

Table S11 : The Penman-Zhang (2020a) Accounting-based Factors

Section B.10 details the measurement of annual earnings-to-price (E/P), annual return on equity (RoeA), and expensed investment-to-lagged price (ExpInv/P). Panel A reports the $4 \times 3 \times 3$ portfolios from sequential sorts on E/P, annual Roe, and ExpInv/P. At the end of June of each year t, we split stocks into 4 E/P groups based on negative E/P and NYSE breakpoints of positive E/P. Within each E/P portfolio, we split stocks into 3 RoeA portfolios on its NYSE breakpoints. Finally, within each E/P-RoeA portfolio, we split stocks into 3 ExpInv/P portfolios based on its NYSE breakpoints. Monthly value-weighted returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June-end of $t+1$. The SUM portfolio is the high E/P-low RoeA-high ExpInv/P portfolio minus the low E/P-high RoeA-low ExpInv/P portfolio. Columns denoted "Col. 3−7" show the results for the Low RoeA-High ExpInv/P portfolio minus the high RoeA-low ExpInv/P portfolio. In Panel B, the Penman-Zhang investment factor (INV) is the value-weighted high-minus-low tercile returns from annual one-way sorts based on the NYSE breakpoints of INV/P (change in total assets scaled by lagged market equity). All t-values are adjusted for autocorrelations and heteroscedasticity.

Panel A: The Penman-Zhang $4 \times 3 \times 3$ benchmark portfolios on E/P, annual Roe, and ExpInv/P

RoeA	Low	Low	Low	M	M	M	High	High	High	Col.	Low	Low	Low	M	M	M	High	High	High	Col.
ExpInv/P	Low	M	High	Low	M	High	Low	M	High	3−7	Low	M	High	Low	M	High	Low	M	High	3−7
	Average excess returns, $\overline{R}$										$t_{\overline{R}}$									
E/P<0	0.09	0.59	0.99	0.46	1.00	0.76	1.03	0.72	0.84	−0.04	0.21	1.46	2.55	1.33	2.96	1.95	3.21	2.27	2.57	−0.14
Low E/P	0.35	0.47	0.92	0.19	0.55	0.69	0.41	0.67	0.69	0.51	1.57	2.10	3.54	0.86	2.69	3.14	1.77	3.35	3.13	2.87
M	0.53	0.51	0.89	0.43	0.72	0.84	0.59	0.65	0.90	0.31	3.39	2.16	4.04	2.31	3.89	3.97	2.77	3.36	4.42	1.68
High E/P	0.71	0.85	0.93	0.63	0.90	1.00	0.63	0.95	0.79	0.30	3.80	3.65	3.70	3.47	4.29	4.51	3.07	4.25	3.29	1.55
SUM										0.52										2.57
	The q-factor alpha, α_q ($p_{\text{GRS}} = 0.12$)										t_q									
E/P<0	−0.31	0.24	0.48	−0.20	0.31	0.16	0.22	0.18	0.21	0.26	−1.09	0.97	2.01	−0.76	1.47	0.63	0.96	0.92	0.97	0.79
Low E/P	−0.35	−0.16	0.26	−0.36	−0.06	0.07	−0.06	0.10	0.10	0.32	−2.61	−1.28	1.89	−2.88	−0.62	0.55	−0.69	1.02	1.04	1.98
M	−0.09	−0.28	0.12	−0.25	0.01	0.01	−0.05	−0.00	0.08	0.17	−0.77	−1.91	0.87	−2.28	0.14	0.13	−0.43	−0.02	0.77	0.90
High E/P	0.01	0.12	0.13	0.05	0.23	0.24	−0.07	0.15	0.07	0.20	0.08	0.89	0.84	0.38	1.71	1.91	−0.46	1.15	0.48	0.92
SUM										0.20										0.19
	The q^5 alpha, α_{q^5} ($p_{\text{GRS}} = 0.41$)										t_{q^5}									
E/P<0	−0.10	0.09	0.32	0.20	0.12	−0.14	0.60	0.19	0.00	−0.29	−0.33	0.36	1.27	0.68	0.55	−0.51	2.33	0.95	0.00	−0.83
Low E/P	−0.21	−0.16	0.17	−0.22	−0.09	0.07	−0.07	0.05	0.09	0.25	−1.52	−1.22	1.19	−1.74	−0.81	0.60	−0.76	0.53	0.87	1.45
M	−0.06	−0.21	0.12	−0.18	0.01	0.04	−0.13	−0.07	0.01	0.26	−0.48	−1.52	0.89	−1.56	0.08	0.38	−1.10	−0.49	0.10	1.35
High E/P	0.07	0.20	0.12	0.14	0.15	0.16	−0.06	0.03	0.09	0.18	0.43	1.40	0.76	1.03	1.11	1.22	−0.44	0.21	0.61	0.83
SUM										0.19										1.04

Panel B: Factor spanning tests between the Penman-Zhang 3-factor model and the q models

	$\overline{R}$	α	β_{Mkt}	β_{SUM}	β_{INV}	R^2
R_{Me}	0.27	0.08	0.16	0.26	0.24	0.26
[t]	2.22	0.76	6.53	9.24	4.50	
$R_{\text{I/A}}$	0.33	0.27	−0.10	0.15	−0.35	0.47
[t]	4.10	4.45	−5.36	10.15	−7.61	
R_{Roe}	0.51	0.65	−0.11	−0.18	−0.11	0.17
[t]	4.96	7.37	−3.40	−6.16	−1.33	
R_{Eg}	0.80	0.93	−0.19	−0.05	−0.11	0.26
[t]	9.69	13.58	−8.88	−3.03	−1.98	

	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}	R^2
SUM	0.52	0.20	0.01	0.56	1.10	−0.40		0.39
[t]	2.57	1.09	0.28	7.66	11.17	−4.61		
		0.19	0.01	0.56	1.10	−0.40	0.01	0.39
[t]		1.04	0.30	7.66	11.18	−3.86	0.11	
INV	−0.13	0.07	0.02	0.11	−0.61	−0.07		0.31
[t]	−1.34	0.79	0.47	2.36	−7.76	−1.26		
		0.05	0.02	0.11	−0.62	−0.09	0.04	0.31
[t]		0.49	0.64	2.23	−8.74	−1.47	0.47	

Table S12 : The Penman-Zhang (2020a) Accounting Factors, NYSE-Amex-NASDAQ Breakpoints and Equal-weighted Returns

Section B.10 details earnings-to-price (E/P), return on equity (RoeA), and expensed investment-to-lagged price (ExpInv/P). Panel A shows the $4 \times 3 \times 3$ portfolios from sequential sorts on E/P, RoeA, and ExpInv/P. At the end of June of year t, we split stocks into 4 E/P groups based on negative E/P and NYSE-Amex-NASDAQ breakpoints of positive E/P. Within each E/P portfolio, we split stocks into RoeA terciles on its NYSE-Amex-NASDAQ breakpoints. Within each E/P-RoeA portfolio, we split stocks into ExpInv/P terciles on its NYSE-Amex-NASDAQ breakpoints. Monthly equal-weighted returns are from July of year t to June of $t+1$, and the portfolios are rebalanced in June-end of $t+1$. The SUM factor is the high E/P-low RoeA-high ExpInv/P portfolio minus the low E/P-high RoeA-low ExpInv/P portfolio. Columns denoted "Col. 3−7" show the results for the Low RoeA-High ExpInv/P portfolio minus the high RoeA-low ExpInv/P portfolio. In Panel B, the Penman-Zhang investment factor (INV) is the equal-weighted high-minus-low tercile returns from annual one-way sorts on the NYSE-Amex-NASDAQ breakpoints of INV/P (change in total assets scaled by lagged market equity). All t-values are adjusted for autocorrelations and heteroscedasticity.

Panel A: The Penman-Zhang $4 \times 3 \times 3$ benchmark portfolios on E/P, annual Roe, and ExpInv/P

RoeA	Low	Low	Low	M	M	M	High	High	High	Col.
ExpInv/P	Low	M	High	Low	M	High	Low	M	High	3−7
	Average excess returns, $\overline{R}$									
E/P<0	0.44	0.55	0.85	0.59	1.13	1.34	0.79	1.19	1.33	0.06
Low E/P	0.55	1.06	1.30	0.41	0.60	0.91	0.37	0.56	0.64	0.92
M	0.75	1.04	1.28	0.65	0.89	1.01	0.67	0.80	0.89	0.60
High E/P	1.02	1.01	1.42	0.87	1.13	1.14	0.80	1.03	1.26	0.62
SUM										1.04
	The q-factor alpha, α_q ($p_{\mathrm{GRS}} = 0.00$)									
E/P<0	0.18	0.37	0.67	0.31	0.74	0.95	0.16	0.70	0.75	0.50
Low E/P	−0.13	0.40	0.63	−0.09	0.02	0.33	−0.17	−0.06	0.02	0.80
M	0.07	0.26	0.53	−0.07	0.10	0.20	−0.01	0.07	0.12	0.54
High E/P	0.33	0.21	0.68	0.24	0.38	0.35	0.12	0.26	0.44	0.56
SUM										0.85
	The q^5 alpha, α_{q^5} ($p_{\mathrm{GRS}} = 0.00$)									
E/P<0	0.08	0.16	0.59	0.37	0.59	0.83	0.40	0.63	0.70	0.19
Low E/P	0.07	0.36	0.60	0.08	0.08	0.40	−0.01	−0.03	0.14	0.60
M	0.14	0.28	0.52	−0.01	0.08	0.25	0.03	0.10	0.17	0.50
High E/P	0.44	0.24	0.63	0.30	0.40	0.39	0.16	0.25	0.45	0.47
SUM										0.64

RoeA	Low	Low	Low	M	M	M	High	High	High	Col.
ExpInv/P	Low	M	High	Low	M	High	Low	M	High	3−7
	$t_{\overline{R}}$									
E/P<0	0.92	1.18	1.84	1.49	2.87	3.34	2.37	3.62	3.80	0.21
Low E/P	2.02	3.50	4.20	1.61	2.25	3.15	1.44	2.09	2.18	5.30
M	4.09	4.03	4.73	3.40	4.04	4.08	2.97	3.24	3.43	4.54
High E/P	4.88	3.97	4.78	4.10	4.71	4.45	3.07	3.80	4.13	4.10
SUM										5.17
	t_q									
E/P<0	0.59	1.29	2.16	1.38	3.41	3.79	1.03	3.94	3.42	1.62
Low E/P	−0.92	3.05	4.25	−0.74	0.15	2.36	−1.75	−0.63	0.17	4.92
M	0.68	2.34	4.24	−0.74	1.25	1.69	−0.07	0.65	1.01	3.92
High E/P	2.52	1.74	4.51	1.80	3.59	2.86	0.86	2.16	2.85	3.68
SUM										4.79
	t_{q^5}									
E/P<0	0.26	0.55	1.91	1.59	2.69	3.16	2.21	3.31	3.09	0.59
Low E/P	0.50	2.62	3.98	0.62	0.65	2.86	−0.09	−0.36	0.94	3.56
M	1.27	2.82	4.12	−0.11	0.97	2.22	0.29	1.08	1.43	3.19
High E/P	3.42	1.96	4.40	2.35	3.97	3.32	1.27	2.30	3.19	2.89
SUM										3.41

Panel B: Factor spanning tests between the Penman-Zhang 3-factor model and the q models

	$\overline{R}$	α	β_{Mkt}	β_{SUM}	β_{INV}	R^2
R_{Me}	0.27	−0.19	0.23	0.19	−0.24	0.21
[t]	2.22	−1.56	7.85	5.71	−1.65	
$R_{\mathrm{I/A}}$	0.33	0.19	−0.12	0.15	−0.12	0.30
[t]	4.10	2.49	−6.58	7.76	−1.39	
R_{Roe}	0.51	0.94	−0.16	−0.11	0.42	0.24
[t]	4.96	10.49	−4.88	−2.71	6.49	
R_{Eg}	0.80	0.98	−0.21	−0.00	0.09	0.23
[t]	9.69	13.03	−8.42	−0.01	2.25	

	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}	R^2
SUM	1.04	0.85	−0.17	0.45	1.06	−0.36		0.37
[t]	5.17	4.79	−3.78	6.80	8.89	−3.25		
		0.64	−0.14	0.48	1.00	−0.47	0.32	0.38
[t]		3.41	−2.95	7.20	8.14	−3.71	2.29	
INV	−0.53	−0.57	0.04	−0.12	−0.28	0.28		0.25
[t]	−5.42	−5.16	1.55	−2.09	−3.93	5.56		
		−0.49	0.03	−0.13	−0.26	0.32	−0.12	0.25
[t]		−5.37	1.17	−2.18	−3.33	5.12	−1.84	

Table S13 : The Penman-Zhang (2020a) Accounting-based Factors, Alternative ExpInv without SG&A

Section B.10 details earnings-to-price (E/P), return on equity (RoeA), and expensed investment-to-lagged price (ExpInv/P). This table shows the results with an alternative ExpInv without SG&A. Panel A shows the $4 \times 3 \times 3$ portfolios from sequential sorts on E/P, RoeA, and ExpInv/P. At the end of June of each year t, we split stocks into 4 E/P groups based on negative E/P and NYSE breakpoints of positive E/P. Within each E/P portfolio, we split stocks into RoeA terciles on NYSE breakpoints. Within each E/P-RoeA portfolio, we split stocks into ExpInv/P terciles based on NYSE breakpoints. Monthly value-weighted returns are from July of year t to June of $t+1$, and the portfolios are rebalanced in June-end of $t+1$. The SUM factor is the high E/P-low RoeA-high ExpInv/P portfolio minus the low E/P-high RoeA-low ExpInv/P portfolio. Columns denoted "Col. 3−7" show the results for the Low RoeA-High ExpInv/P portfolio minus the high RoeA-low ExpInv/P portfolio. In Panel B, the Penman-Zhang investment factor (INV) is the value-weighted high-minus-low tercile returns from annual one-way sorts on the NYSE breakpoints of INV/P (change in total assets scaled by lagged market equity). All t-values are adjusted for autocorrelations and heteroscedasticity.

Panel A: The Penman-Zhang $4 \times 3 \times 3$ benchmark portfolios on E/P, annual Roe, and ExpInv/P

RoeA	Low	Low	Low	M	M	M	High	High	High	Col.	Low	Low	Low	M	M	M	High	High	High	Col.
ExpInv/P	Low	M	High	Low	M	High	Low	M	High	3−7	Low	M	High	Low	M	High	Low	M	High	3−7
	Average excess returns, $\overline{R}$										$t_{\overline{R}}$									
E/P<0	−0.15	0.07	0.87	0.39	0.68	0.93	0.85	0.86	0.57	0.02	−0.38	0.14	2.23	1.21	1.82	2.38	2.81	2.44	1.59	0.06
Low E/P	0.48	0.43	0.60	0.32	0.53	0.65	0.45	0.48	0.74	0.14	2.19	1.80	2.28	1.50	2.44	2.96	1.99	2.13	3.61	0.84
M	0.56	0.45	0.76	0.45	0.61	0.82	0.59	0.67	0.76	0.16	3.45	1.70	3.52	2.54	2.86	4.28	2.91	3.33	3.90	1.00
High E/P	0.76	0.84	0.90	0.60	0.92	0.97	0.75	0.90	0.79	0.16	4.17	2.56	3.73	3.39	4.21	4.37	3.13	4.06	3.50	0.88
SUM										0.45										2.51
	The q-factor alpha, α_q ($p_{\mathrm{GRS}} = 0.00$)										t_q									
E/P<0	−0.79	−0.12	0.54	−0.38	−0.22	0.33	0.06	0.08	0.05	0.48	−3.15	−0.40	2.19	−1.69	−0.82	1.29	0.27	0.37	0.18	1.51
Low E/P	−0.18	−0.38	0.03	−0.35	−0.15	0.14	−0.23	−0.02	0.24	0.26	−1.36	−2.59	0.19	−2.81	−1.21	1.19	−2.35	−0.25	2.46	1.60
M	−0.11	−0.26	−0.02	−0.28	−0.17	0.12	−0.23	0.01	0.08	0.22	−0.97	−1.42	−0.14	−2.69	−1.46	1.08	−2.14	0.11	0.76	1.29
High E/P	0.00	0.30	0.18	0.05	0.10	0.26	−0.10	0.10	0.17	0.28	0.00	1.27	1.27	0.45	0.62	2.00	−0.63	0.63	1.15	1.32
SUM										0.42										2.72
	The q^5 alpha, α_{q^5} ($p_{\mathrm{GRS}} = 0.00$)										t_{q^5}									
E/P<0	−0.40	−0.08	0.26	0.01	−0.23	−0.03	0.40	0.28	−0.15	−0.14	−1.58	−0.23	1.01	0.03	−0.80	−0.12	1.71	1.14	−0.54	−0.41
Low E/P	−0.00	−0.33	−0.10	−0.15	−0.02	0.05	−0.01	−0.07	0.12	−0.09	−0.02	−2.16	−0.65	−1.18	−0.15	0.46	−0.13	−0.71	1.17	−0.50
M	−0.06	−0.28	−0.11	−0.15	−0.15	0.07	−0.21	−0.02	−0.07	0.10	−0.53	−1.32	−0.79	−1.33	−1.26	0.62	−1.83	−0.15	−0.61	0.58
High E/P	0.08	0.30	0.17	0.16	0.22	0.08	0.04	0.05	0.04	0.13	0.53	1.19	1.17	1.21	1.40	0.59	0.26	0.31	0.31	0.57
SUM										0.19										1.13

Panel B: Factor spanning tests between the Penman-Zhang 3-factor model and the q models

	$\overline{R}$	α	β_{Mkt}	β_{SUM}	β_{INV}	R^2
R_{Me}	0.27	0.11	0.16	0.24	0.25	0.21
[t]	2.22	1.00	6.00	5.97	3.91	
$R_{\mathrm{I/A}}$	0.33	0.29	−0.10	0.13	−0.34	0.42
[t]	4.10	4.48	−5.20	6.99	−6.70	
R_{Roe}	0.51	0.68	−0.12	−0.27	−0.13	0.26
[t]	4.96	7.96	−3.71	−8.98	−1.84	
R_{Eg}	0.80	0.92	−0.19	−0.04	−0.11	0.25
[t]	9.69	13.40	−8.82	−2.26	−2.10	

	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}	R^2
SUM	0.45	0.42	−0.04	0.34	0.83	−0.63		0.36
[t]	2.51	2.72	−0.89	6.20	8.28	−8.47		
		0.19	0.00	0.38	0.76	−0.74	0.35	0.38
[t]		1.13	0.06	7.01	7.49	−8.16	3.52	
INV	−0.13	0.07	0.02	0.11	−0.61	−0.07		0.31
[t]	−1.34	0.79	0.47	2.36	−7.76	−1.26		
		0.05	0.02	0.11	−0.62	−0.09	0.04	0.31
[t]		0.49	0.64	2.23	−8.74	−1.47	0.47	

Table S14 : The Penman-Zhang (2020a) Accounting-based Factors, with Operating Cash Flow-to-price (Cop/P)

Section B.10 details operating cash flow-to-price (Cop/P), return on equity (RoeA), and expensed investment-to-lagged price (ExpInv/P). Panel A shows the $4 \times 3 \times 3$ portfolios from sequential sorts on Cop/P, RoeA, and ExpInv/P. At the end of June of each year t, we split stocks into 4 Cop/P groups based on negative Cop/P and NYSE breakpoints of positive Cop/P. Within each Cop/P portfolio, we split stocks into RoeA terciles on NYSE breakpoints. Within each Cop/P-RoeA portfolio, we split stocks into ExpInv/P terciles based on NYSE breakpoints. Monthly value-weighted returns are from July of year t to June of $t+1$, and the portfolios are rebalanced in June-end of $t+1$. The SUM factor is the high Cop/P-low RoeA-high ExpInv/P portfolio minus the low Cop/P-high RoeA-low ExpInv/P portfolio. Columns denoted "Col. 3−7" show the results for the Low RoeA-High ExpInv/P portfolio minus the high RoeA-low ExpInv/P portfolio. In Panel B, the Penman-Zhang investment factor (INV) is the value-weighted high-minus-low tercile returns from annual one-way sorts on the NYSE breakpoints of INV/P (change in total assets scaled by lagged market equity). All t-values are adjusted for autocorrelations and heteroscedasticity.

Panel A: The Penman-Zhang $4 \times 3 \times 3$ benchmark portfolios on Cop/P, annual Roe, and ExpInv/P

RoeA	Low	Low	Low	M	M	M	High	High	High	Col.	Low	Low	Low	M	M	M	High	High	High	Col.
ExpInv/P	Low	M	High	Low	M	High	Low	M	High	3−7	Low	M	High	Low	M	High	Low	M	High	3−7
	Average excess returns, $\overline{R}$										$t_{\overline{R}}$									
Cop/P<0	−0.49	0.27	0.48	0.14	0.17	0.77	−0.17	0.26	0.66	0.65	−1.18	0.65	1.14	0.48	0.47	1.97	−0.50	0.71	1.59	1.92
Low Cop/P	0.32	0.49	0.81	0.35	0.50	0.66	0.38	0.61	0.70	0.43	1.25	2.01	2.86	1.72	2.40	3.25	1.55	3.07	3.19	2.34
M	0.58	0.54	0.81	0.53	0.73	0.88	0.71	0.84	1.02	0.10	2.56	2.47	3.33	2.53	3.51	3.73	3.85	4.17	5.04	0.61
High Cop/P	0.68	1.01	0.96	0.67	0.95	1.07	0.78	0.86	0.87	0.18	2.42	3.53	3.08	3.09	4.47	4.39	3.59	3.81	3.67	0.76
SUM										0.59										2.33
	The q-factor alpha, α_q ($p_{\text{GRS}} = 0.00$)										t_q									
Cop/P<0	−0.98	−0.04	0.28	−0.38	−0.71	−0.24	−0.87	−0.41	−0.03	1.15	−3.46	−0.13	0.88	−1.86	−2.87	−0.83	−3.70	−1.69	−0.09	2.83
Low Cop/P	−0.23	0.05	0.43	−0.30	−0.02	0.07	−0.02	0.07	0.11	0.45	−1.47	0.40	2.96	−2.69	−0.21	0.62	−0.16	0.75	1.15	2.40
M	−0.18	−0.18	0.01	−0.18	0.04	0.15	0.08	0.05	0.24	−0.08	−1.25	−1.52	0.06	−1.50	0.30	0.90	0.78	0.43	2.25	−0.49
High Cop/P	−0.22	0.34	0.11	−0.05	0.13	0.31	0.01	0.13	0.11	0.10	−1.23	1.91	0.72	−0.32	0.98	2.13	0.07	0.87	0.84	0.44
SUM										0.13										0.73
	The q^5 alpha, α_{q^5} ($p_{\text{GRS}} = 0.11$)										t_{q^5}									
Cop/P<0	−0.52	0.09	0.26	−0.16	−0.38	−0.11	−0.51	−0.14	−0.01	0.78	−1.76	0.35	0.78	−0.71	−1.72	−0.39	−1.96	−0.56	−0.05	1.70
Low Cop/P	0.13	0.13	0.38	−0.09	0.05	0.19	−0.02	0.06	0.13	0.40	0.82	1.02	2.37	−0.82	0.46	1.57	−0.16	0.59	1.18	2.01
M	−0.06	−0.26	−0.06	−0.19	0.01	0.02	0.06	−0.05	0.05	−0.12	−0.40	−2.15	−0.45	−1.55	0.04	0.12	0.51	−0.42	0.40	−0.69
High Cop/P	−0.08	0.07	−0.12	0.09	0.06	0.22	0.04	0.07	0.04	−0.17	−0.42	0.43	−0.74	0.55	0.39	1.47	0.27	0.49	0.33	−0.66
SUM										−0.10										−0.53

Panel B: Factor spanning tests between the Penman-Zhang 3-factor model and the q models

	$\overline{R}$	α	β_{Mkt}	β_{SUM}	β_{INV}	R^2
R_{Me}	0.27	0.06	0.12	0.28	0.19	0.40
[t]	2.22	0.70	4.94	10.13	3.73	
$R_{\text{I/A}}$	0.33	0.29	−0.12	0.11	−0.37	0.45
[t]	4.10	4.52	−5.38	8.83	−7.45	
R_{Roe}	0.51	0.65	−0.09	−0.17	−0.08	0.20
[t]	4.96	7.53	−2.63	−7.97	−1.01	
R_{Eg}	0.80	0.92	−0.19	−0.04	−0.10	0.25
[t]	9.69	13.48	−8.63	−2.73	−1.89	

	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}	R^2
SUM	0.59	0.13	0.08	1.02	1.21	−0.53		0.52
[t]	2.33	0.73	1.56	16.26	11.28	−5.94		
		−0.10	0.12	1.05	1.14	−0.65	0.34	0.53
[t]		−0.53	2.29	16.59	10.71	−6.41	2.53	
INV	−0.13	0.07	0.02	0.11	−0.61	−0.07		0.31
[t]	−1.34	0.79	0.47	2.36	−7.76	−1.26		
		0.05	0.02	0.11	−0.62	−0.09	0.04	0.31
[t]		0.49	0.64	2.23	−8.74	−1.47	0.47	

Table S15 : The Penman-Zhang (2020a) Accounting-based Factors, with Operating Profits-to-price (Op/P)

Section B.10 details operating profits-to-price (Op/P), return on equity (RoeA), and expensed investment-to-lagged price (ExpInv/P). Panel A shows the $4 \times 3 \times 3$ portfolios from sequential sorts on Op/P, RoeA, and ExpInv/P. At the end of June of each year t, we split stocks into 4 Op/P groups based on negative Op/P and NYSE breakpoints of positive Op/P. Within each Op/P portfolio, we split stocks into RoeA terciles with NYSE breakpoints. Within each Op/P-RoeA portfolio, we split stocks into ExpInv/P terciles with NYSE breakpoints. Monthly value-weighted returns are calculated from July of year t to June of $t+1$, and the portfolios are rebalanced in June-end of $t+1$. The SUM factor is the high Op/P-low RoeA-high ExpInv/P portfolio minus the low Op/P-high RoeA-low ExpInv/P portfolio. Columns denoted "Col. 3−7" show the results for the Low RoeA-High ExpInv/P portfolio minus the high RoeA-low ExpInv/P portfolio. In Panel B, the Penman-Zhang investment factor (INV) is the value-weighted high-minus-low tercile returns from annual one-way sorts on the NYSE breakpoints of INV/P (change in total assets scaled by lagged market equity). All t-values are adjusted for autocorrelations and heteroscedasticity.

Panel A: The Penman-Zhang $4 \times 3 \times 3$ benchmark portfolios on Op/P, annual Roe, and ExpInv/P

RoeA	Low	Low	Low	M	M	M	High	High	High	Col.	Low	Low	Low	M	M	M	High	High	High	Col.
ExpInv/P	Low	M	High	Low	M	High	Low	M	High	3−7	Low	M	High	Low	M	High	Low	M	High	3−7
	Average excess returns, $\overline{R}$										$t_{\overline{R}}$									
Op/P<0	−0.43	0.47	0.97	0.21	0.52	0.80	0.53	0.50	0.75	0.43	−0.94	1.09	2.10	0.48	1.26	2.06	1.37	1.31	1.77	1.04
Low Op/P	0.31	0.64	0.76	0.20	0.57	0.64	0.43	0.63	0.72	0.33	1.40	2.54	2.56	1.08	2.84	3.02	1.87	3.11	3.34	1.72
M	0.51	0.50	1.14	0.49	0.59	0.86	0.67	0.73	0.82	0.47	3.08	2.21	4.85	2.77	2.98	4.01	3.52	3.63	3.97	2.69
High Op/P	0.89	0.71	0.91	0.68	0.89	0.91	0.56	0.86	0.78	0.36	4.43	2.77	3.35	3.72	4.63	3.64	2.77	3.92	3.19	1.71
SUM										0.48										2.09
	The q-factor alpha, α_q ($p_{\text{GRS}} = 0.00$)										t_q									
Op/P<0	−0.87	0.14	0.77	−0.35	0.07	0.33	−0.01	0.19	0.55	0.77	−2.68	0.50	2.62	−1.19	0.24	1.50	−0.02	0.69	1.75	1.96
Low Op/P	−0.33	−0.02	0.21	−0.35	0.03	0.05	−0.04	0.11	0.18	0.25	−2.37	−0.14	1.44	−3.57	0.27	0.49	−0.40	1.17	1.81	1.41
M	−0.20	−0.30	0.32	−0.23	−0.24	−0.03	0.01	0.00	0.05	0.31	−1.75	−2.34	2.81	−2.07	−2.35	−0.22	0.07	−0.02	0.39	1.90
High Op/P	0.21	−0.02	0.14	0.02	0.23	0.06	−0.14	0.05	0.00	0.28	1.27	−0.10	0.75	0.12	1.80	0.40	−0.96	0.36	−0.03	1.20
SUM										0.18										0.85
	The q^5 alpha, α_{q^5} ($p_{\text{GRS}} = 0.04$)										t_{q^5}									
Op/P<0	−0.66	−0.13	0.72	−0.19	−0.08	0.06	0.33	0.19	0.32	0.40	−1.85	−0.43	2.32	−0.63	−0.26	0.24	0.96	0.65	0.97	0.88
Low Op/P	−0.05	0.02	0.10	−0.20	0.01	0.04	−0.04	0.11	0.19	0.14	−0.38	0.13	0.65	−2.00	0.16	0.40	−0.38	1.12	1.66	0.73
M	−0.19	−0.25	0.26	−0.19	−0.24	0.02	−0.06	−0.05	−0.04	0.32	−1.51	−1.76	2.32	−1.55	−2.13	0.16	−0.50	−0.40	−0.34	2.04
High Op/P	0.24	−0.09	0.11	0.12	0.26	0.10	0.00	0.06	0.01	0.11	1.27	−0.57	0.61	0.74	1.81	0.68	−0.01	0.46	0.06	0.46
SUM										0.15										0.70

Panel B: Factor spanning tests between the Penman-Zhang 3-factor model and the q models

	$\overline{R}$	α	β_{Mkt}	β_{SUM}	β_{INV}	R^2
R_{Me}	0.27	0.10	0.15	0.23	0.22	0.26
[t]	2.22	0.97	6.06	9.77	3.90	
$R_{\text{I/A}}$	0.33	0.29	−0.11	0.13	−0.36	0.45
[t]	4.10	4.58	−4.99	10.33	−7.27	
R_{Roe}	0.51	0.64	−0.11	−0.17	−0.10	0.18
[t]	4.96	7.33	−3.27	−7.47	−1.24	
R_{Eg}	0.80	0.92	−0.19	−0.05	−0.11	0.26
[t]	9.69	13.70	−8.90	−3.41	−1.97	

	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}	R^2
SUM	0.48	0.18	0.01	0.63	1.12	−0.49		0.37
[t]	2.09	0.85	0.16	6.69	9.74	−5.11		
		0.15	0.01	0.63	1.11	−0.50	0.05	0.37
[t]		0.70	0.26	6.64	9.30	−4.57	0.36	
INV	−0.13	0.07	0.02	0.11	−0.61	−0.07		0.31
[t]	−1.34	0.79	0.47	2.36	−7.76	−1.26		
		0.05	0.02	0.11	−0.62	−0.09	0.04	0.31
[t]		0.49	0.64	2.23	−8.74	−1.47	0.47	