Internet Appendix: "Security Analysis: An Investment Perspective" (for Online Publication Only)

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Abstract

This Internet Appendix details variable definitions, portfolio construction, and supplementary results for our manuscript on "Security analysis: An investment perspective."

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A Measurement

A.1 Return on Equity (Roe) and the Expected Growth (Eg)

We measure Roe per Hou, Xue, and Zhang (2019). 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 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.

We measure the expected growth, Eg, per Hou et al. (2019a). 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.

A.2 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 $F_{\mathrm{Cf/A}}$ 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 com-

mon 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:

$$F \equiv F_{\text{Roa}} + F_{\text{dRoa}} + F_{\text{Cf/A}} + F_{\text{Acc}} + F_{\text{dMargin}} + F_{\text{dTurn}} + F_{\text{dLever}} + F_{\text{dLiquid}} + \text{Eq.} \tag{A.1}$$

A.3 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 (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 $-$ $\triangle$ 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, $-(\triangle$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 $[(\text{gp}_t - r^f_{t-1,t}\text{at}_{t-1}) - (\text{gp}_{t-5} - r^f_{t-6,t-5}\text{at}_{t-6})]/\text{at}_{t-5}$, 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 $\text{gp}_t - r^f_{t-1,t}\text{at}_{t-1}$ 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 $[(\text{ib}_t - r^f_{t-1,t}\text{be}_{t-1}) - (\text{ib}_{t-5} - r^f_{t-6,t-5}\text{be}_{t-6})]/\text{be}_{t-5}$, 5-year growth in residual return on assets is $[(\text{ib}_t - r^f_{t-1,t}\text{at}_{t-1}) - (\text{ib}_{t-5} - r^f_{t-6,t-5}\text{at}_{t-6})]/\text{at}_{t-5}$, 5-year growth in residual cash flow over assets is $[(\text{cf}_t - r^f_{t-1,t}\text{at}_{t-1}) - (\text{cf}_{t-5} - r^f_{t-6,t-5}\text{at}_{t-6})]/\text{at}_{t-5}$, in which CF = IB + DP − △WC − CAPX, and 5-year growth in residual gross margin is $(\text{gp}_t - \text{gp}_{t-5})/\text{sale}_{t-5}$.

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:

$$\begin{aligned}\text{O} \equiv\ & -1.32 - 0.407\log(\text{TA}) + 6.03\text{TLTA} - 1.43\text{WCTA} + 0.076\text{CLCA} \\ & -1.72\text{OENEG} - 2.37\text{NITA} - 1.83\text{FUTL} + 0.285\text{IN2} - 0.521\text{CHIN}, \qquad \text{(A.2)}\end{aligned}$$

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: Z = (1.2WC + 1.4RE + 3.3EBIT + 0.6ME + SALE)/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.

A.4 Penman and Zhu's (2018) Fundamental 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).

A.5 Lewellen's (2015) Expected-return Measure

We follow Lewellen's (2015) Model 3, which employs 15 anomaly variables (all from Compustat annual files). We detail their measurement at the beginning of month t as follows:

1. LogSize$_{-1}$: Log market equity at the beginning of month t.

2. LogB/M$_{-1}$: Log book equity minus log market equity, in which the book equity is from the most recent fiscal year ending at least four months ago, and the market equity is at the beginning of month t. For firms with more than one share class, we merge the market equity for all share classes before computing LogB/M. Following Davis, Fama, and French (2000), we measure the 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 (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. $\text{Return}_{-2,-12}$: 11-month cumulative prior stock return from month $t-12$ to $t-2$, skipping month $t-1$.

4. $\text{LogIssues}_{-1,-36}$: Log growth in split-adjusted shares outstanding (CRSP items CFACSHR times SHROUT) from month $t-36$ to month $t-1$.

5. $\text{Accruals}_{\text{Yr}-1}$: Lewellen (2015) follow Sloan's (1996) balance sheet measurement of accruals, which we also adopt. Accruals equal changes in noncash working capital minus depreciation, in which the noncash working capital is changes in noncash current assets minus changes in current liabilities less short-term debt and taxes payable. In particular, accruals = (dCA dCASH) (dCL dSTD dTP) DP, in which dCA is the change in current assets (item ACT), dCASH is the change in cash or cash equivalents (item CHE), dCL is the change in current liabilities (item LCT), dSTD is the change in debt included in current liabilities (item DLC), dTP is the change in income taxes payable (item TXP), and DP is depreciation and amortization (item DP). Missing changes in income taxes payable are set to zero. We scale accruals for the fiscal year ending at least four months ago with the average of total assets (item AT) for the same (current) fiscal year and the 1-year lagged total assets.

6. $\text{ROA}_{\text{Yr}-1}$: Income before extraordinary items (item IB) scaled by average total assets (item AT) across the current and last fiscal year.

7. $\text{LogAG}_{\text{Yr}-1}$: The log of total assets (item AT) for the current fiscal year divided by total assets for the 1-year-lagged fiscal year.

8. $\text{DY}_{-1,-12}$: Cumulative split-adjusted dividends per share from month $t-12$ to month $t-1$ divided by split-adjusted price per share at the end of month $t-1$. We compute split-adjusted price per share for a given month as CRSP items PRC/CFACPR and split-adjusted dividend per share for the month as the split-adjusted price per share at the beginning of the month times the difference between returns with and without dividends (CRSP items RET-RETX). Monthly dividends are then accumulated from month $t-12$ to month $t-1$.

9. $\text{LogReturn}_{-13,-36}$: Log stock return from month $t-36$ to month $t-13$. We require a valid price at the end of month $t-37$ and a valid return for the month $t-13$. In addition, any missing returns from month $t-36$ to $t-14$ must be 99.0, which is the CRSP code for a missing ending price.

10. $\text{LogIssues}_{-1,-12}$: Log growth in split-adjusted shares outstanding (CRSP items CFACSHR times SHROUT) from month $t-12$ to month $t-1$.

11. $\text{Beta}_{-1,-36}$: Market beta estimated with weekly returns from month $t-36$ to month $t-1$ (at least 100 weekly observations).

12. $\text{StdDev}_{-1,-12}$: Monthly standard deviation estimated with daily returns from month $t-12$ to month $t-1$ (at least 120 daily observations).

13. Turnover$_{-1,-12}$: Average monthly turnover from month $t-12$ to month $t-1$. Monthly turnover is the number of shares traded in a month divided by the number of shares outstanding in that month. We adjust the NASDAQ trading volume to account for the institutional differences between NASDAQ and NYSE-Amex volumes, following Gao and Ritter (2010). Prior to February 1, 2001, we divide NASDAQ volume by two. From February 1, 2001 to December 31, 2001, we divide NASDAQ volume by 1.8. For 2002 and 2003, we divide NASDAQ volume by 1.6. From 2004 onward, during which the volume of NASDAQ (and NYSE) stocks has mostly been occurring on crossing networks and other venues, we use a divisor of 1.0.

14. Debt/Price$_{\text{Yr}-1}$: Most recent short-term plus long-term debt (item DLC plus DLTT) divided by the market equity value at the end of month $t-1$. For firms with more than one share class, we merge the market equity for all share classes before computing this ratio.

15. Sales/Price$_{\text{Yr}-1}$: Most recent sales (item SALE) divided by the market equity value at the end of the month $t-1$. For firms with more than one share class, we merge the market equity for all share classes before computing this ratio. Firms with non-positive sales are excluded.

Table A1 : The Asness-Frazzini-Pedersen (2019) Profitability Score Portfolios, January 1967–December 2018

The profitability score is detailed in Appendix A.3. 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 use the Fama-French (1992) 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. 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}, $\beta_{\text{I/A}}$, 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 sorts on the profitability score

	L	2	3	4	5	6	7	8	9	H	H−L		p_{GRS}
$\overline{R}$	0.30	0.43	0.48	0.48	0.52	0.43	0.53	0.58	0.54	0.67	0.37		
$t_{\overline{R}}$	1.10	2.12	2.41	2.37	2.68	2.17	2.82	3.06	2.88	3.54	2.11		
α_q	−0.02	−0.04	−0.04	−0.04	−0.05	−0.04	−0.02	0.06	0.08	0.27	0.29		0.02
t_q	−0.18	−0.47	−0.48	−0.64	−0.67	−0.45	−0.29	0.83	1.15	3.64	2.20		
α_{q^5}	0.11	0.05	0.08	0.03	−0.03	0.10	−0.01	0.06	−0.03	0.09	−0.01		0.38
t_{q^5}	1.00	0.66	0.96	0.44	−0.35	1.15	−0.18	0.81	−0.38	1.24	−0.10		
	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	−0.12	−0.46	−0.32	0.58	0.45		−3.20	−9.40	−4.07	7.69	4.64		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	0.35	0.49	0.47	0.55	0.61	0.26		1.54	2.47	2.47	3.01	3.33	2.10
Micro	0.30	0.73	0.92	1.00	1.01	0.71		0.87	2.40	3.16	3.44	3.58	5.10
Small	0.51	0.65	0.76	0.85	0.97	0.46		1.72	2.68	3.00	3.35	3.78	3.56
Big	0.38	0.48	0.45	0.52	0.60	0.22		1.77	2.47	2.40	2.90	3.26	1.80
	α_q ($p_{\text{GRS}}=0.00$)							t_q					
All	−0.03	−0.03	−0.06	0.02	0.20	0.23		−0.45	−0.54	−1.07	0.27	3.37	2.39
Micro	−0.03	0.13	0.25	0.29	0.34	0.37		−0.20	1.02	2.04	2.51	2.92	2.76
Small	0.12	−0.03	0.04	0.09	0.23	0.11		1.57	−0.42	0.55	1.17	3.02	1.04
Big	0.02	−0.01	−0.07	0.01	0.20	0.19		0.17	−0.18	−1.05	0.13	3.29	1.67
	α_{q^5} ($p_{\text{GRS}}=0.00$)							t_{q^5}					
All	0.07	0.06	0.02	0.02	0.04	−0.03		0.91	1.06	0.25	0.34	0.66	−0.29
Micro	0.03	0.21	0.29	0.30	0.34	0.31		0.16	1.72	2.43	2.62	3.05	2.19
Small	0.20	0.04	0.07	0.11	0.21	0.01		2.48	0.51	1.04	1.55	2.81	0.10
Big	0.11	0.08	0.01	0.01	0.04	−0.07		1.23	1.24	0.23	0.23	0.58	−0.66
	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
All	−0.04	−0.34	−0.35	0.39	0.39		−1.37	−9.64	−5.90	6.88	5.20		0.54
Micro	−0.07	−0.06	0.09	0.63	0.09		−2.28	−1.06	0.91	7.54	1.16		0.37
Small	−0.07	−0.02	0.04	0.62	0.16		−1.94	−0.21	0.43	7.16	1.84		0.38
Big	−0.02	−0.22	−0.38	0.34	0.39		−0.51	−5.37	−5.53	5.18	4.63		0.38

Table A2 : The Asness-Frazzini-Pedersen (2019) Growth Score Portfolios, January 1967–December 2018

The growth score is detailed in Appendix A.3. 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 use the Fama-French (1992) 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. 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}, $\beta_{\text{I/A}}$, 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 sorts on the growth score

	L	2	3	4	5	6	7	8	9	H	H−L	p_{GRS}
$\overline{R}$	0.44	0.47	0.62	0.55	0.49	0.56	0.56	0.54	0.58	0.62	0.18	
$t_{\overline{R}}$	1.87	2.55	3.43	3.17	2.93	3.23	3.08	3.07	3.19	2.79	1.12	
α_q	−0.11	−0.14	−0.08	−0.03	−0.01	−0.03	−0.09	−0.04	0.01	0.37	0.48	0.01
t_q	−1.14	−1.32	−1.00	−0.36	−0.20	−0.41	−1.33	−0.52	0.22	4.07	3.62	
α_{q^5}	−0.12	−0.17	−0.09	−0.07	−0.03	0.01	−0.08	−0.01	0.03	0.19	0.31	0.61
t_{q^5}	−1.17	−1.56	−0.98	−0.76	−0.34	0.09	−1.02	−0.20	0.38	2.16	2.17	
	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	−0.03	−0.35	−1.12	0.37	0.24		−0.80	−6.15	−12.03	4.18	2.41	0.44

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	0.45	0.58	0.51	0.56	0.60	0.15		2.28	3.38	3.05	3.20	2.96	1.11
Micro	0.69	0.91	0.98	1.03	0.83	0.14		2.21	3.35	3.57	3.68	2.84	1.40
Small	0.68	0.85	0.90	0.89	0.85	0.17		2.53	3.77	3.90	3.69	3.20	1.53
Big	0.44	0.57	0.49	0.54	0.58	0.15		2.29	3.33	2.95	3.16	2.91	1.07
	α_q ($p_{\text{GRS}} = 0.00$)							t_q					
All	−0.13	−0.06	−0.04	−0.05	0.25	0.38		−1.67	−0.83	−0.73	−0.96	3.86	3.40
Micro	0.08	0.20	0.24	0.32	0.21	0.13		0.60	2.06	1.99	2.80	2.03	1.33
Small	0.00	0.06	0.15	0.06	0.14	0.13		0.04	0.87	1.46	0.82	1.67	1.25
Big	−0.12	−0.06	−0.04	−0.05	0.25	0.37		−1.34	−0.77	−0.83	−0.94	3.85	3.08
	α_{q^5} ($p_{\text{GRS}} = 0.04$)							t_{q^5}					
All	−0.16	−0.08	−0.02	−0.04	0.13	0.29		−1.85	−1.10	−0.43	−0.65	2.01	2.44
Micro	0.11	0.21	0.27	0.35	0.17	0.07		0.76	2.20	2.30	3.19	1.64	0.60
Small	0.07	0.08	0.13	0.07	0.12	0.06		0.61	1.06	1.45	0.92	1.58	0.51
Big	−0.15	−0.08	−0.03	−0.04	0.13	0.29		−1.66	−1.01	−0.48	−0.63	1.99	2.26
	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	0.00	−0.20	−1.00	0.32	0.14		0.04	−4.60	−11.92	4.12	1.81		0.46
Micro	−0.02	0.01	−0.41	0.29	0.10		−0.91	0.31	−5.46	5.34	1.39		0.21
Small	−0.05	0.07	−0.48	0.37	0.11		−1.59	1.65	−7.06	5.77	1.53		0.25
Big	0.01	−0.15	−1.02	0.31	0.13		0.37	−3.29	−11.07	3.79	1.49		0.42

Table A3 : The Asness-Frazzini-Pedersen (2019) Safety Score Portfolios, January 1967–December 2018

The safety score is detailed in Appendix A.3. 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 use the Fama-French (1992) 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 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 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 safety score

	L	2	3	4	5	6	7	8	9	H	H−L		p_{GRS}
$\overline{R}$	0.31	0.46	0.57	0.48	0.49	0.52	0.59	0.66	0.60	0.51	0.20		
$t_{\overline{R}}$	0.97	1.81	2.52	2.25	2.66	2.70	3.17	3.53	3.21	2.98	0.96		
α_q	−0.30	−0.09	0.06	−0.06	0.01	0.06	0.11	0.18	0.21	0.09	0.39		0.00
t_q	−2.63	−0.96	0.77	−0.73	0.13	0.87	1.66	2.83	2.94	1.29	2.55		
α_{q^5}	−0.14	0.08	0.12	−0.02	0.01	0.08	0.06	0.14	0.05	0.02	0.16		0.15
t_{q^5}	−1.25	0.83	1.52	−0.22	0.12	1.06	0.95	2.02	0.71	0.30	1.05		
	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	−0.45	−0.48	−0.30	0.43	0.35		−9.33	−7.60	−2.92	4.26	3.55		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	0.38	0.50	0.49	0.62	0.56	0.18		1.37	2.34	2.68	3.39	3.23	1.08
Micro	0.40	0.80	0.80	0.91	0.79	0.40		1.05	2.53	2.78	3.33	3.17	2.36
Small	0.59	0.79	0.77	0.88	0.78	0.20		1.83	3.04	3.10	3.60	3.38	1.42
Big	0.37	0.47	0.47	0.60	0.55	0.18		1.39	2.23	2.63	3.34	3.20	1.11
			α_q ($p_{\text{GRS}}=0.00$)							t_q			
All	−0.19	−0.01	0.03	0.14	0.15	0.34		−2.18	−0.23	0.50	2.94	2.77	2.80
Micro	−0.04	0.25	0.13	0.28	0.23	0.27		−0.26	2.05	1.06	2.12	1.73	2.33
Small	−0.02	0.11	0.11	0.17	0.18	0.20		−0.22	1.59	1.62	2.15	2.27	1.80
Big	−0.18	−0.02	0.03	0.14	0.15	0.33		−1.75	−0.29	0.54	2.84	2.71	2.44
			α_{q^5} ($p_{\text{GRS}}=0.02$)							t_{q^5}			
All	−0.02	0.04	0.03	0.10	0.02	0.05		−0.25	0.77	0.57	1.90	0.49	0.41
Micro	0.04	0.28	0.17	0.29	0.26	0.22		0.25	2.33	1.42	2.21	1.91	1.89
Small	0.10	0.15	0.17	0.14	0.19	0.08		1.46	1.95	2.28	1.90	2.29	0.76
Big	0.00	0.04	0.03	0.10	0.02	0.02		0.05	0.68	0.54	1.84	0.42	0.13
	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	−0.39	−0.34	0.29	0.44		−8.41	−7.12	−4.81	3.85	5.23		0.59
Micro	−0.31	−0.29	0.03	0.62	0.07		−10.05	−5.95	0.38	8.82	0.96		0.57
Small	−0.30	−0.23	−0.09	0.40	0.18		−8.37	−3.07	−0.97	4.42	2.23		0.49
Big	−0.29	−0.24	−0.34	0.22	0.47		−7.35	−4.37	−4.51	2.83	4.93		0.44

Table A4 : The Asness-Frazzini-Pedersen (2019) Payout Score Portfolios, January 1967–December 2018

The payout score is detailed in Appendix A.3. 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 use the Fama-French (1992) 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. 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 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 payout score

	L	2	3	4	5	6	7	8	9	H	H−L		p_{GRS}
$\overline{R}$	0.22	0.57	0.47	0.48	0.54	0.63	0.58	0.67	0.58	0.70	0.47		
$t_{\overline{R}}$	0.84	2.49	2.17	2.29	2.88	3.52	3.22	4.06	3.50	4.14	2.79		
α_q	−0.06	0.30	0.13	0.04	0.01	0.04	0.00	0.03	−0.02	0.02	0.08		0.04
t_q	−0.74	3.10	1.75	0.58	0.05	0.63	0.06	0.43	−0.26	0.28	0.71		
α_{q^5}	−0.03	0.29	0.13	−0.01	0.04	0.05	−0.03	−0.11	−0.09	−0.12	−0.09		0.05
t_{q^5}	−0.26	3.24	1.62	−0.11	0.39	0.77	−0.48	−1.31	−1.38	−1.59	−0.67		
	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	−0.14	−0.21	1.05	0.16	0.26		−4.83	−4.16	15.86	2.56	2.86		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	0.40	0.48	0.58	0.60	0.63	0.23		1.68	2.31	3.25	3.62	3.89	1.62
Micro	0.30	0.83	1.01	1.05	1.04	0.74		0.85	2.66	3.49	3.81	4.08	4.88
Small	0.51	0.84	0.93	0.88	0.93	0.41		1.72	3.18	3.77	3.85	4.30	2.83
Big	0.44	0.45	0.55	0.58	0.61	0.17		1.86	2.24	3.13	3.52	3.77	1.21
	α_q ($p_{\text{GRS}}=0.00$)							t_q					
All	0.15	0.10	0.02	−0.01	0.00	−0.15		2.03	1.83	0.37	−0.12	−0.02	−1.57
Micro	−0.09	0.24	0.25	0.26	0.26	0.35		−0.60	1.85	2.11	2.37	2.53	2.73
Small	0.02	0.18	0.08	0.03	0.10	0.08		0.28	2.96	1.24	0.45	1.16	0.79
Big	0.22	0.10	0.02	−0.01	−0.01	−0.23		2.71	1.84	0.31	−0.23	−0.20	−2.28
	α_{q^5} ($p_{\text{GRS}}=0.00$)							t_{q^5}					
All	0.15	0.07	0.05	−0.11	−0.11	−0.26		2.01	1.22	0.77	−2.00	−1.95	−2.56
Micro	−0.02	0.29	0.27	0.30	0.24	0.26		−0.10	2.17	2.46	2.97	2.42	1.92
Small	0.10	0.16	0.15	0.06	0.06	−0.04		1.31	2.52	2.16	0.80	0.75	−0.40
Big	0.20	0.07	0.04	−0.12	−0.12	−0.32		2.52	1.13	0.67	−2.09	−2.07	−3.00
	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	−0.18	0.95	0.17	0.16		−4.81	−4.40	16.12	3.15	2.37		0.60
Micro	−0.21	−0.12	0.70	0.47	0.13		−5.99	−3.00	8.05	4.72	1.95		0.55
Small	−0.21	−0.22	0.92	0.23	0.18		−6.28	−3.10	11.32	2.43	2.46		0.62
Big	−0.09	−0.11	0.98	0.14	0.14		−3.87	−2.73	15.70	2.69	1.95		0.55

Table A5 : Buffett's Alpha, Using Compustat's Berkshire Returns Prior to September 1988, February 1968–December 2018

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 Table **??**. Panel A reports two versions of the AQR 6-factor regressions of Berkshire Hathaway's excess returns. For each sample period, the first two rows use the QMJ factor downloaded from the AQR Web site, and the next two rows use our reproduced QMJ factor (without the payout score) based on Asness, Frazzini, and Pedersen (2019). Panel B 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. All the t-values reported in the rows beneath the corresponding estimates are adjusted for heteroscedasticity and autocorrelations.

Panel A: The AQR 6-factor regressions of Berkshire excess returns

Sample	α	β_{Mkt}	β_{SMB}	β_{HML}	β_{UMD}	β_{BAB}	β_{QMJ}	R^2
11/76–3/17	0.52	0.92	−0.16	0.40	−0.03	0.25	0.38	0.27
	1.77	9.96	−1.27	3.18	−0.51	2.70	2.59	
	0.55	0.89	−0.15	0.43	−0.01	0.26	0.40	0.29
	1.95	10.82	−1.27	3.29	−0.22	2.87	2.73	
2/68–12/18	0.66	0.78	−0.10	0.32	0.01	0.25	0.28	0.18
	2.14	7.99	−0.58	2.09	0.09	2.41	1.82	
	0.65	0.76	−0.08	0.37	0.02	0.25	0.36	0.18
	2.15	8.71	−0.48	2.32	0.29	2.46	2.32	

Panel B: The q-factor and q^5 regressions of Berkshire excess returns

Sample	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}	R^2
11/76–3/17	1.57	0.53	0.86	−0.11	0.69	0.52		0.25
	4.77	1.81	9.66	−0.80	4.08	4.78		
		0.66	0.84	−0.12	0.73	0.58	−0.21	0.26
		2.02	9.33	−0.90	4.15	4.41	−1.02	
2/68–12/18	1.44	0.64	0.75	−0.03	0.58	0.42		0.17
	4.96	2.44	8.40	−0.21	3.61	3.46		
		0.77	0.73	−0.05	0.62	0.48	−0.20	0.18
		2.67	8.14	−0.30	3.79	3.48	−1.11	

Table A6 : The Size Premium After Controlling for Quality, Supplementary Results, January 1967–December 2018

Panel A shows one-way sorts into quintiles on the book equity (Be), sales (Sale), net property, plant, and equipment (Net PPE), and the number of employees (Emp). We report average excess returns ($\overline{R}$) and their t-values adjusted for heteroscedasticity and autocorrelations ($t_{\overline{R}}$) beneath the corresponding average returns. Panel B shows two-way sorts by interacting size with Roe and, separately, with the expected growth (Eg). Appendix A.1 details the measurement of Roe and Eg. All sorts are monthly with NYSE breakpoints, value-weighted returns, and 1-month holding period.

Panel A: One-way sorts

	S	2	3	4	B	S−B		S	2	3	4	B	S−B
Be	0.61	0.67	0.62	0.59	0.51	0.11	Sale	0.57	0.57	0.59	0.57	0.52	0.05
	1.96	2.55	2.70	2.87	3.05	0.52		1.86	2.37	2.67	2.89	3.13	0.25
Net	0.59	0.67	0.70	0.64	0.48	0.10	Emp	0.54	0.54	0.57	0.60	0.52	0.02
PPE	1.87	2.67	3.17	2.95	3.02	0.48		1.87	2.40	2.78	3.08	3.07	0.13

Panel B: Two-way sorts

	S	2	3	4	B	S−B	Ave.	S	2	3	4	B	S−B	Ave.
	$\overline{R}$							$t_{\overline{R}}$						
	Book equity and Roe													
L	−0.06	0.25	0.18	0.32	0.38	−0.44	0.21	−0.16	0.74	0.59	1.12	1.56	−1.86	0.74
2	0.40	0.52	0.72	0.49	0.42	−0.02	0.51	1.32	1.96	2.78	2.33	2.34	−0.11	2.23
3	0.63	0.54	0.69	0.53	0.47	0.16	0.57	2.20	2.18	3.08	2.51	2.71	0.81	2.67
4	0.82	0.73	0.70	0.64	0.59	0.23	0.69	2.75	2.99	3.11	3.01	3.39	1.13	3.18
H	1.18	1.03	0.72	0.74	0.56	0.62	0.85	3.90	3.76	3.00	3.58	3.12	3.03	3.73
H−L	1.24	0.78	0.54	0.43	0.17		0.63	7.61	3.90	3.14	2.45	1.03		4.51
Ave.	0.59	0.62	0.60	0.54	0.48	0.11		1.97	2.37	2.58	2.54	2.75	0.58	
	Book equity and the expected growth													
L	−0.03	0.15	0.03	0.18	0.17	−0.20	0.10	−0.10	0.49	0.10	0.64	0.70	−0.86	0.36
2	0.71	0.57	0.52	0.45	0.29	0.42	0.51	2.33	2.05	2.13	1.91	1.41	2.09	2.14
3	0.87	0.72	0.76	0.57	0.39	0.48	0.66	3.06	2.86	3.35	2.60	2.23	2.35	3.05
4	1.08	0.85	0.88	0.78	0.49	0.59	0.82	3.89	3.35	3.83	3.82	2.84	3.02	3.81
H	1.33	1.15	0.96	0.92	0.80	0.53	1.03	4.62	4.37	4.06	4.24	4.45	2.69	4.63
H−L	1.36	1.00	0.93	0.74	0.63		0.93	10.00	6.24	5.55	5.02	4.19		9.03
Ave.	0.79	0.69	0.63	0.58	0.43	0.36		2.70	2.66	2.68	2.66	2.36	1.99	
	Sales and Roe													
L	0.00	0.02	0.35	0.37	0.39	−0.38	0.22	0.01	0.06	1.12	1.41	1.59	−1.54	0.81
2	0.57	0.48	0.44	0.43	0.45	0.12	0.47	2.03	1.94	1.98	2.23	2.38	0.62	2.26
3	0.55	0.54	0.57	0.59	0.48	0.07	0.55	2.09	2.35	2.75	3.02	2.67	0.41	2.73
4	0.87	0.69	0.69	0.54	0.59	0.28	0.67	3.13	2.96	3.12	2.57	3.37	1.55	3.20
H	1.16	0.90	0.74	0.77	0.58	0.58	0.83	3.70	3.40	3.10	3.48	3.24	2.62	3.63
H−L	1.16	0.88	0.40	0.40	0.20		0.61	7.16	5.20	2.24	2.42	1.18		4.70
Ave.	0.63	0.53	0.56	0.54	0.50	0.13		2.18	2.18	2.47	2.69	2.79	0.75	
	Sales and the expected growth													
L	0.04	−0.16	0.18	0.25	0.14	−0.11	0.09	0.11	−0.52	0.60	0.88	0.60	−0.45	0.33
2	0.62	0.40	0.45	0.50	0.34	0.28	0.46	2.15	1.57	1.85	2.04	1.65	1.45	2.00
3	0.89	0.75	0.72	0.52	0.40	0.49	0.66	3.12	3.00	3.00	2.44	2.30	2.34	3.03
4	0.99	0.83	0.87	0.70	0.52	0.47	0.78	3.53	3.36	3.61	3.48	3.03	2.38	3.66
H	1.22	1.21	1.00	0.99	0.79	0.42	1.04	4.15	4.65	4.12	4.35	4.46	2.13	4.60
H−L	1.18	1.37	0.82	0.75	0.65		0.96	8.62	7.89	4.99	4.68	4.34		8.85
Ave.	0.75	0.61	0.65	0.59	0.44	0.31		2.59	2.42	2.67	2.71	2.44	1.71	

	S	2	3	4	B	S−B	Ave.	S	2	3	4	B	S−B	Ave.
	$\overline{R}$							$t_{\overline{R}}$						
	Net PPE and Roe													
L	−0.07	0.24	0.39	0.36	0.37	−0.44	0.26	−0.18	0.76	1.38	1.22	1.55	−1.70	0.92
2	0.44	0.57	0.46	0.53	0.43	0.01	0.49	1.43	2.20	1.96	2.36	2.43	0.04	2.18
3	0.58	0.64	0.63	0.59	0.46	0.12	0.58	2.03	2.57	2.77	2.54	2.78	0.55	2.71
4	0.76	0.69	0.68	0.76	0.54	0.22	0.69	2.68	2.83	3.14	3.59	3.19	1.10	3.23
H	1.11	0.87	0.97	0.66	0.55	0.56	0.83	3.61	3.46	4.15	2.92	3.12	2.50	3.74
H−L	1.17	0.63	0.58	0.30	0.18		0.57	7.17	3.65	3.48	1.65	1.02		4.33
Ave.	0.56	0.60	0.63	0.58	0.47	0.09		1.87	2.40	2.78	2.64	2.77	0.47	
	Net PPE and the expected growth													
L	−0.04	0.08	0.25	0.23	0.02	−0.06	0.11	−0.11	0.27	0.88	0.86	0.07	−0.24	0.40
2	0.57	0.45	0.63	0.36	0.33	0.24	0.47	1.89	1.77	2.65	1.58	1.59	1.18	2.07
3	0.85	0.81	0.59	0.48	0.41	0.44	0.63	3.00	3.31	2.61	2.18	2.42	2.04	2.97
4	1.07	0.90	0.82	0.74	0.46	0.60	0.80	3.81	3.60	3.83	3.55	2.77	3.00	3.84
H	1.27	1.13	1.06	0.93	0.76	0.51	1.03	4.27	4.48	4.71	4.01	4.44	2.35	4.70
H−L	1.31	1.05	0.81	0.70	0.74		0.92	10.08	6.76	5.40	4.44	4.16		9.27
Ave.	0.74	0.67	0.67	0.55	0.40	0.35		2.55	2.73	2.99	2.56	2.22	1.83	
	The number of employees and Roe													
L	0.01	0.06	0.26	0.28	0.37	−0.36	0.20	0.02	0.22	0.94	1.04	1.45	−1.43	0.73
2	0.52	0.38	0.51	0.43	0.50	0.02	0.47	1.98	1.76	2.66	2.22	2.57	0.09	2.41
3	0.50	0.57	0.59	0.59	0.49	0.01	0.55	2.00	2.67	2.93	3.38	2.66	0.06	2.91
4	0.84	0.62	0.50	0.64	0.58	0.26	0.63	3.23	2.69	2.24	3.13	3.29	1.50	3.11
H	1.07	0.89	0.80	0.84	0.57	0.50	0.83	3.59	3.48	3.44	3.69	3.19	2.44	3.72
H−L	1.06	0.83	0.54	0.55	0.20		0.64	6.76	4.60	3.34	3.16	1.16		4.91
Ave.	0.58	0.51	0.53	0.56	0.50	0.08		2.16	2.24	2.55	2.82	2.77	0.51	
	The number of employees and the expected growth													
L	−0.08	0.01	0.01	0.25	0.15	−0.23	0.07	−0.22	0.03	0.03	0.93	0.62	−0.95	0.25
2	0.62	0.37	0.54	0.58	0.29	0.33	0.48	2.22	1.42	2.09	2.38	1.45	1.74	2.07
3	0.95	0.57	0.70	0.54	0.39	0.56	0.63	3.31	2.18	2.95	2.50	2.21	2.60	2.90
4	0.85	0.82	0.82	0.83	0.50	0.35	0.76	3.02	3.36	3.56	3.89	2.95	1.74	3.64
H	1.26	1.27	0.97	0.96	0.80	0.46	1.05	4.38	5.15	4.16	4.07	4.51	2.34	4.77
H−L	1.34	1.26	0.96	0.72	0.65		0.99	9.02	6.99	6.19	4.47	4.14		9.07
Ave.	0.72	0.61	0.61	0.63	0.43	0.29		2.53	2.46	2.58	2.89	2.38	1.62	

Table A7 : The Bartram-Grinblatt (2015, 2018) Agnostic Fundamental Portfolios, with the $5 Price Screen, January 1977–December 2018

Appendix **??** details the agnostic fundamental measure, $(V-P)/P$, which 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 $t+1$. $(V-P)/P$ is the value-weighted average of the agnostic measure for each portfolio. 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}
$(V-P)/P$	−1.35	−0.43	−0.19	−0.01	0.17	0.38	0.64	0.98	1.56	3.77	5.12	
Book-to-market	0.53	0.36	0.40	0.51	0.59	0.63	0.69	0.74	0.82	1.03	0.49	
$\overline{R}$	0.46	0.63	0.50	0.60	0.79	0.81	0.85	0.88	0.93	1.09	0.63	
$t_{\overline{R}}$	1.68	2.57	2.50	3.46	3.89	3.95	3.66	3.73	3.51	3.74	3.41	
α_q	−0.05	0.06	−0.07	0.16	0.19	0.19	0.16	0.15	0.19	0.32	0.37	0.01
t_q	−0.43	0.42	−0.88	1.60	2.24	1.88	1.08	1.09	1.20	1.94	1.82	
α_{q^5}	0.05	0.00	−0.13	0.06	0.12	0.22	0.23	0.24	0.27	0.43	0.38	0.03
t_{q^5}	0.44	0.00	−1.72	0.48	1.25	2.24	1.42	1.75	1.80	2.92	1.99	
	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	0.01	0.37	0.68	−0.10	−0.02		0.09	3.24	5.24	−0.68	−0.15	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
	$(V-P)/P$							Book-to-market					
All	−0.69	−0.10	0.26	0.78	2.41	3.10		0.40	0.46	0.61	0.71	0.90	0.49
Micro	−2.58	−0.09	0.31	0.88	3.36	5.94		0.84	0.62	0.63	0.70	0.98	0.14
Small	−1.17	−0.09	0.30	0.82	2.39	3.55		0.56	0.48	0.57	0.70	0.94	0.38
Big	−0.62	−0.10	0.25	0.77	2.00	2.62		0.39	0.46	0.61	0.72	0.90	0.51
	$\overline{R}$							$t_{\overline{R}}$					
All	0.61	0.55	0.79	0.87	0.99	0.37		2.47	3.05	4.01	3.77	3.65	1.86
Micro	0.27	0.53	0.75	0.81	1.08	0.81		0.73	1.44	2.28	2.78	3.87	3.70
Small	0.56	0.82	0.83	0.99	1.03	0.47		1.67	2.96	3.10	3.79	3.58	2.26
Big	0.64	0.55	0.79	0.86	1.01	0.37		2.59	3.09	4.10	3.79	3.72	1.70
	α_q ($p_{\text{GRS}} = 0.00$)							t_q					
All	0.09	0.06	0.18	0.17	0.24	0.15		0.74	0.88	2.57	1.20	1.52	0.60
Micro	−0.22	−0.19	−0.06	−0.09	0.23	0.45		−1.17	−0.78	−0.29	−0.63	1.64	1.96
Small	0.00	0.06	0.00	0.13	0.18	0.18		0.02	0.74	0.04	1.08	1.16	0.73
Big	0.14	0.07	0.20	0.22	0.39	0.25		1.06	1.03	2.87	1.44	2.08	0.88
	α_{q^5} ($p_{\text{GRS}} = 0.00$)							t_{q^5}					
All	0.07	−0.04	0.15	0.24	0.32	0.25		0.69	−0.57	2.03	1.75	2.29	1.10
Micro	−0.28	−0.13	−0.10	−0.11	0.30	0.58		−1.53	−0.49	−0.53	−0.87	2.36	2.80
Small	0.05	0.05	0.03	0.16	0.27	0.21		0.45	0.53	0.34	1.41	1.98	0.98
Big	0.14	−0.03	0.17	0.31	0.44	0.31		1.10	−0.46	2.19	1.94	2.44	1.14
	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	0.31	0.73	−0.18	−0.15		0.86	1.52	3.89	−1.04	−1.19		0.19
Micro	−0.02	−0.18	0.64	0.41	−0.19		−0.35	−1.70	4.29	2.94	−1.28		0.15
Small	−0.01	−0.33	0.98	0.14	−0.06		−0.11	−1.98	5.67	0.70	−0.38		0.25
Big	0.11	0.09	0.62	−0.27	−0.09		1.49	0.46	3.30	−1.49	−0.61		0.11

Table A8 : The Penman-Zhu (2018) Fundamental Portfolios, Monthly Formed, May 1982–December 2018

Appendix A.4 details the Penman-Zhu monthly estimated fundamental measure. In Panel A, at the beginning of each month t, we sort stocks into deciles based on the NYSE breakpoints of the Penman-Zhu 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 Penman-Zhu 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 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 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 Penman-Zhu measure

	L	2	3	4	5	6	7	8	9	H	H−L		p_{GRS}
$\overline{R}$	0.32	0.57	0.63	0.63	0.75	0.88	0.69	0.80	0.87	0.88	0.56		
$t_{\overline{R}}$	1.03	2.28	2.76	2.88	3.62	4.42	3.34	4.15	4.12	3.19	3.09		
α_q	−0.27	−0.19	−0.12	−0.19	−0.02	0.11	0.06	0.15	0.17	0.38	0.65		0.02
t_q	−2.06	−1.86	−1.20	−1.70	−0.19	1.27	0.64	1.81	1.88	2.46	3.19		
α_{q^5}	0.06	−0.09	−0.11	−0.10	−0.07	0.05	−0.04	0.03	0.02	0.16	0.10		0.91
t_{q^5}	0.47	−0.83	−0.99	−1.02	−0.70	0.58	−0.53	0.38	0.23	1.06	0.52		
	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	0.04	−0.37	−0.03	−0.32	0.84		0.74	−5.93	−0.23	−2.85	6.91		0.24

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

	L	2	3	4	H	H−L		L	2	3	4	H	H−L
	$\overline{R}$							$t_{\overline{R}}$					
All	0.43	0.62	0.81	0.75	0.87	0.43		1.60	2.98	4.12	3.91	3.78	3.13
Micro	0.29	0.90	1.07	1.11	1.05	0.76		0.73	2.79	3.66	3.68	3.18	5.31
Small	0.56	0.83	1.07	0.99	0.96	0.40		1.61	2.99	4.01	3.86	3.21	2.77
Big	0.48	0.61	0.80	0.74	0.86	0.38		1.83	2.96	4.10	3.89	3.78	2.69
	α_q ($p_{\text{GRS}} = 0.00$)							t_q					
All	−0.23	−0.17	0.04	0.10	0.29	0.52		−2.67	−2.19	0.63	1.62	3.04	3.66
Micro	−0.12	0.26	0.43	0.44	0.44	0.56		−0.58	1.77	3.38	4.22	3.34	3.59
Small	−0.05	−0.03	0.25	0.18	0.18	0.24		−0.52	−0.25	2.79	1.94	1.63	1.55
Big	−0.21	−0.18	0.03	0.10	0.30	0.51		−2.27	−2.27	0.39	1.54	3.02	3.42
	α_{q^5} ($p_{\text{GRS}} = 0.00$)							t_{q^5}					
All	−0.03	−0.12	−0.02	−0.01	0.09	0.12		−0.31	−1.48	−0.25	−0.15	0.95	0.86
Micro	−0.00	0.21	0.36	0.35	0.40	0.41		−0.01	1.49	2.62	3.33	2.81	2.61
Small	0.16	−0.03	0.21	0.11	0.09	−0.07		1.57	−0.35	2.42	1.21	0.87	−0.47
Big	−0.01	−0.13	−0.03	−0.01	0.10	0.11		−0.06	−1.52	−0.45	−0.17	1.03	0.75
	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	−0.01	−0.30	0.02	−0.23	0.62		−0.32	−6.53	0.27	−3.42	7.18		0.29
Micro	−0.08	0.03	0.28	0.24	0.24		−1.87	0.51	2.82	2.85	2.85		0.25
Small	−0.03	−0.12	0.34	0.08	0.47		−0.67	−1.40	3.57	0.70	5.34		0.30
Big	−0.02	−0.25	−0.01	−0.30	0.62		−0.42	−4.77	−0.15	−4.29	6.29		0.21