The Investment CAPM: An Update

Lu Zhang

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A new class of capital asset pricing models arises from the first principle of real investment for individual firms

Three defining characteristics of neoclassical economics:

- Rational expectations
- Consumers maximize utility, and firms maximize market value
- Markets clear

A representative household maximizes:

$$U(C_t) + \rho E_t[U(C_{t+1})]$$

subject to:

$$\begin{aligned} C_t + \sum_i P_{it} S_{it+1} &= \sum_i (P_{it} + D_{it}) S_{it} \\ C_{t+1} &= \sum_i (P_{it+1} + D_{it+1}) S_{it+1} \end{aligned}$$

The first principle of consumption:

$$E_t[M_{t+1} r^S_{it+1}] = 1 \quad \Rightarrow \quad \overbrace{E_t[r^S_{it+1}] - r_{ft} = \beta^M_{it} \lambda_{Mt}}^{\textbf{The Consumption CAPM}}$$

An individual firm i maximizes:

$$P_{it} + D_{it} \equiv \max_{\{I_{it}\}} \left[\Pi_{it} K_{it} - I_{it} - \frac{a}{2} \left(\frac{I_{it}}{K_{it}} \right)^2 K_{it} + E_t \left[M_{t+1} \Pi_{it+1} K_{it+1} \right] \right]$$

The first principle of investment:

$$1 = E_t \left[M_{t+1} \frac{\Pi_{it+1}}{1 + a(I_{it}/K_{it})} \right]$$

$$\frac{P_{it+1} + D_{it+1}}{P_{it}} \equiv \underbrace{r^S_{it+1} = \frac{\Pi_{it+1}}{1 + a(I_{it}/K_{it})}}_{\text{The Investment CAPM}}$$

The investment CAPM: Cross-sectionally varying expected returns

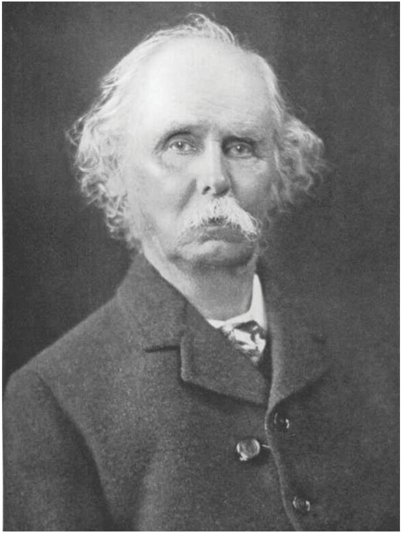
The consumption CAPM and the investment CAPM deliver identical expected returns in general equilibrium:

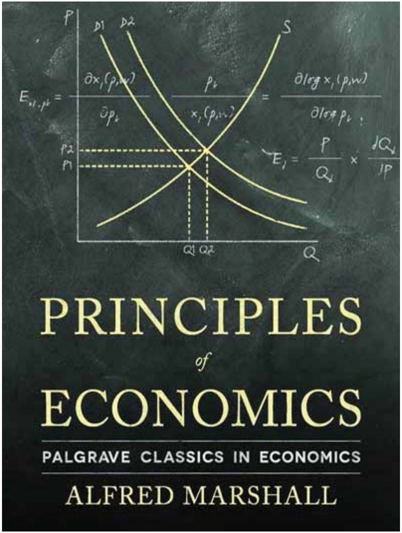
$$r_{ft} + \beta_{it}^{M} \lambda_{Mt} = E_t[r_{it+1}^{S}] = \frac{E_t[\Pi_{it+1}]}{1 + a(I_{it}/K_{it})}$$

- Consumption: Covariances are sufficient statistics of $E_t[r_{it+1}^{S}]$
- Investment: Characteristics are sufficient statistics of $E_t[r_{it+1}^{S}]$

The investment CAPM: The supply theory of asset pricing

Marshall's "scissors:" Marshall (1890, Principles of Economics)





Ricardo and Mill: Costs of production determine value, but Jevons, Menger, and Walras: Marginal utility determines value

- The water versus diamond example

"We might as reasonably dispute whether it is the upper or under blade of a pair of scissors that cuts a piece of paper, as whether value is governed by utility or costs of production. It is true that when one blade is held still, and the cutting is affected by moving the other, we may say with careless brevity that the cutting is done by the second; but the statement is not strictly accurate, and . . . not a strictly scientific account of what happens (Marshall 1890 [1961, 9th edition, p. 348], my emphasis)."

Individual maximization does not imply collective rationality, and collective maximization does not imply individual rationality

The response of the representative consumer to a parameter change might not be the same as the aggregate response of individuals

It is possible for the representative to exhibit preference orderings that are opposite to all the individuals'.

The aggregate behavior of rational individuals might exhibit complicated dynamics, and imposing these dynamics on one individual can lead to unnatural characteristics of the individual

The Sonnenschein-Mantel-Debreu theorem: The aggregate excess demand function is not restricted by the standard rationality assumption on individual demands

- The blunt "blade:" The consumption CAPM is not testable
- Aggregation means consumption growth is not even a factor

Derived for individual firms, the investment CAPM is immune to the aggregation problem, more empirically tractable

Characteristics-based factors as fundamental as macro factors

Outline

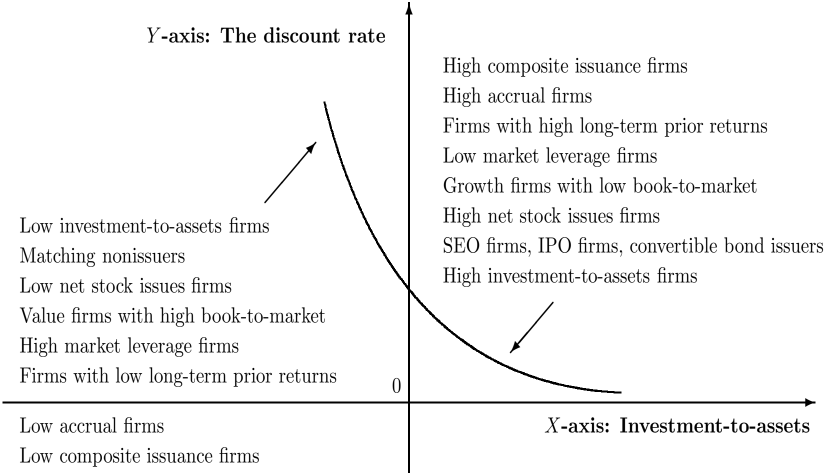
1. The q-factor Model
2. The q^5-model
3. Stress-testing Factor Models
4. Individual Factor Regressions

A factor implementation of the investment CAPM:

$$E[R_i - R_f] = \beta^i_{\text{MKT}}\, E[\text{MKT}] + \beta^i_{\text{Me}}\, E[R_{\text{Me}}] + \beta^i_{\text{I/A}}\, E[R_{\text{I/A}}] + \beta^i_{\text{Roe}}\, E[R_{\text{Roe}}]$$

- MKT, R_{Me}, $R_{\text{I/A}}$, and R_{Roe} are the market, size, investment, and profitability (return on equity, Roe) factors, respectively
- β^i_{MKT}, β^i_{Me}, $\beta^i_{\text{I/A}}$, and β^i_{Roe} are factor loadings

The q-factor model largely summarizes the cross section of average stock returns, capturing most (but not all) anomalies that plague the Fama-French 3-factor model and Carhart 4-factor model


Y-axis: The discount rate
High composite issuance firms
High accrual firms
Firms with high long-term prior returns
Low market leverage firms
Growth firms with low book-to-market
High net stock issues firms
SEO firms, IPO firms, convertible bond issuers
High investment-to-assets firms
Low investment-to-assets firms
Matching nonissuers
Low net stock issues firms
Value firms with high book-to-market
High market leverage firms
Firms with low long-term prior returns
0
Low accrual firms
Low composite issuance firms
X-axis: Investment-to-assets

High Roe relative to low investment means high discount rates:

- Suppose the discount rates were low
- Combined with high Roe, low discount rates would imply high net present values of new projects and high investment
- Discount rates must be high to offset high Roe to induce low investment

Price and earnings momentum winners and less financially distressed firms have higher Roe and earn higher expected returns

The Fama-French 5-factor model:

$$E[R_{it} - R_{ft}] = b_i\, E[\mathrm{MKT}_t] + s_i\, E[\mathrm{SMB}_t] + h_i\, E[\mathrm{HML}_t] + r_i\, E[\mathrm{RMW}_t] + c_i\, E[\mathrm{CMA}_t]$$

- $\mathrm{MKT}_t, \mathrm{SMB}_t, \mathrm{HML}_t, \mathrm{RMW}_t$, and CMA_t are the market, size, value, profitability, and investment factors, respectively
- b_i, s_i, h_i, r_i, and c_i are factor loadings

Fama and French (2018) add UMD to form the six-factor model

The q-factor Model

The q-factor model predates the Fama-French five-factor model by 3–6 years

Neoclassical factors	July 2007
An equilibrium three-factor model	January 2009
Production-based factors	April 2009
A better three-factor model that explains more anomalies	June 2009
An alternative three-factor model	April 2010, April 2011
Digesting anomalies: An investment approach	October 2012, August 2014
Fama and French (2013): A four-factor model for the size, value, and profitability patterns in stock returns	June 2013
Fama and French (2014): A five-factor asset pricing model	November 2013, September 2014

	$\overline{R}$	α	β_{MKT}	β_{SMB}	β_{HML}	β_{RMW}	β_{CMA}	β_{UMD}
R_{Me}	0.31	0.05	0.01	0.97	0.03	0.03	0.02	
	(2.43)	(1.58)	(0.72)	(64.99)	(1.63)	(0.98)	(0.72)	
		0.03	0.01	0.97	0.05	0.04	0.01	0.03
		(0.90)	(1.21)	(68.50)	(2.81)	(1.34)	(0.34)	(2.57)
$R_{\text{I/A}}$	0.41	0.12	0.01	0.04	0.03	0.06	0.82	
	(4.92)	(3.48)	(0.80)	(3.08)	(1.32)	(2.46)	(31.26)	
		0.11	0.01	0.05	0.04	0.06	0.81	0.01
		(3.15)	(0.97)	(3.06)	(1.79)	(2.21)	(33.12)	(0.77)
R_{Roe}	0.55	0.47	0.03	0.12	0.24	0.70	0.10	
	(5.25)	(5.91)	(1.18)	(2.98)	(3.72)	12.80	1.03	
		0.30	0.00	0.12	0.10	0.65	0.01	0.24
		(4.50)	0.03	(3.74)	(2.02)	(14.77)	(0.21)	(9.94)

Hou, Mo, Xue, and Zhang (2018a): Factor spanning tests, 1/1967–12/2016

	$\overline{R}$	α_q	β_{MKT}	β_{ME}	$\beta_{\text{I/A}}$	β_{ROE}
SMB	0.25	0.04	0.01	0.94	0.08	0.09
	(1.92)	(1.32)	(0.66)	(54.18)	(4.21)	(5.84)
HML	0.37	0.07	0.04	0.02	1.01	0.19
	(2.71)	(0.63)	(1.01)	(0.31)	(12.18)	(2.65)
RMW	0.26	0.01	0.03	0.12	0.03	0.54
	(2.53)	(0.11)	(1.21)	(1.70)	(0.35)	(8.53)
CMA	0.33	−0.00	0.04	0.04	0.96	0.10
	(3.51)	(0.13)	(3.74)	(1.90)	(34.93)	(3.48)
UMD	0.64	0.11	0.08	0.24	0.00	0.91
	(3.60)	(0.49)	(1.24)	(1.73)	(0.02)	(5.88)

The *q*-factors subsume RMW, CMA, and UMD in the six-factor model, which in turn cannot subsume the *q*-factors

Augmenting the q-factor model with an expected growth factor:

$$E[R_i - R_f] = \beta^i_{\mathrm{MKT}} E[\mathrm{MKT}] + \beta^i_{\mathrm{Me}} E[R_{\mathrm{Me}}] + \beta^i_{\mathrm{I/A}} E[R_{\mathrm{I/A}}] + \beta^i_{\mathrm{Roe}} E[R_{\mathrm{Roe}}] + \beta^i_{\mathrm{Eg}} E[R_{\mathrm{Eg}}]$$

- R_{Eg} the expected growth factor, and β^i_{Eg} its factor loading

The q^5-model improves on the q-factor model substantially

Recall in the static investment framework:

$$r^S_{it+1} = \frac{\Pi_{it+1}}{1 + a(I_{it}/K_{it})}$$

In the multiperiod investment framework:

$$r^S_{it+1} = \frac{\Pi_{it+1} + (a/2)\left(I_{it+1}/A_{it+1}\right)^2 + (1-\delta)\left[1 + a\left(I_{it+1}/A_{it+1}\right)\right]}{1 + a\left(I_{it}/A_{it}\right)}$$

The "capital gain" component is roughly proportional to investment-to-assets growth, $\left(I_{it+1}/A_{it+1}\right)/\left(I_{it}/A_{it}\right)$

Forecast $d^{\tau}I/A$, τ-year ahead investment-to-assets changes, via monthly cross-sectional regressions

Motivating predictors based on a priori conceptual arguments:

- Tobin's q: Erickson and Whited (2000)
- Operating cash flows: Fazzari, Hubbard, and Petersen (1988)
- Change in return on equity: Liu, Whited, and Zhang (2009)

τ	$\log(q)$	Cop	dRoe	R^2	Pearson	Rank
1	−0.03	0.53	0.80	6.64	0.14	0.21
	(−5.86)	(12.82)	(7.75)		[0.00]	[0.00]
2	−0.08	0.72	0.93	8.88	0.16	0.23
	(−10.09)	(12.58)	(10.25)		[0.00]	[0.00]
3	−0.09	0.76	0.74	9.18	0.16	0.22
	(−12.14)	(12.20)	(8.62)		[0.00]	[0.00]

The q^5-model

An expected growth factor, R_{Eg}, from independent 2×3 sorts on size and $E_t[\text{d}^1\text{I/A}]$

$\overline{R}_{\text{Eg}}$	α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	R^2
0.82	0.63	−0.10	−0.09	0.25	0.30	0.48
(9.81)	(9.11)	(−6.17)	(−3.47)	(6.26)	(9.43)	

α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	$\beta_{\log(q)}$	R^2
0.63	−0.11	−0.09	0.27	0.30	−0.02	0.48
(9.15)	(−6.20)	(−3.54)	(6.00)	(9.05)	(−0.50)	

α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Cop}	R^2
0.36	−0.03	−0.02	0.32	0.15	0.57	0.66
(6.09)	(−1.84)	(−0.70)	(10.36)	(5.07)	(10.41)	

α	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{dRoe}	R^2
0.59	−0.11	−0.09	0.22	0.23	0.15	0.49
(8.06)	(−6.44)	(−3.86)	(4.81)	(5.20)	(2.43)	

158 significant anomalies from Hou, Xue, and Zhang (2017)

- Momentum: 36
- Value-versus-growth: 29
- Investment: 28
- Profitability: 35
- Intangibles: 26
- Trading frictions: 4

7 competing factor models:

- The q-factor model, the q^5-model
- The Fama-French five-factor model, the six-factor model, an alternative six-factor model with RMWc
- The Stambaugh-Yuan four-factor model
- The Barillas-Shanken six-factor model: MKT, SMB, $R_{\mathrm{I/A}}$, R_{Roe}, the Asness-Frazzini monthly formed HML, UMD

Panel A: Momentum (36)

Sue1	Earnings surprise (1-month holding period), Foster, Olsen, and Shevlin (1984)	Abr1	Cumulative abnormal returns around earnings announcements (1-month holding period), Chan, Jegadeesh, and Lakonishok (1996)
Abr6	Cumulative abnormal returns around earnings announcements (6-month holding period), Chan, Jegadeesh, and Lakonishok (1996)	Abr12	Cumulative abnormal returns around earnings announcements (12-month holding period), Chan, Jegadeesh, and Lakonishok (1996)
Re1	Revisions in analysts' forecasts (1-month holding period), Chan, Jegadeesh, and Lakonishok (1996)	Re6	Revisions in analysts' forecasts (6-month holding period), Chan, Jegadeesh, and Lakonishok (1996)
$R^6 1$	Price momentum (6-month prior returns, 1-month holding period), Jegadeesh and Titman (1993)	$R^6 6$	Price momentum (6-month prior returns, 6-month holding period), Jegadeesh and Titman (1993)
$R^6 12$	Price momentum (6-month prior returns, 12-month holding period), Jegadeesh and Titman (1993)	$R^{11} 1$	Price momentum (11-month prior returns, 1-month holding period), Fama and French (1996)

$R^{11}6$	Price momentum, (11-month prior returns, 6-month holding period), Fama and French (1996)
Im1	Industry momentum, (1-month holding period), Moskowitz and Grinblatt (1999)
Im6	Industry momentum (6-month holding period), Moskowitz and Grinblatt (1999)
Im12	Industry momentum (12-month holding period), Moskowitz and Grinblatt (1999)
Rs1	Revenue surprise (1-month holding period), Jegadeesh and Livnat (2006)
dEf1	Analysts' forecast change (1-month hold period), Hawkins, Chamberlin, and Daniel (1984)
dEf6	Analysts' forecast change (6-month hold period), Hawkins, Chamberlin, and Daniel (1984)
dEf12	Analysts' forecast change (12-month hold period), Hawkins, Chamberlin, and Daniel (1984)
Nei1	# of consecutive quarters with earnings increases (1-month holding period), Barth, Elliott, and Finn (1999)
52w6	52-week high (6-month holding period), George and Hwang (2004)
$\epsilon^6 6$	Six-month residual momentum (6-month holding period), Blitz, Huij, and Martens (2011)
$\epsilon^6 12$	Six-month residual momentum (12-month holding period), Blitz, Huij, and Martens (2011)

$\epsilon^{11}1$	11-month residual momentum, 1-month, Blitz, Huij, and Martens (2011)
$\epsilon^{11}12$	11-month residual momentum, 12-month, Blitz, Huij, and Martens (2011)
Ilr1	Industry lead-lag effect in prior returns, 1-month, Hou (2007)
Ilr12	Industry lead-lag effect in prior returns, 12-month, Hou (2007)
Cm1	Customer momentum, 1-month Cohen and Frazzini (2008)
Sim1	Supplier industries momentum, 1-month, Menzly and Ozbas (2010)
Cim6	Customer industries momentum, 6-month, Menzly and Ozbas (2010)
$\epsilon^{11}6$	11-month residual momentum, 6-month, Blitz, Huij, and Martens (2011)
Sm1	Segment momentum 1-month, Cohen and Lou (2012)
Ilr6	Industry lead-lag effect in prior returns, 6-month, Hou (2007)
Ile1	Industry lead-lag effect in earnings news, 1-month, Hou (2007)
Cm12	Customer momentum, 12-month Cohen and Frazzini (2008)
Cim1	Customer industries momentum, 1-month, Menzly and Ozbas (2010)
Cim12	Customer industries momentum, 12-month, Menzly and Ozbas (2010)

Panel B: Value-versus-growth (29)

Bm	Book-to-market equity, Rosenberg, Reid, and Lanstein (1985)	Bmj	Book-to-June-end market equity, Asness and Frazzini (2013)
Bm^q12	Quarterly Book-to-market equity (12-month holding period)	Rev6	Reversal (6-month holding period), De Bondt and Thaler (1985)
Rev12	Reversal (12-month holding period) De Bondt and Thaler (1985)	Ep	Earnings-to-price, Basu (1983)
Ep^q1	Quarterly earnings-to-price (1-month holding period)	Ep^q6	Quarterly earnings-to-price (6-month holding period)
Ep^q12	Quarterly earnings-to-price (12-month holding period)	Cp	Cash flow-to-price, Lakonishok, Shleifer, and Vishny (1994)
Cp^q1	Quarterly Cash flow-to-price (1-month holding period)	Cp^q6	Quarterly Cash flow-to-price (6-month holding period)
Cp^q12	Quarterly Cash flow-to-price (12-month holding period)	Nop	Net payout yield, Boudoukh, Michaely, Richardson, and Roberts (2007)
Em	Enterprise multiple, Loughran and Wellman (2011)	Em^q1	Quarterly enterprise multiple (1-month holding period)

Em^{q}6	Quarterly enterprise multiple (6-month holding period)
Sp	Sales-to-price, Barbee, Mukherji, and Raines (1996)
Sp^{q}6	Quarterly sales-to-price (6-month holding period)
Ocp	Operating cash flow-to-price, Desai, Rajgopal, and Venkatachalam (2004)
Ir	Intangible return, Daniel and Titman (2006)
Vfp	Analysts-based intrinsic value-to-market, Frankel and Lee (1998)
Dur	Equity duration, Dechow, Sloan, and Soliman (2004)
Em^{q}12	Quarterly enterprise multiple (12-month holding period)
Sp^{q}1	Quarterly sales-to-price (1-month holding period)
Sp^{q}12	Quarterly sales-to-price (12-month holding period)
Ocp^{q}1	Operating cash flow-to-price (1-month holding period)
Vhp	Intrinsic value-to-market, Frankel and Lee (1998)
Ebp	Enterprise book-to-price, Penman, Richardson, and Tuna (2007)

Panel C: Investment (28)

Aci	Abnormal corporate investment, Titman, Wei, and Xie (2004)	I/A	Investment-to-assets, Cooper, Gulen, and Schill (2008)
Ia^q6	Quarterly investment-to-assets (6-month holding period)	Ia^q12	Quarterly investment-to-assets (12-month holding period)
dPia	(Changes in PPE and inventory)/assets, Lyandres, Sun, and Zhang (2008)	Noa	Net operating assets, Hirshleifer, Hou, Teoh, and Zhang (2004)
dNoa	Changes in net operating assets, Hirshleifer, Hou, Teoh, and Zhang (2004)	dLno	Change in long-term net operating assets, Fairfield, Whisenant, and Yohn (2003)
Ig	Investment growth, Xing (2008)	2Ig	Two-year investment growth, Anderson and Garcia-Feijoo (2006)
Nsi	Net stock issues, Pontiff and Woodgate (2008)	dIi	% change in investment− % change in industry investment, Abarbanell and Bushee (1998)
Cei	Composite equity issuance, Daniel and Titman (2006)	Ivg	Inventory growth, Belo and Lin (2011)

Ivc	Inventory changes, Thomas and Zhang (2002)	Oa	Operating accruals, Sloan (1996)
dWc	Change in net non-cash working capital, Richardson, Sloan, Soliman, and Tuna (2005)	dCoa	Change in current operating assets, Richardson, Sloan, Soliman, and Tuna (2005)
dNco	Change in net non-current operating assets, Richardson, Sloan, Soliman, and Tuna (2005)	dNca	Change in non-current operating assets, Richardson, Sloan, Soliman, and Tuna (2005)
dFin	Change in net financial assets, Richardson, Sloan, Soliman, and Tuna (2005)	dFnl	Change in financial liabilities, Richardson, Sloan, Soliman, and Tuna (2005)
dBe	Change in common equity, Richardson, Sloan, Soliman, and Tuna (2005)	Dac	Discretionary accruals, Xie (2001)
Poa	Percent operating accruals, Hafzalla, Lundholm, and Van Winkle (2011)	Pta	Percent total accruals, Hafzalla, Lundholm, and Van Winkle (2011)
Pda	Percent discretionary accruals	Ndf	Net debt finance, Bradshaw, Richardson, and Sloan (2006)

Panel D: Profitability (35)

Roe1	Return on equity, 1-month, Hou, Xue, and Zhang (2015)	Roe6	Return on equity, 6-month, Hou, Xue, and Zhang (2015)
dRoe1	Change in Roe, 1-month horizon	dRoe6	Change in Roe, 6-month horizon
dRoe12	Change in Roe, 12-month horizon	Roa1	Return on assets, 1-month horizon, Balakrishnan, Bartov, and Faurel (2010)
dRoa1	Change in Roa, 1-month horizon	dRoa6	Change in Roa, 6-month horizon
Rna^q1	Return on net operating assets, 1-month horizon	Rna^q6	Return on net operating assets, 6-month horizon
Ato^q1	Quarterly asset turnover, 1-month horizon	Ato^q6	Quarterly asset turnover, 6-month horizon
Ato^q12	Quarterly asset turnover, 12-month horizon	Cto^q1	Quarterly capital turnover, 1-month horizon
Cto^q6	Quarterly capital turnover, 6-month horizon	Cto^q12	Quarterly capital turnover, 12-month horizon
Gpa	Gross profits-to-assets, Novy-Marx (2013)	Gla^q1	Gross profits-to-lagged assets, 1-month horizon

Stress Tests

Hou, Mo, Xue, and Zhang (2018b): Testing deciles, profitability

Gla^{q}6	Gross profits-to-lagged assets, 6-month horizon
Ole^{q}1	Operating profits-to-lagged equity, 1-month horizon
Opa	Operating profits-to-assets, Ball, Gerakos, Linnainmaa, and Nikolaev (2015)
Ola^{q}6	Operating profits-to-lagged assets, 6-month horizon
Cop	Cash-based operating profitability, Ball, Gerakos, Linnainmaa, and Nikolaev (2016)
Cla^{q}1	Cash-based operating profits-to-lagged assets, 1-month horizon
Cla^{q}12	Cash-based operating profits-to-lagged assets, 12-month horizon
F^{q}6	Quarterly F-score, 6-month horizon
Fp^{q}6	Failure probability, 6-month horizon, Campbell, Hilscher, and Szilagyi (2008)
Gla^{q}12	Gross profits-to-lagged assets, 12-month horizon
Ole^{q}6	Operating profits-to-lagged equity , 6-month horizon
Ola^{q}1	Operating profits-to-lagged assets, 1-month horizon
Ola^{q}12	Operating profits-to-lagged assets, 12-month horizon
Cla	Cash-based operating profits-to-lagged assets
Cla^{q}6	Cash-based operating profits-to-lagged assets, 6-month horizon
F^{q}1	Quarterly F-score, 1-month horizon
F^{q}12	Quarterly F-score, 12-month horizon

Panel E: Intangibles (26)

Oca	Organizational capital-to-assets, Eisfeldt and Papanikolaou (2013)	Ioca	Industry-adjusted organizational capital-to-assets, Eisfeldt and Papanikolaou (2013)
Adm	Advertising expense-to-market, Chan, Lakonishok, and Sougiannis (2001)	Rdm	R&D-to-market, Chan, Lakonishok, and Sougiannis (2001)
Rdm^q1	Quarterly R&D-to-market, 1-month horizon	Rdm^q6	Quarterly R&D-to-market, 6-month horizon
Rdm^q12	Quarterly R&D-to-market, 12-month horizon	Ol	Operating leverage, Novy-Marx (2011)
Ol^q1	Quarterly operating leverage, 1-month horizon	Ol^q6	Quarterly operating leverage, 6-month horizon
Ol^q12	Quarterly operating leverage, 12-month horizon	Hs	Industry concentration (sales), Hou and Robinson (2006)
Etr	Effective tax rate, Abarbanell and Bushee (1998)	Rer	Real estate ratio, Tuzel (2010)
Eprd	Earnings predictability, Francis, Lafond, Olsson, and Schipper (2004)	Etl	Earnings timeliness, Francis, Lafond, Olsson, and Schipper (2004)

Alm^{q}1	Asset liquidity (market assets), 1-month horizon	Alm^{q}6	Asset liquidity (market assets), 6-month horizon
Alm^{q}12	Asset liquidity (market assets), 12-month horizon	R_a^1	12-month-lagged return, Heston and Sadka (2008)
$R_a^{[2,5]}$	Years 2–5 lagged returns, annual Heston and Sadka (2008)	$R_n^{[2,5]}$	Years 2–5 lagged returns, nonannual Heston and Sadka (2008)
$R_a^{[6,10]}$	Years 6–10 lagged returns, annual Heston and Sadka (2008)	$R_n^{[6,10]}$	Years 6–10 lagged returns, nonannual Heston and Sadka (2008)
$R_a^{[11,15]}$	Years 11–15 lagged returns, annual Heston and Sadka (2008)	$R_a^{[16,20]}$	Years 16–20 lagged returns, annual Heston and Sadka (2008)

Panel F: Trading frictions (4)

Sv1	Systematic volatility risk, 1-month horizon, Ang, Hodrick, Xing, and Zhang (2006)	Dtv12	Dollar trading volume, 12-month horizon, Brennan, Chordia, and Subrahmanyam (1998)
Isff1	Idiosyncratic skewness per the 3-factor model, 1-month horizon	Isq1	Idiosyncratic skewness per the q-factor model, 1-month horizon

	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$
q	0.25	46	17	0.11	98
q^5	0.18	19	4	0.10	58
FF5	0.38	89	61	0.12	113
FF6	0.28	67	33	0.11	95
FF6c	0.25	55	21	0.10	68
BS6	0.28	61	34	0.14	147
SY4	0.27	57	25	0.10	87

	Momentum (36)					Value-versus-growth (29)				
	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$
q	0.26	8	1	0.10	23	0.20	4	0	0.11	17
q^5	0.19	6	1	0.09	12	0.19	4	0	0.13	15
FF5	0.64	34	27	0.16	34	0.14	1	0	0.08	9
FF6	0.29	18	8	0.10	25	0.16	4	1	0.09	11
FF6c	0.27	16	5	0.10	18	0.15	4	0	0.09	8
BS6	0.25	12	5	0.13	33	0.24	11	5	0.13	26
SY4	0.34	21	7	0.10	22	0.20	6	2	0.11	15

	Investment (28)					Profitability (35)				
	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$
q	0.20	9	4	0.10	17	0.23	12	4	0.10	19
q^5	0.10	0	0	0.08	7	0.14	2	0	0.09	12
FF5	0.23	11	6	0.09	17	0.45	28	21	0.12	30
FF6	0.21	10	5	0.09	17	0.32	22	11	0.10	21
FF6c	0.18	7	1	0.08	7	0.26	14	6	0.10	17
BS6	0.20	7	4	0.11	26	0.28	16	11	0.13	34
SY4	0.17	5	3	0.08	17	0.29	15	7	0.09	21

	Intangibles (26)					Trading frictions (4)				
	$\overline{\lvert\alpha_{\mathrm{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq1.96}$	$\#_{\lvert t\rvert\geq3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$	$\overline{\lvert\alpha_{\mathrm{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq1.96}$	$\#_{\lvert t\rvert\geq3}$	$\overline{\lvert\alpha\rvert}$	$\#_{p<5\%}$
q	0.41	11	8	0.17	19	0.23	2	0	0.09	3
q^5	0.31	7	3	0.13	10	0.17	0	0	0.08	2
FF5	0.41	13	6	0.15	20	0.22	2	1	0.08	3
FF6	0.42	11	8	0.16	18	0.20	2	0	0.08	3
FF6c	0.43	12	9	0.16	17	0.19	2	0	0.07	1
BS6	0.42	13	7	0.19	25	0.21	2	2	0.10	3
SY4	0.33	8	6	0.14	10	0.19	2	0	0.08	2

The q^5-model is the best performing model

The q-factor model compares well with the Fama-French six-factor models and the Stambaugh-Yuan model with a lower number of high-minus-low alphas, but a higher number of GRS rejections

The Fama-French five-factor model and the Barillas-Shanken model have the highest number of significant high-minus-low alphas and the highest number of GRS rejections, respectively

Individual Factor Regressions

Momentum, 1/1967–12/2016

	Sue1	Abr1	Abr6	Abr12	Re1	Re6	$R^6 1$	$R^6 6$	$R^6 12$	$R^{11} 1$
$\overline{R}$	0.46	0.70	0.33	0.23	0.75	0.47	0.60	0.82	0.55	1.16
$t_{\overline{R}}$	3.48	5.45	3.41	2.99	3.18	2.24	2.08	3.50	2.91	3.99
α_q	0.06	0.62	0.30	0.24	0.09	−0.02	−0.03	0.25	0.16	0.31
α_{q^5}	−0.04	0.56	0.25	0.20	0.08	−0.08	−0.44	−0.16	−0.06	−0.20
α_{FF5}	0.52	0.82	0.46	0.40	0.78	0.59	0.74	1.00	0.80	1.29
α_{FF6}	0.30	0.64	0.30	0.26	0.37	0.21	−0.21	0.18	0.20	0.21
α_{FF6c}	0.25	0.65	0.30	0.25	0.38	0.21	−0.18	0.16	0.13	0.20
α_{BS6}	0.14	0.67	0.30	0.25	0.08	−0.01	−0.16	0.12	0.12	0.13
α_{SY4}	0.29	0.71	0.36	0.31	0.58	0.35	−0.05	0.28	0.33	0.30
t_q	0.46	4.25	2.61	2.79	0.38	−0.08	−0.08	0.83	0.81	0.81
t_{q^5}	−0.30	4.00	2.26	2.24	0.31	−0.38	−1.31	−0.60	−0.31	−0.59
t_{FF5}	3.92	5.81	4.58	5.37	3.16	2.73	2.20	3.65	4.16	3.73
t_{FF6}	2.54	4.66	3.30	4.10	1.89	1.26	−1.10	1.77	1.83	1.74
t_{FF6c}	2.10	4.50	3.12	3.69	1.96	1.28	−0.90	1.44	1.19	1.63
t_{BS6}	1.25	4.48	2.93	3.29	0.43	−0.04	−0.76	1.00	0.86	1.01
t_{SY4}	2.42	5.11	3.61	4.19	2.59	1.92	−0.17	1.38	2.10	1.22

Individual Factor Regressions

Momentum, 1/1967–12/2016

	$R^{11}6$	Im1	Im6	Im12	Rs1	dEf1	dEf6	dEf12	Nei1	52w6
$\overline{R}$	0.80	0.68	0.60	0.63	0.32	0.94	0.56	0.33	0.33	0.56
$t_{\overline{R}}$	3.13	2.86	3.01	3.57	2.28	4.33	3.19	2.37	3.04	2.01
α_q	0.14	0.28	0.07	0.32	0.24	0.55	0.18	0.07	0.12	0.01
α_{q^5}	−0.17	−0.10	−0.33	0.03	0.12	0.48	0.16	0.06	0.02	−0.34
α_{FF5}	1.06	0.74	0.66	0.84	0.56	1.08	0.72	0.50	0.41	0.77
α_{FF6}	0.20	0.09	−0.01	0.30	0.44	0.74	0.40	0.27	0.27	0.03
α_{FF6c}	0.13	0.09	−0.05	0.22	0.41	0.64	0.37	0.22	0.23	0.02
α_{BS6}	0.08	0.20	−0.07	0.23	0.40	0.55	0.20	0.11	0.17	−0.14
α_{SY4}	0.33	0.18	0.08	0.37	0.37	0.90	0.49	0.34	0.27	0.07
t_q	0.49	0.93	0.30	1.45	1.71	2.49	1.08	0.60	1.20	0.02
t_{q^5}	−0.63	−0.34	−1.37	0.13	0.86	2.07	0.92	0.49	0.25	−1.47
t_{FF5}	3.88	2.67	2.81	4.30	4.06	4.68	4.07	3.89	4.28	3.09
t_{FF6}	1.57	0.43	−0.10	1.99	3.27	3.75	3.14	2.60	2.95	0.26
t_{FF6c}	1.03	0.46	−0.35	1.44	3.01	3.06	2.77	2.13	2.33	0.14
t_{BS6}	0.52	0.91	−0.44	1.32	3.15	2.80	1.51	1.05	1.82	−1.08
t_{SY4}	1.55	0.72	0.43	2.08	2.81	4.42	3.31	3.14	2.65	0.42

Individual Factor Regressions

Momentum, 1/1967–12/2016

	$\epsilon^6 6$	$\epsilon^6 12$	$\epsilon^{11} 1$	$\epsilon^{11} 6$	$\epsilon^{11} 12$	Sm1	Ilr1	Ilr6	Ilr12	Ile1
$\overline{R}$	0.45	0.37	0.61	0.50	0.33	0.53	0.69	0.34	0.35	0.58
$t_{\overline{R}}$	3.74	3.85	3.72	3.82	2.88	2.36	3.33	3.35	4.27	3.48
α_q	0.26	0.20	0.26	0.22	0.12	0.59	0.73	0.19	0.19	0.32
α_{q^5}	0.06	0.05	0.02	0.05	0.01	0.40	0.50	0.01	0.02	0.11
α_{FF5}	0.47	0.43	0.57	0.56	0.42	0.66	0.80	0.37	0.39	0.70
α_{FF6}	0.20	0.19	0.21	0.23	0.16	0.58	0.66	0.10	0.12	0.49
α_{FF6c}	0.18	0.17	0.22	0.21	0.14	0.55	0.65	0.09	0.10	0.44
α_{BS6}	0.17	0.18	0.14	0.16	0.12	0.64	0.77	0.15	0.13	0.43
α_{SY4}	0.27	0.25	0.28	0.31	0.22	0.64	0.67	0.17	0.17	0.45
t_q	1.64	1.57	1.25	1.31	0.82	2.15	2.94	1.45	1.80	1.84
t_{q^5}	0.38	0.35	0.08	0.29	0.08	1.37	2.03	0.04	0.22	0.59
t_{FF5}	3.45	3.78	3.03	3.62	3.16	2.77	3.41	3.11	3.83	4.21
t_{FF6}	1.76	2.16	1.32	1.90	1.51	2.43	3.03	1.22	2.06	2.92
t_{FF6c}	1.54	1.76	1.37	1.73	1.30	2.10	2.74	1.01	1.57	2.53
t_{BS6}	1.36	1.85	0.84	1.23	1.08	2.55	3.30	1.59	2.04	2.38
t_{SY4}	1.91	2.27	1.53	2.11	1.84	2.41	2.94	1.62	2.04	2.64

Individual Factor Regressions

Momentum and value-versus-growth, 1/1967–12/2016

	Cm1	Cm12	Sim1	Cim1	Cim6	Cim12	Bm	Bmj	$\text{Bm}^{q}12$	Rev6
$\overline{R}$	0.78	0.15	0.79	0.75	0.29	0.27	0.54	0.46	0.48	−0.42
$t_{\overline{R}}$	3.85	2.22	3.65	3.35	2.76	3.41	2.61	2.12	2.21	−2.01
α_q	0.70	0.05	0.57	0.64	0.06	0.08	0.15	0.28	0.37	−0.21
α_{q^5}	0.68	−0.02	0.25	0.36	−0.17	−0.12	0.08	0.30	0.38	−0.07
α_{FF5}	0.75	0.13	0.75	0.74	0.25	0.29	−0.10	−0.13	−0.12	−0.01
α_{FF6}	0.74	0.02	0.60	0.62	−0.01	0.04	−0.08	0.07	0.16	−0.10
α_{FF6c}	0.72	0.02	0.56	0.54	0.02	0.03	−0.08	0.10	0.18	−0.15
α_{BS6}	0.74	0.03	0.57	0.66	0.02	0.03	−0.29	−0.11	−0.04	−0.06
α_{SY4}	0.75	0.03	0.56	0.57	0.01	0.05	0.03	0.08	0.23	0.10
t_q	2.84	0.55	1.87	2.36	0.35	0.65	0.99	1.59	2.18	−1.20
t_{q^5}	2.70	−0.23	0.82	1.25	−1.05	−1.03	0.51	1.77	2.25	−0.37
t_{FF5}	3.38	1.45	2.72	3.02	1.76	2.48	−0.88	−0.95	−0.84	−0.04
t_{FF6}	3.00	0.23	2.36	2.66	−0.07	0.56	−0.70	0.54	1.35	−0.59
t_{FF6c}	2.84	0.19	2.11	2.32	0.20	0.38	−0.63	0.79	1.47	−0.85
t_{BS6}	3.09	0.38	2.11	2.66	0.16	0.32	−2.17	−0.80	−0.37	−0.30
t_{SY4}	3.05	0.33	2.07	2.35	0.05	0.52	0.20	0.48	1.77	0.59

Individual Factor Regressions

Value-versus-growth, 1/1967–12/2016

	Rev12	Ep	Ep^q1	Ep^q6	Ep^q12	Cp	Cp^q1	Cp^q6	Cp^q12	Nop
$\overline{R}$	−0.39	0.44	0.93	0.59	0.43	0.43	0.62	0.48	0.40	0.63
$t_{\overline{R}}$	−1.99	2.26	4.94	3.42	2.60	2.14	2.93	2.42	2.12	3.40
α_q	−0.13	0.02	0.41	0.09	−0.04	0.04	0.42	0.31	0.16	0.35
α_{q^5}	−0.01	−0.07	0.52	0.10	−0.04	0.02	0.53	0.37	0.21	0.20
α_{FF5}	−0.02	−0.10	0.41	0.08	−0.07	−0.22	0.05	−0.05	−0.15	0.22
α_{FF6}	−0.06	−0.14	0.55	0.17	−0.03	−0.18	0.40	0.23	0.02	0.24
α_{FF6c}	−0.09	−0.21	0.47	0.10	−0.09	−0.25	0.37	0.19	−0.01	0.16
α_{BS6}	−0.00	−0.52	−0.04	−0.32	−0.46	−0.47	0.01	−0.09	−0.26	0.12
α_{SY4}	0.11	0.04	0.70	0.32	0.13	0.07	0.48	0.32	0.18	0.17
t_q	−0.78	0.12	1.74	0.46	−0.25	0.20	1.96	1.65	0.95	2.42
t_{q^5}	−0.08	−0.37	2.25	0.58	−0.25	0.10	2.59	2.11	1.36	1.33
t_{FF5}	−0.14	−0.81	2.38	0.56	−0.57	−1.74	0.28	−0.31	−1.23	1.83
t_{FF6}	−0.41	−1.04	3.21	1.23	−0.21	−1.48	2.91	1.81	0.18	1.92
t_{FF6c}	−0.56	−1.59	2.85	0.69	−0.68	−2.08	2.69	1.51	−0.07	1.22
t_{BS6}	−0.01	−3.05	−0.23	−2.27	−3.66	−3.02	0.06	−0.69	−2.13	0.83
t_{SY4}	0.66	0.19	3.77	1.99	0.90	0.39	2.97	2.18	1.27	1.35

Individual Factor Regressions

Value-versus-growth, 1/1967–12/2016

	Em	$\text{Em}^{q}1$	$\text{Em}^{q}6$	$\text{Em}^{q}12$	Sp	$\text{Sp}^{q}1$	$\text{Sp}^{q}6$	$\text{Sp}^{q}12$	Ocp	$\text{Ocp}^{q}1$
$\overline{R}$	−0.54	−0.71	−0.43	−0.43	0.50	0.59	0.56	0.53	0.70	0.64
$t_{\overline{R}}$	−2.86	−3.21	−2.05	−2.15	2.37	2.39	2.43	2.47	3.14	2.28
α_q	−0.24	−0.48	−0.21	−0.19	−0.05	0.20	0.14	0.05	0.36	0.48
α_{q^5}	−0.05	−0.45	−0.15	−0.12	0.05	0.36	0.28	0.18	0.24	0.43
α_{FF5}	−0.05	−0.33	−0.04	−0.03	−0.26	−0.21	−0.23	−0.24	−0.02	0.12
α_{FF6}	−0.01	−0.45	−0.14	−0.08	−0.16	0.13	0.05	−0.04	0.06	0.41
α_{FF6c}	0.13	−0.31	−0.01	0.05	−0.18	0.10	0.03	−0.06	0.01	0.40
α_{BS6}	0.17	−0.17	0.07	0.12	−0.47	−0.25	−0.28	−0.36	−0.15	0.31
α_{SY4}	−0.16	−0.55	−0.27	−0.23	−0.09	0.16	0.10	0.02	0.30	0.60
t_q	−1.40	−2.00	−0.99	−1.03	−0.28	0.70	0.59	0.23	1.98	1.62
t_{q^5}	−0.27	−1.91	−0.72	−0.65	0.30	1.44	1.33	1.00	1.28	1.66
t_{FF5}	−0.35	−1.70	−0.20	−0.21	−1.82	−1.04	−1.38	−1.60	−0.12	0.53
t_{FF6}	−0.06	−2.55	−0.87	−0.51	−1.22	0.70	0.33	−0.33	0.47	2.59
t_{FF6c}	0.94	−1.77	−0.05	0.34	−1.33	0.55	0.22	−0.48	0.07	2.46
t_{BS6}	1.07	−1.01	0.43	0.75	−3.01	−1.27	−1.73	−2.38	−0.92	1.81
t_{SY4}	−0.94	−2.79	−1.47	−1.37	−0.57	0.78	0.60	0.13	1.70	3.04

Individual Factor Regressions

Value-versus-growth and investment, 1/1967–12/2016

	Ir	Vhp	Vfp	Ebp	Dur	Aci	I/A	Ia^q6	Ia^q12	dPia
$\overline{R}$	−0.47	0.38	0.47	0.41	−0.42	−0.30	−0.44	−0.50	−0.48	−0.48
$t_{\overline{R}}$	−2.22	2.05	2.18	2.00	−2.19	−2.13	−2.89	−3.00	−3.11	−3.64
α_q	−0.16	0.01	0.12	0.06	−0.03	−0.16	0.07	−0.11	0.00	−0.18
α_{q^5}	−0.02	−0.11	0.11	0.08	0.06	−0.16	0.08	0.00	0.09	−0.11
α_{FF5}	0.13	−0.15	0.09	−0.22	0.11	−0.30	0.02	0.01	0.03	−0.30
α_{FF6}	0.05	−0.15	0.08	−0.13	0.12	−0.21	0.02	−0.06	0.02	−0.26
α_{FF6c}	0.03	−0.22	0.02	−0.11	0.14	−0.20	0.00	−0.12	−0.04	−0.29
α_{BS6}	0.18	−0.48	−0.25	−0.33	0.48	−0.17	0.14	0.00	0.10	−0.18
α_{SY4}	0.02	0.05	0.28	−0.03	−0.02	−0.19	0.16	0.14	0.19	−0.05
t_q	−1.05	0.06	0.55	0.42	−0.17	−1.02	0.62	−1.09	0.03	−1.47
t_{q^5}	−0.12	−0.61	0.49	0.49	0.30	−1.07	0.63	0.02	0.77	−0.91
t_{FF5}	0.96	−1.06	0.50	−1.70	0.80	−2.05	0.17	0.10	0.36	−2.61
t_{FF6}	0.39	−1.06	0.42	−1.09	0.91	−1.37	0.22	−0.56	0.18	−2.26
t_{FF6c}	0.21	−1.48	0.09	−0.86	0.99	−1.29	−0.02	−1.23	−0.46	−2.29
t_{BS6}	1.20	−2.71	−1.23	−2.65	3.07	−1.00	1.28	0.01	0.92	−1.42
t_{SY4}	0.14	0.29	1.31	−0.18	−0.09	−1.31	1.30	1.30	1.83	−0.43

Individual Factor Regressions

Investment, 1/1967–12/2016

	Noa	dNoa	dLno	Ig	2Ig	Nsi	dIi	Cei	Ivg	Ivc
$\overline{R}$	−0.44	−0.55	−0.39	−0.46	−0.33	−0.64	−0.29	−0.57	−0.33	−0.44
$t_{\overline{R}}$	−3.25	−4.14	−2.99	−3.76	−2.52	−4.46	−2.61	−3.32	−2.44	−3.33
α_q	−0.45	−0.15	0.03	−0.07	0.06	−0.29	0.11	−0.29	0.01	−0.28
α_{q^5}	−0.13	−0.10	0.13	−0.12	0.06	−0.12	0.10	−0.04	0.10	0.01
α_{FF5}	−0.53	−0.26	−0.09	−0.18	−0.07	−0.30	0.00	−0.30	−0.08	−0.36
α_{FF6}	−0.45	−0.23	−0.04	−0.15	0.01	−0.28	0.09	−0.26	−0.03	−0.30
α_{FF6c}	−0.44	−0.22	−0.12	−0.19	−0.03	−0.20	0.09	−0.17	−0.01	−0.24
α_{BS6}	−0.61	−0.07	0.01	−0.02	0.09	−0.22	0.27	−0.08	0.09	−0.25
α_{SY4}	−0.17	−0.09	0.19	−0.04	0.08	−0.15	0.09	−0.22	0.03	−0.19
t_q	−2.59	−1.04	0.19	−0.59	0.49	−2.32	1.06	−2.25	0.09	−2.08
t_{q^5}	−0.88	−0.66	0.79	−0.90	0.44	−0.89	0.83	−0.31	0.75	0.08
t_{FF5}	−3.37	−1.81	−0.62	−1.65	−0.59	−2.58	−0.01	−2.92	−0.66	−2.97
t_{FF6}	−3.18	−1.64	−0.28	−1.37	0.08	−2.39	0.89	−2.33	−0.26	−2.44
t_{FF6c}	−2.88	−1.64	−0.82	−1.57	−0.23	−1.60	0.86	−1.56	−0.06	−1.89
t_{BS6}	−4.02	−0.53	0.05	−0.13	0.71	−1.65	2.37	−0.55	0.69	−1.78
t_{SY4}	−1.21	−0.66	1.36	−0.37	0.69	−1.36	0.79	−1.91	0.27	−1.45

	Oa	dWc	dCoa	dNco	dNca	dFin	dFnl	dBe	Dac	Poa
$\overline{R}$	−0.27	−0.42	−0.31	−0.41	−0.42	0.28	−0.32	−0.32	−0.39	−0.39
$t_{\overline{R}}$	−2.19	−3.25	−2.28	−3.52	−3.47	2.39	−3.09	−2.03	−2.95	−2.89
α_q	−0.56	−0.51	0.08	−0.06	−0.02	0.43	−0.07	0.12	−0.67	−0.13
α_{q^5}	−0.23	−0.22	0.20	0.05	0.03	0.12	0.01	0.17	−0.28	−0.01
α_{FF5}	−0.52	−0.50	0.05	−0.20	−0.15	0.50	−0.17	0.13	−0.64	−0.13
α_{FF6}	−0.47	−0.45	0.06	−0.17	−0.14	0.48	−0.15	0.13	−0.63	−0.10
α_{FF6c}	−0.31	−0.30	0.09	−0.17	−0.17	0.36	−0.13	0.07	−0.53	0.01
α_{BS6}	−0.54	−0.40	0.18	−0.08	−0.05	0.53	−0.12	0.19	−0.72	−0.04
α_{SY4}	−0.44	−0.43	0.13	0.00	0.01	0.38	−0.06	0.28	−0.50	−0.15
t_q	−4.10	−3.80	0.78	−0.50	−0.21	3.00	−0.62	0.97	−4.73	−1.00
t_{q^5}	−1.51	−1.62	1.66	0.41	0.24	0.81	0.12	1.19	−1.91	−0.05
t_{FF5}	−4.20	−3.90	0.55	−1.62	−1.26	4.17	−1.63	1.17	−4.90	−1.13
t_{FF6}	−3.42	−3.45	0.56	−1.39	−1.18	3.86	−1.39	1.18	−4.55	−0.88
t_{FF6c}	−2.04	−2.14	0.76	−1.38	−1.37	2.65	−1.19	0.67	−3.63	0.05
t_{BS6}	−3.68	−2.74	1.55	−0.71	−0.43	3.71	−1.06	1.44	−4.94	−0.32
t_{SY4}	−3.23	−3.33	1.14	−0.02	0.11	2.90	−0.60	2.19	−3.45	−1.19

Individual Factor Regressions

Investment and profitability, 1/1967–12/2016

	Pta	Pda	Ndf	Roe1	Roe6	dRoe1	dRoe6	dRoe12	Roa1	dRoa1
$\overline{R}$	−0.42	−0.48	−0.30	0.68	0.42	0.75	0.36	0.24	0.57	0.56
$t_{\overline{R}}$	−3.14	−3.91	−2.45	3.12	1.98	5.53	3.16	2.39	2.63	3.76
α_q	−0.19	−0.39	0.01	−0.03	−0.16	0.34	−0.03	−0.10	0.04	0.06
α_{q^5}	−0.04	−0.12	0.10	−0.17	−0.29	0.10	−0.21	−0.18	−0.20	−0.13
α_{FF5}	−0.16	−0.42	−0.07	0.53	0.32	0.79	0.40	0.26	0.53	0.53
α_{FF6}	−0.16	−0.37	−0.06	0.35	0.16	0.56	0.21	0.11	0.30	0.31
α_{FF6c}	−0.13	−0.34	−0.03	0.23	0.04	0.56	0.19	0.09	0.16	0.28
α_{BS6}	−0.08	−0.40	0.01	−0.07	−0.20	0.35	−0.05	−0.11	−0.02	0.11
α_{SY4}	−0.07	−0.26	−0.03	0.35	0.16	0.55	0.18	0.10	0.31	0.35
t_q	−1.42	−2.60	0.11	−0.28	−1.32	2.37	−0.31	−1.11	0.34	0.37
t_{q^5}	−0.34	−0.78	0.84	−1.40	−2.53	0.68	−1.76	−1.93	−1.75	−0.72
t_{FF5}	−1.32	−3.01	−0.67	3.98	2.49	5.54	3.31	2.58	3.80	3.41
t_{FF6}	−1.32	−2.57	−0.58	2.86	1.33	4.36	1.98	1.28	2.51	2.01
t_{FF6c}	−1.04	−2.28	−0.23	1.45	0.24	4.24	1.77	0.93	1.10	1.84
t_{BS6}	−0.54	−2.54	0.11	−0.56	−1.55	2.61	−0.46	−1.25	−0.19	0.62
t_{SY4}	−0.61	−1.92	−0.27	2.20	0.98	3.93	1.62	1.11	2.01	2.18

Individual Factor Regressions

Profitability, 1/1967–12/2016

	dRoa6	Rna^{q}1	Rna^{q}6	Ato^{q}1	Ato^{q}6	Ato^{q}12	Cto^{q}1	Cto^{q}6	Cto^{q}12	Gpa
$\overline{R}$	0.27	0.64	0.43	0.62	0.53	0.42	0.44	0.40	0.36	0.37
$t_{\overline{R}}$	1.99	2.77	2.01	3.44	3.07	2.56	2.44	2.34	2.14	2.63
α_q	−0.19	0.19	0.10	0.35	0.34	0.32	−0.10	−0.08	−0.06	0.17
α_{q^5}	−0.27	−0.04	−0.15	0.11	0.11	0.11	−0.16	−0.14	−0.11	0.04
α_{FF5}	0.25	0.57	0.38	0.52	0.50	0.45	0.07	0.07	0.08	0.26
α_{FF6}	0.05	0.42	0.28	0.42	0.40	0.36	0.03	0.02	0.04	0.24
α_{FF6c}	0.05	0.30	0.14	0.37	0.34	0.29	−0.09	−0.10	−0.09	0.17
α_{BS6}	−0.19	0.19	0.11	0.52	0.53	0.52	−0.04	−0.02	0.03	0.31
α_{SY4}	0.08	0.44	0.30	0.25	0.24	0.20	−0.11	−0.10	−0.08	0.05
t_q	−1.38	1.41	0.79	2.06	2.09	2.03	−0.60	−0.50	−0.35	1.24
t_{q^5}	−1.77	−0.29	−1.24	0.62	0.69	0.67	−0.95	−0.81	−0.66	0.29
t_{FF5}	1.83	4.08	3.02	3.17	3.41	3.19	0.47	0.50	0.58	2.06
t_{FF6}	0.42	3.22	2.37	2.74	2.85	2.61	0.21	0.15	0.29	1.86
t_{FF6c}	0.35	1.96	1.04	2.28	2.23	1.97	−0.50	−0.62	−0.58	1.24
t_{BS6}	−1.42	1.39	0.83	3.24	3.67	3.61	−0.25	−0.10	0.16	2.14
t_{SY4}	0.58	2.58	1.90	1.65	1.67	1.42	−0.69	−0.69	−0.51	0.35

Individual Factor Regressions

Profitability, 1/1967–12/2016

	Gla^{q}1	Gla^{q}6	Gla^{q}12	Ole^{q}1	Ole^{q}6	Opa	Ola^{q}1	Ola^{q}6	Ola^{q}12	Cop
$\overline{R}$	0.51	0.33	0.28	0.71	0.48	0.41	0.75	0.52	0.46	0.63
$t_{\overline{R}}$	3.48	2.46	2.18	3.40	2.39	2.09	3.53	2.59	2.46	3.57
α_q	0.21	0.11	0.14	0.03	−0.11	0.46	0.40	0.26	0.32	0.69
α_{q^5}	0.04	−0.04	0.00	−0.17	−0.31	−0.04	−0.08	−0.20	−0.10	0.10
α_{FF5}	0.41	0.28	0.26	0.32	0.12	0.57	0.74	0.54	0.54	0.82
α_{FF6}	0.33	0.22	0.22	0.18	0.02	0.52	0.58	0.41	0.43	0.73
α_{FF6c}	0.25	0.13	0.13	0.04	−0.14	0.41	0.50	0.32	0.33	0.51
α_{BS6}	0.31	0.20	0.22	−0.20	−0.30	0.58	0.48	0.34	0.38	0.82
α_{SY4}	0.23	0.14	0.16	0.21	0.06	0.39	0.55	0.41	0.45	0.58
t_q	1.59	0.93	1.17	0.18	−0.79	2.96	2.64	1.89	2.49	5.04
t_{q^5}	0.31	−0.28	0.01	−1.17	−2.23	−0.28	−0.59	−1.79	−0.92	0.89
t_{FF5}	3.01	2.34	2.27	2.35	0.99	3.60	4.47	3.85	4.24	6.53
t_{FF6}	2.51	1.90	1.97	1.35	0.20	3.67	3.89	3.25	3.75	6.15
t_{FF6c}	1.80	1.08	1.06	0.23	−0.89	2.55	2.87	2.10	2.44	4.28
t_{BS6}	2.20	1.63	1.78	−1.33	−2.08	3.57	3.23	2.52	3.01	5.93
t_{SY4}	1.66	1.12	1.30	1.23	0.40	2.44	3.60	2.91	3.44	4.51

Individual Factor Regressions

Profitability and intangibles, 1/1967–12/2016

	Cla	Cla^{q}1	Cla^{q}6	Cla^{q}12	F^{q}1	F^{q}6	F^{q}12	Fp^{q}6	Oca	Ioca
$\overline{R}$	0.55	0.52	0.49	0.46	0.52	0.48	0.38	−0.62	0.54	0.53
$t_{\overline{R}}$	3.23	3.26	3.60	3.63	2.32	2.39	2.05	−1.99	2.67	4.31
α_q	0.75	0.46	0.41	0.45	0.13	0.14	0.05	−0.18	0.13	0.07
α_{q^5}	0.17	−0.02	−0.03	0.04	0.24	0.28	0.18	0.33	−0.13	−0.02
α_{FF5}	0.85	0.63	0.57	0.60	0.37	0.37	0.26	−0.86	0.36	0.30
α_{FF6}	0.78	0.54	0.47	0.51	0.23	0.26	0.18	−0.35	0.34	0.17
α_{FF6c}	0.56	0.45	0.37	0.40	0.25	0.24	0.12	−0.32	0.43	0.16
α_{BS6}	0.89	0.53	0.46	0.51	0.05	0.09	0.00	−0.24	0.27	0.03
α_{SY4}	0.66	0.41	0.40	0.43	0.33	0.38	0.28	−0.28	0.00	0.09
t_q	5.23	3.02	2.97	3.63	0.58	0.85	0.36	−0.68	0.69	0.57
t_{q^5}	1.40	−0.13	−0.28	0.41	1.21	1.67	1.28	1.39	−0.63	−0.16
t_{FF5}	6.82	4.28	4.35	5.07	1.78	2.23	1.94	−3.18	1.80	2.40
t_{FF6}	6.36	3.93	4.10	4.84	1.15	1.53	1.30	−2.17	1.71	1.41
t_{FF6c}	4.68	3.16	3.06	3.71	1.20	1.33	0.82	−1.85	1.90	1.21
t_{BS6}	6.22	3.69	3.70	4.63	0.27	0.53	0.02	−1.40	1.39	0.25
t_{SY4}	4.87	2.97	3.44	4.23	1.59	2.24	1.85	−1.93	−0.01	0.72

Individual Factor Regressions

Intangibles, 1/1967–12/2016

	Adm	Rdm	Rdm^{q}1	Rdm^{q}6	Rdm^{q}12	Ol	Ol^{q}1	Ol^{q}6	Ol^{q}12	Hs
$\overline{R}$	0.66	0.70	1.11	0.80	0.82	0.44	0.49	0.48	0.48	−0.31
$t_{\overline{R}}$	2.71	2.75	2.91	2.18	2.43	2.62	2.60	2.62	2.77	−2.12
α_q	0.09	0.72	1.39	0.95	0.81	0.01	0.08	0.10	0.12	−0.30
α_{q^5}	0.06	0.25	1.07	0.54	0.37	0.06	0.11	0.04	0.04	−0.12
α_{FF5}	−0.09	0.57	0.89	0.63	0.60	0.14	0.26	0.25	0.29	−0.41
α_{FF6}	0.04	0.60	1.33	0.92	0.77	0.13	0.26	0.25	0.27	−0.34
α_{FF6c}	0.03	0.76	1.36	1.01	0.88	0.13	0.24	0.24	0.26	−0.32
α_{BS6}	−0.26	0.73	1.40	0.96	0.80	−0.02	0.10	0.09	0.11	−0.46
α_{SY4}	0.08	0.30	1.14	0.63	0.47	0.02	0.15	0.14	0.14	−0.26
t_q	0.35	3.11	3.06	2.87	3.01	0.06	0.48	0.61	0.77	−1.56
t_{q^5}	0.27	1.13	2.26	1.57	1.31	0.33	0.61	0.21	0.25	−0.55
t_{FF5}	−0.50	2.55	2.26	1.98	2.22	0.94	1.51	1.54	1.81	−2.50
t_{FF6}	0.21	2.77	3.58	3.05	3.00	0.88	1.56	1.57	1.71	−1.96
t_{FF6c}	0.13	3.34	3.65	3.36	3.51	0.81	1.29	1.35	1.52	−1.85
t_{BS6}	−1.14	3.09	3.44	2.89	2.84	−0.10	0.59	0.53	0.64	−2.46
t_{SY4}	0.35	1.34	2.87	2.13	1.84	0.17	0.93	0.86	0.96	−1.44

Individual Factor Regressions

Intangibles, 1/1967–12/2016

	Etr	Rer	Eprd	Etl	Alm^{q}1	Alm^{q}6	Alm^{q}12	R^1_a	$R^{[2,5]}_a$	$R^{[2,5]}_n$
$\overline{R}$	0.24	0.34	−0.53	0.34	0.58	0.60	0.54	0.67	0.69	−0.50
$t_{\overline{R}}$	2.29	2.44	−2.96	2.79	2.75	3.05	2.84	3.43	4.11	−2.22
α_q	0.09	0.34	−0.55	0.27	0.25	0.24	0.14	0.58	0.81	−0.20
α_{q^5}	0.11	0.18	−0.43	0.18	0.24	0.22	0.17	0.50	0.85	−0.09
α_{FF5}	0.20	0.29	−0.91	0.36	0.02	0.09	0.05	0.67	0.73	0.05
α_{FF6}	0.17	0.27	−0.81	0.26	0.09	0.10	0.03	0.48	0.74	−0.05
α_{FF6c}	0.23	0.25	−0.85	0.33	0.09	0.10	0.02	0.41	0.66	−0.05
α_{BS6}	0.13	0.35	−0.81	0.35	−0.03	−0.03	−0.12	0.47	0.78	0.12
α_{SY4}	0.13	0.20	−0.58	0.18	0.15	0.17	0.12	0.59	0.83	0.05
t_q	0.75	2.05	−3.02	1.56	1.68	1.78	1.01	2.75	4.06	−1.06
t_{q^5}	0.82	1.14	−2.49	1.10	1.61	1.62	1.22	2.25	4.02	−0.42
t_{FF5}	1.83	1.86	−5.56	2.48	0.18	0.76	0.44	3.58	4.03	0.27
t_{FF6}	1.51	1.73	−4.97	1.90	0.71	0.93	0.28	2.67	3.80	−0.31
t_{FF6c}	2.03	1.59	−5.08	2.41	0.72	0.90	0.21	2.12	3.24	−0.28
t_{BS6}	0.97	2.08	−4.64	2.23	−0.20	−0.28	−0.93	2.23	3.73	0.69
t_{SY4}	1.10	1.23	−3.71	1.30	1.06	1.28	0.90	3.16	4.21	0.29

	$R_a^{[6,10]}$	$R_n^{[6,10]}$	$R_a^{[11,15]}$	$R_a^{[16,20]}$	Sv1	Dtv12	Isff1	Isq1
$\overline{R}$	0.83	−0.46	0.62	0.54	−0.49	−0.40	0.28	0.25
$t_{\overline{R}}$	5.06	−2.38	4.46	3.26	−2.23	−2.23	3.11	2.80
α_q	1.11	0.03	0.60	0.62	−0.22	−0.13	0.27	0.29
α_{q^5}	0.95	0.05	0.55	0.61	−0.16	−0.15	0.20	0.19
α_{FF5}	1.05	−0.08	0.68	0.60	−0.26	−0.06	0.30	0.28
α_{FF6}	1.11	0.00	0.65	0.60	−0.25	−0.06	0.26	0.24
α_{FF6c}	1.11	−0.03	0.66	0.63	−0.18	−0.09	0.27	0.24
α_{BS6}	1.11	0.33	0.58	0.59	−0.21	−0.01	0.31	0.33
α_{SY4}	1.01	−0.09	0.59	0.56	−0.24	−0.03	0.24	0.25
t_q	5.05	0.15	3.48	3.22	−0.90	−1.72	2.56	2.84
t_{q^5}	4.74	0.24	3.16	2.83	−0.59	−1.94	1.73	1.76
t_{FF5}	5.37	−0.47	3.91	3.72	−1.15	−0.77	3.05	2.89
t_{FF6}	5.69	−0.02	4.13	3.43	−1.08	−0.79	2.76	2.54
t_{FF6c}	5.25	−0.19	3.76	3.30	−0.75	−1.13	2.63	2.35
t_{BS6}	4.73	1.70	3.16	3.32	−0.84	−0.11	3.12	3.14
t_{SY4}	4.97	−0.50	3.85	3.01	−0.98	−0.35	2.36	2.39

Asset prices are equilibrated by both supply and demand

The investment CAPM as the supply theory of asset pricing

The q-factor model and q^5-model as workhorse factor models

My fellow freedom fighters: Kewei Hou, Chen Xue, and Haitao Mo