”The Investment CAPM: Latest Developments”

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The Investment CAPM

Latest Developments

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Keynote
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A new class of Capital Asset Pricing Models arises from the first principle of real investment for individual firms

Outline

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Three defining characteristics of neoclassical economics:

- Rational expectations
- Consumers maximize utility; firms maximize market value
- Markets clear

A representative household (investor) 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:

$$E_t[M_{t+1} R_{it+1}] = 1 \quad \Rightarrow \quad \overbrace{E_t[R_{it+1}] - R_{ft} = \beta_{it}^{M} \lambda_{Mt}}^{\textbf{The Consumption CAPM}}$$

An individual firm i maximizes:

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

The first principle of investment:

$$\frac{P_{it+1} + D_{it+1}}{P_{it}} \equiv \underbrace{R_{it+1} = \frac{\Pi_{it+1}}{1 + a(I_{it}/A_{it})}}_{\textbf{The Investment CAPM}}$$

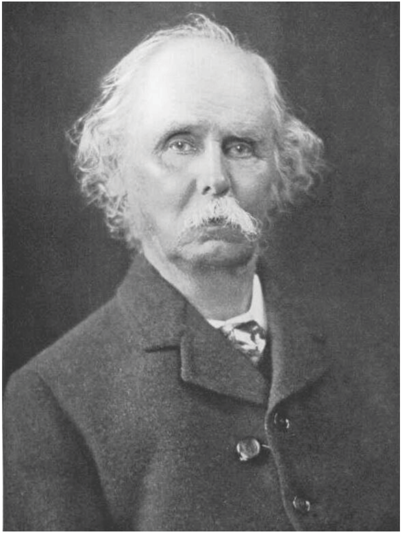
The investment CAPM: Cross-sectionally varying expected returns

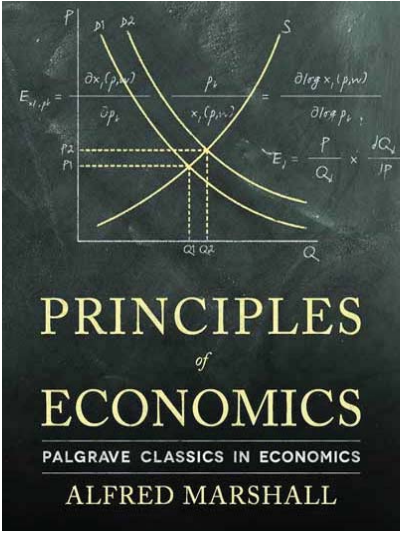
The consumption CAPM and the investment CAPM deliver identical expected returns in general equilibrium:

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

- Consumption: Risks as sufficient statistics of $E_t[R_{it+1}]$
- Investment: Characteristics as sufficient statistics of $E_t[R_{it+1}]$

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





1890s: What determines value? Costs of production (Ricardo and Mill) vs. marginal utility (Jevons, Menger, and Walras)

- 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 is to be excused only so long as it claims to be merely a popular and not a strictly scientific account of what happens (Marshall 1890 [1961, 9th edition, p. 348], my emphasis)."

What explains the empirical failure of the consumption CAPM?

Most consumption CAPM studies assume a representative investor, despite the Sonnenschein-Mantel-Debreu theorem:

- The aggregate excess demand function not restricted by rationality assumptions on individual demands

The investment CAPM from individual firms:

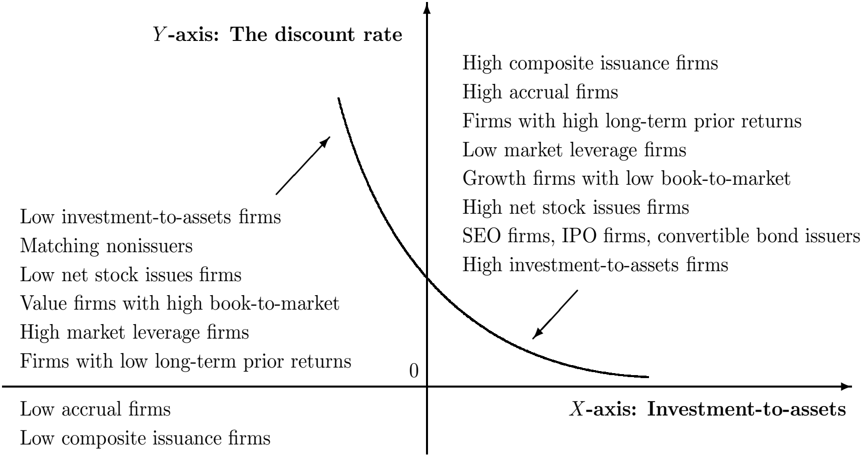
- Less severe aggregation problem

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

- MKT, R_{Me}, $R_{\mathrm{I/A}}$, and R_{Roe}: Market, size, investment, and Roe factors, respectively
- β^i_{MKT}, β^i_{Me}, $\beta^i_{\mathrm{I/A}}$, and β^i_{Roe}: Factor loadings

$$E_t[R_{it+1}] = \frac{E_t[\Pi_{it+1}]}{1 + a(I_{it}/A_{it})}$$

- All else equal, high investment stocks should earn lower expected returns than low investment stocks
- All else equal, high expected profitability stocks should earn higher expected returns than low expected profitability stocks


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)
- So discount rates must be high to counteract high Roe to induce low investment

Price and earnings momentum winners and low distress firms tend to have higher Roe and earn higher expected returns

Augmenting the q-factor model to form the q^5 model:

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

in which R_{Eg} is the expected growth factor

In the multiperiod investment framework:

$$R_{it+1} \approx \frac{\Pi_{it+1} + (1-\delta)\left[1 + a\left(I_{it+1}/A_{it+1}\right)\right]}{1 + a\left(I_{it}/A_{it}\right)}$$

The "dividend yield" component, $\Pi_{it+1}/[1 + a\left(I_{it}/A_{it}\right)]$, motivates the q-factor model

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

Forecast τ-year-ahead investment-to-assets changes with:

- Tobin's q: Erickson and Whited (2000)
- Cash flows: Internal funds, Fazzari, Hubbard, and Petersen (1988); better than earnings in capturing the expected growth, likely due to intangibles, Ball et al. (2016)
- dRoe: Capturing short-term dynamics of investment growth, Liu, Whited, and Zhang (2009)

τ	$\log(q)$	Cop	dRoe	R^2	Pearson	Rank
1	−0.03	0.52	0.77	6.42	0.14	0.21
	(−5.63)	(12.75)	(7.62)		[0.00]	[0.00]

$E_t[\mathrm{d}^1\mathrm{I/A}]$ and $\mathrm{d}^1\mathrm{I/A}$ aligned at the portfolio level (Corr = 0.64):

	Low	2	3	4	5	6	7	8	9	High	H−L
$E_t[\mathrm{d}^1\mathrm{I/A}]$	−15.2	−7.7	−5.6	−4.2	−3.0	−2.0	−0.9	0.5	2.5	7.7	22.9
$\mathrm{d}^1\mathrm{I/A}$	−16.7	−12.3	−4.1	−3.6	−1.1	−0.4	−0.3	0.6	1.6	6.0	22.7

R_{Eg}, independent 2×3 monthly sorts on size and $E_t[\mathrm{d}^1\mathrm{I/A}]$:

$\overline{R}_{\mathrm{Eg}}$	α	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	R^2
0.84	0.67	−0.11	−0.09	0.21	0.30	0.44
(10.27)	(9.75)	(−6.38)	(−3.56)	(4.86)	(9.13)	

Spanning tests: $p_{GRS} = 0$ for the R_{Me}, $R_{I/A}$, and R_{Roe} alphas = 0, with and without the R_{Eg} alpha, in the Fama-French (2018) 6-factor models

	$\overline{R}$	α	MKT	SMB	HML	RMW	CMA	UMD	RMWc
$R_{I/A}$	0.38	0.10	0.01	−0.04	0.04	0.06	0.81	0.01	
	4.59	2.82	0.84	−2.75	2.16	2.09	33.60	0.83	
		0.10	0.01	−0.04	0.05		0.80	0.01	0.06
		2.57	0.91	−2.68	2.26		31.45	0.82	1.49
R_{Roe}	0.55	0.27	0.00	−0.12	−0.10	0.66	−0.00	0.24	
	5.44	4.32	0.07	−3.71	−2.02	15.43	−0.01	9.58	
		0.23	0.03	−0.10	−0.04		−0.16	0.24	0.71
		2.94	1.37	−2.53	−0.55		−1.88	6.92	8.55
R_{Eg}	0.84	0.71	−0.09	−0.14	−0.01	0.23	0.21	0.12	
	10.27	11.39	−5.44	−6.34	−0.51	5.65	4.50	6.04	
		0.64	−0.06	−0.09	−0.00		0.16	0.11	0.40
		9.87	−3.47	−3.90	−0.04		3.31	5.47	7.02

Spanning tests: $p_{\text{GRS}} = 0.68$ (0.00) for the nonmarket 6-factor alphas = 0 in q, $p_{\text{GRS}} = 0.09$ (0.11) in q^5 with RMW (RMWc)

	$\overline{R}$	α	R_{Mkt}	R_{Me}	$R_{\text{I/A}}$	R_{Roe}	R_{Eg}
UMD	0.64	0.14	−0.08	0.23	−0.03	0.90	
	3.73	0.61	−1.31	1.74	−0.17	5.85	
		−0.16	−0.03	0.27	−0.12	0.77	0.44
		−0.77	−0.53	2.03	−0.69	4.39	2.81
CMA	0.30	0.00	−0.04	0.03	0.96	−0.09	
	3.29	0.08	−3.66	1.72	35.11	−3.41	
		−0.04	−0.04	0.04	0.94	−0.11	0.06
		−0.94	−2.96	1.96	38.15	−3.73	2.16
RMW	0.28	0.03	−0.03	−0.12	0.02	0.54	
	2.76	0.32	−1.23	−1.73	0.20	8.72	
		−0.01	−0.03	−0.11	0.00	0.52	0.06
		−0.17	−1.05	−1.57	0.04	8.04	0.85
RMWc	0.33	0.24	−0.10	−0.18	0.09	0.29	
	4.18	3.75	−5.90	−5.36	2.06	9.97	
		0.11	−0.08	−0.16	0.05	0.23	0.19
		1.80	−4.90	−4.58	1.08	6.85	5.02

- The q-factor model, the q^5 model
- The Fama-French 5-factor model, the 6-factor model, the alternative 6-factor model with RMWc
- The replicated Stambaugh-Yuan 4-factor model
- The Barillas-Shanken 6-factor model, including MKT, SMB, $R_{\mathrm{I/A}}$, R_{Roe}, the Asness-Frazzini monthly formed HML, UMD
- The replicated Daniel-Hirshleifer-Sun 3-factor model

Monthly sharpe ratios of factor models, 1/1967–12/2018							
q	q^5	FF5	FF6	FF6c	BS6	SY4	DHS
0.42	0.63	0.32	0.37	0.43	0.48	0.41	0.42

150 anomalies with NYSE breakpoints and value-weighted returns significant at the 5% level:

- Momentum: 39
- Value-versus-growth: 15
- Investment: 26
- Profitability: 40
- Intangibles: 27
- Trading frictions: 3

	$\overline{\lvert\alpha_{\text{H−L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#^{\text{GRS}}_{p<5\%}$
			All (150)		
q	0.28	52	25	0.11	101
q^5	0.19	23	6	0.10	57
FF5	0.43	100	69	0.13	112
FF6	0.30	74	37	0.11	91
FF6c	0.27	59	25	0.11	71
BS6	0.29	63	37	0.13	132
SY4	0.29	64	25	0.11	87
DHS	0.37	70	33	0.14	97

	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#^{\text{GRS}}_{p<5\%}$
	Momentum (39)				
q	0.25	11	3	0.10	24
q^5	0.17	4	1	0.09	15
FF5	0.62	37	29	0.15	36
FF6	0.27	19	6	0.10	21
FF6c	0.24	14	5	0.09	18
BS6	0.23	12	4	0.12	33
SY4	0.32	19	6	0.10	23
DHS	0.25	10	3	0.14	26

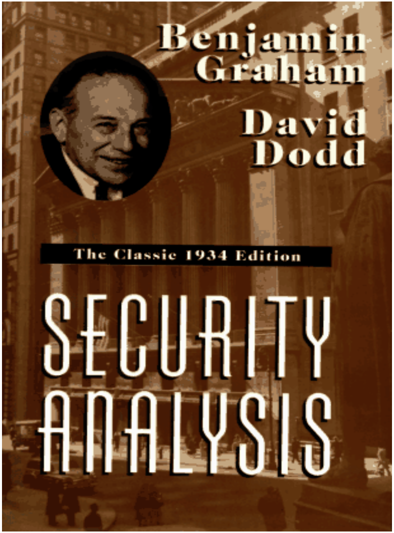
	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#^{\text{GRS}}_{p<5\%}$
	Value-versus-growth (15)				
q	0.21	1	0	0.11	8
q^5	0.22	3	0	0.13	7
FF5	0.15	2	0	0.10	7
FF6	0.19	4	0	0.10	9
FF6c	0.17	3	0	0.10	6
BS6	0.23	6	2	0.13	14
SY4	0.24	4	1	0.12	9
DHS	0.78	15	13	0.23	15

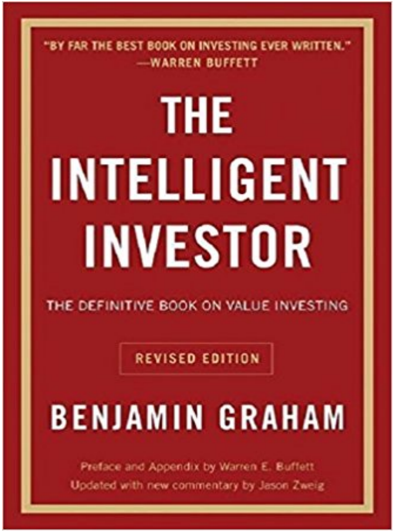
	$\overline{\lvert\alpha_{\mathrm{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#^{\mathrm{GRS}}_{p<5\%}$
	Investment (26)				
q	0.22	9	4	0.10	19
q^5	0.10	1	0	0.08	6
FF5	0.24	10	7	0.09	17
FF6	0.22	10	6	0.09	16
FF6c	0.18	8	2	0.08	7
BS6	0.22	8	6	0.11	24
SY4	0.19	8	3	0.09	17
DHS	0.34	20	4	0.10	22

	$\overline{\lvert\alpha_{\text{H-L}}\rvert}$	$\#_{\lvert t\rvert\geq 1.96}$	$\#_{\lvert t\rvert\geq 3}$	$\overline{\lvert\alpha\rvert}$	$\#^{\text{GRS}}_{p<5\%}$
	Profitability (40)				
q	0.25	16	6	0.10	28
q^5	0.14	5	1	0.09	14
FF5	0.43	32	23	0.12	32
FF6	0.31	26	13	0.10	25
FF6c	0.26	18	7	0.10	21
BS6	0.31	20	12	0.12	37
SY4	0.29	20	9	0.10	24
DHS	0.18	6	1	0.09	13

	$\alpha_{\text{H−L}}$	$t_{\text{H−L}}$	$\overline{\lvert\alpha\rvert}$	p_{GRS}
	All (150): $\overline{R}$ = 1.69 (t = 9.62)			
q	0.86	5.64	0.16	0.00
q^5	0.37	2.62	0.10	0.01
FF5	1.33	7.94	0.25	0.00
FF6	0.94	7.46	0.16	0.00
FF6c	0.82	6.77	0.14	0.00
BS6	0.68	4.85	0.13	0.00
SY4	0.90	7.61	0.16	0.00
DHS	0.74	4.98	0.14	0.00

	Sue1	$R^6 6$	Bm	Oa	dFin	Dac	Rdm
$\overline{R}$	0.45	0.83	0.43	−0.29	0.27	−0.45	0.73
$t_{\overline{R}}$	3.50	3.66	2.14	−2.36	2.43	−3.47	2.96
α_q	0.05	0.30	0.11	−0.57	0.41	−0.74	0.81
α_{q^5}	−0.07	−0.16	0.05	−0.20	0.14	−0.31	0.27
t_q	0.39	1.04	0.71	−4.25	2.97	−5.33	3.64
t_{q^5}	−0.52	−0.64	0.32	−1.30	0.97	−2.16	1.24
α_{FF6}	0.26	0.19	−0.09	−0.48	0.46	−0.69	0.68
α_{FF6c}	0.22	0.16	−0.09	−0.32	0.34	−0.59	0.79
t_{FF6}	2.23	1.92	−0.82	−3.49	3.81	−5.08	3.24
t_{FF6c}	1.84	1.57	−0.74	−2.13	2.63	−4.12	3.64


Benjamin Graham
David Dodd
The Classic 1934 Edition
SECURITY ANALYSIS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THE INTELLIGENT INVESTOR
THE DEFINITIVE BOOK ON VALUE INVESTING
REVISED EDITION
BENJAMIN GRAHAM
Preface and Appendix by Warren E. Buffett
Updated with new commentary by Jason Zweig

Invest in undervalued securities selling well below the intrinsic value:

- The intrinsic value is the value that can be justified by the firm's earnings, assets, and other accounting information
- The intrinsic value is distinct from the market value subject to artificial manipulation and psychological distortion

Maintain margin of safety, the intrinsic-market value distance

The Superinvestors of Graham-and-Doddsville

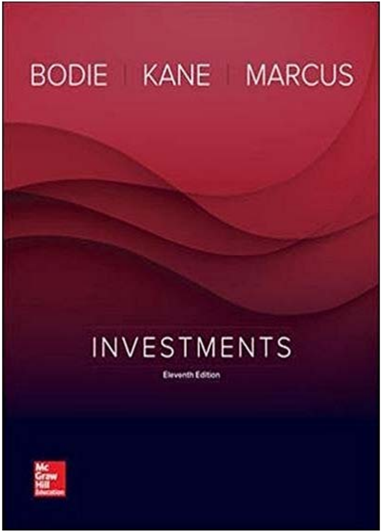
By Warren E. Buffett

"Superinvestor" Warren E. Buffett, who got an A+ from Ben Graham at Columbia in 1951, never stopped making the grade. He made his fortune using the principles of Graham & Dodd's Security Analysis. *Here, in celebration of the fiftieth anniversary of that classic text, he tracks the records of investors who stick to the "value approach" and have gotten rich going by the book.*

"Our Graham & Dodd investors, needless to say, do not discuss beta, the capital asset pricing model or covariance in returns among securities. These are not subjects of any interest to them. In fact, most of them would have difficulty defining those terms (p. 7)"

Explaining Security Analysis

Bodie, Kane, and Marcus (2017)



"[T]he efficient market hypothesis predicts that most fundamental analysis also is doomed to failure. if the analyst relies on publicly available earnings and industry information, his or her evaluation of the firm's prospects is not likely to be significantly more accurate than those of rival analysts (p. 356, original emphasis)."

	L	2	3	4	H	H−L	L	2	3	4	H	H−L
	$\overline{R}$						$t_{\overline{R}}$					
All	0.32	0.50	0.47	0.59	0.84	0.52	1.34	2.79	2.53	3.23	4.63	3.56
Micro	0.53	0.73	0.81	0.94	0.96	0.43	1.51	2.60	2.78	3.36	3.60	2.51
Small	0.46	0.75	0.74	0.86	0.93	0.47	1.51	3.06	3.05	3.43	3.86	2.87
Big	0.35	0.49	0.46	0.56	0.82	0.47	1.51	2.78	2.48	3.15	4.60	3.08
	α_{q^5} $(p_{\mathrm{GRS}} = 0.87)$						t_{q^5}					
All	0.06	0.07	−0.02	−0.04	0.05	−0.01	0.62	1.16	−0.37	−0.54	0.68	−0.10
Micro	0.08	0.04	0.10	0.13	0.14	0.06	0.64	0.43	1.23	1.31	1.49	0.43
Small	0.03	0.01	0.06	0.00	0.06	0.03	0.37	0.11	0.83	0.04	0.74	0.18
Big	0.15	0.08	−0.02	−0.04	0.04	−0.11	1.41	1.34	−0.31	−0.57	0.49	−0.84
	β_{Mkt}	β_{Me}	$\beta_{\mathrm{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\mathrm{I/A}}$	t_{Roe}	t_{Eg}	
All	−0.12	0.06	0.02	0.40	0.42		−3.44	1.02	0.28	4.86	4.48	
Micro	−0.10	−0.26	0.37	0.67	−0.02		−2.23	−2.13	2.88	6.10	−0.19	
Small	−0.13	−0.10	0.42	0.57	0.08		−2.74	−0.78	3.52	5.08	0.82	
Big	−0.12	0.17	0.00	0.39	0.45		−2.85	2.71	0.02	4.51	4.42	

	L	2	3	4	H	H−L	L	2	3	4	H	H−L
			$\overline{R}$						$t_{\overline{R}}$			
All	0.37	0.46	0.47	0.56	0.63	0.26	1.48	2.34	2.58	3.05	3.36	1.79
Micro	0.29	0.78	0.91	0.92	0.90	0.61	0.79	2.60	3.13	3.27	3.36	3.92
Small	0.50	0.72	0.79	0.77	0.92	0.42	1.61	2.93	3.15	3.10	3.65	3.19
Big	0.40	0.43	0.44	0.54	0.62	0.22	1.69	2.25	2.47	2.99	3.31	1.53
			α_{q^5} (p_{GRS} = 0.00)						t_{q^5}			
All	−0.01	−0.06	−0.02	0.07	0.11	0.12	−0.12	−0.84	−0.36	1.35	1.85	1.14
Micro	−0.01	0.22	0.23	0.34	0.29	0.30	−0.06	1.73	2.26	2.81	2.32	2.45
Small	0.14	0.08	0.06	0.12	0.23	0.09	1.82	1.08	0.90	1.86	2.77	0.83
Big	0.04	−0.06	−0.02	0.07	0.11	0.07	0.39	−0.75	−0.36	1.24	1.75	0.59
	β_{Mkt}	β_{Me}	$\beta_{I/A}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{I/A}$	t_{Roe}	t_{Eg}	
All	−0.17	−0.36	−0.61	0.42	0.39		−5.74	−8.82	−9.04	6.76	5.47	
Micro	−0.18	−0.21	0.00	0.64	0.13		−5.94	−4.09	0.00	8.06	1.83	
Small	−0.18	−0.12	−0.12	0.54	0.23		−4.89	−1.34	−1.41	6.72	3.00	
Big	−0.15	−0.22	−0.66	0.38	0.39		−4.40	−5.12	−8.74	5.60	4.76	

Asness, Frazzini, and Pedersen (2019): Alternative quality score (with payout)

	L	2	3	4	H	H−L	L	2	3	4	H	H−L
	$\overline{R}$						$t_{\overline{R}}$					
All	0.24	0.47	0.54	0.58	0.63	0.39	0.94	2.32	2.83	3.13	3.60	2.74
Micro	0.20	0.85	0.95	1.02	0.93	0.72	0.55	2.76	3.35	3.72	3.62	4.39
Small	0.47	0.76	0.76	0.88	0.92	0.45	1.48	2.99	3.10	3.58	3.85	3.30
Big	0.25	0.44	0.51	0.55	0.62	0.36	1.03	2.26	2.74	3.03	3.53	2.71
	α_{q^5} (p_{GRS} = 0.00)						t_{q^5}					
All	−0.02	0.00	0.04	0.04	0.08	0.10	−0.29	−0.03	0.80	0.75	1.52	1.07
Micro	−0.06	0.27	0.27	0.37	0.26	0.33	−0.35	2.16	2.14	3.62	2.24	2.54
Small	0.13	0.15	0.01	0.15	0.20	0.08	1.55	2.39	0.13	2.42	2.37	0.73
Big	0.03	0.01	0.04	0.03	0.07	0.04	0.32	0.09	0.76	0.59	1.36	0.43
	β_{Mkt}	β_{Me}	$\beta_{\text{I/A}}$	β_{Roe}	β_{Eg}		t_{Mkt}	t_{Me}	$t_{\text{I/A}}$	t_{Roe}	t_{Eg}	
All	−0.17	−0.40	−0.20	0.38	0.43		−6.14	−10.46	−2.98	6.47	6.42	
Micro	−0.24	−0.18	0.17	0.66	0.17		−7.64	−3.82	1.93	7.91	2.34	
Small	−0.23	−0.15	0.17	0.53	0.22		−6.16	−1.76	2.15	5.90	2.80	
Big	−0.14	−0.26	−0.22	0.34	0.43		−4.59	−6.64	−2.88	5.57	5.76	

The AQR 6-factor regressions

	α	β_{Mkt}	β_{SMB}	β_{HML}	β_{UMD}	β_{BAB}	β_{QMJ}	R^2
11/76–3/17	0.46	0.92	−0.18	0.38	−0.05	0.27	0.39	0.29
	1.69	10.62	−1.45	3.00	−0.93	3.04	2.81	
2/68–12/18	0.61	0.78	−0.11	0.30	−0.02	0.27	0.29	0.19
	2.08	8.21	−0.70	1.98	−0.24	2.65	1.91	

The q-factor and q^5 regressions

	$\overline{R}$	α	β_{Mkt}	β_{Me}	$\beta_{I/A}$	β_{Roe}	β_{Eg}	R^2
11/76–3/17	1.51	0.48	0.87	−0.14	0.73	0.50		0.27
	4.81	1.75	10.30	−1.03	4.40	4.56		
		0.66	0.84	−0.16	0.78	0.60	−0.30	0.27
		2.10	9.70	−1.18	4.58	4.63	−1.46	
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	

Spanning tests: $p_{GRS} = 0$ for the R_{Me}, $R_{I/A}$, and R_{Roe} alphas = 0, with and without the R_{Eg} alpha, in the AQR 6-factor models

	$\overline{R}$	α	MKT	SMB	HML	UMD	BAB	QMJ*	QMJ
$R_{I/A}$	0.38	0.24	−0.08	−0.05	0.39	0.04	0.06	−0.02	
	4.59	3.21	−4.71	−1.88	13.10	1.78	2.25	−0.55	
		0.28	−0.10	−0.08	0.35	0.04	0.07		−0.13
		4.00	−6.74	−3.00	12.05	1.82	2.88		−3.08
R_{Roe}	0.55	0.05	0.10	−0.12	−0.07	0.18	0.11	0.64	
	5.44	0.66	4.24	−2.89	−1.49	5.71	3.20	11.54	
		0.13	0.05	−0.13	−0.04	0.21	0.13		0.59
		1.75	2.20	−3.34	−0.71	6.91	4.24		10.24
R_{Eg}	0.84	0.62	−0.04	−0.10	0.11	0.11	0.01	0.34	
	10.27	9.09	−2.19	−4.09	4.00	4.77	0.41	6.27	
		0.67	−0.08	−0.11	0.13	0.12	0.02		0.29
		9.64	−4.20	−4.91	3.70	5.55	1.03		5.93

$p_{\text{GRS}} = 0.00$ for the nonmarket AQR 6-factor alphas = 0 in q^5

	$\overline{R}$	α	R_{Mkt}	R_{Me}	$R_{\text{I/A}}$	R_{Roe}	R_{Eg}
SMB	0.19	0.06	−0.01	0.92	−0.20	−0.11	
	1.54	1.65	−0.64	54.74	−6.13	−4.03	
		0.10	−0.01	0.92	−0.19	−0.09	−0.05
		2.63	−1.07	54.39	−5.87	−3.14	−2.06
BAB	0.90	0.32	0.06	0.15	0.68	0.45	
	5.73	1.94	1.21	2.19	5.51	4.67	
		0.29	0.07	0.16	0.67	0.43	0.05
		1.73	1.33	2.18	5.35	4.17	0.54
QMJ*	0.42	0.33	−0.21	−0.15	−0.08	0.49	
	4.15	5.23	−11.92	−6.21	−1.95	13.61	
		0.17	−0.18	−0.13	−0.13	0.42	0.23
		2.71	−11.40	−5.15	−3.58	13.45	4.63
QMJ	0.30	0.27	−0.14	−0.15	−0.29	0.47	
	3.02	3.69	−6.75	−4.94	−6.46	11.09	
		0.11	−0.11	−0.13	−0.34	0.40	0.23
		1.69	−5.87	−3.99	−7.68	8.67	4.46

With cross-sectionally varying expected returns, *Security Analysis* conceptually not inconsistent with the EMH

Validating *Security Analysis* on equilibrium grounds:

- Latest factor models all fail to explain Buffett's alpha
- Discretionary, active management cannot be fully substituted by passive factor investing (Kok, Ribando, and Sloan 2017)

Outline

How do the q-factor and q^5 models perform globally?

- Global q-factors

Factor models are poor in out-of-sample performance:

- The fundamental cost of capital

What drives the investment, Roe, and expected growth premiums?

- An equilibrium theory of factors

Like any prices, asset prices are equilibrated by supply and demand

The consumption CAPM and behavioral finance, both of which are demand-based, cannot possibly be the whole story

Anomalies doom the consumption CAPM, but the investment CAPM emerges as a new asset pricing paradigm

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