Aggregation, Capital Heterogeneity, and the Investment CAPM

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Aggregation and capital heterogeneity in the investment CAPM go a long way in explaining value and momentum simultaneously

Markowitz (1952)

Treynor (1962), Sharpe (1964), Lintner (1965), Mossin (1966)

Merton (1973), Ross (1976)

Rubinstein (1976), Lucas (1978), Breeden (1979)

Hansen and Singleton (1982, 1983), Breeden, Gibbons, and Litzenberger (1989)

Cochrane (2005), Back (2010), Campbell (2017)

Berk and DeMarzo (2013), Bodie, Kane, and Marcus (2014)

Böhm-Bawert (1891)

Fisher (1930), Hirshleifer (1958, 1965, 1970)

Modigliani and Miller (1958)

Cochrane (1991)

Zhang (2005, 2017)

Liu, Whited, and Zhang (2009), Liu and Zhang (2014)

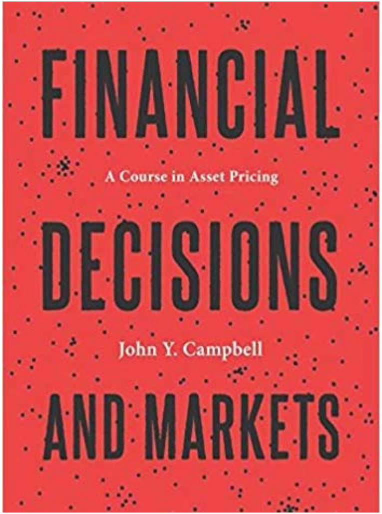
Hou, Xue, and Zhang (2015, 2017)

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

- The water versus diamond debate

"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 (our emphasis)."

Campbell (2017): An entire chapter on the investment model



An empirical challenge facing the structural investment model:

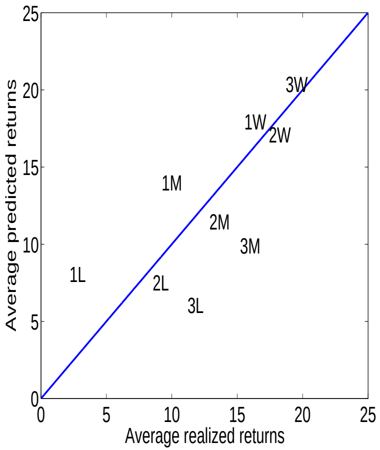
"This problem, that different parameters are needed to fit each anomaly, is a pervasive one in the q-theoretic asset pricing literature (p. 275)."

2009 JPE:

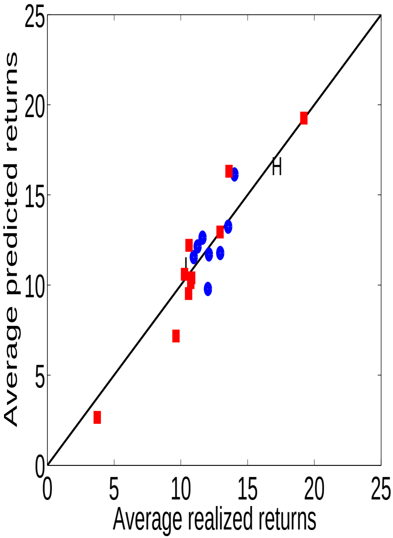
TABLE 2
PARAMETER ESTIMATES AND TESTS OF OVERIDENTIFICATION

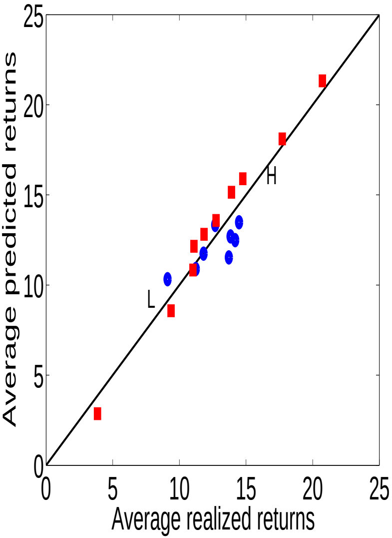
	SUE	B/M	CI
	A. Matching Expected Returns		
a	7.7	22.3	1.0
	[1.7]	[25.5]	[.3]
α	.3	.5	.2
	[.0]	[.3]	[.0]
χ^2	4.4	6.0	6.5
d.f.	8	8	8
p	.8	.7	.6
m.a.e.	.7	2.3	1.5

2014 JME:



Average predicted versus realized stock returns, value- and equal-weighted value and momentum





Outline

Operating profits: $\Pi(K_{it}, C_{it}, X_{it})$

- K_{it}: Physical capital; C_{it}: Current assets
- X_{it}: A vector of exogenous shocks
- Constant returns to scale, Cobb-Douglas

Capital accumulation:

$$\begin{aligned} K_{it+1} &= I_{it} + (1 - \delta_{it})K_{it} \\ C_{it+1} &= J_{it} + C_{it} \end{aligned}$$

Adjustment costs on physical capital:

$$\Phi(I_{it}, K_{it}) = \frac{a}{2}\left(\frac{I_{it}}{K_{it}}\right)^2 K_{it}$$

Optimal physical capital investment: $E_t[M_{t+1} r^I_{it+1}] = 1$, in which the physical investment return:

$$r^I_{it+1} = \frac{(1-\tau_{t+1})\left[\gamma_K \frac{Y_{it+1}}{K_{it+1}} + \frac{a}{2}\left(\frac{I_{it+1}}{K_{it+1}}\right)^2\right] + \tau_{t+1}\delta_{it+1} + (1-\delta_{it+1})\left[1 + (1-\tau_{t+1})a\left(\frac{I_{it+1}}{K_{it+1}}\right)\right]}{1 + (1-\tau_t)a\left(\frac{I_{it}}{K_{it}}\right)}$$

Optimal current assets investment: $E_t[M_{t+1} r^J_{it+1}] = 1$, in which the current investment return:

$$r^J_{it+1} \equiv 1 + (1-\tau_{t+1})\gamma_C \frac{Y_{it+1}}{C_{it+1}}$$

The weighted average of the investment returns equals the weighted average of the cost of equity and after-tax cost of debt:

$$w_{it}^K r_{it+1}^I + (1 - w_{it}^K) r_{it+1}^J = w_{it}^B r_{it+1}^{Ba} + (1 - w_{it}^B) r_{it+1}^S$$

$w_{it}^K = q_{it} K_{it+1} / (q_{it} K_{it+1} + C_{it+1})$ and $w_{it}^B = B_{it+1} / (P_{it} + B_{it+1})$

- Modigliani and Miller (1958, Proposition II)

The investment model of asset pricing:

$$r_{it+1}^S = \underbrace{\frac{w_{it}^K r_{it+1}^I + (1 - w_{it}^K) r_{it+1}^J - w_{it}^B r_{it+1}^{Ba}}{1 - w_{it}^B}}_{\textbf{The fundamental return},\ r_{it+1}^F}$$

Outline

Test the expected return implications of the investment model:

$$E[r^S_{pt+1} - r^F_{pt+1}] = 0,$$

r^S_{pt+1}: Portfolio p's stock return, r^F_{pt+1}: The fundamental return

- The pricing error: $e_p = E_T[r^S_{pt+1} - r^F_{pt+1}]$, with $E_T[\cdot]$ the sample mean

The investment model counterpart of Hansen and Singleton (1982)

γ_K and γ_C enter the moment condition only in the form of $\gamma = \gamma_K + \gamma_C$:

$$
\begin{aligned}
w_{it}^K r_{it+1}^I + (1 - w_{it}^K) r_{it+1}^J \quad = & \\
& \frac{(1-\tau_{t+1})(\gamma_K + \gamma_C) Y_{it+1}/(K_{it+1} + C_{it+1})}{q_{it} K_{it+1}/(K_{it+1} + C_{it+1}) + C_{it+1}/(K_{it+1} + C_{it+1})} + \\
& w_{it}^K \frac{(1-\tau_{t+1})(a/2)\left(I_{it+1}/K_{it+1}\right)^2 + \tau_{t+1}\delta_{it+1} + (1-\delta_{it+1}) q_{it+1}}{q_{it}} \\
& + (1 - w_{it}^K)
\end{aligned}
$$

The 2-capital model as parsimonious as the physical capital model

Let $\mathbf{c} \equiv (\gamma, a)$, $\mathbf{g}_T$ the sample moments, $\mathbf{D} = \partial \mathbf{g}_T / \partial \mathbf{c}$

The GMM objective function: $\mathbf{g}_T' \mathbf{W} \mathbf{g}_T$, in which $\mathbf{W} = \mathbf{I}$

$\text{Var}(\hat{\mathbf{c}}) = (\mathbf{D}'\mathbf{W}\mathbf{D})^{-1}\mathbf{D}'\mathbf{W}\mathbf{S}\mathbf{W}\mathbf{D}(\mathbf{D}'\mathbf{W}\mathbf{D})^{-1}/T$

$\text{Var}(\mathbf{g}_T) = \left[\mathbf{I} - \mathbf{D}(\mathbf{D}'\mathbf{W}\mathbf{D})^{-1}\mathbf{D}'\mathbf{W}\right] \mathbf{S} \left[\mathbf{I} - \mathbf{D}(\mathbf{D}'\mathbf{W}\mathbf{D})^{-1}\mathbf{D}'\mathbf{W}\right]' / T$

The overidentification test:

$$\mathbf{g}_T' \left[\text{var}(\mathbf{g}_T)\right]^{+} \mathbf{g}_T \sim \chi^2(\#\,\text{moments} - \#\,\text{parameters})$$

Portfolio-level fundamental returns are constructed from portfolio-level accounting variables aggregated from the firm level:

$$E\left[\begin{array}{c}\sum_{i=1}^{N_{pt}} w_{ipt} r_{ipt+1}^{S} - \\ r_{pt+1}^{F}\left(\gamma_K, a; Y_{pt+1}, K_{pt+1}, I_{pt+1}, \delta_{pt+1}, I_{pt}, K_{pt}, r_{pt+1}^{Ba}, w_{pt}^{B}\right)\end{array}\right] = 0$$

- N_{pt}: The number of firms in portfolio p at the start of t, w_{ipt}: Stock i's weight in portfolio p, r_{ipt+1}^{S}: The return of stock i in p over time t, r_{pt+1}^{F}: The fundamental return of p

Aggregating firm-level characteristics to the portfolio level:
$I_{pt+1} = \sum_{i=1}^{N_{pt}} I_{ipt+1}$, $w_{pt}^{B} = \sum_{i=1}^{N_{pt}} B_{ipt+1} / \sum_{i=1}^{N_{pt}} (P_{ipt} + B_{ipt+1})$, etc

Construct firm-level fundamental returns from firm-level accounting variables, then aggregate to portfolio-level fundamental returns:

$$E\left[\begin{array}{c} \sum_{i=1}^{N_{pt}} w_{ipt} r^S_{ipt+1} - \sum_{i=1}^{N_{pt}} w_{ipt} \times \\ r^F_{ipt+1}\left(\gamma, a; Y_{ipt+1}, K_{ipt+1}, I_{ipt+1}, \delta_{ipt+1}, I_{ipt}, K_{ipt}, r^{Ba}_{ipt+1}, w^B_{ipt}\right) \end{array}\right] = 0$$

- r^F_{ipt+1}: Firm i's fundamental return, r^F_{pt+1} varies with w_{ipt}

Why?

- Economics: Firms can make different investment choices
- Econometrics: The substantial firm-level heterogeneity helps identify structural parameters

Two sets of deciles:

- NYSE breakpoints and value-weighted returns
- All-but-micro breakpoints and equal-weighted returns

Deciles formed on:

- Book-to-market: Bm
- Momentum (prior 11-month returns, 1-month horizon): R^{11}
- Asset growth: I/A
- Return on equity: Roe

Average returns of the 40 testing deciles, value-weights

	L	2	3	4	5	6	7	8	9	H	H−L
						The Bm deciles					
m	0.42	0.50	0.57	0.46	0.51	0.54	0.66	0.61	0.72	0.89	0.47
t_m	1.74	2.54	2.93	2.18	2.73	3.01	3.46	3.20	3.85	3.76	2.07
						The R^{11} deciles					
m	−0.12	0.36	0.43	0.45	0.42	0.46	0.45	0.62	0.67	1.08	1.20
t_m	−0.35	1.33	1.93	2.24	2.23	2.35	2.52	3.11	3.13	3.88	4.10
						The I/A deciles					
m	0.68	0.67	0.61	0.51	0.52	0.54	0.58	0.46	0.57	0.31	−0.37
t_m	2.85	3.28	3.64	3.01	2.95	2.92	3.07	2.31	2.28	1.15	−2.22
						The Roe deciles					
m	0.04	0.22	0.38	0.40	0.53	0.42	0.54	0.50	0.56	0.73	0.69
t_m	0.12	0.88	1.79	2.15	2.84	2.07	2.85	2.70	2.83	3.29	2.98

Average returns of the 40 testing deciles, equal-weights

	L	2	3	4	5	6	7	8	9	H	H−L
					The Bm deciles						
m	0.24	0.36	0.51	0.56	0.62	0.70	0.73	0.71	0.73	0.89	0.66
t_m	0.77	1.36	2.06	2.40	2.71	3.27	3.52	3.32	3.46	3.87	2.80
					The R^{11} deciles						
m	−0.07	0.37	0.49	0.50	0.55	0.63	0.71	0.77	0.99	1.19	1.26
t_m	−0.21	1.40	2.13	2.32	2.78	3.19	3.57	3.58	3.93	3.65	4.21
					The I/A deciles						
m	0.69	0.77	0.78	0.70	0.74	0.72	0.64	0.59	0.45	0.17	−0.52
t_m	2.65	3.76	4.01	3.74	3.63	3.66	2.92	2.56	1.75	0.57	−3.39
					The Roe deciles						
m	0.12	0.30	0.50	0.50	0.60	0.62	0.71	0.74	0.82	1.07	0.95
t_m	0.34	1.08	2.26	2.47	2.92	2.87	3.46	3.40	3.72	4.23	4.13

Y_{it}: Sales

K_{it}: Net property, plant, and equipment

C_{it}: Current assets

B_{it+1}: Long-term debt plus short-term debt (zero if missing)

P_{it}: Market equity, from CRSP

τ_t: The statutory corporate income tax rate from the Commerce Cleaning House

δ_{it}: The amount of depreciation and amortization minus amortization, scaled by net PPE

I_{it}: $K_{it+1} - (1 - \delta_{it})K_{it}$

r_{it}^B: Total interest and related expenses, scaled by total debt

Construct monthly fundamental returns from annual accounting variables to match with monthly stock returns

For each month t, take firm-level accounting variables from the fiscal year end closest to month t to measure time-t variables in the model, and to take accounting variables from the subsequent fiscal year end to measure time-$t+1$ variables

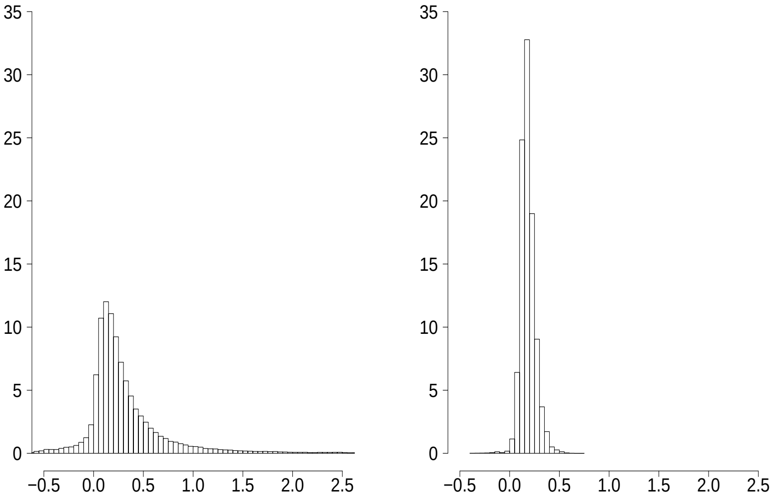
Compound the portfolio stock returns within a 12-month rolling window with month t in the middle of the window to match with the portfolio fundamental return for month t

	m	σ	5%	25%	50%	75%	95%
$\frac{I_{it}}{K_{it}}$	0.38	0.56	−0.03	0.11	0.23	0.44	1.32
$\frac{J_{it}}{C_{it}}$	0.14	0.39	−0.30	−0.05	0.07	0.23	0.82
$\frac{Y_{it+1}}{K_{it+1}}$	9.59	14.46	0.46	2.38	5.21	10.10	35.00
$\frac{Y_{it+1}}{C_{it+1}}$	3.17	2.26	0.78	1.79	2.62	3.84	7.47
$\frac{Y_{it+1}}{K_{it+1}+C_{it+1}}$	1.67	1.05	0.30	0.97	1.51	2.11	3.81
$\frac{K_{it+1}}{K_{it+1}+C_{it+1}}$	0.38	0.25	0.07	0.18	0.32	0.55	0.88
w_{it}^{B}	0.26	0.22	0.00	0.07	0.22	0.42	0.68
δ_{it+1}	0.20	0.13	0.05	0.11	0.16	0.25	0.49
r_{it+1}^{B}	0.10	0.10	0.00	0.06	0.08	0.11	0.25

Data

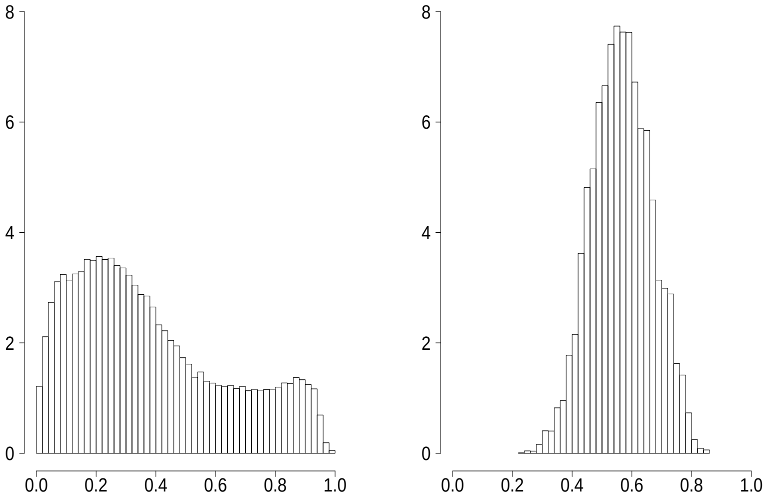
Correlation matrix, firm-level variables, the full sample

	$\frac{I_{it+1}}{K_{it+1}}$	$\frac{J_{it}}{C_{it}}$	$\frac{J_{it+1}}{C_{it+1}}$	$\frac{Y_{it+1}}{K_{it+1}}$	$\frac{Y_{it+1}}{C_{it+1}}$	$\frac{Y_{it+1}}{K_{it+1}+C_{it+1}}$	$\frac{K_{it+1}}{K_{it+1}+C_{it+1}}$	w_{it}^B	δ_{it+1}	r_{it+1}^B
$\frac{I_{it}}{K_{it}}$	0.26	0.29	0.09	0.07	−0.05	0.05	−0.15	−0.15	0.23	0.07
$\frac{I_{it+1}}{K_{it+1}}$		0.21	0.29	0.23	0.00	0.19	−0.26	−0.26	0.53	0.20
$\frac{J_{it}}{C_{it}}$			0.03	0.04	−0.05	0.00	−0.05	−0.07	0.05	0.03
$\frac{J_{it+1}}{C_{it+1}}$				0.05	0.22	0.18	0.08	−0.12	0.09	0.15
$\frac{Y_{it+1}}{K_{it+1}}$					0.08	0.53	−0.53	−0.16	0.49	0.07
$\frac{Y_{it+1}}{C_{it+1}}$						0.57	0.44	0.18	−0.16	0.05
$\frac{Y_{it+1}}{K_{it+1}+C_{it+1}}$							−0.31	−0.07	0.22	0.12
$\frac{K_{it+1}}{K_{it+1}+C_{it+1}}$								0.36	−0.56	−0.05
w_{it}^B									−0.32	−0.07
δ_{it+1}										0.12



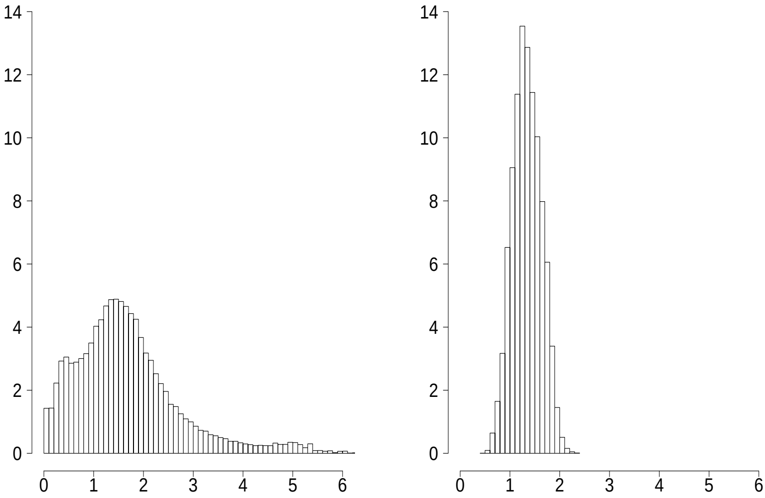
35
30
25
20
15
10
5
0
−0.5
0.0
0.5
1.0
1.5
2.0
2.5

Histograms, firm versus portfolio $K_{it+1}/(K_{it+1} + C_{it+1})$

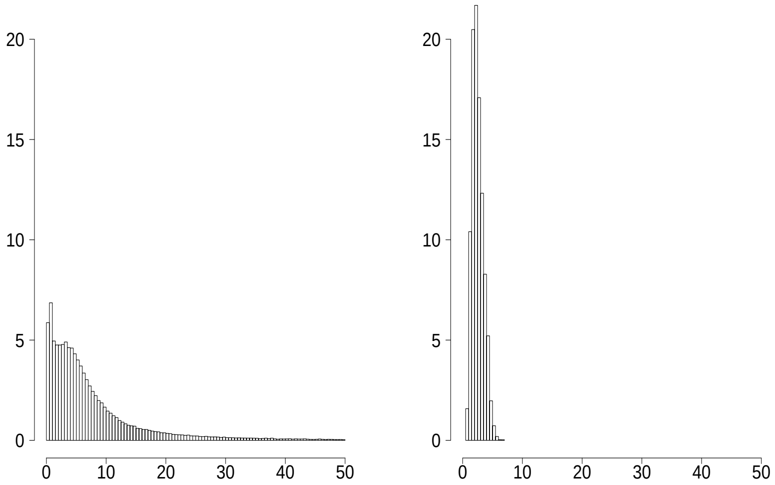


Data

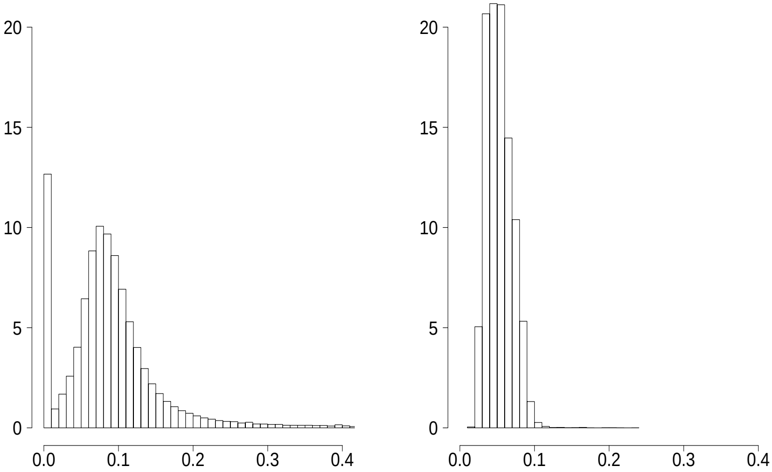
Histograms, firm versus portfolio $Y_{it+1}/(K_{it+1} + C_{it+1})$



Histograms, firm versus portfolio Y_{it+1}/K_{it+1}



Histograms, firm versus portfolio r^B_{it+1}

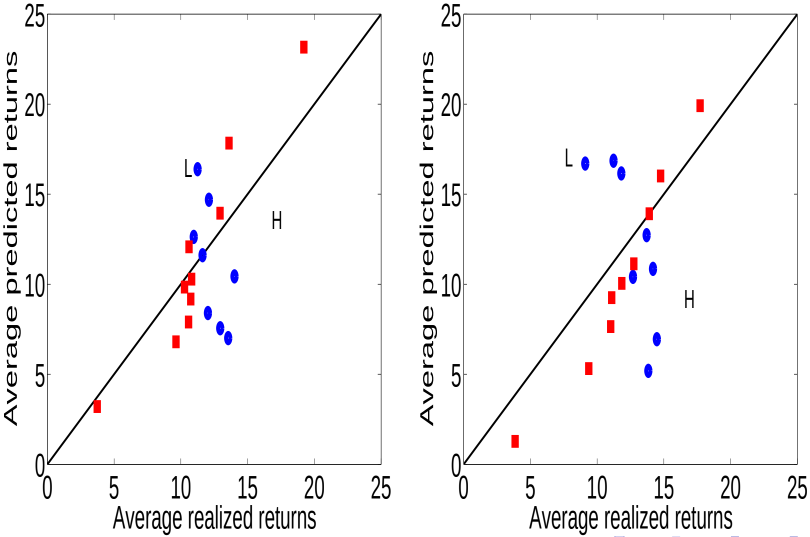


	d.f.	γ_K	$[\gamma_K]$	a	$[a]$	m.a.e.	$\overline{\lvert e_{H-L} \rvert}$	p
Bm	8	16.78	[2.41]	6.33	[1.93]	2.34	1.24	0.00
R^{11}	8	11.99	[1.14]	1.27	[0.53]	1.38	1.56	14.90
I/A	8	12.28	[1.08]	1.13	[0.40]	2.07	0.21	0.00
Roe	8	10.34	[0.98]	0.00	[0.05]	3.18	0.25	0.00
Bm-R^{11}	18	13.26	[1.18]	2.30	[0.48]	2.86	6.97	0.00
I/A-Roe	18	11.59	[1.02]	0.85	[0.35]	2.78	1.60	0.00
Bm-R^{11}-I/A-Roe	38	12.55	[1.09]	1.73	[0.35]	2.88	4.30	0.00

	d.f.	γ_K	$[\gamma_K]$	a	$[a]$	m.a.e.	$\overline{\lvert e_{\text{H–L}} \rvert}$	p
Bm	8	72.08	[12.75]	63.40	[0.51]	3.65	3.79	7.31
R^{11}	8	12.93	[1.29]	1.34	[0.58]	1.31	0.14	34.03
I/A	8	14.72	[1.46]	2.24	[0.52]	2.50	1.33	0.00
Roe	8	11.54	[1.11]	0.00	[0.04]	2.90	0.29	0.00
Bm-R^{11}	18	14.04	[1.39]	2.85	[0.52]	4.05	12.24	0.00
I/A-Roe	18	13.75	[1.33]	1.75	[0.40]	2.97	3.24	0.00
Bm-R^{11}-I/A-Roe	38	14.09	[1.34]	2.50	[0.37]	3.50	7.43	0.00

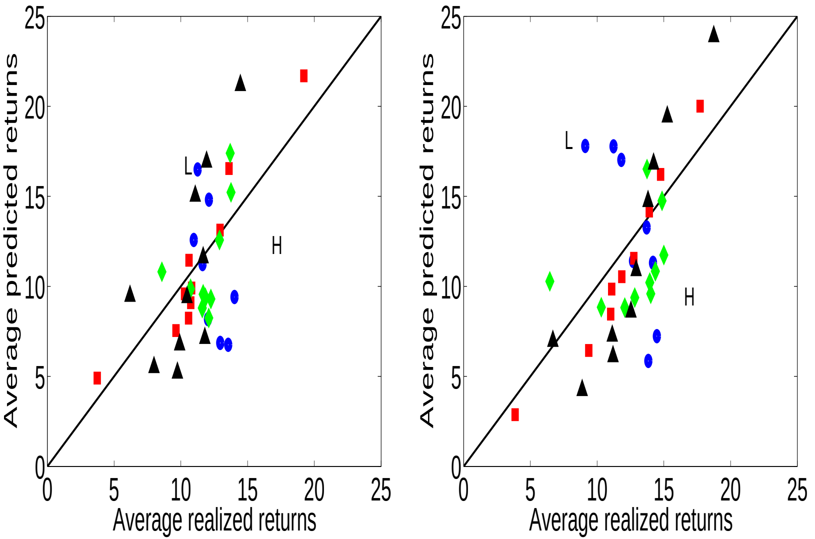
GMM Estimation and Tests

Average predicted versus realized stock returns, Bm-R^{11}, value- and equal-weights, the 1-capital model at the portfolio level



GMM Estimation and Tests

Bm-R^{11}-I/A-Roe, value- and equal-weights, the 1-capital model at the portfolio level



GMM Estimation and Tests

The 2-capital model estimated at the firm level, NYSE breakpoints and value-weighted deciles

	d.f.	γ_K	$[\gamma_K]$	a	$[a]$	m.a.e.	$\overline{\lvert e_{H-L} \rvert}$	p
Bm	8	15.17	[2.55]	5.37	[0.00]	0.74	2.37	97.81
R^{11}	8	16.32	[2.06]	3.74	[0.00]	0.86	0.20	77.48
I/A	8	17.17	[1.80]	1.56	[0.69]	0.96	2.63	0.78
Roe	8	15.10	[2.76]	6.07	[0.01]	0.94	1.93	49.13
Bm-R^{11}	18	16.68	[2.09]	3.60	[0.01]	1.00	1.06	2.35
I/A-Roe	18	17.01	[1.84]	1.65	[0.70]	1.15	2.28	0.00
Bm-R^{11}-I/A-Roe	38	16.69	[2.05]	3.55	[0.00]	1.29	0.94	0.00

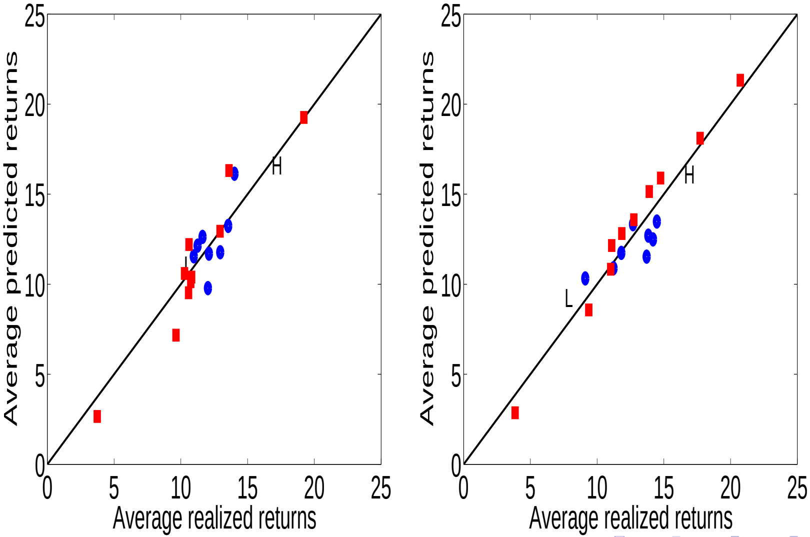
GMM Estimation and Tests

The 2-capital model estimated at the firm level, all-but-micro breakpoints and equal-weighted deciles

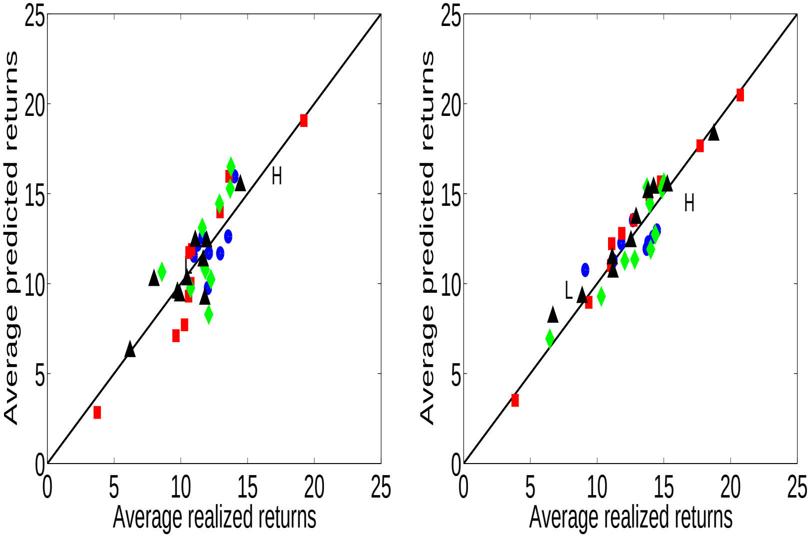
	d.f.	γ_K	$[\gamma_K]$	a	$[a]$	m.a.e.	$\overline{\lvert e_{H-L} \rvert}$	p
Bm	8	15.60	[1.99]	3.60	[0.01]	0.78	1.82	2.47
R^{11}	8	15.69	[1.97]	2.65	[0.97]	0.58	0.29	41.86
I/A	8	16.48	[1.79]	1.99	[0.47]	0.64	0.88	0.70
Roe	8	14.82	[1.98]	3.74	[0.01]	0.34	0.24	40.99
Bm-R^{11}	18	15.52	[2.09]	3.28	[0.26]	0.93	1.84	0.00
I/A-Roe	18	16.17	[1.84]	2.05	[0.43]	0.70	1.30	0.00
Bm-R^{11}-I/A-Roe	38	15.91	[1.96]	2.78	[0.27]	0.91	1.82	0.00

GMM Estimation and Tests

Average predicted versus realized stock returns, Bm-R^{11}, value- and equal-weights, the 2-capital model at the firm level



Bm-R^{11}-I/A-Roe, value- and equal-weights, the 2-capital model at the firm level



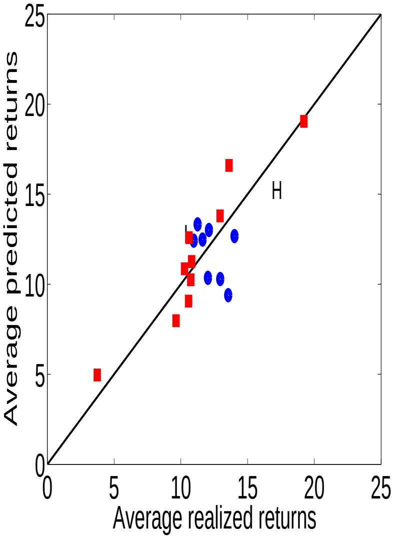
The physical investment return:

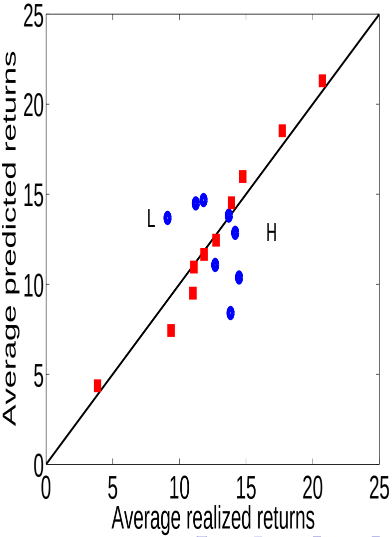
$$r^I_{it+1} = \frac{(1-\tau_{t+1})\left[\gamma_K \frac{Y_{it+1}}{K_{it+1}} + \frac{a}{2}\left(\frac{I_{it+1}}{K_{it+1}}\right)^2\right] + \tau_{t+1}\delta_{it+1} + (1-\delta_{it+1})\left[1+(1-\tau_{t+1})a\left(\frac{I_{it+1}}{K_{it+1}}\right)\right]}{1+(1-\tau_t)a\left(\frac{I_{it}}{K_{it}}\right)}$$

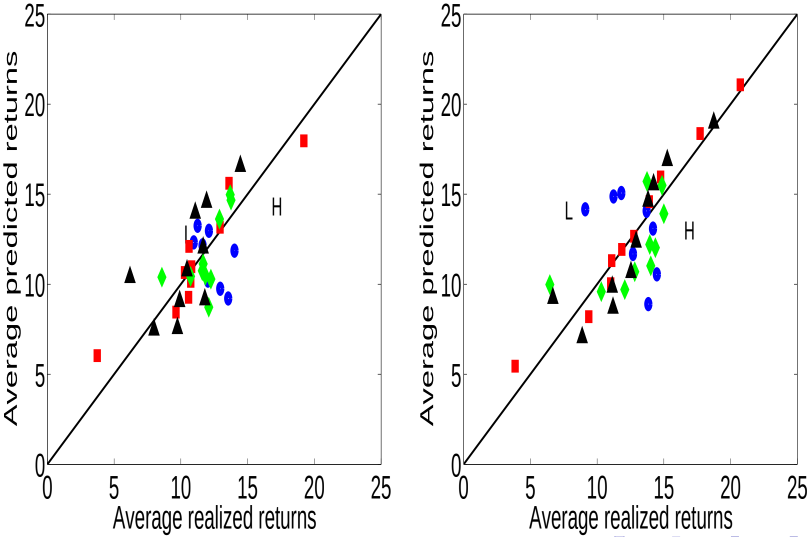
	VW	EW	VW	EW
	Bm		I/A	
Benchmark	1.60	4.10	−0.48	1.13
$\overline{I_{it}/K_{it}}$	40.94	44.72	−26.64	−26.94
$\overline{I_{it+1}/K_{it+1}}$	−36.06	−29.56	16.41	17.72
$\overline{Y_{it+1}/(K_{it+1}+C_{it+1})}$	−7.13	−3.05	1.64	2.71
	R^{11}		Roe	
Benchmark	−0.75	−0.11	−0.95	1.93
$\overline{I_{it}/K_{it}}$	−12.28	−12.78	−7.96	−11.31
$\overline{I_{it+1}/K_{it+1}}$	22.49	23.48	14.21	18.83
$\overline{Y_{it+1}/(K_{it+1}+C_{it+1})}$	3.77	4.68	4.50	10.19

GMM Estimation and Tests

The impact of aggregation, Bm-R^{11}, value- and equal-weights, the 2-capital model at the portfolio level






Average predicted returns
Average realized returns
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Average predicted returns
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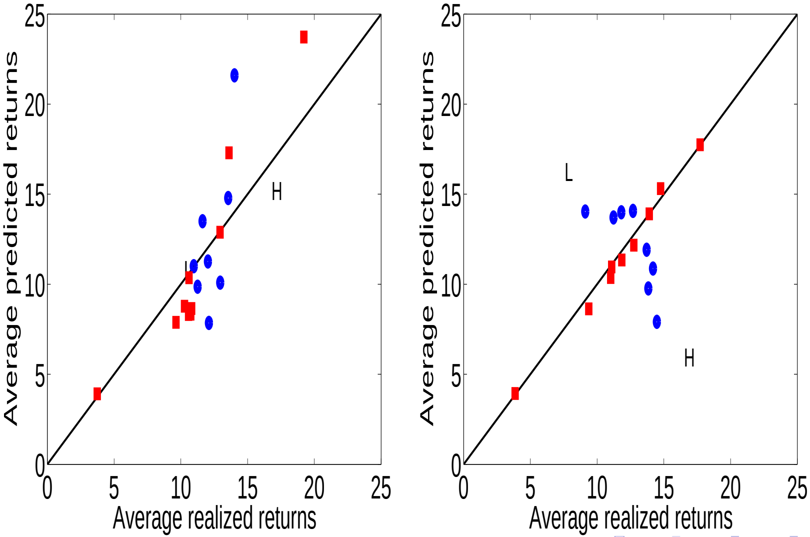
Average predicted returns
Average realized returns
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Average predicted returns
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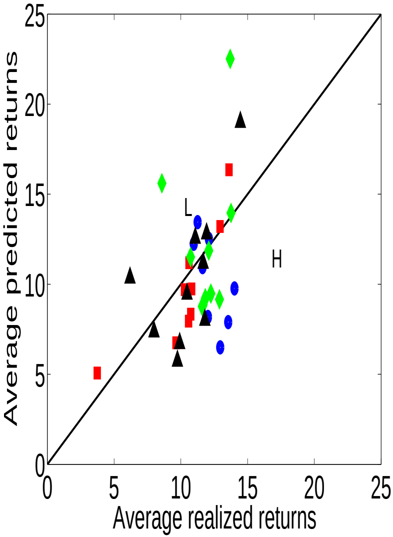
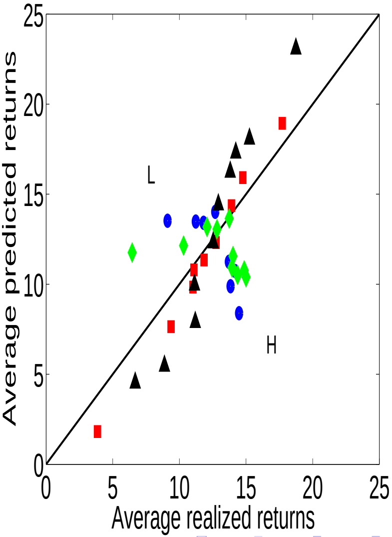
The impact of capital heterogeneity, Bm-R^{11}-I/A-Roe, value- and equal-weights, the 1-capital model at the firm level



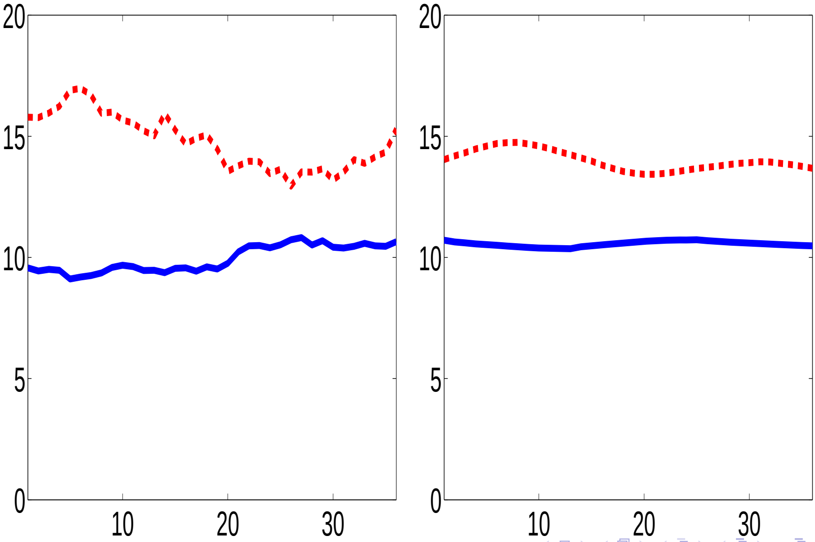


Outline

Correlations between the stock returns of various leads and lags and the contemporaneous fundamental return, r_{it}^F

	r_{it-24}^S	r_{it-12}^S	r_{it-3}^S	r_{it}^S	r_{it+3}^S	r_{it+12}^S	r_{it+24}^S
All firms	-0.03^{***}	0.02^{***}	0.12^{***}	0.14^{***}	0.14^{***}	0.05^{***}	-0.01
vw-portfolios	0.05^{*}	0.10^{***}	0.20^{***}	0.22^{***}	0.21^{***}	0.12^{***}	0.08^{***}
No microcaps	-0.01^{*}	0.06^{***}	0.14^{***}	0.14^{***}	0.13^{***}	0.04^{***}	-0.01^{*}
ew-portfolios	0.23^{***}	0.27^{***}	0.36^{***}	0.37^{***}	0.36^{***}	0.27^{***}	0.22^{***}

	L	2	3	4	5	6	7	8	9	H	H−L
					Value-weighted deciles						
Bm	0.13	0.20	0.12	0.02	0.12^{**}	0.20	0.01	−0.02	0.03	0.25^{**}	0.32^{***}
R^{11}	0.25^{**}	0.12	0.07	−0.04	−0.03	0.02	0.02	0.09	0.09	0.22	0.18^{**}
I/A	0.19^{**}	0.10	0.12	−0.03	0.10	−0.01	0.07	0.01	0.10	0.29^{***}	0.39^{***}
Roe	0.25^{**}	0.19^{*}	0.12	0.13^{*}	−0.02	0.00	0.07	0.02	−0.01	0.10	0.21^{**}
					Equal-weighted deciles						
Bm	0.38^{***}	0.28^{**}	0.23	0.14	0.17	0.20^{**}	0.16^{*}	0.14^{*}	0.17^{*}	0.13	0.54^{***}
R^{11}	0.23^{**}	0.13	0.09	0.04	0.06	0.05	0.16	0.22^{**}	0.27^{***}	0.42^{***}	0.28^{***}
I/A	0.18	0.13	−0.04	0.05	0.08	0.11	0.12	0.13	0.16	0.34^{***}	0.44^{***}
Roe	0.34^{***}	0.22^{*}	0.12	0.02	0.01	0.09	0.13	0.09	0.12	0.24^{**}	0.34^{***}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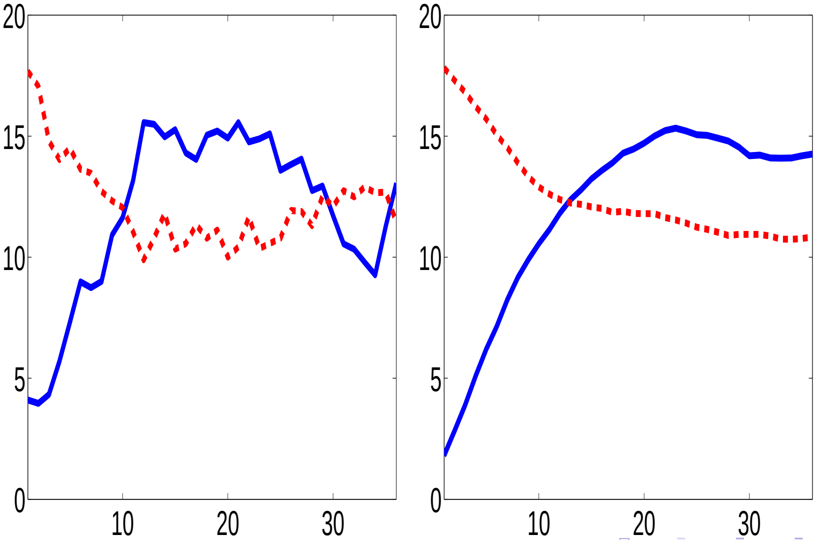
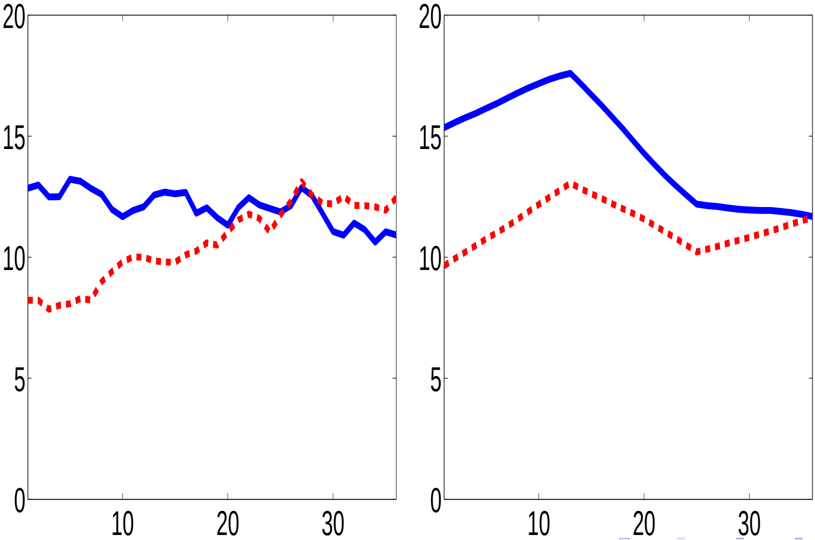
Diagnostics

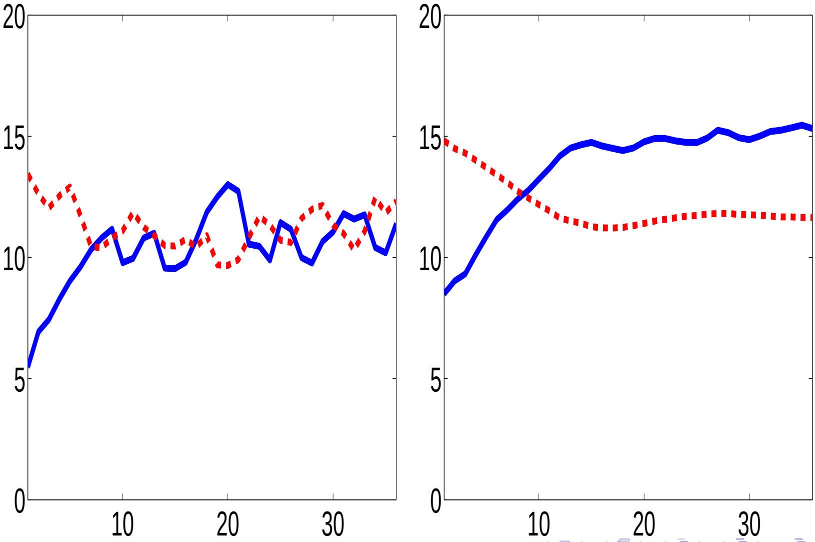
The short-term dynamics of the (value-weighted) momentum premium, the stock and fundamental returns in event-time



Diagnostics

The long-term dynamics of the (value-weighted) investment premium, the stock and fundamental returns in event-time

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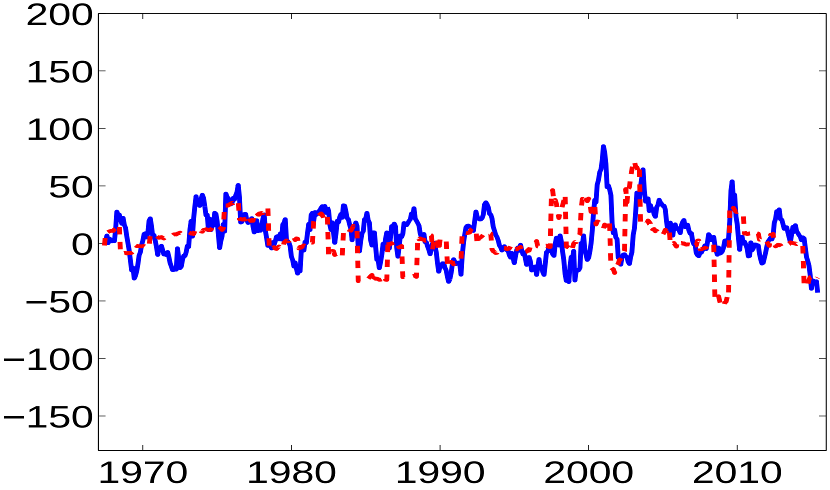
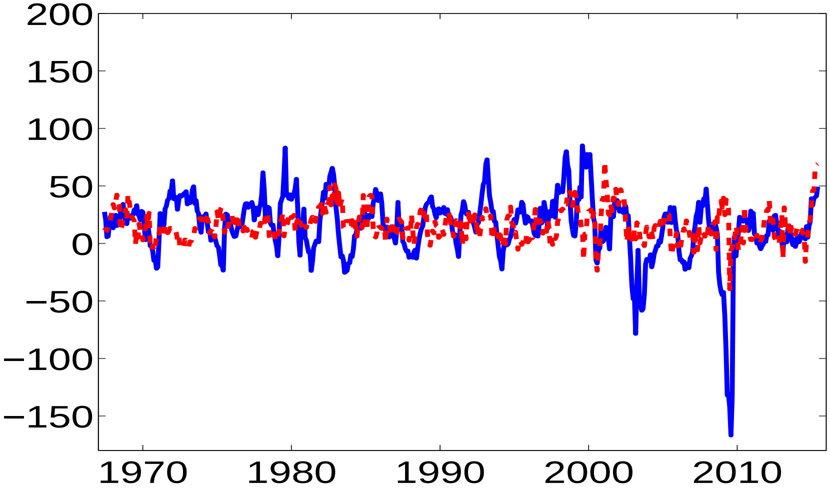
Diagnostics

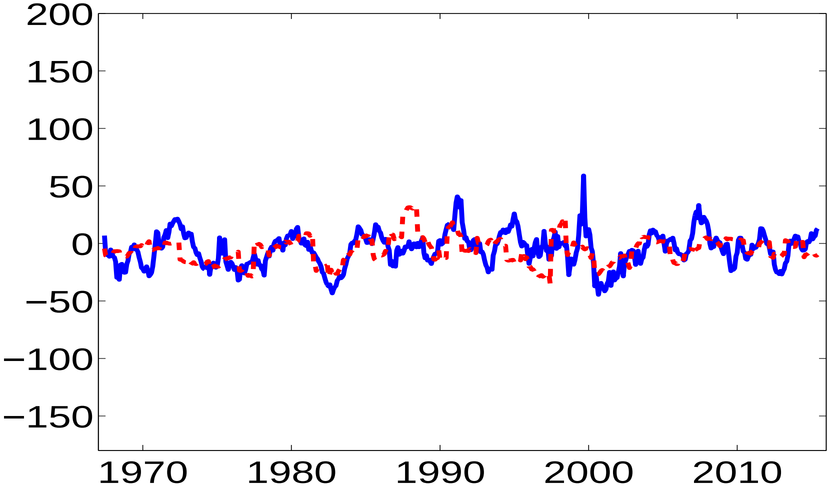
Time series of stock and fundamental returns,
the (value-weighted) value premium, correlation = 0.32



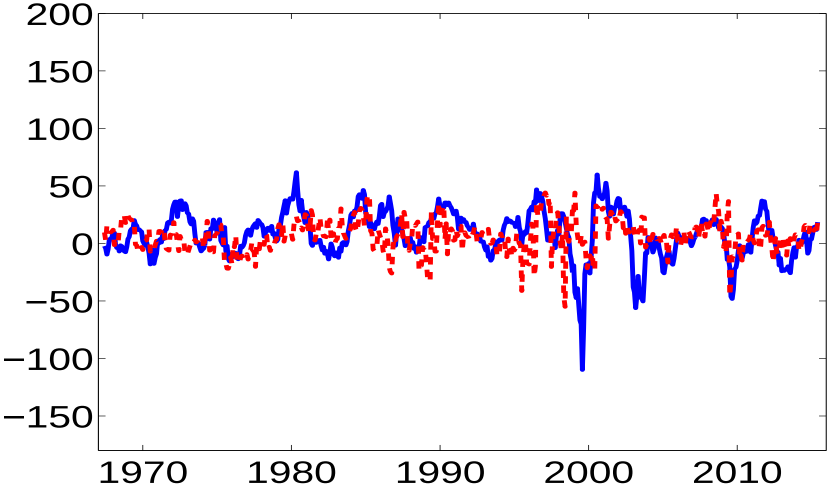
Time series of stock and fundamental returns, the (value-weighted) momentum premium, correlation = 0.18



Time series of stock and fundamental returns, the (value-weighted) investment premium, correlation = 0.39



Time series of stock and fundamental returns,
the (value-weighted) Roe premium, correlation = 0.21



		L	2	3	4	5	6	7	8	9	H	H−L
σ	r^S	20.50	18.04	17.64	18.90	16.82	16.37	17.38	16.85	17.09	21.37	$19.99^{\star\star\star}$
	r^F	5.49	7.40	7.80	8.67	9.69	10.82	8.76	10.03	14.36	19.71	$19.47^{\star\star\star}$
S_k	r^S	−0.25	0.01	−0.07	−0.06	−0.18	−0.07	−0.22	−0.47	−0.12	0.09	0.45
	r^F	−0.90	−0.69	2.21	0.97	1.14	−1.85	0.70	0.28	0.44	0.41	0.02
K_u	r^S	2.98	3.08	2.75	3.38	3.19	3.62	3.48	4.35	3.96	4.42	3.40
	r^F	3.86	5.35	13.81	6.69	5.39	8.17	3.01	3.44	4.59	4.82	$4.37^{\star}$

		L	2	3	4	5	6	7	8	9	H	H−L
σ	r^S	29.59	24.18	19.87	18.20	16.55	17.22	15.87	17.85	19.52	26.05	27.48***
	r^F	11.65	9.13	9.21	7.90	8.36	7.49	7.50	7.64	7.90	7.77	13.19***
S_k	r^S	1.54	0.98	0.15	0.46	−0.10	−0.14	−0.23	−0.19	−0.13	−0.06	−1.83*
	r^F	−0.90	−0.17	0.05	0.40	0.95	0.99	1.18	0.72	0.60	−0.18	0.57**
K_u	r^S	10.43	8.21	3.84	4.11	3.65	3.49	2.96	3.03	3.48	3.16	12.08***
	r^F	6.20	5.61	7.42	4.95	6.29	6.21	7.00	5.53	5.03	3.94	4.71**

		L	2	3	4	5	6	7	8	9	H	H−L
σ	r^S	22.11	18.51	15.78	15.38	15.68	16.60	16.68	17.38	21.58	22.88	14.90***
	r^F	8.82	9.90	9.33	7.37	6.14	8.67	6.53	5.83	8.18	7.94	11.46***
S_k	r^S	0.46	−0.05	−0.01	−0.17	−0.27	−0.18	−0.19	−0.17	−0.30	−0.22	0.06
	r^F	0.14	1.68	0.68	0.65	0.47	−0.52	−0.07	0.43	0.21	−0.26	0.33
K_u	r^S	4.42	3.57	3.14	3.45	3.51	3.16	3.15	3.11	3.27	3.09	3.44
	r^F	3.03	9.44	3.25	4.34	2.95	5.35	4.52	4.15	4.26	4.09	3.72

		L	2	3	4	5	6	7	8	9	H	H−L
σ	r^S	27.67	22.03	18.82	16.40	16.75	17.64	16.66	16.81	17.54	20.15	20.41***
	r^F	14.08	14.14	12.87	10.15	8.66	8.08	7.34	5.96	5.70	5.99	14.01***
S_k	r^S	0.19	0.24	−0.03	−0.05	−0.22	−0.35	−0.41	−0.11	−0.23	−0.09	−0.84*
	r^F	0.38	0.57	1.37	0.68	0.48	1.39	−0.03	−0.03	0.07	0.02	−0.24
K_u	r^S	3.69	3.96	4.11	3.31	3.08	3.53	3.11	2.87	3.33	2.66	5.78***
	r^F	4.65	6.22	11.05	6.37	4.99	7.60	3.65	4.21	3.38	2.89	4.35**

Aggregation and capital heterogeneity in the investment CAPM

Future work: Toward the fundamental cost of capital