Does the Investment Model Explain Value and Momentum Simultaneously?

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Two innovations (aggregation and current assets) in the investment model go a long way in explaining value and momentum jointly

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)

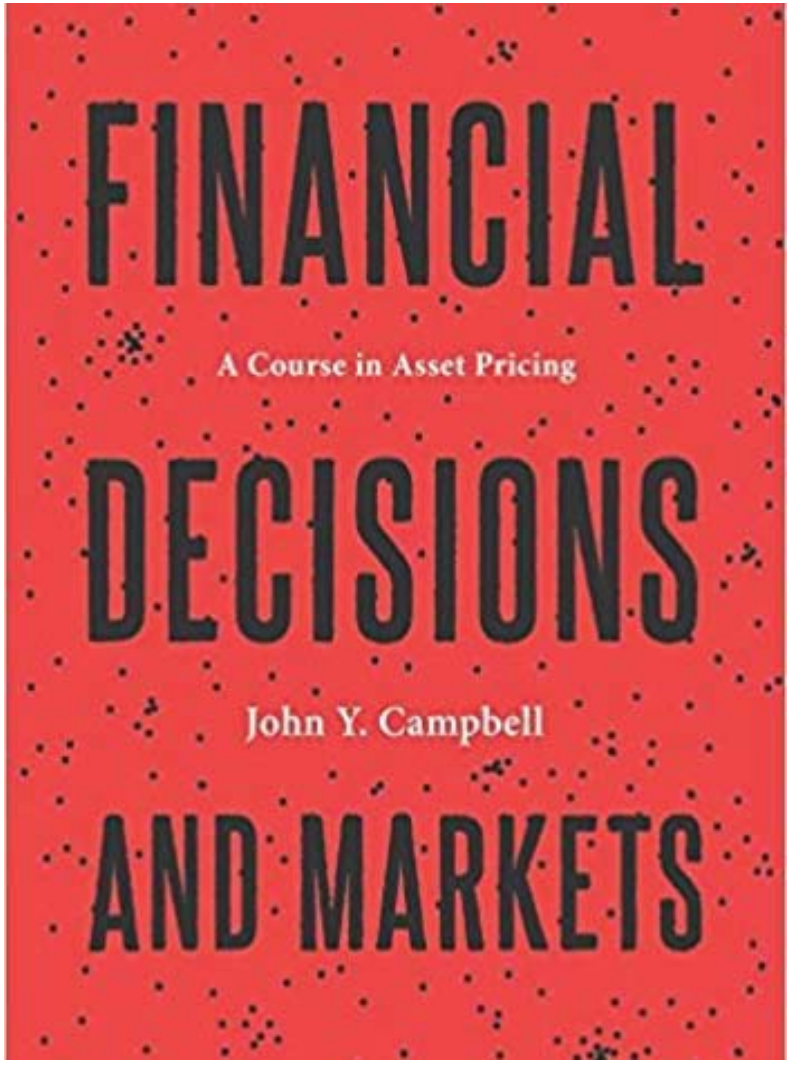
Ricardo and Mill: Costs of production determine value
Jevons, Menger, and Walras: Marginal utility determines value

- 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)."

Introduction

Campbell (2017) devotes an entire chapter to the investment model



An empirical challenge facing the structural investment model:

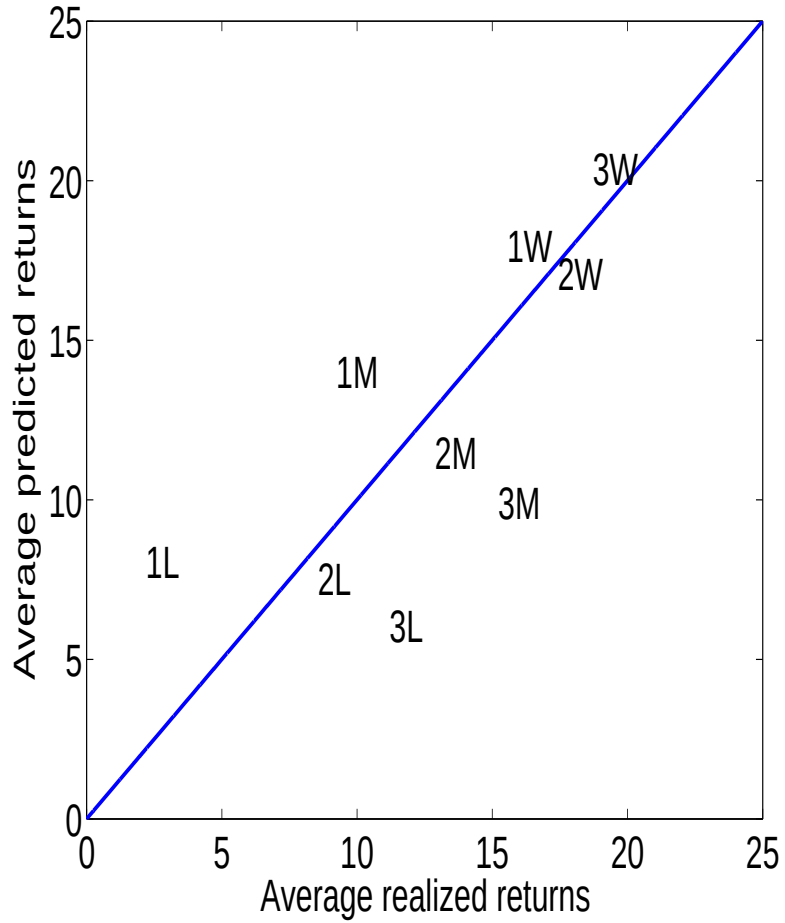
"This problem, that different parameters are needed to fit each anomaly, is a pervasive one in the q-theoretic asset pricing literature (p. 275)."

2009 JPE:

TABLE 2
PARAMETER ESTIMATES AND TESTS OF OVERIDENTIFICATION

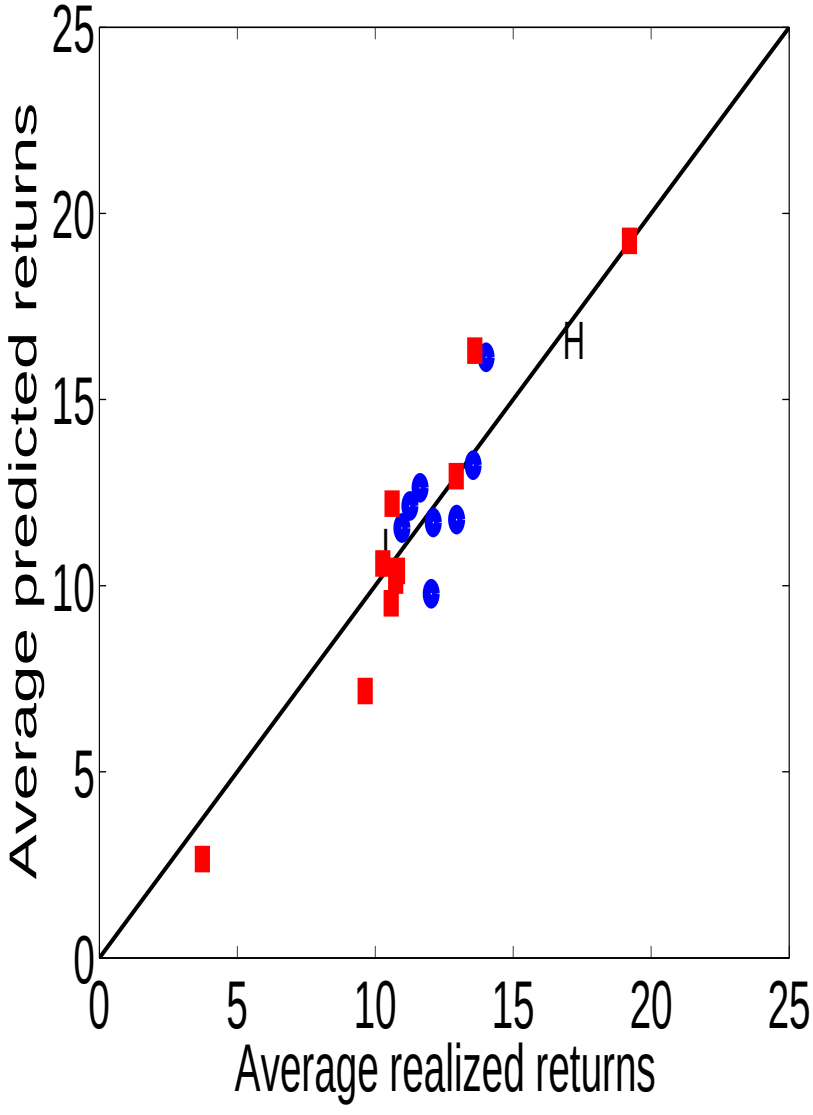
	SUE	B/M	CI
	A. Matching Expected Returns		
a	7.7	22.3	1.0
	[1.7]	[25.5]	[.3]
α	.3	.5	.2
	[.0]	[.3]	[.0]
χ^2	4.4	6.0	6.5
d.f.	8	8	8
p	.8	.7	.6
m.a.e.	.7	2.3	1.5

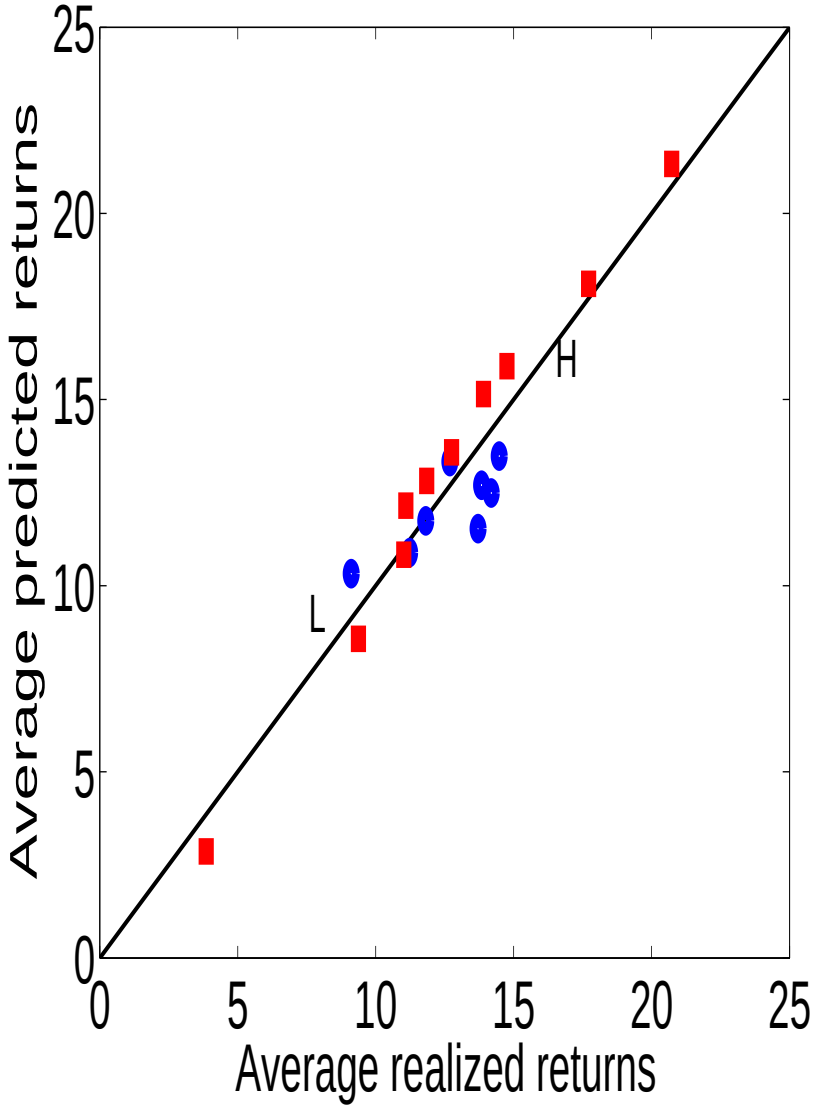
2014 JME:



Introduction

Average predicted versus realized stock returns, value- and equal-weighted value and momentum, the Gonçalves-Xue-Zhang (2017) model





Factor models are effective for "risk" management in practice, but their cost of capital estimates are noisy (Fama and French 1997)

The implied cost of capital literature based on accounting-based valuation models (Gebhardt, Lee, and Swaminathan 2001)

Alas, the implied cost of capital does not seem to forecast one-period-ahead realized returns (Easton and Monahan 2005, Hughes, Liu, and Liu 2009, Guay, Kothari, and Shu 2011)

Toward the fundamental cost of capital implied from the investment model

Outline

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:

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

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

Aggregating firm-level characteristics to the portfolio level: $I_{pt+1} = \sum_{i=1}^{N_{pt}} I_{ipt+1}$, $w^{B}_{pt} = \sum_{i=1}^{N_{pt}} B_{ipt+1} / \sum_{i=1}^{N_{pt}} (P_{ipt} + B_{ipt+1})$, 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: Allows firms to follow different investment policies
- Econometrics: Allows the substantial firm-level heterogeneity to help identify structural parameters

Outline

Data

40 testing deciles, January 1967–December 2015

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

Data

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

Data

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

Data

Descriptive statistics of firm-level accounting variables, the full sample

	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

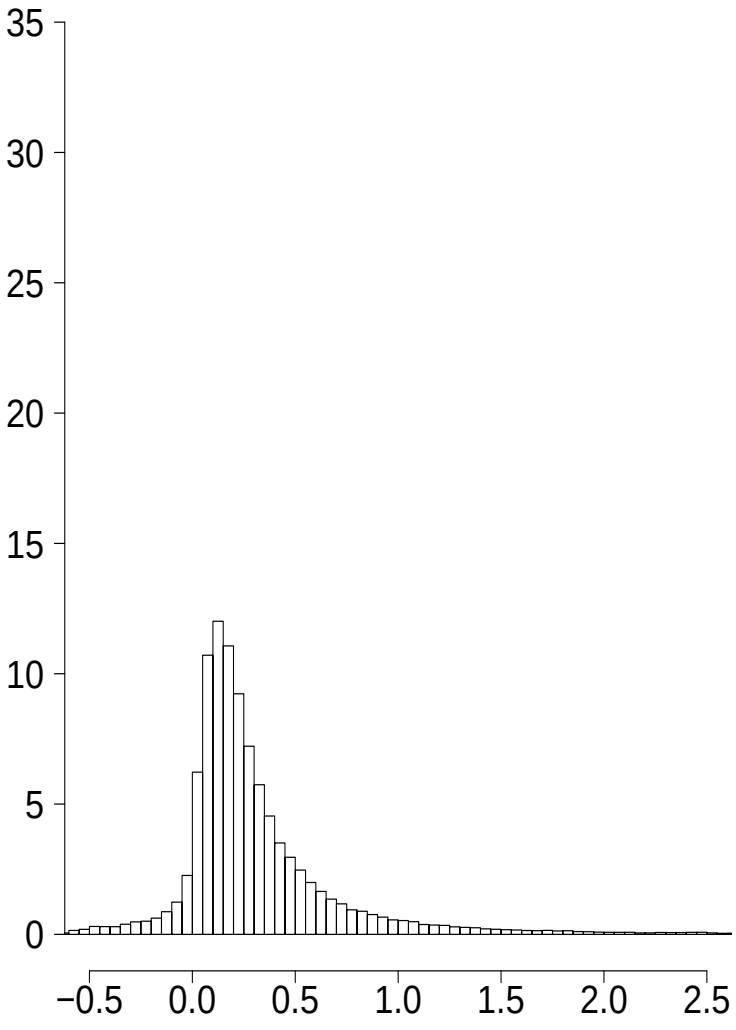
Data

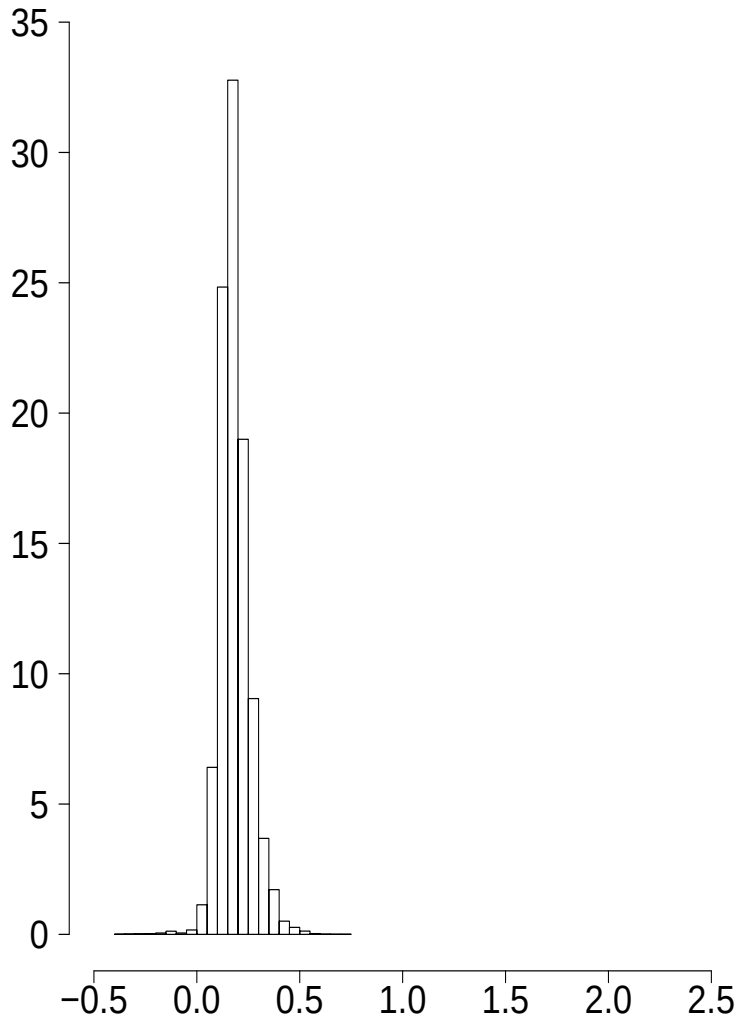
Correlation matrix of firm-level accounting variables, the full sample

	$\frac{I_{it+1}}{K_{it+1}}$	$\frac{J_{it}}{C_{it}}$	$\frac{J_{it+1}}{C_{it+1}}$	$\frac{Y_{it+1}}{K_{it+1}}$	$\frac{Y_{it+1}}{C_{it+1}}$	$\frac{Y_{it+1}}{K_{it+1}+C_{it+1}}$	$\frac{K_{it+1}}{K_{it+1}+C_{it+1}}$	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

Data

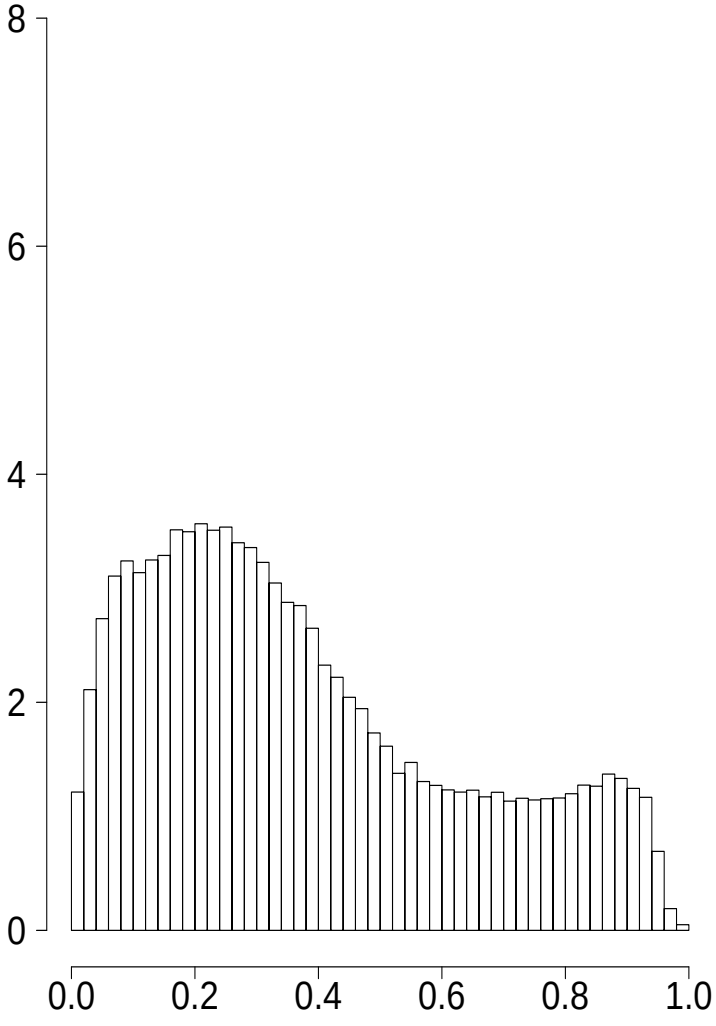
Histograms of firm-level versus portfolio-level I_{it}/K_{it}

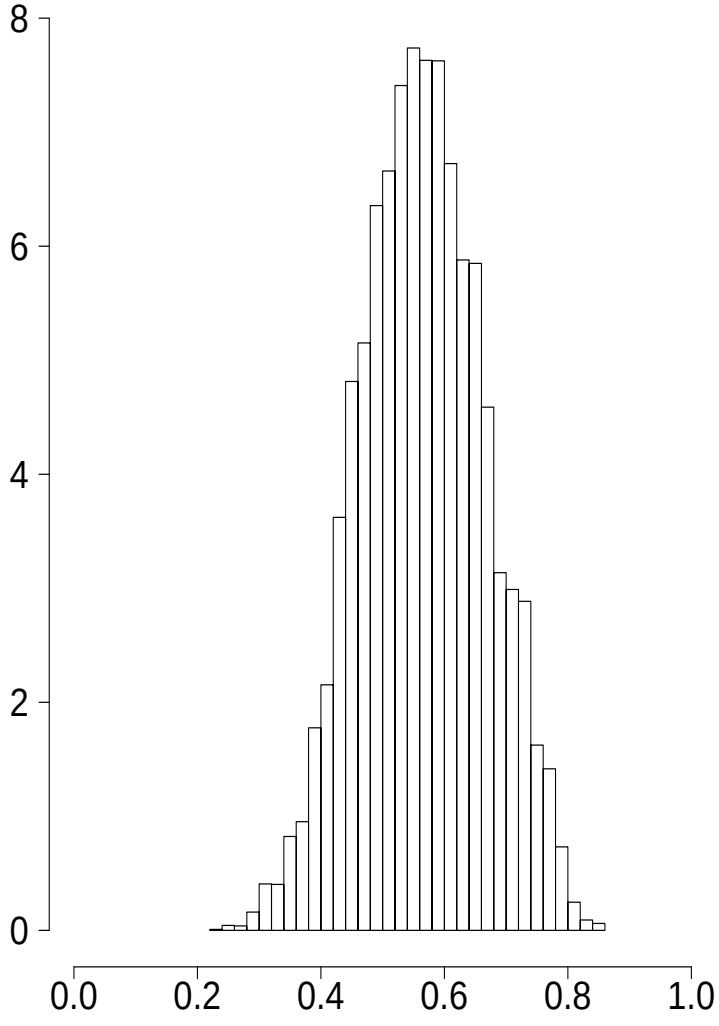




Data

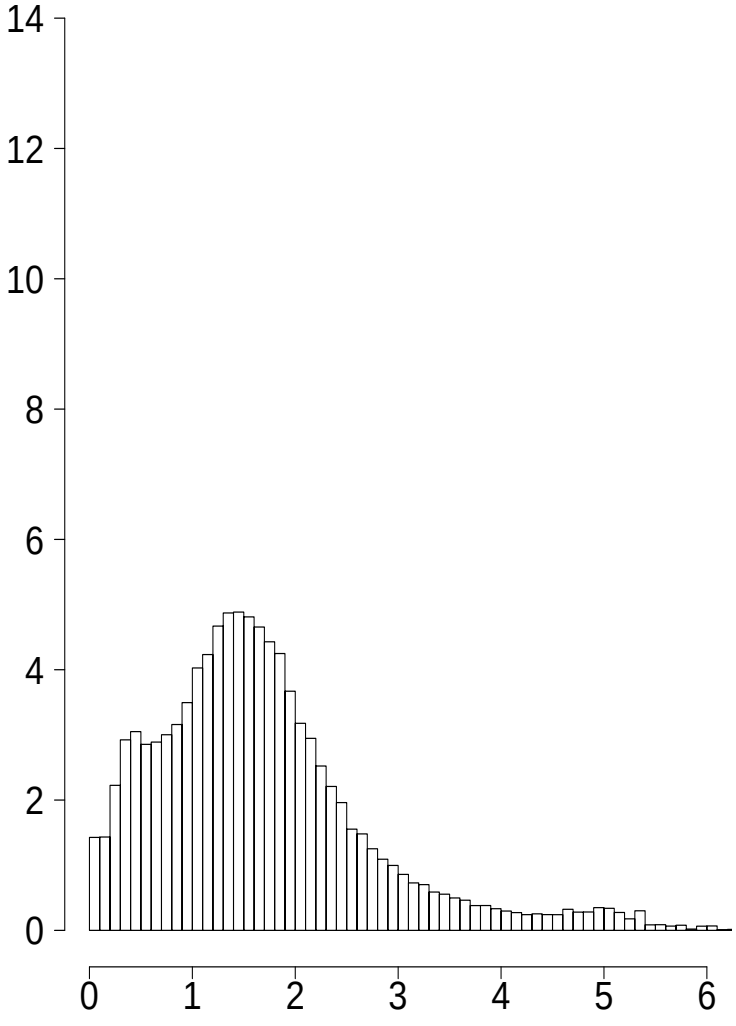
Histograms of firm-level versus portfolio-level $K_{it+1}/(K_{it+1} + C_{it+1})$

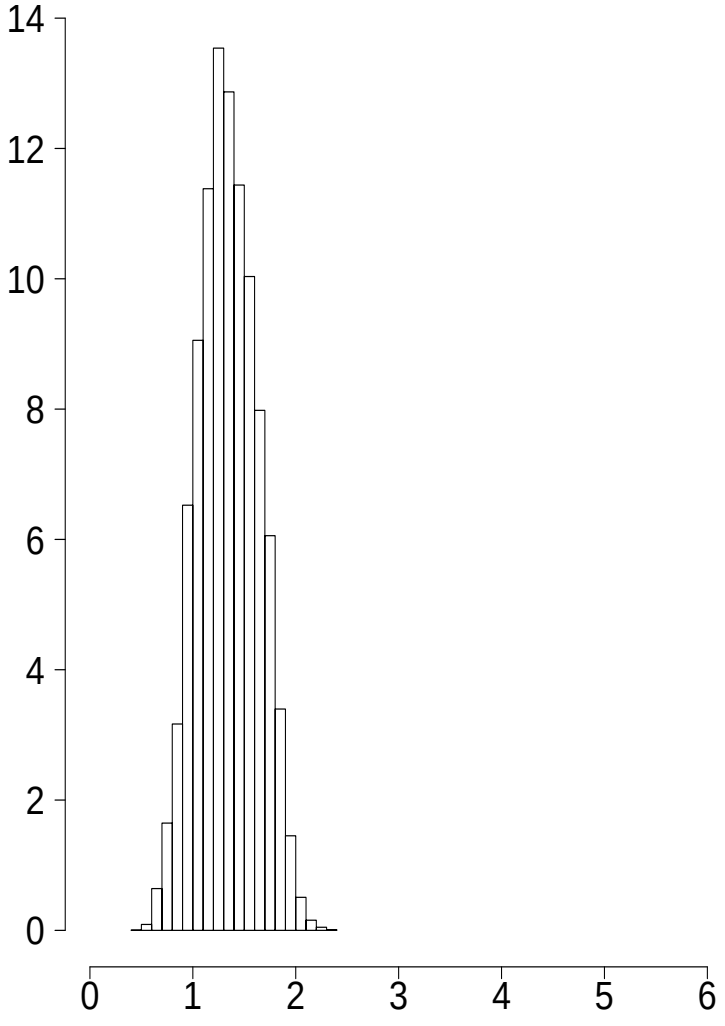




Data

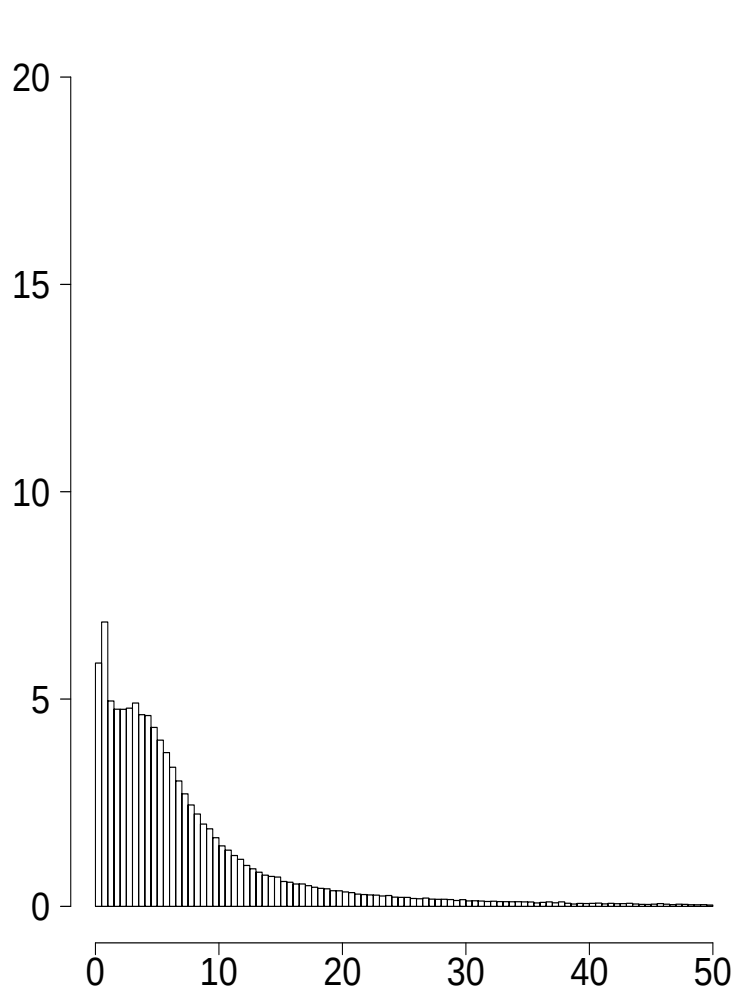
Histograms of firm-level versus portfolio-level $Y_{it+1}/(K_{it+1} + C_{it+1})$

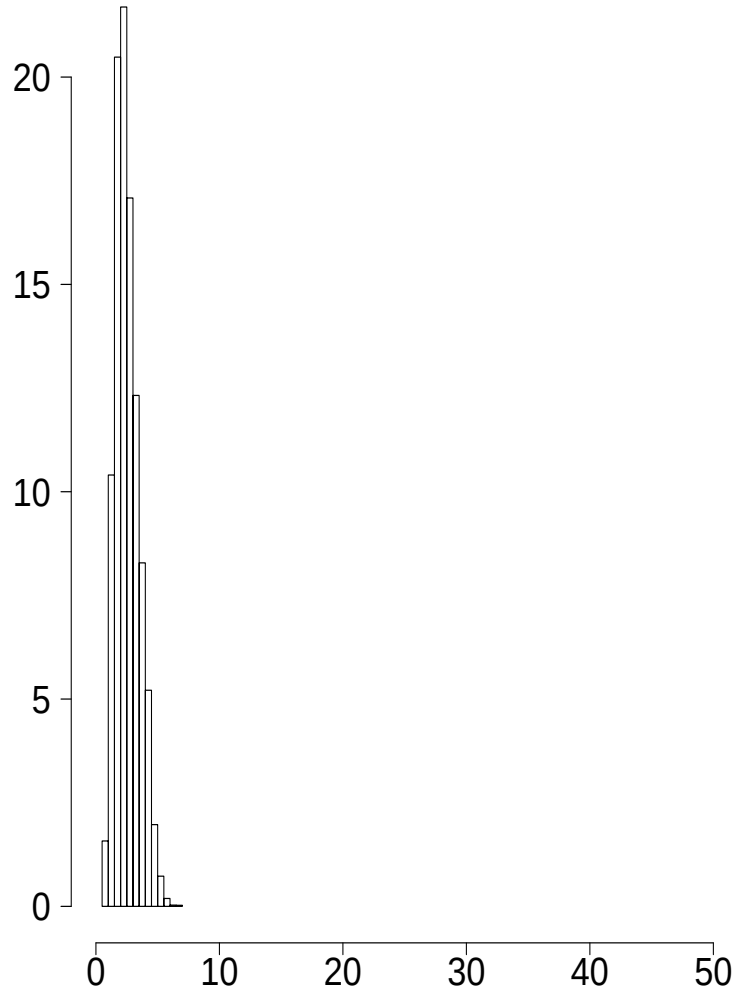




Data

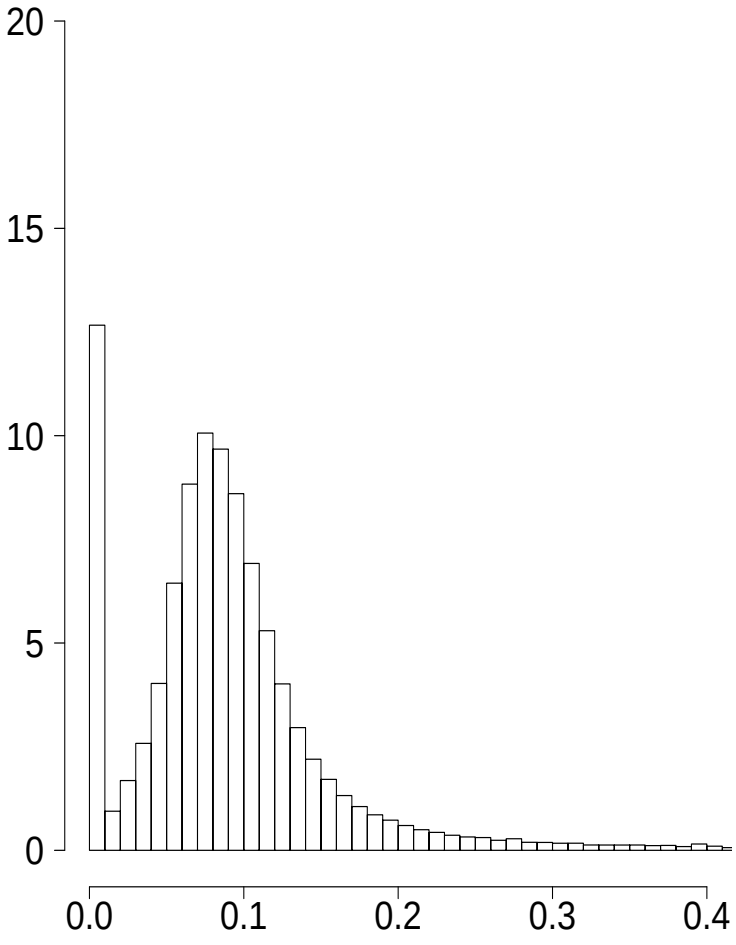
Histograms of firm-level versus portfolio-level Y_{it+1}/K_{it+1}

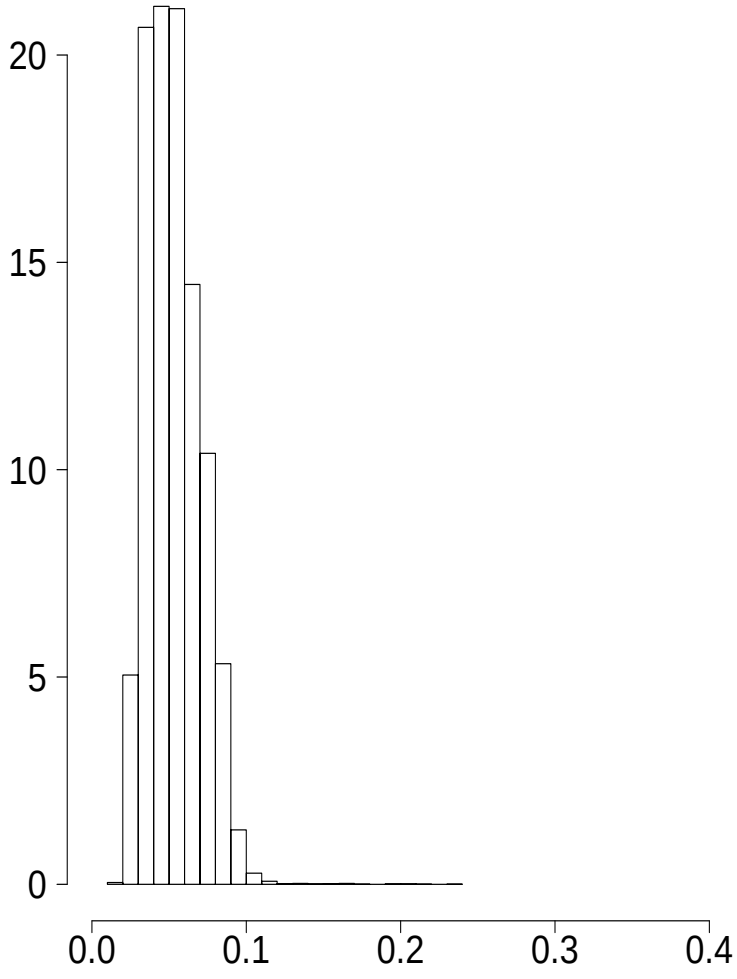




Data

Histograms of firm-level versus portfolio-level r^B_{it+1}





Outline

GMM Estimation and Tests

Replicating prior studies: The physical capital model estimated at the portfolio 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	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

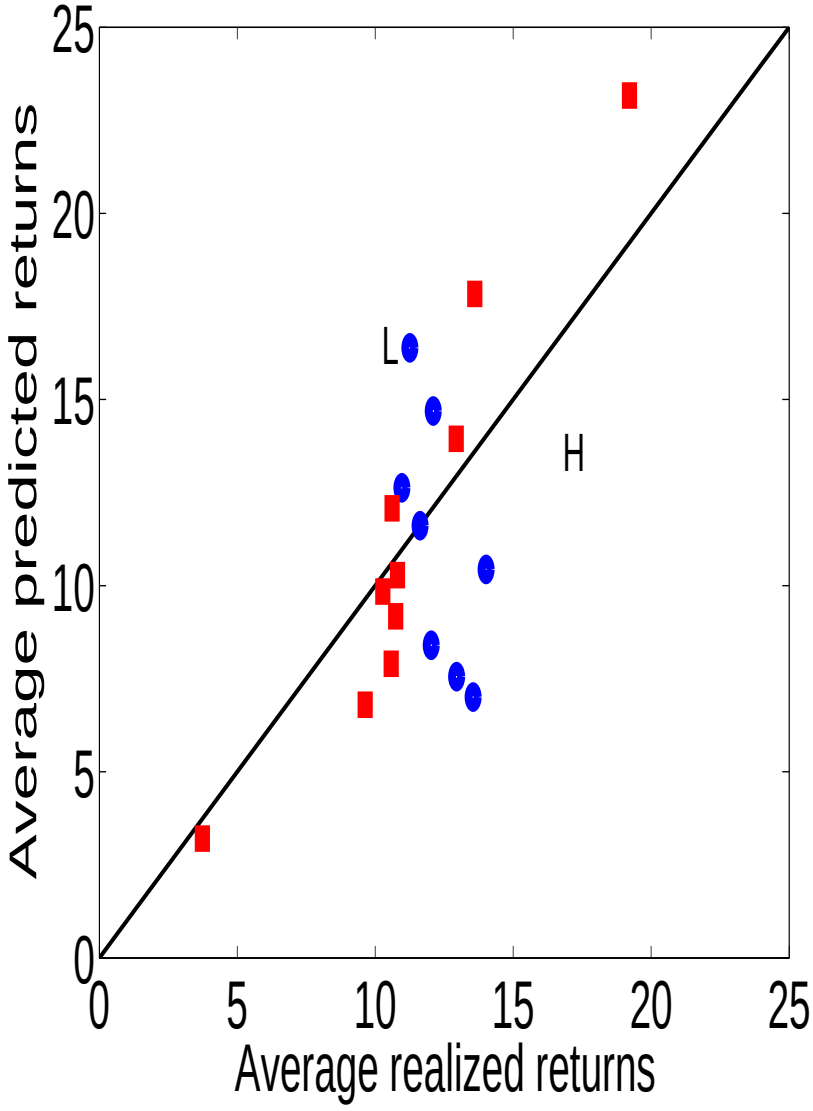
GMM Estimation and Tests

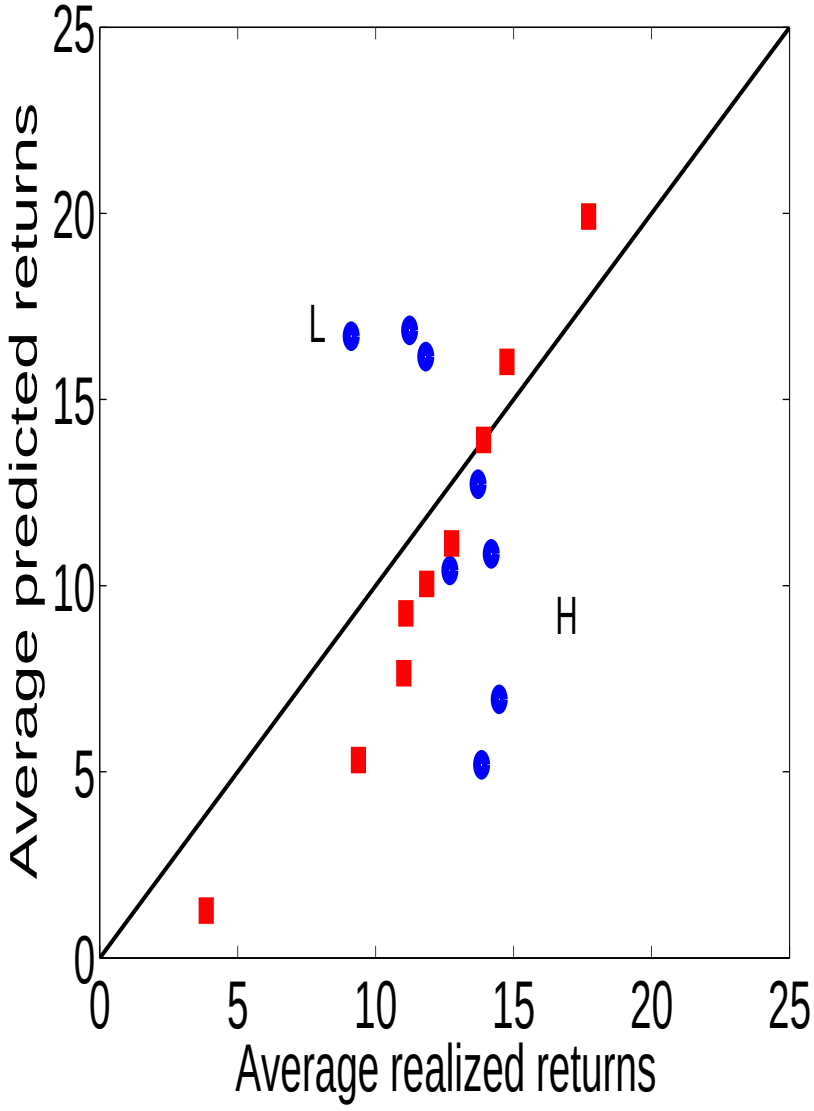
Replicating prior studies: The physical capital model estimated at the portfolio level, all-but-micro breakpoints and equal-weighted deciles

	d.f.	γ_K	$[\gamma_K]$	a	$[a]$	m.a.e.	$\overline{\lvert e_{H-L} \rvert}$	p
Bm	8	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

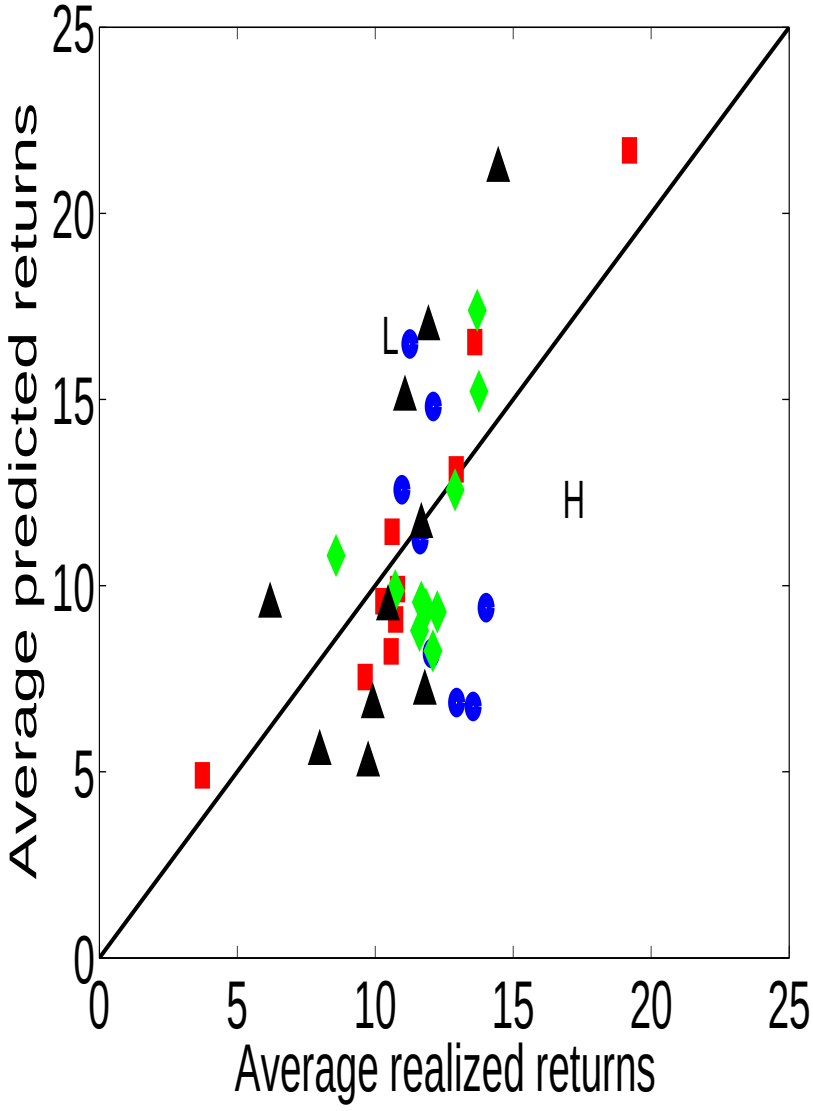
Average predicted versus realized stock returns, Bm-R^{11}, value- and equal-weights, the physical capital model estimated at the portfolio level

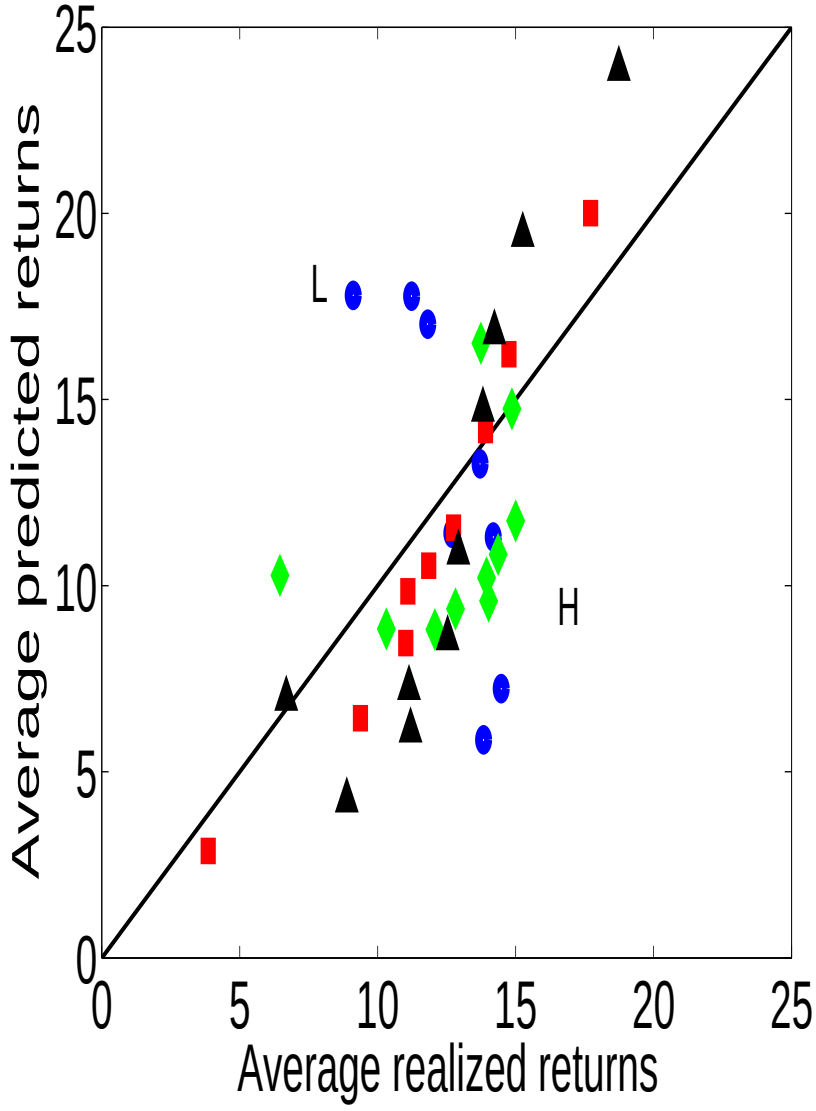




GMM Estimation and Tests

Average predicted versus realized stock returns, Bm-R^{11}-I/A-Roe, value- and equal-weights, the physical capital model estimated 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

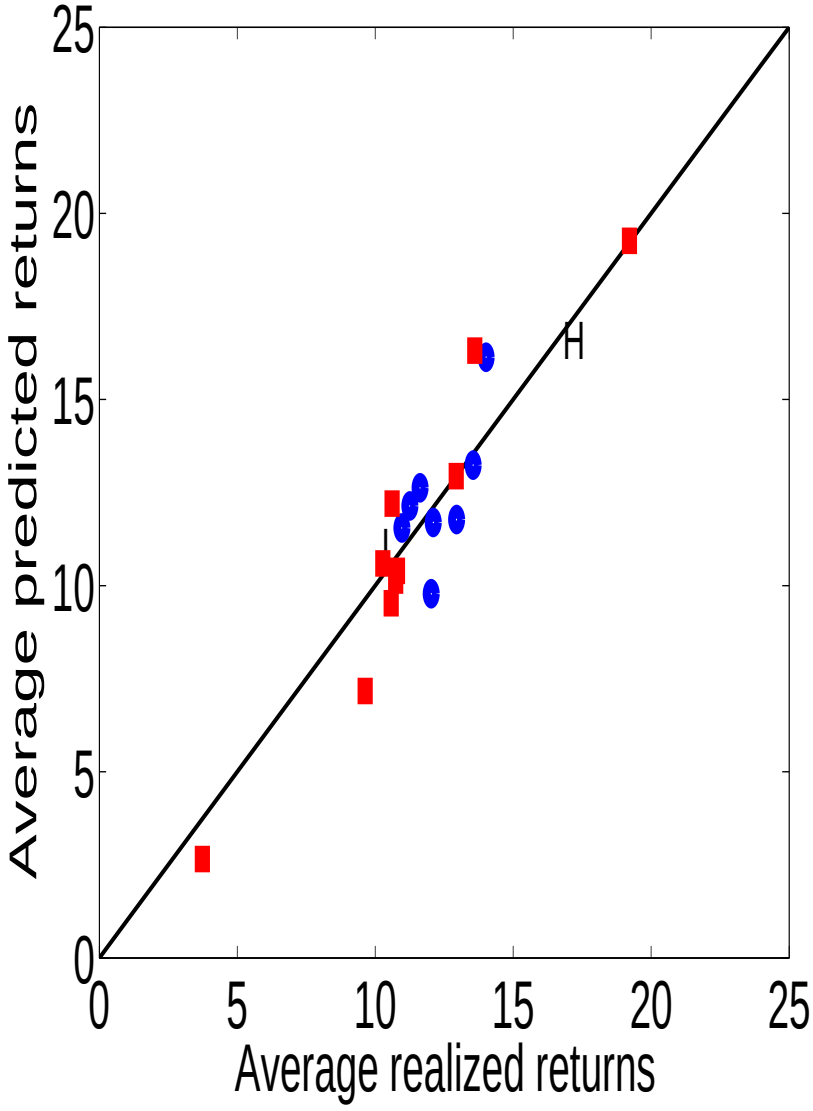
GMM Estimation and Tests

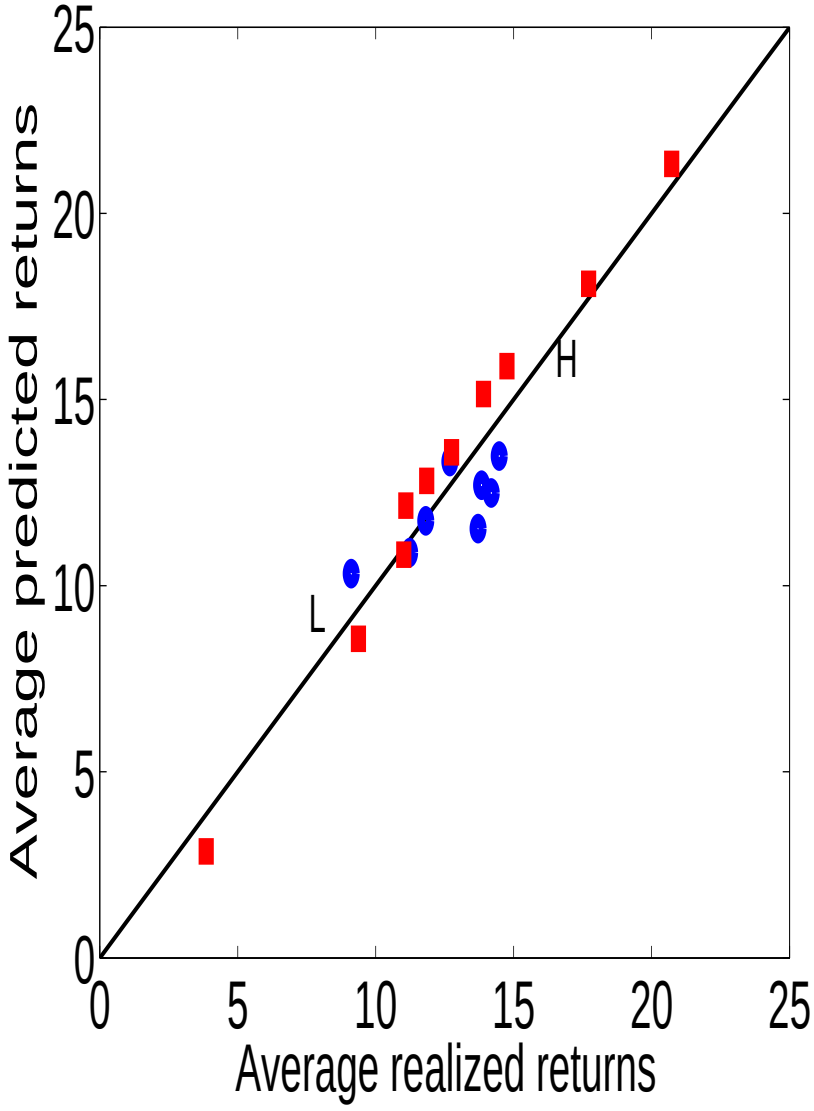
The 2-capital model estimated at the firm level, all-but-micro breakpoints and equal-weighted deciles

	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

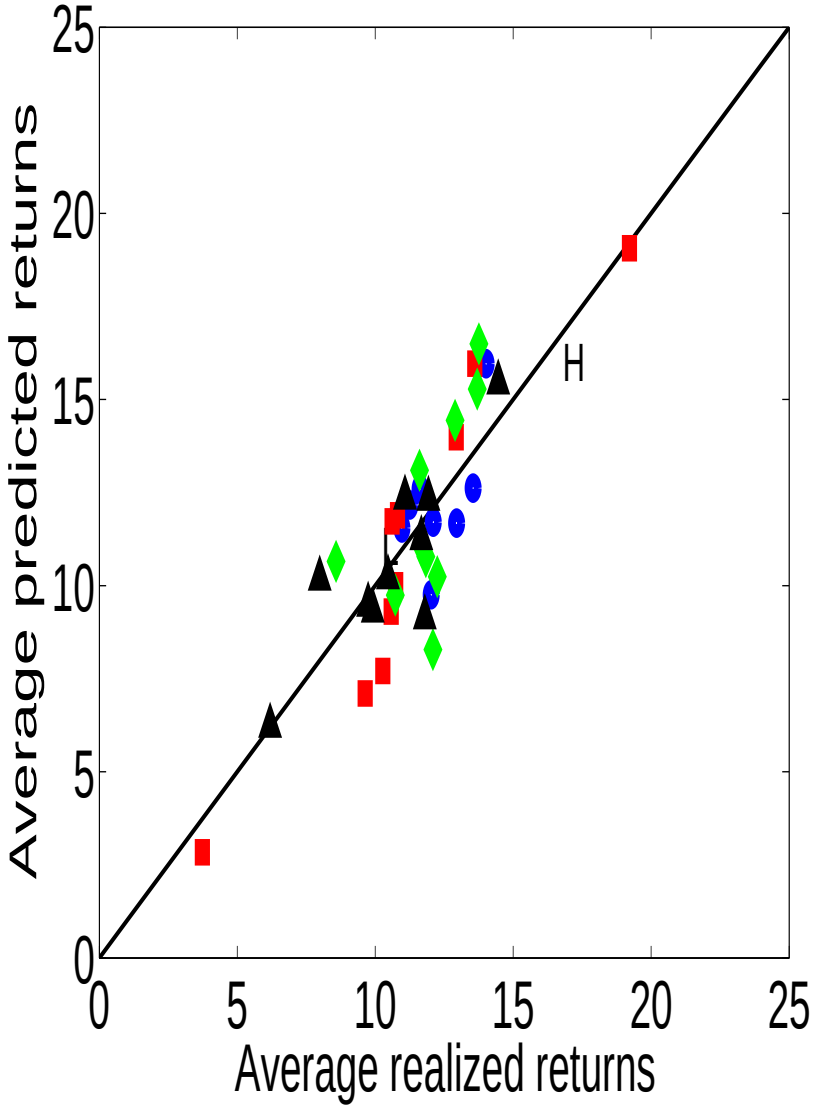
Average predicted versus realized stock returns, Bm-R^{11}, value- and equal-weights, the 2-capital model estimated at the firm level

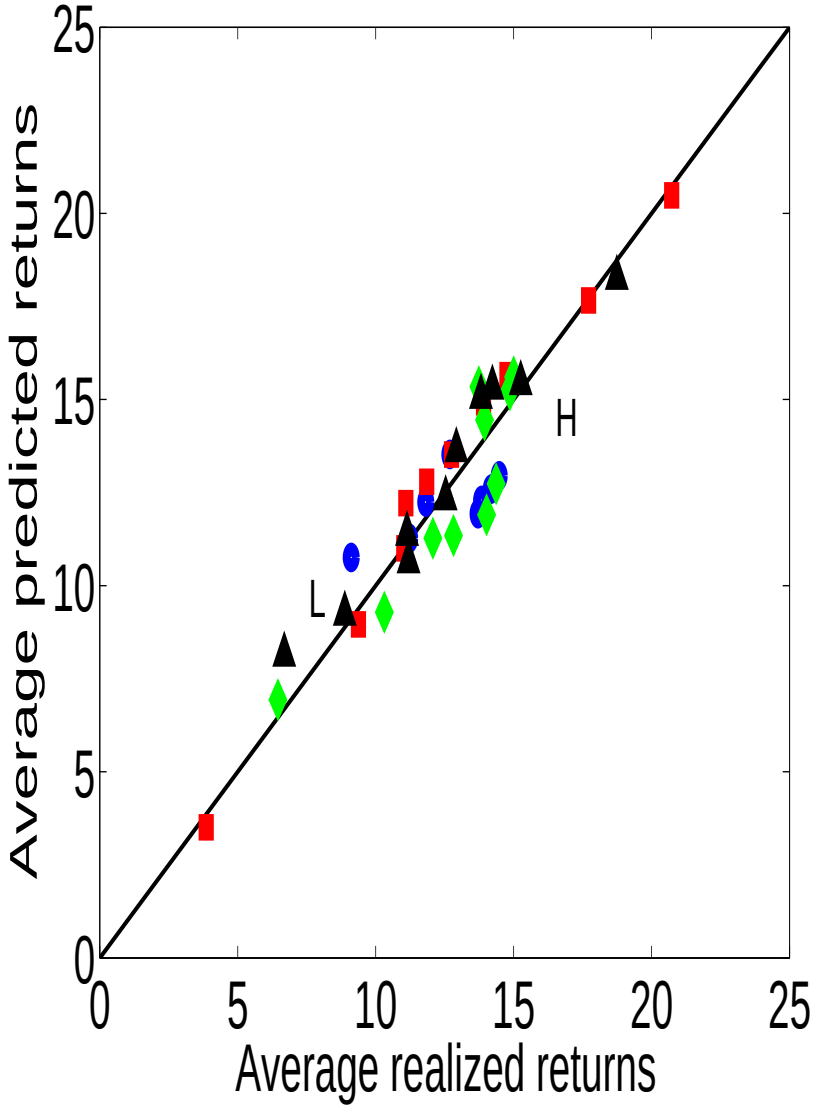




GMM Estimation and Tests

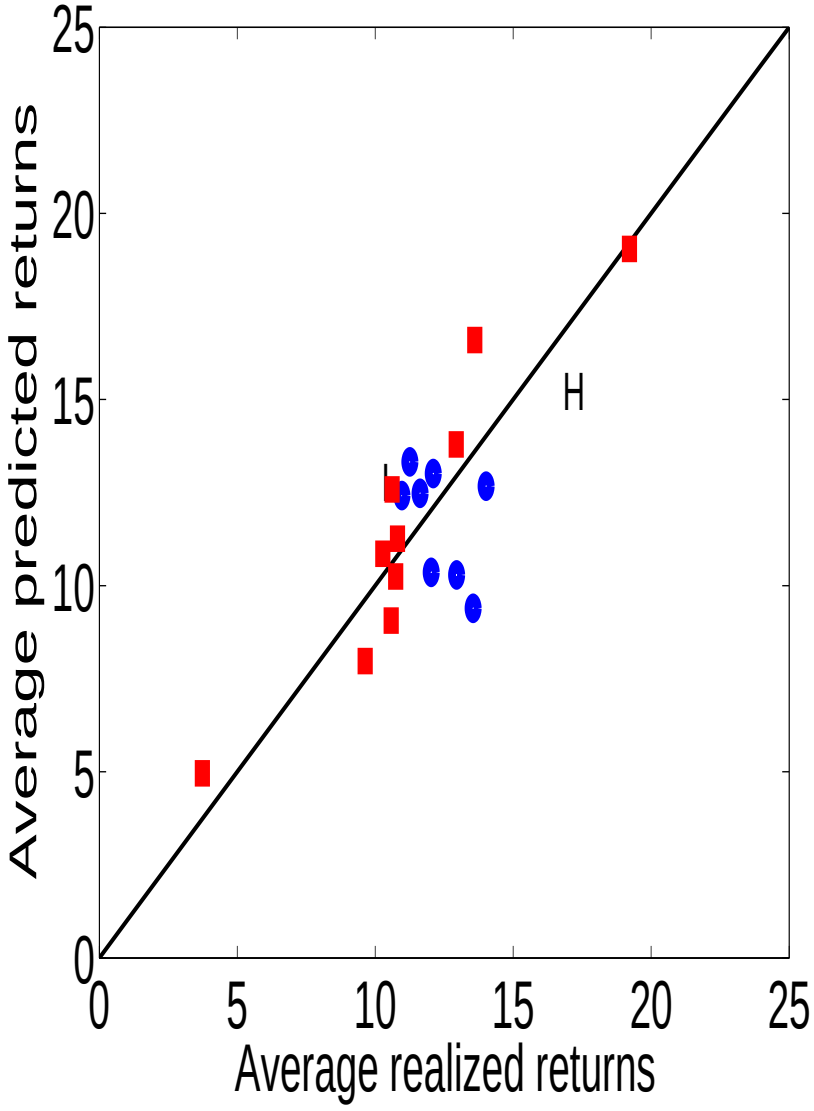
Average predicted versus realized stock returns, Bm-R^{11}-I/A-Roe, value- and equal-weights, the 2-capital model estimated at the firm level

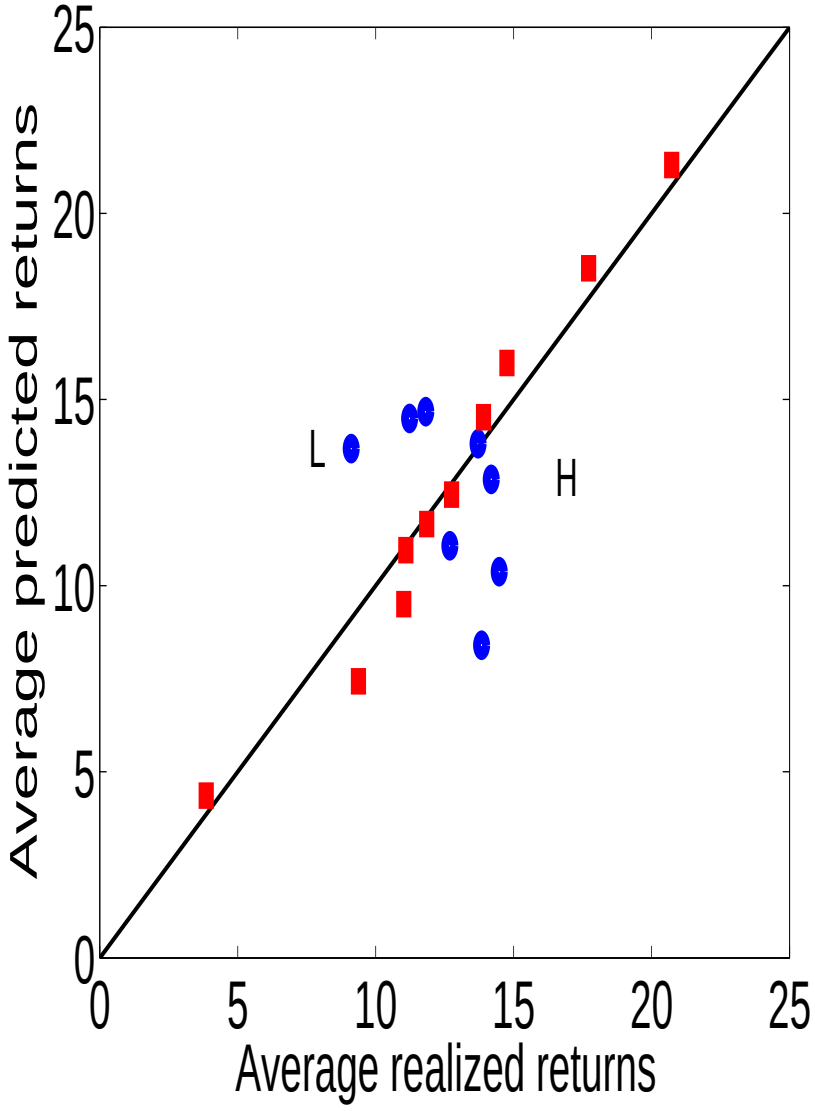




GMM Estimation and Tests

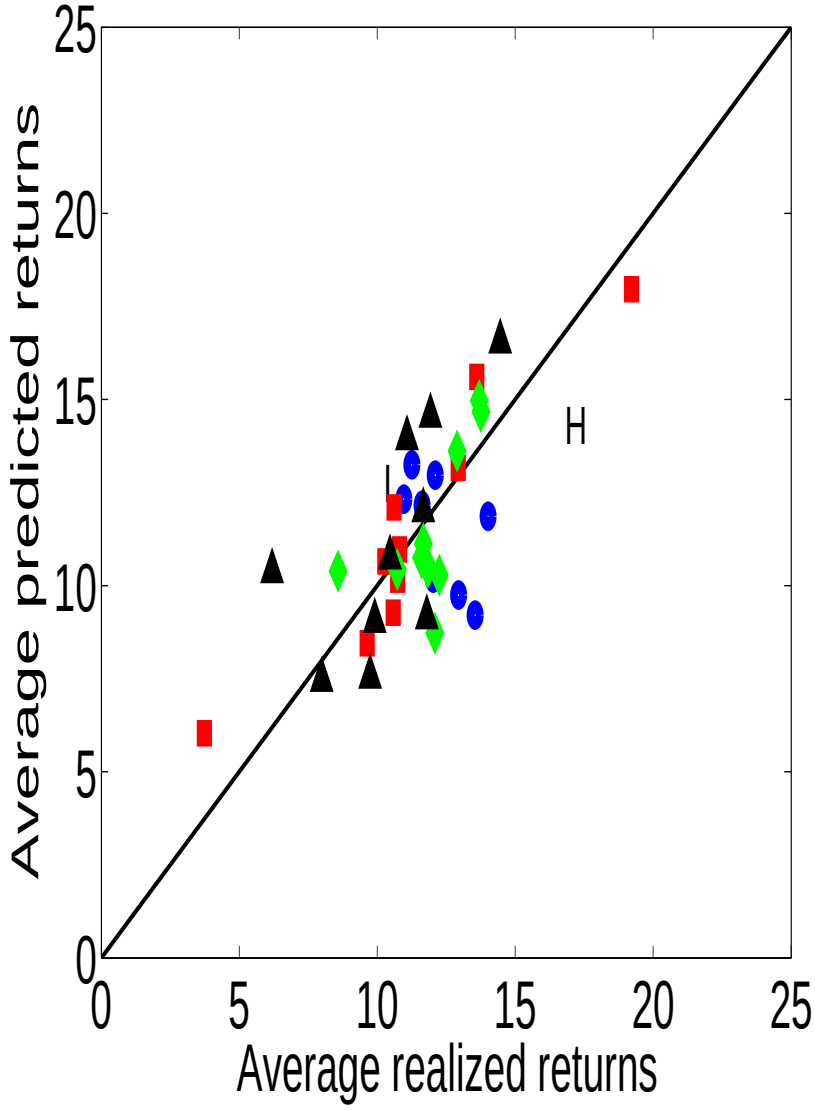
The impact of aggregation, Bm-R^{11}, value- and equal-weights, the 2-capital model estimated at the portfolio level

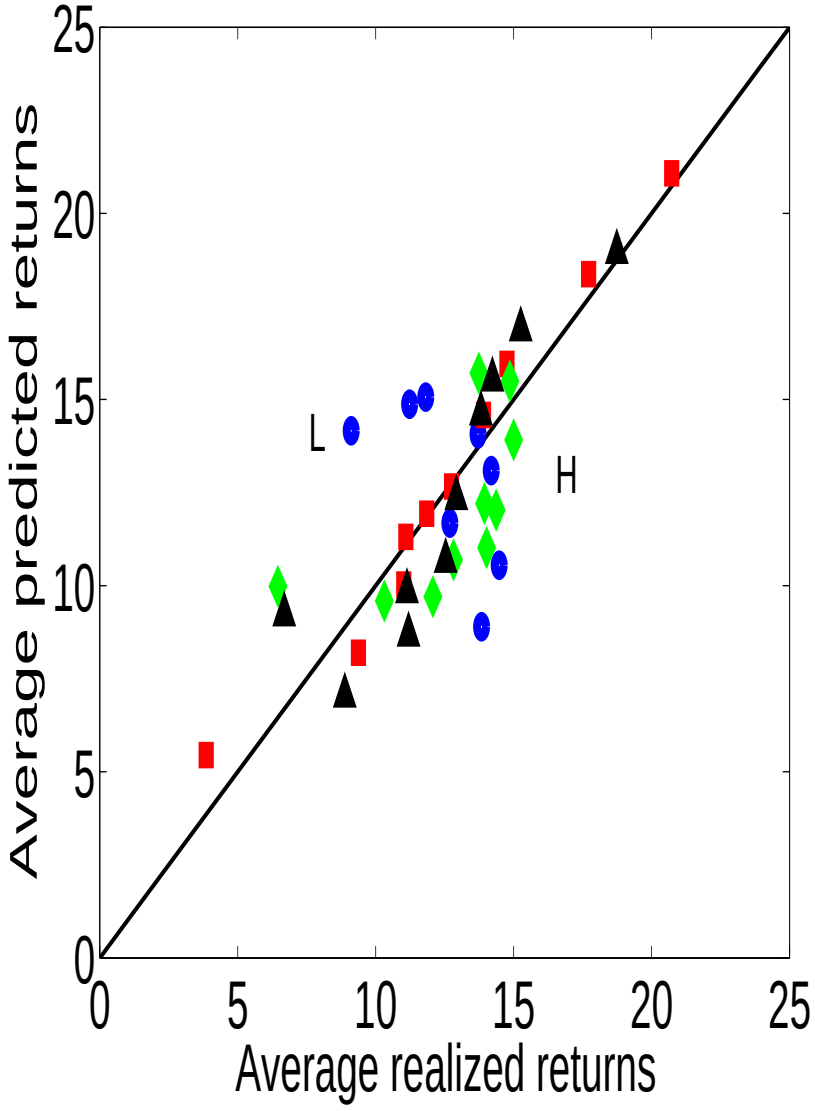




GMM Estimation and Tests

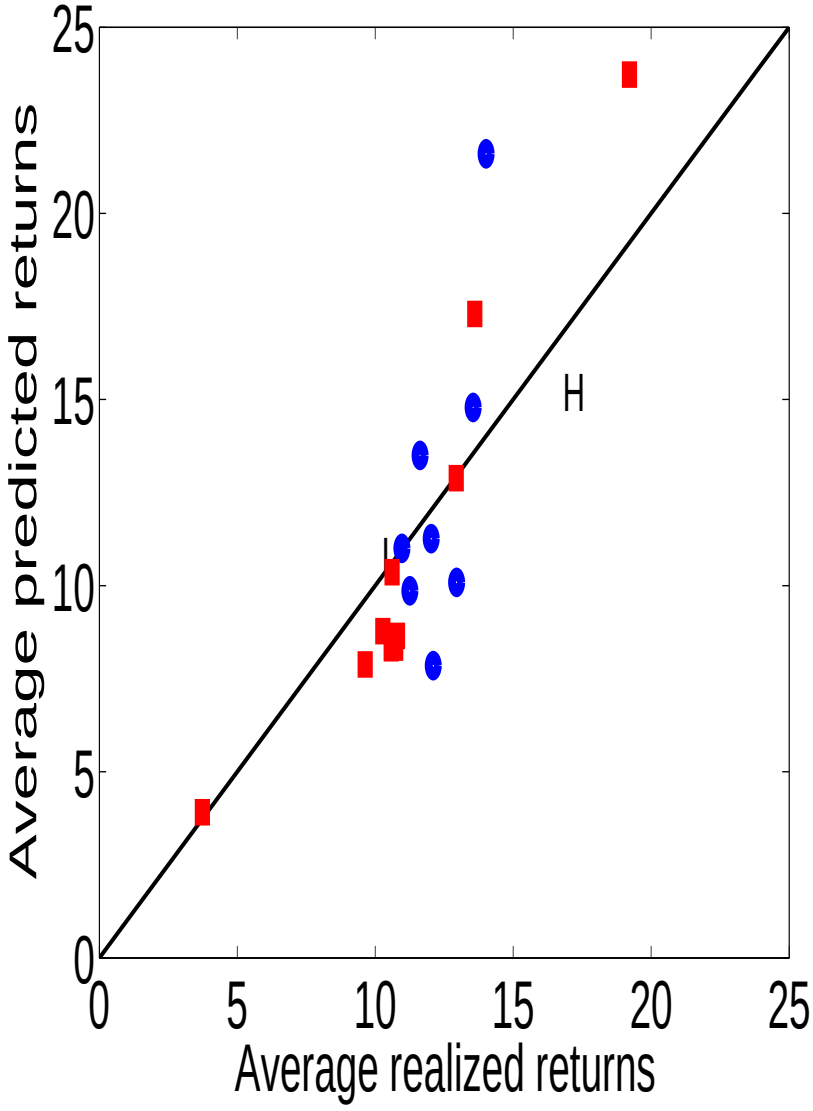
The impact of aggregation, Bm-R^{11}-I/A-Roe, value- and equal-weights, the 2-capital model estimated at the portfolio level

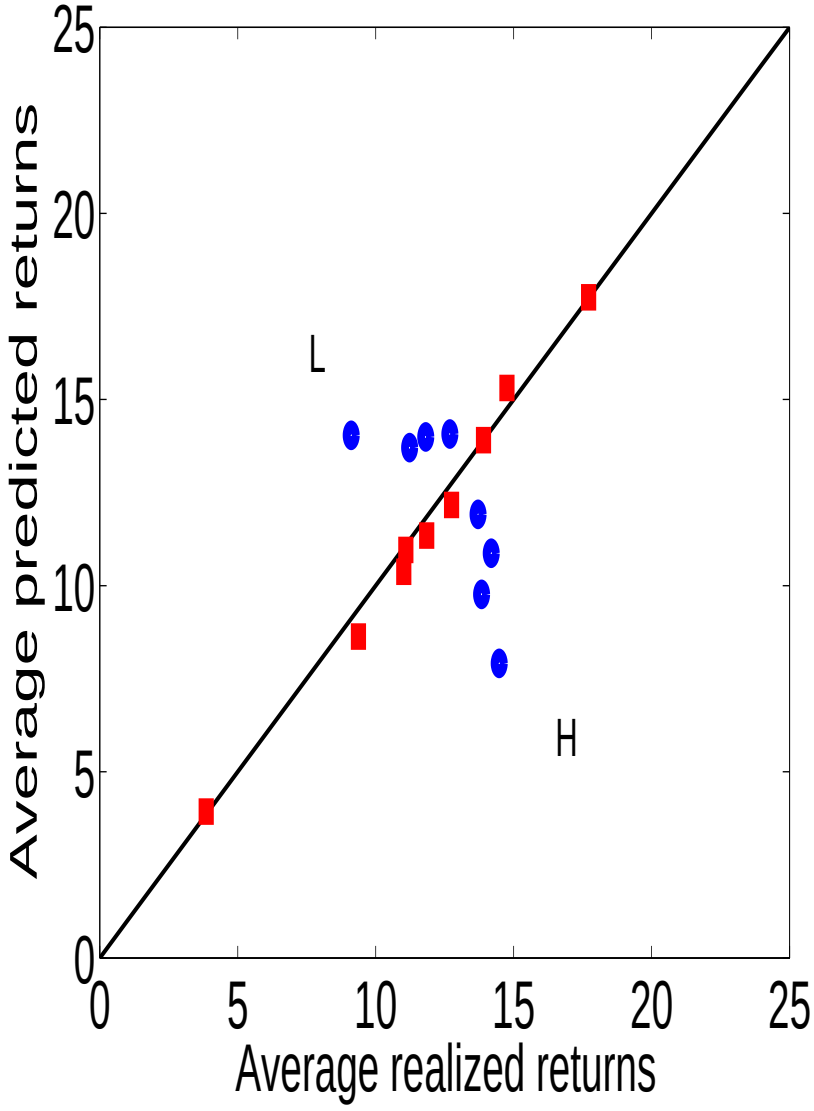




GMM Estimation and Tests

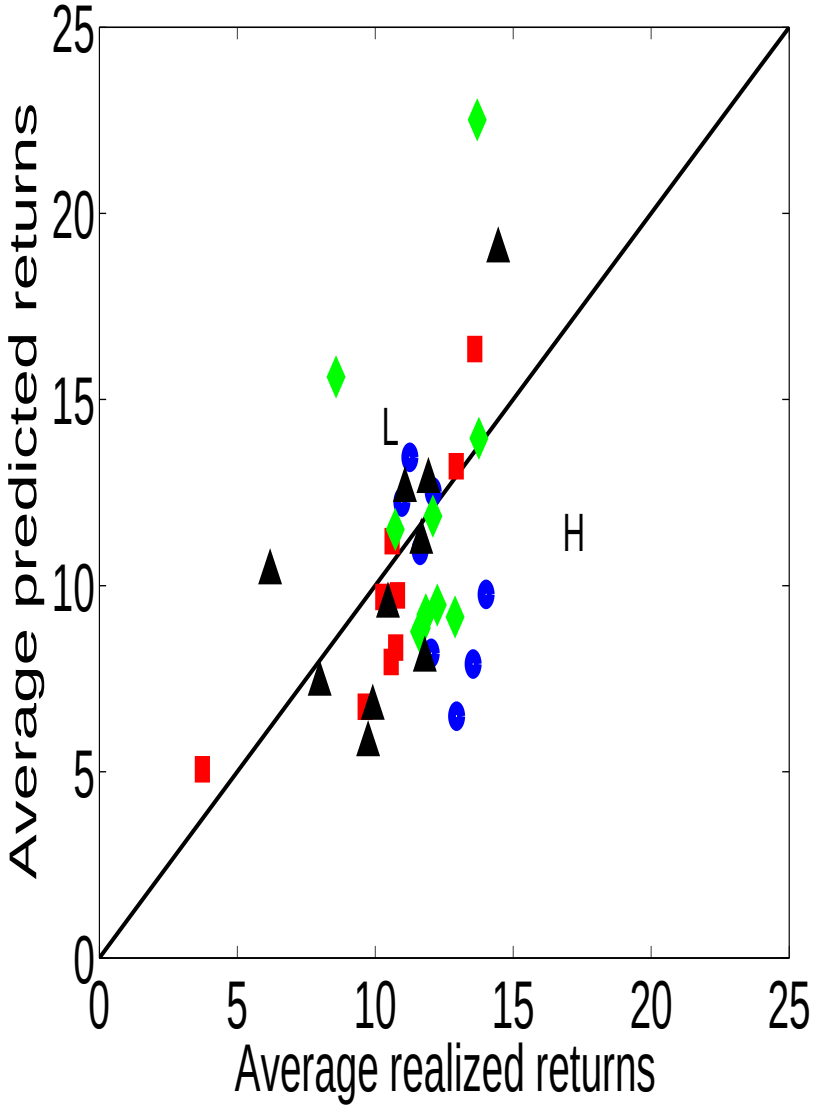
The impact of capital heterogeneity, Bm-R^{11}, value- and equal-weights, the physical capital model estimated at the firm level

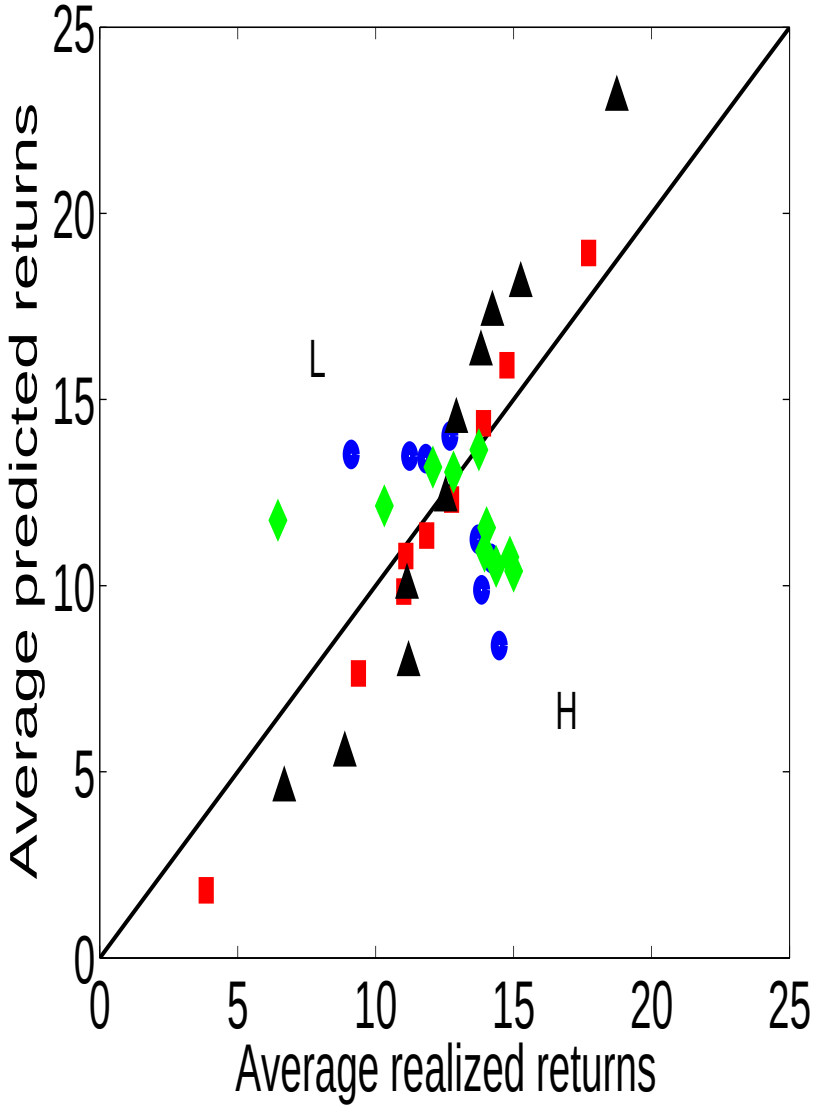




GMM Estimation and Tests

The impact of capital heterogeneity, Bm-R^{11}-I/A-Roe, value- and equal-weights, the physical capital model estimated at the firm level





Outline

Diagnostics

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

	r^S_{it-24}	r^S_{it-12}	r^S_{it-3}	r^S_{it}	r^S_{it+3}	r^S_{it+12}	r^S_{it+24}
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^{***}

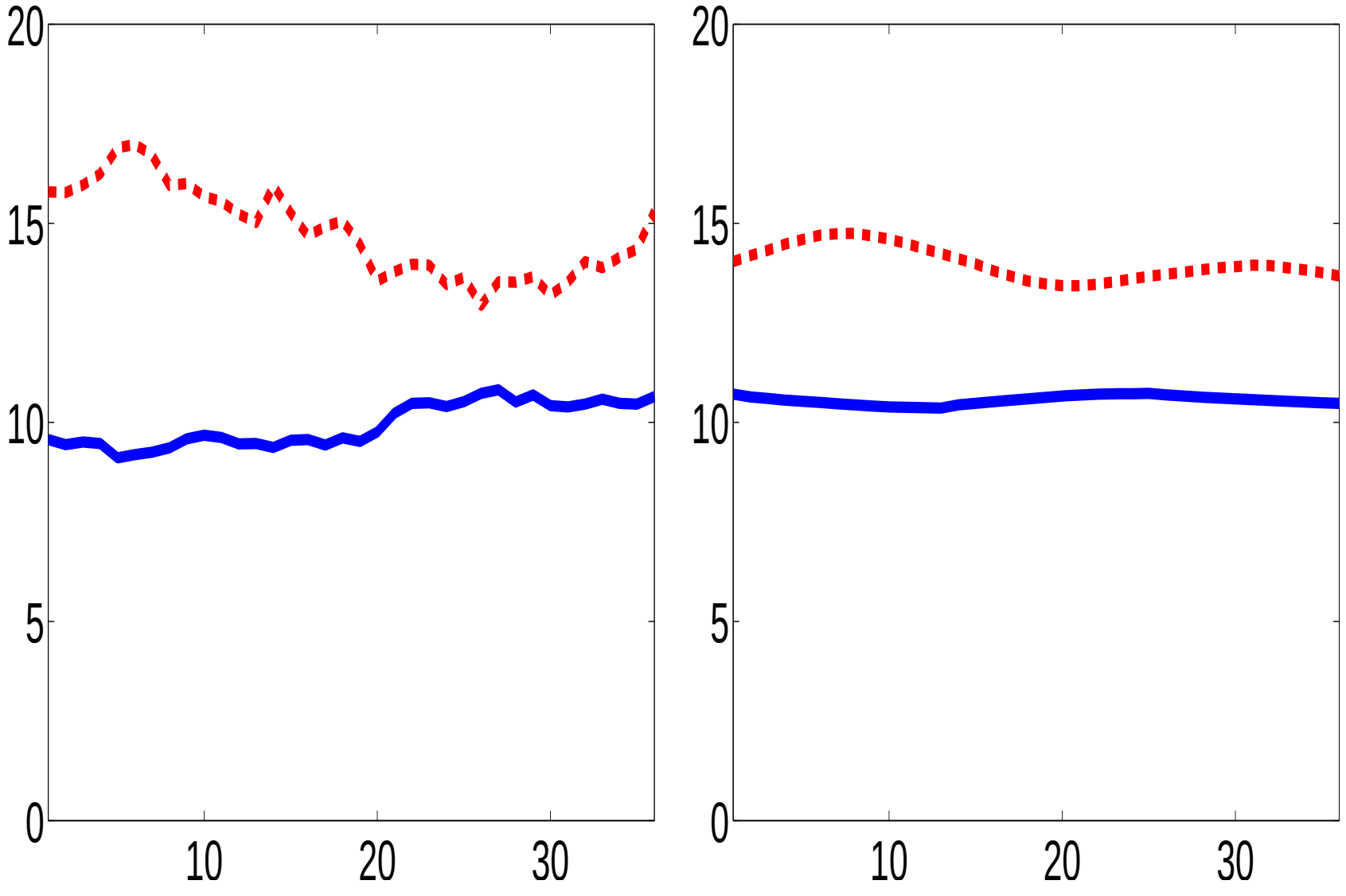
Diagnostics

Contemporaneous correlations between stock and fundamental returns

	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^{***}

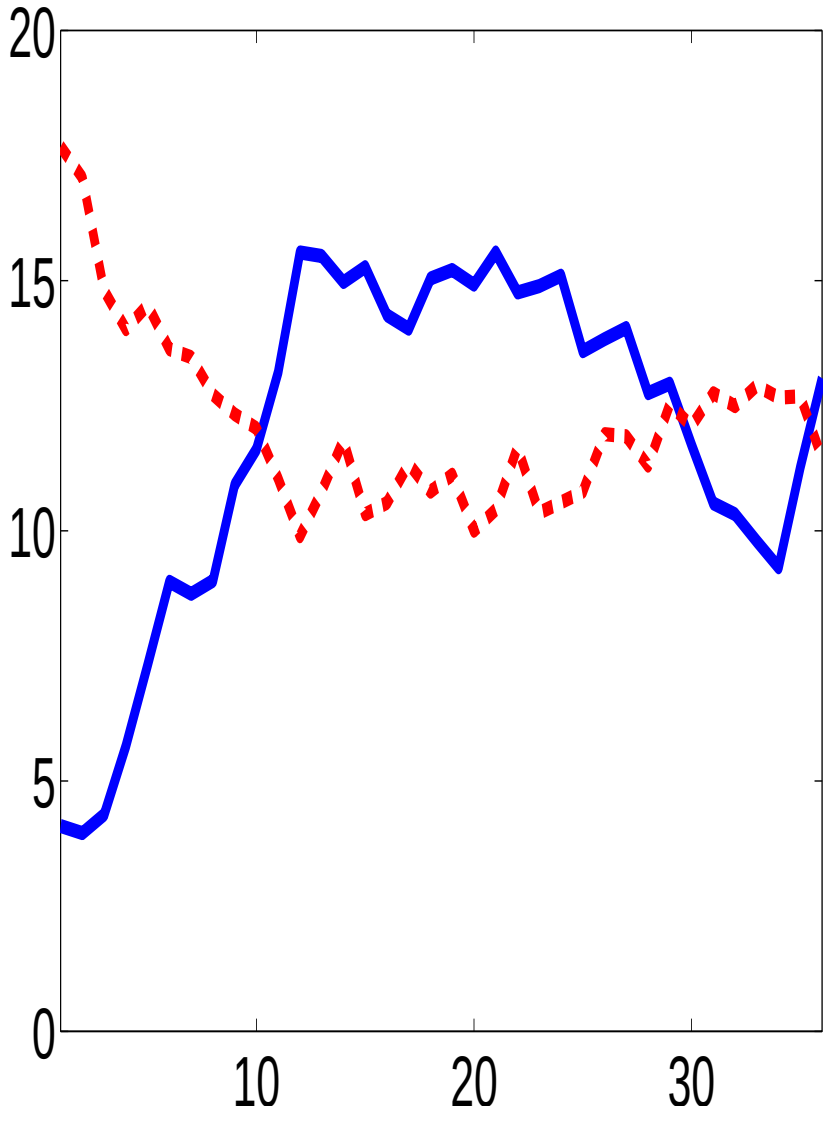
Diagnostics

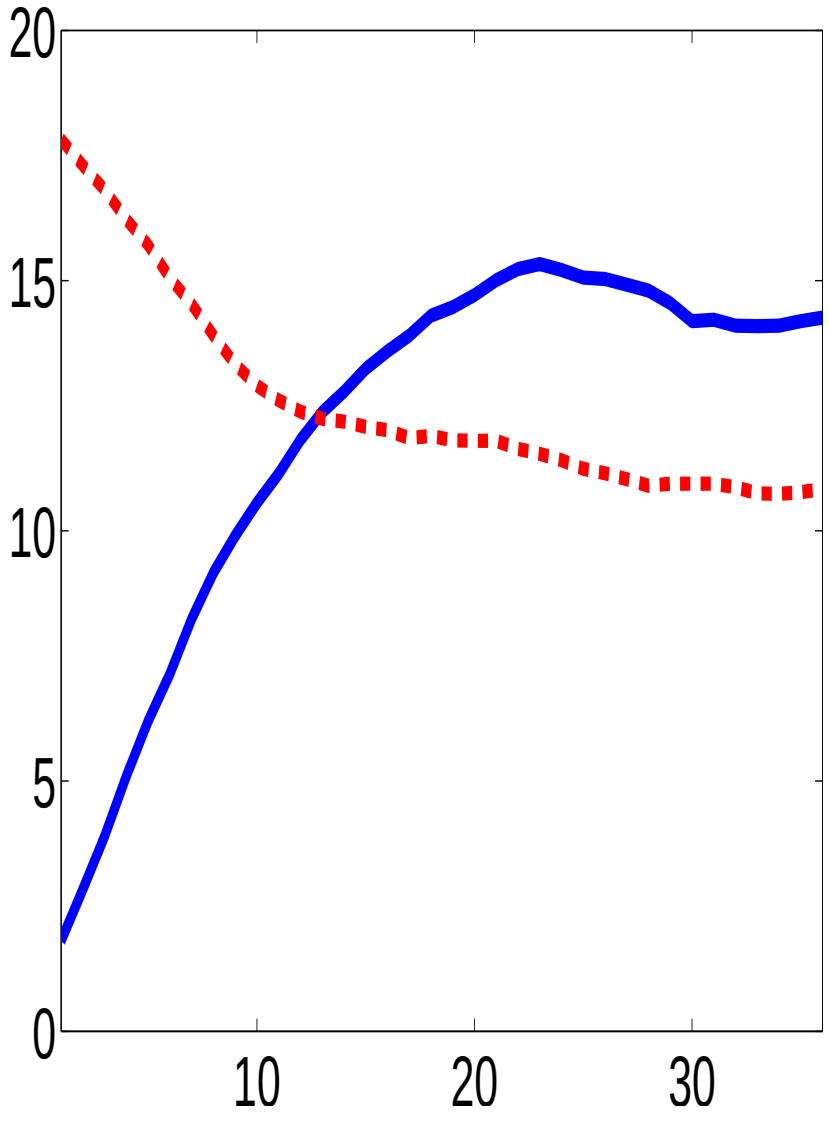
The long-term dynamics of the (value-weighted) value premium, the stock and fundamental returns during 36 months after the portfolio formation



Diagnostics

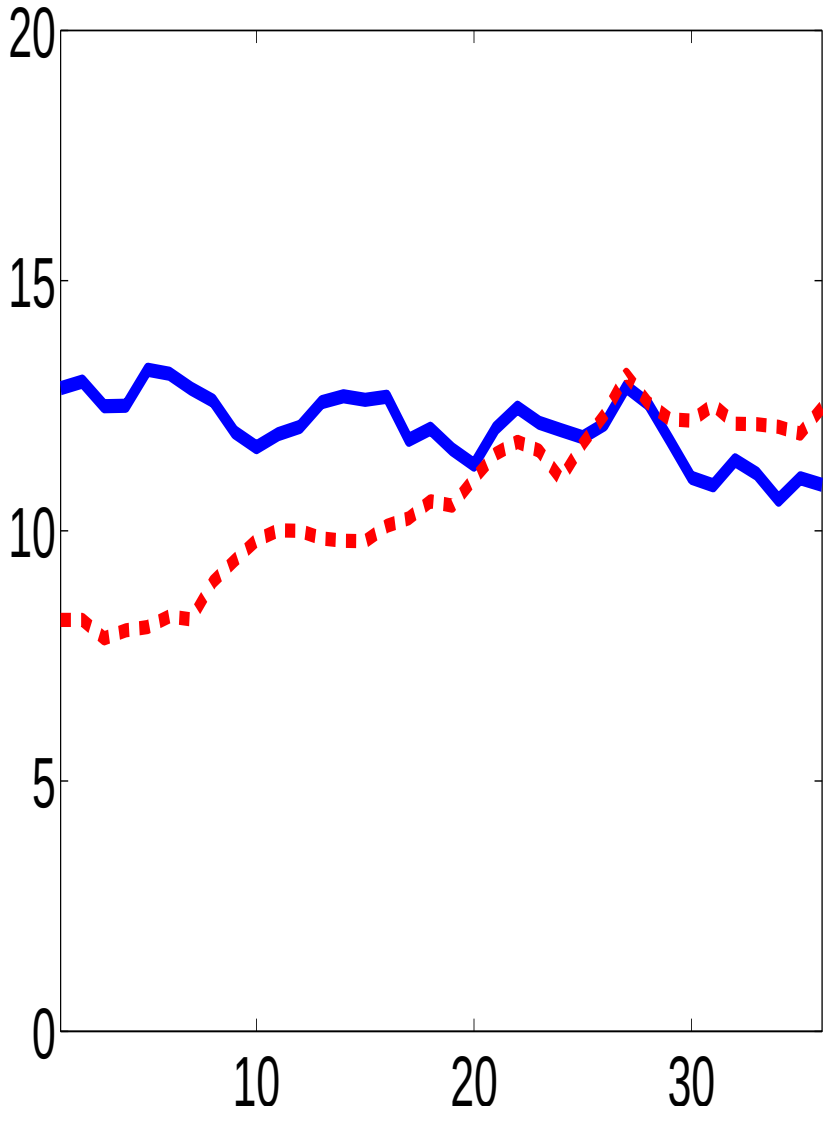
The short-term dynamics of the (value-weighted) momentum premium, the stock and fundamental returns during 36 months after the portfolio formation

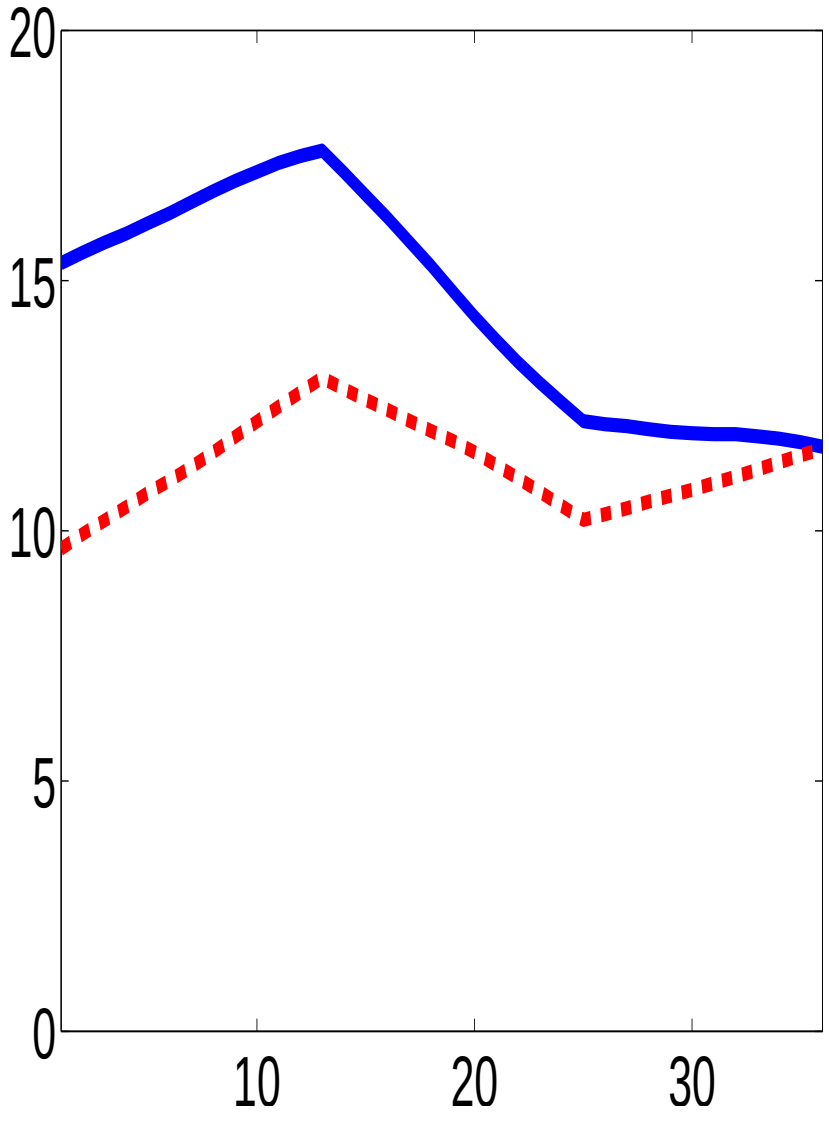




Diagnostics

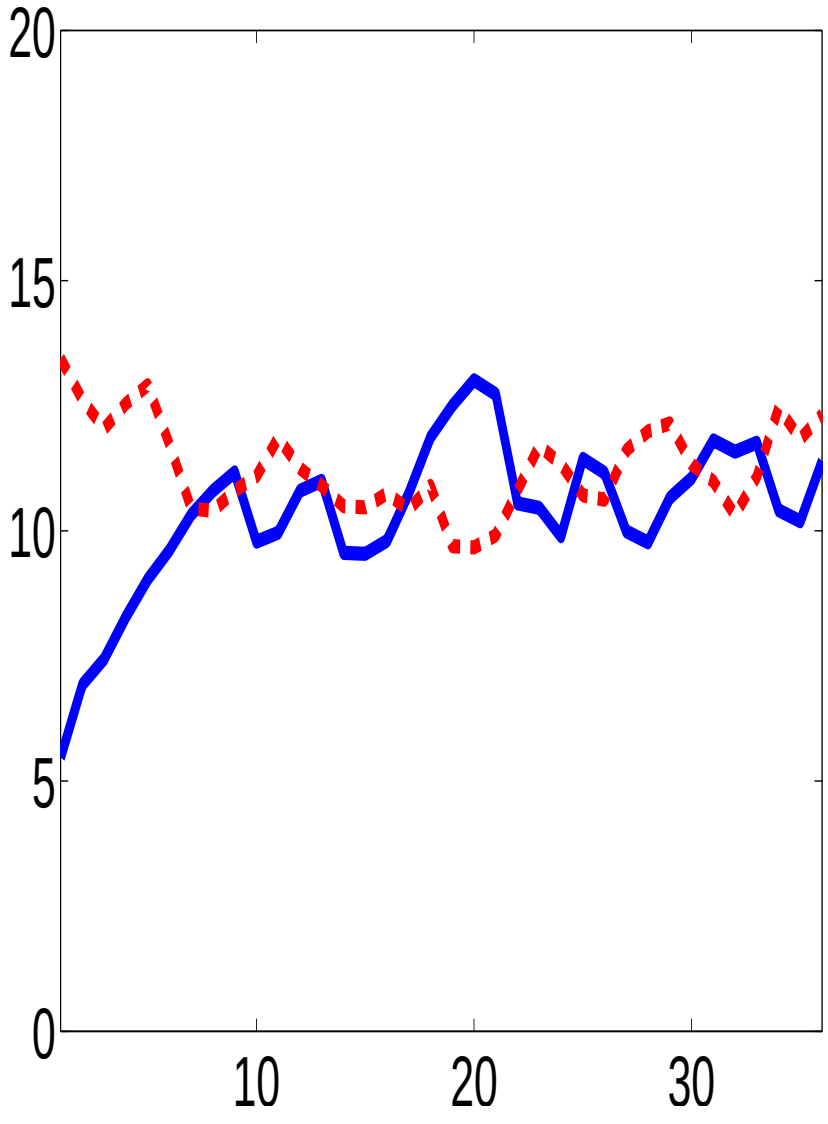
The long-term dynamics of the (value-weighted) investment premium, the stock and fundamental returns during 36 months after the portfolio formation

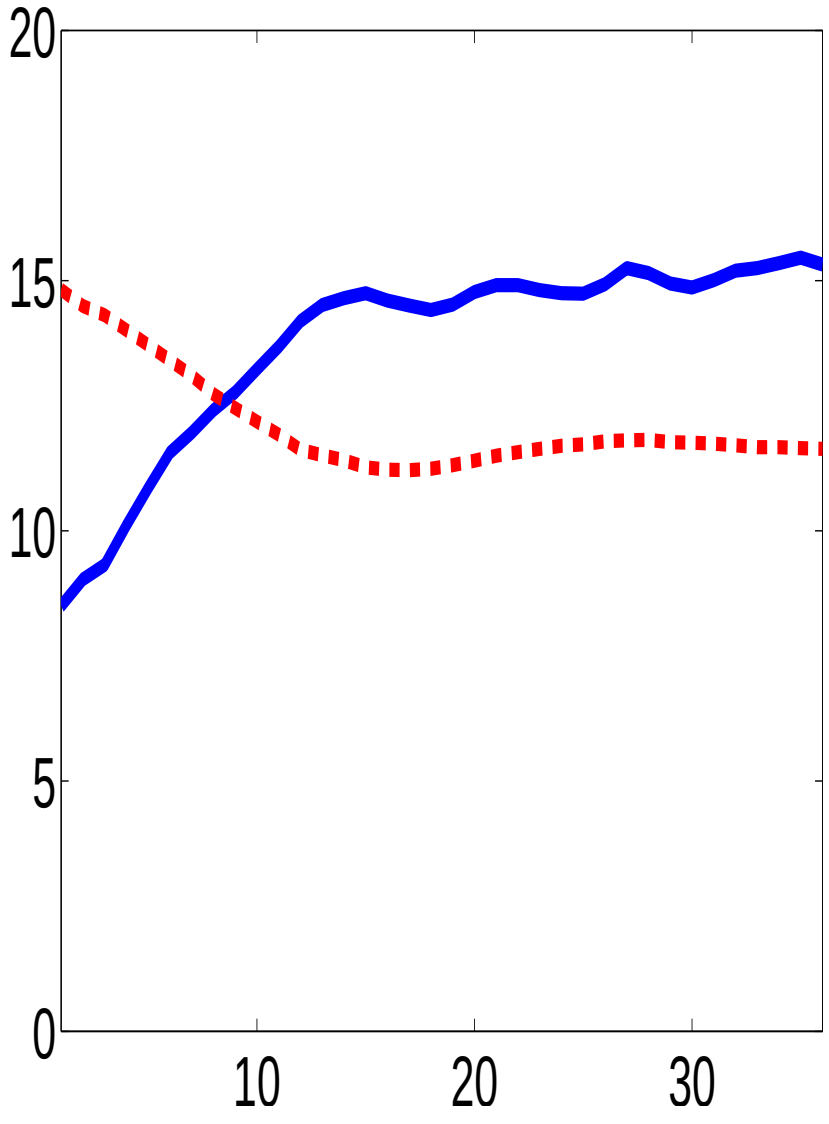




Diagnostics

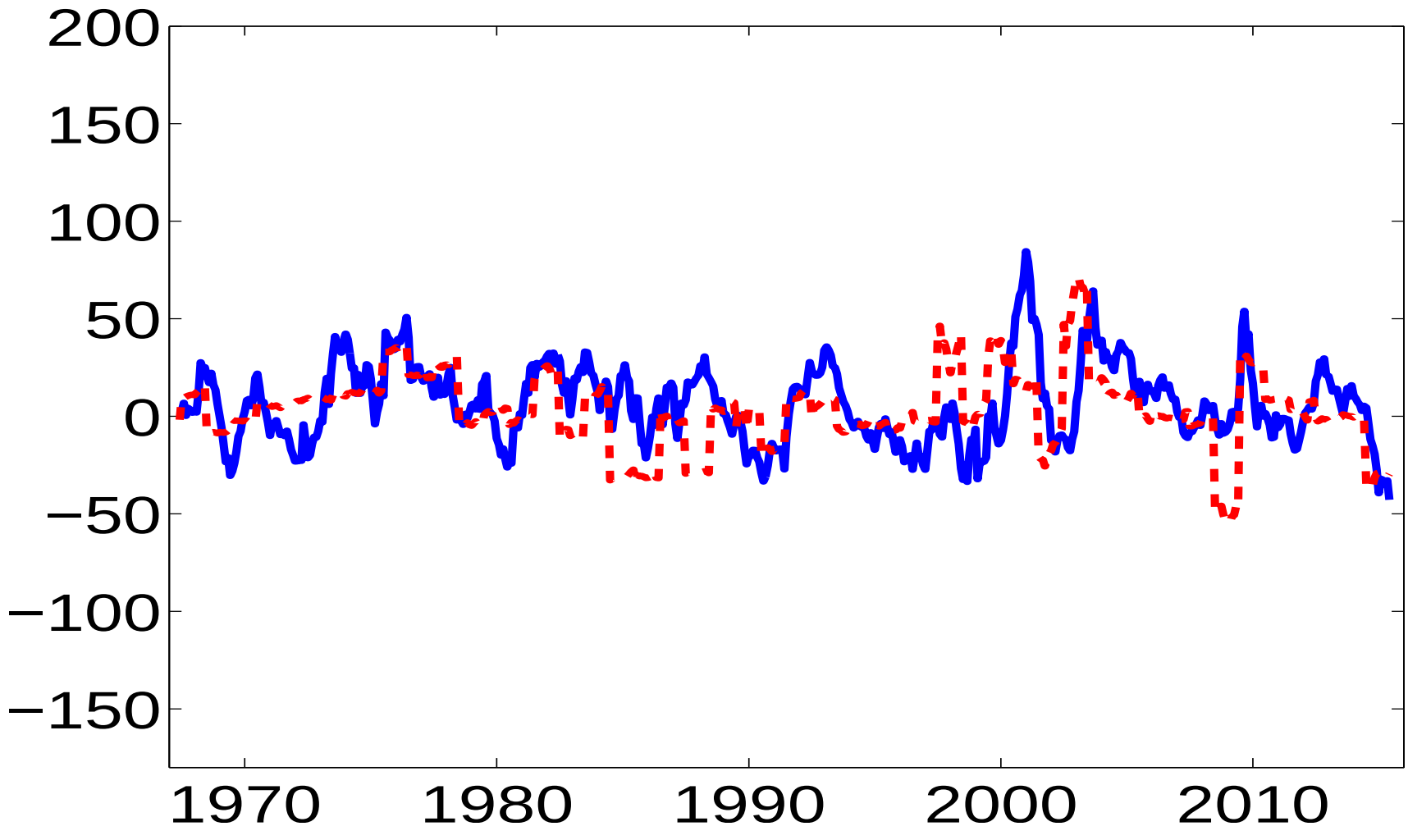
The short-term dynamics of the (value-weighted) Roe premium, the stock and fundamental returns during 36 months after the portfolio formation





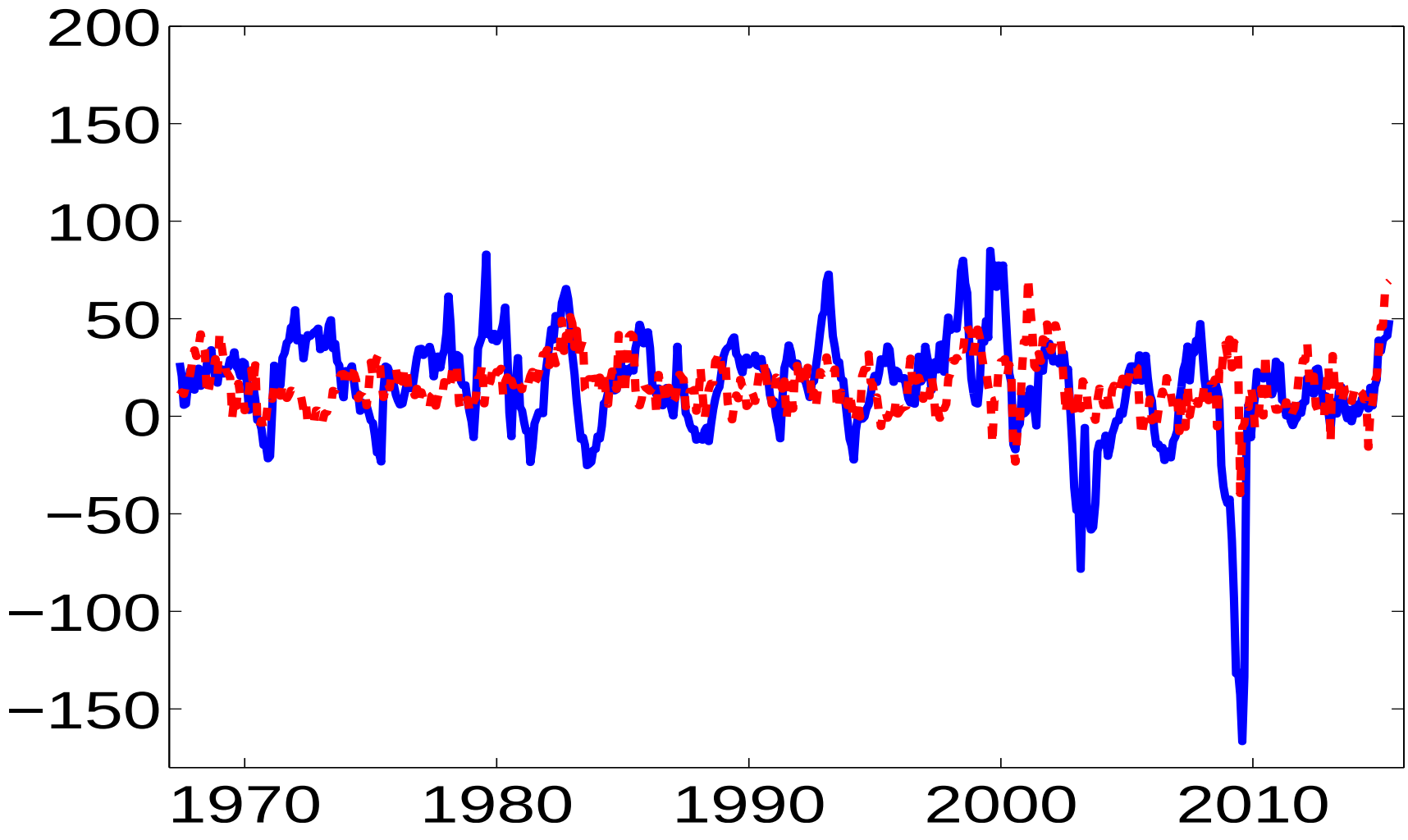
Diagnostics

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



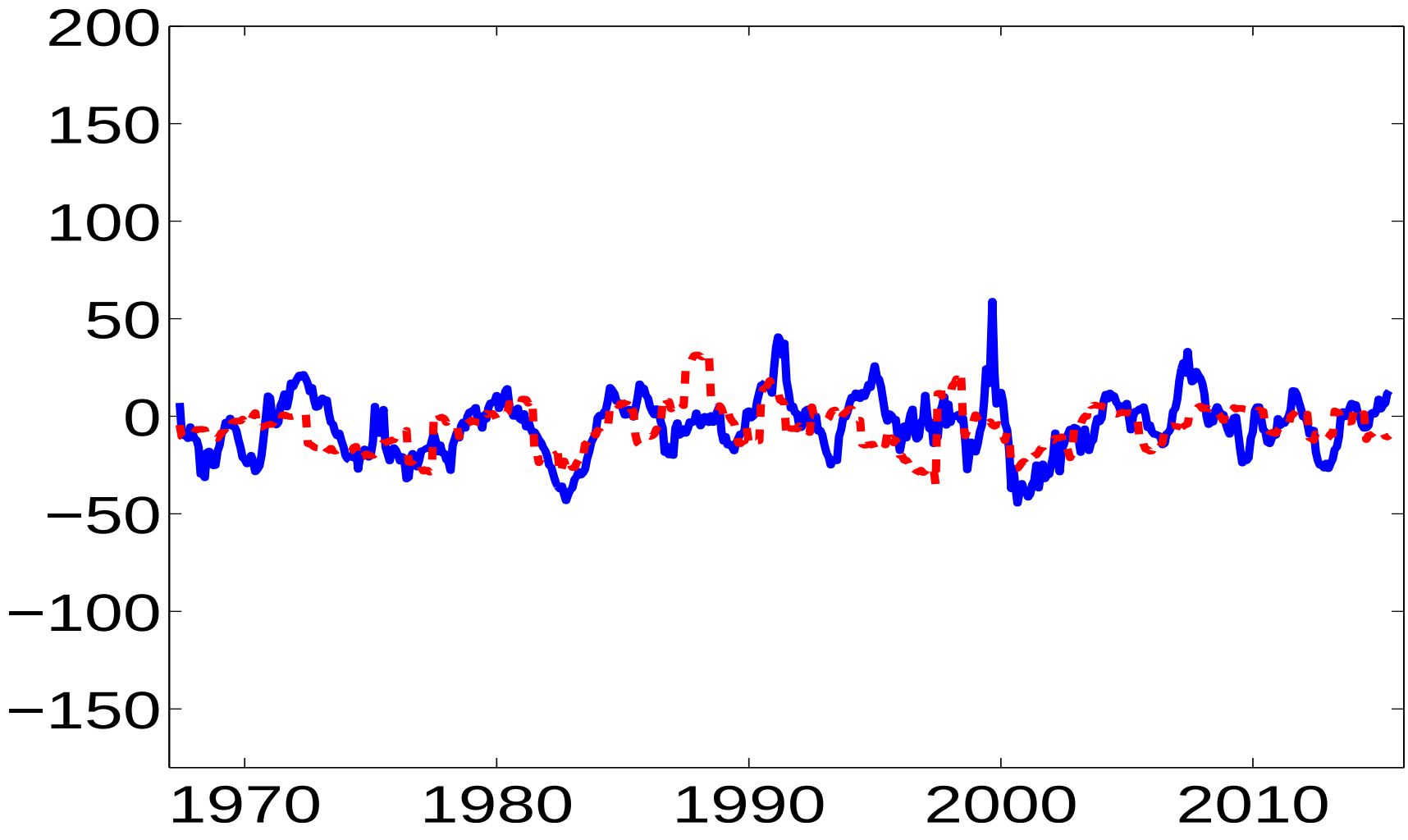
Diagnostics

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



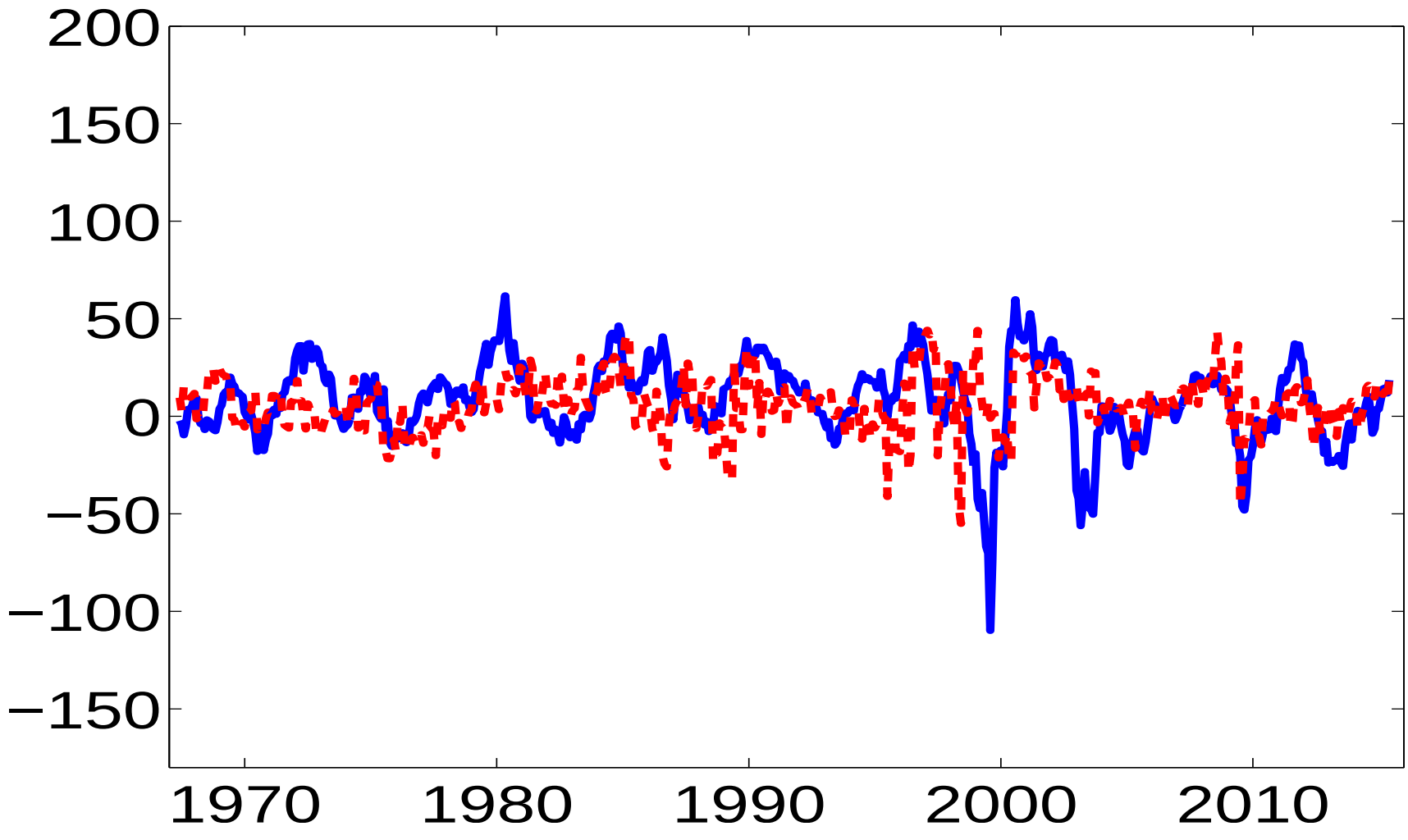
Diagnostics

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



Diagnostics

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



Diagnostics

Higher moments, the (value-weighted) Bm deciles

		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***
	r^F	5.49	7.40	7.80	8.67	9.69	10.82	8.76	10.03	14.36	19.71	19.47***
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*

Diagnostics

Higher moments, the (value-weighted) R^{11} deciles

		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^{**}

Diagnostics

Higher moments, the (value-weighted) I/A deciles

		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

Diagnostics

Higher moments, the (value-weighted) Roe deciles

		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**

Two innovations (aggregation and current assets) in the investment model go a long way in explaining value and momentum jointly