Internet Appendix to "Firm Characteristics and Stock Returns: The Role of Investment-Specific Shocks"

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1 Solution to the model

Here, we describe the solution of the model in more detail.

1.1 Valuation

Firms' investment decisions are based on a tradeoff between the market value of a new project and the cost of physical capital. Given (17), the time-t market value of an existing project j is equal to the present value of its cashflows

$$\begin{aligned} p(u_{jt}, x_t, K_j) =& \mathrm{E}_t \left[\int_t^\infty e^{-\delta(s-t)} \frac{\pi_s}{\pi_t} \left(u_{js}\, x_s\, K_j^\alpha \right) ds \right] = A(u_{jt})\, x_t\, K_j^\alpha, \\ A(u) =& \frac{1}{r_f + \gamma_x\, \sigma_x + \delta - \mu_X} + \frac{1}{r_f + \gamma_x\, \sigma_x + \delta - \mu_X + \theta_u} (u-1). \end{aligned} \tag{A.1}$$

The optimal investment decision follows the NPV rule: firm f chooses the amount of capital K_j to invest in project j to maximize it's net present value

$$NPV_{jt} = \max_{K_j} p(1, x_t, K_j) - p_t^I K_j. \tag{A.2}$$

Because the marginal productivity of capital in (8) is infinite at the zero capital level, it is always optimal to invest a positive and finite amount. The optimal capital investment in the new project is given by

$$K^*(z_t) = \alpha^{\frac{1}{1-\alpha}} \left(\frac{p(1, x_t, K_j)}{p_t^I} \right)^{\frac{1}{1-\alpha}} = z_t^{\frac{1}{1-\alpha}} \left(\frac{\alpha}{r_f + \gamma_x\, \sigma_x + \delta - \mu_X} \right)^{\frac{1}{1-\alpha}}. \tag{A.3}$$

Equation (A.3) illustrates the relation between the optimal level of investment K^* and the ratio of the market value of a new project $p(1, x, K)$ to the cost of capital p^I. This ratio bears similarities to the marginal Q in the Q-theory of investment. However, in contrast to most Q-theory models, optimal investment depends on the market valuation of a new project, which in general is not directly linked to the market valuation of the entire firm. Furthermore, the relation in (A.3) holds conditional on the firm having the opportunity to invest. That is yet another reason why the firm's marginal (or average) Q is not a sufficient statistic for the optimal investment in our model, since investment depends on the firm's current investment opportunities λ_{ft}.

The market value of a firm is the sum of the value of its existing projects and the value of its future growth opportunities:

$$VAP_{ft} = \sum_{j \in \mathcal{J}_{ft}} p(u_{jt}, x_t, K_j) = \; x_t \sum_{j \in \mathcal{J}_{ft}} A(u_{jt})\, K_j^{\alpha}. \tag{A.4}$$

The present value of growth opportunities equals the expected discounted NPV of future investments

$$PVGO_{ft} = \mathrm{E}_t \left[\int_t^{\infty} \frac{\pi_s}{\pi_t} \, (\lambda_{fs}\, NPV_t)\; ds \right] = z_t^{\frac{\alpha}{1-\alpha}}\, x_t \; (G_L + p_{ft}\,(G_H - G_L)) \,, \tag{A.5}$$

where

$$NPV_t = x_t\, z_t^{\frac{\alpha}{1-\alpha}}\, (\alpha^{-1} - 1) \left(\frac{\alpha}{r_f + \gamma_x\, \sigma_x + \delta - \mu_X} \right)^{\frac{1}{1-\alpha}} , \tag{A.6}$$

$$G_H = \lambda_f \; (\alpha^{-1} - 1) \left(\frac{\alpha}{r_f + \gamma_x\, \sigma_x + \delta - \mu_X} \right)^{\frac{1}{1-\alpha}} \left(\rho^{-1} + \frac{\mu_L}{\mu_L + \mu_H} (\lambda_H - \lambda_L)\, (\rho + \mu_H + \mu_L)^{-1} \right),$$

$$G_L = \lambda_f \; (\alpha^{-1} - 1) \left(\frac{\alpha}{r_f + \gamma_x\, \sigma_x + \delta - \mu_X} \right)^{\frac{1}{1-\alpha}} \left(\rho^{-1} - \frac{\mu_H}{\mu_L + \mu_H} (\lambda_H - \lambda_L)\, (\rho + \mu_H + \mu_L)^{-1} \right),$$

$$\rho = r + \gamma_x\, \sigma_x - \mu_x - \frac{\alpha}{1-\alpha} \left(\mu_z - \gamma_z\, \sigma_z - \frac{1}{2} \sigma_z^2 \right) - \frac{1}{2} \left(\frac{\alpha}{1-\alpha} \right)^2 \sigma_z^2, \tag{A.7}$$

Adding the two pieces, the total value of the firm is equal to

$$V_{ft} = x_t \sum_{j \in \mathcal{J}_{ft}} A(u_{jt})\, K_j^{\alpha} + z_t^{\frac{\alpha}{1-\alpha}}\, x_t \; (G_L + p_{ft}\,(G_H - G_L)) \,. \tag{A.8}$$

Examining equation (A.9), we can see that the firm's stock return beta with the disembodied productivity shock x and the IST shock z is equal to

$$\beta^x_{ft} = 1, \tag{A.9}$$

$$\beta^z_{ft} = \frac{\alpha}{1-\alpha} \, \frac{PVGO_{ft}}{V_{ft}}. \tag{A.10}$$

The firm's asset mix between growth opportunities and assets in place determines its risk premium

$$\frac{1}{dt} \mathrm{E}_t[R_{ft}] - r_f = \gamma_x \sigma_x + \frac{\alpha}{1-\alpha} \gamma_z \sigma_z \, \frac{PVGO_{ft}}{V_{ft}}. \tag{A.11}$$

Given (17), the price of the investment firm is given by

$$V_{I,t} = x_t \, z_t^{\frac{\alpha}{1-\alpha}} \, \frac{\phi}{\rho} \left(\int_{\mathcal{F}} \lambda_f \, df \right) \left(\frac{\alpha}{r_f + \gamma_x \, \sigma_x + \delta - \mu_X} \right)^{\frac{1}{1-\alpha}} . \tag{A.12}$$

A positive IST shock z benefits the investment-good producers. Even though the price of their output declines, the elasticity of investment demand with respect to price is greater than one, so their profits increase.

1.2 Growth Opportunities and Firm Characteristics

Tobin's Q

The firm's average Tobin's Q, defined as the market value of the firm V_f over the replacement cost of its capital stock

$$B_{ft} = p_t^I \sum_{j \in \mathcal{J}_{ft}} K_j, \tag{A.13}$$

is positively related to the ratio of growth opportunities to firm value:

$$Q_{ft} = \frac{V_{ft}}{B_{ft}} = \left(1 - \frac{PVGO_{ft}}{V_{ft}} \right)^{-1} \times \frac{VAP_{ft}}{B_{ft}}. \tag{A.14}$$

Investment rate

The firm's investment rate, measured as the ratio of capital expenditures to the lagged replacement cost of its capital stock, B_{ft}, is related to the ratio of growth opportunities to firm value. Specifically, a firm's investment over an interval $[t, t+\Delta$ is equal to the cumulative capital expenditures

$$INV_{f,t+\Delta} = \int_t^{t+\Delta} p_s^I \, K^*(z_s) \, dN_{fs}. \tag{A.15}$$

Earnings-to-Price

First, note that the value of assets in place increases in the output of current projects

$$VAP_{ft} = x_t \sum_{j \in \mathcal{J}_{ft}} a_0 \, K_j^\alpha + \frac{1}{r_f + \gamma_x \, \sigma_x + \delta - \mu_X} E_{ft} \approx \frac{1}{r_f + \gamma_x \, \sigma_x + \delta - \mu_X} E_{ft} \quad \text{if} \quad \theta_u \ll 1, \tag{A.16}$$

where $E_{ft} = x_t \sum_{j \in \mathcal{J}_{ft}} u_{jt} \, K_j^\alpha$, and a_0 tends to zero as the persistence of the project-specific shocks increases.

Market Beta

The market portfolio, defined as the value-weighted portfolio of all consumption and investment firms, is exposed to both the disembodied shock x and the IST shock z

$$\beta^x_{Mt} = 1, \qquad \beta^z_{Mt} = \frac{\alpha}{1-\alpha}\,\frac{PVGO_{Ct} + V_{It}}{V_{Ct} + V_{It}}, \tag{A.17}$$

where $PVGO_{Ct} = \int_{\mathcal{F}} PVGO_{ft}\,df$ and $V_{Ct} = \int_{\mathcal{F}} V_{ft}\,df$ are the total present value of growth opportunities and the total firm value in the consumption sector respectively. A consumption-sector firm's market beta is therefore equal to

$$\begin{aligned}\beta^M_{ft} =& \frac{\sigma_x^2 + \left(\frac{\alpha}{1-\alpha}\right)^2 \frac{PVGO_{Ct}+V_{It}}{V_{Ct}+V_{It}} \times \frac{PVGO_{ft}}{V_{ft}}\sigma_z^2}{\sigma_x^2 + \left(\frac{\alpha}{1-\alpha}\right)^2 \left(\frac{PVGO_{Ct}+V_{It}}{V_{Ct}+V_{It}}\right)^2 \sigma_z^2} \\ =& B_{0t} + B_{1t}\frac{PVGO_{ft}}{V_{ft}},\end{aligned} \tag{A.18}$$

As a result, cross-sectional differences in market betas are positively related to cross-sectional differences in growth opportunities.

Idiosyncratic volatility

In our model, the idiosyncratic variance of the firm return equals

$$\begin{aligned} IVOL^2_{ft} = & \underbrace{\left[\sigma_u^2 \sum_{j\in\mathcal{J}_{ft}} \frac{1}{u_{jt}} \left(\frac{x_t\,K_j^\alpha a_1\,u_{jt}}{VAP_{ft}}\right)^2 + \delta \sum_{j\in\mathcal{J}_{ft}} \left(\frac{x_t\,K_j^\alpha A(u_{jt})}{VAP_{ft}}\right)^2\right]}_{C\left(x_t,\{K_j,u_{jt}\}_{j\in\mathcal{J}_{ft}}\right)} \left(\frac{VAP_{ft}}{V_{ft}}\right)^2 \\ & + \underbrace{\left[\bar\lambda_{ft}\left(A(p_{ft}) + B(p_{ft})\right)^2 + h_e^2\,B^2(p_{ft})\right]}_{H(p_{ft})} \left(\frac{PVGO_{ft}}{V_{ft}}\right)^2, \end{aligned} \tag{A.19}$$

where

$$\begin{aligned} A(p_{ft}) =& \frac{(\alpha^{-1}-1)\left(\frac{\alpha}{r_f+\gamma_x\,\sigma_x+\delta-\mu_X}\right)^{\frac{1}{1-\alpha}}}{G_L + p_{ft}\,(G_H - G_L)} \qquad \text{(A.20)} \\ B(p_{ft}) =& \frac{(G_H - G_L)\,p_{ft}\left(\lambda_f\,\lambda_H - \bar\lambda_{ft}\right)}{G_L + p_{ft}\,(G_H - G_L)}. \qquad \text{(A.21)} \end{aligned}$$

2 Tables

2.1 Additional results

Table A.1: Portfolio characteristics and leverage

	Book leverage									
	Lo	2	3	4	5	6	7	8	9	Hi
Q	17.7	22.8	23.2	22.7	21.5	19.8	17.5	13.9	9.1	3.4
I/K	15.5	20.3	20.0	19.4	19.0	17.5	16.6	15.1	14.3	12.9
E/P	13.0	17.5	20.1	20.8	21.9	22.8	22.8	23.2	21.4	15.8
MBETA	15.5	18.8	19.3	18.9	18.4	17.9	17.7	17.2	16.7	15.0
IVOL	27.7	19.5	18.9	18.3	18.1	17.2	15.7	14.2	13.1	11.1

Table shows book leverage for decile portfolios of firms sorted on investment rate (I/K), Tobin's Q (Q), market beta (MBETA), idiosyncratic volatility (IVOL) and earnings to price (E/P).

Table A.2: IMC-beta and characteristics: Model

BIMC(t)	a. Market Beta		b. Investment		c. Price/Earnings		d. Idiosyncratic Volatility		e. Tobin's Q		f. All	
$BIMC_{t-1}$		0.610		0.149		0.505		0.565		0.506		0.179
		(104.47)		(28.33)		(54.60)		(98.17)		(82.35)		(24.91)
$MBETA_{t-1}$	0.757	0.151									0.071	-0.103
	(98.14)	(16.15)									(14.10)	(-13.02)
$(I/K)_{t-1}$			0.061	-0.181							-0.392	-0.398
			(4.02)	(-17.15)							(-33.22)	(-35.21)
E/P_{t-1}					-5.817	-4.934					-5.061	-4.889
					(-249.20)	(-145.62)					(-139.69)	(-133.34)
$IVOL_{t-1}$							4.552	1.569			0.457	0.452
							(38.81)	(27.57)			(8.56)	(9.04)
$\ln Q(t-1)$									0.128	0.066	0.035	0.030
									(51.03)	(42.50)	(32.39)	(30.52)

Table reports the relation between firm's IMC-beta (BIMC) and firm characteristics in simulated data.

Table A.3: Fama-MacBeth regressions: Model

	a. Market Beta		b. Investment			c. Earnings/Price			d. Idiosyncratic Volatility			e. Tobin's Q		
$E_{t-1}[BIMC_t]$		-0.046			-0.077			-0.084			-0.075			-0.074
		(-3.67)			(-4.03)			(-3.18)			(-3.98)			(-3.93)
$MBETA_{t-1}$	-0.06	-0.004		-0.06	0.008		-0.007	0.001		-0.053	0.002		-0.046	0.001
	(-4.24)	(-0.86)		(-4.08)	(1.03)		(-2.39)	(0.36)		(-4.00)	(0.76)		(-3.90)	(0.22)
$(I/K)_{t-1}$			-0.078	-0.052	-0.009									
			(-4.95)	(-2.44)	(-1.04)									
E/P_{t-1}						0.501	0.419	0.011						
						(4.32)	(4.38)	(0.90)						
$IVOL_{t-1}$									-0.209	-0.183	-0.031			
									(-4.41)	(-5.16)	(-1.35)			
$\ln Q_{t-1}$												-0.011	-0.008	-0.002
												(-4.52)	(-5.41)	(-2.22)

Table reports results of running Fama-McBeth regressions in simulated data. See main text and notes to Table 7 for more details.

Table A.4: Correlation between characteristic decile assignments

Sort	Data				Model			
	Q	I/K	P/E	MBETA	Q	I/K	P/E	MBETA
Q								
I/K	38.1				19.3			
P/E	63.6	20.6			47.4	27.5		
MBETA	20.5	-19.3	-14.3		40.4	25.6	73.2	
IVOL	12.3	-11.3	-11.5	21.3	12.7	44.3	49.2	39.1

Table reports correlations between portfolio decile assignments across the characteristics Q, I/K, E/P, MBETA, and IVOL. See main text and notes to Tables 1 for more details.

Table A.5: market beta and characteristics

$MBETA_t$	a. Investment		b. Earnings/Price		c. Idiosyncratic Volatility		d. Tobin's Q		e. All	
$MBETA_{t-1}$		0.335		0.345		0.340		0.325		0.318
		(11.67)		(11.92)		(12.20)		(11.25)		(11.38)
$(I/K)_{t-1}$	0.411	0.245							0.235	0.136
	(10.36)	(8.26)							(6.67)	(4.53)
E/P_{t-1}			-0.061	-0.029					0.055	0.037
			(-1.38)	(-0.76)					(1.99)	(1.31)
$IVOL_{t-1}$					1.969	0.998			1.378	0.665
					(2.95)	(1.68)			(2.20)	(1.17)
$\ln Q_{t-1}$							0.100	0.066	0.084	0.059
							(7.94)	(5.40)	(6.88)	(4.85)
R^2	0.092	0.185	0.080	0.181	0.086	0.182	0.105	0.192	0.112	0.194

Table reports results of regressing a firm's market beta (MBETA) on lagged estimates of MBETA and firm characteristics – equation (4) in main text. All specifications include year-fixed effects. We report t-statistics in parenthesis computed using clustered errors by firm and year. See main text and notes to Tables 1 for more details.

Table A.6: PC1-beta and characteristics

$BPC1_t$	a. Market Beta		b. Investment		c. Earnings/Price		d. Idiosyncratic Volatility		e. Tobin's Q		f. All	
$BPC1_{t-1}$		0.198		0.152		0.200		0.198		0.195		0.146
		(10.21)		(8.32)		(9.57)		(9.51)		(9.79)		(8.46)
$MBETA_{t-1}$	0.161	0.132									0.088	0.078
	(2.89)	(2.80)									(1.82)	(1.78)
$(I/K)_{t-1}$			0.506	0.406							0.204	0.177
			(8.07)	(7.97)							(4.42)	(4.00)
E/P_{t-1}					-0.383	-0.302					0.022	0.012
					(-2.72)	(-2.71)					(0.33)	(0.19)
$IVOL_{t-1}$							9.775	8.038			9.041	7.457
							(14.72)	(12.69)			(12.98)	(11.19)
$\ln Q_{t-1}$									0.107	0.086	0.052	0.045
									(5.21)	(4.94)	(3.33)	(3.03)
R^2	0.238	0.268	0.274	0.291	0.235	0.266	0.236	0.268	0.240	0.270	0.280	0.296

This table reports results of regressing a firm's PC1-beta (BPC1) on lagged estimates of PC1-beta and firm characteristics – following equation (4) in main text. All specifications include year-fixed effects. We report t-statistics in parenthesis computed using clustered errors by firm and year. Estimation sample is 1964-2008. See main text and notes to Tables 1 for more details.

Table A.7: HML-beta and characteristics

$BHML_t$	a. Market Beta		b. Investment		c. Earnings/Price		d. Idiosyncratic Volatility		e. Tobin's Q		f. All	
$BHML_{t-1}$		0.151		0.182		0.184		0.175		0.157		0.124
		(8.45)		(8.65)		(9.20)		(9.06)		(8.54)		(6.99)
$MBETA_{t-1}$	-0.256	-0.169									-0.212	-0.143
	(-5.51)	(-4.37)									(-4.95)	(-3.95)
$(I/K)_{t-1}$			-0.562	-0.448							-0.227	-0.194
			(-9.81)	(-9.23)							(-6.05)	(-5.58)
E/P_{t-1}					-0.007	-0.023					-0.025	-0.038
					(-0.08)	(-0.27)					(-0.54)	(-0.85)
$IVOL_{t-1}$							1.719	1.405			3.545	2.982
							(1.21)	(1.09)			(2.80)	(2.51)
$\ln Q_{t-1}$									-0.182	-0.156	-0.161	-0.148
									(-9.60)	(-8.83)	(-10.18)	(-9.89)
R^2	0.311	0.325	0.296	0.320	0.295	0.319	0.301	0.323	0.319	0.336	0.334	0.343

This table reports results of regressing a firm's HML-beta (BHML) on lagged estimates of HML-beta and firm characteristics – equation (4) in main text. All specifications include year-fixed effects. We report t-statistics in parenthesis computed using clustered errors by firm and year. Estimation sample is 1964-2008. See main text and notes to Tables 1 for more details.

Table A.8: Fama-MacBeth regressions – split sample, predicted market beta

	a. Market Beta		b. Investment			c. Price/Earnings			d. Idiosyncratic Volatility			e. Tobin's Q		
$E_{t-1}[BIMC_t]$		-0.346			-0.327			-0.276			-0.151			-0.345
		(-5.31)			(-4.95)			(-5.00)			(-1.61)			(-5.43)
$E_{t-1}[MBETA_t]$	-0.089	0.281		-0.063	0.277		-0.083	0.208		-0.047	0.096		-0.048	0.319
	(-3.09)	(4.30)		(-2.20)	(4.28)		(-3.17)	(3.64)		(-1.84)	(1.18)		(-2.13)	(4.74)
$(I/K)_{t-1}$			-0.151	-0.118	-0.075									
			(-6.01)	(-5.84)	(-3.57)									
E/P_{t-1}						0.255	0.236	0.152						
						(4.60)	(4.72)	(3.86)						
$IVOL_{t-1}$									-1.831	-1.658	-1.112			
									(-6.63)	(-6.31)	(-3.11)			
$\ln Q_{t-1}$												-0.031	-0.025	-0.022
												(-4.15)	(-3.94)	(-3.44)

Table reports results of Fama and MacBeth (1973) regressions using lagged firm characteristics, contemporaneous fitted values of IMC beta ($\widehat{\text{BIMC}}$) and MBETA using the regression model in the last column of Table A.5 estimated during the 1965-1986 subsample. Estimation is done at annual frequencies, with the stock return on fiscal year t defined as the stock return from June of calendar year t to May of calendar year $t+1$. The sample period used in the Fama-Macbeth regression is 1987-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.9: Fama-MacBeth regressions – split sample, PC1 beta

	a. Market Beta		b. Investment			c. Price/Earnings			d. Idiosyncratic Volatility			e. Tobin's Q		
$\widehat{BPC1}\_t$		-0.143			-0.133			-0.121			-0.067			-0.132
		(-6.18)			(-5.73)			(-6.00)			(-1.75)			(-6.04)
$MBETA_{t-1}$	-0.013	-0.004		-0.006	-0.001		-0.013	-0.007		-0.008	-0.006		-0.003	0.002
	(-1.10)	(-0.47)		(-0.57)	(-0.12)		(-1.24)	(-0.78)		(-0.78)	(-0.75)		(-0.31)	(0.24)
$(I/K)_{t-1}$			-0.151	-0.144	-0.094									
			(-6.01)	(-6.48)	(-4.23)									
E/P_{t-1}						0.255	0.247	0.146						
						(4.60)	(4.61)	(3.69)						
$IVOL_{t-1}$									-1.831	-1.771	-1.054			
									(-6.63)	(-6.63)	(-2.49)			
$\ln Q_{t-1}$												-0.031	-0.030	-0.024
												(-4.15)	(-4.27)	(-3.69)

Table reports results of Fama and MacBeth (1973) regressions using lagged firm characteristics, contemporaneous fitted values of PC1 beta ($\widehat{\mathrm{BIMC}}$) using the regression model in the last column of Table A.6 estimated during the 1965-1986 subsample. Estimation is done at annual frequencies, with the stock return on fiscal year t defined as the stock return from June of calendar year t to May of calendar year $t+1$. The sample period used in the Fama-Macbeth regression is 1987-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.10: Fama-MacBeth regressions – split sample, HML beta

	a. Market Beta		b. Investment			c. Price/Earnings			d. Idiosyncratic Volatility			e. Tobin's Q		
$\widehat{BHML}\_t$		-0.017			-0.052			0.015			0.120			-0.147
		(-0.82)			(-2.40)			(0.69)			(3.80)			(-4.94)
$MBETA_{t-1}$	-0.013	-0.029		-0.006	-0.035		-0.013	-0.017		-0.008	0.029		-0.003	-0.055
	(-1.10)	(-2.75)		(-0.57)	(-3.27)		(-1.24)	(-1.98)		(-0.77)	(3.18)		(-0.31)	(-3.90)
$(I/K)_{t-1}$			-0.151	-0.144	-0.179									
			(-6.01)	(-6.48)	(-9.08)									
E/P_{t-1}						0.255	0.248	0.256						
						(4.60)	(4.61)	(4.12)						
$IVOL_{t-1}$									-1.832	-1.772	-2.411			
									(-6.63)	(-6.63)	(-6.14)			
$\ln Q_{t-1}$												-0.031	-0.030	-0.055
												(-4.15)	(-4.27)	(-5.61)

Table reports results of Fama and MacBeth (1973) regressions using lagged firm characteristics, contemporaneous fitted values of HML beta ($\widehat{\text{BHML}}$) using the regression model in the last column of Table A.7 estimated during the 1965-1986 subsample. Estimation is done at annual frequencies, with the stock return on fiscal year t defined as the stock return from June of calendar year t to May of calendar year $t+1$. The sample period used in the Fama-Macbeth regression is 1987-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.11: Fama-MacBeth regressions – full sample

	a. Market Beta		b. Investment			c. Price/Earnings			d. Idiosyncratic Volatility			e. Tobin's Q		
$E_{t-1}[BIMC_t]$		-0.263			-0.247			-0.217			-0.167			-0.228
		(-5.35)			(-5.01)			(-4.60)			(-3.86)			(-3.84)
$MBETA_{t-1}$	-0.026	0.061		-0.019	0.058		-0.024	0.046		-0.019	0.030		-0.017	0.053
	(-2.42)	(4.15)		(-1.92)	(3.91)		(-2.47)	(3.39)		(-2.00)	(2.99)		(-1.77)	(2.86)
$(I/K)_{t-1}$			-0.138	-0.123	-0.044									
			(-5.26)	(-5.28)	(-2.31)									
E/P_{t-1}						0.269	0.249	0.169						
						(5.96)	(6.10)	(5.68)						
$IVOL_{t-1}$									-1.625	-1.421	-0.721			
									(-4.10)	(-3.58)	(-1.84)			
$\ln Q_{t-1}$												-0.029	-0.026	-0.009
												(-5.61)	(-5.71)	(-1.66)

Table reports results of Fama and MacBeth (1973) regressions using lagged firm characteristics, lagged point estimates of IMC beta (BIMC) estimated using equation (32) and contemporaneous fitted values of IMC beta ($\widehat{\text{BIMC}}$) using the regression model in the last column of Table 6. Estimation is done at annual frequencies, with the stock return on fiscal year t defined as the stock return from June of calendar year t to May of calendar year $t+1$. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.12: Fama-MacBeth regressions, raw IMC beta

$BIMC_t$	-0.022	-0.022	-0.019	-0.024	-0.017	-0.016	-0.010	-0.020	-0.018
	(-2.31)	(-2.56)	(-2.11)	(-2.69)	(-2.06)	(-2.10)	(-1.32)	(-2.49)	(-2.03)
$MBETA_{t-1}$	-0.010		-0.005		-0.013		-0.014		-0.004
	(-1.09)		(-0.61)		(-1.49)		(-1.82)		(-0.48)
$(I/K)_{t-1}$		-0.123	-0.119						
		(-5.36)	(-5.34)						
E/P_{t-1}				0.245	0.239				
				(6.18)	(6.18)				
$IVOL_{t-1}$						-1.435	-1.386		
						(-3.64)	(-3.55)		
$\ln Q_{t-1}$								-0.026	-0.025
								(-5.55)	(-5.62)

Table A.12 reports results of Fama and MacBeth (1973) regressions using lagged firm characteristics, lagged point estimates of IMC beta (BIMC) estimated using equation (32) and contemporaneous fitted values of IMC beta ($\widehat{\text{BIMC}}$) using the regression model in the last column of Table 6. Estimation is done at annual frequencies, with the stock return on fiscal year t defined as the stock return from June of calendar year t to May of calendar year $t+1$. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.13: Investment response to IST shock: response to PC1

$(I/K)_{ft}$	Q	I/K	E/P	MBETA	IVOL
Δz_{t-1}	-0.23	0.17	1.14	-0.10	0.04
	(-0.84)	(0.77)	(2.00)	(-0.29)	(0.13)
$D(G_f)_2 \times \Delta z_{t-1}$	0.24	-0.08	-1.03	-0.07	0.05
	(2.03)	(-0.65)	(-1.89)	(-0.44)	(0.36)
$D(G_f)_3 \times \Delta z_{t-1}$	0.40	0.13	-1.18	0.03	0.38
	(2.92)	(0.93)	(-2.20)	(0.18)	(0.19)
$D(G_f)_4 \times \Delta z_{t-1}$	0.54	0.13	-1.22	0.20	0.50
	(2.28)	(1.24)	(-2.35)	(0.71)	(1.68)
$D(G_f)_H \times \Delta z_{t-1}$	0.77	0.84	-1.47	1.13	0.82
	(2.34)	(1.92)	(-2.92)	(3.07)	(2.53)

Table shows the differential response of investment of firms with different characteristics $G_f \in \{Q, I/K, E/P, MBETA, IVOL\}$ on the empirical risk factor PC1.

Table A.14: Investment response to IST shock: model

$(I/K)_{ft}$	Q	I/K	E/P	MBETA	IVOL
Δz_{t-1}	2.48	1.92	4.16	2.48	1.94
	(4.64)	(4.45)	(5.27)	(4.84)	(4.43)
$D(G_f)_2 \times \Delta z_{t-1}$	0.13	0.64	-0.59	0.15	0.59
	(1.25)	(3.32)	(-2.66)	(1.21)	(3.72)
$D(G_f)_3 \times \Delta z_{t-1}$	0.39	1.17	-1.05	0.47	0.98
	(2.00)	(4.54)	(-4.03)	(2.69)	(4.85)
$D(G_f)_4 \times \Delta z_{t-1}$	0.72	1.52	-1.61	0.79	1.46
	(3.60)	(5.40)	(-4.89)	(3.94)	(5.34)
$D(G_f)_H \times \Delta z_{t-1}$	1.50	2.30	-2.39	1.37	2.44
	(4.78)	(6.60)	(-5.27)	(4.81)	(5.97)

Table shows the differential response of investment of firms with different characteristics $G_f \in \{Q, I/K, E/P, MBETA, IVOL\}$ on the IST shock in simulated data.

Table A.15: Return predictability: Model vs Data

Horizon (k)	a. Price/Dividend			b. Price/Earnings			c. Tobin's Q			d. Investment rate			e. Market volatility		
(years)	Slope	t	R^2	Slope	t	R^2	Slope	t	R^2	Slope	t	R^2	Slope	t	R^2
A. Model															
1	-0.10	-2.04	0.07	-0.14	-2.02	0.07	-0.11	-1.81	0.06	-0.06	-1.93	0.06	-0.13	-1.52	0.04
2	-0.19	-2.47	0.13	-0.27	-2.42	0.13	-0.22	-2.29	0.12	-0.12	-2.32	0.12	-0.25	-1.90	0.07
3	-0.26	-2.76	0.19	-0.38	-2.70	0.19	-0.32	-2.65	0.17	-0.18	-2.56	0.16	-0.36	-2.11	0.10
4	-0.33	-2.97	0.24	-0.47	-2.94	0.24	-0.39	-2.82	0.21	-0.22	-2.70	0.20	-0.46	-2.25	0.12
5	-0.40	-3.18	0.28	-0.57	-3.15	0.28	-0.47	-3.02	0.25	-0.27	-2.84	0.23	-0.55	-2.51	0.15
B. Data															
1	-0.12	-2.14	0.07	-0.09	-1.64	0.05	-0.11	-1.97	0.06	-0.40	-1.79	0.05	-0.01	-0.16	0.00
2	-0.14	-2.04	0.08	-0.11	-1.51	0.04	-0.13	-1.86	0.06	-0.68	-2.82	0.11	-0.07	-0.91	0.01
3	-0.16	-1.60	0.06	-0.13	-1.25	0.04	-0.15	-1.55	0.06	-1.00	-3.20	0.16	-0.13	-1.27	0.03
4	-0.21	-1.59	0.08	-0.18	-1.37	0.06	-0.21	-1.71	0.09	-1.22	-3.22	0.19	-0.05	-0.40	0.00
5	-0.27	-1.62	0.12	-0.22	-1.38	0.09	-0.27	-1.84	0.15	-1.37	-3.08	0.23	-0.02	-0.15	0.00

Table reports results of return predictability regressions in simulated data. In particular, we report coefficients $b(k)$ from

$$\sum_{h=1}^{k} r_{M,t+h} = a(k) + b(k)\, x_t + u_{t+h}$$

r_M is log gross return on the market portfolio; x is the log aggregate price dividend ratio (panel a), log aggregate price-earnings ratio (panel b), log aggregate Tobin's Q (panel c), and log aggregate investment rate (panel d). Standard errors are computed using the Newey-West procedure with the number of lags equal to 1.5 times the return horizon. Point estimates, t-statistics, and the R^2 are median values across 1,000 independent simulations of the model. For each simulated sample we start with 100 years of simulate data and omit the first 50 years to eliminate the effect of initial conditions.

Table A.16: Estimates of the stochastic discount factor, by cross-section

Factor price	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	10 portfolios sorted on Market beta					10 portfolios sorted on Idiosyncratic volatility				
Δx	1.32	-0.88				0.38	-0.74			
	[0.54, 2.09]	[-1.62, -0.13]				[-0.42, 1.19]	[-1.76, 0.28]			
R_{MKT}			0.29	0.45	0.38			0.16	0.50	0.46
			[0.08, 0.49]	[0.22, 0.67]	[0.18, 0.59]			[-0.06, 0.37]	[0.22, 0.79]	[0.19, 0.72]
Δz^I		-1.32					-1.33			
		[-2.01, -0.63]					[-2.12, -0.54]			
R_{IMC}				-0.47					-0.65	
				[-0.87, -0.07]					[-1.21, -0.09]	
$-R_{HML}$					-0.45					-1.22
					[-0.85, -0.05]					[-2.33, -0.11]
SSQE	0.47	0.08	0.49	0.07	0.09	1.86	0.42	1.09	0.35	0.82
	10 portfolios sorted on Investment					10 portfolios sorted on Tobin's Q				
Δx	1.33	-0.62				1.54	0.35			
	[0.49, 2.18]	[-1.64, 0.40]				[0.79, 2.30]	[-0.21, 0.91]			
R_{MKT}			0.29	0.53	0.44			0.34	0.62	0.43
			[0.10, 0.48]	[0.30, 0.75]	[0.24, 0.63]			[0.15, 0.53]	[0.39, 0.85]	[0.23, 0.63]
Δz^I		-1.28					-0.78			
		[-2.00, -0.56]					[-1.41, -0.15]			
R_{IMC}				-0.71					-1.21	
				[-1.08, -0.33]					[-1.67, -0.75]	
$-R_{HML}$					-0.65					-0.57
					[-0.98, -0.33]					[-0.88, -0.27]
SSQE	1.00	0.31	0.82	0.10	0.10	0.61	0.31	0.84	0.12	0.20
	10 portfolios sorted on Price/Earnings					10 portfolios sorted on profitability				
Δx	1.62	0.93				1.64	0.91			
	[0.89, 2.35]	[0.15, 1.70]				[0.59, 2.68]	[-0.35, 2.18]			
R_{MKT}			0.37	0.54	0.47			0.32	0.49	0.27
			[0.17, 0.57]	[0.32, 0.75]	[0.26, 0.67]			[0.12, 0.52]	[0.22, 0.75]	[0.06, 0.47]
Δz^I		-0.47					-0.38			
		[-1.21, 0.28]					[-0.93, 0.18]			
R_{IMC}				-0.84					-0.62	
				[-1.20, -0.48]					[-1.08, -0.17]	
$-R_{HML}$					-0.85					0.35
					[-1.23, -0.47]					[-0.06, 0.77]
SSQE	0.38	0.30	1.07	0.35	0.21	0.39	0.36	0.30	0.11	0.23

Table reports empirical estimates of γ_x and γ_z from the model SDF: $m = a - \gamma_x \ \Delta x - \gamma_z \ \Delta z$. We sort firms on Q, I/K, E/P, MBETA, IVOL and GP/A (see main text for variable definitions). We use annual data in the 1964-2008 period and report first-stage estimates; 90%-confidence intervals around the point estimates computed using the Newey-West procedure with 3 lags; the sum of squared errors (SSQE); and mean absolute pricing errors (MAPE).

Figure A.1: Investment shock and firm output comovement: Model

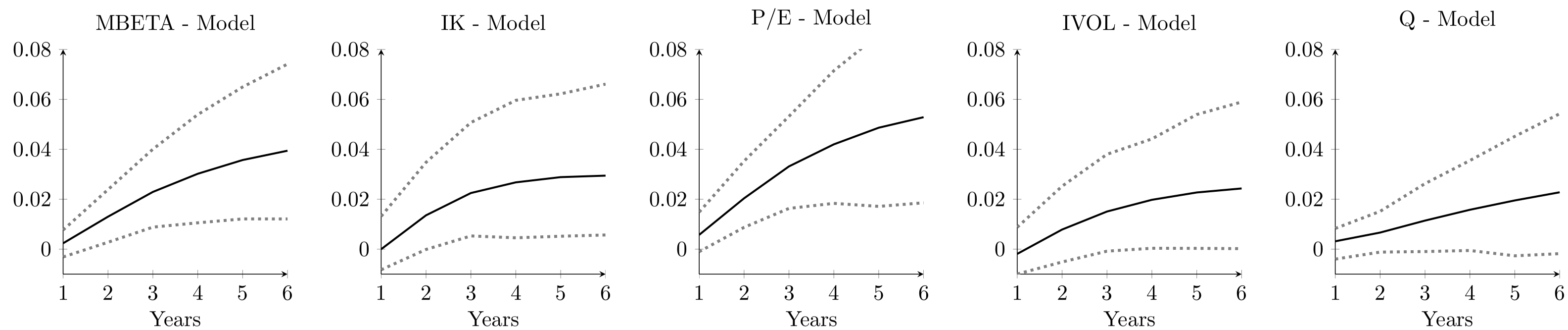

Figure plots the differential response of sales growth on the IST shock between firms with high and low I/K, E/P, Q, IVOL or MBETA using equation (7) in the text.

Table A.17: Portfolios sorted on Tobin's Q

	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
Data											
$E(R) - r_f(\%)$	10.26	9.48	7.43	5.74	4.19	4.27	5.76	5.13	4.94	1.47	-8.79
	(4.43)	(5.01)	(3.91)	(2.82)	(1.80)	(2.10)	(2.21)	(1.91)	(1.93)	(0.58)	(-3.26)
$\sigma(\%)$	19.06	19.74	16.87	16.62	18.13	17.29	17.35	20.85	20.31	24.94	20.75
β^{mkt}	0.86	0.92	0.82	0.82	0.90	0.89	0.87	1.06	0.99	1.15	0.29
	(7.25)	(7.27)	(8.82)	(10.24)	(16.87)	(20.49)	(15.79)	(13.78)	(15.13)	(9.61)	(1.66)
$\alpha(\%)$	5.98	4.90	3.35	1.66	-0.32	-0.20	1.43	-0.17	-0.00	-4.29	-10.27
	(3.25)	(3.68)	(3.22)	(1.61)	(-0.35)	(-0.26)	(1.16)	(-0.14)	(-0.00)	(-2.25)	(-3.64)
$R^2(\%)$	65.33	69.79	75.77	78.14	79.96	86.69	81.02	83.85	76.71	69.02	6.55
β^{imc}	0.07	0.17	0.12	0.22	0.21	0.31	0.15	0.41	0.31	0.68	0.61
I/K	0.08	0.09	0.10	0.11	0.12	0.14	0.16	0.18	0.21	0.28	
Q	0.29	0.53	0.72	0.95	1.27	1.77	2.56	4.07	7.57	23.83	
Model											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	10.12	8.31	7.36	6.71	6.16	5.70	5.32	5.03	4.81	4.85	-5.27
	(6.44)	(4.87)	(4.05)	(3.50)	(3.05)	(2.69)	(2.43)	(2.25)	(2.16)	(2.35)	(-5.71)
$\sigma(\%)$	11.23	12.30	13.16	13.98	14.78	15.53	16.14	16.47	16.51	15.82	6.89
β^{mkt}	0.72	0.80	0.86	0.92	0.97	1.02	1.06	1.08	1.08	1.03	0.31
	(21.96)	(33.01)	(46.04)	(60.03)	(66.17)	(63.02)	(56.91)	(54.01)	(51.91)	(46.87)	(7.71)
$\alpha(\%)$	5.61	3.30	1.98	0.99	0.12	-0.63	-1.24	-1.66	-1.88	-1.51	-7.13
	(11.73)	(8.95)	(6.49)	(3.89)	(0.39)	(-2.50)	(-4.29)	(-5.30)	(-5.89)	(-4.94)	(-10.83)
$R^2(\%)$	89.60	94.29	96.07	96.94	97.27	97.25	97.11	96.92	96.80	96.08	53.34
β^{imc}	0.50	0.57	0.64	0.70	0.78	0.84	0.90	0.93	0.93	0.86	0.36
I/K	0.08	0.08	0.09	0.10	0.10	0.11	0.11	0.12	0.13	0.15	
Q	1.81	2.21	2.56	2.92	3.31	3.71	4.10	4.51	5.01	5.89	

Table shows characteristics for the 10 portfolios of firms sorted on Tobin's Q. The top panel shows results from actual data, the bottom panel shows results from data simulated by the model. We report average returns in excess of the risk-free rate, as well CAPM alphas and univariate post-formation betas with respect to the market portfolio, β_t^{mkt}, and the investment minus consumption portfolio (defined in Appendix A), β_t^{imc}. Estimation is done at annual frequencies in both the model and the data. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.18: Portfolios sorted on the earnings-to-price ratio (E/P)

					Data						
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	2.28	1.65	2.23	5.35	7.34	6.65	7.89	8.23	8.95	11.19	8.91
	(0.72)	(0.84)	(1.13)	(2.56)	(3.67)	(3.47)	(3.51)	(3.33)	(3.98)	(4.25)	(3.00)
$\sigma(\%)$	25.72	16.90	16.24	16.99	18.25	17.27	17.86	19.05	19.76	20.96	19.72
β^{mkt}	1.21	0.86	0.85	0.85	0.90	0.88	0.91	0.92	0.81	0.97	-0.25
	(10.72)	(12.44)	(15.67)	(12.41)	(10.86)	(13.09)	(10.10)	(10.37)	(4.85)	(9.59)	(-1.62)
$\alpha(\%)$	-3.80	-2.63	-2.00	1.11	2.85	2.26	3.36	3.64	4.88	6.35	10.15
	(-2.24)	(-2.67)	(-3.02)	(1.72)	(2.40)	(3.10)	(2.95)	(2.88)	(2.50)	(3.15)	(3.51)
$R^2(\%)$	72.25	83.28	88.35	81.05	78.41	83.92	83.54	75.21	55.15	68.98	5.11
β^{imc}	0.87	0.31	0.30	0.08	0.17	0.24	0.17	0.18	-0.04	0.18	-0.69
I/K	0.13	0.12	0.11	0.11	0.11	0.11	0.10	0.11	0.12	0.13	
Q	2.20	2.11	1.99	1.80	1.62	1.41	1.34	1.22	1.00	0.44	
					Model						
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	2.97	3.75	4.32	4.91	5.49	6.11	6.82	7.62	8.60	10.18	7.21
	(0.99)	(1.41)	(1.75)	(2.15)	(2.57)	(3.06)	(3.66)	(4.43)	(5.48)	(7.47)	(3.93)
$\sigma(\%)$	20.48	18.69	17.55	16.53	15.59	14.65	13.66	12.63	11.48	9.85	13.33
β^{mkt}	1.36	1.25	1.18	1.11	1.05	0.99	0.92	0.84	0.76	0.62	-0.74
	(26.04)	(32.56)	(40.53)	(51.63)	(66.04)	(78.22)	(63.71)	(44.29)	(30.22)	(17.48)	(-9.53)
$\alpha(\%)$	-5.76	-4.28	-3.27	-2.24	-1.27	-0.24	0.90	2.18	3.71	6.18	11.94
	(-7.65)	(-7.86)	(-7.81)	(-7.09)	(-5.28)	(-1.42)	(3.66)	(7.25)	(9.67)	(11.69)	(10.47)
$R^2(\%)$	92.30	94.52	95.84	96.59	97.12	97.25	96.88	95.69	92.83	83.49	64.23
β^{imc}	1.22	1.09	0.99	0.91	0.83	0.75	0.66	0.58	0.49	0.35	-0.90
I/K	0.13	0.12	0.12	0.11	0.11	0.10	0.09	0.08	0.07	0.07	
Q	4.27	4.26	4.11	3.86	3.61	3.27	2.97	2.69	2.47	2.26	

Table shows characteristics for the 10 portfolios of firms sorted on the earnings-to-price ratios. The top panel shows results from actual data, the bottom panel shows results from data simulated by the model. We report average returns in excess of the risk-free rate, as well CAPM alphas and univariate post-formation betas with respect to the market portfolio, β_t^{mkt}, and the investment minus consumption portfolio (defined in Appendix A), β_t^{imc}. Estimation is done at annual frequencies in both the model and the data. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.19: Portfolios sorted on the investment rate (I/K)

	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
Data											
$E(R) - r_f (\%)$	7.46	6.98	7.25	7.08	6.98	6.00	5.74	4.07	3.28	2.51	-4.94
	(3.00)	(3.42)	(4.40)	(3.73)	(3.29)	(2.64)	(2.45)	(1.67)	(1.30)	(0.65)	(-1.42)
$\sigma(\%)$	20.60	17.04	15.15	16.47	16.33	17.81	18.72	19.50	23.00	33.30	24.86
β^{mkt}	0.94	0.82	0.73	0.83	0.85	0.91	0.93	0.99	1.16	1.56	0.62
	(7.79)	(10.05)	(10.61)	(12.24)	(15.75)	(12.85)	(15.96)	(14.18)	(14.69)	(9.52)	(2.91)
$\alpha(\%)$	2.77	2.87	3.61	2.92	2.70	1.43	1.09	-0.89	-2.52	-5.27	-8.04
	(1.40)	(2.16)	(4.13)	(4.38)	(2.87)	(1.70)	(0.88)	(-0.89)	(-2.02)	(-1.85)	(-2.41)
$R^2(\%)$	67.02	75.49	75.24	82.93	88.70	85.42	80.01	83.89	82.52	70.80	20.13
β^{imc}	0.13	0.14	0.07	0.13	0.24	0.30	0.23	0.35	0.67	1.16	1.03
I/K	0.03	0.05	0.07	0.09	0.11	0.13	0.16	0.21	0.30	0.64	
Q	0.96	0.78	0.91	1.03	1.19	1.45	1.73	2.08	2.83	4.54	
Model											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f (\%)$	9.41	8.13	7.24	6.53	5.97	5.54	5.52	6.10	6.34	4.61	-4.81
	(5.95)	(4.57)	(3.77)	(3.20)	(2.78)	(2.48)	(2.48)	(2.99)	(3.45)	(2.30)	(-7.85)
$\sigma(\%)$	11.51	13.03	14.09	14.95	15.67	16.18	15.97	14.64	13.39	14.45	4.41
β^{mkt}	0.75	0.87	0.94	1.00	1.05	1.09	1.07	0.99	0.90	0.98	0.22
	(27.22)	(44.25)	(61.23)	(70.66)	(63.66)	(56.21)	(45.82)	(52.66)	(56.02)	(53.67)	(7.10)
$\alpha(\%)$	4.52	2.49	1.12	0.04	-0.85	-1.49	-1.44	-0.30	0.50	-1.71	-6.23
	(11.11)	(8.34)	(4.41)	(-0.02)	(-3.34)	(-5.05)	(-4.42)	(-1.00)	(1.90)	(-6.81)	(-13.88)
$R^2(\%)$	91.98	95.73	96.81	97.13	97.11	96.87	96.60	96.84	96.81	97.11	53.01
β^{imc}	0.48	0.62	0.72	0.80	0.87	0.92	0.92	0.79	0.67	0.78	0.29
I/K	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.14	0.25	
Q	2.36	2.81	3.21	3.60	3.96	4.22	4.36	4.31	2.90	2.97	

Table shows characteristics for the 10 portfolios of firms sorted on investment rate. The top panel shows results from actual data, the bottom panel shows results from data simulated by the model. We report average returns in excess of the risk-free rate, as well CAPM alphas and univariate post-formation betas with respect to the market portfolio, β_t^{mkt}, and the investment minus consumption portfolio (defined in Appendix A), β_t^{imc}. Estimation is done at annual frequencies in both the model and the data. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.20: Portfolios sorted on the market beta (MBETA)

	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
Data											
$E(R)-r_f(\%)$	5.81	6.40	5.42	6.73	5.92	5.08	6.02	5.04	3.98	3.84	-1.97
	(2.51)	(3.04)	(2.72)	(3.77)	(3.13)	(2.65)	(2.43)	(1.95)	(1.19)	(0.98)	(-0.52)
$\sigma(\%)$	18.20	16.21	17.50	15.60	16.86	16.62	20.16	21.02	25.47	30.98	26.47
β^{mkt}	0.71	0.64	0.78	0.76	0.80	0.83	1.06	1.10	1.27	1.46	0.75
	(5.19)	(5.42)	(5.33)	(13.67)	(10.39)	(10.02)	(18.41)	(24.42)	(14.65)	(11.75)	(4.26)
$\alpha(\%)$	2.24	3.21	1.53	2.93	1.90	0.95	0.74	-0.44	-2.39	-3.47	-5.71
	(1.11)	(2.09)	(1.32)	(2.72)	(1.59)	(0.87)	(0.76)	(-0.43)	(-1.64)	(-1.48)	(-1.87)
$R^2(\%)$	49.70	50.28	64.13	76.94	73.46	80.12	88.95	88.09	81.13	72.10	25.93
β^{imc}	0.10	-0.13	-0.00	0.12	0.05	0.11	0.44	0.57	0.78	1.14	1.05
I/K	0.09	0.09	0.09	0.09	0.10	0.11	0.12	0.13	0.15	0.17	
Q	1.04	1.02	1.07	1.13	1.23	1.32	1.48	1.62	1.98	2.61	
Model											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	9.59	8.63	7.81	7.14	6.53	6.01	5.50	5.07	4.63	4.04	-5.55
	(6.50)	(5.38)	(4.54)	(3.92)	(3.37)	(2.93)	(2.54)	(2.21)	(1.90)	(1.56)	(-4.06)
$\sigma(\%)$	10.66	11.66	12.53	13.32	14.13	14.88	15.65	16.49	17.33	18.33	9.84
β^{mkt}	0.68	0.76	0.83	0.88	0.94	0.99	1.05	1.10	1.15	1.22	0.54
	(21.22)	(29.69)	(39.88)	(53.09)	(67.40)	(71.61)	(63.28)	(52.33)	(41.13)	(31.87)	(9.21)
$\alpha(\%)$	5.21	3.74	2.49	1.46	0.48	-0.38	-1.21	-2.00	-2.78	-3.77	-8.98
	(10.71)	(9.56)	(7.63)	(5.34)	(1.91)	(-1.78)	(-4.77)	(-6.26)	(-6.73)	(-6.95)	(-10.14)
$R^2(\%)$	87.92	92.50	94.89	96.17	96.78	97.12	97.05	96.72	96.01	94.66	63.49
β^{imc}	0.40	0.47	0.54	0.60	0.67	0.73	0.80	0.86	0.93	1.02	0.65
I/K	0.05	0.07	0.08	0.08	0.09	0.10	0.11	0.11	0.11	0.12	
Q	2.40	2.55	2.73	2.96	3.16	3.41	3.63	3.80	3.91	3.96	

Table shows characteristics for the 10 portfolios of firms sorted on market beta. The top panel shows results from actual data, the bottom panel shows results from data simulated by the model. We report average returns in excess of the risk-free rate, as well CAPM alphas and univariate post-formation betas with respect to the market portfolio, β_t^{mkt}, and the investment minus consumption portfolio (defined in Appendix A), β_t^{imc}. Estimation is done at annual frequencies in both the model and the data. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.21: Portfolios sorted on idiosyncratic return volatility (IVOL)

	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
Data											
$E(R) - r_f(\%)$	5.02	5.96	6.40	7.28	5.84	5.60	3.59	3.42	1.01	-0.84	-5.86
	(2.45)	(2.60)	(3.23)	(2.89)	(1.99)	(1.72)	(0.97)	(0.87)	(0.20)	(-0.14)	(-0.95)
$\sigma(\%)$	15.35	17.38	17.82	20.69	25.59	26.55	30.27	32.75	39.33	42.44	37.05
β^{mkt}	0.77	0.92	0.93	1.07	1.29	1.26	1.45	1.53	1.67	1.76	0.98
	(12.71)	(44.95)	(18.91)	(19.60)	(15.81)	(10.53)	(10.81)	(9.59)	(9.23)	(8.20)	(3.97)
$\alpha(\%)$	1.14	1.34	1.73	1.92	-0.63	-0.68	-3.67	-4.24	-7.34	-9.64	-10.78
	(1.12)	(1.65)	(2.10)	(2.69)	(-0.42)	(-0.30)	(-1.41)	(-1.43)	(-1.71)	(-1.90)	(-1.83)
$R^2(\%)$	82.67	91.64	89.14	86.86	82.69	72.53	74.67	70.99	58.41	55.65	22.85
β^{imc}	0.07	0.27	0.32	0.41	0.77	0.81	0.98	1.04	1.55	1.45	1.37
I/K	0.10	0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.15	0.12	
Q	0.93	1.19	1.23	1.28	1.38	1.43	1.65	1.88	1.95	2.25	
Model											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	9.61	8.27	7.56	7.02	6.57	6.15	5.76	5.39	4.99	4.37	-5.24
	(6.45)	(4.86)	(4.15)	(3.68)	(3.31)	(2.99)	(2.71)	(2.47)	(2.25)	(1.95)	(-5.38)
$\sigma(\%)$	10.90	12.51	13.36	13.99	14.49	14.92	15.33	15.65	15.88	15.85	7.03
β^{mkt}	0.70	0.83	0.89	0.94	0.98	1.01	1.03	1.05	1.07	1.07	0.36
	(21.74)	(35.65)	(49.38)	(65.35)	(76.75)	(70.48)	(60.14)	(49.43)	(42.20)	(35.09)	(6.99)
$\alpha(\%)$	5.06	2.92	1.79	0.97	0.29	-0.32	-0.89	-1.40	-1.89	-2.50	-7.56
	(10.78)	(8.65)	(6.44)	(3.96)	(1.06)	(-1.65)	(-3.48)	(-4.63)	(-5.33)	(-6.01)	(-10.68)
$R^2(\%)$	89.17	94.78	96.29	96.90	97.13	97.09	96.93	96.65	96.15	95.53	54.79
β^{imc}	0.41	0.56	0.63	0.69	0.74	0.79	0.82	0.85	0.87	0.89	0.48
I/K	0.04	0.06	0.07	0.08	0.08	0.09	0.10	0.11	0.13	0.15	
Q	2.63	3.09	3.33	3.50	3.63	3.74	3.83	3.84	3.74	3.12	

Table shows characteristics for the 10 portfolios of firms sorted on idiosyncratic volatility. The top panel shows results from actual data, the bottom panel shows results from data simulated by the model. We report average returns in excess of the risk-free rate, as well CAPM alphas and univariate post-formation betas with respect to the market portfolio, β_t^{mkt}, and the investment minus consumption portfolio (defined in Appendix A), β_t^{imc}. Estimation is done at annual frequencies in both the model and the data. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

Table A.22: Portfolios sorted on profitability to book

	Data										
Gross Profit.	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	3.75	4.54	3.02	5.81	5.93	3.92	6.90	4.81	7.85	7.92	4.17
	(1.03)	(1.52)	(1.41)	(2.83)	(2.76)	(1.95)	(2.88)	(2.00)	(3.10)	(2.80)	(1.28)
$\sigma(\%)$	36.24	22.48	18.07	18.91	19.79	17.82	20.13	17.18	19.71	19.31	32.86
β_{MKT}	1.44	1.12	0.92	0.98	1.04	0.92	1.02	0.83	0.86	0.89	-0.55
	(6.00)	(9.41)	(12.84)	(14.25)	(18.27)	(11.80)	(12.48)	(11.68)	(8.14)	(10.36)	(-1.85)
$\alpha(\%)$	-3.45	-1.07	-1.58	0.94	0.74	-0.69	1.77	0.67	3.57	3.50	6.95
	(-1.26)	(-0.58)	(-1.46)	(1.08)	(0.68)	(-0.59)	(1.60)	(0.57)	(2.30)	(2.14)	(1.96)
$R^2(\%)$	51.21	80.86	83.91	86.29	89.16	86.55	84.07	75.41	61.11	68.15	9.25
β^{imc}	1.36	0.60	0.33	0.41	0.40	0.29	0.41	0.18	0.21	0.10	-1.26
I/K	0.09	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.11	
Q	6.53	1.10	0.90	1.06	1.23	1.45	1.73	2.01	2.47	2.48	
	Model										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	3.79	5.12	6.69	6.98	7.09	7.13	7.07	7.03	6.97	7.11	3.32
	(1.80)	(2.73)	(3.27)	(3.58)	(3.74)	(3.83)	(3.84)	(3.83)	(3.86)	(4.19)	(2.13)
$\sigma(\%)$	18.79	16.00	14.66	14.01	13.65	13.46	13.37	13.40	13.31	12.72	7.70
β^{mkt}	1.25	1.07	0.98	0.94	0.91	0.90	0.89	0.89	0.88	0.83	-0.42
	(31.44)	(47.93)	(56.28)	(59.10)	(56.51)	(54.62)	(51.39)	(47.16)	(44.00)	(34.89)	(-7.90)
$\alpha(\%)$	-4.21	-1.77	0.37	0.94	1.22	1.34	1.34	1.30	1.32	1.81	6.02
	(-5.79)	(-2.26)	(1.47)	(3.75)	(4.74)	(5.06)	(4.92)	(4.48)	(4.17)	(4.65)	(6.80)
$R^2(\%)$	94.40	96.46	96.86	96.78	96.64	96.53	96.37	96.17	95.80	93.71	60.24
β^{imc}	1.05	0.83	0.73	0.68	0.64	0.63	0.62	0.61	0.60	0.55	-0.49
I/K	0.11	0.11	0.10	0.09	0.08	0.08	0.07	0.08	0.08	0.09	
Q	3.48	3.06	2.86	2.88	2.99	3.16	3.39	3.69	4.11	5.12	

Table shows characteristics for the 10 portfolios of firms sorted on gross profitability (Compustat gp over at). The top panel shows results from actual data, the bottom panel shows results from data simulated by the model. We report average returns in excess of the risk-free rate, as well CAPM alphas and univariate post-formation betas with respect to the market portfolio, β_t^{mkt}, and the investment minus consumption portfolio (defined in Appendix A), β_t^{imc}. Estimation is done at annual frequencies in both the model and the data. The sample period is 1965-2008 and excludes firms producing investment goods, financial firms (SIC6000-6799) and utilities (SIC4900-4949).

2.2 Comparative statics

Table A.23: Characteristics and average returns: calibration without learning

	10 MBETA portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	10.46	8.99	7.97	7.11	6.37	5.67	5.03	4.40	3.74	2.83	-7.63
	(7.85)	(5.99)	(4.87)	(4.01)	(3.35)	(2.78)	(2.30)	(1.87)	(1.47)	(1.02)	(-4.42)
	10 I/K portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	7.76	6.71	5.96	5.36	4.84	4.43	4.42	5.01	5.26	3.78	-3.98
	(6.50)	(4.99)	(4.09)	(3.45)	(2.95)	(2.59)	(2.59)	(3.23)	(3.75)	(2.45)	(-7.80)
	10 P/E portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	10.66	9.17	8.09	7.18	6.34	5.61	4.90	4.19	3.45	2.41	-8.25
	(8.11)	(6.15)	(4.95)	(4.06)	(3.33)	(2.75)	(2.23)	(1.77)	(1.34)	(0.82)	(-4.50)
	10 IVOL portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	5.13	6.02	6.49	6.86	7.21	7.51	7.78	8.01	8.10	5.99	0.86
	(2.43)	(3.04)	(3.39)	(3.69)	(3.98)	(4.24)	(4.49)	(4.70)	(4.75)	(3.11)	(1.79)
	10 Q portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	10.37	8.62	7.67	6.97	6.36	5.83	5.36	5.05	4.90	5.16	-5.20
	(6.94)	(5.32)	(4.46)	(3.84)	(3.32)	(2.89)	(2.56)	(2.35)	(2.28)	(2.56)	(-5.59)
	10 Profitability (ROA) portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	3.99	5.51	6.41	6.91	7.18	7.31	7.37	7.32	7.23	7.26	3.27
	(1.52)	(2.53)	(3.23)	(3.68)	(3.94)	(4.07)	(4.14)	(4.15)	(4.14)	(4.36)	(3.07)

Table shows moments of decile portfolios in a calibration of the model without the learning channel.

Table A.24: Characteristics and average returns: Kogan and Papanikolaou (2011) model

10 MBETA portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	7.58	7.48	7.30	7.05	6.84	6.59	6.29	5.89	5.41	4.91	-2.67
	(3.79)	(3.61)	(3.45)	(3.27)	(3.10)	(2.91)	(2.70)	(2.43)	(2.12)	(1.65)	(-2.11)
10 I/K portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	6.77	6.66	6.63	6.65	6.58	6.52	6.57	6.50	6.40	6.17	-0.61
	(3.14)	(3.05)	(3.02)	(3.01)	(2.96)	(2.92)	(2.93)	(2.86)	(2.77)	(2.57)	(-1.04)
10 P/E portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	7.11	7.08	6.91	6.86	6.64	6.46	6.23	5.95	5.67	4.94	-2.17
	(3.51)	(3.39)	(3.24)	(3.13)	(2.97)	(2.82)	(2.65)	(2.45)	(2.22)	(1.79)	(-1.81)
10 IVOL portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	6.62	6.58	6.55	6.54	6.51	6.50	6.51	6.50	6.53	6.53	-0.09
	(2.98)	(2.96)	(2.95)	(2.93)	(2.93)	(2.93)	(2.94)	(2.95)	(2.98)	(3.05)	(-0.13)
10 Q portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	8.11	7.42	7.05	6.71	6.58	6.41	6.07	5.57	4.92	3.96	-4.15
	(3.85)	(3.60)	(3.42)	(3.26)	(3.09)	(2.90)	(2.67)	(2.42)	(2.07)	(1.52)	(-2.90)
10 Profitability (ROA) portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	6.29	6.45	6.53	6.61	6.68	6.66	6.71	6.69	6.56	6.35	0.06
	(2.54)	(2.73)	(2.84)	(2.92)	(2.98)	(3.01)	(3.07)	(3.08)	(3.04)	(2.97)	(0.20)

Table shows characteristics for decile portfolios sorted on the corresponding characteristics using the model in Kogan and Papanikolaou (2011).

Table A.25: Parameters

Parameter	Symbol	Value
Technology		
Growth rate of X-shock	μ_x	0.50%
Volatility of x-shock	σ_x	7.00%
Growth rate of IST shock	μ_Z	0.30%
Volatility of IST shock	σ_Z	4.20%
Mean-reversion parameter of project-specific shock	θ_u	0.03
Volatility of project-specific shock	σ_u	1.25
Production		
Project DRS parameter	α	0.85
Profit margin of investment firms	ϕ	7.5%
Depreciation rate of capital	δ	10%
Learning		
Noise in public signal	σ_e	15%
Investment		
Maximum long-run project arrival rate	$\overline{\lambda}$	25
Minimum long-run project arrival rate	$\underline{\lambda}$	5
Project arrival rate in high-growth state	λ_H	5.100
Transition probability into high-growth state	μ_H	0.050
Transition probability into low-growth state	μ_L	0.250
Stochastic discount factor		
Risk-free rate	r	3%
Price of risk of x-shock	b_x	1.77
Price of risk of IST shock	b_z	-0.57

Table shows the parameters in model calibration. See main text for more details.

2.3 Robustness tests

Table A.26: Portfolio characteristics: decile portfolios, sorted by industry

	10 MBETA portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	6.64	5.06	5.85	5.81	4.99	6.62	5.25	4.90	5.24	3.56	-3.09
	(2.41)	(3.17)	(3.03)	(2.85)	(2.67)	(3.01)	(2.09)	(2.04)	(1.86)	(1.13)	(-1.08)
$\sigma(\%)$	20.29	16.85	16.62	17.31	15.98	18.17	18.07	18.65	21.87	24.59	17.82
β_{MKT}	0.83	0.76	0.85	0.89	0.77	0.92	0.95	0.98	1.13	1.25	0.42
	(6.64)	(7.73)	(13.20)	(15.77)	(9.89)	(10.67)	(29.60)	(28.23)	(18.27)	(16.62)	(3.06)
$\alpha(\%)$	2.50	1.28	1.61	1.33	1.12	2.02	0.48	-0.01	-0.41	-2.68	-5.19
	(1.13)	(0.97)	(1.94)	(1.44)	(0.93)	(1.52)	(0.51)	(-0.01)	(-0.34)	(-1.54)	(-2.06)
$R^2(\%)$	53.99	65.41	84.12	86.75	76.04	83.22	90.30	89.76	86.68	83.53	18.02
β_{IMC}	0.21	0.07	0.19	0.19	0.02	0.29	0.38	0.34	0.64	0.71	0.51
	(0.86)	(0.50)	(1.83)	(1.81)	(0.17)	(2.96)	(3.11)	(2.40)	(5.74)	(5.30)	(2.66)
	10 E/P portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	4.11	3.70	2.96	5.43	5.38	6.67	7.16	7.69	8.43	9.04	4.92
	(1.65)	(1.55)	(1.32)	(2.42)	(2.74)	(2.82)	(3.28)	(4.33)	(3.52)	(3.92)	(2.65)
$\sigma(\%)$	22.19	18.43	16.52	18.07	15.26	17.56	16.28	16.06	20.38	20.34	15.73
β_{MKT}	1.17	0.96	0.83	0.95	0.75	0.88	0.82	0.79	0.93	0.93	-0.24
	(29.18)	(20.88)	(10.54)	(18.34)	(9.90)	(12.86)	(14.18)	(9.26)	(7.66)	(7.97)	(-1.95)
$\alpha(\%)$	-1.73	-1.09	-1.20	0.67	1.61	2.26	3.06	3.73	3.77	4.39	6.12
	(-1.60)	(-1.34)	(-1.10)	(1.11)	(1.65)	(2.28)	(3.61)	(4.35)	(2.21)	(2.57)	(3.01)
$R^2(\%)$	89.77	87.40	82.09	90.07	78.77	81.75	81.96	78.63	67.80	67.70	7.44
β_{IMC}	0.55	0.37	0.14	0.19	0.06	0.09	0.07	0.10	0.03	0.14	-0.41
	(4.25)	(3.15)	(1.41)	(1.60)	(0.73)	(0.74)	(0.64)	(0.79)	(0.15)	(0.78)	(-3.03)
	10 Q portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	10.21	6.94	7.23	4.88	6.27	5.27	4.55	3.74	4.93	2.78	-7.43
	(5.03)	(3.36)	(3.59)	(2.49)	(2.60)	(2.11)	(2.09)	(1.84)	(2.25)	(1.00)	(-3.23)
$\sigma(\%)$	20.41	17.39	18.12	15.87	16.67	17.59	17.93	18.09	18.57	24.49	17.87
β_{MKT}	0.99	0.85	0.93	0.80	0.82	0.90	0.90	0.93	0.89	1.21	0.22
	(10.80)	(9.90)	(15.48)	(17.35)	(15.79)	(15.59)	(15.03)	(13.75)	(11.17)	(12.55)	(1.54)
$\alpha(\%)$	5.27	2.68	2.58	0.87	2.15	0.74	0.06	-0.94	0.50	-3.26	-8.53
	(4.48)	(2.46)	(2.75)	(1.00)	(1.77)	(0.68)	(0.07)	(-1.33)	(0.34)	(-2.18)	(-3.91)
$R^2(\%)$	75.75	77.94	85.33	82.91	79.20	85.74	81.37	86.68	73.99	78.76	4.94
β_{IMC}	0.27	0.24	0.23	0.24	0.25	0.23	0.12	0.37	0.19	0.67	0.40
	(1.72)	(1.91)	(2.15)	(2.05)	(2.04)	(2.18)	(0.95)	(3.22)	(1.65)	(5.61)	(3.14)

Table shows characteristics for decile portfolios using industry breakpoints. We use the 17 industry classification of Fama and French (1997).

Table A.27: Portfolio characteristics: decile portfolios, sorted by industry, continued

	10 I/K portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	7.67	8.25	7.48	6.66	5.11	5.99	5.05	3.63	3.04	2.81	-4.86
	(2.85)	(3.49)	(2.91)	(2.74)	(2.01)	(2.26)	(1.85)	(1.30)	(1.18)	(0.74)	(-1.95)
$\sigma(\%)$	19.76	16.78	18.48	17.38	16.68	17.45	18.70	20.03	17.68	26.40	17.49
β_{MKT}	0.92	0.81	0.92	0.86	0.82	0.90	0.96	0.97	0.90	1.30	0.39
	(8.65)	(11.59)	(11.24)	(10.57)	(10.57)	(17.02)	(16.14)	(12.30)	(11.93)	(11.65)	(2.52)
$\alpha(\%)$	3.09	4.20	2.88	2.34	1.01	1.47	0.24	-1.22	-1.44	-3.70	-6.79
	(2.00)	(3.30)	(2.54)	(2.57)	(0.99)	(1.60)	(0.20)	(-1.02)	(-1.26)	(-1.78)	(-2.72)
$R^2(\%)$	69.60	75.54	80.33	79.82	78.13	86.62	85.48	75.98	83.26	78.80	15.76
β_{IMC}	0.26	0.25	0.35	0.19	0.13	0.48	0.37	0.21	0.45	0.91	0.66
	(1.39)	(1.43)	(1.81)	(1.20)	(0.85)	(4.35)	(2.76)	(1.03)	(3.02)	(4.35)	(4.09)
	10 IVOL portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	4.93	5.12	6.62	5.63	6.12	4.57	5.99	7.27	0.88	2.74	-2.19
	(2.31)	(2.10)	(2.76)	(2.47)	(2.58)	(1.69)	(1.98)	(2.42)	(0.30)	(0.76)	(-0.93)
$\sigma(\%)$	16.18	18.19	17.83	18.95	20.14	20.30	25.07	23.37	24.73	29.18	21.15
β_{MKT}	0.86	0.94	0.94	0.99	1.06	1.03	1.25	1.19	1.17	1.35	0.50
	(18.98)	(12.54)	(19.69)	(14.00)	(20.49)	(16.02)	(13.15)	(19.61)	(10.23)	(11.35)	(3.33)
$\alpha(\%)$	0.64	0.42	1.91	0.67	0.82	-0.60	-0.24	1.32	-4.98	-4.03	-4.67
	(0.77)	(0.38)	(2.91)	(0.78)	(1.03)	(-0.38)	(-0.16)	(0.64)	(-2.57)	(-1.46)	(-1.47)
$R^2(\%)$	91.05	86.51	90.44	88.90	90.00	84.14	80.20	83.88	72.62	69.85	17.90
β_{IMC}	0.21	0.11	0.24	0.22	0.37	0.33	0.42	0.61	0.57	0.68	0.47
	(2.05)	(0.88)	(2.40)	(1.72)	(2.85)	(2.24)	(3.25)	(5.10)	(4.36)	(3.41)	(3.16)

Table shows characteristics for decile portfolios using industry breakpoints. We use the 17 industry classification of Fama and French (1997).

Table A.28: Excess return comovement, within industry sort

	Cross-sections						Eigenvalues
	I/K	P/E	IVOL	MBETA	Q	ALL	$\lambda_1/\sum\lambda_i$
I/K							31.3
(p-value)							(0.00)
P/E	79.1						41.1
(p-value)							(0.00)
IVOL	4.3	4.7					40.5
(p-value)							(0.00)
MBETA	68.0	74.6	3.7				30.5
(p-value)							(0.00)
Q	84.1	79.9	18.3	66.3			30.8
(p-value)							(0.00)
ALL (I/K, PE, IVOL, MBETA, Q)	89.8	67.4	31.6	63.7	76.5		32.3
(p-value)	(0.00)	(0.00)	(0.14)	(0.00)	(0.00)		(0.00)
IMC	57.5	75.2	4.8	63.8	69.6	43.8	
-HML	-63.5	-68.3	-27.4	-63.0	-73.9	-63.7	
Δz^I	11.4	9.3	6.3	35.1	17.7	4.5	

Table shows return comovement across the 5 decile portfolio sorts (I/K, PE, MBETA and IVOL), constructed using industry breakpoints. We extract the first principal component from standardized return residuals from a market model regression. We normalize the sign of the first principal component so that it loads positively on portfolio 10 with the exception of the E/P sort, where it loads negatively on portfolio 10. In addition, we extract the first principal component from a pooled cross-section of 20 portfolios that includes portfolios 1,2, 9 and 10 from each sort. We show the correlation matrix of these principal components, along with their correlations with IMC, HML and the real proxy for the IST shock Δz^I. We compute p-values based on 10,000 bootstraps, where we randomly permute the order of each cross-section separately.

Table A.29: Portfolio characteristics: decile portfolios, exclude small firms

	10 MBETA portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	4.44	5.98	6.41	6.60	5.05	6.23	5.43	4.88	4.52	2.97	-1.47
	(2.19)	(2.91)	(3.39)	(3.79)	(2.56)	(3.07)	(2.21)	(1.83)	(1.35)	(0.75)	(-0.38)
$\sigma(\%)$	16.27	16.39	16.46	15.08	17.17	18.72	19.54	21.00	25.66	31.04	26.99
β_{MKT}	0.68	0.71	0.82	0.73	0.86	0.92	1.01	1.08	1.28	1.47	0.80
	(6.51)	(6.45)	(8.31)	(11.13)	(12.46)	(9.54)	(21.74)	(17.23)	(15.54)	(11.68)	(4.21)
$\alpha(\%)$	1.05	2.44	2.32	2.95	0.75	1.61	0.37	-0.51	-1.90	-4.41	-5.46
	(0.71)	(1.76)	(2.38)	(2.66)	(0.75)	(1.32)	(0.35)	(-0.50)	(-1.23)	(-1.88)	(-1.73)
$R^2(\%)$	56.26	60.53	80.13	75.62	81.18	78.92	87.04	85.70	81.25	73.18	28.27
β_{IMC}	0.03	-0.08	0.12	0.05	0.12	0.16	0.48	0.51	0.80	1.16	1.13
	(0.18)	(-0.76)	(1.20)	(0.49)	(0.91)	(1.13)	(4.13)	(3.53)	(5.28)	(8.23)	(7.44)
	10 E/P portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	2.31	3.49	4.06	5.29	4.92	6.69	8.08	9.28	7.92	10.55	8.24
	(0.89)	(1.49)	(1.95)	(2.46)	(2.64)	(3.14)	(3.83)	(3.88)	(3.28)	(5.08)	(3.63)
$\sigma(\%)$	23.50	19.93	15.55	17.33	16.92	17.16	17.49	19.06	19.50	18.87	19.05
β_{MKT}	1.16	0.97	0.76	0.89	0.83	0.85	0.87	0.88	0.96	0.83	-0.33
	(12.63)	(12.71)	(16.86)	(16.56)	(8.40)	(9.70)	(11.02)	(7.14)	(12.10)	(7.33)	(-1.84)
$\alpha(\%)$	-3.48	-1.38	0.25	0.83	0.74	2.44	3.70	4.89	3.12	6.38	9.86
	(-2.80)	(-1.10)	(0.32)	(0.93)	(0.78)	(2.19)	(4.29)	(3.47)	(2.25)	(3.77)	(4.46)
$R^2(\%)$	78.67	77.14	77.75	85.87	78.99	79.72	81.03	68.70	78.81	63.14	9.45
β_{IMC}	0.79	0.32	0.11	0.24	0.13	0.21	0.15	0.02	0.23	0.08	-0.71
	(5.28)	(2.54)	(1.04)	(2.65)	(1.20)	(1.79)	(1.04)	(0.11)	(1.40)	(0.51)	(-8.37)
	10 Q portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	9.99	8.76	6.54	5.57	4.26	4.32	5.95	5.01	4.61	1.02	-8.97
	(4.87)	(4.81)	(3.40)	(2.67)	(1.76)	(2.14)	(2.19)	(1.87)	(1.78)	(0.39)	(-3.30)
$\sigma(\%)$	18.84	18.43	16.37	17.10	18.80	16.98	18.41	20.87	20.08	25.39	21.30
β_{MKT}	0.88	0.87	0.77	0.83	0.94	0.87	0.94	1.05	0.98	1.16	0.28
	(7.49)	(8.13)	(8.73)	(10.30)	(16.76)	(21.04)	(22.46)	(12.84)	(16.58)	(8.67)	(1.36)
$\alpha(\%)$	5.57	4.38	2.68	1.40	-0.42	-0.03	1.22	-0.24	-0.31	-4.79	-10.37
	(3.67)	(3.42)	(2.82)	(1.33)	(-0.46)	(-0.03)	(1.02)	(-0.19)	(-0.24)	(-2.25)	(-3.56)
$R^2(\%)$	71.24	73.04	72.26	77.04	80.55	85.04	85.27	82.03	77.90	67.93	5.56
β_{IMC}	0.11	0.16	0.09	0.21	0.28	0.21	0.28	0.41	0.31	0.71	0.60
	(0.75)	(1.04)	(0.79)	(1.61)	(2.35)	(1.73)	(2.85)	(3.44)	(2.20)	(5.32)	(4.41)

Table shows characteristics for decile portfolios of firms sorted on market beta (Panel A) profitability (Panel B) or Q (Panel C), excluding the bottom 20% of firms in terms of market capitalization.

Table A.30: Portfolio characteristics: decile portfolios, exclude small firms, continued

	10 I/K portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	5.94	7.74	6.68	7.56	6.84	5.47	4.98	4.40	2.88	3.08	-2.86
	(2.82)	(3.99)	(3.90)	(3.76)	(3.22)	(2.33)	(2.06)	(1.86)	(1.07)	(0.82)	(-1.00)
$\sigma(\%)$	18.70	15.95	15.30	17.08	16.22	18.75	18.63	20.32	23.91	33.23	23.96
β_{MKT}	0.89	0.75	0.76	0.88	0.83	0.96	0.96	1.03	1.20	1.56	0.66
	(9.73)	(11.40)	(11.53)	(14.25)	(14.28)	(13.30)	(27.17)	(14.92)	(13.13)	(9.50)	(3.25)
$\alpha(\%)$	1.47	3.97	2.89	3.14	2.67	0.67	0.16	-0.76	-3.14	-4.71	-6.18
	(1.02)	(3.30)	(4.33)	(4.28)	(2.53)	(0.70)	(0.17)	(-0.75)	(-2.41)	(-1.76)	(-2.25)
$R^2(\%)$	74.00	72.35	79.28	86.78	85.88	84.67	86.88	83.46	82.38	71.15	24.82
β_{IMC}	0.13	0.05	0.15	0.17	0.19	0.33	0.34	0.37	0.71	1.13	1.00
	(0.86)	(0.50)	(1.05)	(1.67)	(2.02)	(2.84)	(3.16)	(3.29)	(4.85)	(6.95)	(8.60)
β_{IMC}	0.62	0.39	0.34	0.22	0.46	0.31	0.33	0.17	0.06	0.37	-0.25
	(3.43)	(1.84)	(1.97)	(1.20)	(3.35)	(2.16)	(2.08)	(1.18)	(0.37)	(2.32)	(-1.47)
	10 IVOL portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	5.34	5.36	5.34	7.93	5.49	7.07	4.22	3.08	3.32	-2.03	-7.38
	(2.58)	(2.31)	(2.86)	(3.19)	(2.15)	(2.34)	(1.31)	(0.84)	(0.80)	(-0.40)	(-1.39)
$\sigma(\%)$	15.32	17.23	16.93	20.33	22.03	27.70	25.88	29.87	36.23	37.00	31.43
β_{MKT}	0.76	0.91	0.88	1.05	1.12	1.38	1.23	1.44	1.63	1.63	0.87
	(11.97)	(31.95)	(18.70)	(20.49)	(15.58)	(13.25)	(12.37)	(11.20)	(9.11)	(10.30)	(4.36)
$\alpha(\%)$	1.52	0.80	0.92	2.66	-0.14	0.16	-1.96	-4.11	-4.83	-10.19	-11.71
	(1.37)	(1.01)	(1.23)	(3.92)	(-0.13)	(0.09)	(-0.87)	(-1.62)	(-1.44)	(-2.38)	(-2.26)
$R^2(\%)$	80.63	90.59	88.31	87.02	84.51	80.72	73.88	75.07	65.57	62.97	24.66
β_{IMC}	0.08	0.22	0.24	0.51	0.44	0.84	0.83	0.96	1.35	1.32	1.24
	(0.89)	(1.87)	(2.45)	(4.08)	(2.60)	(5.94)	(6.12)	(5.65)	(9.03)	(8.50)	(7.89)

Table shows characteristics for decile portfolios, excluding the bottom 20% of firms in terms of market capitalization every year.

Table A.31: Excess return comovement, excluding small firms

	Cross-sections						Eigenvalues
	I/K	P/E	IVOL	MBETA	Q	ALL	$\lambda_1/\sum\lambda_i$
I/K							35.5
(p-value)							(0.00)
P/E	85.4						41.7
(p-value)							(0.00)
IVOL	48.6	30.5					48.9
(p-value)							(0.00)
MBETA	80.3	74.5	57.4				43.8
(p-value)							(0.00)
Q	76.2	77.8	40.0	65.8			30.8
(p-value)							(0.00)
ALL (I/K, E/P, IVOL, MBETA, Q)	92.1	84.6	53.6	88.1	76.9		39.0
(p-value)	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)		(0.00)
IMC	61.5	59.5	55.8	68.3	-69.6	64.8	
-HML	-74.4	-70.7	-30.5	-71.1	-73.9	-83.2	
Δz^I	27.2	28.0	15.0	42.3	-17.7	29.6	

Table shows return comovement across the 5 decile portfolio sorts (I/K, E/P, MBETA and IVOL), excluding the bottom 20% of firms in terms of market capitalization. We extract the first principal component from standardized return residuals from a market model regression. We normalize the sign of the first principal component so that it loads positively on portfolio 10 with the exception of the E/P sort, where it loads negatively on portfolio 10. In addition, we extract the first principal component from a pooled cross-section of 20 portfolios that includes portfolios 1,2, 9 and 10 from each sort. We show the correlation matrix of these principal components, along with their correlations with IMC, HML and the real proxy for the IST shock Δz^I. We compute p-values based on 10,000 bootstraps, where we randomly permute the order of each cross-section separately.

Table A.32: Portfolio characteristics: decile portfolios, exclude services firms

10 MBETA portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	6.53	7.47	5.82	5.84	4.94	6.39	5.42	4.38	3.79	3.47	-3.06
	(2.35)	(3.58)	(2.50)	(3.23)	(2.36)	(3.12)	(2.20)	(1.57)	(1.14)	(0.81)	(-0.65)
$\sigma(\%)$	20.37	16.10	17.97	16.02	17.75	17.32	19.68	21.41	25.57	32.61	26.81
β_{MKT}	0.81	0.67	0.84	0.80	0.88	0.84	1.00	1.11	1.24	1.50	0.69
	(4.89)	(6.49)	(7.69)	(15.47)	(12.38)	(9.67)	(16.80)	(17.97)	(12.14)	(11.25)	(3.49)
$\alpha(\%)$	2.47	4.13	1.63	1.83	0.52	2.20	0.41	-1.16	-2.42	-4.02	-6.49
	(0.92)	(2.93)	(1.05)	(1.62)	(0.56)	(2.01)	(0.39)	(-1.00)	(-1.51)	(-1.50)	(-1.76)
$R^2(\%)$	51.47	55.55	70.49	81.27	80.25	75.77	84.32	86.85	76.61	68.49	21.31
β_{IMC}	0.26	0.01	0.14	0.21	0.15	0.19	0.41	0.63	0.88	1.26	1.00
	(1.25)	(0.11)	(1.35)	(2.17)	(0.95)	(1.52)	(2.70)	(5.17)	(5.61)	(8.22)	(4.80)
10 E/P portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	3.41	2.26	3.18	5.16	5.78	6.35	8.11	6.71	8.93	10.46	7.05
	(1.03)	(0.85)	(1.89)	(2.26)	(2.91)	(2.75)	(3.98)	(2.95)	(3.42)	(4.39)	(2.16)
$\sigma(\%)$	27.18	21.26	16.56	18.22	16.83	17.88	17.95	18.23	19.23	19.68	24.16
β_{MKT}	1.24	1.06	0.82	0.92	0.84	0.90	0.90	0.91	0.90	0.78	-0.46
	(8.83)	(12.01)	(11.89)	(9.99)	(12.08)	(13.27)	(10.83)	(9.91)	(9.64)	(5.20)	(-2.09)
$\alpha(\%)$	-2.77	-3.03	-0.91	0.54	1.58	1.87	3.61	2.15	4.40	6.58	9.35
	(-1.33)	(-2.80)	(-1.03)	(0.49)	(1.68)	(1.48)	(3.89)	(1.88)	(3.14)	(3.06)	(3.07)
$R^2(\%)$	67.05	80.51	79.01	83.23	80.75	81.31	81.18	81.07	71.76	50.39	11.76
β_{IMC}	0.96	0.62	0.32	0.22	0.17	0.25	0.28	0.18	0.20	0.00	-0.96
	(3.88)	(4.23)	(2.52)	(1.69)	(1.38)	(2.17)	(2.18)	(1.67)	(1.22)	(0.03)	(-6.62)
10 Q portfolios											
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R)-r_f(\%)$	10.49	9.59	7.22	6.47	4.11	6.28	5.25	4.83	4.68	0.66	-9.83
	(4.55)	(4.71)	(3.98)	(2.89)	(1.89)	(2.48)	(2.13)	(1.75)	(1.76)	(0.25)	(-4.01)
$\sigma(\%)$	19.57	20.85	16.22	18.65	17.69	19.76	17.09	21.36	20.22	24.98	19.17
β_{MKT}	0.90	1.03	0.76	0.90	0.90	1.01	0.86	1.07	0.96	1.15	0.24
	(8.57)	(10.19)	(8.73)	(11.01)	(17.18)	(15.60)	(19.65)	(15.02)	(14.22)	(8.95)	(1.44)
$\alpha(\%)$	5.96	4.44	3.42	1.95	-0.41	1.23	0.95	-0.50	-0.13	-5.09	-11.05
	(3.59)	(3.12)	(3.34)	(1.62)	(-0.51)	(0.94)	(0.93)	(-0.42)	(-0.09)	(-2.38)	(-4.19)
$R^2(\%)$	69.23	79.19	71.06	76.06	84.48	84.70	81.82	80.76	73.44	68.58	5.29
β_{IMC}	0.29	0.35	0.20	0.38	0.33	0.26	0.25	0.46	0.32	0.75	0.47
	(2.01)	(2.60)	(1.52)	(2.24)	(3.13)	(1.81)	(2.35)	(3.63)	(1.99)	(5.66)	(4.22)

Table shows characteristics for decile portfolios, excluding investment firms and services (Fama and French (1997) classifications 14-17).

Table A.33: Portfolio characteristics: decile portfolios, exclude services firms, continued

	10 I/K portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	7.26	7.10	7.68	7.71	6.15	4.78	6.25	4.48	2.66	2.46	-4.80
	(3.09)	(3.15)	(4.31)	(3.97)	(2.97)	(2.11)	(2.28)	(1.99)	(1.05)	(0.61)	(-1.59)
$\sigma(\%)$	21.35	18.00	15.94	16.98	16.75	16.88	20.44	20.36	22.74	34.34	21.74
β_{MKT}	1.01	0.87	0.79	0.85	0.86	0.87	0.98	1.04	1.11	1.61	0.60
	(12.24)	(10.19)	(11.69)	(11.66)	(13.52)	(16.12)	(12.61)	(14.11)	(15.03)	(8.69)	(3.70)
$\alpha(\%)$	2.20	2.75	3.75	3.47	1.83	0.43	1.33	-0.72	-2.90	-5.60	-7.79
	(1.31)	(1.94)	(4.79)	(4.88)	(2.29)	(0.56)	(0.82)	(-0.69)	(-3.10)	(-1.92)	(-2.58)
$R^2(\%)$	72.80	76.03	78.83	80.56	86.32	86.06	75.04	84.68	77.35	71.29	24.60
β_{IMC}	0.52	0.28	0.20	0.14	0.22	0.32	0.25	0.48	0.74	1.31	0.79
	(4.88)	(1.87)	(1.52)	(0.95)	(2.03)	(2.81)	(1.67)	(4.41)	(6.06)	(8.50)	(6.64)
	10 IVOL portfolios										
	Lo	2	3	4	5	6	7	8	9	Hi	Hi-Lo
$E(R) - r_f(\%)$	5.64	5.38	8.10	6.07	5.67	5.81	1.87	3.01	0.69	-0.78	-6.42
	(2.71)	(2.57)	(3.46)	(2.14)	(1.80)	(1.76)	(0.48)	(0.67)	(0.13)	(-0.13)	(-1.03)
$\sigma(\%)$	15.67	17.15	19.22	22.52	27.84	27.06	30.82	37.09	40.98	44.23	38.92
β_{MKT}	0.81	0.91	0.98	1.16	1.34	1.30	1.43	1.70	1.68	1.76	0.94
	(16.94)	(32.51)	(21.45)	(17.08)	(11.89)	(10.19)	(10.46)	(8.65)	(9.02)	(7.37)	(3.47)
$\alpha(\%)$	1.57	0.83	3.18	0.27	-1.01	-0.70	-5.29	-5.48	-7.72	-9.57	-11.14
	(1.84)	(1.04)	(3.89)	(0.21)	(-0.50)	(-0.32)	(-1.76)	(-1.59)	(-1.71)	(-1.80)	(-1.84)
$R^2(\%)$	87.46	91.43	84.89	86.00	74.63	74.90	70.02	67.81	54.64	51.21	19.06
β_{IMC}	0.14	0.31	0.51	0.53	0.95	0.94	1.12	1.33	1.65	1.64	1.50
	(1.42)	(3.40)	(3.99)	(3.02)	(6.84)	(6.59)	(6.29)	(8.18)	(7.93)	(8.48)	(7.46)

Table shows characteristics for decile portfolios, excluding investment firms and services (Fama and French (1997) classifications 14-17).

Table A.34: Excess return comovement, excluding services

	Cross-sections						Eigenvalues
	I/K	E/P	IVOL	MBETA	Q	ALL	$\lambda_1 / \sum \lambda_i$
I/K							33.7
(p-value)							(0.00)
-E/P	65.0						31.3
(p-value)							(0.00)
IVOL	52.8	46.9					54.2
(p-value)							(0.00)
MBETA	61.1	59.9	57.3				36.4
(p-value)							(0.00)
Q	77.2	56.7	46.3	56.1			30.8
(p-value)							(0.00)
ALL (I/K, E/P, IVOL, MBETA, Q)	76.0	72.9	80.7	81.8	71.3		29.0
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
IMC	52.9	59.3	61.2	59.8	69.6	71.9	
-HML	60.3	55.1	33.3	66.7	73.9	69.9	
Δz^I	17.9	31.8	20.6	41.2	17.7	29.4	

Table shows return comovement across the 5 decile portfolio sorts (Q, I/K, E/P, MBETA and IVOL), excluding investment firms and services (Fama and French (1997) classifications 14-17).. We extract the first principal component from standardized return residuals from a market model regression. We normalize the sign of the first principal component so that it loads positively on portfolio 10 with the exception of the E/P sort, where it loads negatively on portfolio 10. In addition, we extract the first principal component from a pooled cross-section of 20 portfolios that includes portfolios 1, 2, 9 and 10 from each sort. We show the correlation matrix of these principal components, along with their correlations with IMC, HML and the real proxy for the IST shock Δz^I. We compute p-values based on 10,000 random permutations, where we randomly permute the order of each cross-section separately.

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