Essays in financial economics

Golec, P.M.

Publication date
2019

Document Version
Other version

License
Other

Link to publication

Citation for published version (APA):
Golec, P. M. (2019). *Essays in financial economics*. Tinbergen Institute.

Appendix A

Appendix to chapter 1

A.1 Model

A.1.1 Dynamic problem

Under full information about μ, the dynamic problem is as follows:

$$
\begin{aligned}
V(K, z, \mu, t) &= \max_I [C(K, a, t, I) + \mathbb{E}\beta V(K', z', \mu', t+1)] \\
\text{where } C(K, a, t, I) &= e^{z+\mu} K_t^\alpha - I - f_Y(t)\Phi(I, K) \\
f_Y(t) &= 1 - \frac{b_Y}{1+t} \\
s.t. \quad K' &= (1-\delta)K + I \\
z_{t+1} &= \rho_z z_t + \varepsilon_{t+1}, \text{ where } \varepsilon_{t+1} \sim N(0, f_z(t)\sigma_z^2) \\
f_z(t) &= 1 + \frac{b_z}{1+t} \\
\mu' &= \mu
\end{aligned}
$$

Taking into account that the firm is learning about μ, the dynamic problem is as follows:

$$
\begin{aligned}
V(K, \widehat{z}, \widehat{\mu}, t) &= \max_{i_t} [C(K, a, t, I) + \mathbb{E}\beta V(K', \widehat{z}', \widehat{\mu}', t+1)] \\
\text{where } C(K, a, t, I) &= e^a K_t^\alpha - I - f_Y(t)\Phi(I, K) \\
a &= \widehat{\mu} + \widehat{z} \\
f_Y(t) &= 1 - \frac{b_Y}{1+t} \\
s.t. \quad K' &= (1-\delta)K + I \\
\widehat{z}' &= \rho_z \widehat{z} - \frac{m_z/f(t)}{P^{-1} + m_z/f(t)} v_a'(t) - \frac{m_l}{P^{-1} + m_z/f(t) + m_l} v_l'(t) + (1-\rho_z) v_a'(t) \\
\widehat{\mu}' &= \widehat{\mu} + \frac{m_z/f(t)}{P^{-1} + m_z/f(t) + m_l} v_a'(t) + \frac{m_l}{P^{-1} + m_z/f(t) + m_l} v_l'(t) \\
P' &= \frac{1}{P^{-1} + m_z/f(t) + m_l}
\end{aligned}
$$

where $v'_a(t) = \frac{a' - \rho_z a}{1-\rho_z}$ is the forecast error of a, and $v'_l(t)$ is the forecast error of the private signal l. The joint distribution of $v'_a(t)$ and $v'_l(t)$ is

$$\begin{pmatrix} v'_a(t) \\ v'_l(t) \end{pmatrix} \sim \mathcal{N}\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} P(t) + \frac{f_z(t)}{m_z} & P(t) \\ P(t) & P(t) + \frac{1}{m_l} \end{pmatrix}\right]$$

where $m_z = \frac{1-\rho_z^2}{\sigma_z^2}$ and $m_l = \frac{1}{\sigma_l^2}$. Uncertainty P is essentially pinned down by the firms age t.

A.1.2 Choice of initial capital

To choose it's initial capital stock, the firm solves the following problem:

$$\max_{K_0} V(K_0, a_0, \widehat{\mu}_0, t = 0) - (1 + r + C_0)K_0,$$

where $r = (1 - \beta)/\beta$ is the rental rate of capital.

A.1.3 Numerical solution

I discretize the state space as follows. The lower bound for the capital stock is set to

$$\left(\frac{\alpha e^x}{\frac{1-\beta}{\beta}(1 + \gamma\delta) + \delta}\right)^{\frac{1}{1-\alpha}} \quad \text{where} \begin{cases} x = 1.5\sqrt{m_z^{-1}} + 2\sigma_\mu & \text{for upper bound} \\ x = -1.5\sqrt{m_z^{-1}} - 2\sigma_\mu & \text{for lower bound} \end{cases}$$

I use 200 log-spaced nodes for K. The bounds for $\widehat{z}$ are $[-3\sigma_{z,\text{init}}, 3\sigma_{z,\text{init}}]$ where $\sigma_{z,\text{init}}$ is the standard deviation of z_0. I use 16 equally-spaced nodes for $\widehat{z}$. The bounds for $\widehat{\mu}$ are $[-3\sigma_\mu, 3\sigma_\mu]$. I use $max(2, \sigma_\mu * 12)$ number of nodes for $\widehat{\mu}$, depending on the value of σ_μ. The bounds for t are $[0, 21]$ and are log-spaced. I use 4 nodes for t, plus I add another node for $t = 200$ to do the normalization of C_0, described in section A.2.1. I chose the bounds for each variable such that at least 99% of the simulated values are inbetween. To choose the number of nodes I started at a low number and then increased them until the moments from the simulated data did not change anymore at the 1% level. I interpolate linearly between nodes. This procedure ensures that the model is solved accurately but still as fast as possible.

To solve the linear initial capital choice problem I simply check which for which K the slope of the value function $V(a_0, \widehat{\mu}_0, t = 0)$ is closest to the cost of capital $1 + r + C_0$.

A.2 SMM procedure

A.2.1 Normalisation of initial cost of capital

I estimate a version of the model where C_0 is normalised to facilitate the identification of the parameters and the subsequent comparative statics. In the model, firms have incentives to start with a high capital stock to smooth future adjustment costs in case they learn they are productive over time or get a positive transitory productivity shock. The initial deadweight cost of capital C_0 thus not only affects how much a firm will grow towards its efficient scale, but also how much on average it will grow due to due to other sources. To isolate GTES from the other sources, I assume that firms choose their initial capital stock believing that $t = \infty$, i.e., shock volatility and adjustment costs are that of a mature firm and that its current belief about μ is correct, i.e., $P = 0$. This aallows me to shut down GTES when performing comparative statics by setting $C_0 = 0$, without affecting the other mechanisms. Essentially, if investment declines when $C_0 = 0$ in the model, then it must come from a mechanism other than GTES. Note that this is just a normalisation that facilitates the interpretation. Estimating the model this way will provide exactly the same fit to the data.

A.2.2 Global optimization routine

The SMM estimation proceeds as follows. First, I generate simulated data using the numerical solution to the model. Specifically, I take a random draw from the distribution of (μ, v_a, v_l) and then compute simulated time series for 10'000 firms. To be clear, each firm draws from the same distribution, but not the same value of μ. Since I truncated the the empirical data by including only firm-year observations where years since IPO is 20 or less, I do exactly the same with the simulated sample. For consistency I also winsorize all ratios at the 1% level, as I did for the data. The variables in the model map into the the data as described in Table A.31. Then I calculate the moments for the simulated sample and calculate a loss function together with the weight matrix. I use a differential evolution optimizer to sweep over different parameter values and minimize the distance between the empirical and simulated moments, implemented in the Julia Package BlackBoxOptim.jl (Feldt, 2018). This algorithm is specialized to find global minima when the objective function is not differentiable. Importantly, I feed the same draw of shocks in the simulator for each set of parameter values that the algorithm tries.

A.2.3 Weight matrix and standard errors

In the estimation I am using more moments than parameters, so the question of how to construct the weight matrix. I use influence functions to calculate the optimal weight matrix, which has been shown to yield good finite sample performance (Bazdresch et al., 2017). I calculate clustered standard errors for the moments and parameter estimates using usual GMM formulas, see section A.4 in Warusawitharana and Whited (2015) for more details.

A.3 Additional tables

Table A.31: Mapping the model to the data

	data	model
time	years since IPO	t
capital stock	ppegt	K
investment	capx /ppegt	I/K
sales	sale	AK^{α}
sales-to-capital ratio	sale /ppegt	AK^{α}/K
scaled operating income	oibdp/ppegt	$(AK^{\alpha} - f_Y\Phi(I,K))/K$
Q	(mkteq + dltt + dlc) / ppegt	V/K

This table is the bridge between the variables in the model and in Compustat data. Note that in the main text I use two different measures for profitability, scaled operating income and the sales-to-capital ratio. I use scaled operating income for the level of profitability, and the sales-to-capital ratio for the dyanamics of profitability.

Table A.32: Investment regressions

	capxK	
	(1)	(2)
logK		-0.020**
logK2		-0.002**
logsaleK		0.105***
logsaleK2		0.017***
oibdpK		-0.008***
oibdpK2		0.007***
AgeIPOFE	Yes	Yes
FirmFE		Yes
N	57,351	56,526
R^2	0.133	0.559
Within-R^2	0.000	0.250

Calculations are based on a sample of nonfinancial firms from the annual COMPUSTAT database. The sample period is from 1960 to 2018. The construction of variables is described in Table A.31. *AgeIPOFE* are number-of-years-since-IPO fixed effects. Standard errors are clustered at the firm level.

Table A.33: Empirical Policy Function (EPF)

	Δinvest
	(1)
ΔlogsaleK x $\text{year}_{0,1}$	0.223***
	(0.024)
ΔlogsaleK x $\text{year}_{2,3}$	0.090***
	(0.019)
ΔlogsaleK x $\text{year}_{4,6}$	0.074***
	(0.016)
ΔlogsaleK x $\text{year}_{7,11}$	0.010
	(0.018)
ΔlogsaleK	0.090***
	(0.012)
ΔlogK x $\text{year}_{0,1}$	-0.175***
	(0.033)
ΔlogK x $\text{year}_{2,3}$	-0.120***
	(0.023)
ΔlogK x $\text{year}_{4,6}$	-0.061**
	(0.020)
ΔlogK x $\text{year}_{7,11}$	-0.048*
	(0.022)
ΔlogK	-0.118***
	(0.015)
AgeIPOFE	Yes
N	49,452
R^2	0.316

This table shows the estimates of the empirical policy function regression used for the SMM estimation. The Standard errors are clustered at the firm level. The construction of variables is described in Table A.31. A variable starting with Δ means first difference of that variable. $\text{year}_{i,j}$ is a dummy for all i to j years since IPO. *AgeIPOFE* are number-of-years-since-IPO fixed effects. Standard errors are clustered at the firm level.

Table A.34: Fitted moments

	Empirical	Simulated	t-statistic
average investment years 10 to 20	0.128	0.127	0.379
average profitability years 10 to 20	0.296	0.319	-1.079
volatility of profitability years 10 to 20	0.132	0.146	-1.686
volatility of profitability years 0 to 5	0.216	0.214	0.278
autocorrelation of profitability	0.604	0.587	1.877
sens. of invest. to prof. at years 0 + 1	0.313	0.283	1.459
sens. of invest. to prof. at years 2 + 3	0.180	0.183	-0.220
sens. of invest. to prof. at years 4 to 6	0.165	0.131	2.956
sens. of invest. to prof. at years 7 to 11	0.100	0.128	-2.223
sens. of invest. to prof. at years 12 to 20	0.090	0.122	-2.722
decline in investment	0.358	0.357	0.118
decline in conditional investment	0.193	0.204	-1.541
decline in profitability	0.597	0.604	-0.271
decline in log Q	1.094	1.132	-1.421
decl. in cond. Q from years 0 + 1 on	0.428	0.467	-1.740
decl. in cond. Q from years 2 + 3 on	0.173	0.262	-4.376
decl. in cond. Q from years 4 to 6 on	0.083	0.117	-1.839
decl. in cond. Q from years 7 to 11 on	0.047	0.064	-1.165

Calculations are based on a sample of nonfinancial firms from the annual COMPUSTAT database. The sample period is from 1960 to 2018. The Figure reports the simulated and actual moments and the clustered t-statistics for the differences between the corresponding moments.

Table A.35: Jacobian matrix

	δ	C_0	σ_z	ρ_z	α	γ	σ_μ	σ_l	μ_{z0}	b_z	b_γ
average investment years 10 to 20	0.970	0.010	0.010	0.020	-0.030	0.000	-0.100	-0.000	-0.030	0.000	-0.010
average profitability years 10 to 20	1.580	0.010	-0.400	-0.440	-0.760	-0.000	0.340	-0.010	-0.010	-0.030	-0.010
volatility of profitability years 10 to 20	0.020	-0.000	0.880	-0.070	-0.000	-0.000	-0.010	-0.000	-0.000	0.010	0.000
volatility of profitability years 0 to 5	0.090	-0.030	1.300	-0.210	-0.000	0.000	-0.130	0.000	0.020	0.050	0.010
autocorrelation of profitability	-0.120	-0.040	0.140	0.910	0.140	0.020	-0.120	-0.010	0.020	0.050	-0.010
sens. of invest. to prof. at years 0 + 1	1.060	0.080	-0.430	0.220	0.290	-0.060	0.910	0.020	-0.050	-0.040	0.440
sens. of invest. to prof. at years 2 + 3	0.590	0.050	-0.120	0.350	0.100	-0.040	-0.090	0.050	-0.010	-0.020	0.210
sens. of invest. to prof. at years 4 to 6	0.360	0.020	-0.040	0.340	0.040	-0.030	-0.030	0.010	-0.030	-0.010	0.010
sens. of invest. to prof. at years 7 to 11	0.360	0.010	-0.060	0.350	0.070	-0.030	0.040	-0.010	-0.030	-0.010	0.020
sens. of invest. to prof. at years 12 to 20	0.340	0.000	-0.030	0.350	0.100	-0.020	0.050	-0.010	-0.030	-0.010	0.010
decline in investment	0.130	0.730	0.520	-0.350	0.430	-0.070	-2.710	-0.010	-0.050	-0.000	0.590
decline in conditional investment	0.490	0.220	0.500	-0.410	0.440	-0.020	-1.140	-0.050	0.110	0.010	0.530
decline in profitability	-0.810	0.640	0.460	-0.040	-0.360	-0.020	-4.720	0.060	0.710	0.050	0.000
decline in log Q	-1.270	1.310	1.900	1.290	1.510	-0.060	-1.610	-0.610	-0.360	0.240	0.030
decl. in cond. Q from years 0 + 1 on	0.660	-0.130	0.570	-0.150	1.390	0.000	4.150	-0.430	-0.090	0.070	0.040
decl. in cond. Q from years 2 + 3 on	0.310	-0.040	0.340	0.250	0.850	-0.000	1.150	-0.080	-0.090	0.050	-0.010
decl. in cond. Q from years 4 to 6 on	0.130	-0.020	0.190	0.330	0.430	-0.000	-0.480	0.200	-0.060	0.030	-0.010
decl. in cond. Q from years 7 to 11 on	0.030	0.000	0.090	0.160	0.240	-0.000	-0.370	0.140	-0.040	0.010	-0.000

This Table contains the derivatives of the moments with respect to the estimated parameters at the SMM estimates. Table 1.2 contains these estimates and describes the parameters.

Table A.36: Counterfactuals

	C_0	lrn	b_Y	b_z	μ_{z0}	(i)	(ii)	(iii)	(iv)	(v)	(vi)
1	N	N	N	N	N	-0.037	0.006	0.001	0.020	-7.331e-04	-0.003
2	Y	N	N	N	N	0.519	0.008	0.473	0.022	0.024	0.302
3	N	Y	N	N	N	0.110	0.139	0.435	0.406	0.032	0.018
4	Y	Y	N	N	N	0.682	0.225	0.958	0.515	0.059	0.322
5	N	N	Y	N	N	-0.041	-0.010	0.005	0.028	0.107	-0.005
6	Y	N	Y	N	N	0.583	0.146	0.489	0.028	0.129	0.308
7	N	Y	Y	N	N	0.116	0.172	0.444	0.418	0.141	0.018
8	Y	Y	Y	N	N	0.772	0.386	0.984	0.534	0.185	0.332
9	N	N	N	Y	N	0.090	0.140	0.232	0.156	-0.002	-0.009
10	Y	N	N	Y	N	0.580	0.161	0.646	0.182	0.017	0.245
11	N	Y	N	Y	N	0.249	0.303	0.681	0.585	0.022	-0.011
12	Y	Y	N	Y	N	0.756	0.338	1.135	0.638	0.046	0.246
13	N	N	Y	Y	N	0.085	0.150	0.241	0.169	0.096	-0.012
14	Y	N	Y	Y	N	0.631	0.303	0.663	0.196	0.115	0.245
15	N	Y	Y	Y	N	0.247	0.366	0.683	0.600	0.120	-0.017
16	Y	Y	Y	Y	N	0.831	0.502	1.141	0.663	0.158	0.243
17	N	N	N	N	Y	-0.258	-0.010	-0.137	0.013	0.002	0.214
18	Y	N	N	N	Y	0.263	0.008	0.299	0.015	0.025	0.513
19	N	Y	N	N	Y	-0.115	0.071	0.230	0.313	0.030	0.237
20	Y	Y	N	N	Y	0.426	0.145	0.722	0.422	0.058	0.535
21	N	N	Y	N	Y	-0.287	-0.006	-0.138	0.022	0.107	0.208
22	Y	N	Y	N	Y	0.309	0.148	0.308	0.018	0.140	0.515
23	N	Y	Y	N	Y	-0.130	0.130	0.233	0.323	0.142	0.232
24	Y	Y	Y	N	Y	0.490	0.319	0.735	0.437	0.191	0.538
25	N	N	N	Y	Y	-0.072	0.120	0.152	0.147	-0.002	0.222
26	Y	N	N	Y	Y	0.393	0.167	0.541	0.172	0.019	0.472
27	N	Y	N	Y	Y	0.064	0.262	0.544	0.551	0.018	0.221
28	Y	Y	N	Y	Y	0.543	0.307	0.970	0.603	0.042	0.471
29	N	N	Y	Y	Y	-0.097	0.136	0.157	0.161	0.088	0.218
30	Y	N	Y	Y	Y	0.429	0.314	0.555	0.185	0.114	0.470
31	N	Y	Y	Y	Y	0.048	0.345	0.541	0.563	0.109	0.214
32	Y	Y	Y	Y	Y	0.601	0.489	0.973	0.626	0.155	0.468

Each row in this Table represents one counterfactual exercise. Row 32 coincides with the baseline estimates. (i) and (ii) calculate the integral of the investement and conditional investment curves, respectively. (iii) and (iv) calculate the decline in log Q and conditonal log Q, (v) the decline in the sensitivity of investment to profitability and (vi) the decline in profitability. For example, from row 2 it is apparent that if one simulates the model when only GTES is activated, then Q at year 0 higher than at year 20 by 0.473.

Table A.37: Time since IPO vs. founding

	capxK					
	(1)	(2)	(3)	(4)	(5)	(6)
logK				0.003	0.004	0.008*
logK2				0.000	-0.001	-0.000
logsaleK				0.028***	0.034***	0.034***
logsaleK2				0.008***	0.009***	0.007***
oibdpK				0.012***	0.013***	0.014***
oibdpK2				0.008***	0.008***	0.007***
AgeIPOFE	Yes		Yes	Yes		Yes
AgeFoundFE		Yes	Yes		Yes	Yes
N	19,960	19,960	19,960	19,960	19,960	19,960
R^2	0.197	0.111	0.212	0.312	0.263	0.325
Within-R^2	0.000	0.000	0.000	0.143	0.171	0.144

These regressions are based on a subsample of firms with available founding dates from Jay Ritters website. I only include firms that went public within 25 years of founding, which are the only firms for which conditional investment declines in the first place. The construction of variables is described in Table A.31. Variables ending with "2" are squared terms of that variable. *AgeIPOFE* are number-of-years-since-IPO fixed effects and *AgeFoundFE* are number-of-years-since-founding fixed effects. Standard errors are clustered at the firm level.

Table A.38: Robustness of identification - parameter estimates.

	Baseline	$C_0 = 0$	$C_0 = 0$, $\alpha = 0.506$	$\sigma_{l,0} = 0$	$\sigma_{l,0} = 0$, $\alpha = 0.506$	$b_\gamma = 0$	$b_z = 0$	$\mu_{z0} = 0$
δ	0.138	0.152	0.133	0.146	0.130	0.138	0.133	0.123
C_0	0.296	0.000	0.000	0.649	0.431	0.273	0.503	0.364
σ_z	0.337	0.332	0.339	0.337	0.301	0.274	0.412	0.389
ρ_z	0.800	0.742	0.795	0.755	0.766	0.723	0.840	0.840
α	0.506	0.783	0.506	0.880	0.506	0.537	0.681	0.427
γ	3.267	4.127	9.404	4.898	2.563	1.590	5.172	4.746
σ_μ	0.460	0.405	0.857	0.560	0.560	0.541	0.292	0.417
σ_l	0.224	0.604	1.876			0.501	0.037	0.001
μ_{z0}	0.400	0.534	0.385	0.518	0.253	0.489	0.453	0.000
b_z	1.702	1.853	1.686	1.681	2.836	3.500	0.000	0.468
b_γ	0.740	0.685	0.938	0.706	0.555	0.000	0.744	0.826

This Table contains the parameter estimates for SMM estimations under different parameter restrictions. The descriptions of the parameters are in Table 1.2. The first column is the baseline estimation, $C_0 = 0$ means no growing towards the efficient scale, $\sigma_{l,0} = 0$ means there is no learning, $b_\gamma = 0$ means no rigidity, $b_z = 0$ means no decreasing volatility and $\mu_{z0} = 0$ means no abnormal initial productivity.

Table A.39: Robustness of identification - moments

	Baseline	$C_0 = 0$	$C_0 = 0$, $\alpha = 0.506$	$\sigma_{l,0} = 0$	$\sigma_{l,0} = 0$, $\alpha = 0.506$	$b_\gamma = 0$	$b_z = 0$	$\mu_{z0} = 0$	
average investment years 10 to 20	0.128	0.127	0.123	0.119	0.125	0.126	0.122	0.129	0.129
average profitability years 10 to 20	0.296	0.319	0.185		0.169		0.292	0.243	0.400
volatility of profitability years 10 to 20	0.132	0.146	0.145	0.146	0.145	0.129	0.115	0.179	0.170
volatility of profitability years 0 to 5	0.216	0.214	0.227	0.223	0.224	0.235	0.236	0.184	0.196
autocorrelation of profitability	0.604	0.587	0.590	0.613	0.611	0.579	0.545	0.602	0.584
sens. of invest. to prof. at years 0 + 1	0.313	0.283	0.275	0.399	0.283	0.216	0.249	0.301	0.284
sens. of invest. to prof. at years 2 + 3	0.180	0.183	0.176	0.228	0.185	0.168	0.176	0.198	0.188
sens. of invest. to prof. at years 4 to 6	0.165	0.131	0.119	0.087	0.114	0.138	0.166	0.128	0.117
sens. of invest. to prof. at years 7 to 11	0.100	0.128	0.109	0.075	0.106	0.133	0.160	0.119	0.112
sens. of invest. to prof. at years 12 to 20	0.090	0.122	0.100	0.063	0.095	0.126	0.155	0.111	0.104
decline in investment	0.358	0.357	0.355	0.346	0.364	0.341	0.350	0.355	0.349
decline in conditional investment	0.193	0.204	0.202	0.231	0.214	0.159	0.157	0.199	0.201
decline in profitability	0.597	0.604	0.617	0.528	0.605	0.603	0.730	0.627	0.403
decline in log Q	1.094	1.132	1.117	1.050	1.080	0.997	1.273	1.110	1.068
decl. in cond. Q from years 0 + 1 on	0.428	0.467	0.542	0.582	0.486	0.198	0.534	0.410	0.356
decl. in cond. Q from years 2 + 3 on	0.173	0.262	0.369	0.382	0.299	0.125	0.336	0.201	0.167
decl. in cond. Q from years 4 to 6 on	0.083	0.117	0.234	0.251	0.170	0.067	0.192	0.060	0.033
decl. in cond. Q from years 7 to 11 on	0.047	0.064	0.143	0.165	0.088	0.023	0.115	0.032	0.014

This Table contains the fitted moments for SMM estimations under different parameter restrictions. The descriptions of the parameters are in Table 1.2. The first column is the baseline estimation, $C_0 = 0$ means no growing towards the efficient scale, $\sigma_{l,0} = 0$ means there is no learning, $b_\gamma = 0$ means no rigidity, $b_z = 0$ means no decreasing volatility and $\mu_{z0} = 0$ means no abnormal initial productivity.

Table A.310: Robustness of α - parameter estimates

α	baseline	0.4	0.5	0.6	0.7	0.8
δ	0.138	0.134	0.137	0.139	0.141	0.149
C_0	0.296	0.350	0.326	0.384	0.394	0.297
σ_z	0.337	0.345	0.339	0.351	0.355	0.347
ρ_z	0.800	0.811	0.794	0.785	0.799	0.753
α	0.506	0.400	0.500	0.600	0.700	0.800
γ	3.267	3.385	3.337	3.552	4.088	3.607
σ_μ	0.460	0.488	0.459	0.348	0.293	0.293
σ_l	0.224	0.137	0.224	0.080	0.106	0.291
μ_{z0}	0.400	0.332	0.409	0.437	0.470	0.528
b_z	1.702	1.648	1.716	1.352	1.072	1.418
b_γ	0.740	0.737	0.721	0.724	0.731	0.631

This Table contains the parameter estimates for SMM estimations under different restrictions of the returns to scale parameter α. The descriptions of the parameters are in Table 1.2. The first column is the baseline estimation, and the following corresponds to the value I set α to.

Table A.311: Robustness of α - percentage contribution to conditional investment

α	baseline	0.4	0.5	0.6	0.7	0.8
GTES + rigidity	31	40	32	35	34	12
learning + rigidity	37	29	37	35	38	58
volatility + rigidity	32	31	31	30	28	30
Age 0 to 4: GTES + rigidity	48	57	48	52	53	25
Age 0 to 4: learning + rigidity	31	24	31	32	32	55
Age 0 to 4: volatility + rigidity	21	19	21	16	15	20

This Table contains the percentage contribution of the relevant mechanisms to the conditional investment for SMM estimations under different restrictions of the returns to scale parameter α. The bottom three rows contain the percentage contribution for ages 0 to 4.

A.4 Additional figures

Figure A.41: Observations across fiscal year.

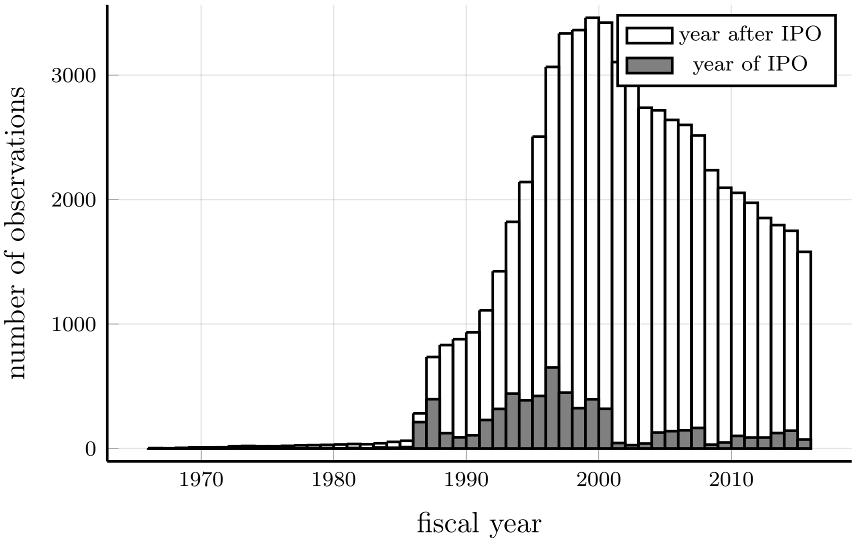
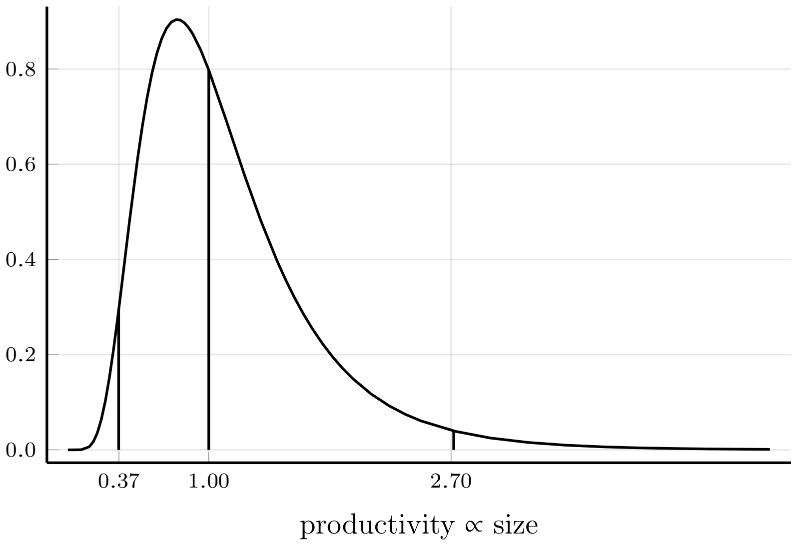
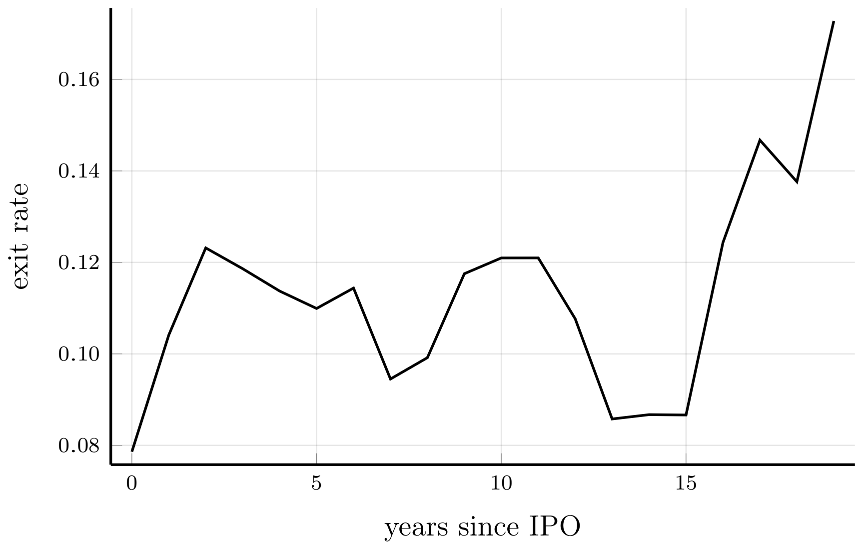


Figure A.42: How skewness produces positive average net investment.



The curve plots the distribution of productivity. The three vertical lines mark the mean (1.00) and two standard deviations below (0.37) and above (2.70) the mean. Starting at the same point of the productivity distribution, a firm that receives a positive productivity shock will grow more than a firm with a negative productivity shrinks. On average, this implies a positive net investment rate.

Figure A.43: Exit rates depending on time since IPO.



A firm is defined as exiting the sample if Compustat contains no observation the following year and the year is not 2018, which is when my sample stops. The Figure plots the conditional exit rate, i.e., the exit rate is calculated as the number of exiting firms divided by all firm-year observations available for that year since IPO.