Aggregate Implications of Corporate Lending by Nonfinancial Firms

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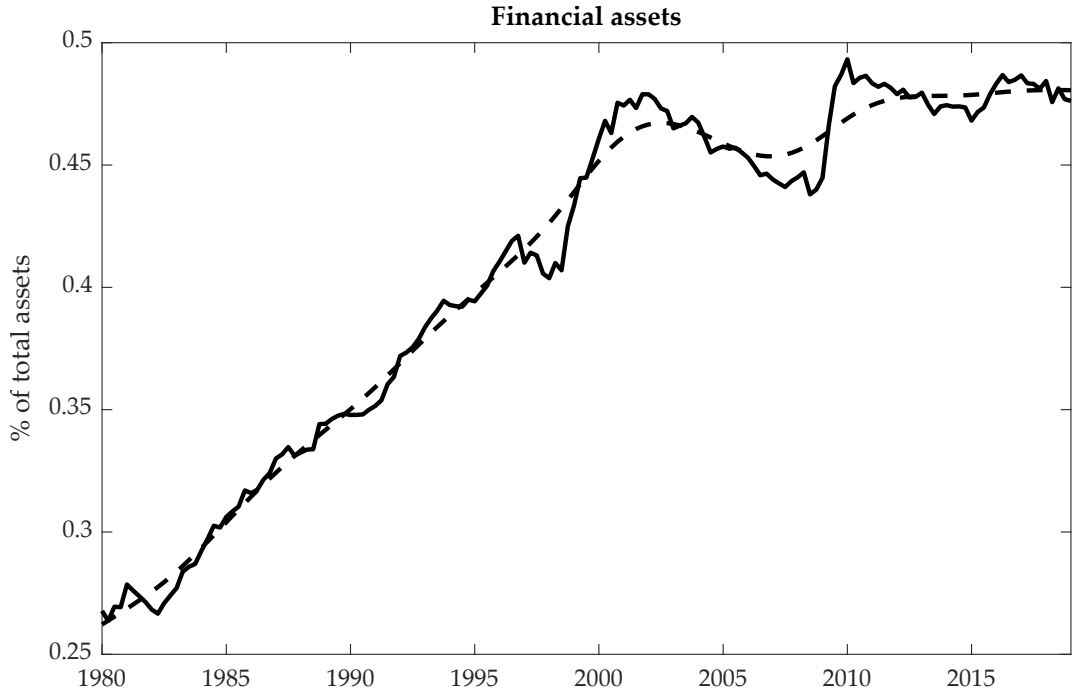
ESEM, August 2023

Nonfinancial firms savings portfolio

"When you buy a share of Apple stock, you do not simply buy into a $1 trillion technology company. You also buy a share of one of the world's largest investment companies: Braeburn Capital, a wholly owned subsidiary of Apple. Braeburn manages a $244 billion financial portfolio — 70% of Apple's total book assets."

Wall Street Journal on August 23, 2018 "Apple is a Hedge Fund That Makes Phones"

Nonfinancial firms financial assets



- Financial assets as a % of total assets almost doubled in 40-years
- Large heterogeneity in terms of riskiness

How does the portfolio composition affects:

1. Firms' investment decisions?
2. Aggregate dynamics?

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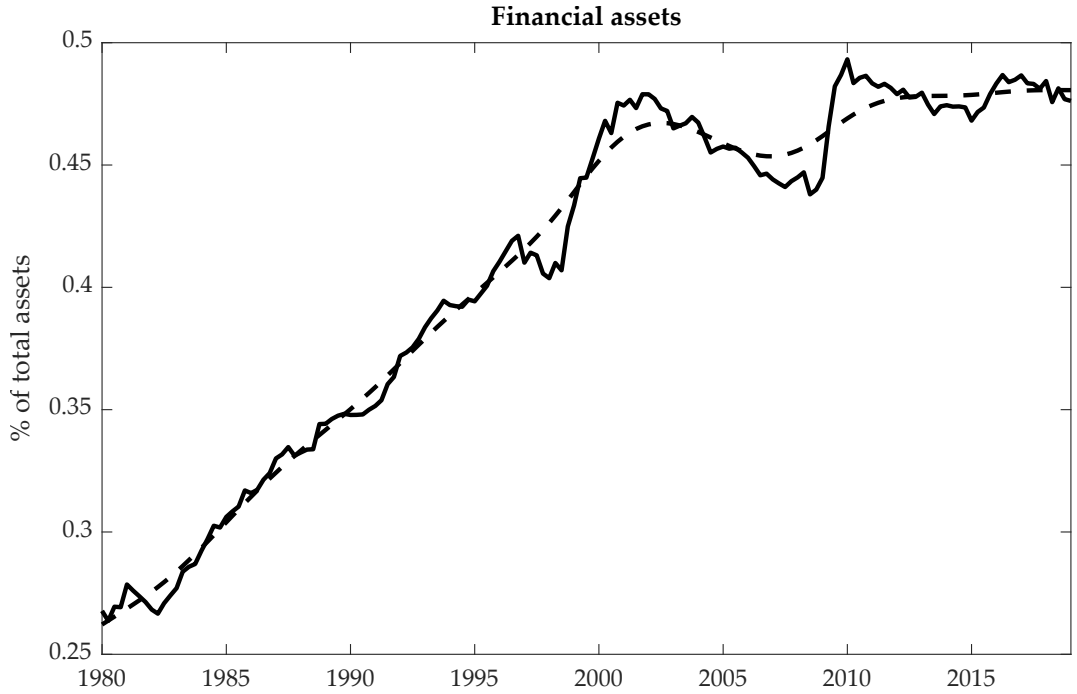

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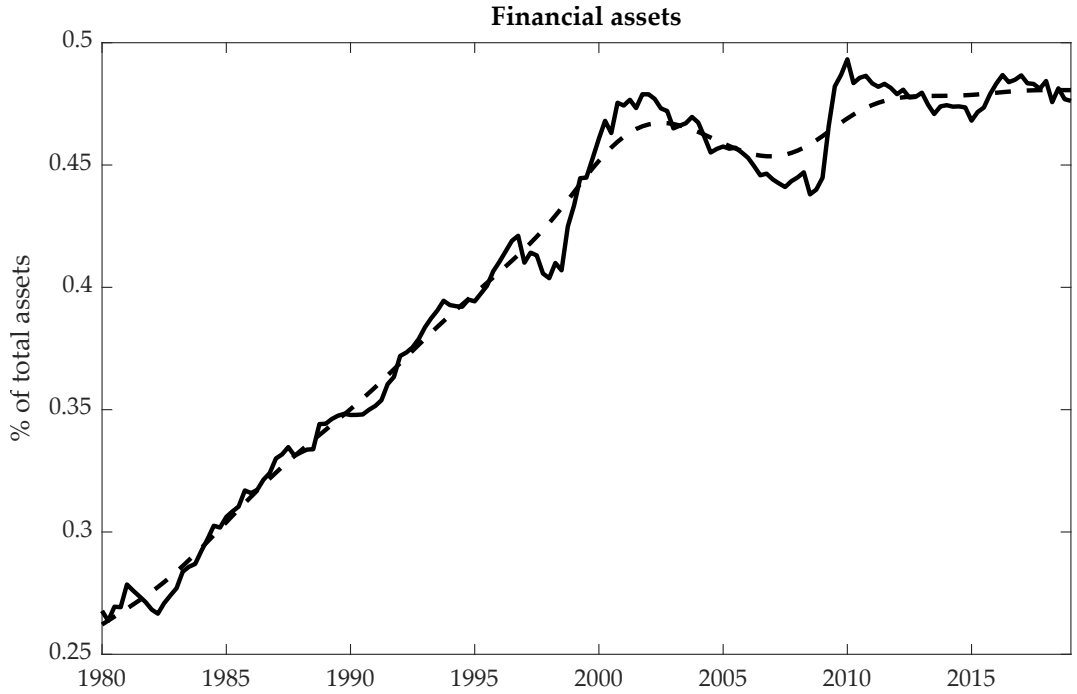

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- **Empirical**
  - I use existing and collected data on portfolio composition by nonfinancial firms
  - Characterize the heterogeneity in the portfolio composition across firms
  - Establish if the portfolio composition affects firms' investment decisions
- **Model**
  - Heterogeneous firms using capital to produce
  - Portfolio of financial assets
    - Risk-free asset
    - Risky asset: Corporate bonds
  - Identify micro mechanisms and quantify macro outcomes

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What I find

- **Empirical** - Three stylized facts
  - Share of risky asset holdings increasing over the last 30 years
  - Large heterogeneity in the portfolio composition across firms
  - Investment drop during Great Recession twice as large for firms with high share of risky savings
- **Model**
  - Two important determinants of portfolio composition:
    1. Size
    2. Link between production and financial side of the firms
  - Decrease in interest rate fully explains increase in risky asset holdings over last 30 years
  - Portfolio composition amplifies the aggregate investment decrease by **50%** in response to large productivity shock

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Related Literature

- **Firm dynamics and propagation of shocks:** Hopenhayn (1992), Khan and Thomas (2008), Jermann and Quadrini(2012), Khan and Thomas (2013), Clementi and Palazzo (2016), Carvalho and Grassi (2019)

  $\Rightarrow$ Novel channel via the propagation from borrowers to nonfinancial lending firms

- **Firms' balance sheet compositon:** Crouzet (2017); Buera and Karmakar (2018); Lanteri (2018); Jeenas (2018); Xiao (2018); Melcangi (2018); Ottonello and Winberry (2018); Salomao and Begenau (2018)

  $\Rightarrow$ Implications of portfolio composition on firms decisions and aggregate outcomes

- **Firms' savings composition:** Almeida et al. (2004); Bates et al. (2009); Riddick and Whited (2009); Nikolov and Whited (2014); Bigio (2015); Cardella et al. (2015); Lyandres and Palazzo (2016); Begenau and Palazzo (2017); Chen et al. (2017); Cunha and Pollet (2017); Duchin et al. (2017); Darmouni and Mota (2020)

  $\Rightarrow$ Idiosyncratic and aggregate determinants of the composition of savings across the firm distribution

Roadmap

1. Stylized Facts
2. Model
3. Calibration
4. Results and mechanism
5. Conclusion

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Empirical results - 3 stylized facts

1. Share of risky assets increasing over the last 30 years
   - Risky securities: Non-money-like assets (Corporate bonds, equity, etc)
   - Share of risky assets grew from 26% to above 40% in 30-years

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Empirical results - 3 stylized facts

2. Share of risky assets increasing on firm size
   - Micro data on U.S. publicly listed firms during the 2000-2018 period
   - Proxy for risky assets - Long-term financial investments
   - Larger firms hold on average a riskier portfolio Stylized fact 2
   - Robustness: QFR data, which is representative of the universe of U.S. firms Robustness

3. Firms with a riskier portfolio dropped investment by more during Great Recession
   - Investment of firms with high vs low share of risky asset holdings during great recession
   - Firms in control group dropped investment on average 9.7%
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Roadmap

1. Stylized Facts
2. Model
3. Calibration
4. Results and mechanism
5. Conclusion

Model overview

- Heterogeneous firms business-cycle model Firm's problem
  - Firms invest in productive capital k, subject to convex adjustment costs and capital irreversibility Production
  - Firms save in Financial side
    - Risk-free assets a^{rf} at a guaranteed rate r^{rf}
    - Corporate bonds a^{r} at uncertain rate
  - Firms borrow b at a given interest rate r^{b} Liabilities
    - If a firm fails to pay back its debt b, it will default and leave the market
  - Idiosyncratic ϵ and aggregate z productivity shocks
  - Continuum of potential entrants, draw productivity signal and enter if value of entering larger than cost of entry Entrants

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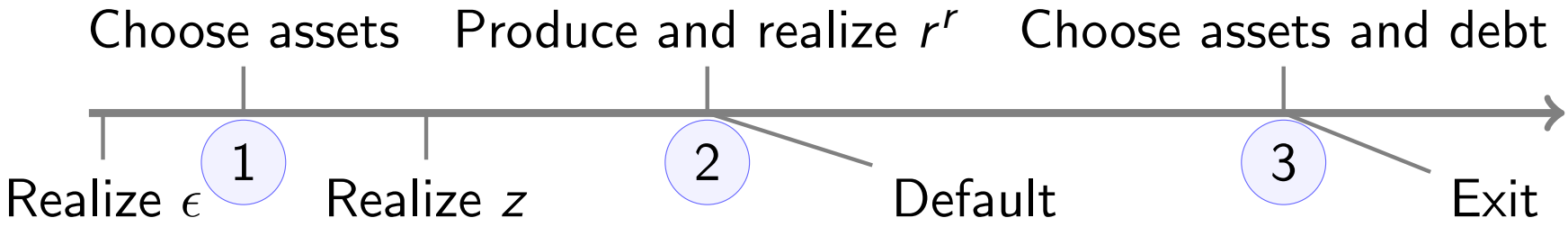

1. Intra-period stage: After observing ϵ, firms can adjust assets
2. Production stage: After observing z and r^r, firms either produce or default
3. Inter-period stage: Conditional on surviving exit shock, firm adjust debt and assets

Variables with a hat are intra-period decisions, whereas the non-hat variables are inter-period

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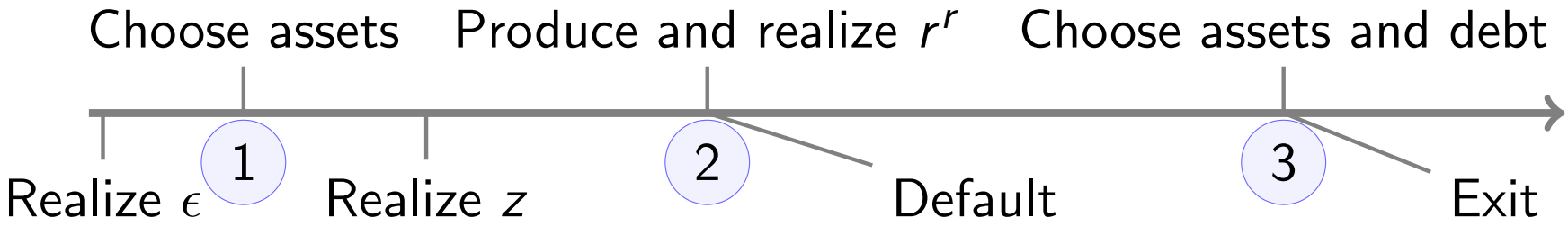

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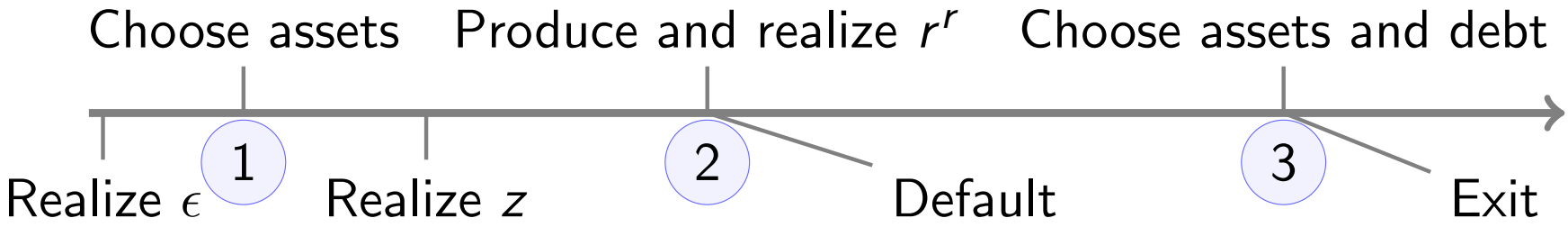

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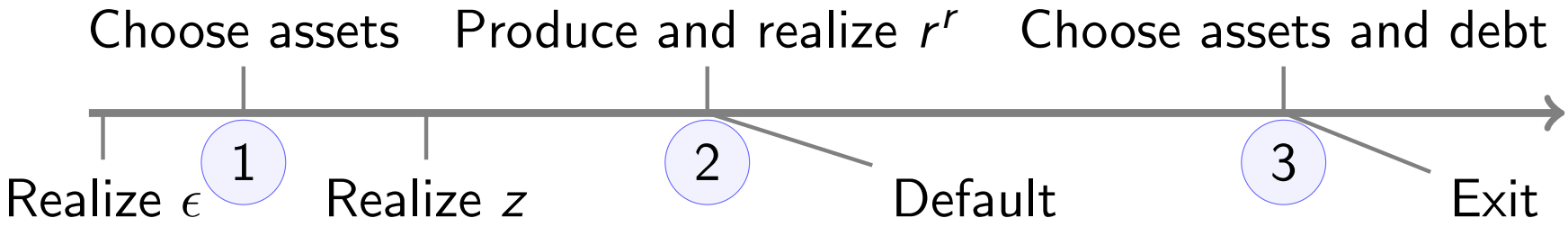

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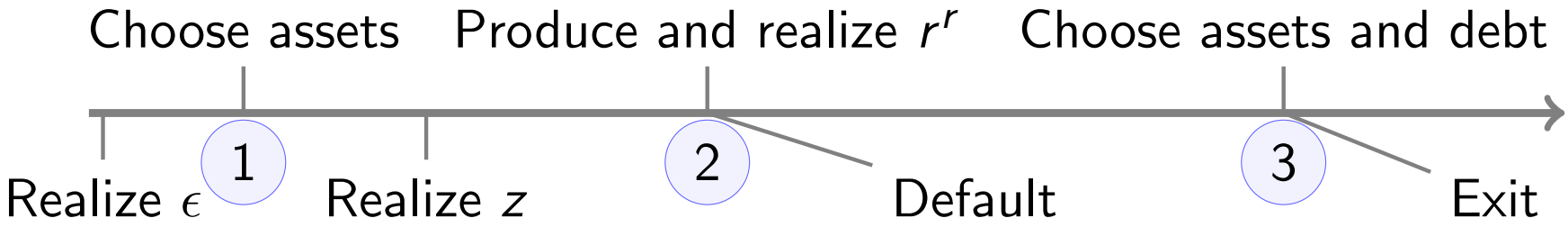

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Calibration Strategy - Simulated Method of Moments

- Two objectives
  1. Discipline portfolio composition across firms
  2. Discipline return on risky assets
- 6 free parameters: C_f, F_e, ω, ρ_z, σ_z, σ_ϵ
- 6 moments to match:
  - Average share of risky savings
  - Standard deviation of share risky savings
  - Mean share risky $k \geq Q3_k$/mean share risky $k \leq Q1_k$
  - Default rate
  - Share of debt in firms age=1
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Calibration Fit

Moment	Source	Data	Model
Average share of risky savings	Flow of Funds	0.2918	0.2925
Standard deviation of share risky savings	Compustat	0.3504	0.4096
Mean share risky $k \geq Q3_k$/mean share risky $k \leq Q1_k$	Compustat	4.3758	4.7373
Default rate	LBD	0.0824	0.0819
Share of debt in firms age=1	Compustat	0.1097	0.0682
Entrants average leverage	Compustat	0.2160	0.2207

Table: Calibration fit

End Parameters Exo Parameters Regressions Fit

Roadmap

1. Stylized Facts
2. Model
3. Calibration
4. Results and mechanism
5. Conclusion

Results

1. Two main determinants of portfolio composition Result 1
   - Link between production and financial sides
   - Firm size
2. Increase in risky savings fully explained by drop in risk-free interest rate - Lower cost of debt shifts firm size distribution to the right Result 2
   - Direct impact: Large firms hold more risky assets - explains 13.2%
   - Indirect impact: Share defaulted debt $\downarrow \rightarrow$ Risky asset excess returns $\uparrow$ - explains 86.8%
3. Portfolio of savings affects firms' investment and generates large non-linearities at the macro level Result 3
   - Minimizes the impact of small shocks
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- Two determinants of the nonfinancial firms savings portfolio
  - Size
  - Real production frictions
- Nonfinancial firms risky asset holdings have been increasing since early 1990s
  - Real interest rate decrease fully accounts for this increase
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- Aggregate data from U.S. flow of funds between 1980 and 2019
- Financial assets:
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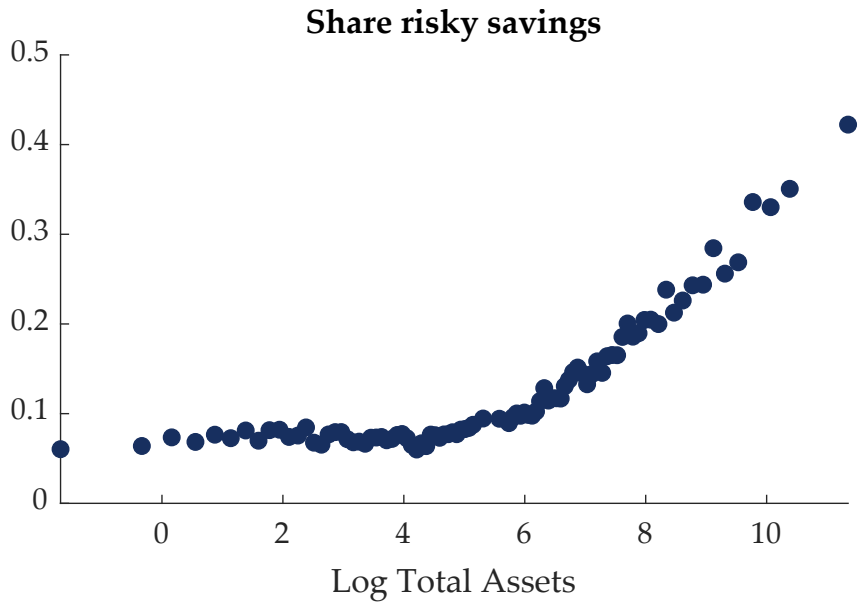

- Share of risky savings increasing in the size of the firm

Savings distribution Back

Stylized fact 3 - Impact on investment

- Dif and dif method to assess effect of portfolio composition on investment during the Great Recession
- Crisis dummy equal to one from 2008 to 2010
- Risky asset dummy, if share of risky assets above 70% in the period before the stock market crash Non parametric
- Coefficient of interest is the interaction between the two dummies

$$ln(Inv)_{ijt} = \gamma crisis_t + \alpha risky_{ij2008Q2} + \beta crisis_t \times risky_{ij2008Q2} + \lambda_i + \theta_{jt} + \epsilon_{ijt}$$

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1. Size: U.S. publicly listed firms not representative of universe of firms
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Assets histogram

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Static Model: Intra period firm's problem

Firm chooses k, a^{rf} and a^{r} to maximize expected profits, given z, b and e_0

$$\max_{k,a_r,a_{rf}} E_{z_2,r_r}\left[\Pi|(e,b,z_1)\right] = \int_{\underline{z}_2}\int_{\underline{r}_r}\Big[z_1 z_2 k^{\alpha} + (1+r^{rf})a^{r} f + (1+r^{r})a^{r} - (1+r^{b})b\Big] dF(z_2)dF(r^{r}) + \int^{\underline{z}_2}\int^{\underline{r}^{r}} -DdF(z_2)dF(r^{r})$$

$$\text{s.t.: } k + a^{r} + a^{rf} = e + b$$

back

Static Model: Beginning of period firm's problem

Firm chooses b to maximize expect profits, given e_0 and optimal policies $k^*(b,z)$, $a^{rf^*}(b,z)$ and $a^{r^*}(b,z)$

$$\max_b E_{z_1,z_2,r^r}[\Pi|e] = \int_{z_1}\int_{\underline{z}_2}\Big[z_1 z_2 k^\alpha + (1+r^{rf})a^{rf} + (1+r^r)a^r - (1+r^b)b\Big]dF(z_2)dF(z_1) + \int^{z_1}\int^{\underline{z}_2} -DdF(z_2)dF(z_1)$$

back

Potential Entrants

- Continuum of potential entrants
- Potential entrants draw a signal for their productivity tomorrow ϵ_0
- Firms will decide to enter if value larger than entry cost

$$V_e(\epsilon_0, k_0, 0, S) = \max(0, V^1(\epsilon_0, k_0, 0, S) - f_e)$$

- Among feasible set of firms, a subset is randomly chosen to keep number of firms constant (Arellano et al. 2018)

back

Default regions

Firm defaults if

$$z < \underline{z} = \frac{C_f + b - (1 + r^{rf})\hat{a^{rf}} - (1 + r^r)\hat{a}_f^r - p_k^-(1-\delta)\hat{k}}{\epsilon k^\alpha}$$

$$r^r < \underline{r}^r = \frac{C_f + b - (1 + r^{rf})\hat{a^{rf}} - p_k^-(1-\delta)\hat{k} - y(z)}{\hat{l}_f} - 1$$

back

Real Frictions

- Convex adjustment costs

$$g(k', k) = \frac{p_k}{2}\left(\frac{k' - (1-\delta)k}{k}\right)^2 k$$

- Partial irreversibility

$$0 < p_k^- < p_k^+$$

- Firms distribute dividends if unconstrained

$$D = \kappa y^{\kappa_y} k^{\kappa_k}$$

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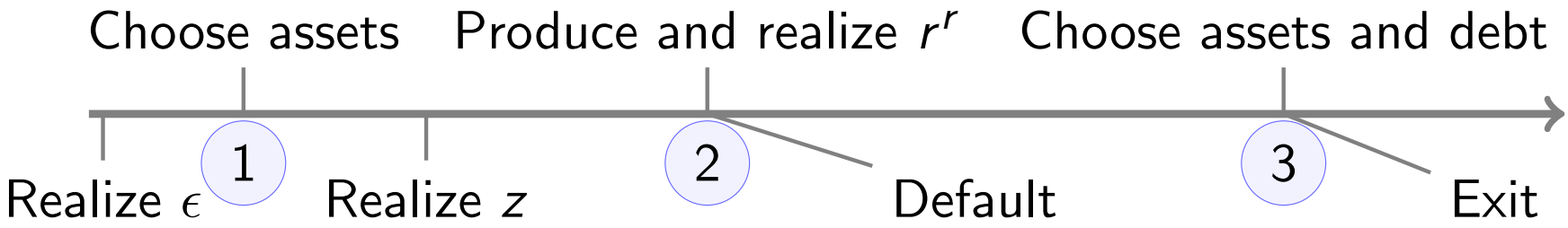
Within period timing



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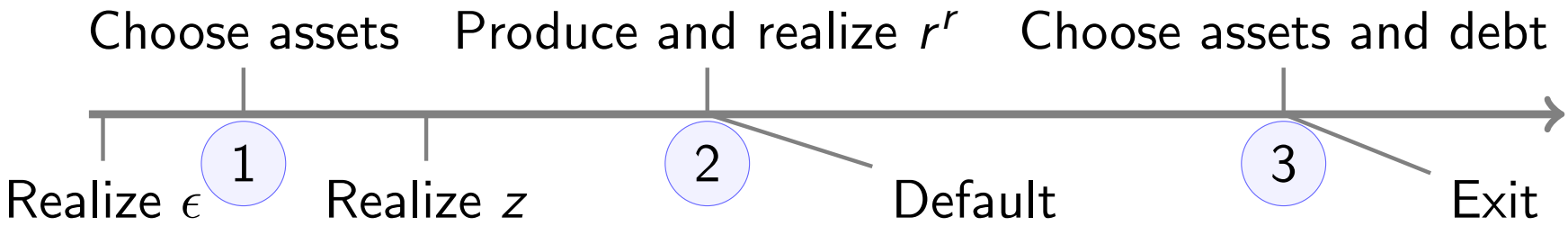

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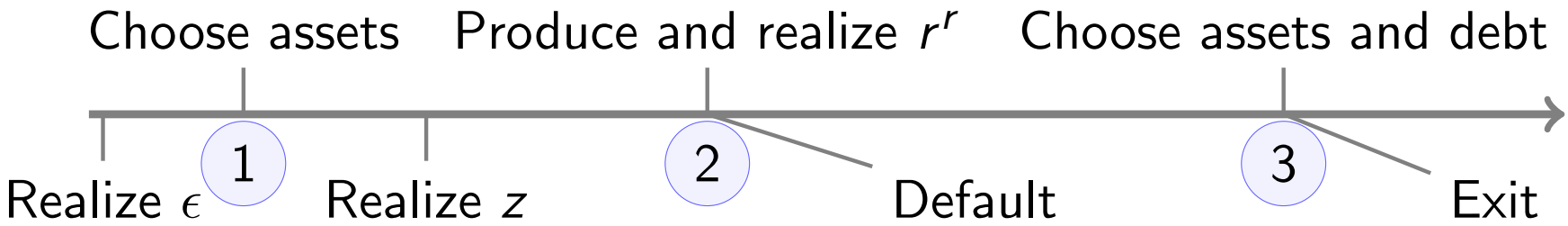

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Liabilities side

- Firms issue one period bonds at a given interest rate $r^b = r^{rf} + \omega$
- If a firm fails to pay back its debt b, it will default and leave the market
- Default happens if either productivity or the return on risky assets fall below a given threshold $\underline{z}$ and $\underline{r}^r$ Default

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Production side

- Firms use issued debt b and beginning of period cash x to invest in capital k to produce according to

$$y = z\epsilon k^{\alpha}$$

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Real frictions

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  - Systemic risk: Default rate in each period determines the return
  - Defaults losses: In case of default, lender only recovers

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$$\min(\underbrace{\chi}_{\text{Recovery rate}} \quad \underbrace{(x' + p_k^-(1-\delta)k')}_{\text{Liquidation value of the firm}} , b)$$

Back

Financial side

- Firms can save in
  1. A risk free security a^{rf} that provides a guaranteed return r^{rf}
  2. A corporate bond a^{r}, that provides an uncertain return r^{r}
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  - Not idiosyncratic risk: Well diversified portfolio
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Back

Financial side

- The return on bonds is given by

$$1 + r^r = \frac{(1 + r^b)\text{Non-defaulted debt} + \text{Defaulted debt recovered}}{\text{Total debt}}$$

- Given the state of the economy today, firms form expectations on the return according to

$$S' = \Gamma^{S'}(S)$$

$$E(r^{r'}) = \Lambda(S')$$

Recursive Competitive Equilibrium Algorithm Return on bonds

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Recursive Competitive Equilibrium | Algorithm | Return on bonds

Back

Firm's problem

At the end of period, given $\epsilon, \hat{k}, \hat{x}$ and S firms choose $k', b', a^{rf'}, a^{r'}$ and D

$$V^1(\epsilon, \hat{k}, \hat{x}, S) = \max_{k', b', a^{rf'}, a^{r'}, D} D + \beta E[\underbrace{\hat{V}^0(\epsilon', k', x', b', S)}_{\text{Intraperiod value function}}]$$

In the middle of the period firms are allowed to readjust assets

$$\hat{V}^0(\epsilon', k', x', b', S) = \max_{\hat{k}', \hat{a^{rf'}}, \hat{a^{r'}}} \left[\int_{\underline{r}^{r'}} \int_{\underline{z}'} V^0(\epsilon', \hat{k}', \hat{x}', S') dF(z') dF(S') \right]$$

Where V^0 is given by

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Subject to adjustment costs, price of capital, aggregate law of motion, expected return on risk asset and the budget constraint Budget constraint

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Back

Recursive Competitive Equilibrium

i. Firm value and policy functions solve its optimization problem
ii. Financier value and policy functions solve the financier problem
iii. Debt price satisfies equation

$$q^r = q^{rf} - \omega$$

and return on debt satisfies equation

$$1 + r^r = (1 + r^b)\frac{\int_{nd} b_{nd} d\mu}{\int b d\mu} + \frac{\int_d \min(b_d, \chi((\hat{x}_d + p_k^- \hat{k}_d)))d\mu}{\int b d\mu}$$

iv. The measure of firms evolves according to

$$\mu' = \eta \int (1 - 1_{default}(z, k, x, S))\phi d[z \times k \times x] + \mu_e$$

back

Algorithm

I. Start by guessing specification coefficients and initialize the forecast rules

$$\begin{bmatrix} \log B^{f'} \\ \log K' \\ r_r \end{bmatrix} = A + B \begin{bmatrix} \log B^{f} \\ \log K \end{bmatrix} + C \log(z) \tag{1}$$

II. Solve both the incumbent and potential entrant problems for different $E(r^r)$ using the Howard's improvement step and multivariate splines.

III. Simulate the economy for T=2000.

IV. Check if the guess for specification (1) coefficients converged. If not, update and go back to ii.

back

Return on bonds

The return on bonds is given by

$$1 + r^r = (1 + r^b) \underbrace{\frac{\int b d\mu_{nd}}{\int b d\mu}}_{\text{Share of non-defaulted debt}} + \underbrace{\frac{\int \min(b, \chi((x + p_k^- k)))d\mu_{de}}{\int b d\mu}}_{\text{Defaulted debt recovered}}$$

back

Budget constraint

At the end of period, firm has the following amount of cash

$$\hat{x} = y - C_f - b + (1 + r^{rf})\hat{a^{rf}} + (1 + r^{r})\hat{a^{r}}$$

Subject to adjustment costs, price of capital, aggregate law of motion, expected return on risk asset and the following budget constraint

$$x' = \hat{x} + b' - D - g(k', \hat{k}) \geq 0$$

In the middle of the period, the firm is subject to the following budget constraint

$$\hat{a^{r'}} + \hat{a^{rf'}} + g(\hat{k'}, k') \leq x'$$

Back

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Back

Parameters

Parameter	Value	Description
C_f	8.006	Fixed cost of production
f_e	2.414	Entry cost
ω	0.01	Risk premium
σ_ϵ	0.15	Volatility of idiosyncratic shock
σ_z	0.074	Volatility of aggregate shock
ρ_z	0.949	Persistence of aggregate shock

Table: Endogenous Parameters

back

Parameters

Parameter	Value	Description	Source
Preferences			
β	0.96	Household discount factor	Literature
Production			
α	0.66	Return on capital	Literature
p_k^-	0.57	Price of sold capital	Bloom (2009)
δ	0.06	Depreciation rate	Literature
k_0	0.171	Entrants share of incumbents average capital	Compustat
η	0.065	Exogenous probability of exit	LBD
Financial intermediary			
χ	0.64	Recovery rate of defaulted debt	Xiao (2018)
Idiosyncratic productivity			
ρ_ϵ	0.6	Persistence of the idiosyncratic shock	Khan and Thomas (2013)
Dividend Policy			
κ	0.727	Constant	Compustat
κ_k	0.070	Dividend sensitivity to capital	Compustat
κ_y	0.479	Dividend sensitivity to sales	Compustat

Table: Exogenous Parameters

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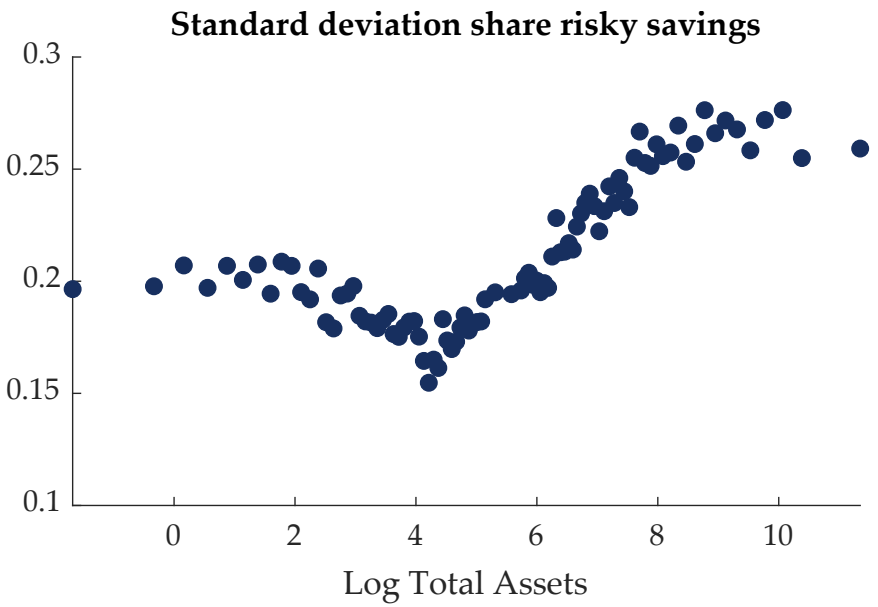
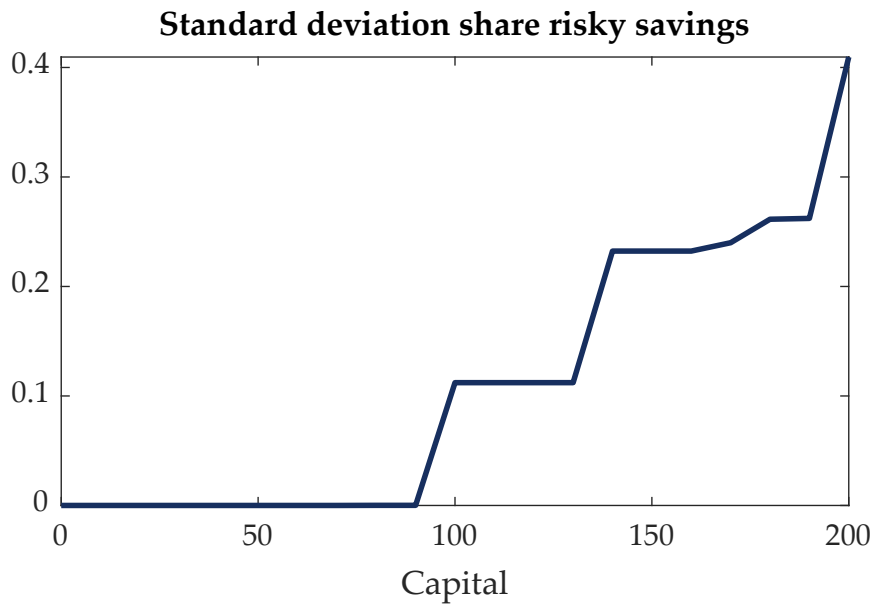
Firm distribution





- Idiosyncratic risk Idiosyncratic Risk
- Expected return Expected return back

Regressions Fit

VARIABLES	Log(Debt)	Log(Capital)	Risky Return
B	-0.743***	1.053***	0.623***
C	0.627***	0.049***	0.099***
D	-0.379***	0.058***	0.130***
R-squared	0.980	0.978	0.853

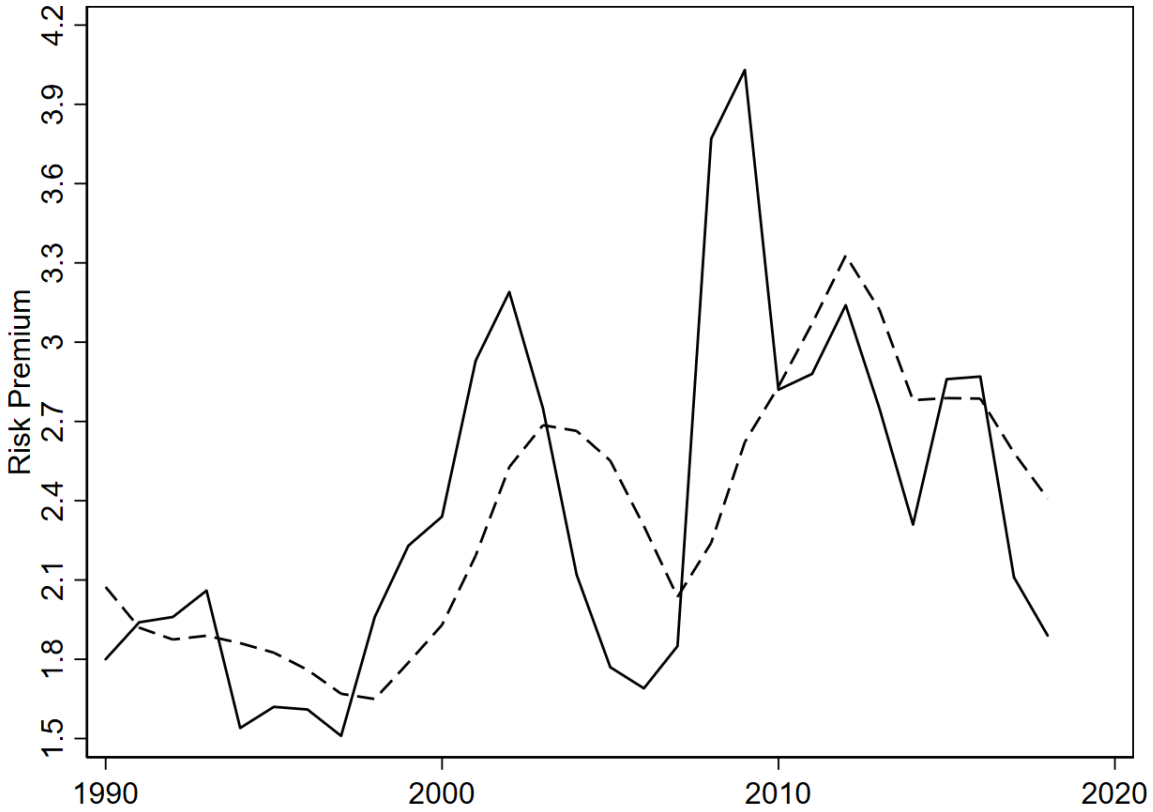
*** p<0.01, ** p<0.05, * p<0.1

back

Real Interest Rate

back

Risk premium



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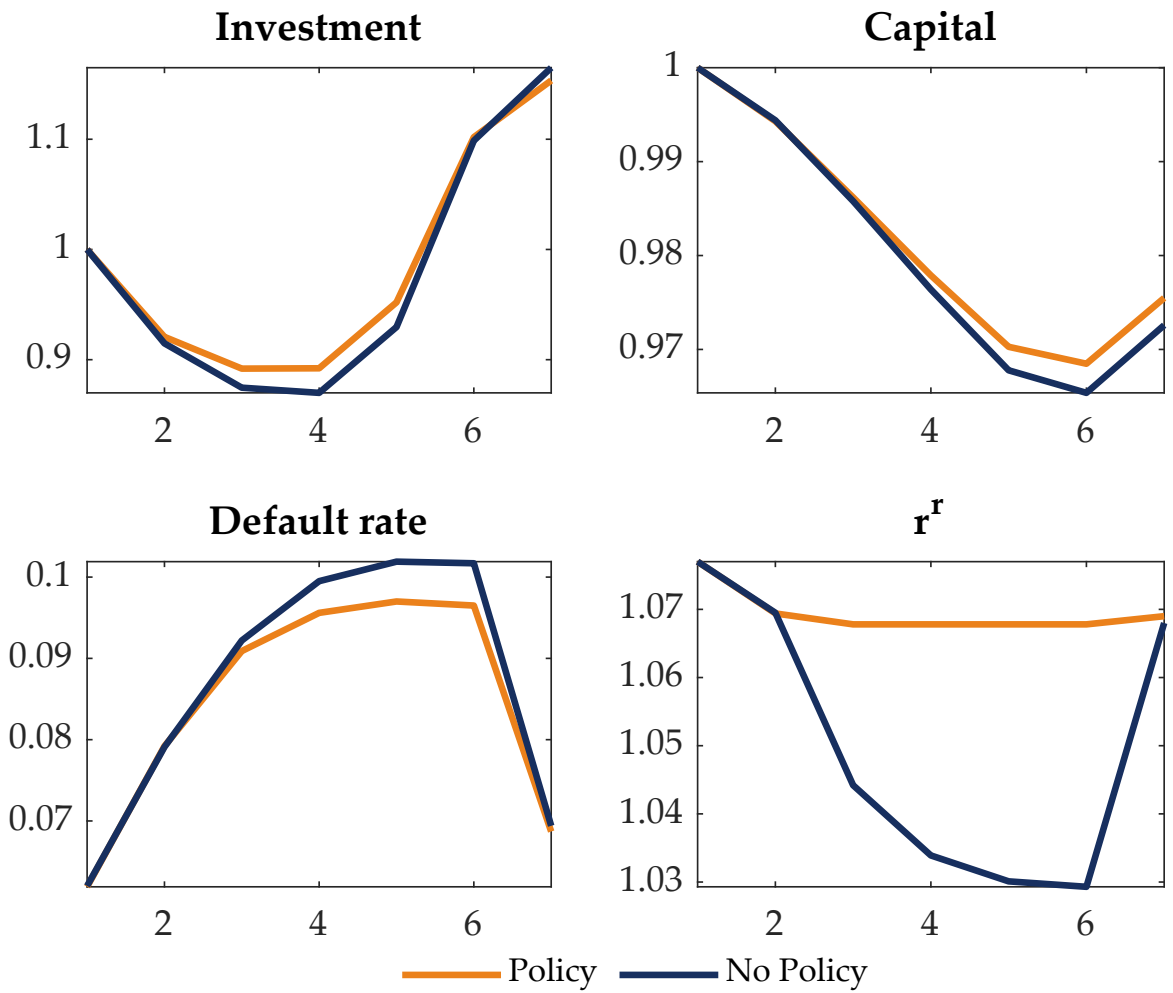
IRF: Productivity and Financial shock



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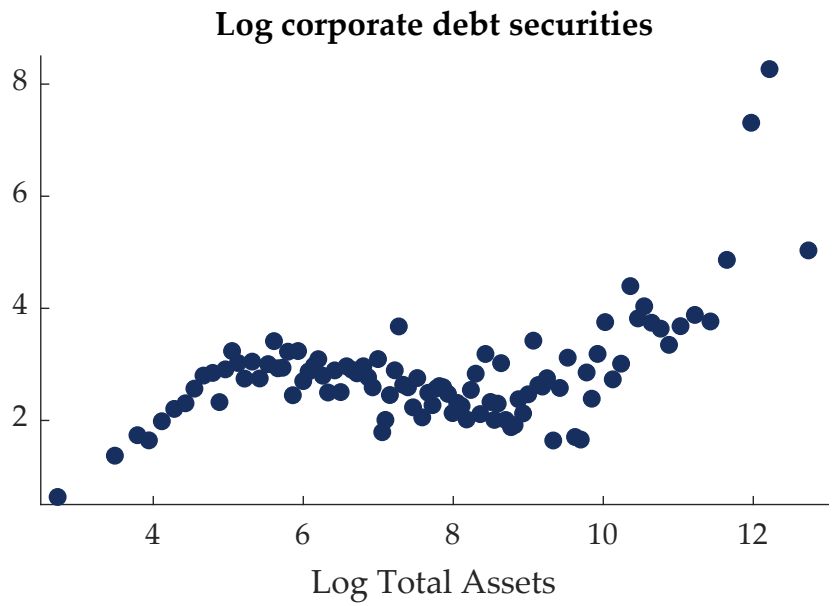
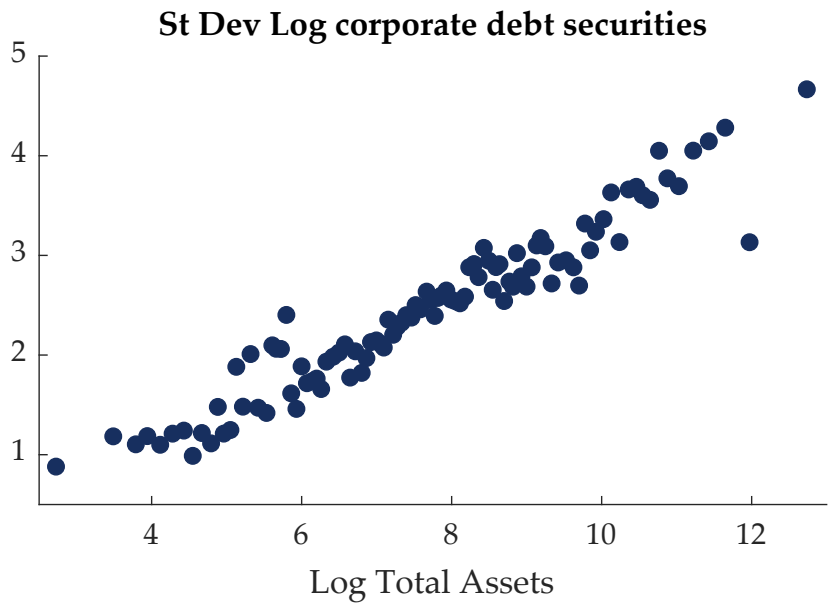
Corporate debt holdings





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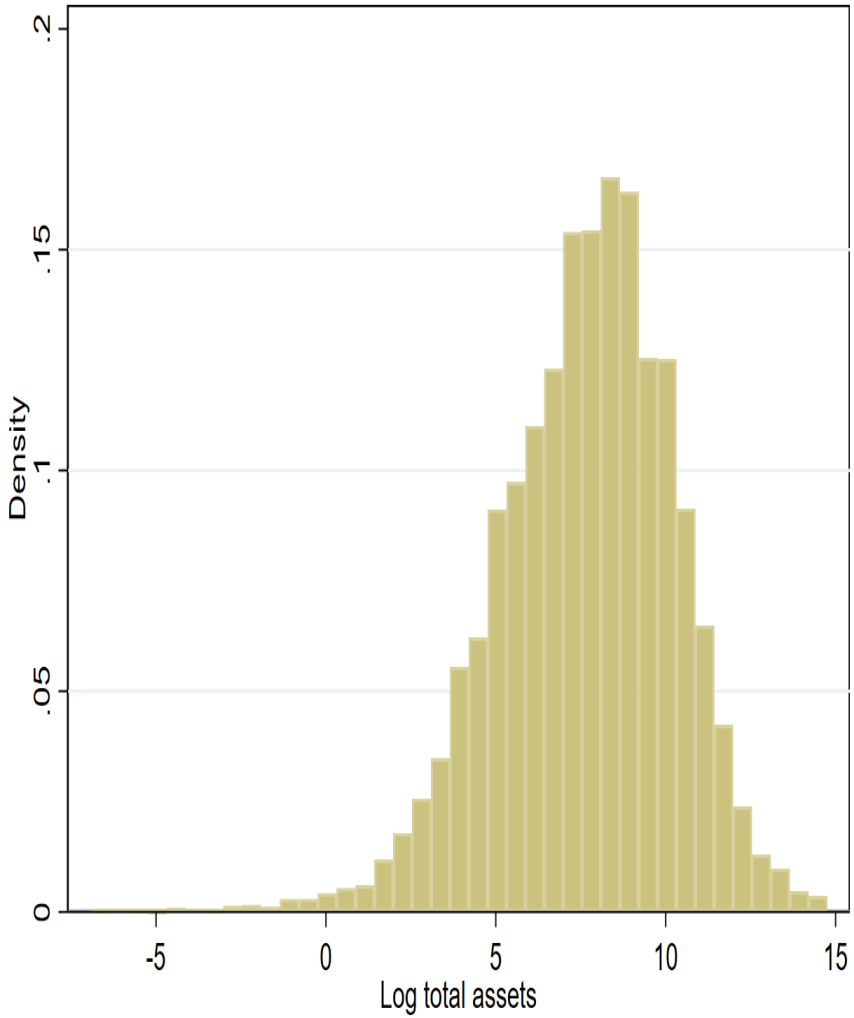
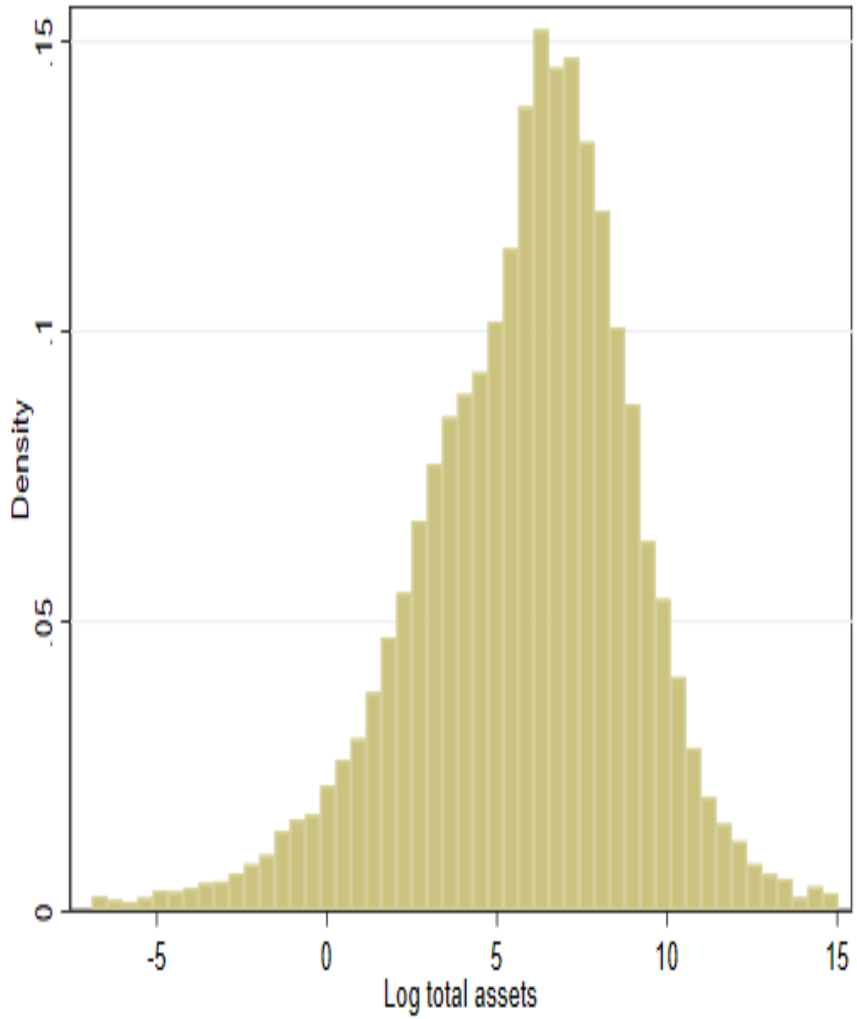
Log total assets histogram





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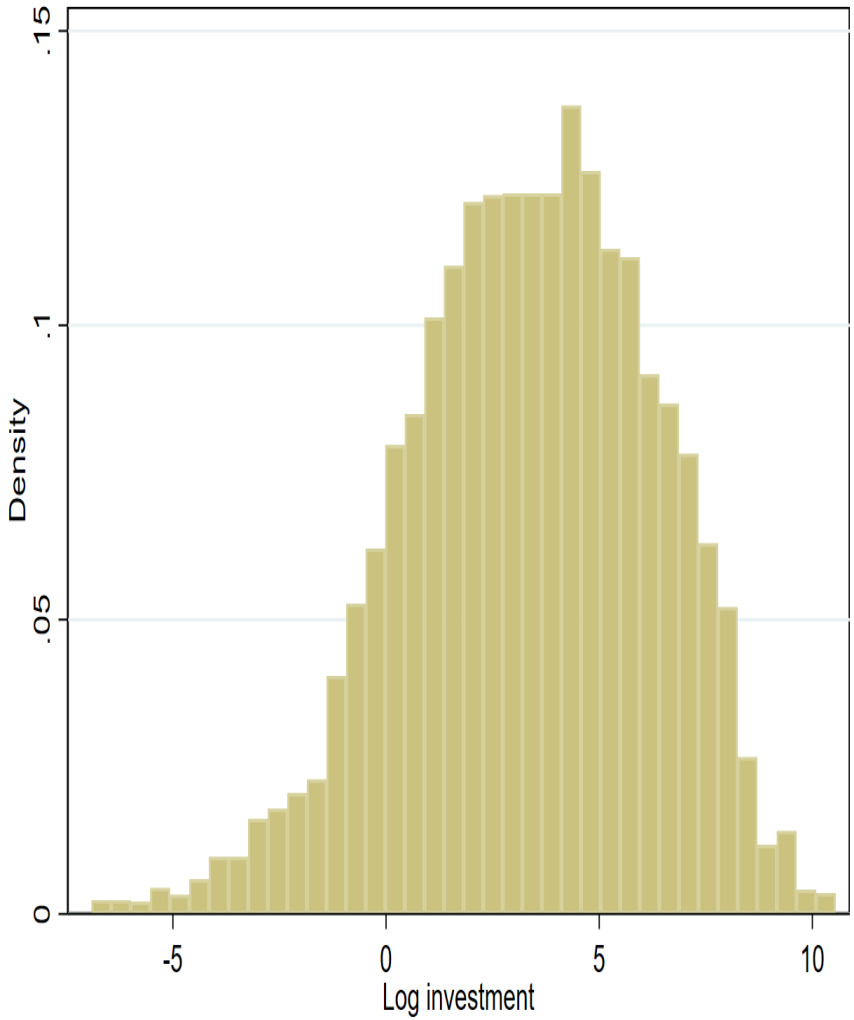
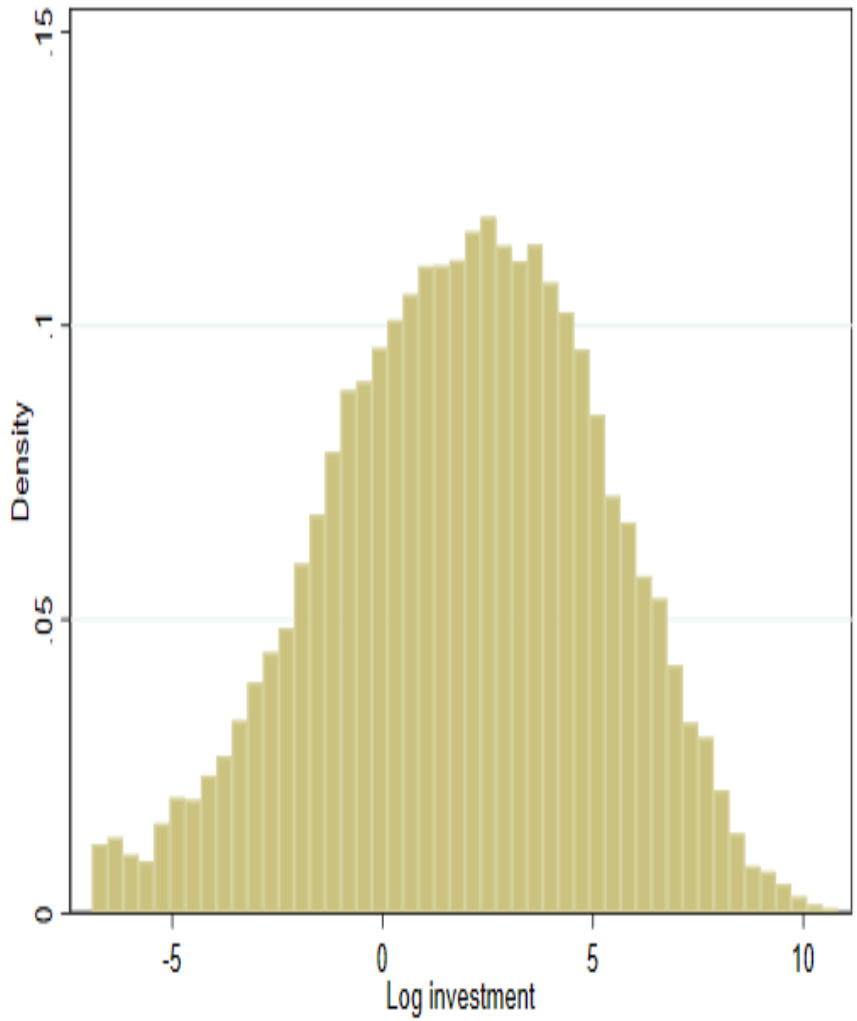
Log investment histogram





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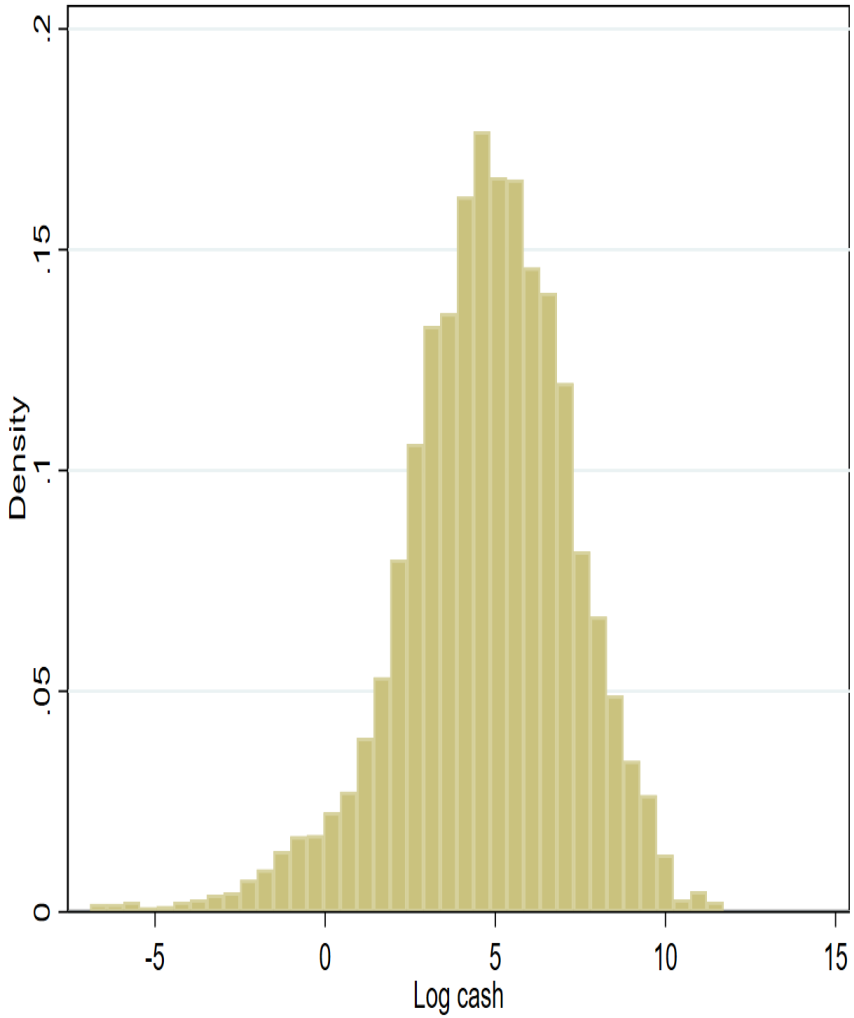
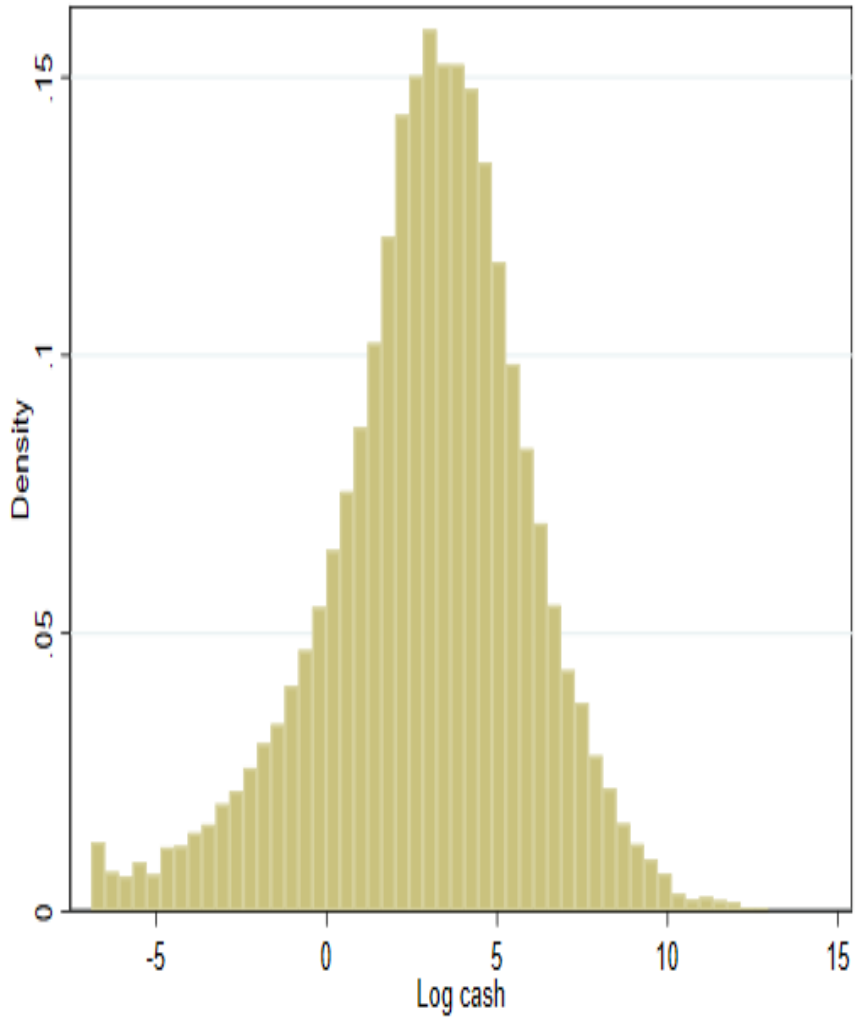
Log cash histogram





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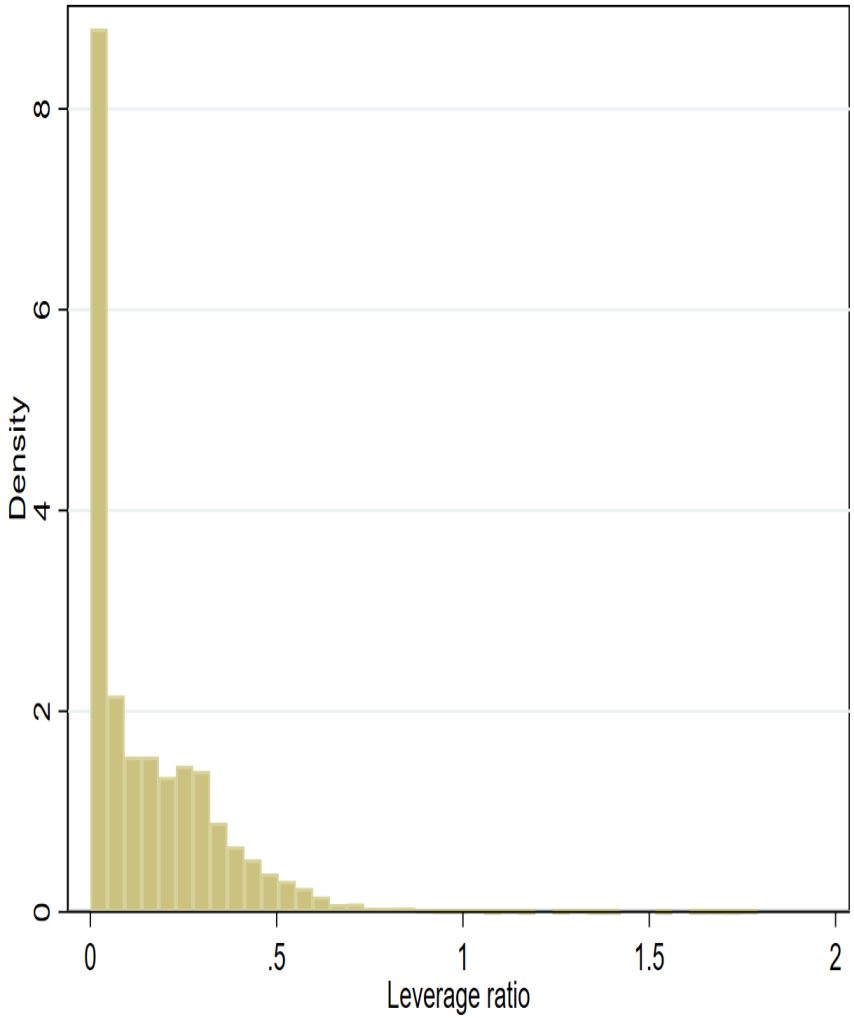
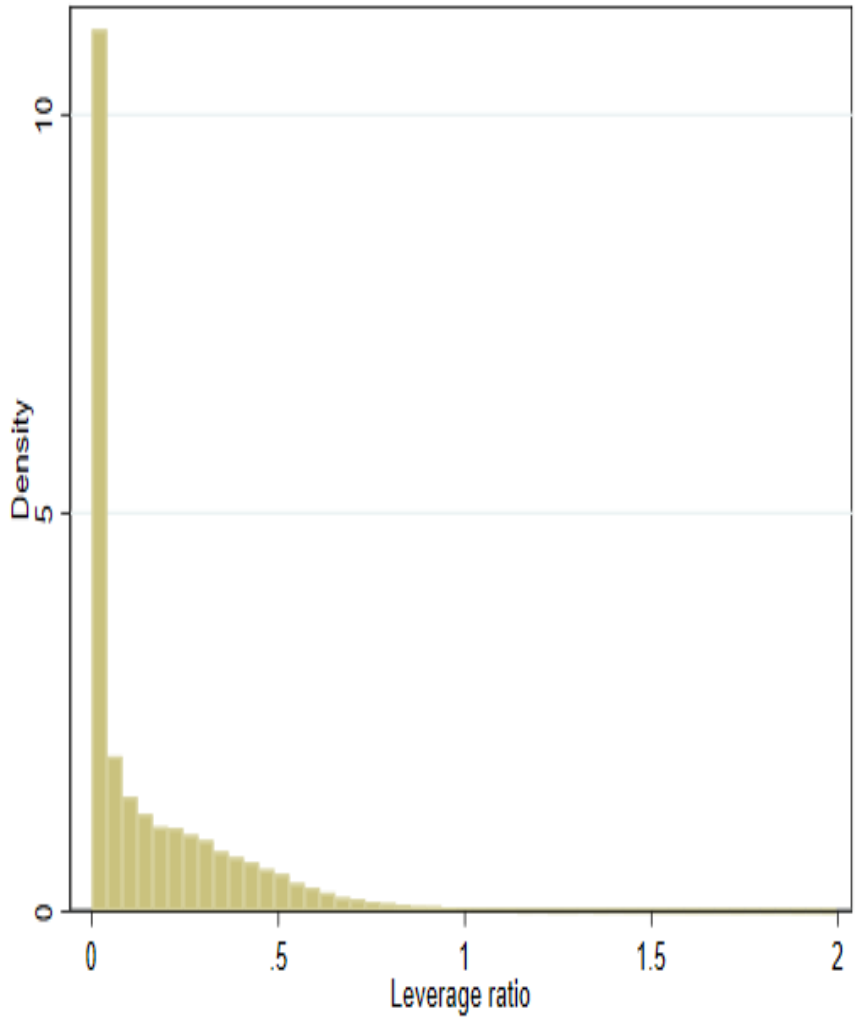
Leverage histogram





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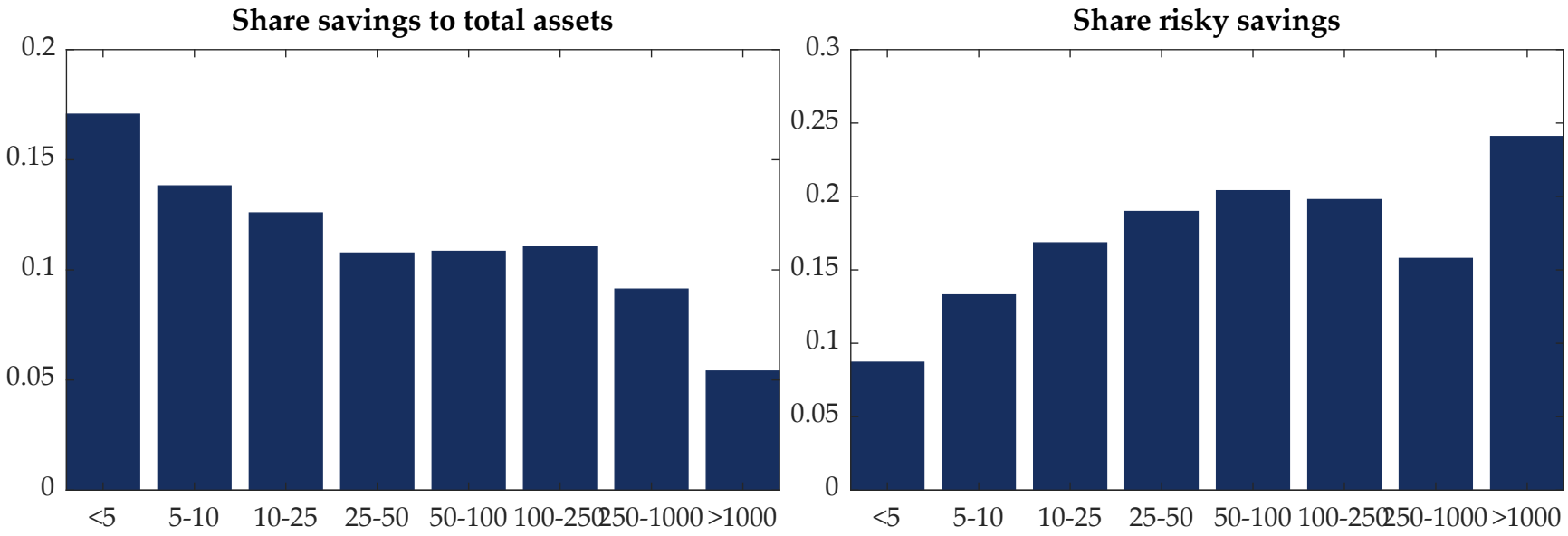
Small vs large firms savings portfolio



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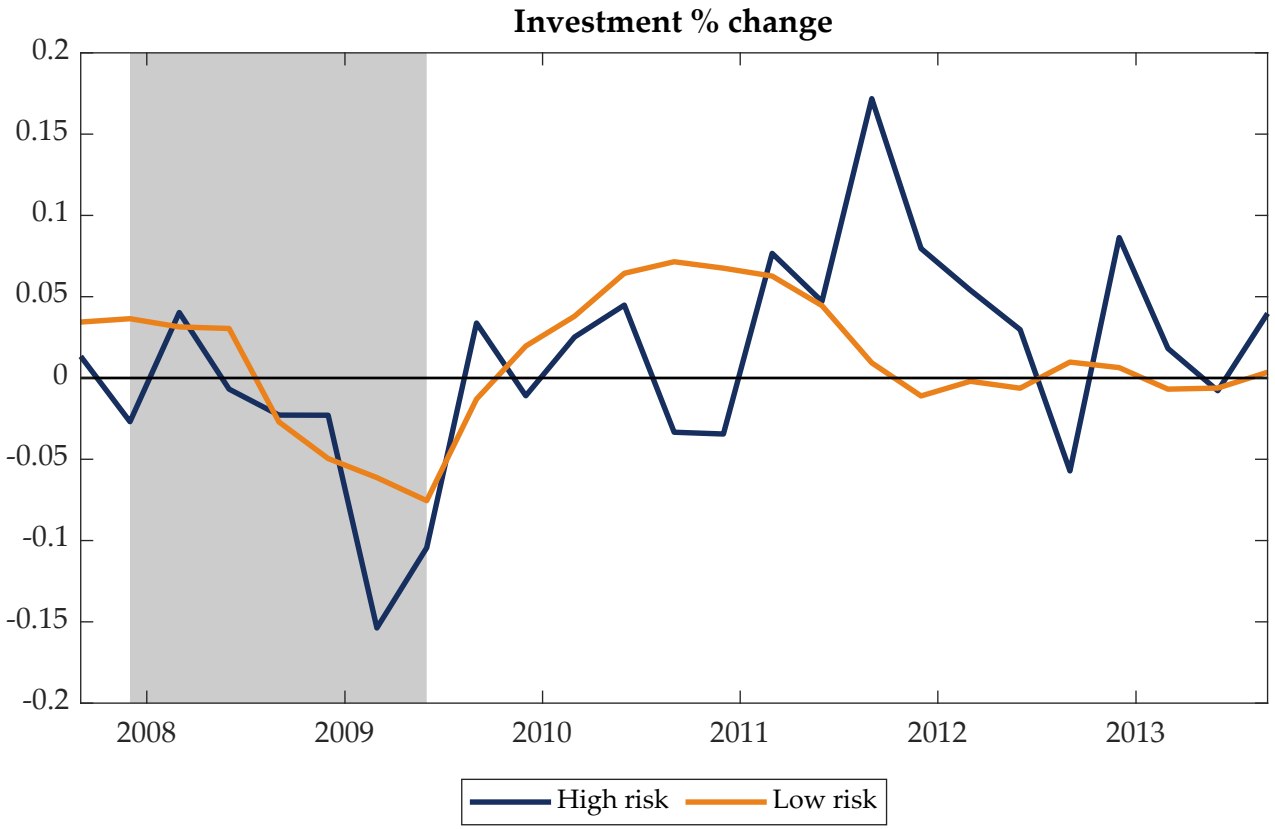
Investment during Great Recession



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Aggregate corporate bond holdings by industry

Fama-French Industry	Amount (M$)	% Total Assets	% Cash and Cash Equivalents	% Cash
Total	254,273.8	5.0	31.9	63.7
Consumer	17,669.82	1.5	12.6	19.2
Manufacturing	15,423.42	0.9	13.4	16.5
High Tech	172,265.10	9.8	37.5	95.4
Health	83,491.78	9.5	46.5	94.1
Others	32,903.31	2.7	24.0	31.0

back

Firm corporate bond holdings by industry

Fama-French Industry	Amount (M$)	% Total Assets	% Cash and Cash Equivalents	% Cash
Total	704.20	7.9	94.0	259.7
Consumer	253.32	2.2	123.3	148.1
Manufacturing	221.06	2.0	18.0	26.7
High Tech	1,059.12	9.1	28.9	72.7
Health	847.30	17.6	269.8	885.8
Others	772.18	2.7	48.6	167.5

back

Top 20 firms corporate bond holdings

Name	Amount (M$)	Name	% Total Assets
APPLE INC	60998	INTERCEPT PHARMA INC	69.8
AMERICAN SCIENCE ENGINEERING	42229	TONIX PHARMACEUTICALS HLDG	66.2
GENERAL ELECTRIC CO	27686	ALPINE IMMUNE SCIENCES INC	62.6
ALPHABET INC	15555	XENOPORT INC	60.1
CISCO SYSTEMS INC	14318	ACHAOGEN INC	57.6
SPECTRUM BRND HLDG INC	10933	PTC THERAPEUTICS INC	55.6
AMGEN INC	9390	ENANTA PHARMACEUTICALS INC	53.4
QUALCOMM INC	9108	OVASCIENCE INC	51.0
AUTOMATIC DATA PROCESSING	7558	REGULUS THERAPEUTICS INC	48.8
PFIZER INC	6775	KYTHERA BIOPHARMA INC	48.5
GENERAL MOTORS CO	6699	CHIASMA INC	47.7
MICROSOFT CORP	6643	ZAFGEN INC	47.4
MERCK & CO	6249	SYNDAX PHARMACEUTICALS INC	45.8
BOEING CO	5344	PULSE BIOSCIENCES INC	44.8
MEDTRONIC PLC	5150	ADAPTIMMUNE THERAPEUTICS	44.8
FACEBOOK INC	5141	MITEK SYSTEMS INC	44.2
EBAY INC	4514	DYNAVAX TECHNOLOGIES CORP	43.7
GILEAD SCIENCES INC	4504	CERES INC	43.5
PAYPAL HOLDINGS INC	4168	XENCOR INC	43.2
INTEL CORP	3834	NEKTAR THERAPEUTICS	43.0

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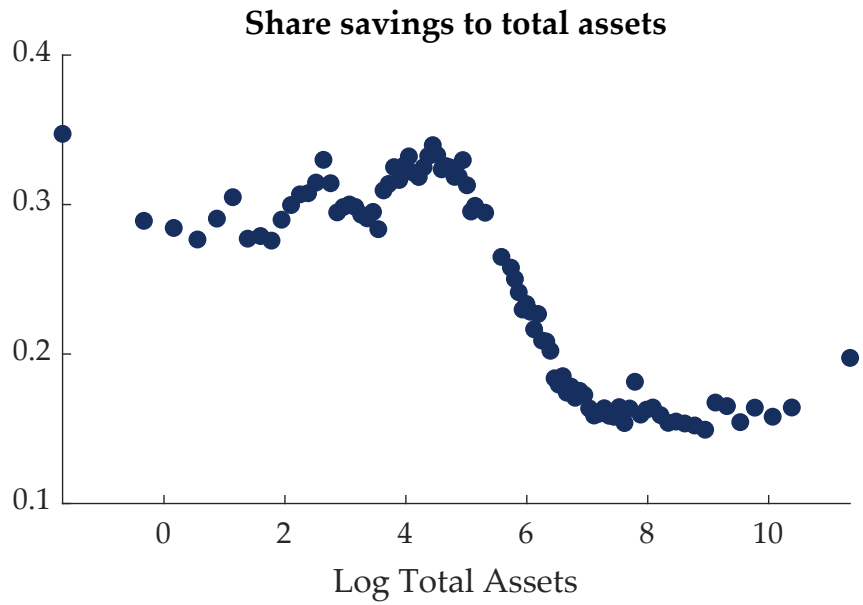
Composition of risky savings

- Corporate bonds represented more than 60% of risky assets in 2017
- Different risk profile. Risk-weight of 100% vs 50% of municipal bonds (second most held asset - Darmouni and Mota 2020)

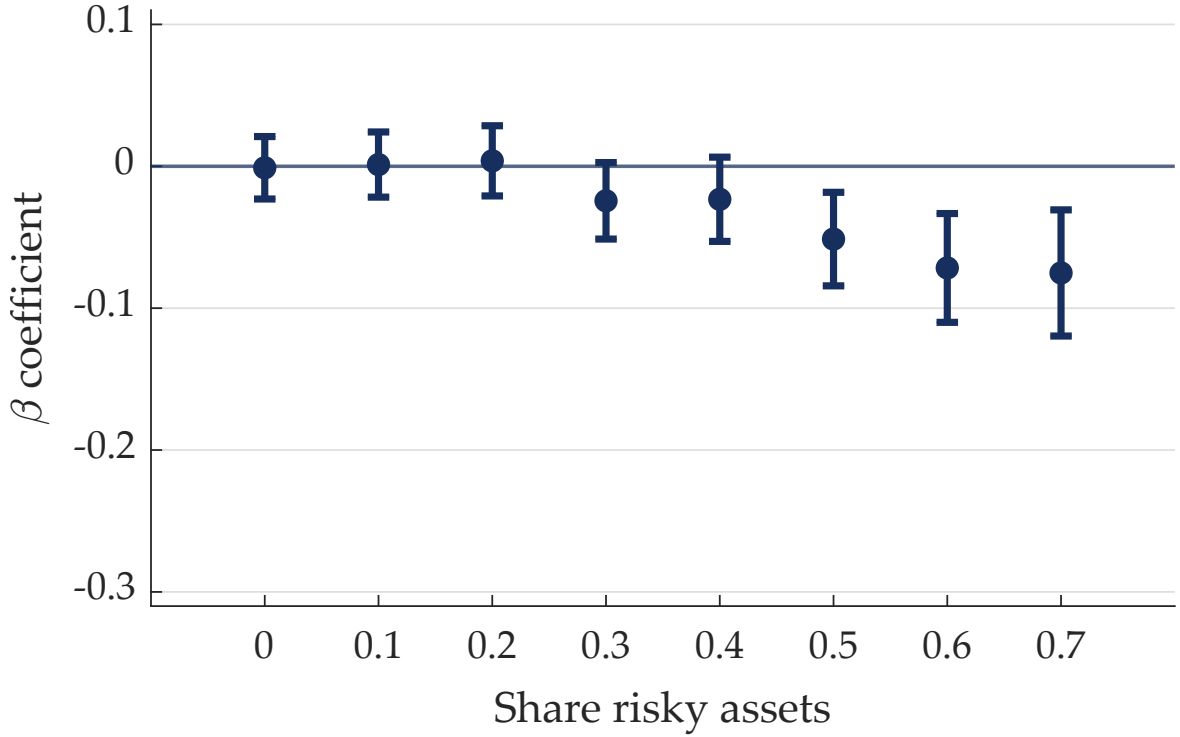
back

Savings distribution



Small firms save more than large firms, despite saving mainly in the risk-free securities. Back

Empirical Analysis: Great Recession



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Stylized fact 3

	(1)	(2)	(3)
β	-0.071***	-0.055***	-0.089***
	(0.023)	(0.023)	(0.027)
Firm FE	Yes	Yes	Yes
Sector-Time FE	Yes	No	Yes
Sector-Crisis dummy	No	Yes	No
Time FE	No	Yes	No
$ln(asset)_{ijt-1}$	-	-	(+)
$ln(revenues)_{ijt-1}$	-	-	(+)
$ln(cash)_{ijt-1}$	-	-	(+)
$leverage_{ijt-1}$	-	-	(-)

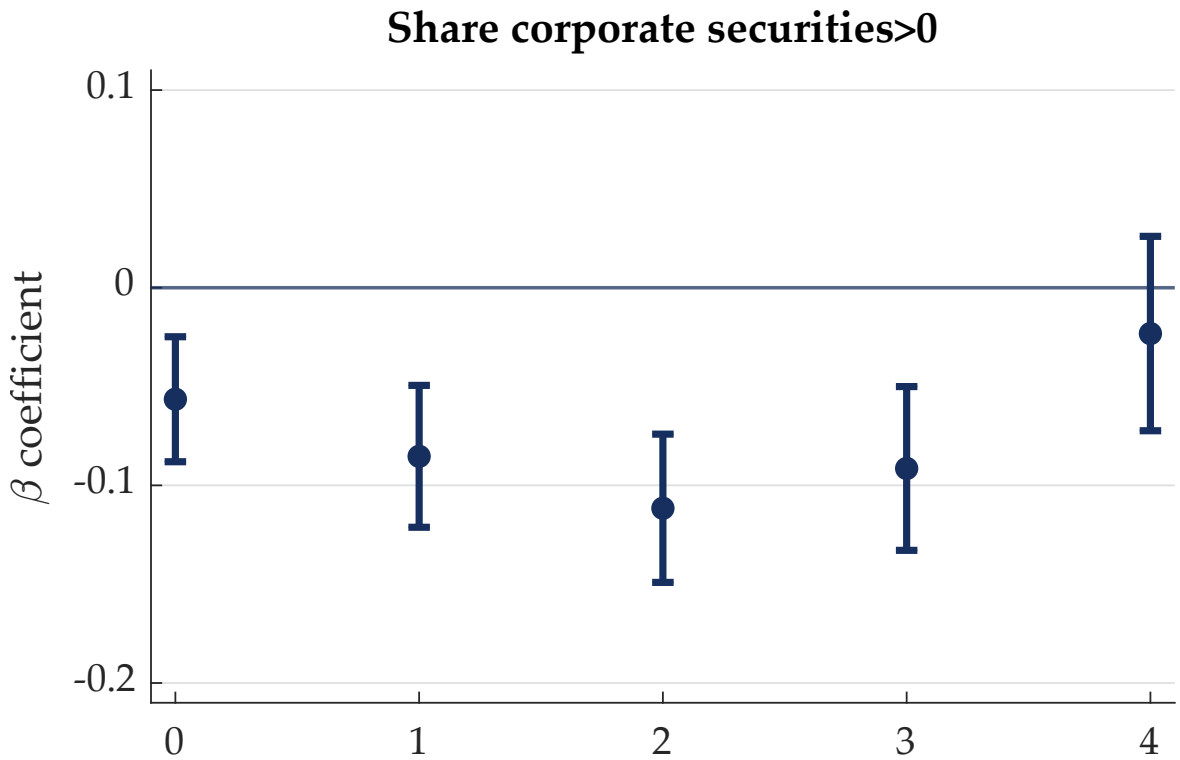
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

back

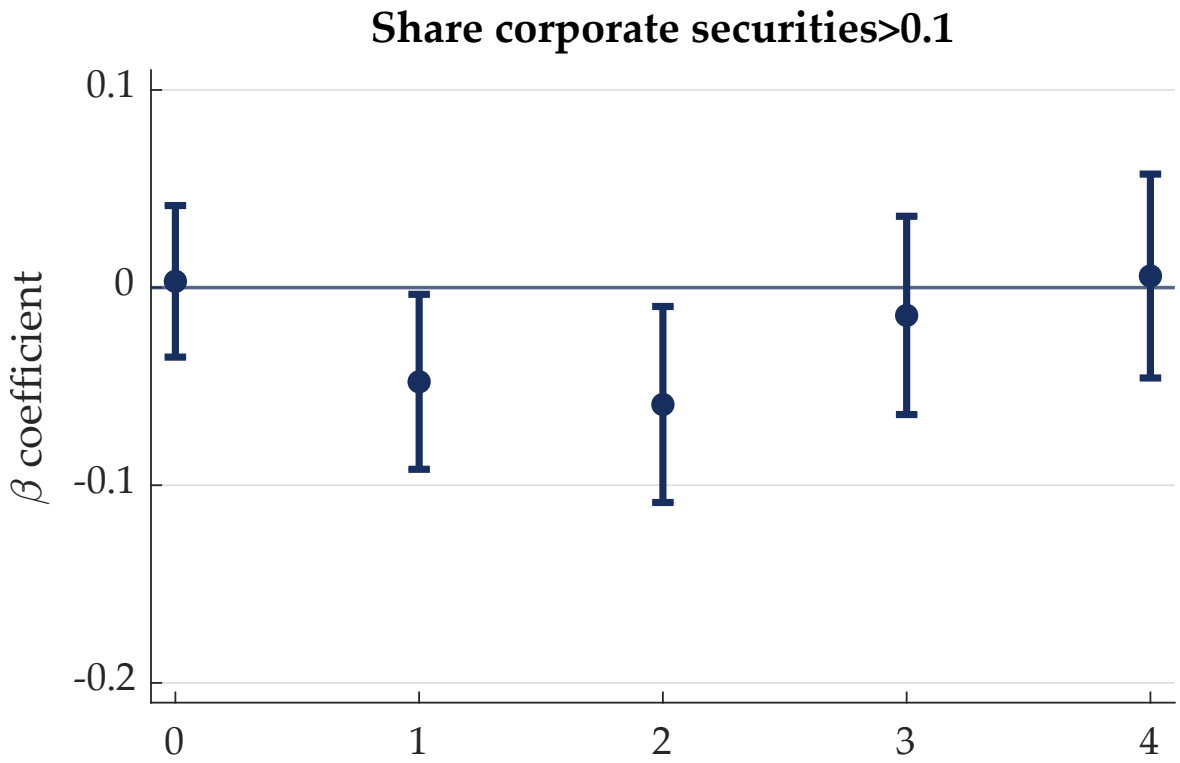
Empirical Analysis: Web scraping data

$$ln(Inv)_{ijt+h} = \gamma S\&P\_vol_{t-1} + \alpha risky_{ijt-1} + \beta S\&P\_vol_{t-1} * risky_{ijt-1} + \lambda_i + \theta_j + \epsilon_{ij}$$



Threshold robustness 0.1 | Threshold robustness 0.2 | Threshold robustness 0.3 | Back

Empirical Analysis: Web scraping data



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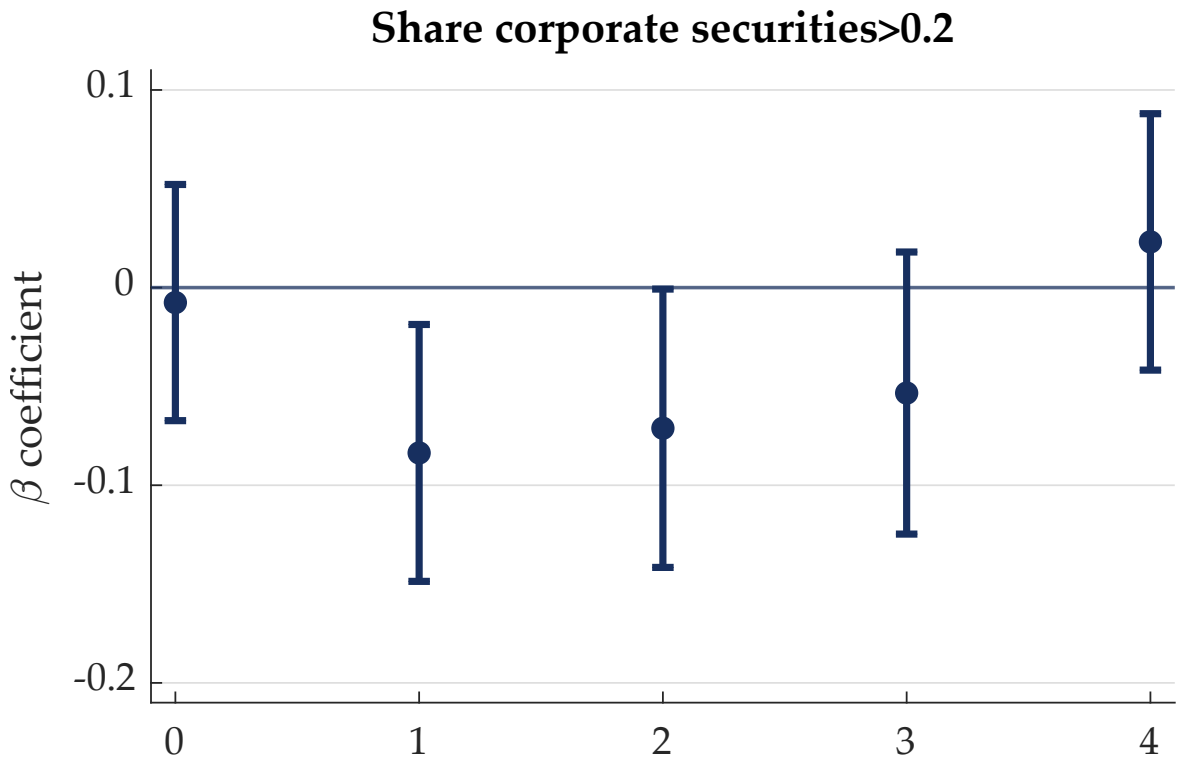
Empirical Analysis: Web scraping data



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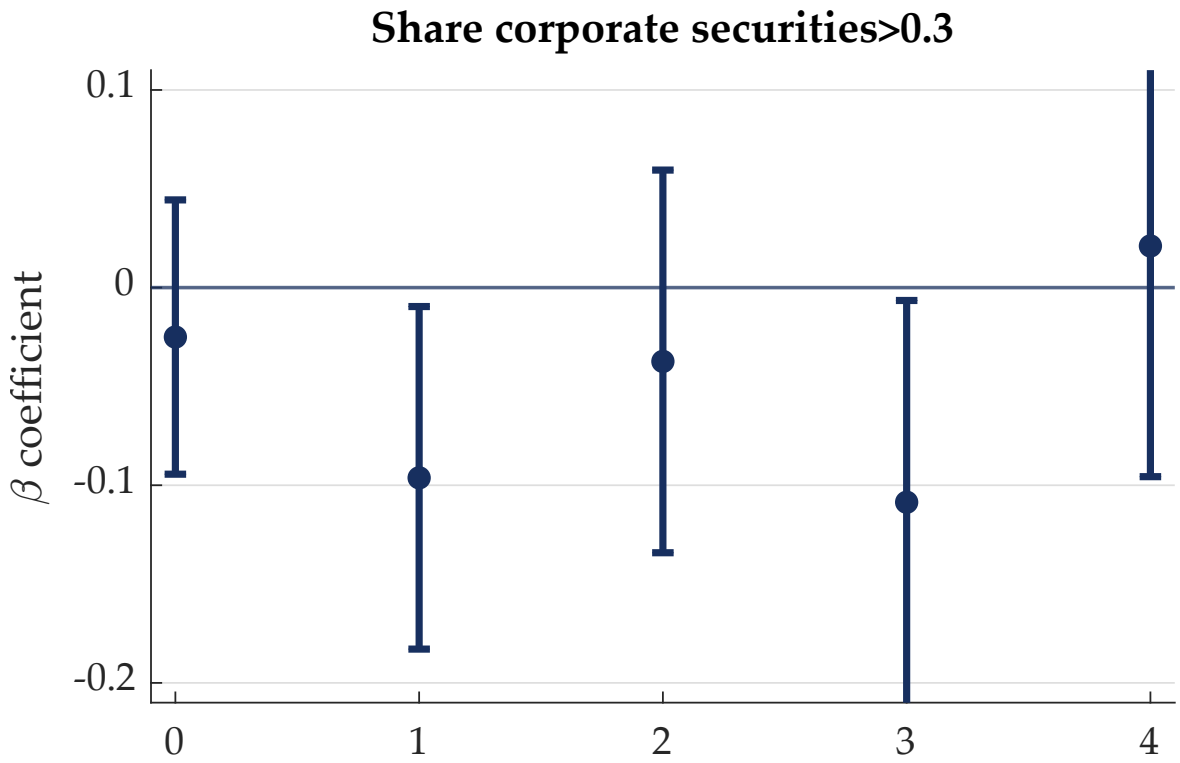
Empirical Analysis: Web scraping data



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Mechanism validation: Bond and cash holdings

$$Y_{ijt} = \beta_1 Revt_{ijt-1} + \beta_2 Debt_{ijt-1} + X_{ijt-1} + \alpha_i + \lambda_{jt} + \epsilon$$

VARIABLES	(1) Bond holdings	(2) Cash
β_1	0.141***	-0.029**
	(0.020)	(0.012)
β_2	0.054***	0.072***
	(0.011)	(0.007)
Observations	4,769	4,730
R-squared	0.955	0.910

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

- Debt associated with cash savings - precautionary savings
- Increase in revenues associated with accumulations of corporate bonds

back

1 - Portfolio determinants: Production and financial link

- Real frictions important determinant of portfolio composition
  - Firms in inaction region save to finance future investment

Moment	Inaction	Action
% of firms	35.3%	64.7%
Savings to capital ratio	29.2%	4.89%
Share of risky savings	38.2%	16.3%

Back

1 - Portfolio determinants: Production and financial link

- Real frictions important determinant of portfolio composition
  - Firms in inaction region save to finance future investment

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% of firms	35.3%	64.7%
Savings to capital ratio	29.2%	4.89%
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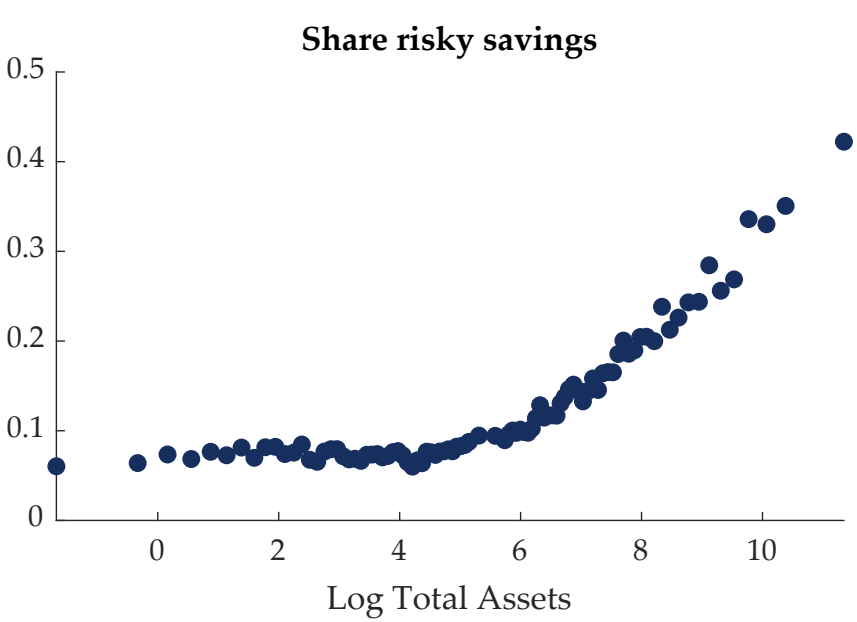

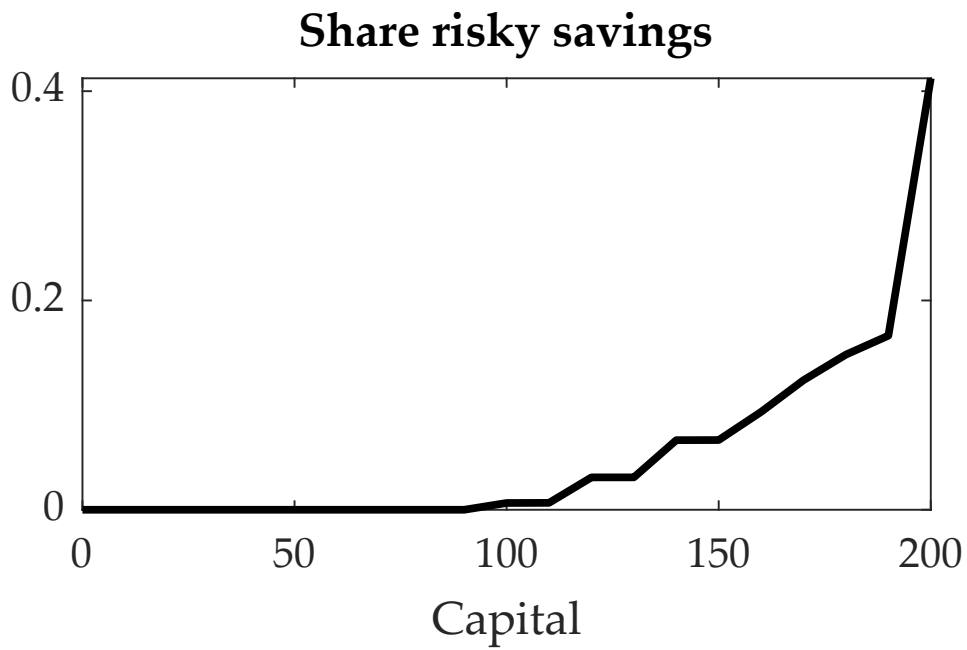

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- Probability of default decreasing on the size of the firm
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Size mechanism

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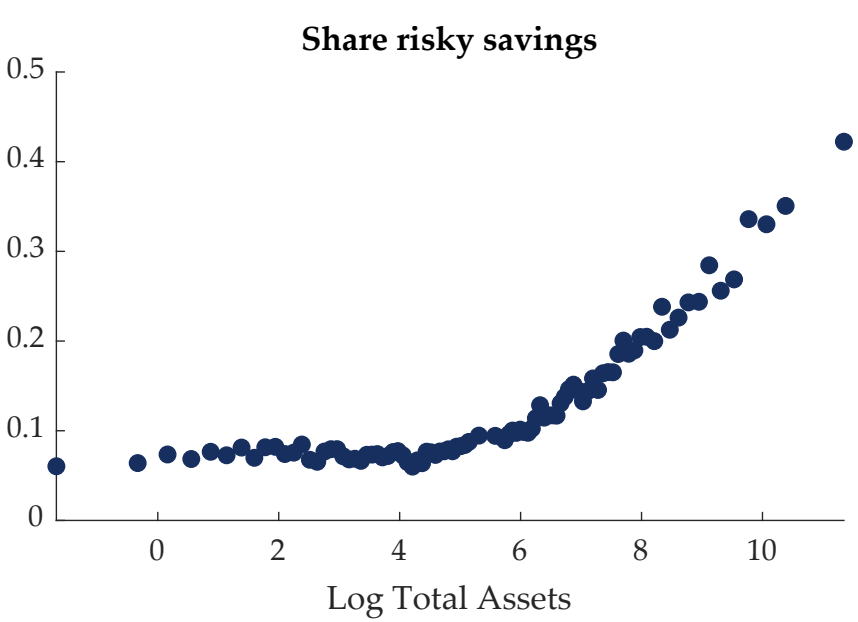

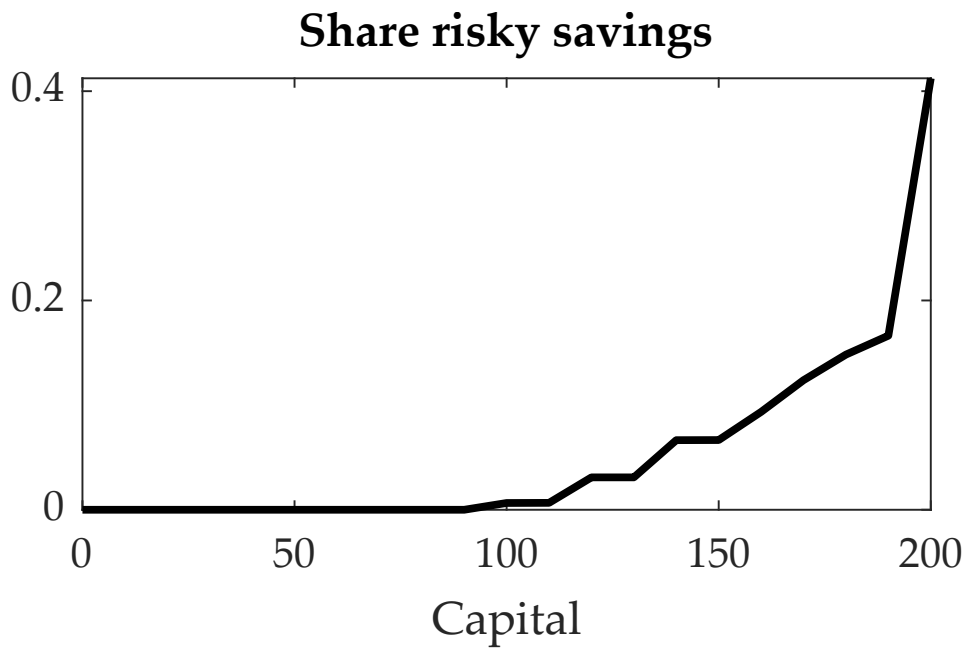

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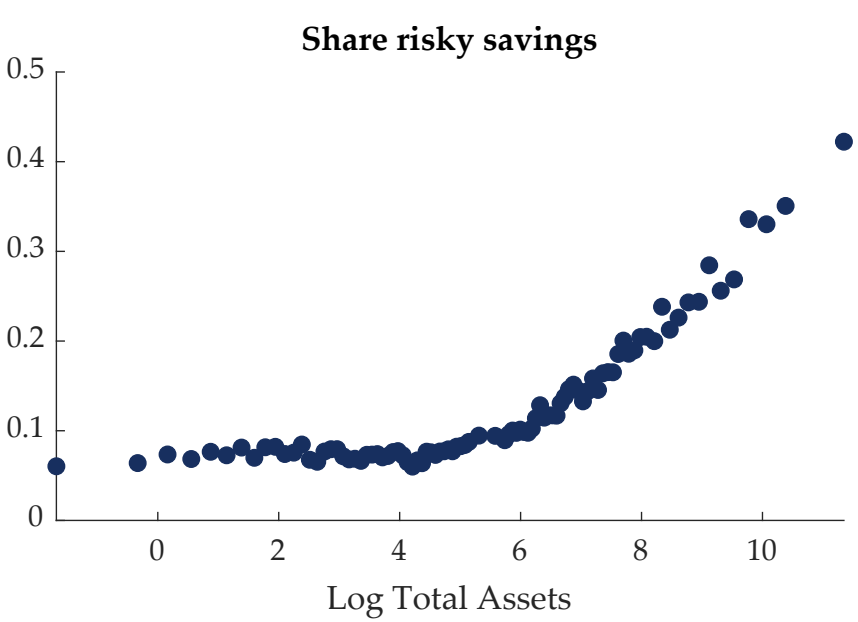

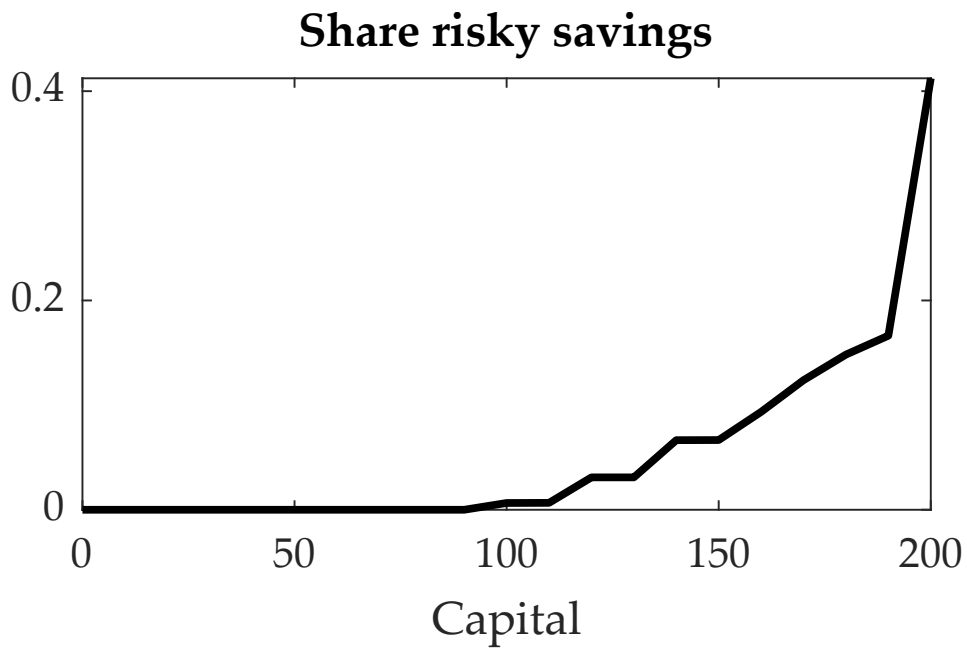

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2 - Determinants of increase in risky savings

- Decrease in real interest rate fully accounts for increase in risky asset holdings
- I calibrate the model to match the share of risky asset holdings in 1989
- I use the risk-free interest rate in that same year
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2 - Determinants of increase in risky savings

Moment	1989	2017	Variation
Share risky savings - Data	29.18%	41.89%	12.71 p.p.
Share risky savings - Model	29.25%	42.36%	13.11 p.p.

- Decrease in real interest rate fully accounts for share of risky savings increase
- Lower cost of debt shifts firm size distribution to the right Distribution
  - Direct impact: Large firms hold more risky assets - accounts for 13.2% of the increase
  - Indirect impact: Share defaulted debt $\downarrow \rightarrow$ Risky asset excess returns $\uparrow$ (Model: 0.32p.p. vs Observed: 0.44p.p.) - accounts for 86.8% of the increase Contributions

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- Investment and default both affected by portfolio composition
- I compare the same firms while holding different shares of risky assets to scenario where firms only hold risk-free securities
- Check investment and default rate in periods when $r^r < r^{rf}$

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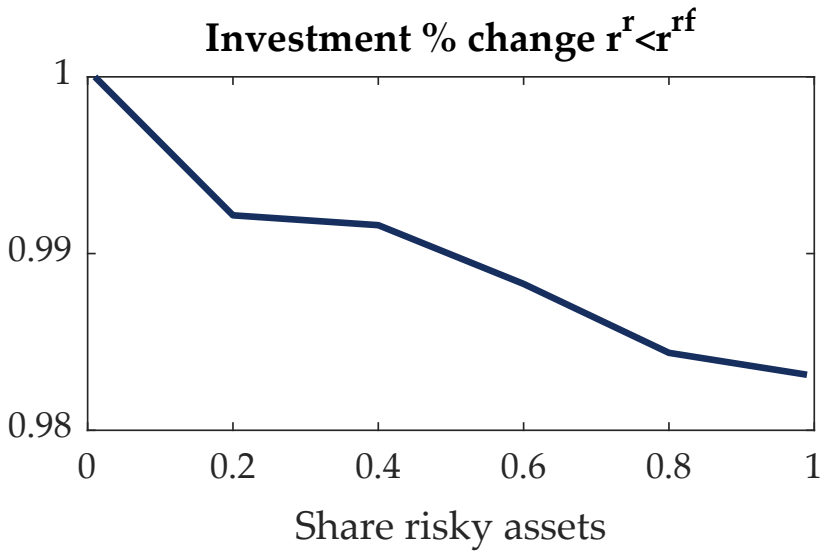

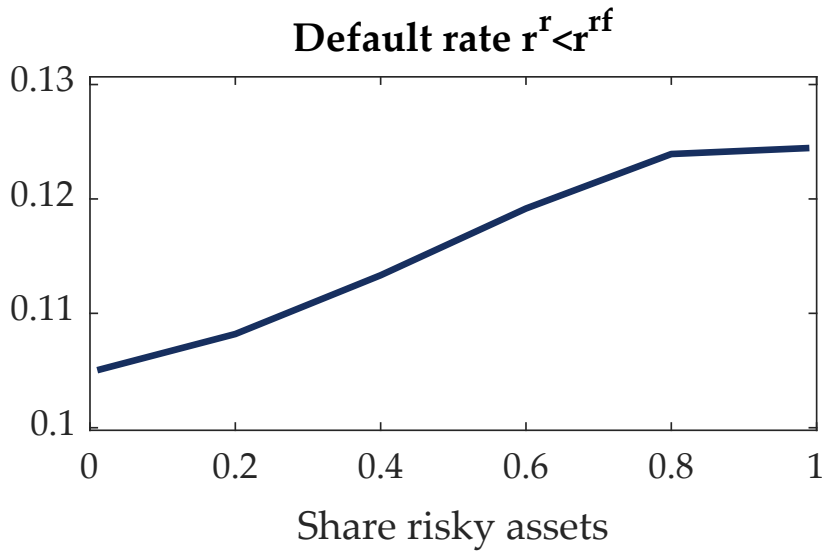

- The larger the share of risky assets, the more firms' investment and default react to r^r

$r^r < 0$ $r^r > r^{rf}$

3 - Macro outcomes

- Aggregating the micro effects generates large macro non-linearities
- Small and large shocks produce qualitatively and quantitatively different results
- Small shock is a 1% drop in aggregate productivity
- Large shock is calibrated to match the decrease in investment during the Great Recession in the U.S.

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3 - Macro outcomes

Moment	Small negative	
	Risk-free	Risky
Investment	-0.22%	-0.14%
Capital	-0.07%	-0.06%
Default rate	6.21%	6.21%
r^r-r^{rf}	-	0.92p.p.

- For small shocks, return on risky assets is still above the risk-free rate

3 - Macro outcomes

Moment	Small negative		Large negative	
	Risk-free	Risky	Risk-free	Risky
Investment	-0.22%	-0.14%	-8.58%	-13.01%
Capital	-0.07%	-0.06%	-2.71%	-3.53%
Default rate	6.21%	6.21%	9.12%	10.19%
r^r-r^{rf}	-	0.92p.p.	-	-3.85p.p.

- For small shocks, return on risky assets is still above the risk-free rate
- Identified micro mechanism is only triggered in large recessions

IRF

Policy Implications

Two different policies:

- Market liquidity provision policy:
  - In the spirit of Secondary Market Corporate Credit Facility by the Fed
  - Limit losses on risky savings in large recessions: $r^r \geq r^{rf}$
  - Limits propagation of the negative shock from defaulting borrowers to lending firms
  - Smaller decrease of investment and capital IRF
- Financial sector regulations:
  - Capital requirements - share of risky savings lower than 94%
  - Counter-cyclical buffers - during downturns the maximum share of risky savings is 2.5 p.p. lower
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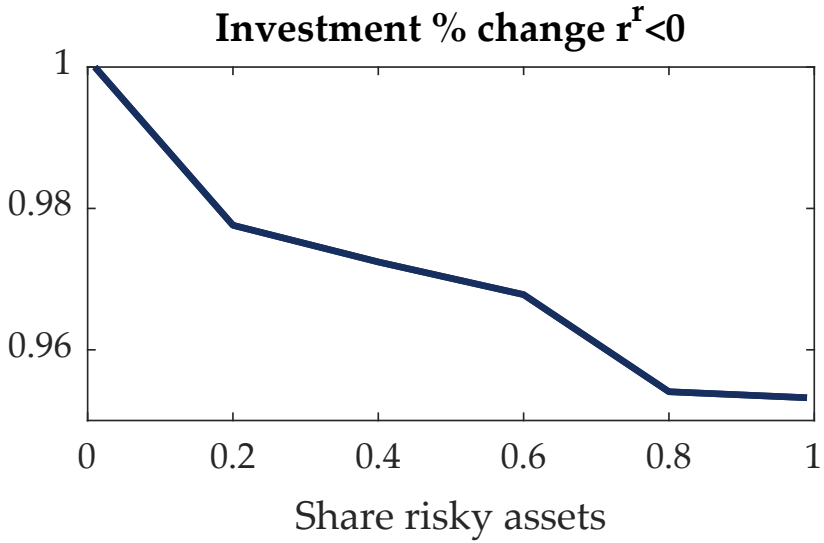
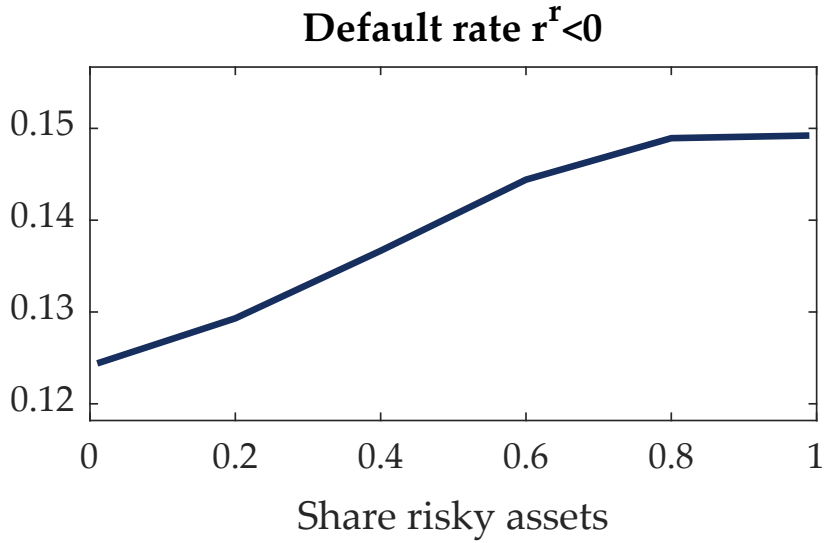
Investment and risky holdings

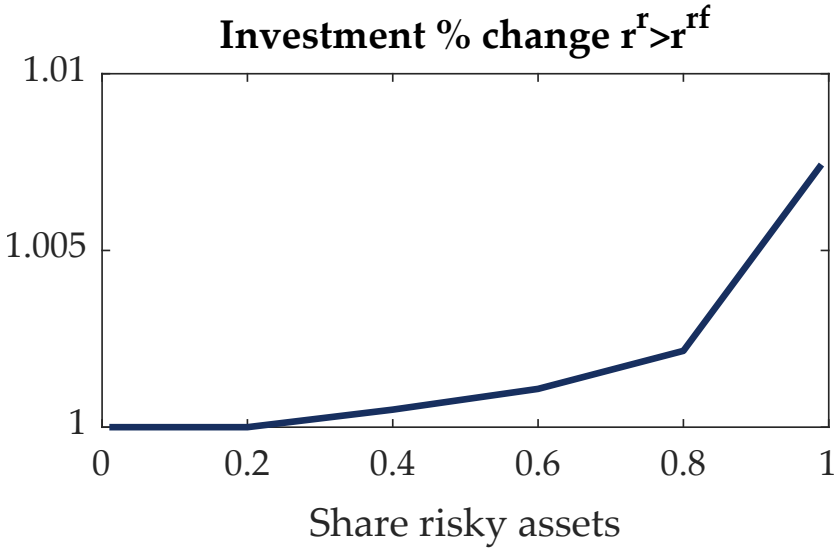


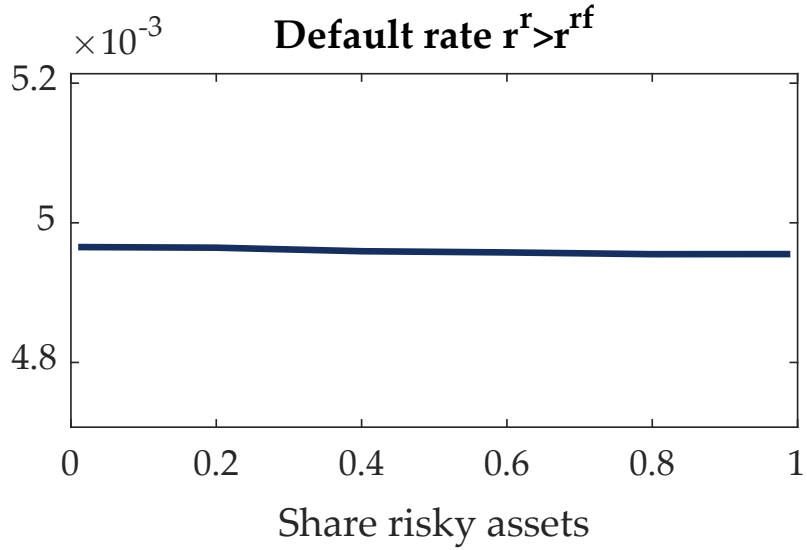


- Effect stronger when considering periods with $r^r < 0$

Back

Default and risky holdings





- Default rates also change with the exposure to corporate bonds

Back

1 - Portfolio determinants: Size

- To focus exclusively on the size effect, I simplify some model assumptions
  - Static: Firms start with a given endowment and choose capital to produce at the end of the period
  - No real frictions
  - Same timing

Static Model

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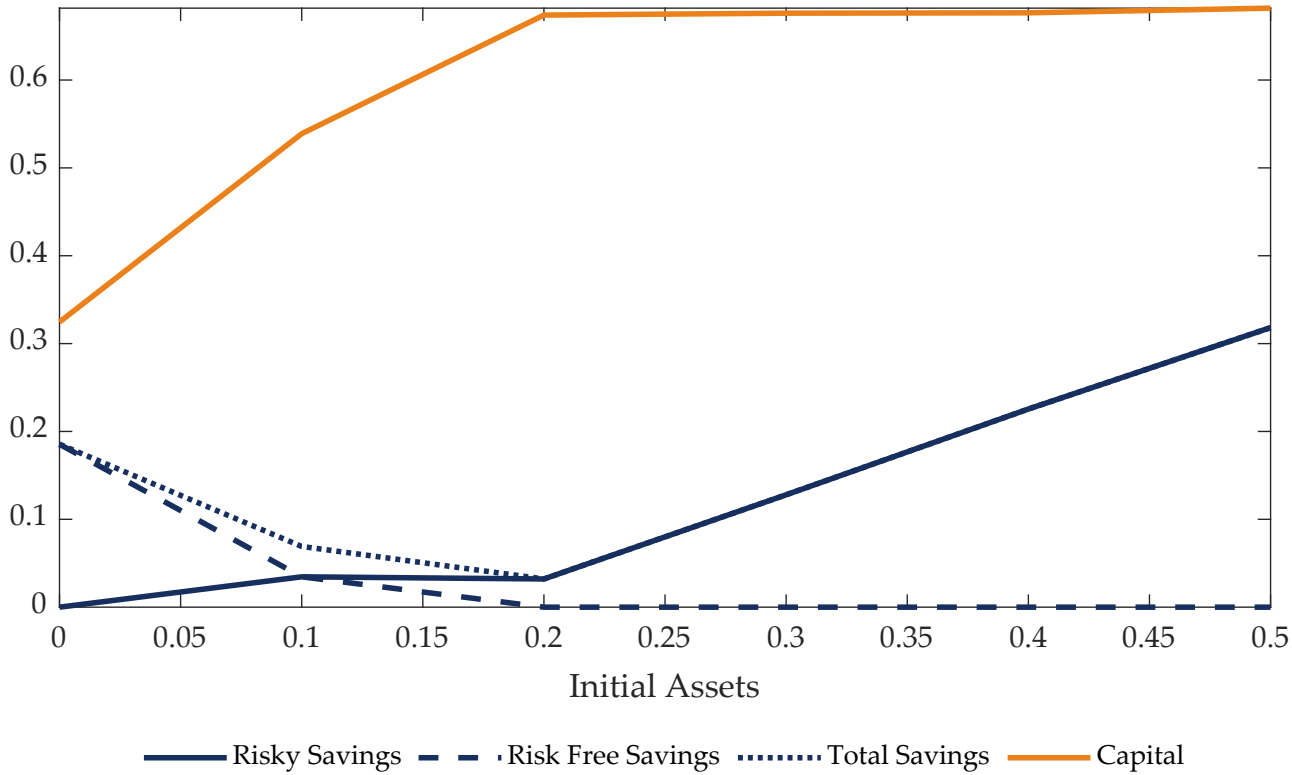
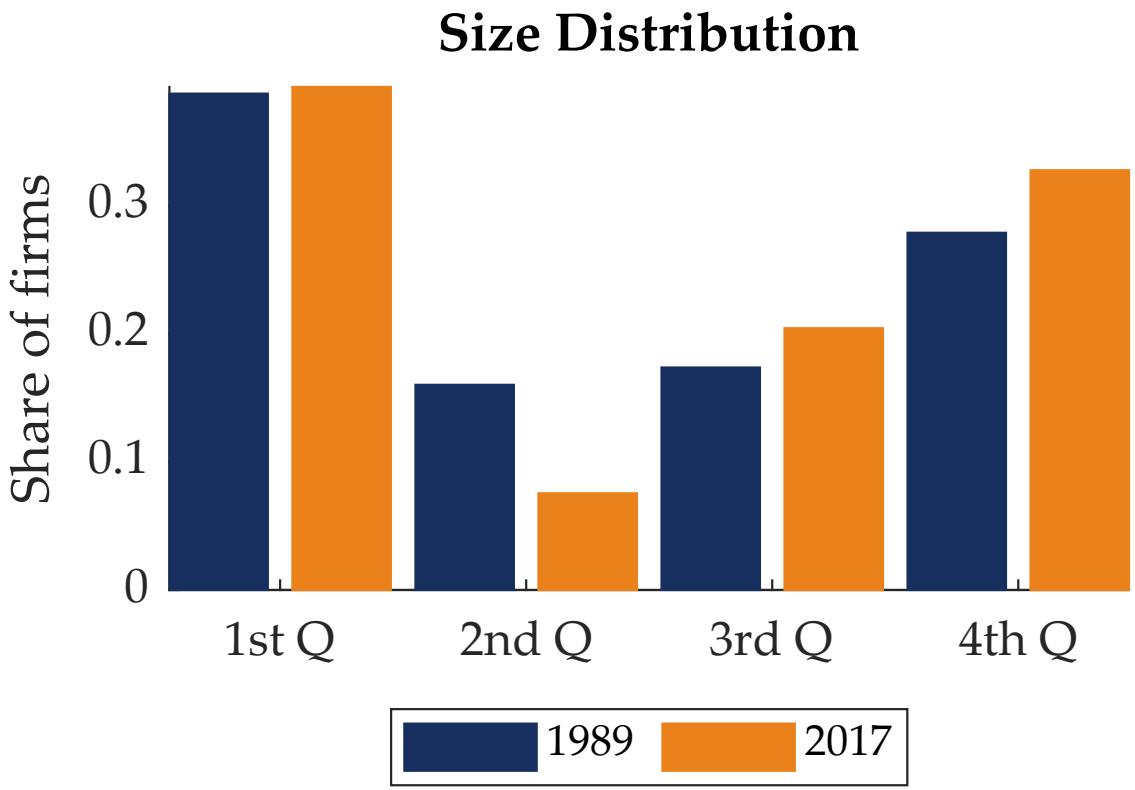


- Small firms invest in capital and save in the risk free asset
  - Precautionary savings
- As firms grow, probability of default decreases and share of risky asset holdings increase

Empirical Validation Back

Mechanisms: Distribution



- More firms at the top of the distribution

back

Determinants of increase in risky assets

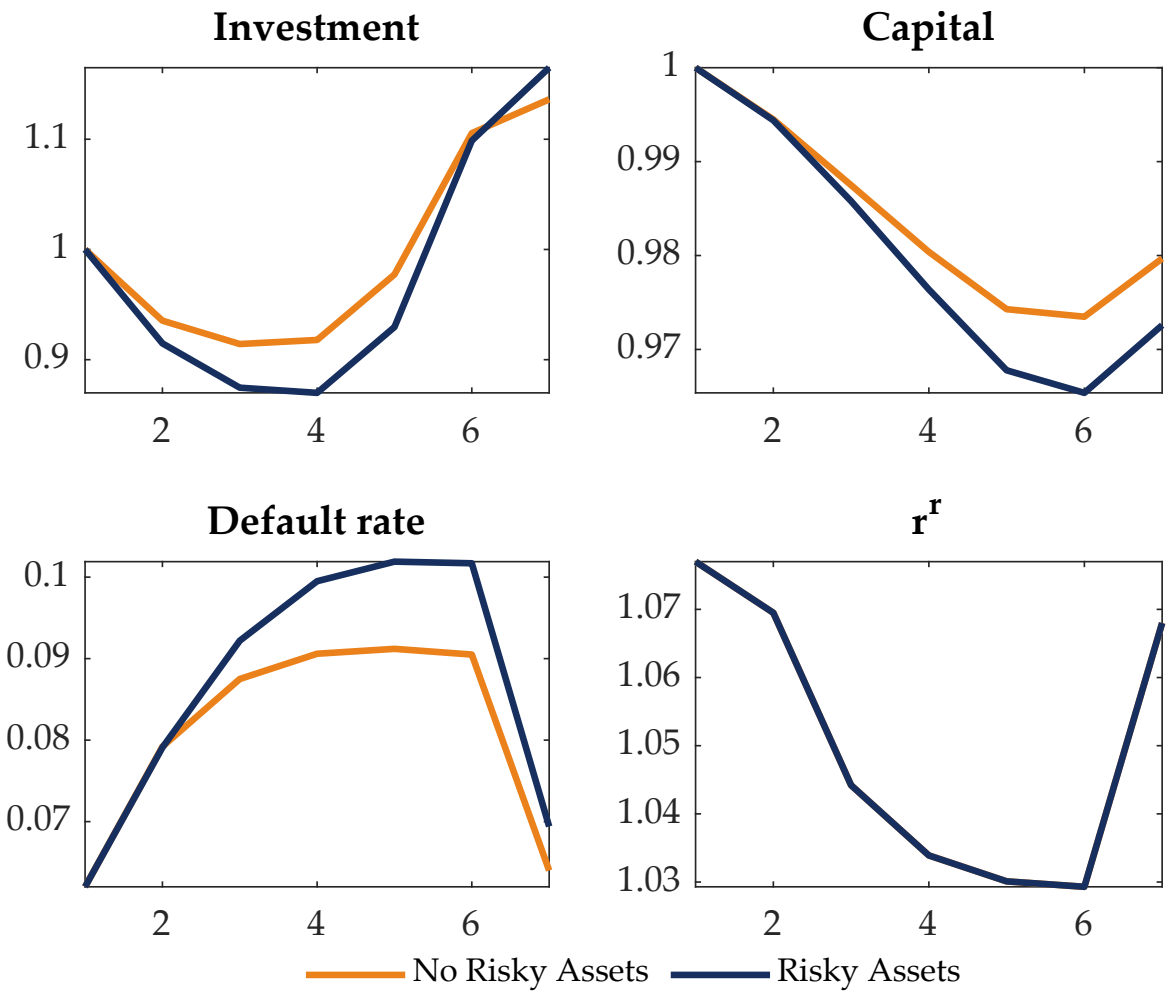
Moment	Variation	Contribution
Excess return	**0.32p.p.**	**86.8p.p.**
Distribution		**13.2p.p.**

Mechanism: $\downarrow$ r $\rightarrow$ Share defaulted debt $\downarrow$ $\rightarrow$ Risky asset excess returns $\uparrow$ (Model: 0.32p.p. vs Observed: 0.44p.p.) $\rightarrow$ Risky savings $\uparrow$ Interest rate

Risk Premium

back

IRF: Productivity and Financial shock



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