Financial Cycles with Heterogeneous Intermediaries

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Financial Crises and Credit Booms

- Crises are often credit booms gone bust (Minsky, Kindleberger)
  - There are good booms and bad booms
  - Credit growth coupled with low credit spreads forecasts crises
- Macro finance literature has focused less on boom phase.
- Important to understand:
  - The **risk build-up** phase
  - Link between **monetary policy and financial stability**
  - Cross-sectional **concentration of risk**
- Challenges for macroprudential policies.

Booms and heterogenity in risk-taking

- Sweden (Englund (2016)): between 1985 and 1990 the rate of increase of lending by financial institutions jumped to 16% with rapid shifts in market shares. Significant correlation between the rate of credit expansion of institutions and their subsequent credit losses.
- Spain (Tanos (2017)): between 2002 and 2009, the regional banks leveraged a lot to invest in the real estate sector. Combined balance sheet reached 40% of Spanish GDP in 2009. Some (Bancaja) more than tripled their balance sheet while more "conservative" ones (Catalunya Caixa) doubled it.
- Germany (Hellwig (2018)): Deutsche Bank leveraged up to quadruple the size of its balance sheet from about €0.5 trillion in early 1990s to about €2 trillion in 2008.
- US (Wilmarth (2013)): Citigroup nearly doubled the share of its subprime mortgage business from 10% in 2005 to 19% in 2007.

This paper

- Dynamic macroeconomic model with financial intermediaries that are **heterogeneous in risk-taking**
- Flexible framework that can be integrated in complex recursive macroeconomic models
- Allows joint analysis of monetary policy and financial stability (default costs)
- Generates time variation in **systemic risk and risk-premia**
- Opens the door for combining panel data on financial intermediaries and theoretical macro models
- Generates fluctuations in **cross-sectional patterns of leverage** (dispersion and skewness) as in the data.

Related Literature (subset!)

- **Financial intermediation:** Fostel and Geanakoplos (2009), Adrian and Shin (2010), Gertler and Kiyotaki (2010), Brunnermeier and Sannikov (2014), He and Krishnamurthy (2013), Nuño and Thomas (2013), Martinez-Miera and Suarez (2014), Aldasoro and Faia (2016), Koijen and Yogo (2016), Boissay, Collard and Smets (2016), Korinek and Nowak (2017), Gersbach and Rochet (2017), Martinez-Miera and Repullo (2017).

- **Monetary policy with financial intermediaries:** Bernanke and Gertler (1995), Gertler and Karadi (2011), Gertler, Kiyotaki and Queralto (2011), Aoki, Benigno and Kiyotaki (2015), Curdia and Woodford (2009), Challe, Mojon and Ragot (2013).

- **Financial cycles:** Lorenzoni (2008), Genakoplos (2010), Bruno and Shin (2014); Jimenez et al. (2014); Miranda-Agrippino and Rey (2015); Schularick and Taylor (2012); Krishnamurthy and Muir (2016); Mian, Verner and Sufi (2016); Guerrieri and Uhligh (2016); Guerrieri and Lorenzoni (2017); Kaplan, Mitman and Violante (2017); Bordalo, Gennaioli and Schleifer (2017), Berger et al (2018).

Stylized facts in the cross-section

Heterogeneity in leverage dynamics

We use balance sheet data from Bankscope from 1993 to 2015

- 959 private financial intermediaries
- 25 countries
- Leverage defined as ratio of total assets to common equity
- Average of 417 observations per year (unbalanced)

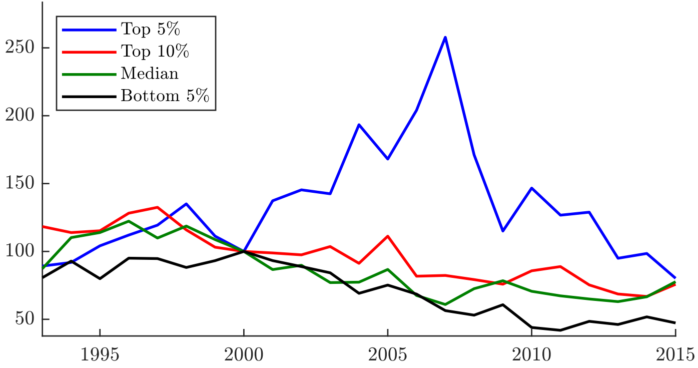
To weigh observations by their importance on aggregate we often use asset weights where:

$$w_{it} = \frac{Assets_{it}}{\sum_{j=1}^{N} Assets_{jt}}$$

Stylized facts in the cross-section

Heterogeneity in leverage dynamics

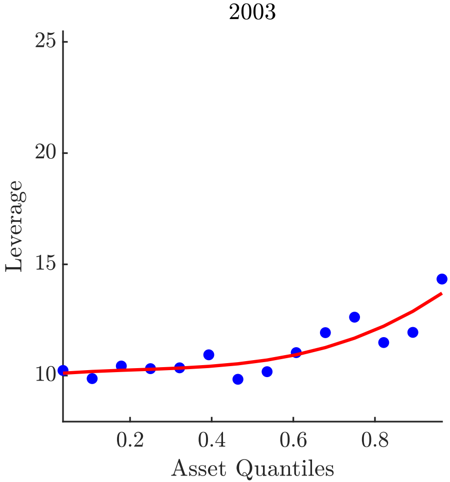
Asset-weighted quantiles of leverage, 2000=100



Unweighted

Stylized facts in the cross-section

Distribution of leverage in the cross-section



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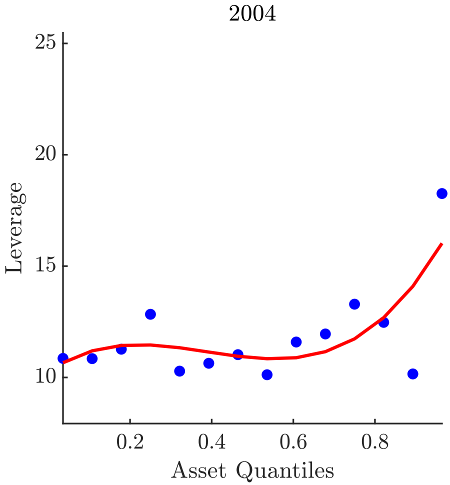

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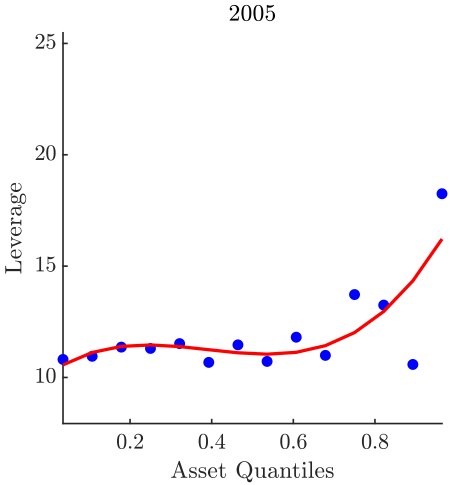

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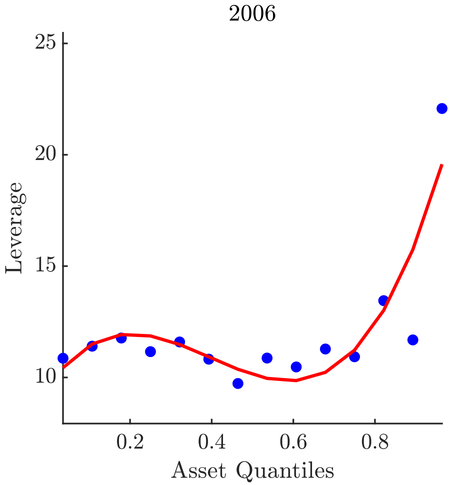

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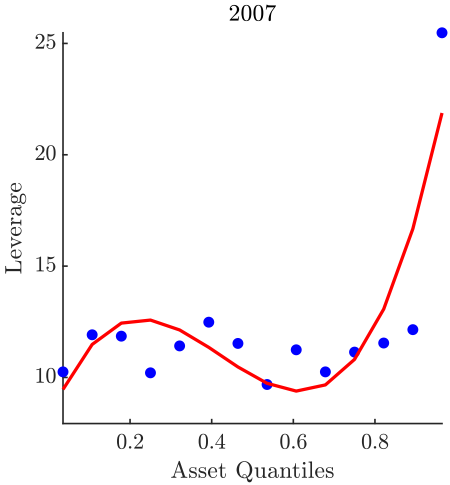
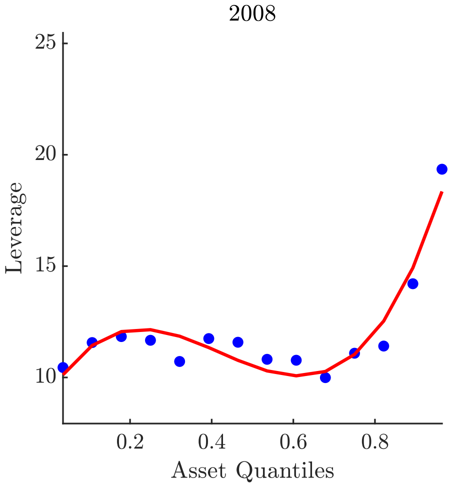
Distribution of leverage in the cross-section



Stylized facts in the cross-section

Distribution of leverage in the cross-section



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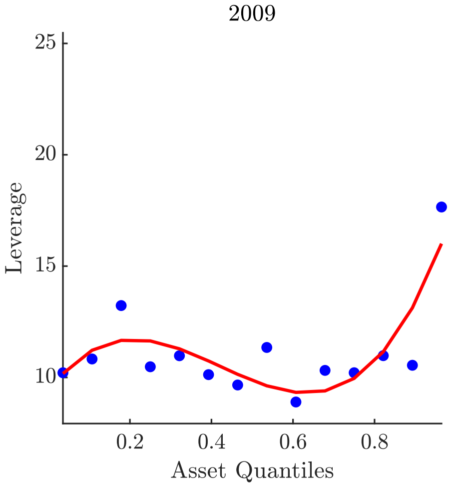

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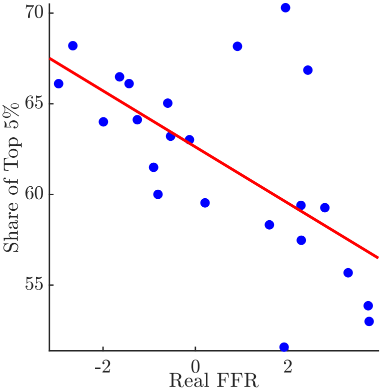


Share of assets of the top 5% most levered intermediaries in total intermediaries' assets and real FFR Nominal FFR

Stylized facts in the cross-section

Leverage and the Fed Funds Rate

We run simple regressions to investigate further this link.

The baseline specification is as follows:

$$Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_2 FF_t + \beta_3 Top5_{i,t} + \\ + \beta_4 FF_t \times Top5_{i,t} + \alpha_i + \varepsilon_{i,t}$$

Stylized facts in the cross-section

Investigating link with Fed Funds Rate

	$Lev_{i,t}$	$Lev_{i,t}$	$\Delta Lev_{i,t}$	$Lev_{i,t}$	$Lev_{i,t}$	$\Delta Lev_{i,t}$
$Lev_{i,t-1}$	0.459***	0.433***		0.449***	0.432***	
	(0.013)	(0.013)		(0.013)	(0.013)	
FF_t	0.066	0.019				
	(0.063)	(0.085)				
$Top5_{i,t}$	26.53***	25.81***	15.04***	26.60***	25.91***	14.99***
	(1.369)	(1.441)	(1.503)	(1.371)	(1.442)	(1.505)
$Top5_{i,t} \times FF_t$	-1.870***	-2.334***		-1.873***	-2.349***	
	(0.287)	(0.403)		(0.286)	(0.402)	
$Top10_{i,t}$		6.488***			6.627***	
		(1.040)			(1.041)	
$Top10_{i,t} \times FF_t$		0.321			0.333	
		(0.309)			(0.309)	
$Median_{i,t}$		2.346***			2.482***	
		(0.562)			(0.566)	
$Median \times FF_t$		0.156			0.160	
		(0.130)			(0.130)	
ΔFF_t			-0.045			
			(0.078)			
$Top5_{i,t} \times \Delta FF_t$			-0.911***			-0.915***
			(0.347)			(0.347)
N	5325	5325	5325	5325	5325	5325
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	Yes	Yes	Yes
R^2	0.67	0.62	0.02	0.67	0.61	0.02

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

Stylized facts in the cross-section

Summing up

- Strong cross-sectional heterogeneity in leverage dynamics
  - By leverage quantiles
  - By asset quantiles
- Pre-crisis rise in leverage concentrated in large, highly levered institutions
  - Not emulated by median quantiles, if anything reduced leverage
  - Increase in cross-sectional concentration of leverage pre-2008
- Links with Fed Funds Rate:
  - Strong correlation with cross-sectional concentration
  - Correlated with leverage of large, highly levered institutions
  - No systematic effect apparent correlation for others

Model

Intermediaries

- Have limited liability, are risk neutral and have heterogeneous Value-at-Risk constraints.
- Collect deposits from households and invest in risky capital or invest in a constant return to scale storage technology. Live for two periods (OLG).
- Leveraged intermediaries can default in equilibrium.

Households

- Infinitely-lived and risk averse. Can have deposits or invest in storage technology. Cannot invest directly in risky projects.

Official sector

- Government guarantee deposits. Lump sum tax.
- Monetary authority provides wholesale funding (affects average cost of funds.)

Firms, Production and Aggregate Returns

Production Function

- Output Y_t is produced according to:

$$Y_t = Z_t K_{t-1}^{\theta} L_t^{1-\theta}$$
$$\log Z_t = \rho^z \log Z_{t-1} + \varepsilon_t$$
$$\varepsilon_t^z \sim N(0, \sigma_z)$$

- Firm maximization ($L_t = \bar{L}$)

$$W_t = (1-\theta) Z_t K_{t-1}^{\theta}$$
$$R_t^k = \theta Z_t K_{t-1}^{\theta-1} + (1-\delta)$$

Financial intermediaries

At the center of the model are **financial intermediaries**

- Two-period OLG structure (no bequests)
- Born with an endowment of equity $\omega_{it} = \omega$
- When young, buy k_{it} shares in the aggregate capital stock using equity and possibly deposits d_{it} at interest rate r_t^D
- When old, consume net worth and die
- Risk neutral, have limited liability and are subject to a VaR constraint
  - Constrained maximal probability of incurring losses: α^i
  - Heterogeneous across intermediaries: $G(\alpha^i)$

Sticky equity | Time-series of debt and equity | Cross-sectional β

Heterogeneity in Value-at-Risk constraints

Intermediaries are indexed by their **VaR parameter** α^i

- Different risk management cultures or models.
- Regulatory constraints implemented differently across intermediaries (business lines).
  - Basel Committee on Banking Supervision provided a test portfolio to a cross section of banks.
  - Median implied capital requirements calculated by the banks was about 18 million euros. The minimum was 13 million euros and the maximum was 34 million euros.

Financial intermediaries

Role of frictions

- Interaction of **limited liability** with different probabilities of default leads to different willingness to pay for risky financial assets (**risk-shifting**).
- Due to **deposit guarantees**, depositors do not discriminate based on intermediary default risk.

The financial intermediary

Intermediary balance sheets

The intermediary balance sheet:

Assets	Liabilities
k_{it}	ω_{it}
s_{it}	d_{it}

Net cash flow after returns are realized:

$$\pi_{i,t+1} = R^K_{i,t+1} k_{it} + s_{it} - R^D_t d_{it}$$

Intermediary problem

The maximization program:

$$
\begin{aligned}
&\max \ \mathbb{E}_t c_{i,t+1} \\
&\text{s.t. } \ \Pr(\pi_{i,t+1} < \omega_t^i) \le \alpha^i \\
&\qquad k_{it} + s_{it} = \omega_{it} + d_{it} \\
&\qquad \pi_{i,t+1} = R^K_{i,t+1} k_{it} + s_{it} - R^D_t d_{it} \\
&\qquad c_{i,t+1} = \max\left(0, \pi_{i,t+1}\right)
\end{aligned}
$$

Intermediary problem

Intermediaries choose optimally to participate or not in risky asset markets

- A **risky** participating intermediary chooses to be levered

$$V_{it}^{L} = \max_{k_{it}, d_{it} > 0} E_t \left[max(0, R_{i,t+1}^{K} k_{it} + s_{it} - R_t^{D} d_{it}) \right]$$

- A **safe** participating chooses to invest without leverage

$$V_{it}^{N} = \max_{k_{it} \leq \omega} E_t \left[R_{i,t+1}^{K} k_{it} + s_{it} \right]$$

- A **non-participating** intermediary stores its entire net worth

$$V_{it}^{O} = \omega$$

Extensive margin

- Entry conditions: an intermediary takes as given the price of deposits R_t^D, the aggregate capital stock K_t, the expected productivity Z_{t+1}^e and compares the value of entering the market to its outside option, subject to its Value-at-Risk contraint.

- An intermediary will participate in the market for risky assets iff $V_{it}^L \geq \omega$ or $V_{it}^N \geq \omega$ and its Value-at-Risk constraint is satisfied.

Extensive margin

Whenever $\mathbb{E}_t\left[R^K_{t+1}\right] \geq 1$ there are 3 business models

- **Risky Business Model**: $\alpha^i > \alpha^L_t$
  - Enter market for risky projects and lever up to VaR constraint
  - $\alpha^j = \alpha^L_t \Rightarrow V^L_{jt} = V^N_{jt}$
- **Safe Business Model** $\alpha^i \in \left[\alpha^N_t, \alpha^L_t\right]$
  - Enter market for risky projects but do not lever up
  - $\alpha^j = \alpha^N_t \Rightarrow$ VaR binding for $\lambda_{jt} = 1$
- **Non-Participation** $\alpha^i < \alpha^N_t$
  - Invest entire net worth in storage

Intensive margin: Heterogeneous leverage

For levered intermediaries ($\alpha^i > \alpha_t^L$), leverage is given by:

$$\lambda_t^i \equiv \frac{k_{it}^L}{\omega} = \frac{r_t^D}{r_t^D - \theta Z_t^{\rho^z} K_t^{\theta-1} \; F^{-1}(\frac{\alpha^i - \zeta}{1-\zeta}) + \delta}$$

Conditional on participation, λ_t^i is:

- Increasing in intermediary risk-taking α^i
- Decreasing in cost of leverage: r_t^D
- Increasing in expected returns: $\theta Z_t^{\rho^z} K_t^{\theta-1} - \delta$
- Decreasing in idiosyncratic risk ζ and TFP volatility σ_z

Heterogeneous leverage and second derivatives

A fall in rates r_t^D:

- Has a larger effect on leverage, the lower are rates to begin with: $\frac{\partial^2 \lambda_t^i}{\partial (r_t^D)^2} > 0$
- Has a larger effect on leverage, the more risk-taking is the intermediary: $\frac{\partial^2 \lambda_t^i}{\partial r_t^D \partial \alpha^i} < 0$

Leverage more elastic wrt cost of funds for more risk-taking intermediaries and lower rates.

Financial Market Equilibrium

To close the financial market equilibrium, we need to use the market clearing condition for the aggregate capital stock:

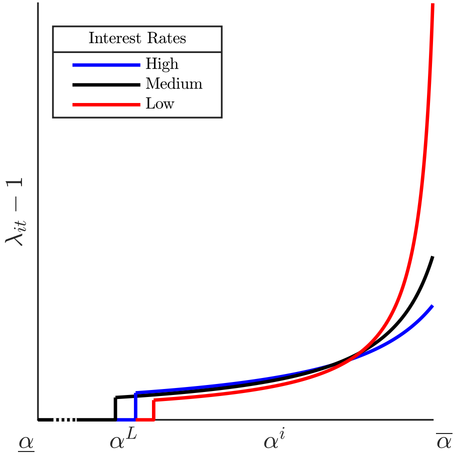
$$K_t = \int_{\alpha^N}^{\alpha_t^L} k_{it}^N \, dG(\alpha^i) + \int_{\alpha_t^L}^{\overline{\alpha}} k_{it}^L \, dG(\alpha^i)$$

- Financial block described by the joint dynamics of $(\alpha_t^L, r_t^D, Z_{t+1}^e, K_t)$.

- For a given r_t^D and Z_t^e, we can solve for (K_t, α_t^L)
  - Indifference condition $V_{it}^L = V_{it}^N$
  - Market clearing condition

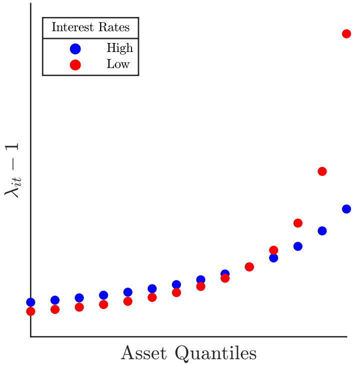
$\Rightarrow$ **Deposit demand curve:** $\mathcal{D}_t(r_t^D)$

Partial Equilibrium: taking financing costs as given



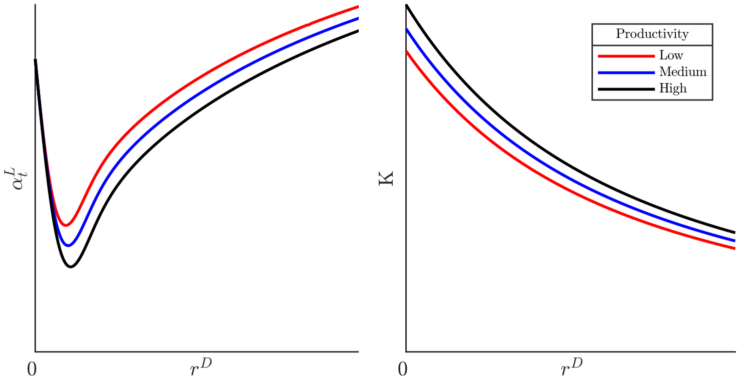
Cross-sectional distribution of leverage as a function of α^i

Partial Equilibrium: taking financing costs as given



Cross-sectional distribution of leverage by asset quantile

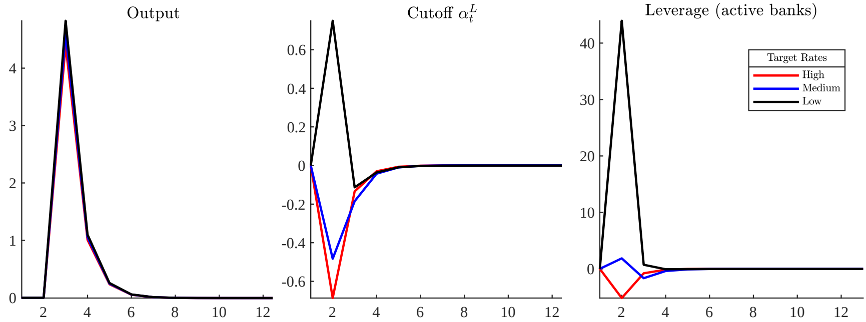
Partial Equilibrium



Cut-off and aggregate capital as a function of deposit rates.

- Macroeconomic variables (K, C, Y) are smooth but the underlying financial structure supporting aggregate outcomes can be very different.

Partial Equilibrium



IRFs to a 100 bp shock to deposit rates (% changes)

$$R_t = \bar{R}^{1-\nu} R_{t-1}^{\nu} \varepsilon_t^R$$

Elasticity of returns of capital and financial stability

Intuition can be gained by looking at a fall in interest rates in two extreme cases.

- An inelastic capital stock (real estate?): $K_t = \bar{K}$
  - Riskier intermediaries can buy more as the constraint relaxes, so some less risky intermediaries must exit the market. Price adjusts and the cutoff rises $\Rightarrow$ *Conservative players drop out.*

- A perfectly elastic capital stock: $E[R^K_{t+1}] = \bar{R}^K$
  - Since expected returns remain unchanged, a decrease in the cost of leverage will always lead to entry. Capital stock grows and the cutoff falls $\Rightarrow$ *Conservative players enter.*

Volatility Paradox

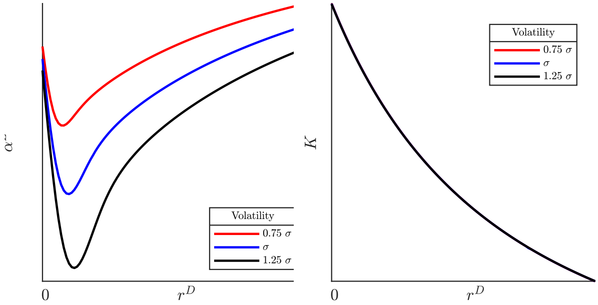


Figure: Comparative statics on volatility and interest rates: lower volatility leads to higher risk concentration.

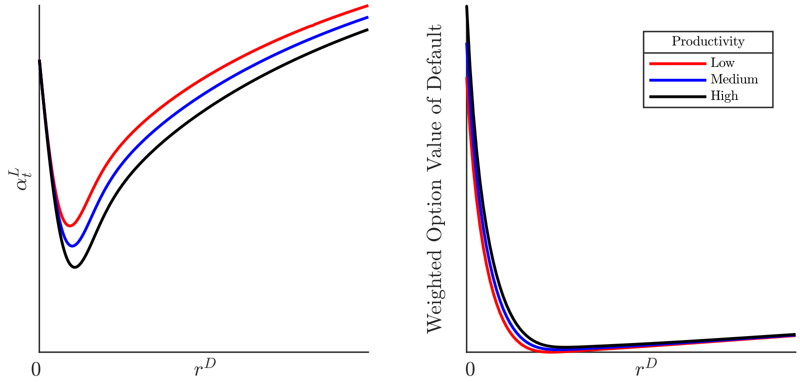
Financial (In)Stability Measures

Financial stability: multidimensional object depending on time-varying cross-sectional distributions of leverage, default risk and risk-taking

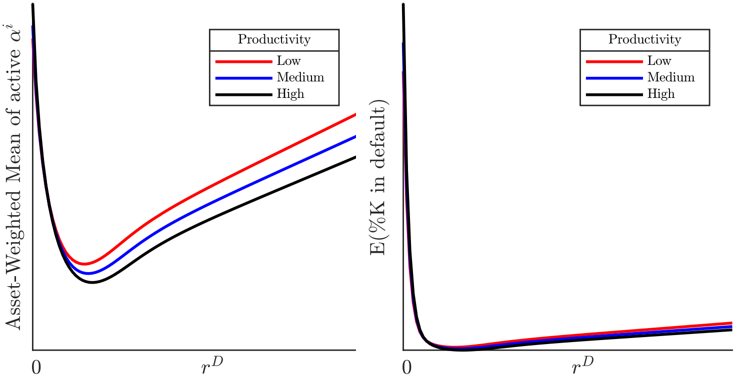
Two main summary measures of financial instability:

- M^1: Probability that the entire leveraged part of the financial system has a negative ROE
  - $M^1_t = \alpha^L_t$
  - Tracks risk-attitude of marginal investor
- M^2_t: Asset-weighted option value of default
  - Limited liability creates an option value of default
  - Measure of aggregate distortions caused by risk-shifting
- Other alternative measures explored in the paper

Financial Instability Measures



Alternative Systemic Risk Measures



General Equilibrium

- Partial eq: r_t^D assumed to be exogenous
- General eq: r_t^D is the price that clears the market for funds
  - Household program defines a deposit supply curve
  - Financial sector block defines a deposit demand curve
  - In equilibrium $D_t^H = \int d_{it} dG(\alpha^i)$

- Households are assumed to be able to both invest in deposits and storage
  - ...but not directly in the capital stock
  - Also provide a fixed supply of labour $\bar{L} = 1$ and pay lumpsum taxes T_t

General equilibrium

Households

Representative household:

$$\max_{\left\{C_t, S_t^H, D_t^H\right\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \beta^t u(C_t^H) \qquad \text{s.t.}$$

$$C_t^H + D_t^H + S_t^H = R_{t-1}^D D_{t-1}^H + S_{t-1}^H + W_t - T_t$$

- Households deposit D_t^H (return $= R_t^D$) with financial intermediaries or invest in storage technology S_t^H (return=1).

$$u(C) = \frac{C^{1-\psi} - 1}{1 - \psi}$$

- Intertemporal consumption saving decision.

Integrating monetary policy with the intermediary problem

- Monetary policy has the effect of decreasing the real cost of funds. Deregulation could also play the same role. Or shifts in preference for savings (savings glut).

- Monetary policy: Intermediaries now have also access to wholesale funding l_{it} at rate R_t^L

$$k_{it} = \omega + d_{it} + l_{it}$$

Monetary policy

Assumption 1: Up to χ units of Central Bank funding per unit of deposits d^i

$$l_{it} = \chi d_{it}$$

Assumption 2: Central Bank funds are provided at a spread from deposit rates

$$R^L_t = (1 - \gamma_t) R^D_t$$

Assumption 3: Deep-pocketed monetary authority

- Internal asset management not modelled
  - Can always fund wholesale funding
  - Interest differential is deadweight loss/gain

Monetary policy

Intermediary balance sheets

Assets	Liabilities
k_{it}	ω
s_{it}	d_{it}
	l_{it}

Monetary policy

Intermediary balance sheets

Assets	Liabilities
k_{it}	ω
s_{it}	f_{it}

Monetary policy

Intermediary balance sheets

Assets	Liabilities
k_{it}	ω
s_{it}	f_{it}

with

$$R_t^F = \frac{1+\chi(1-\gamma_t)}{1+\chi} R_t^D$$

$$f_{it} = d_{it}(1+\chi)$$

Intermediary problem is then the same, but now there is a wedge

- Between deposit rates and the cost of funding
- Between total deposits and total funding

Solving the model

Calibration

Calibrating $G(\alpha^i)$

To clarify the composition effect, we assume the mass of each intermediary is constant across the distribution so:

$$\alpha^i \sim \mathbb{U}[0, \overline{\alpha}]$$

To calibrate $\overline{\alpha}$, we look at FDIC data on failed banks and find the median age of failed banks to be 20 years approximately. We then calibrate $\overline{\alpha}$ such that the median bank will have a default probability of 5% at steady-state.

Calibration

Calibrating the process for γ_t, λ_t and ω

To calibrate the process of γ_t, we fit an AR(1) in logs to the difference between the FFR and $1/\beta$, the model's long run deposit rate.

To calibrate χ, we use Bankscope data and target the percentage of wholesale funding in total liabilities: $\frac{\chi}{1+\chi} = 0.41$

For ω, we target an average leverage at the stochastic steady-state of 7.3, the asset-weighted mean using Bankscope data for levered intermediaries and a leverage of 1 for Other Financial Institutions (Global Shadow Banking Report, Financial Stabillity Board, 2015).

Calibration

Parameter	Value	Description
ψ	4	Risk aversion parameter
β	0.96	Subjective discount factor
ρ^z	0.9	AR(1) parameter for TFP
σ_z	0.03	Standard deviation of TFP shock
μ^γ	0.023	Target spread over deposit rates
ρ^γ	0.816	Spread persistence
σ_γ	0.0128	Standard deviation of spread
$\frac{\chi}{1+\chi}$	0.41	Wholesale funding percentage
θ	0.35	Capital share of output
δ	0.1	Depreciation rate
ω	0.697	Equity of intermediaries
$\overline{\alpha}$	0.4961	Upper bound of distribution $G(\alpha^i)$
ζ	0.01	Probability of idiosyncratic shock

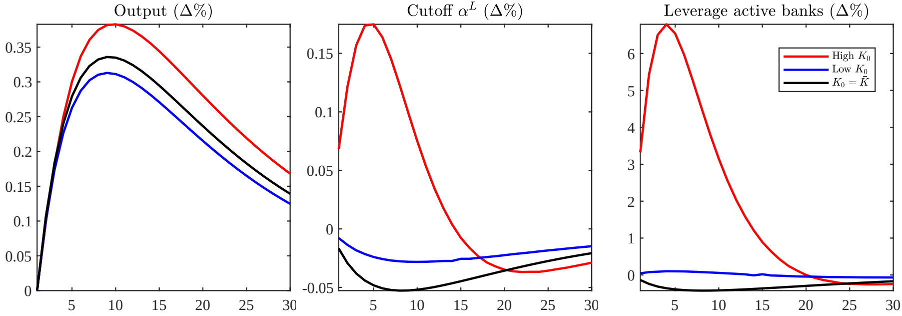
Monetary policy and systemic risk

We now compare the IRFs at 3 different parts of the state space:

- **Scenario 1:** Starting with large $K_{t-1} \Rightarrow$ "low" R^D
- **Scenario 2:** Starting with $K_{t-1} = \bar{K} \Rightarrow$ "average" R^D
- **Scenario 3:** Starting with low $K_{t-1} \Rightarrow$ "high" R^D

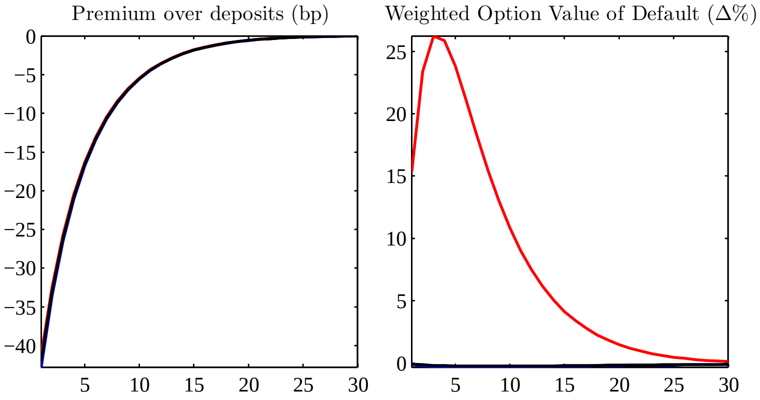
General Equilibrium: IRF to monetary policy shock

Monetary policy: decreases cost of wholesale funds; decreases average cost of funds.



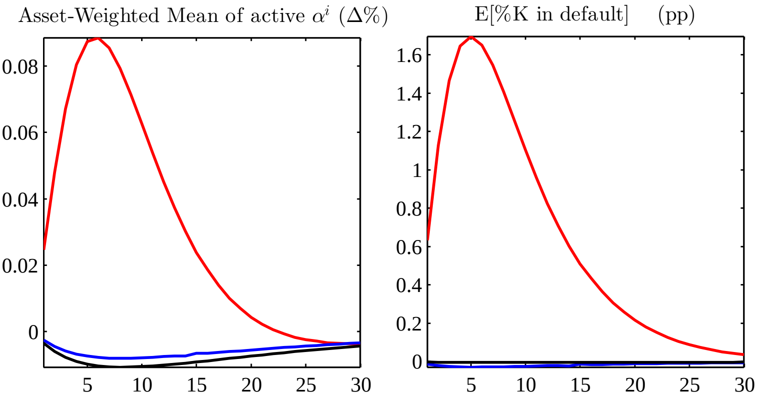
Monetary Policy Shock

Financial variables



General Equilibrium: IRF to monetary policy shock

Systemic Risk Measures



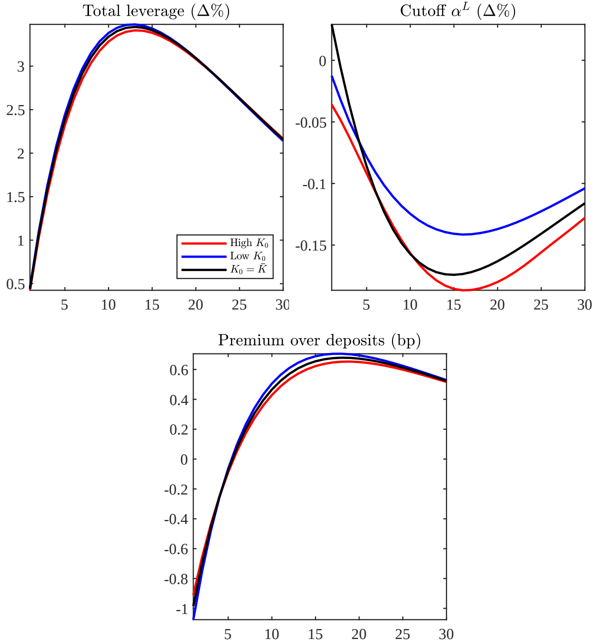
Monetary Policy in General Equilibrium

Monetary policy modelled as affecting cost of funds.

- It affects:
  - The composition of the financial sector.
  - Aggregate risk-shifting
- Credit booms due to fall in cost of funds associated with
  - Decreases in the risk premium
  - Higher skewness of the cross-sectional distribution of leverage.

Meaningful tradeoff between monetary policy and financial stability when rates are low.

General Equilibrium: IRF to a positive productivity shock



Systemic crises and efficiency losses: costly default

- When intermediaries cannot repay their deposits:
  - Government taxes households
  - Repays deposit insurance
- Assets held by defaulting intermediaries suffer a proportional sunk cost $\overline{\Delta}$ (bankruptcy costs).

$$R_{it}^{Def} = (1-\overline{\Delta})\theta Z_t K_{t-1}^{\theta-1} + (1-\delta)$$

- Crisis might also affect productivity in following periods
  - Poisson shock ξ determines if economy remains distressed
  - If yes, productivity loss is proportional to the mass of capital held by defaulting intermediaries μ_t^D
  - Scaled by the maximal loss: $\overline{\Delta}$

Calibration with costly default - Additional Parameters

Parameter	Value	Description
$P(\xi = 1)$	0.5	Average crisis length of 2 years
$\overline{\Delta}$	0.115	Efficiency loss of 11.5%

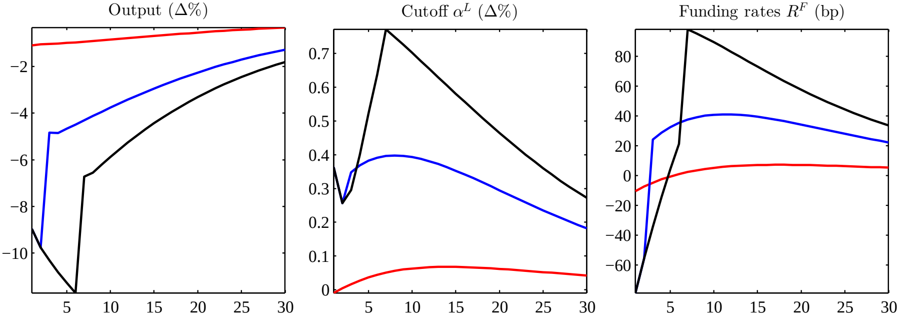
Systemic crises and productivity shocks

We now compare the IRFs of 3 scenarios:

- **Scenario 1:** Largest negative productivity shock that doesn't trigger defaults
- **Scenarios 2 and 3:** Negative shock that triggers defaults of intermediaries holding 50% of the capital stock
  - **Scenario 2:** Crisis lasts one period: $\xi_t = 1$
  - **Scenario 3:** Crisis last for 5 periods longer: $\xi_s = 1$, $\forall_{s \in [t, t+5]}$

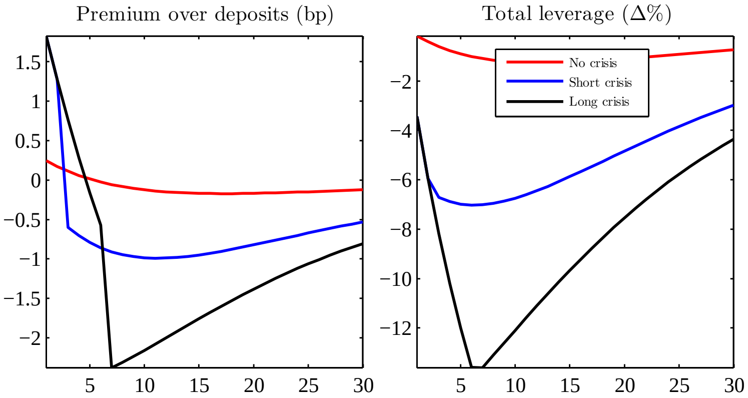
IRF to large productivity shocks

Key variables



IRF to TFP shocks

Financial variables



Productivity shocks in General Equilibrium

- Risk premium increases on impact during crisis and then decreases.
- Wealth of households is depleted when crisis is long. Dynamic effect means that cost of funds has to go up when productivity picks up again.
- The more fragile is the system, the smaller the shocks needed to trigger a crisis.

Model generates Good Booms and Bad Booms

Bad Booms.

- When there is a monetary expansion:
  - GDP expands
  - Risk premium decreases sizably
  - **When interest rate is low**, financial stability deteriorates sizably

Good Booms.

- When there is a positive productivity shock:
  - GDP expands
  - Risk premium does not move much (goes down a bit)
  - Financial stability improves

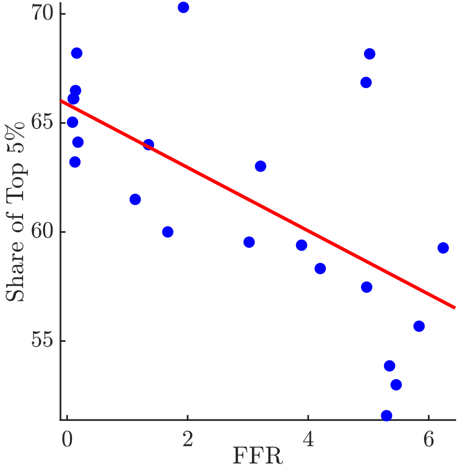
Conclusion

A new tractable framework with heterogeneous financial intermediaries

- Time variation in leverage, risk-shifting and systemic risk (default of intermediaries)
- Can generate credit booms associated with low risk premia
- Trade-off between monetary policy and financial stability
  - Only when rates are low
  - Risk-taking channel of monetary policy.
- Fits time variation in cross-sectional patterns of leverage
- Potential applications include international capital flows; real estate markets.

Additional Slides

Cross-sectional leverage concentration and nominal FFR



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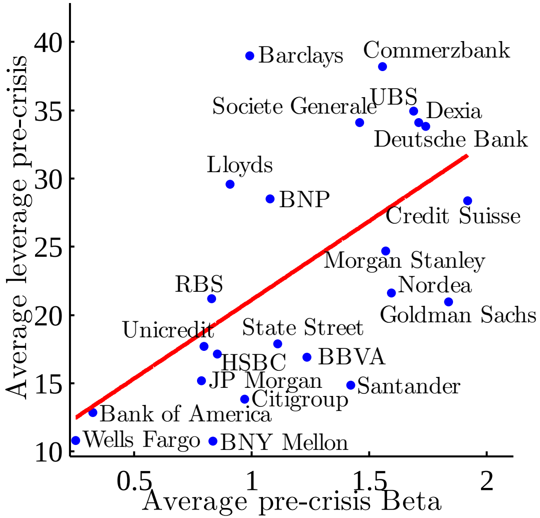
Leverage and market betas



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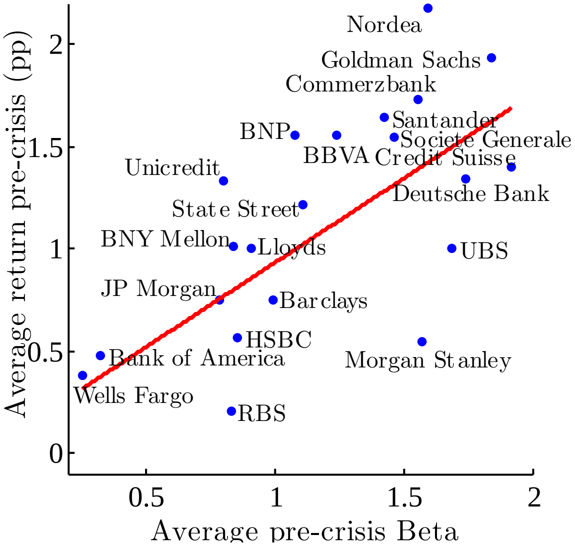
Returns and market betas



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General equilibrium

Financial sector equilibrium

- We first solve for the financial sector equilibrium on a grid of (R^F, Z^e).

General equilibrium block

- First we discretize the state space using a Tauchen-Hussey procedure for the AR(1) processes (Z, γ)
- Guess R_0^F and set storage policy function $S_0 = 0$
- Obtain capital and deposits from the financial sector block
- Update prices using the consumer Euler Equation and storage using the household budget constraint.
- Iterate until convergence

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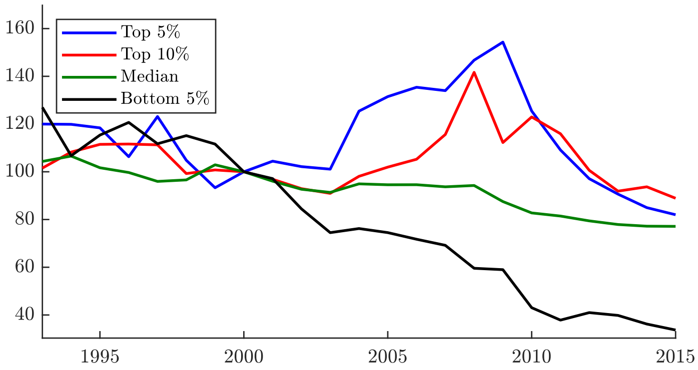
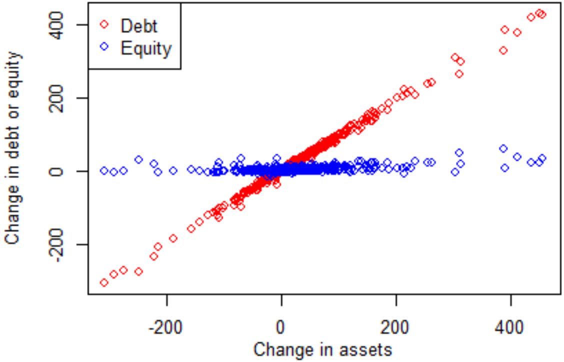
Stylized facts in the cross-section

Substantial heterogeneity in the behaviour of leverage

Unweighted quantiles of leverage, 2000=100

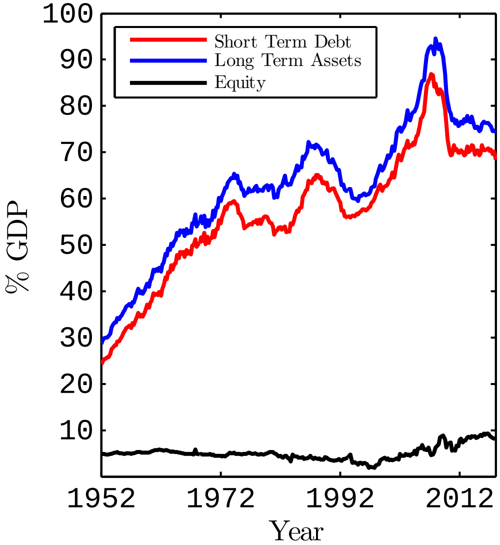


Yearly changes in assets due to changes in equity and/or debt



Source: Bankscope, billions of dollars, 1993-2015. Back

Time series of assets, debt and equity



Results

- Standard effects of reductions in the cost of funding for intermediaries (regulation, monetary policy, savings glut) on aggregate investment
- But **non-monotonic effects** of reductions in the cost of funding on **financial stability**
- Sign of the effect on systemic risk depends on the level of funding costs
  - From a **high** level: systemic risk falls due to entry of less risk taking intermediaries
  - From a **low** level: rise in systemic risk as less risk-taking intermediaries are priced out by more risk-taking ones
- Time variation in the distribution of leverage across intermediaries
- Time variation in risk premium