Sovereign Default and Banking

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The Story

- Prudential regulation is necessary to prevent excessive risk-taking by banks
- Prudential regulation relies on “safe assets”
- Government bonds are considered safe by regulator

- When government debt is no longer safe,
- Prudential regulation fails – banks gamble
- Government default brings about banking crisis

- Examples?
  - Russia in 1998
  - Argentina in 2001

The Story

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- Examples?
  - Russia in 1998
  - Argentina in 2001
  - Europe in 2011?

The Plan

- Very simple model to illustrate the story
- What do we learn?
  - The government may *choose* to not adjust the regulation
    - Allowing “gambling” lowers the cost of borrowing
  - Funds are diverted away from productive projects
- Make the model a little richer (realistic)
  - Show that key insights are reinforced
- Empirical support
  - Russia: Anecdotes and banks’ balance sheets
  - Europe: Repatriation of debt
- Policy Implications: Lessons for Europe?
  - Should LTRO allow GIPSI banks to buy GIPSI bonds?

Simple Model: Roadmap

- Simplest model with role for banking regulation:
- Banks can invest in
  - Safe projects
  - Risky projects = bad gambles
    - Lower expected return, but chance of a high payoff
  - Government bonds

- Laissez-faire: Banks invest in risky projects
- Prudential regulation prevents this excessive risk-taking

- If government bonds are risky,
- but regulation considers them safe,
- regulation fails

Simple Model. Banking

- Competitive risk-neutral bankers
- Investment opportunities
  - Safe projects:
    - Deterministic return r
  - Risky projects:
    - Return R with probability p, 0 otherwise
    - Can be perfectly correlated
    - $pR < r < R$
  - Government bonds:
    - Pay $(1 + i_g)$
    - Interest rate is endogenous

Simple Model. Banking

- Bankers are essential
  - Non-bankers cannot identify good projects
- Banking is subject to limited liability
- and moral hazard
  - Depositors don't know what banks invest in

- Keeping it simple, take as exogenous:
- Supply of deposits, X
  - from OLG households with Cobb-Douglas preferences
- Government debt, D
- Bankers' total wealth, B

Role for Regulation

- First Best:
  - Invest in safe projects only
  - Implied interest rates: $r = 1 + i = 1 + i_g$

- Laissez-faire:
  - Banks would gamble (due to limited liability):

$$p(R - (1 + i)) > r - (1 + i) = 0$$

- Needed: Prudential regulation:
  - Force the banks to hold enough
    - own wealth (capital)
    - safe securities
  - to make bad gambles unattractive

Simple Prudential Regulation

- Capital requirement
  - Banks must own fraction b of investments

- Reserve requirement
  - Banks must hold fraction q in bonds
    - bonds are in abundant supply: $D > q(X + B)$
    - so that the interest rate $(1 + i_g)$ is endogenous

- Prudential regulation is effective if

$$b \;\; r(1-p) \geqslant (1-q) \;\; p(R-r)$$

- The regulation achieves the First Best

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$$b \;\; r(1-p) \geqslant (1-q) \;\; p(R-r)$$

- The regulation achieves the First Best
  - As long as the bonds are indeed risk-free

Possibility of Government Default

The Environment:

- Government debt is now risky
- The default probability is exogenous
  - abstracts from endogenous cost of default, etc.
  - to highlight one key mechanism
- The default probability is $(1-p)$
  - there are risky projects perfectly correlated with debt

What happens if the regulation is not adjusted?

Possibility of Government Default

The Equilibrium:

- All banks gamble
  - by investing in bonds and perfectly correlated risky projects
- Some may quit banking and invest own capital
- **Bonds are just another gamble**: $1 + i_g = R$
- Deposit interest rate (promised) pinned down by:

$$p(R - (1 - b)(1 + i)) = br$$

- Investment in safe projects is unprofitable: $1 + i > r$

Key Insights

- Equilibrium interest rate on government bonds:
  - If regulation were adjusted: $1 + i_g = \frac{r}{p}$
    - safe banks have to be compensated for default risk
  - If regulation not adjusted: $1 + i_g = R < \frac{r}{p}$
    - gambling banks bid the bond prices up
- Not adjusting the regulation lowers the cost of borrowing
  - may allow government to postpone/avoid default
- Investment is diverted away from productive projects
  - into "gambles" correlated with government bonds

Robustness

Key findings carry on to richer models:

- Endogenous return to risk-free projects
  - Some banks specialize in safe projects
- More sophisticated prudential regulation

In all these models

- Some banks gamble
  - diverting investment away from productive projects
- Default leads to banking crisis
- Govt cost of borrowing is lower
  when regulation is *not* adjusted

Augmented Model

- Make return on safe projects endogenous:
  - There's a fixed measure of safe projects
    - which belong to entrepreneurs, who get the profits
  - with decreasing returns scale
    - r is decreasing in the amount invested in safe projects
- Denote by r^{FB} the (bankers') rate of return when all available funds $(B + X - D)$ are invested in safe projects
- Assume $r^{FB} > pR$ and $r^{FB} < R$
- If govt bonds are safe, regulation works (as before) if

$$b \;\; r^{FB}(1-p) \geqslant (1-q) \;\; p(R - r^{FB})$$

- But what if the debt is risky?

Augmented Model with Risk of Default

- If govt bonds are risky (but presumed safe),
  - Some banks gamble
    - investing in bonds and risky projects
  - Rate of return on safe project goes up
  - Some banks invest in safe projects (survive the crisis)
  - Depositors cannot identify safe banks
- While allowing gambling increases the interest rates,
- The government still faces low borrowing cost: $1 + i_g = R$

Sophisticated Prudential Regulation

$$b(q) = (1-q)\frac{p(R - r^{FB})}{r^{FB}(1-p)}$$

- If govt bonds are safe, regulation works (as before)
- If govt bonds are risky (but presumed safe),
  - Safe banks hold no government bonds
  - Gambling banks hold bonds and correlated gambles
  - Equilibrium interest rates:

$$R > 1 + i_g = r = 1 + i > pR$$

  - Holding govt debt allows capital-poor banks to expand
    - This makes bonds even more attractive and expensive

Anecdotal Evidence from Russia

- Ippolito (2002)
  - Government default did not kill Russian banks
  - Gambling killed Russian banks

Estimates of forward liabilities to non-residents:

Bank	$mln	% of Capital	Bank	$mln	% of Capital
Inkombank	1884	719%	Sberbank	379	23%
Onexim	1442	203%	NRB	224	50%
Vneshtorgbank	1062	136%	Menatep	91	37%
MDM	634	713%	MFK	80	46%
Avtobank	602	299%	Mezhkombank	67	67%

Source: Troika Dialog on the basis of banks' RAS as of 01.07.98

Systematic Evidence: Russia 1998

Correlations between GKO holdings and Currency Risk

Period	All Banks	State	Private	Foreign	Domestic
1998.Q1	0.2173	0.0966	0.2228	0.7431	0.1421
1998.Q2	0.1798	0.1675	0.1820	0.5173	0.1206
1998.Q3	0.0206	-0.1576	0.0280	0.2910	0.0116
1998.Q4	-0.0004	-0.2649	0.0076	0.3717	-0.0177

Systematic Evidence: Regressions

OLS with Currency Risk as Dependent Variable; by Quarter

Variable	1998.Q1	1998.Q2	1998.Q3	1998.Q4
GKO/Assets	0.0955	0.0724	0.0194	-0.0111
	(0.0171)***	(0.0158)***	(0.0273)	(0.0312)
Foreign Dummy	-0.0783	0.0230	-0.0796	-0.0956
	(0.0318)**	(0.0315)	(0.0402)**	(0.0411)**
State Dummy	-0.0311	-0.0163	-0.0218	-0.0278
	(0.0209)	(0.0201)	(0.0296)	(0.0304)
(GKO/Assets)*State	-0.0361	0.0074	-0.1104	-0.1159
	(0.1044)	(0.0899)	(0.1289)	(0.1391)
(GKO/Assets)*Foreign	0.8084	0.3751	0.3522	0.5859
	(0.0826)***	(0.0794)***	(0.1556)**	(0.1683)***
Constant	-0.0030	-0.0021	-0.0038	-0.0094
	(0.0024)	(0.0023)	(0.0036)	(0.0040)**
R^2	0.1357	0.0806	0.0062	0.0108
Adjusted R^2	0.1330	0.0775	0.0028	0.0073

Evidence from Europe

- Repatriation of sovereign debt in Southern Europe
  - Greater share of risky bonds held in home countries
  - A lot of it held by domestic banks

  - Brutti Sauré (2013)

- Banks of troubled countries borrowed from ECB and purchased government bonds
  - Acharya Steffen (2014) “Greatest Carry Trade Ever?”

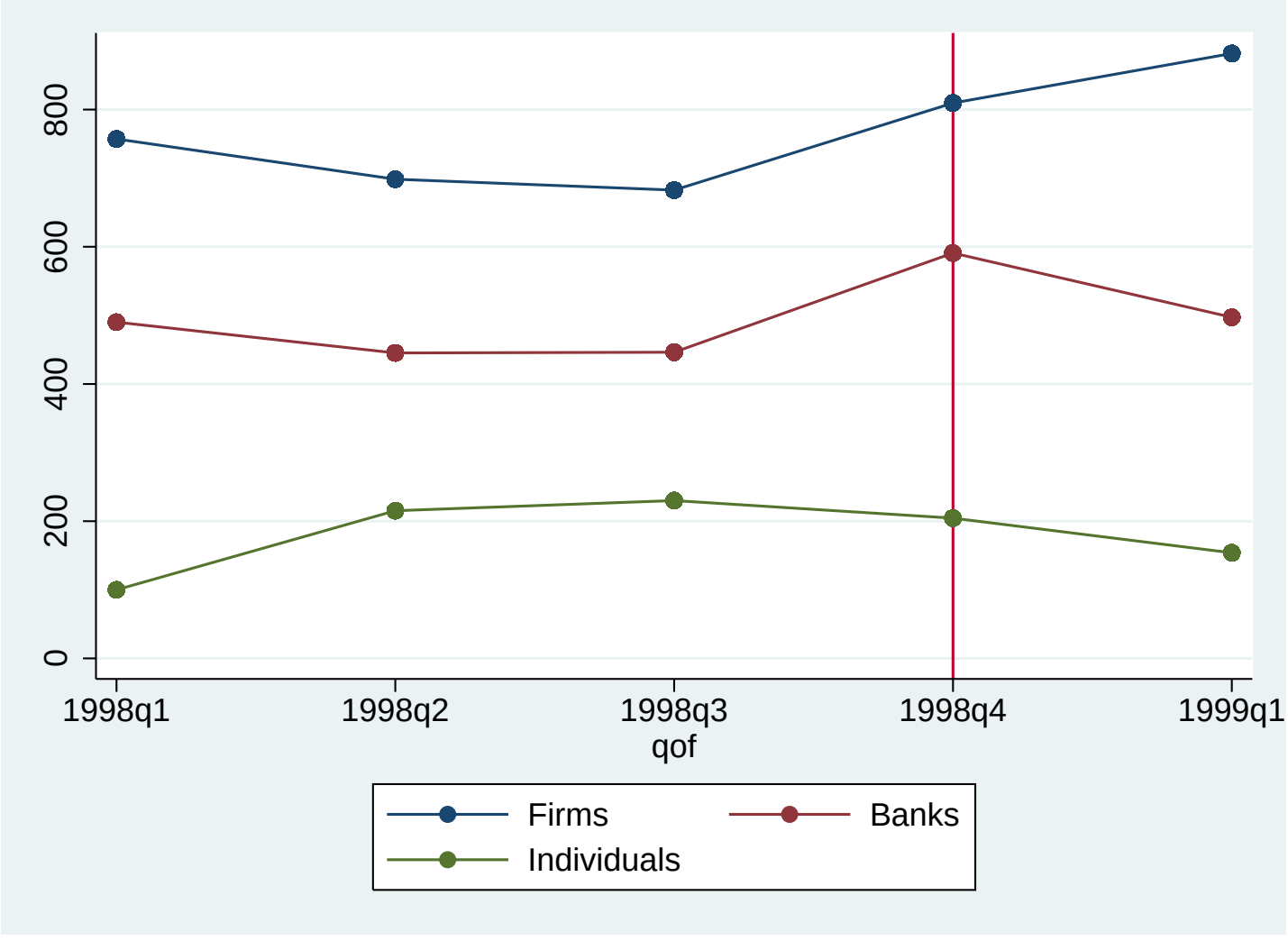
Lesson for Europe?

- LTRO scheme delegated screening of collateral
  - to member countries' central banks
- This may lead to (constitute) failure of prudential regulation
  - This failure may not just be costly *ex-post*
  - It distorts banks' incentives
  - Generating *ex-ante* dead-weight loss
- *If* ECB (eurozone) are willing to subsidize GIPSI borrowing
  - They should do so directly
  - Without introducing distortions into the banking system
  - May as well buy the bonds

Summary

- Prudential regulation that considers *risky* govt bonds safe
  - Generates excessive risk taking by banks
  - Diverts investment from productive projects
  - Default leads to banking crisis
- Governments may *choose* not to adjust the regulation
  - Failure to adjust lowers the cost of borrowing
  - May prolong the life of a government
  - Effectively, the government gambles with the banks
  - Alternative reason: Endogenous commitment
- Evidence (both micro and anecdotal) lends support
- Implication for the design of LTRO in Europe

Bank Deposits by Source



excludes Sberbank

Bankers' Problem: No Regulation

- Safe bank:

$$V^S(w) = \max_{D,q} \left[(D+w)\left(q(1+i_g) + (1-q)r\right) - D(1+i) \right]$$

- Gambling bank: $V^R = \mathrm{E}\max\{\text{Return} - \text{Payment}, 0\}$

$$V^R(w) = \max_{D,q} \ \mathbf{p} \ \left[(D+w)\left(q(1+i_g) + (1-q)R\right) - D(1+i) \right]$$

- Not a bank: $V^N(w) = wr$

- $V(w) = \max\left\{V^S(w), V^R(w), V^N(w)\right\}$

Bankers' Problem: No Risk of Default

- Safe bank:

$$V^S(w) = \max \quad [(D+w)\,(q(1+i_g)+(1-q)r) - D(1+i)]$$
$$\text{s.t.} \qquad q \geqslant \overline{q} \qquad \frac{w}{D+w} \geqslant b$$

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Bankers' Problem: Risk of Default

- Safe bank:

$$V^S(w) = \max \quad (D+w)\left(\mathbf{p}q(1+i_g) + (1-q)r\right) - D(1+i)$$
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Bankers' Problem: CAR Regulation

- Safe bank:

$$V^S(w) = \max \quad (D+w)\left(pq(1+i_g)+(1-q)r\right) - D(1+i)$$
$$\text{s.t.} \qquad \frac{w}{D+w} \geqslant b(q)$$

- Gambling bank:

$$V^R(w) = \max \quad p\left[(D+w)\left(q(1+i_g)+(1-q)R\right) - D(1+i)\right]$$
$$\text{s.t.} \qquad \frac{w}{D+w} \geqslant b(q)$$

- Not a bank: $V^N(w) = wr$

- $V(w) = \max\left\{V^S(w), V^R(w), V^N(w)\right\}$

Why Not change regulation?

- Lower cost of borrowing for the government
  - may postpone/avoid default
- At time T, the govt can repay
  - up to Q_1 with certainty
  - up to Q_2 with probability p
  - where $pQ_2 > Q_1$
- At $(T-1)$, the government can raise
  - up to $D_1 = \frac{Q_1}{r}$ without possibility of default
  - up to $D_2 = \frac{pQ_2}{r} > D_1$ adjusting regulations
  - up to $D_3 = \frac{Q_2}{R} > D_2$ without adjusting regulations
- If government owes $D \in (D_2, D_3]$ it may let banks gamble

Augmented Model with Risk of Default

- With possibility of default and
- Unadjusted naive prudential regulation

  - Safe banks survive the crisis (lose some of their capital)
  - Risky banks fail following default
  - Only risky banks hold govt debt in excess of q
  - $1 + i_g = R$
  - Risky banks: $p(R - (1+i)(1-b)) = br$
  - Safe banks: $pqR + (1-q)r - (1+i)(1-b) = br$
  - Equilibrium interest rates are not revealing

$$\frac{r^{FB}}{p} > R = 1 + i_g > r > 1 + i > r^{FB} > pR$$