Deadly Embrace: Sovereign and Financial Balance Sheet Doom Loops

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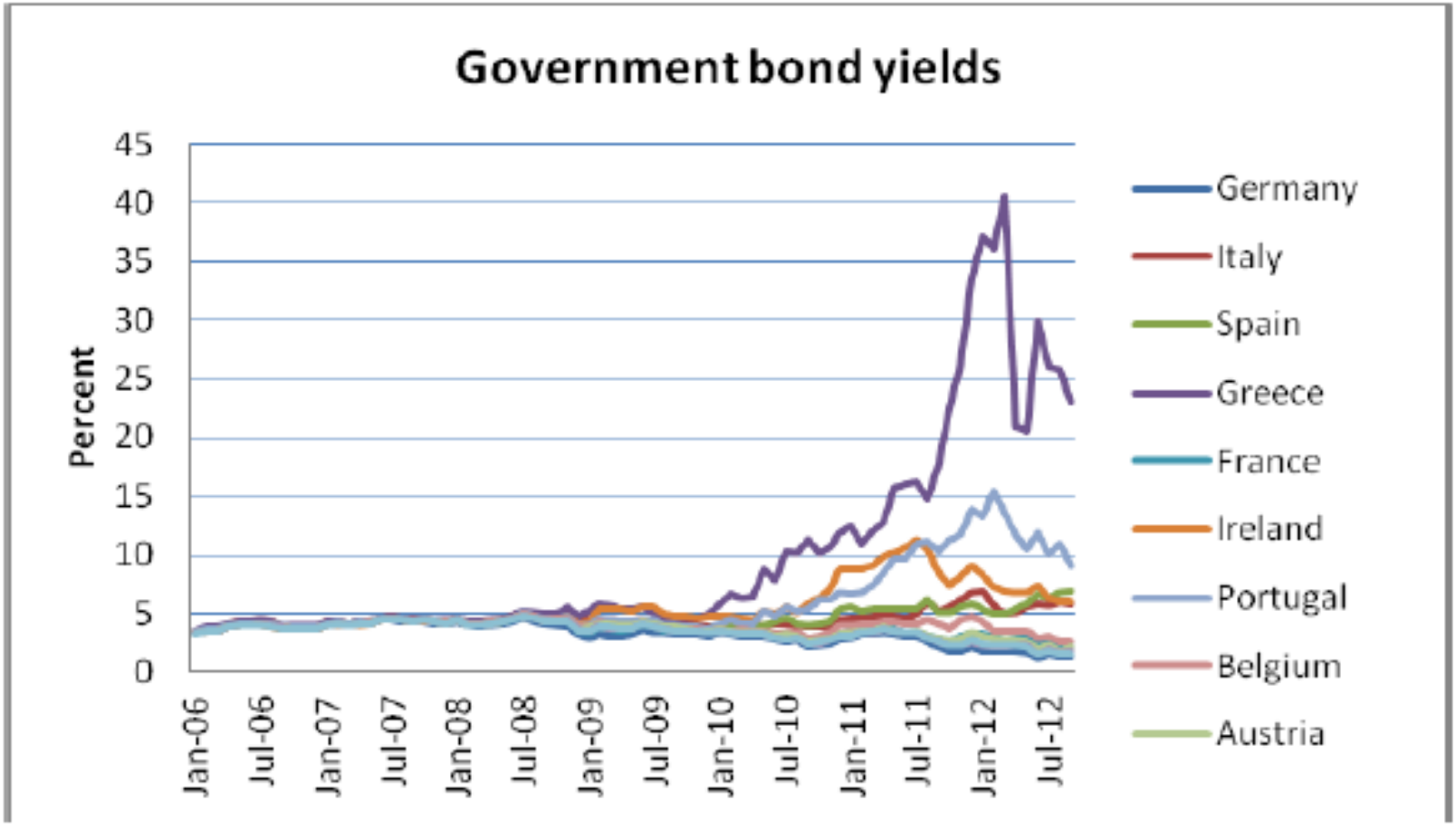
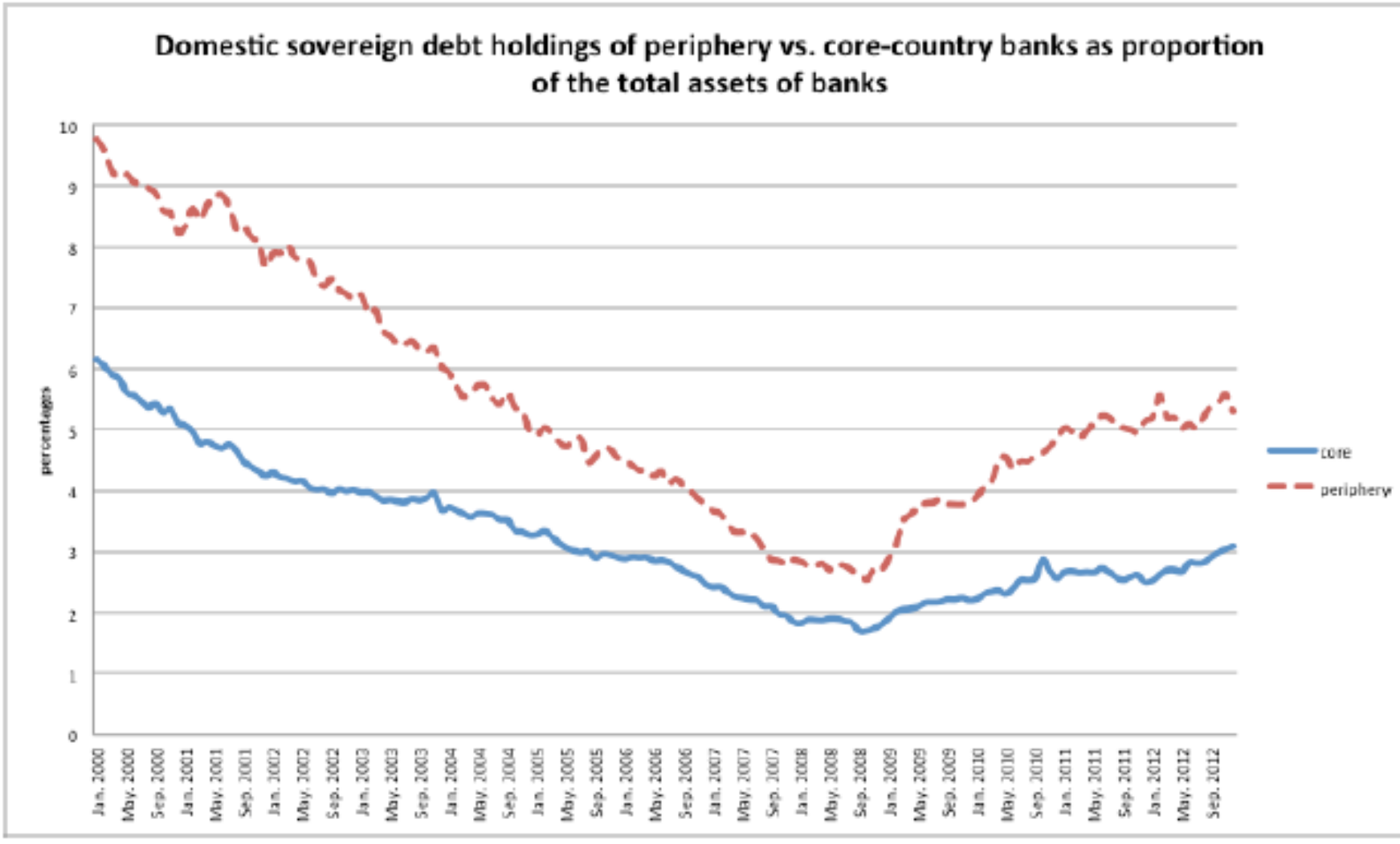
Sovereign Yields in Europe



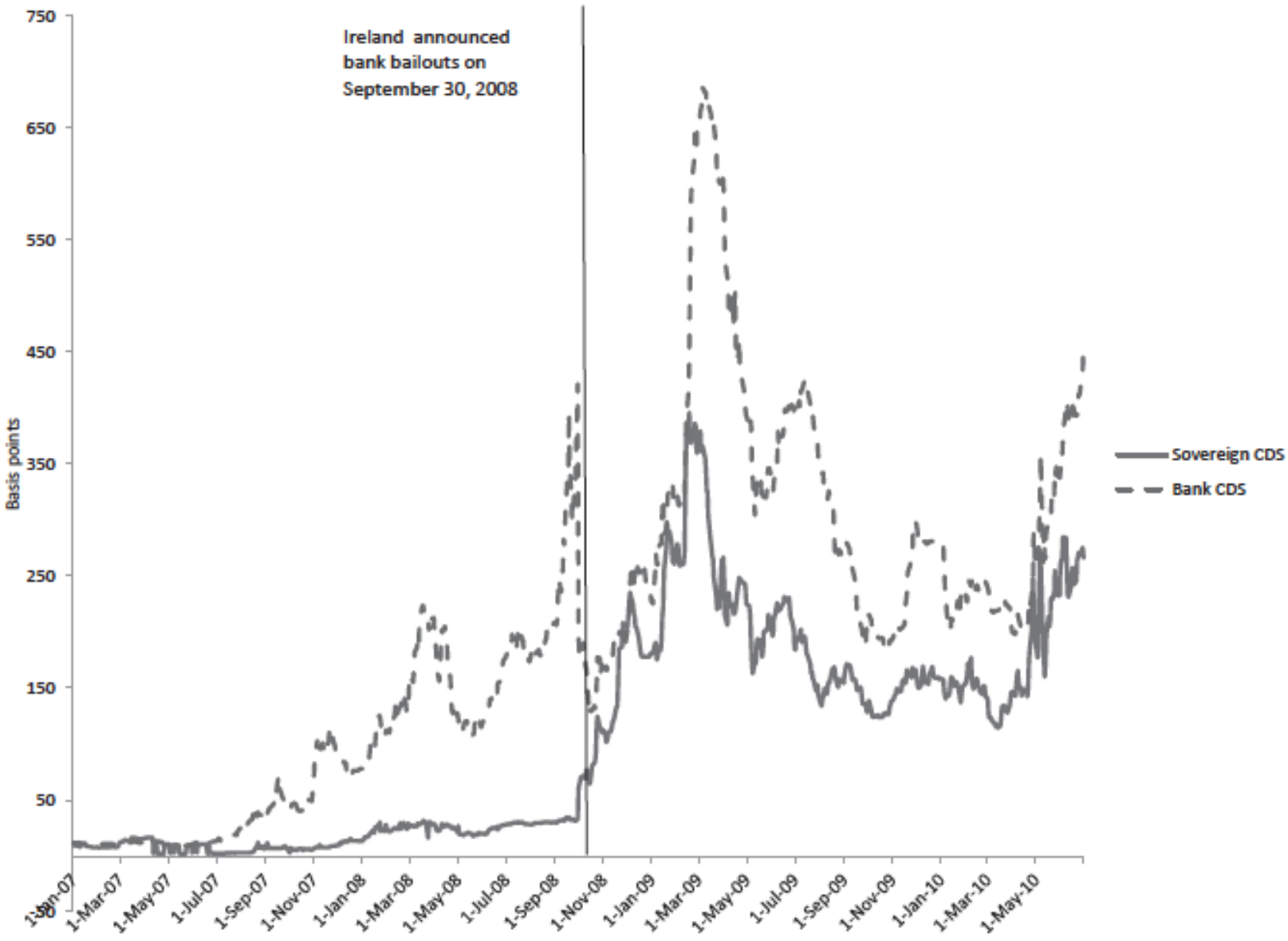
Source: Datastream.

Renationalization of Sovereign Debt



Sources: ECB and authors' calculations.

Doom Loop in Ireland



Euro Crisis

- Euro construction: financial integration
- Euro crisis: financial fragmentation
- Segmentation/renationalization of sovereign bond markets
- Doom loops between banks and sovereigns
- Major impetus for banking union

Many Questions

- Why did segmentation/renationalization occur?
- Why were foreign creditors worried?
- Why did domestic supervisors let it happen?
- What should the policy response be?

Theories?

- This paper: double-decker bailout theory
- Alternative theories:
  - selective default
  - financial repression
  - home bias/hedging

Setup

- Three periods $t = 0, 1, 2$
- Uncertainty:
  - state s revealed at date 1, density $d\pi(s)$
  - residual uncertainty revealed at date 2

International Investors

- Large continuum of international investors
- Date-t utility $V_t^* = \mathbb{E}_t[\sum_{s=t}^{2} c_s^*]$

Domestic Consumers

- Mass-1 continuum of domestic consumers
- Endowment E at date 2
- Consume at date 2 endowment net of taxes
- Utility $V_t^C = \mathbb{E}_t[c_2^C]$
- Density $f(E|s)$

Banking Entrepreneurs

- Mass-1 continuum of banking entrepreneurs
- Endowment A at date 0
- Investment opportunity:
  - $I(s)$ at date 1
  - return $\rho_1(s)I(s) > I(s)$ at date 2, not pledgeable
  - $A \geq \max_{s \in S} I(s)$
- Consume at date 2
- Utility $V_t^B = \mathbb{E}_t[c_2^B]$

Shocks

- High s is good news
- Fiscal: $\frac{\partial(f(E|s)/(1-F(E|s)))}{\partial s} \leq 0$
- Financial: $\frac{dI(s)}{ds} \leq 0$ and $\frac{d(\rho_1(s)I(s))}{ds} \geq 0$

Assets

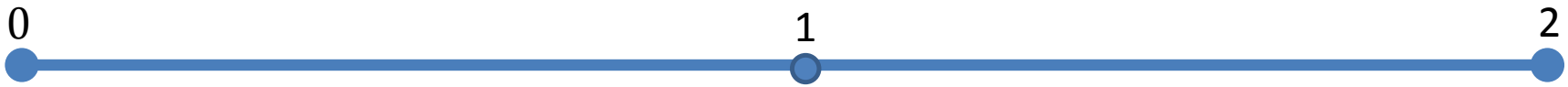
- Domestic banking entrepreneurs invest in assets at date 0, and liquidate them at date 1 to finance investment
- Safe foreign bonds b_0^*
- Risky domestic bonds b_0: price p_0, $p_1(s)$

Government

- Outstanding bonds B_0, maturing at date 2
- Date 1: bank bailout $X(s)$, debt issuance $B_1(s) - B_0$
- Date 2: default at cost Φ or repay, fiscal capacity E
- Government decides without commitment to maximize welfare

$$W_t = \mathbb{E}_t[c_2^C + \beta^B c_2^B + \beta^I(s)\mu(s)I(s)]$$

- $\beta^B < 1$ so pure transfers costly
- $\beta^I(s)$ high enough so that banks bailed out
- Φ high enough that no default if can repay



- Domestic debt market clears at p_0 (WTP of foreign investors)
- Supervisor chooses $\underline{b}_0^{**} \leq \underline{b}_0^{*}$,
- Banks select their portfolios $\left\{b_0, b_0^{*} \geq \underline{b}_0^{**}\right\}$ such that $A = b_0^{*} + p_0\, b_0$.

- State of nature s is realized, determining fiscal prospects $f(E|s)$ and financial needs $I(s)$.
- Government issues $B_1(s)$- B_0 to finance rescue package $x(s)$.
- Banks invest $I(s)$ if they can.

Government (non-selectively) defaults iff $E < B_1(s)$.

Figure : Timeline.

Equilibrium

- Banks load up on domestic debt $b_0^* = \underline{b}_0^{**}$
- Bank net worth at date 1

$$A_1(s) = \underline{b}_0^{**} + (A - \underline{b}_0^{**})\frac{p_1(s)}{p_0}$$

- Bailout

$$X(I(s), \underline{b}_0^{**}, p_1(\underline{s}); p_0) = \max\{I(s) - A_1(s), 0\}$$

- Bond prices

$$p_0 = \int p_1(s) d\pi(s)$$

$$p_1(s) = 1 - F(B_1(s)|s)$$

- Date-1 bond issuance

$$p_1(s)[B_1(s) - B_0] = X(I(s), \underline{b}_0^{**}, p_1(\underline{s}); p_0)$$

Doom Loop

- Two key equations

$$p_1(s) = 1 - F(B_1(s)|s)$$

$$p_1(s)[B_1(s) - B_0] = X(I(s), \underline{b}_0^{**}, p_1(\underline{s}); p_0)$$

- Resulting doom loop

$$\frac{dp_1}{ds} = \frac{-F_s - \frac{f}{1-F} X_I \frac{dI}{ds}}{1 - \frac{f}{1-F}(\frac{X}{p_1} - X_{p_1})}$$

Consolidated Balance Sheet

- Ex-post consolidated balance sheet

$$b_0^* + p_1(s)[B_1(s) - (B_0 - b_0)] = I(s)$$

- Ex-ante consolidated balance sheet

$$b_0^* - p_0(B_0 - b_0) = A - p_0 B_0$$

- Ex-ante decisions of banks (b_0, b_0^*):
  - impact ex-post consolidated balance sheet
  - masked in ex-ante consolidated balance sheet

Welfare

- Equilibrium welfare

$$\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0$$

  - $\mathscr{E}_0$ efficiency term: legacy debt repayment and default costs
  - $\mathscr{R}_0$ distributive term: rents of bankers vs. domestic consumers

- Off-equilibrium welfare (for supervisory decision $\underline{b}_0^{**}$)

$$\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0 + \mathscr{C}_0$$

  - $\mathscr{C}_0$ new distributive term: rents of bankers vs. legacy creditors

Benefits of Supervision

- No supervisory leniency $\underline{b}_0^{**} = \underline{b}_0^*$
  $(\mathscr{E}_0 \uparrow, \mathscr{R}_0 \downarrow, \mathscr{C}_0 \uparrow, \mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0 + \mathscr{C}_0 \uparrow)$
- Benefits of high supervisory capacity $\underline{b}_0^*$
  $(\mathscr{E}_0 \uparrow, \mathscr{R}_0 \downarrow, \mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0 \uparrow)(B_0$ or $p_0 B_0$ constant$)$
- Underlying reason:
  - inability of government not to bail out banks
  - magnified by doom loop

Connection with Bulow-Rogoff (88)

- Letting banks purchase domestic debt $\approx$ debt buy-back
- BR (88): debt buy-backs are bad deals
- Connection with our results?
- Focus on "benefits of high supervisory capacity" (B_0 constant)

Bulow-Rogoff (88)

- Zero default costs
- Mechanical defaults
- Date-0 debt buy-back to $B_0 + \Delta B_0 < B_0$
- New No-Default states $\Delta ND = [B_0 + \Delta B_0, B_0]$
- Change in welfare from debt buy-back

$$\Delta \mathscr{W}_0^* = \mathbb{E}_0[B_0 1_{\{E(s) \in \Delta ND\}}] > 0$$

$$\Delta \mathscr{W}_0 = -\Delta \mathscr{W}_0^* < 0$$

- Zero-sum game between sovereign and foreign creditors
- Default costs?

Default Costs and Mechanical Defaults

- Nonzero default costs Φ
- Mechanical defaults
- Change in welfare from debt buy-back

$$\Delta \mathscr{W}_0^* = \mathbb{E}_0[B_0 1_{\{E(s) \in \Delta ND\}}] > 0$$

$$\Delta \mathscr{W}_0 = \mathbb{E}_0[(\Phi - B_0) 1_{\{E(s) \in \Delta ND\}}]$$

- Positive sum game between sovereign and foreign creditors
- Overturns BR (88) if Φ large: $\Delta \mathscr{W}_0 > 0$

Connection with Bulow-Rogoff (88)

- Large default costs Φ and mechanical default...
- ...by themselves make debt buy-backs desirable...
- ...but not by domestic banks!
- New default states $\Delta D(s) = [B_1(s), B_1(s) + \Delta B_1(s)]$
- Change in welfare from debt buy-back

$$\Delta \mathscr{W}_0^* = -\mathbb{E}_0[B_0 1_{\{E(s) \in \Delta D(s)\}}] < 0$$

$$\Delta \mathscr{W}_0 = \underbrace{-\mathbb{E}_0[(\Phi - B_0)1_{\{E(s) \in \Delta D(s)\}}]}_{\Delta \mathscr{E}_0 < 0} - \underbrace{(1 - \beta^B)\mathbb{E}_0[\Delta X(s)]}_{\Delta \mathscr{R}_0 > 0} < 0$$

- Efficiency and distributive gains of tough supervision

Collective Moral Hazard

- Possibility of evading regulation...cost $\Psi(\underline{b}_0^{**} - b_0^*(i))$
- Strategic complementarities across banks of choice of $b_0^*(i)$
- Amplification of bad shocks through renationalization
- Possibility of multiple equilibria
  - G...high diversification, low default probability
  - B...low diversification, high default probability,
  - B more likely if large legacy debt, low fiscal capacity
- First mechanism for renationalization

Legacy Laffer Curve

- Legacy Laffer curve $p_1(s; \tilde{B}_0)(\tilde{B}_0 - b_0)$
- Suppose $\tilde{B}_0$ on wrong side of Laffer curve
- Legacy creditors make take-it-or-leave-it offer to reduce debt to peak $B_0(s)$ of Laffer curve
- Feedback loop increases incentives to forgive debt

Strategic Supervisory Leniency

- Set $\underline{b}_0^{**} < \underline{b}_0^{*}$ if "bailout-shifting"
  (debt forgiveness when bailouts)
- Concession from legacy creditors $\mathscr{E}_0 \uparrow$
- Distributive costs $\mathscr{R}_0 \uparrow, \mathscr{C}_0 \downarrow$
- Benefits outweigh costs $\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0 + \mathscr{C}_0 \uparrow$
- Second mechanism for renationalization

Rationale for Centralized Supervision

- Add ex-ante legacy debt issuance stage
- Future debt forgiveness priced in issuance price p_0
- Country hurt by inability to commit to tough supervision ex-post
- Country benefits from delegating supervision to international supervisor
  ($\mathscr{E}_0 \uparrow$, $\mathscr{R}_0 \downarrow$, $\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0 \uparrow$)
- Rationale for centralized supervision

Multiple Risky Countries

- Two symmetric risky countries and one safe country
- Assume:
  - balance sheet and fiscal shocks positively correlated within a country
  - fiscal shocks imperfectly correlated across countries
- Then:
  - risk shifting solely through domestic bond holdings (strict equilibrium)
  - lax supervision...let domestic banks load up on domestic risk, not foreign risk
- Renationalization robust to multiple risky countries

Summary

- Doom loops
  - misleading to consolidate balance sheets
  - amplification mechanism
- Explains debt re-nationalization
  - collective MH
  - debt forgiveness and supervisory leniency
- Rationale for centralized supervision

Many Open Questions

- Non-fiscal (LOLR) bailouts
- Risk transfer within banking union Strategic defaults
- ...

Equilibrium Welfare

- Equilibrium welfare

$$\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0$$

- Efficiency term (legacy debt repayment and default costs)

$$\mathscr{E}_0 = \int \left[\int_{B_1(s)}^{\infty} [E - B_0] f(E|s) dE + \int_0^{B_1(s)} [E - \Phi] f(E|s) dE \right] d\pi(s) + tiop$$

- Distributive term (rents of bankers vs. domestic consumers)

$$\mathscr{R}_0 = (1 - \beta^B) \int \left[\max\{\underline{b}_0^{**} + (A - \underline{b}_0^{**}) \frac{p_1(s)}{p_0} - I(s), 0\} - [A - I(s)] \right] d\pi(s)$$

Off-Equilibrium Welfare

- Off-equilibrium welfare (for supervisory decision $\underline{b}_0^{**}$)

$$\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0 + \mathscr{C}_0$$

- New distributive term (rents of bankers vs. legacy creditors)

$$\mathscr{C}_0 = \beta^B \int \left[\underline{b}_0^{**} + (A - \underline{b}_0^{**}) \frac{p_1(s)}{p_0} - A \right] d\pi(s)$$

Debt Maturity

- Compare issuing short-term instead of long-term debt
- Require raising same amount of date-0 revenues
- Debt maturity trade-off...with short-term debt:
  - insulate banks from sovereign credit risk $\mathscr{R}_0 \downarrow$ (commitment benefits)
  - higher expected default costs $\mathscr{E}_0 \downarrow$ (maturity mismatch $\rightarrow$ less risk sharing)
  - welfare $\mathscr{W}_0 = \mathscr{E}_0 - \mathscr{R}_0$?
- Higher welfare with LT debt iff $\underline{b}_0^*$ high enough

Extension 1: Banks in Safe Countries

- Back to one domestic risky country, one foreign safe country
- Banks in foreign safe country...same as domestic banks
- Only difference between home and foreign: risky vs. safe sovereign bonds
- No strategic supervisory leniency in foreign country
- Supervisory externality:
  - foreign welfare increases with supervisory effort of the domestic country
  - domestic welfare is independent of the supervisory effort of foreign country
- Further rationale for centralized supervision

Extension 2: Diversification Rat Race

- Suppose not always enough funds to bail out all banks
- Pecking order of bailout: priority to banks with highest $b_0^*(i)$
- Banks trade off:
  - probability of having enough liquidity
  - value of bailout
- Asymmetric equilibrium....distribution of $b_0^*(i) > 0$...even if $\underline{b}_0^* = 0$
- Countervailing force: diversification rat-race

Extension 3: Leverage

- Introduce pledgeable return $\rho_0(s)I(s) < \rho_1(s)I(s)$
- Financing need:
  - $(1-\rho_0(s))I(s)$ if no joint default
  - $(1-\rho_0(s)p_1(s))I(s)$ if joint default
- Leverage strengthens feedback loop, especially if joint default