# Deadly Embrace: Sovereign and Financial Balance Sheet Doom Loops

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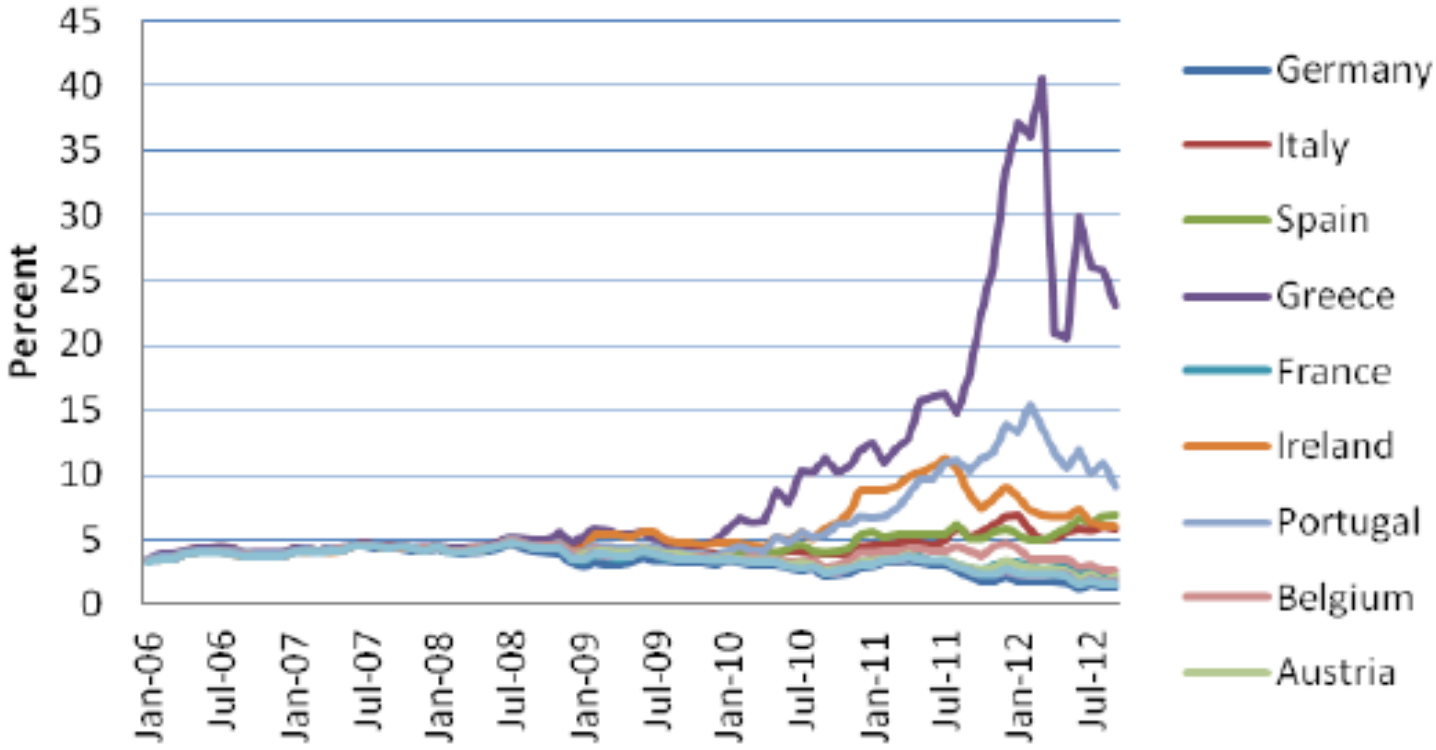
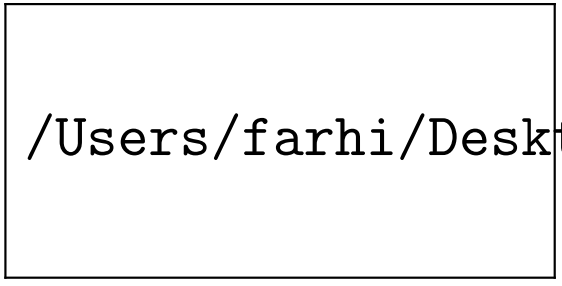
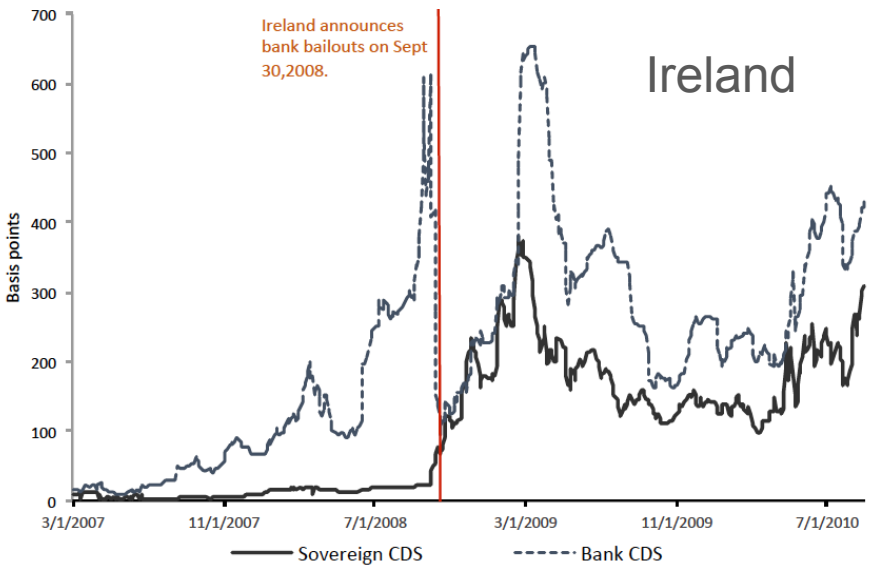
# Sovereign Yields in Europe

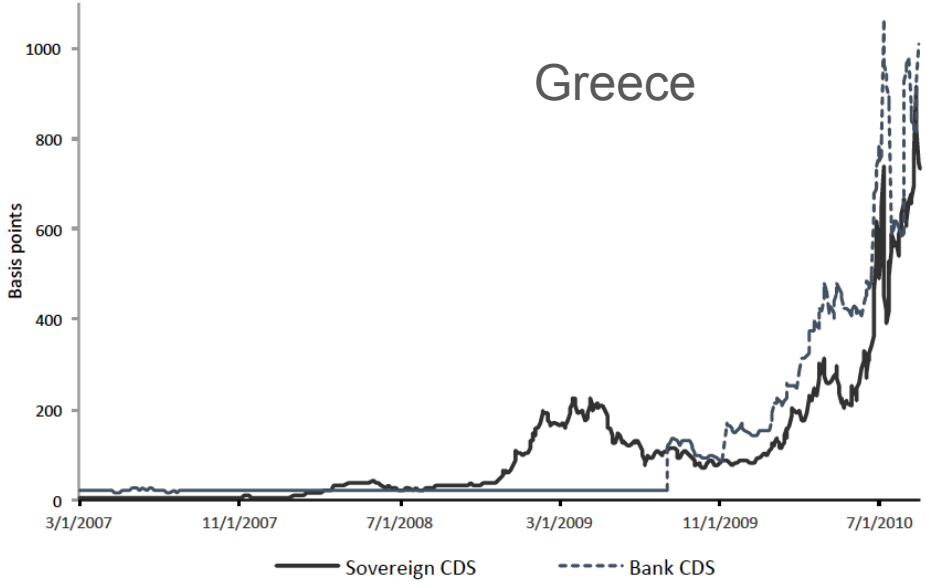


# Renationalization of Sovereign Debt



# Doom Loop


Ireland announces bank bailouts on Sept 30,2008.
Ireland
Basis points
700
600
500
400
300
200
100
0
3/1/2007
11/1/2007
7/1/2008
3/1/2009
11/1/2009
7/1/2010
Sovereign CDS
Bank CDS


Greece
Basis points
1000
800
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400
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0
3/1/2007
11/1/2007
7/1/2008
3/1/2009
11/1/2009
7/1/2010
Sovereign CDS
Bank CDS

# Bailouts

- Bank bailouts:
  - guarantees
  - liquidity assistance
  - recapitalizations
- International bailouts:
  - debt forgiveness
  - international loans and debt forgiveness

# Euro Crisis

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

# Many Questions

- Why did segmentation/renationalization occur?
- What is the link with the doom loop?
- 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
- Link renationalization and doom loop
- Alternative theories for renationalization:
  - discrimination
    (Broner et al. 2013)
  - risk-shifting
    (Genaioli et al. 2014, Uhlig 2014, Achary 2015, Acharya et al. 2015)
  - financial repression
    (Chari et al. 2014)
- Alternative theories for doom loop in closed economies
  (Acharya et al. 2015, Cooper and Nikolov 2015, Bocola 2016)

# Outline

- Doom loop
- Single-decker bailout:
  - renationalization as supervisory arbitrage
- Double-decker bailout (debt forgiveness, transfers):
  - renationalization as strategic supervisory leniency
  - rationale for banking union
    (centralized supervision + fiscal backstop)

# 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 $\rho_1(s) > I(s)$ 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 $\frac{d\rho_1(s)}{ds} \geq 0$

# Assets

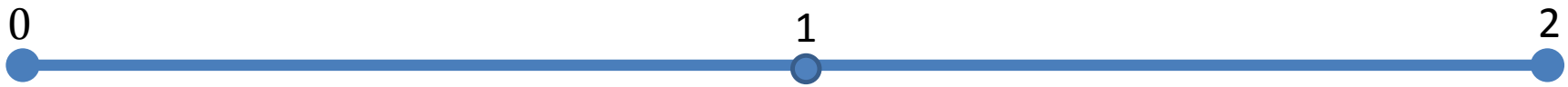
- Domestic banking entrepreneurs invest in assets at date 0, and liquidate them at date 1 to finance investment
- Safe foreign bonds $b_0^*$
- Risky domestic bonds $b_0$: price $p_0$, $p_1(s)$

# 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 $\Phi$ 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
- $\Phi$ high enough that no default if can repay




- Domestic debt market clears at $p_0$ (WTP of foreign investors)
- Supervisor chooses $r \leq \overline{r}$ (unobserved by market)
- Banks observe $r$ and privately select their portfolios $\{b_0, b_0^* \geq r\}$ 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 $b_0^* = r$
- Bank net worth at date 1

$$A_1(s) = r + (A - r)\frac{p_1(s)}{p_0}$$

- Bailout

$$X(I(s), \underline{r}, p_1(\underline{s}); p_0) = \max\{I(s) - A_1(s), 0\}$$

- Bond prices

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

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

- Date-1 bond issuance

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

# Doom Loop

- Two key equations

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

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

- 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

- Balance sheets: banks $((b_0, b_0^*))$ and Sovereign $((-B_0, 0))$
- Can be consolidated $((b_0 - B_0, b_0^*)$ sufficient statistic)?
  - to predict $B_1(s)$ and default probability
    - in bailout region, yes
    - in no-bailout region, no
  - to predict domestic welfare (level and distribution), no

# 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)

$$\mathscr{R}_0 = (1 - \beta^B) \int \max\{I(s) - r - (A - r)\frac{p_1(s)}{p_0}, 0\} d\pi(s)$$

# Off-Equilibrium Welfare

- Off-equilibrium welfare (for supervisory decision $r$)

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

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

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

# Benefits of Supervision

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

# 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 $\Phi$
- 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 $\Phi$ large: $\Delta \mathscr{W}_0 > 0$

# Connection with Bulow-Rogoff (88)

- Large default costs $\Phi$ 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 $\Psi(r - b_0^*(i))$
- Strategic complementarities across banks of choice of $b_0^*(i)$
- Amplification of bad (risk-increasing) shocks via renationalization
  (feedback loop...riskiness of sovereign debt / evasion)
- First mechanism for renationalization

# Legacy Laffer Curve and Debt Forgiveness

- 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
- Doom loop increases incentives to forgive debt

# Strategic Supervisory Leniency

- Set $r < \bar{r}$ 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 ($p_0 B_0$ constant)
- 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 banking union (centralized supervision)

# Country Solidarity and International Transfers

- Neighboring countries:
  - spillover cost $\Gamma > 0$ of in case of default
  - can make (state-contingent) transfer $T \geq 0$ at $t = 1$
- Similar implications as debt-forgiveness

# Strategic Supervisory Leniency

- Set $r < \bar{r}$ if "bailout-shifting"
  (transfers when bailouts)
- Doom loop makes transfers more attractive for neighboring countries
- Third mechanism for renationalization

# Rationale for Banking Union

- Transfers improve risk-sharing
- Benefits from lower issuance at $t = 0$ not internalized by foreigners
- Centralized supervision alone can reduce welfare
- Pareto-improvement possible if combined with commitment to transfers
  (complementarity centralized supervision / fiscal integration)
- Rationale for banking union
  (centralized supervision+fiscal backstop)

# Specialness of Sovereign Debt

- Doom loop
- Return covariance
- Renationalization robust to multiple risky countries

# Summary

- Doom loops:
  - misleading to consolidate balance sheets
  - amplification mechanism
- Generates or amplifies debt re-nationalization:
  - collective MH
  - debt forgiveness, transfers and supervisory leniency
- Rationale for banking union:
  - centralized supervision
  - fiscal backstop

# Many Open Questions

- Non-fiscal (LOLR) bailouts
- Strategic defaults
- ...

# Extension 1: 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 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 $r = 0$
- Countervailing force: diversification rat-race

# Extension 3: Leverage

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

# Extension 4: 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