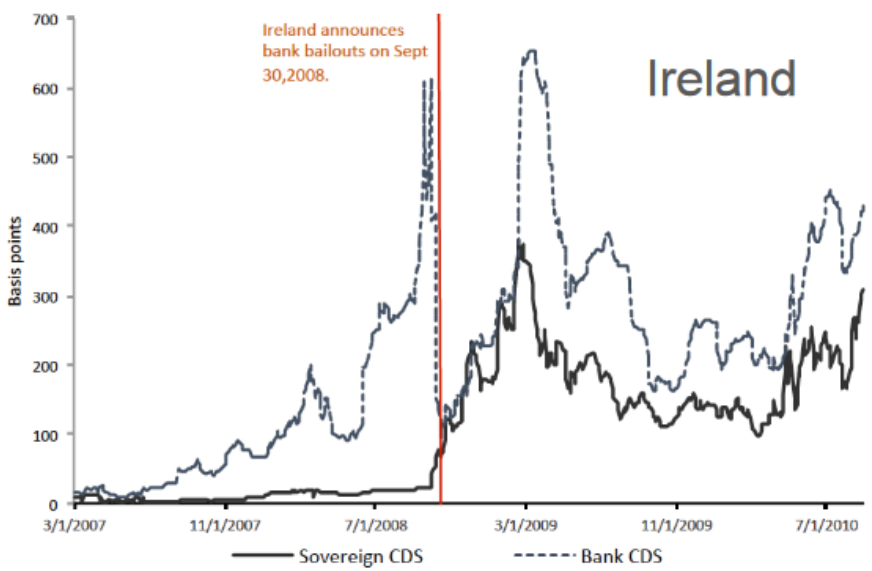
Deadly Embrace: Sovereign and Financial Balance Sheet Doom Loops

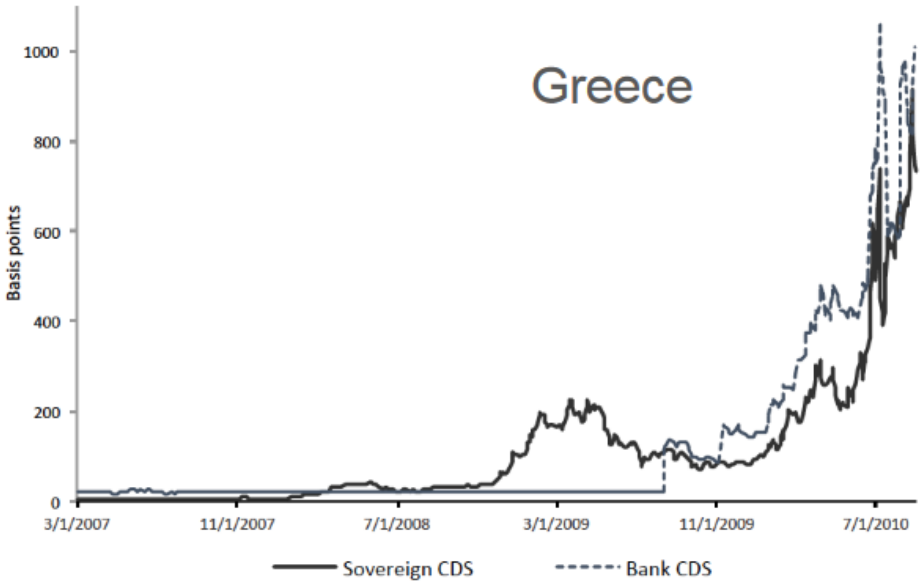
Emmanuel Farhi Jean Tirole

March 25, 2020

Doom loop

- Context: The European debt crisis:
  - Increasing sovereign debt levels and spreads.
  - Re-nationalization of sovereign debt holdings.
- Doom loop: From 2009 onward bank and sovereign CDS spreads started to comove.





Main contributions

- Detail the doom loop feedback mechanism.
- Detail re-nationalization mechanisms.
  - Bank incentives: In riskier financial straits the "bailout put" has a higher value.
  - Sovereign incentives: In riskier straits they have incentives to share the risk internationally.
- Provide a rationale for externalized banking supervision.
  - Debtor country: Commitment not to loosen its banking supervision ex post, reducing its ex-ante cost of borrowing.
  - Foreign countries: Reduce the rents extracted by the domestic banking system from the bailouts.

Model

- Three periods: $t = 0, 1, 2$.
- Uncertainty:
  - Date 1: State s is revealed, density $d\pi(s)$.
  - Date 2: Random endowment $E \in [0, \infty)$ is revealed, density $f(E|s)$ and distribution function $F(E|s)$.
- Agents:
  - Sovereign government
  - Banking entrepreneurs
  - International investors
  - Domestic consumers

International investors & domestic consumers

- International investors:
  - Large continuum of international investors.
  - Date-t utility: $V_t^* = \mathbb{E}_t \left[\sum_{s=t}^{2} c_s^* \right]$
    - The international rate of interest is equal to 0
- Domestic consumers:
  - Mass-1 continuum of domestic consumers.
  - Endowment E at $t = 2$, density $f(E|s)$.
  - Consume at date 2 the endowment net of taxes.
  - Utility: $V_t^C = \mathbb{E}_t \left[c_2^C \right]$

Banking entrepreneurs

- Mass-1 continuum of banking entrepreneurs: $V_t^B = \mathbb{E}_t \left[c_2^B \right]$
- Date 0: $A = b_0^* + p_0 b_0$
  - Endowment: A.
  - Investment: Safe foreign bonds b_0^* and risky domestic bonds b_0.
  - Regulation: $b_0^* \geq r$
- Date 1: Investment opportunity:
    - Investment cost: $I(s)$, such that $\frac{dI(s)}{ds} \leq 0$.
    - Return at date 2: $\rho_1(s) > I(s)$, such that $\frac{d\rho_1(s)}{ds} \geq 0$.
    - $A \geq \max_{s \in S} I(s)$.
  - Liquidate all the assets to finance investment: $p_1(s)$.
  - If a bank cannot finance the investment the sovereign can bail it out $X(s)$.
- Date 2: Consumption: $c_2^B = \rho_1(s) + \max\{b_0^* + p_0 b_0 - I(s), 0\}$

Sovereign government

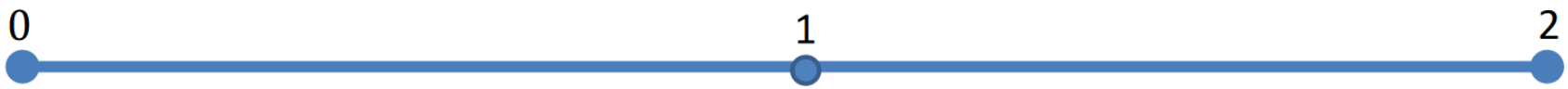
- Government decides without commitment to maximize welfare:

$$W_t = E_t \left[c_2^C + \beta^B c_2^B + \beta^I(s)\mu(s)I(s) \right]$$

  - $\beta^B < 1$, so pure transfers are costly.
  - $\beta^I(s)$ high enough so that banks are bailed out.
  - $\mu(s)$ is the share of banks that conduct the investment.

- Date 0: Outstanding bonds B_0, maturing at date 2.
  - Regulates the maximum amount of domestic bonds holding for banks, $r \leq \bar{r}$ (unobserved by market): $b_0^* \geq r$
- Date 1: Bank bailout $X(s)$, debt issuance $B_1(s) - B_0$.
- Date 2: Default at cost ϕ or repay (fiscal capacity E).
  - ϕ high enough that no default if can repay.

Timeline



- 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 $E < B_1(s)$.

Equilibrium: Bond prices

- The marginal investor in domestic bonds is a risk-neutral international investor:

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

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

- At date 1 in states, the Sovereign can thus collect $(B_1 - B_0)[1 - F(B_1|s)]$ by issuing $B_1 - B_0$.

- Issuance Laffer curve: It is strictly quasi-concave in B_1 and increasing in s.

- Bailout capacity is limited.

Equilibrium: Debt issuance

- Banks load up on domestic debt:

$$b_0^* = r$$

- Bailout:

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

- Date 1 bond issuance:

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

$$B_1(s) = B_0 + \max\{\frac{I(s) - r}{p_1(s)} - \frac{A - r}{p_0}, 0\} \quad (1)$$

Equilibrium: Doom loop

- Applying the implicit function theorem to the following expression:

$$p_1(s)[B_1(s) - B_0] = \max\{I(s) - r - (A - r)\frac{p_1(s)}{p_0}, 0\}$$

- Feedback Loop: The sensitivity of date-1 bond prices to the state s when a bailout is required:

$$\frac{dp_1}{ds} = \frac{-\frac{\partial F(B_1(s)|s)}{\partial s} - \frac{1}{p_1(s)} f(B_1(s)|s)\frac{dI(s)}{ds}}{1 - \frac{I(s)-r}{p_1(s)^2} f(B_1(s)|s)} \tag{2}$$

  - $\uparrow \frac{dp_1}{ds}$ when $\uparrow I(s) - r$ (financing need)
  - $\uparrow \frac{dp_1}{ds}$ when $\uparrow \frac{I(s)-r}{p_1(s)^2} f(B_1(s)|s)$ (semi-elasticity of the debt price to additional debt issuance)

Equilibrium: No supervisory leniency

- **Proposition 2**: As long as there are bailouts, it is never optimal for the supervisor to engage in supervisory leniency: $r = \bar{r}$.
  - In this baseline model, leniency reduces the overall welfare:
    - Efficiency benefit: Decreases expected legacy debt repayments.
    - Efficiency cost: Increases the expected default costs.
    - Distributive cost: Increases the rents extracted by bankers at the expense of consumers because of bank bailouts (magnified by doom loop).

- **Proposition 3**: Setting $\bar{r} = \bar{I}$, if feasible, maximizes ex-ante welfare.
  - Avoids banking sector becoming illiquid.
  - Prevents the feedback loop from occurring.

Debt re-nationalization

- Extension of the baseline model:
  1. Possibility of evading regulation at a cost: $\Psi(r - b_0^*(i))$.
  2. Bad fiscal shock: Shifter ξ (risk-increasing, $\frac{\partial F(B_1(s;\xi)|s;\xi)}{\partial \xi} > 0$)
  3. For simplicity: $I(s) = \bar{I}$ and $A = \bar{I}$

- **Proposition 4**: An adverse fiscal shock ($\uparrow \xi$) leads to a reduction in the price of debt ($\downarrow p_0$) and an increase in the exposure of domestic banks to domestic sovereign risk ($\downarrow b_0^*$):

$$\frac{db_0^*}{d\xi} = \frac{\int_{s \geq \tilde{s}} \frac{p_1(s)}{p_0^2} d\pi(s)}{\Psi''(\bar{r} - b_0^*)} \underbrace{\frac{dp_0}{d\xi}}_{<0} < 0 \tag{3}$$

- Stronger strategic complementarities across banks ($\uparrow \frac{1}{\Psi''(\bar{r} - b_0^*)}$) increase the debt re-nationalization.

International transfers

- Extension of the baseline model including neighboring countries:
  1. Incur spillover cost in case of default : $\Gamma > 0$.
  2. Can operate a (state-contingent) transfer: $T(s) \geq 0$.
  3. For simplicity: $I(s) = \bar{I} = A$ and $F(E|s) = F(E - s)$ with f decreasing.

- **Proposition 8**: If Γ is large enough, the only equilibrium with endogenous supervisory leniency features maximal leniency $r = 0$ and is bailout shifting.
  - Bailouts occur only when transfers are strictly positive.

- Doom loop makes transfers more attractive for neighboring countries.

Banking union

- Under the hypotheses of Proposition 8, supervisory leniency occurs, leading to an inefficient equilibrium.
  - Lax domestic supervision reduces foreign welfare, which is not internalized by the domestic supervisor.

- Centralized supervision alone can reduce welfare.
  - Benefits from lower issuance at date 0 not internalized by foreigners.

- **Proposition 9**: As long as β^B is not too large, a banking union whereby:
  - Supervision is delegated to a supranational supervisor who puts full weight on foreign consumers,
  - Foreigners commit to a set of minimal ex-post transfers,

  leads to full supervision $r = \bar{r}$ and to Pareto-improvements in welfare.

Conclusions

- The existence of bailouts generates a doom loop mechanism through which risk is transferred between sovereign government and local banks.
  - Abrupt decreases in the debt prices and increases in the amount of debt.
  - Liquidity regulation allows to mitigate this doom loop.
- Banks exploit the doom loop mechanism by debt re-nationalization when:
  - They can hide the overexposure to domestic debt to the supervisor.
  - A default would hurt foreign countries and these would be willing to finance the bailouts.
- Externalized banking supervision combined with compromise to minimal transfers can help to avoid doom loops and increase the welfare.