CREDIT POLICY IN TIMES OF FINANCIAL DISTRESS

Costas Azariadis

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  - 30 financial crises (runs, failures, panics, stock market crashes)
- Crises defused by central bank action
  - Bank of England: 1878, 1890, 1914
  - Bank of France: 1882, 1889, 1930
  - Federal Reserve: 2008-2010(?)

2. TOOLS & LITERATURE

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- Default successfully averted by debt limits on borrowers

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- Central Bank goal: offset adverse shocks to expected future debt limits

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(a) Benchmark Economy

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  - alternating endowments with constant aggregate income

    $$\left(\omega_t^1, \omega_t^2\right) = \begin{cases} (1+\alpha, 1-\alpha) & \textit{if} \;\; t = 0, 2, \ldots \\ (1-\alpha, 1+\alpha) & \textit{if} \;\; t = 1, 3, \ldots \end{cases}$$

    with $0 < \alpha < 1$

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- Budget and debt constraints

$$c_t^i + b_{t+1}^i = \omega_t^i + R_t b_t^i \tag{1}$$

$$b_t^i + L_t^i \geq 0 \tag{2}$$

$$\begin{cases} b_t^i = \text{claims of household } i \text{ on other households payable at time } t \\ R_t = 1 + r_t = \text{yield on debt payable at time } t \\ L_t^i = \text{debt limit for households } i \text{ at } t \end{cases}$$

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- Default
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  - value of default at t

$$v_t^{i,A} = \sum_{s=0}^{\infty} \beta^s u\left(\omega_{t+s}^i\right)$$

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  - consumers maximize v_0^i $s.t.$ (1) and (2)
  - market clears: $\sum_i b_t^i = 0, \; \forall t$
  - debt limits $\left(L_t^i\right)$ are the largest values consistent with participation constraints

$$v_t^i \geq v_t^{i,A} \;\; \forall t, i \tag{3}$$

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$$b_t^i = \pm \frac{\alpha\beta}{1+\beta}$$

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$$L_t^i \geq \alpha\beta/\left(1+\beta\right) \quad \forall t, i$$

  - equivalently iff the payoff from solvency exceeds that of default

$$\frac{u\left(1\right)}{1-\beta} \geq \frac{u\left(1+\alpha\right)+\beta u\left(1-\alpha\right)}{1-\beta^2} \tag{4}$$

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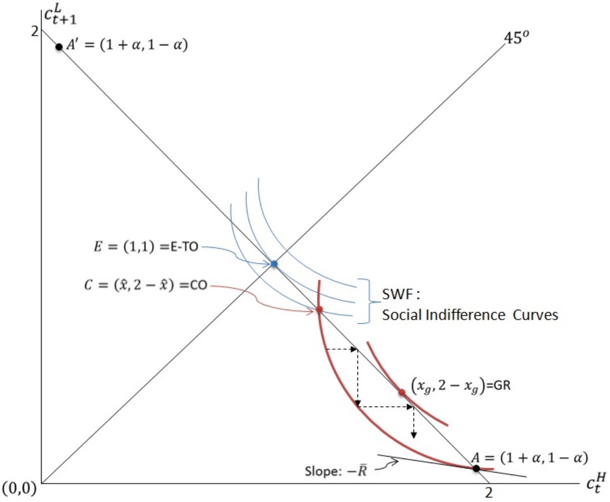

FIGURE 1: FINANCIAL FRAGILITY UNDER LAISSEZ-FAIRE

Steady states: $c_t^H = \begin{cases} 1+\alpha & \longleftrightarrow \text{ suboptimal \& robust} \\ \hat{x} & \longleftrightarrow \text{ optimal \& fragile} \end{cases}$

(c) Equilibrium with Financial Frictions

- Assume $\left\{ \begin{array}{c} \text{Arrow} - \text{Debreu allocation violates (4)} \\ \text{Autarky is a suboptimal allocation} \end{array} \right\} \Rightarrow$

$$(1+\beta)\,u(1) > u_A := u(1+\alpha) + \beta u(1-\alpha) \tag{5}$$

$$\overline{R} := \frac{u'(1+\alpha)}{\beta u'(1-\alpha)} < 1 \tag{6}$$

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- Figure 1 illustrates; also shows golden rule allocation (GR)
- The allocation $(\hat{x}, 2-\hat{x})$ at C is the *constrained optimum*
- CO maximizes SWF, the equal-treatment social welfare function $u\,(x) + u\,(2-x)$, *s.t.* resource & participation constraints

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- $\hat{x} \in [1, 1+\alpha]$ is the smallest solution to

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- If $\hat{R} := u'(\hat{x}) / \beta u'(2-\hat{x})$, then the CO is also a stationary equilibrium at a loan yield $\hat{R}$, with

$$\left(c_t^i, b_t^i\right) = \begin{cases} \left(\hat{x}, -\dfrac{1+\alpha-\hat{x}}{1+\hat{R}}\right) & \textit{if } \omega_t^i = 1+\alpha \\ \left(2-\hat{x}, \dfrac{1+\alpha-\hat{x}}{1+\hat{R}}\right) & \textit{if } \omega_t^i = 1-\alpha \end{cases}$$

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- Autarky is also an equilibrium corresponding to

$$\left(R_t, c_t^i, b_t^i\right) = \left(\overline{R}, \omega_t^i, 0\right) \quad \forall t, i$$

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- Laissez-Faire dynamics in Figure 2 and eq.

$$u_A = u\left(x_t\right) + \beta u\left(2 - x_{t+1}\right) \tag{8}$$

$$x_t \in [1, 1+\alpha] \tag{9}$$

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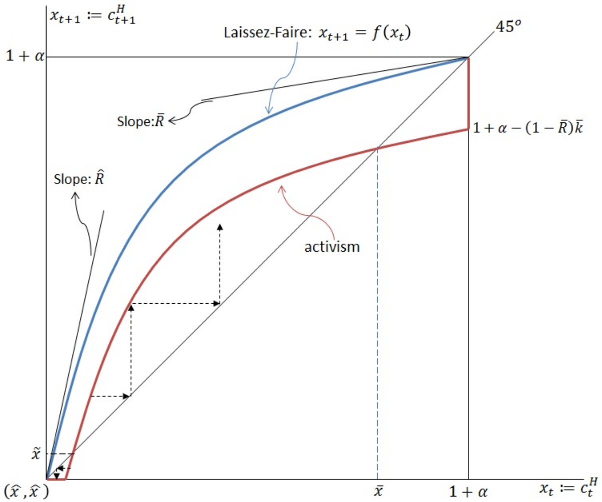

FIGURE 2: PROS AND CONS OF CAPITAL RESERVE POLICIES

Steady states: $\begin{cases} c^H_t = \hat{x} & \longleftrightarrow \text{ optimal \& locally robust} \\ c^H_t = \bar{x} > \hat{x} & \longleftrightarrow \text{ suboptimal \& locally robust} \end{cases}$

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  - with f: increasing concave;
    $f(\hat{x}) = \hat{x}, \quad f(1+\alpha) = 1+\alpha$
    $f'(\hat{x}) = \hat{R} \in (1, 1/\beta)$
    $f'(1+\alpha) = \overline{R} \in (0, 1)$

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(a) Central Bank as Intermediary

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- Advantages over private FI's
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  - power to extract and collateralize (small) reserves from lenders
- Disadvantages
  - reserves invested in inferior "storage" technology with low yield $\overline{R} < 1$
  - LLR "wastes" exogenous fraction $\delta \in (0, 1)$of all CB deposits; converts $1 - \delta$ into CB loans
  - CB informational disadvantage:

$$\begin{cases} \text{higher cost of state verification;} \\ \text{cannot exclude defaulters from future lending} \end{cases}$$

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- Countercyclical credit policy: $k_{t+1} = \phi(x_{t+1}, k_t)$, mapping the current state $(x_{t+1},\, k_t) \in [1, 1+\alpha] \times \left[0, \overline{k}\right]$ of the economy into today's reserve requirement.

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  - If autarky and the constrained optimum outcome are both steady states, then

$$\phi(\hat{x}, 0) = \phi(1+\alpha, 0) = 0 \tag{11}$$

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  satisfy policy rule and analog of eq. (8), *i.e.*

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- Sol'n to (12)

$$x_{t+1} = f(x_t) - k_{t+1} + \overline{R}k_t \qquad (13)$$

shown in Fig.2 for $k_t = k_{t+1} = \overline{k}$

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(a) When loans have dried up

- CB rewards "good" behavior by lowering capital requirements; punishes "bad" behavior by raising them

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- Achieving $x_{t+1} = \hat{x}$ for any x_t near $\hat{x}$
- Eqs. (12) and (13) suggest

$$x_{t+1} = \hat{x} + \overline{R}k_t - k_{t+1} \quad (\Rightarrow)$$

$$k_{t+1} = \phi(x_{t+1}, k_t) = \overline{R}k_t + f(x_{t+1}) - \hat{x} \tag{14}$$

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  - $\because$ Capital requirements overreact to deviations of equilibrium from the optimal state

$$\left(\frac{\partial k_{t+1}}{\partial x_{t+1}}\right)_{x_{t+1}=\hat{x}} = \hat{R} \in \left(1, \frac{1}{\beta}\right)$$

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- CB response to large credit shocks fraught with peril if conducted through capital reserves

8. LENDING OF LAST RESORT

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- Wastes fraction δ of all household deposits

(b) Rationing equilibria

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$$u\left(c_t^H\right) + \beta u\left(c_{t+1}^L\right) = u_A \tag{16}$$

  (assuming central bank excludes defaulters from both sides of credit market)

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- Solving for x_{t+1}:

$$x_{t+1} = f\left(x_t\right) - \frac{\delta}{1-\delta} L\left(x_t\right) \tag{19}$$

8. LENDING OF LAST RESORT

- The optimal policy rule

$$L(x_t) = \frac{1-\delta}{\delta}\left[f(x_t) - \hat{x}\right] \tag{20}$$

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  - To achieve this outcome, the CB must react vigorously to any diminution of private credit below the optimal amount.

8. LENDING OF LAST RESORT

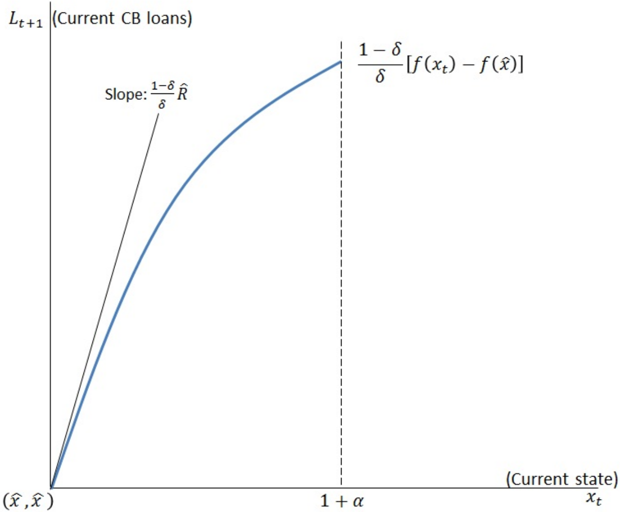

FIGURE 3: OPTIMAL LLR POLICY

8. LENDING OF LAST RESORT

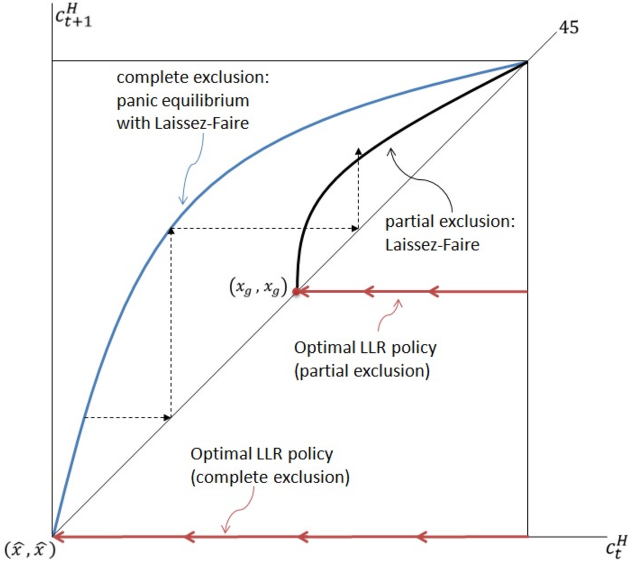

FIGURE 4: LOAN DYNAMICS UNDER OPTIMAL LLR POLICY

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- The best a weak CB can do is guide economy to GR(cf. Fig. 4)

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- Manipulating capital reserves useful against small deviations from steady states; problematic for large shocks
- Last resort lending by informed CB an effective guarantee against panics in economies with complete markets / no private information
- Last resort lending by relative uninformed CB averts panics at the cost of never achieving the constrained optimum reached by laissez-faire in good times

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(b) Extensions

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  - FI's highly levered, prone to default: regulation needed
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- CB efficiency. CSV for FI's and CB's: Who is better at collecting information on borrowers?