# The Eurozone Crisis and Target2

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- Eurozone Crisis combines elements of 'old' crises:
    - The Tragedy-of-the-Commons
    - Multiple Equilibria
    - Nominal Rigidities
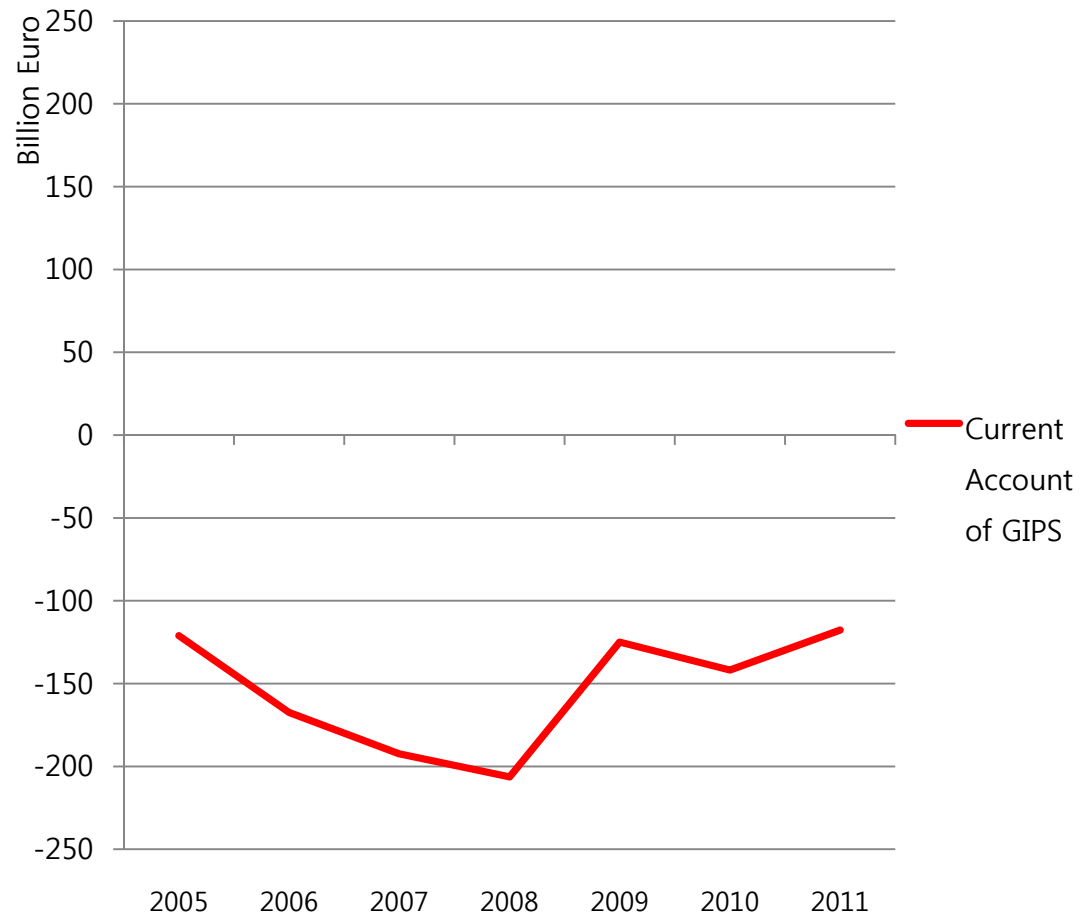   - Systemic Bailout Guarantees

- Policies that only address multiple equilibria and nominal rigidities:
    - Exacerbate the Tragedy-of-the-Commons
    - Make the eventual crisis more severe
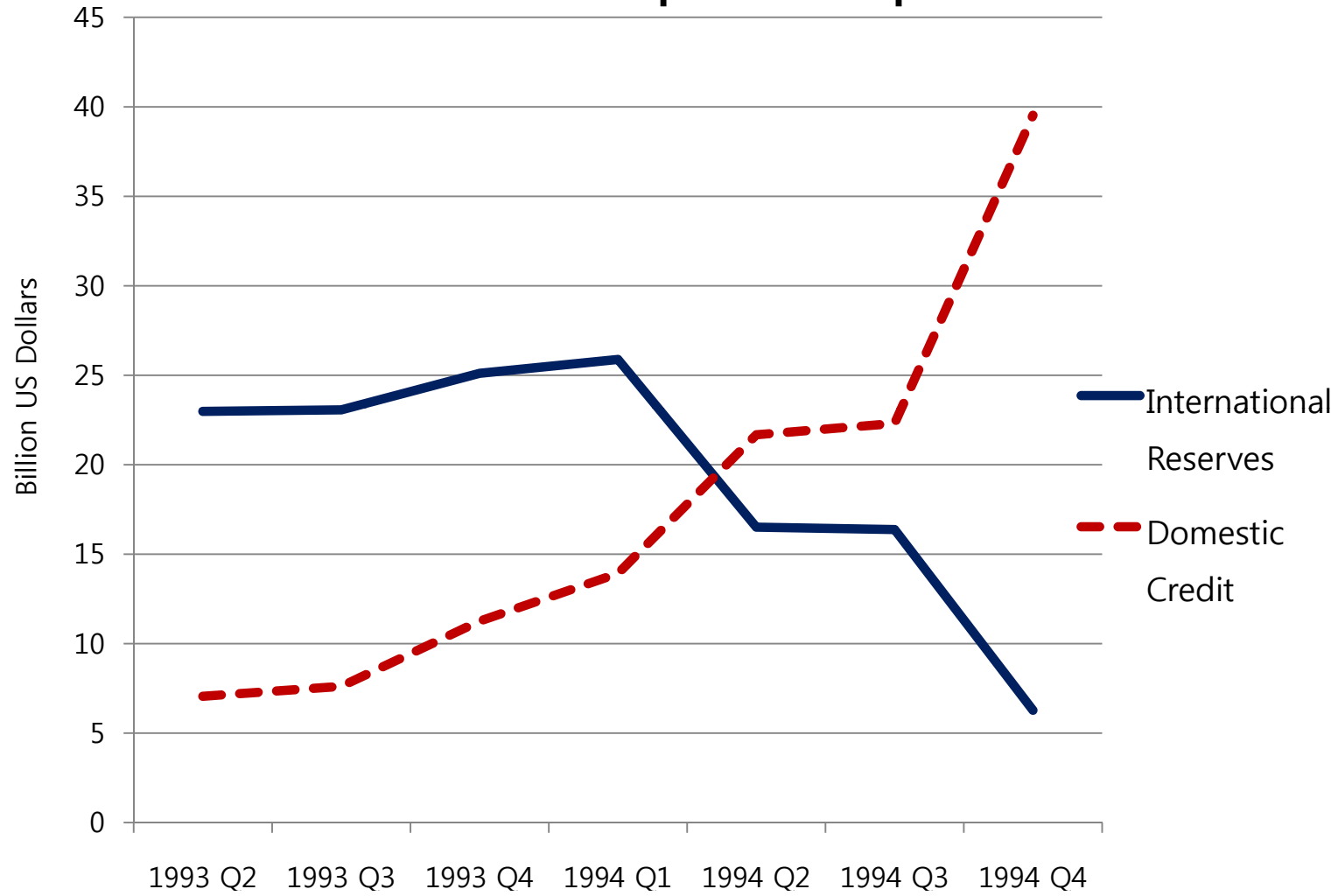
Sudden-Stop and Current Account Adjustment
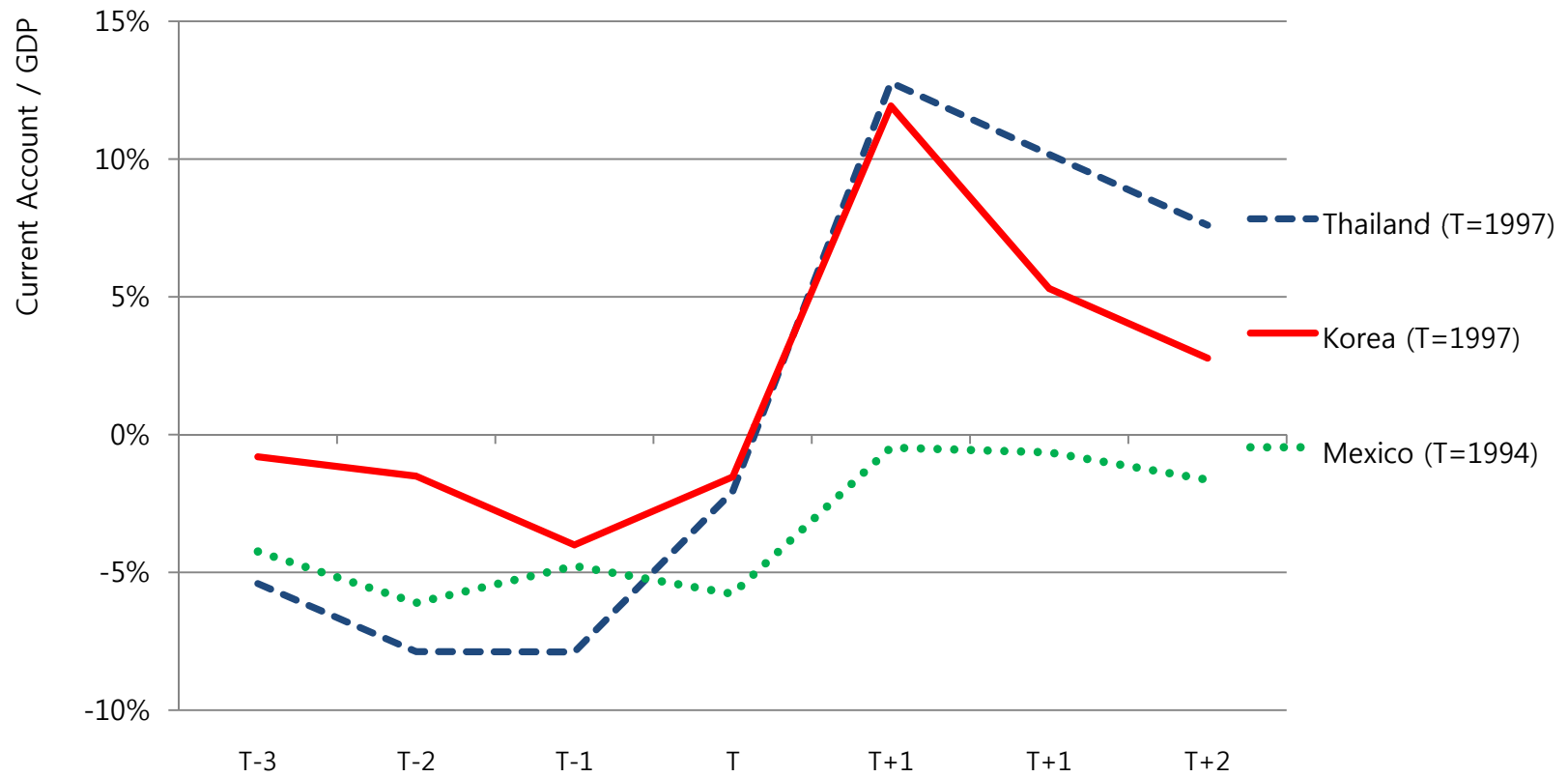
Current Account = National Income - Expenditure

Insufficient Adjustment in GIPS

Mexico in the Run-up to the Tequila crisis

- International Reserves
- Domestic Credit

Billion US Dollars

45
40
35
30
25
20
15
10
5
0

1993 Q2   1993 Q3   1993 Q4   1994 Q1   1994 Q2   1994 Q3   1994 Q4

Credit of National Central Banks to Domestic Institutions

4
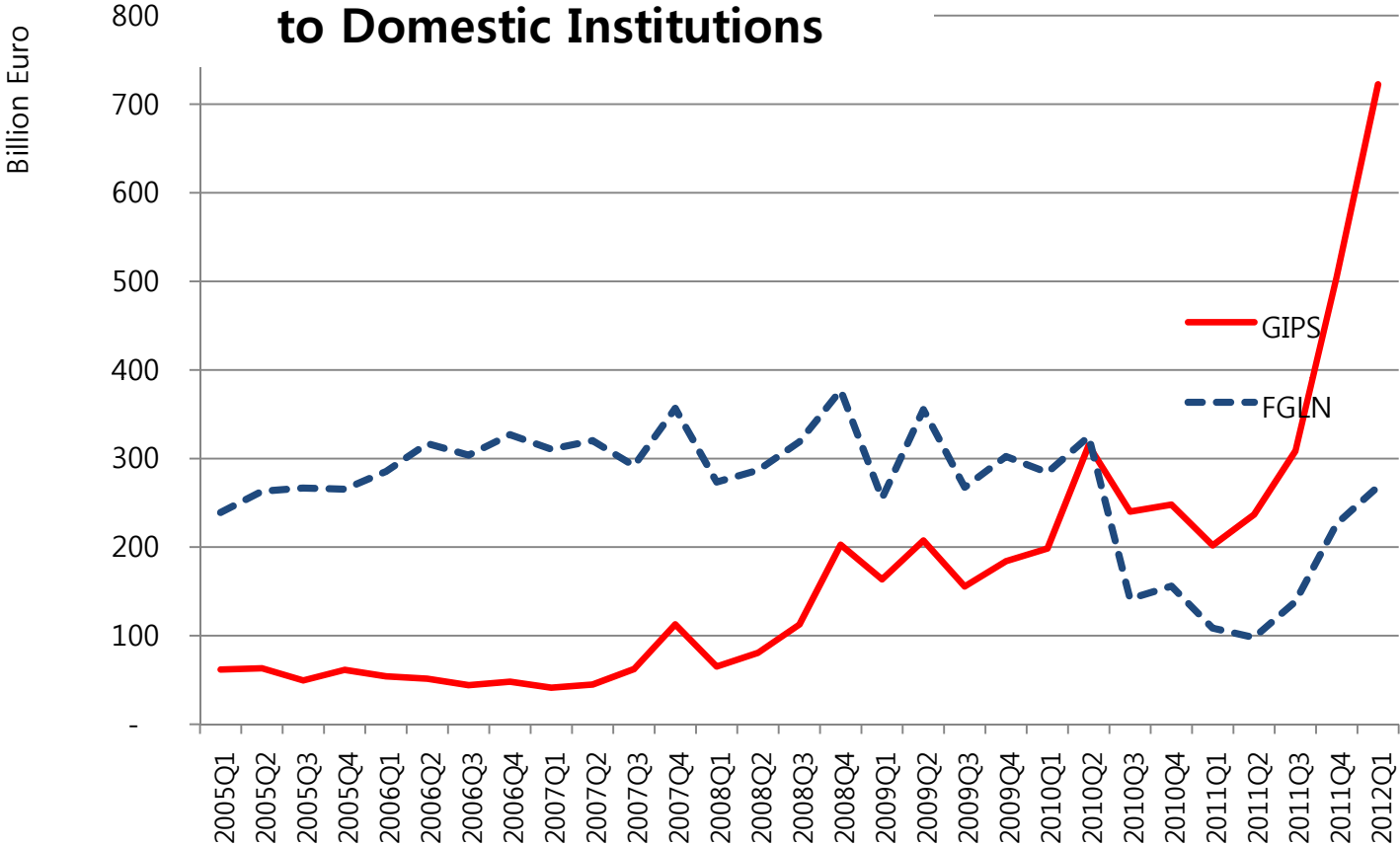
Target2 Net Liabilities and NCB Domestic Credit

5
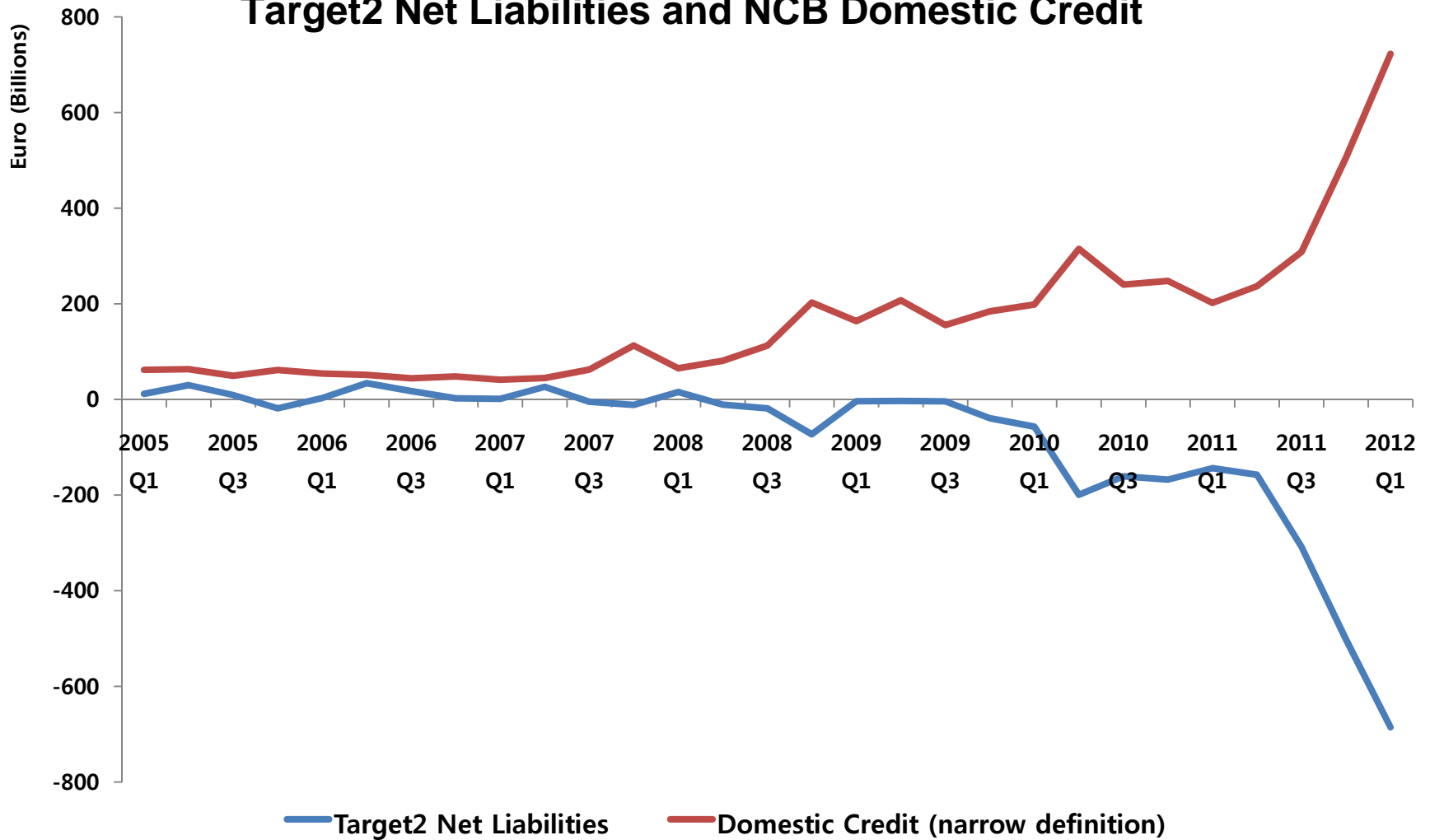
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- Collateral Rules have been relaxed significantly since 2008.

Double Common-Pool Problem in EZ

- *Within-country*
  - Several interest groups with power to extract resources from the fisc.
    - Sub-national Governments, Unions, Industrial Groups
    - Banks & "connected-lending"

- *Across-countries*
  - Occurs mainly at the Eurosystem of Central Banks
  - Supported by Target2

N Powerful Groups

- Borrow from banks g_{it}, consume c_{it} and invest abroad
- Group i gross debt to domestic banks

$$d_{i,t} = \left[1 + \rho_{t-1}\right] d_{i,t-1} + g_{i,t-1}$$

- Group i "safe assets abroad"

$$b_{i,t+1} = \left[1 + \beta\right] b_{i,t} + g_{i,t} - c_{i,t}$$

- Objective function

$$U_i(s) = \sum_{t=s}^{\infty} \frac{1}{\delta^{t-s}} \log(c_{i,t}), \qquad \delta \equiv 1 + r$$

- *Domestic Banks.* Controlled by the groups;
    - Make loans to the groups.
    - Fund loans by selling one-period bonds (that promise $1 + \rho_t$) to foreign investors or by borrowing from the NCB.
- *Foreign Investors.* Competitive risk-neutral agents with an opportunity cost r.
- *National Central Bank (NCB).* Provides systemic bailout guarantees to foreign bond-holders and to domestic banks.

- *Systemic bailout guarantees.* If a majority of domestic banks is at risk of bankruptcy, the NCB extends credit to them so that: (i) they honor the promised repayment on all their outstanding bonds and (ii) they fund new loans to the groups. If a majority of domestic banks is *not* at risk of bankruptcy, the NCB does not make any loans to any bank.

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- Two states of the world:
  Good state. Investors roll over bonds
  Bad state. Investors do not roll over bonds
  The bad state is absorbing.

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- $\overline{D}_t$ evolves over time

$$\overline{D}_{t+1} - \overline{D}_t = \lambda \left[\overline{D}_t - D_t \right] + rD_t, \qquad \lambda \geq 0$$
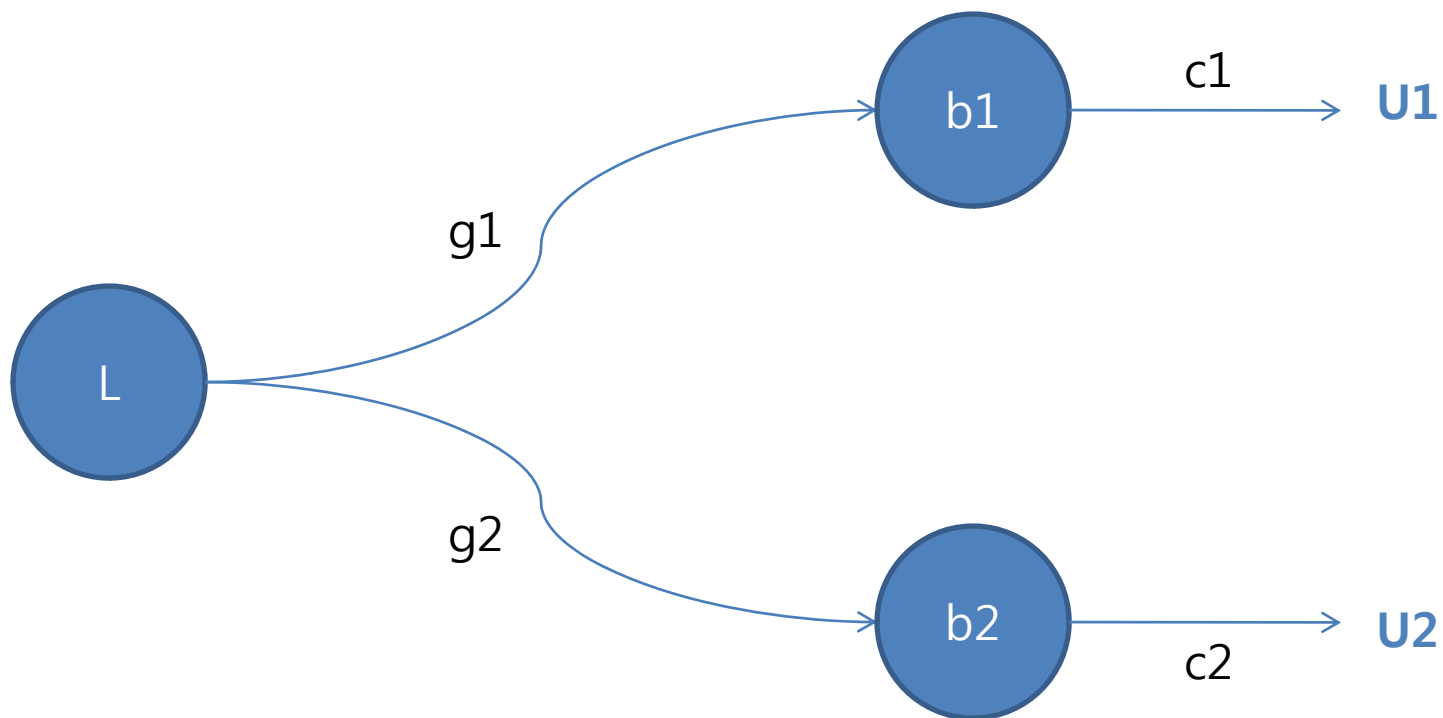
- **Dynamic game across groups.**

Groups share a common-pool resource: "available NCB domestic credit"

$$L_t \equiv \overline{D}_t - D_t \geq 0$$

The NCB's dynamic constraint

$$L_t = [1 + \lambda]L_{t-1} - \sum_{i=1}^{n} g_{i,t-1} \tag{1}$$

- *Group i.* Given the strategies of the other $n - 1$ groups, select $\{g_{i,t}, c_{i,t}\}_{t=s}^{\infty}$ to maximize U_t^i subject to
    - NCB's dynamic constraint (1)
    - Private assets eqn $\quad b_{i,t+1} = [1 + \beta]\, b_{i,t} + g_{i,t} - c_{i,t}$
    - Upper bound $g_{i,t} \in [0, \overline{g}L_t]$

$$L_t = [1 + \lambda]L_{t-1} - \sum_{i=1}^{n} g_{i,t-1}, \qquad L_t \geq 0$$

$$b_{i,t+1} = [1 + \beta] b_{i,t} + g_{i,t} - c_{i,t}$$

Markov Perfect Equilibrium

- There is a MPE if and only if $\beta < \lambda < \beta + (1 + \beta)(n - 1)$
- The MPE is unique

$$\hat{g}_i = \frac{\lambda - \beta}{n - 1} \cdot L_t$$

$$c_i = r \left[\frac{1 + \beta}{1 + r} \right] \cdot [L_t + b_{i,t}]$$

- Intuition: Suppose for a moment that $\hat{g}_j(L_t, b_{j,t})$ is linear in L_t :
  $\hat{g}_j(L_t, b_{j,t}) = \gamma_j \cdot L_t$
    - From group i's 'private' perspective:
        - RoR on the common-pool asset:

        $$\lambda - \sum_{j \neq i} \hat{\gamma}_j,$$

        - RoR on the private-asset abroad: β.
        - *group i* compares the return on both assets $\rightarrow$

        $$\beta = \lambda - \sum_{j \neq i} \hat{\gamma}_j$$

        - This condition must hold for all $i = 1, ..., n \rightarrow$ the equilibrium is unique & must be symetric
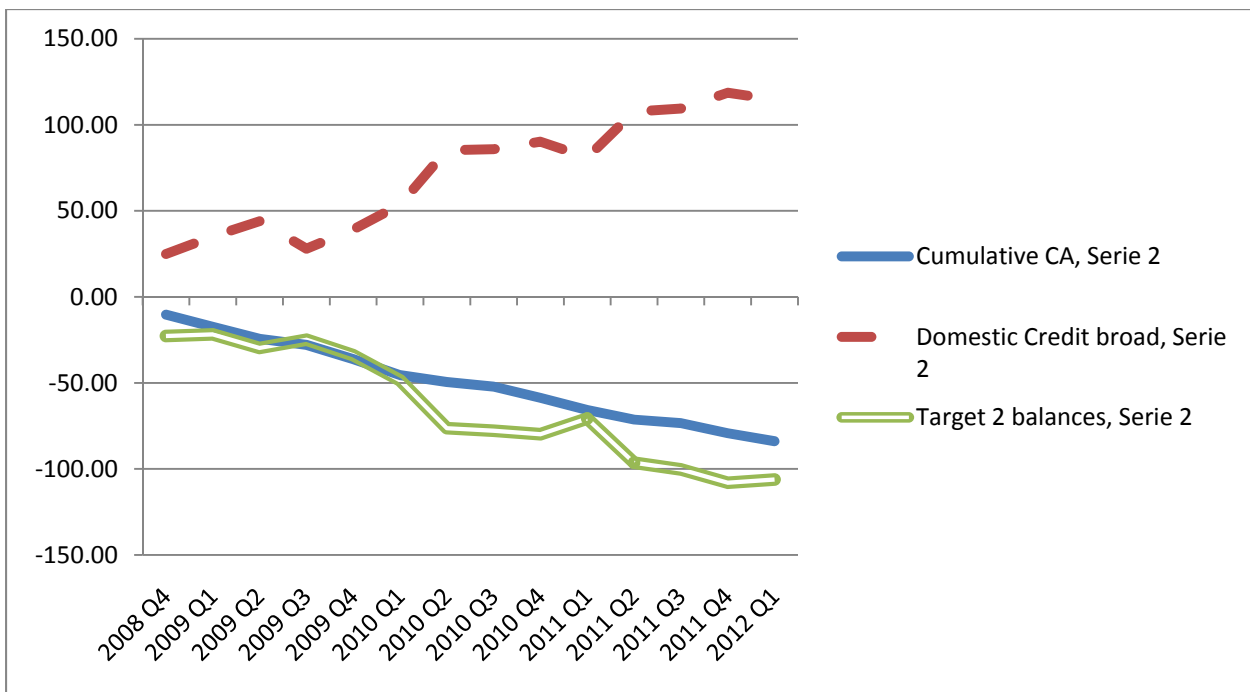
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Stylized fact

- Before the Sudden-stop
  - GIPS interest rates were almost as low as German interest rates.
  - Gross private capital inflows into GIPS were booming
- Following the Sudden-stop
  - GIPS NCB's credit to domestic banks grow exponentially
  - GIPS Target2 liabilities mirror NCB's credit to domestic banks

Greece: Cumulative CA & Private Capital Inflows

- Cumulative CA, Serie 1
- Cumulative PKF, Serie 1
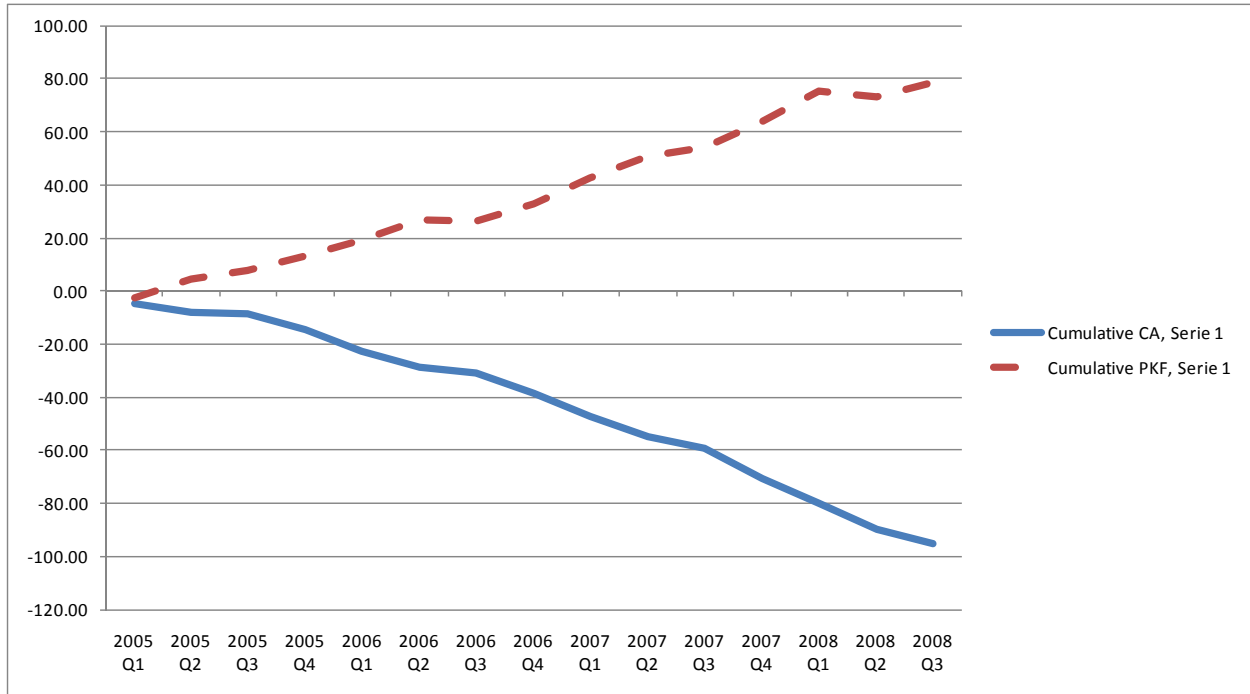
Greece: Cumulative CA & Target2 Imbalances

- Cumulative CA, Serie 2
- Domestic Credit broad, Serie 2
- Target 2 balances, Serie 2

- Bailout guarantee $\Rightarrow$
  - Investors set interest rate $\rho_t = r$
  - Buy banks' bonds up to PV of maximum bailout
    $$F_t \le \overline{F}_t \equiv \frac{\overline{D}_{t+1} - \sum_{i=1}^n g_{i,t-1}}{1+r}$$

- Domestic banks' debt to foreign investors

$$F_t = \begin{cases} [1+r]\, F_{t-1} + \sum_{i=1}^n g_{i,t-1} & \text{if } S_t = good \\ 0 & \text{if } S_t = bad \end{cases}$$

- NCB credit to domestic banks

$$D_t^a = \begin{cases} 0 & \text{if } S_t = good \\ [1+r]\, F_{t-1} + \sum_{i=1}^n g_{i,t-1} & \text{if } S_t = bad \ \& \ S_{t-1} = good \\ [1+r]\, D_{t-1}^a + \sum_{i=1}^n g_{i,t-1} & \text{if } S_t = bad \ \& \ S_{t-1} = bad \end{cases}$$

- In equilibrium
    - Groups save abroad even if $\beta < r$.
    - ↑ National gross debt coexist with ↑ private assets abroad.
- The Current Account

$$CA_t = \beta \sum_{i=1}^n b_{i,t} - rD_{t-1} - \sum_{i=1}^n c_{i,t}$$

- Private assets abroad of each group

$$\hat{b}_{i,t} = \left[\frac{1+\beta}{\delta}\right]^t [b_{i,0} + L_0] - \left[1 + \frac{n\beta - \lambda}{n-1}\right]^t L_0$$

- National debt

$$\hat{D}_t = \delta^{t-1}\Gamma \left[\frac{1 - (\Upsilon/\delta)^t}{1 - \Upsilon/\delta}\right] L_0, \qquad \Upsilon \equiv 1 + \frac{n\beta - \lambda}{n-1}, \quad \Gamma \equiv \frac{n[\lambda - \beta]}{n-1}$$

Effects of ECB Policies

The ECB can indirectly relax the constraints on periphery NCBs:

- Authorizing the purchase of bonds in the secondary market (SMP).
- Further relax the criteria for "acceptable collateral" and in this way allow an NCB to grant more credit to banks.
- Emergency loans agreements (ELAs) can be authorized when there is no more eligible collateral
- Outright monetary transactions (OMT)

- In an interior equilibrium, without conditionality

- The benefits from an ECB policy shift that increase λ are squandered
- $\uparrow \lambda \rightarrow \uparrow$ groups' borrowing–fiscal appropriations–and results in lower growth of L_t
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- *"What leaves one aghast is the irresponsibility of those who think of fixing themselves when the house is still burning"* M. Monti, FT Dec11, 2012

Direct effect: $\uparrow \lambda \rightarrow \uparrow$ growth of L, NCB available credit to banks

Indirect effect: $\uparrow \lambda \rightarrow \uparrow$ groups' loan demand

$$\frac{\partial \hat{g}_{i,t}}{\partial \lambda} = \frac{1}{n-1} L_t > 0$$

Net effect: $\downarrow$ growth of L

$$\frac{\partial \left(\hat{L}_{t+1}/\hat{L}_t \right)}{\partial \lambda} = 1 - \frac{n}{n-1} = \frac{-1}{n-1} < 0$$

Neither groups' consumption nor utility increase

$$V_i = \frac{\delta}{\delta - 1} \left[\log(L_0 + b_{i,0}) + \frac{1}{\delta - 1} \log\left(\frac{1 + \beta}{\delta} \right) \right]$$

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- BUT it exposes the ECB governing board to *direct* political pressure from *powerful groups*

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- Can eliminate Target2 imbalances, and still have an EZ problem
- BUT, political limits will be hit. Target2 cannot grow forever.

- What share of Target2 is a bailout?
- Back-of-the envelope calculation
- Between 2009:I and 2012:I

$$\underbrace{\uparrow \text{Target2 GIPS liabilities}}_{\text{€680bn}}$$

$$\underbrace{\downarrow \text{G\&F banks claims}}_{\substack{\text{on GIPS} \\ \underbrace{\text{€280bn}} \\ \approx \text{Bailout}}} \qquad \underbrace{\sum \text{CA deficit}}_{\substack{\underbrace{\text{€370bn}} \\ \approx \text{Excess Spending-Income}}} \qquad \underbrace{\downarrow \text{gross PAA}_{\text{gips}}}_{\substack{\underbrace{\text{€5bn}} \\ \approx \text{Private Repay}}}$$

Structural Reform

- ECB policies open a window of opportunity for reform
- Do reforms—that affect powerful groups—happen in good times or during severe crises?
- Ranciere & Tornell (forthcoming)

Conclusion

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