Capital Controls or Macroprudential Regulation?[1]

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Capital Flows, Systemic Risk, and Policy Responses

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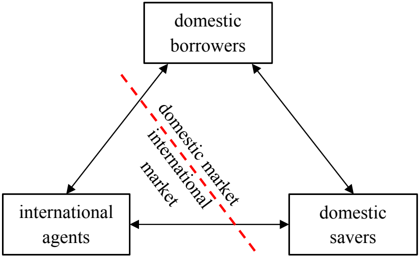
[1] The views expressed herein are those of the authors and should not be attributed to the IMF, its Executive Board, or its management.

Motivation

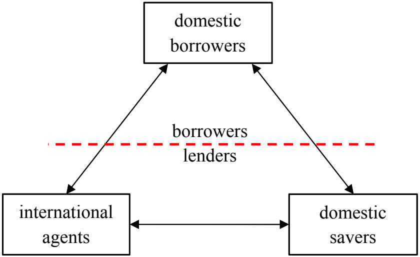
- How to protect open economies against financial instability?
- Two instruments:
  - Capital controls (CC)
  - Macroprudential regulation (MP)
- Both curb credit booms, but so far studied in isolation
- In this paper, we ask following questions
  - What are the relative merits?
  - Does MP eliminate the need for CC? Or vice versa?
  - If not, what determines the optimal mix?

Definitions

- CC segment domestic and foreign capital markets
- MP places a wedge between domestic borrowers and all lenders



Capital Controls



Macroprudential Regulation

Models of pecuniary externalities

We analyze CC and MP in models of pecuniary externalities

- Exchange rate externalities

  $\Rightarrow$ both CC and MP are needed

- Asset price externalities

  $\Rightarrow$ MP is sufficient, no need for CC

Literature review

- Ex-ante prudential policies motivated by pecuniary externalities
  - CC due to RER externalities
    Korinek (2007, 2010), Bianchi (2011)
  - MP due to asset price externalities
    Lorenzoni (2008), Jeanne and Korinek (2010), Bianchi and Mendoza (2010)
- Ex-post policies to alleviate credit crunch
  Gertler and Kiyotaki (2010), Gertler and Karadi (2011,2013), Del Negro, Ferrero, Eggertsson and Kiyotaki (2011), Sandri and Valencia (2013)

Model with RER externalities

- Deterministic equilibrium
- Small open economy in three time periods $t \in \{0, 1, 2\}$
- Three classes of agents
  - domestic borrowers B
  - domestic savers S
  - foreigners that borrow/lend at the risk-free rate
- Discount factor and risk-free rate set to zero
- Domestic savers and borrowers maximize

$$U^i = u(c^i_{T,0}) + u(c^i_{T,1}, c^i_{N,1}) + u(c^i_{T,2}) \quad \text{for} \quad i = B, S$$

Budget constraints

- Domestic agents:
  - receive endowments $y^i_{T,t}$, $y^i_{N,1}$
  - buy/issue bonds denominated in tradable goods b^i_t

- Budget constraints:

$$\begin{aligned} c^i_{T,0} + b^i_1 &= y^i_{T,0} + b^i_0 \\ c^i_{T,1} + pc^i_{N,1} + b^i_2 &= y^i_{T,1} + py^i_{N,1} + b^i_1 \\ c^i_{T,2} &= y^i_{T,2} + b^i_2 \end{aligned}$$

- In period 1, borrowers face credit constraint:

$$b^B_2 \geq -\phi \left(y^B_{T,1} + py^B_{N,1} \right)$$

Time 1 equilibrium

- Defining $m^i = b_1^i + y_{T,1}^i$, individual agents maximize

$$V^i\left(m^i; M^B, M^S\right) = Log\left((c_{T,1}^i)^\alpha (c_{N,1}^i)^{1-\alpha}\right) + Log\left(y_{T,2}^i + b_2^i\right)$$
$$+ \mu^i\left(m^i + p(y_{N,1}^i - c_{N,1}^i) - c_{T,1}^i - b_2^i\right) + \lambda^i\left(b_2^i + \phi(y_{T,1}^i + p y_{N,1}^i)\right)$$

- The FOCs imply

$$\begin{aligned} u_{T,1}^i &= u_{T,2}^i + \lambda^i \\ u_{T,1}^i &= u_{N,1}^i / p \end{aligned}$$

Aggregate wealth effects

- Impact of aggregate wealth on individual utility

$$\frac{\partial V^j}{\partial M^i} = u^j_{T,1} \cdot \underbrace{\frac{\partial p}{\partial M^i}(y^j_{N,1} - c^j_{N,1})}_{\text{redistribution between agents } R^j_i} + \lambda^j \cdot \underbrace{\frac{\partial p}{\partial M^i}\phi y^j_{N,1}}_{\text{relaxation of constraint } \Phi^j_i}$$

- Using market clearing in non-tradable goods

$$\frac{\partial p}{\partial M^i} = \kappa \cdot MPC^i$$

where

$$MPC^B = 1 \quad , \quad MPC^S = 1/2$$

Time 0 equilibrium

- At time 0 agents solve

$$\max \quad u(c^i_{T,0}) + V^i\left(m^i; M^B, M^S\right)$$
$$\text{subject to}$$
$$m^i = b^i_0 + y^i_{T,0} - c^i_{T,0} + y^i_{T,1}$$

- Individual agents take prices as given
- Standard Euler equation

$$u^i_{T,0} = \frac{\partial V^i}{\partial m^i} = u^i_{T,1}$$

Optimal Prudential Policy

- Prudential planner: sets B_1^i but leaves laissez-faire for $t \geq 1$ (as in Stiglitz, 1982, Geanakoplos-Polemarchakis, 1986)

- The planner sets

$$\gamma^i u^i_{T,0} \quad = \quad \underbrace{\gamma^i u^i_{T,1}}_{\text{private benefit}} \quad + \quad \underbrace{\gamma^i \frac{\partial V^i}{\partial M^i} + \gamma^j \frac{\partial V^j}{\partial M^i}}_{\text{social benefit}}$$

internalizing the effects of borrowing on future exchange rates

Implementation

- The planner's solution can be implemented with borrowing taxes and saving subsidies

$$\frac{u^i_{T,1}}{u^i_{T,0}} = 1 - \tau^i$$

- Optimal taxes are

$$\tau^B = \frac{\lambda^B}{u^B_{T,0}} \frac{\frac{\partial p}{\partial M^B} \phi Y^B_{N,1}}{1 + R^B_B - R^B_S} \quad \text{and} \quad \tau^S = \frac{\lambda^B}{u^B_{T,0}} \frac{\frac{\partial p}{\partial M^S} \phi Y^B_{N,1}}{1 + R^B_B - R^B_S}$$

$$\tau^B = \frac{MPC^B}{MPC^S} \cdot \tau^S > 0$$

Capital controls or macroprudential regulation?

Proposition

In a model with RER externalities, both MP and CC are needed to achieve constrained efficiency.

- By segmenting domestic borrowers from capital markets
  $\Rightarrow$ MP increases τ^B without affecting τ^S
- By segmenting domestic versus international markets
  $\Rightarrow$ CC lead to an equal increase in both τ^B and τ^S
- The appropriate combination of MP and CC is given by

$$
\begin{aligned}
1-\tau^{CC} &= 1-\tau^{S} \\
1-\tau^{MP} &= \frac{1-\tau^{B}}{1-\tau^{S}}
\end{aligned}
$$

Stochastic setting

The results carry forward to a stochastic setting

- Without state contingent assets

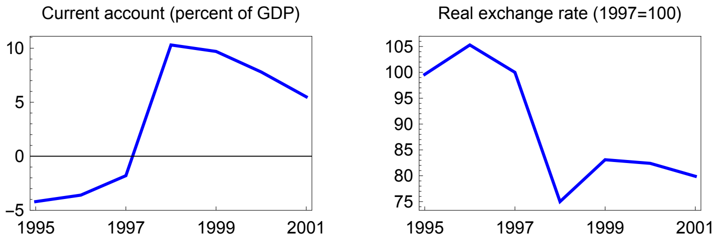
  $\rightarrow$ Size of CC and MP depends on likelihood of constraints becoming binding

- With state contingent assets

  $\rightarrow$ Individual agents under-insure

  $\rightarrow$ CC and MP should be risk sensitive

Numerical illustration: 1997 East Asian Crisis

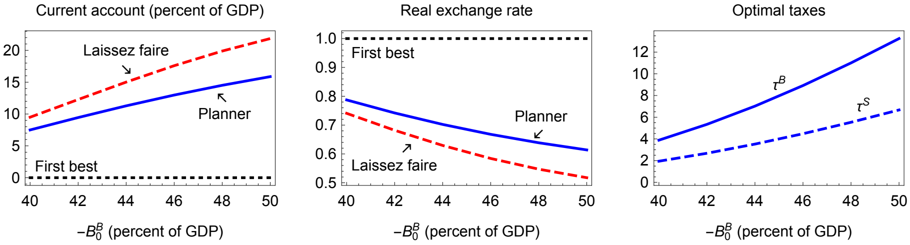


- Balanced growth path if constraint does not bind
- Financial constraint ϕ tightens with 5% probability
  $\rightarrow$ to match CA surplus and REER depreciation
- Pre-crisis net foreign assets equal to -40%

α	$Y^i_{T,0}$	$Y^i_{T,1}$	$Y^i_{N,1}$	$Y^i_{T,2}$	B^B_0	B^S_0	π	$\phi(L)$	$\phi(H)$
0.3	1	α	$1-\alpha$	$1-B^i_0$	-0.8	0	5%	0.65	∞

Wealth inequality and optimal taxes

- Under benchmark calibration, 2 percent CC and MP taxes



- Greater wealth inequality, i.e. larger gross positions,

  $\Rightarrow$ higher optimal taxes

Model with asset price externalities

- Domestic agents receive capital k_1 that produces output at time 2
- Borrowers have access to more efficient production technology

$$F^B(k_2^B) = Ak_2^B \quad , \quad F^{S\prime}(0) = A \quad , \quad F^{S\prime\prime}(k_2^S) < 0$$

- Budget constraints:

$$\begin{aligned} c_{T,0}^i + b_1^i &= y_{T,0}^i + b_0^i \\ c_{T,1}^i + b_2^i &= y_{T,1}^i + q(k_1^i - k_2^i) + b_1^i \\ c_{T,2}^i &= y_{T,2}^i + F^i(k_2^i) + b_2^i \end{aligned}$$

- In period 1, borrowers face credit constraint:

$$b_2^B \geq -\phi q k_2^B$$

Aggregate wealth and asset prices

- Laissez-faire FOCs

$$u^i_{T,1} = u^i_{T,2} + \lambda^i \quad \text{and} \quad q = \frac{F^{i\prime}(k^i_2)}{\phi + (1-\phi)u^i_{T,1}/u^i_{T,2}}$$

- For unconstrained savers, $u^S_{T,1} = u^S_{T,2}$ and

$$\frac{\partial q}{\partial M^S} = 0$$

$\Rightarrow$ Fisherian separation between consumption and investment

- For constrained borrowers, $u^B_{T,1} > u^B_{T,2}$ and

$$\frac{\partial q}{\partial M^B} > 0$$

Planner's solution

- The planner reduces borrowing, but does not distort saving

$$\tau^B = \lambda^B \frac{\frac{\partial q}{\partial M^B} \phi k_2^B}{1 + R_B^B}$$

$$\tau^S = 0$$

Proposition

In a model with asset price externalities, MP is sufficient to achieve constrained efficiency. No need for CC.

Conclusions

- Contractionary RER depreciations ⇒ both CC and MP
  - increase net worth of people who spend on domestic goods, i.e. both borrowers and savers
  - but regulate borrowers more since higher MPC

$$\tau^B = \frac{MPC^B}{MPC^S} \cdot \tau^S > 0$$

- Fire sales of assets ⇒ MP is sufficient
  - No need to increase savers' wealth since no impact on asset prices

$$\tau^B > 0 = \tau^S$$