

# The Macprudential Role of International Reserves

Olivier Jeanne  
Johns Hopkins University\*

December 2015

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\*Olivier Jeanne, Department of Economics, Johns Hopkins University, 3400 N.Charles Street, Baltimore MD 21218; email: ojeanne@jhu.edu

# 1 Introduction

There has been a lot of interest since the global financial crisis in how emerging market economies should respond to fluctuations in the availability of external credit associated with the "global financial cycle". Economists, including the staff of the IMF, have advocated a more active use of capital controls.<sup>1</sup> However emerging markets economies seem to have a predilection for using cyclical accumulation of reserves rather than capital controls. We need to understand better the role of reserves in capital flow management.

This note discusses the role of reserves in capital flow management based on a simple welfare-based model of capital flows with banking frictions. The model features an emerging market economy (EM) and global banks. The banks are subject to a fire-sale risk and to a Value-at Risk constraint. The EM can mitigate the friction by accumulating reserves in good times and using them to put a floor on the price of its assets in bad times. The optimal management of reserves requires a government intervention as the private incentives to accumulate reserves are in general not aligned with the social benefits of reserves.<sup>2</sup> Capital controls have a role in this model, but it is limited to making agents internalize the social cost of accumulating reserves.

## 2 Model

The model has two periods  $t = 1, 2$  and one homogeneous good that is used for consumption. There is an emerging-markets economy (EME) and global banks. The emerging-market country is populated by a representative borrower with utility,

$$U = u(c_1) + E_1 c_2. \quad (1)$$

The *EM* borrower finances consumption and reserves by borrowing from bankers. His budget constraints are,

$$c_1 + m = b, \quad (2)$$

$$c_2 = y - (1 + r)b + m, \quad (3)$$

where  $b \geq 0$  are bank loans,  $r$  is the interest rate on bank loans, and  $m \geq 0$  are international reserves.

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<sup>1</sup>See Jeanne and Korinek (2010), Rey (2015), Farhi and Werning (2014), Ostry et al. (2012) and IMF (2012).

<sup>2</sup>The case for liquidity regulation is similar to Stein (2012).

Bankers finance their loans by raising zero interest rate deposits. There is a small probability that a fraction  $s$  of bankers will have to fire-sale their assets between period 1 and period 2 at a price  $q$ . The only agents on the buying side of a fire sale are the EM residents who buy the assets with international reserves. Hence the fire-sale price of the asset satisfies  $qsb = m$ .

I assume that the bankers have no equity in period 1 and are subject to a value-at-risk constraint. They raise  $b$  in non-interest-bearing deposits and must be able to repay the deposits even if they fire-sale their assets. Hence  $q$  must be equal to 1 which is possible only if,

$$m \geq sb.$$

Reserves must amount to at least a fraction  $s$  of gross capital inflows so that the EM can buy back its assets at a price that ensures that banks satisfy their value-at-risk constraints. This is a necessary condition for the EM to receive any capital inflow at all.

Importantly, this condition is in general not satisfied if the decision to accumulate reserves is left to decentralized EM agents. To see this assume that the probability of fire sales is vanishingly small so that ex ante welfare is not affected by the risk of a fire sale. Then private agents maximize (1) subject to the budget constraints (2) and (3) and the non-negativity constraints  $b \geq 0$  and  $m \geq 0$ . The solution is  $u'(b) = 1+r$  and  $m = 0$ . Private agents have no incentives to accumulate reserves that bear an opportunity cost  $r$  but bring a benefit with a vanishingly small probability.

In general, private agents accumulate reserves but this limit case illustrates that the private marginal gain from reserves, which is proportional to the *probability* of a fire sale, does not coincide with the social marginal gain from reserves, which depends on the fire-sale *price*. There is a true pecuniary externality coming from the fact that private agents do not internalize the impact of international reserves on the fire-sale price ex post which determines their access to credit ex ante.

### 3 Policy

There are different ways that the EM government can implement the constrained-efficient allocation. The government can impose the constraint  $m \geq sb$  on individual borrowers through quantitative financial regulation (a reserve requirement) or subsidize reserve accumulation. However, the reach of financial

regulation may be limited to a subset of agents in the financial sector and the taxes required to finance the subsidy may be distortive. An alternative is for the government to engage in balance sheet operations by which it finances reserves accumulation by issuing its own debt.

Capital controls can play a role in this model but it is derivative—it is simply to make individual agents internalize the social cost of reserves. If the government can impose the constraint  $m \geq sb$  on individual borrowers there is no need for capital controls because individual agents take into account the opportunity cost of reserves in their borrowing decisions. It is not desirable to reduce the level of net capital inflows, which is already lower than the unconstrained first best. However in arrangements where the reserves are accumulated by the government it is necessary to impose a tax on capital inflows so as to make private agents internalize the social cost of accumulating the reserves.

I will conclude by observing that the model is consistent with a few stylized facts about the behavior of capital flows and international reserves in the global financial cycle. EM sell risky claims on themselves and accumulate safe claims on the rest of the world. We can think of the global financial cycle as originating from fluctuations in the interest rate  $r$ .<sup>3</sup> In good phases of the cycle, when  $r$  is low, there is an expansion in both gross capital inflows to, and outflows from, EM economies. In bad phases of the cycle, when  $r$  is high, there is a contraction in the EM balance sheet, a combination of a "stop" and a "retrenchment" in the terminology of Forbes and Warnock (2012). Gross flows are more volatile than net flows.

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<sup>3</sup>This is obviously a very simplified view of the global financial cycle. Another source of fluctuation could be in bank equity, which here has been set to zero.

## References

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