

DEALING WITH CAPITAL INFLOWS



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•PRELIMINARY AND INCOMPLETE.

BASED ON WORK WITH JONATHAN OSTRY, REX GOSH, AND MARCOS CHAMON.

Managing Capital Inflows



- Focus on exogenously triggered capital inflows.
- Potentially three tools:
 - Policy rate
 - Sterilized FX Intervention
 - Capital flow management (CFM) tools
- Several studies on implications of specific distortions and use of one or two instruments.
- But no integrated view, and drastically different policy mixes across countries
- IMF has revisited capital controls, but no similar reassessment of FX intervention.

How Central Banks Actually Respond



Capital Flow Management Tools

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- Looking at capital inflows to EMs from 2009 on.
- Capital controls. Heterogeneity of responses:
 - Brazil used them heavily (broad based tax on inflows); Israel used non-resident currency swaps
 - South Africa and Thailand liberalized restrictions on outflows
 - Some simply ruled out their use (e.g., Chile and Turkey).
- Targeted macro prudential instruments
 - FX-related measures (Brazil, Korea and Peru)
 - Minimum holding period for CB bills (Indonesia)

FX Intervention, and Policy Rate

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- **FX Intervention**
 - Widespread use
 - Official motivation: “Avoid disorderly conditions in the FX market”
 - Consistent with often large accumulation?
- **Policy rate**
 - No consistent response.
 - Perceived dilemma? Increase: increase flows/appreciation.
Decrease: increase overheating

Econometric Estimates

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- We estimate responses of the policy rate (r) and FX (R) to either the exchange rate (e), or gross capital flows (k), instrumented by gross global flows to non reserve currency countries (all quarterly innovations from VAR)
 - $r = a e + \varepsilon$; $R = b e + \varepsilon$, *IV(x: global flows)*
or
 - $r = b k + \varepsilon$; *or* $R = b k + \varepsilon$, *IV(x: global flows)*
- 2005-1 to 2013-4. 19 countries

Estimation Results

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- Policy rate to exchange rate: no significant effect
 - Overall 12 positive, 7 negative.
 - Significant in both stages 2 positive , 0 negative
- FX response to exchange rate: positive, often significant
 - Overall 15 positive, 4 negative.
 - Significant in both stages 5 positive , 0 negative
- Policy rate to gross flows: positive, often significant
 - Overall 11 positive, 8 negative.
 - Significant in both stages 6 positive , 1 negative
- FX response to gross flows: positive, significant
 - Overall 16 positive, 3 negative.
 - Significant in both stages 12 positive , 0 negative

What Do Capital Flows Actually Do?



What do Capital Flows Do?

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- Seems like a silly question at this stage. But surprisingly unsettled:
- In a standard Mundell-Fleming model, inflows are contractionary if the policy rate remains constant (because of appreciation) (and remember the empirical evidence on the policy rate above)
- But policy makers perceive inflows as expansionary, a source of credit booms, and overheating.
- What may be missing? Financial sector effects for a given policy rate.

A simplistic Model of Capital Flows

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- Need two domestic interest-paying assets available to foreign investors.
So:
- Three domestic assets:
 - Money (M)
 - Government bonds (B), (policy) rate determined by monetary policy
 - Equities (X) (alternatively, private bonds, bank wholesale funding)
- One (relevant) foreign asset
 - Foreign bonds, (B^*)
- Domestic investors choose between M, B, X, B^*
- Foreign investors choose between B^* , B, X

The Central Bank

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- The domestic central bank can issue money (M) and buy either domestic or foreign assets (B, X, B*). $M=B+X+B^*$
- Conducts OMO by buying/selling domestic bonds B.
- Conducts FX intervention by buying/selling foreign currency and then buying/selling foreign bonds, B*.
- Sterilizes by selling/buying either domestic bonds B or domestic equities X.

Equilibrium Conditions

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- Equilibrium in M, B, X, and the capital account require:

$$M = M_D$$

$$\bar{B} = B_D + B_{CB} + B_F$$

$$\bar{X} = X_D + X_{CB} + X_F$$

$$(X_F - \bar{X}_F) + (B_F - \bar{B}_F) =$$

$$(B_D^* - \bar{B}_D^*) / E + (B_{CB}^* - \bar{B}_{CB}^*) / E$$

Demand Functions: Domestic Investors

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$$M = (\alpha_0 - \alpha_1 R_1)W$$

$$B_D = (a + a_1(R_1 - R_2) + a_2(R_1 - R^*E / E_{+1}^e))(W - M)$$

$$X_D = (b + b_1(R_2 - R_1) + b_2(R_2 - R^*E / E_{+1}^e))(W - M)$$

$$B_D^* / E = (c + c_1(R^*E / E_{+1}^e - R_1) + c_2(R^*E / E_{+1}^e - R_2))(W - M)$$

Where:

$$a + b + c = 1, \quad a_1 + a_2 - b_1 - c_1 = 0$$

$$b_1 + b_2 - a_1 - c_2 = 0, \quad c_1 + c_2 - a_2 - b_2 = 0$$

Demand Functions: Foreigners

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Without capital controls; s_1 and s_2 are shifts in foreign demand.

$$M_F = 0$$

$$B_F = (d + d_1(R_1 - R_2 + s_1) + d_2(R_1 - R^*E / E_{+1}^e + s_1))W^*$$

$$X_F = (f + f_1(R_1 - R_2 + s_2) + f_2(R_2 - R^*E / E_{+1}^e + s_2))W^*$$

With capital controls

$$M_F = 0$$

$$B_F = (d + d_1((1 - k_1)R_1 - (1 - k_2)R_2 + s_1) + d_2((1 - k_1)R_1 - R^*E / E_{+1}^e + s_1))W^*$$

$$X_F = (f + f_1(1 - k_1)R_1 - (1 - k_2)R_2 + s_2) + f_2((1 - k_2)R_2 - R^*E / E_{+1}^e + s_2))W^*$$

Where k_1 and k_2 are indices of capital controls (tax rates)

Equilibrium

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- We can drop one equilibrium condition (Walras' law): Drop the equilibrium condition for M
- We look at sterilized FX, so assume the policy rate R_1 (equivalently M) to be given.
- We assume all elasticities to be equal to b ; $R_1=R^*=E(+1)=1$, and convenient normalizations on W^* and $W-M$.
- Focus on equilibrium on equity and FX market, which determine R_2 and E .
- Let x_{cb} and b^*_{cb} : changes in CB holdings of stocks and foreign bonds

Equilibrium R2 and E

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Equilibrium in the equity market:

R2 up. Increase demand for equities. E must go up (expected depreciation, less attractive domestic assets)

$$b(R_2 - 1) + b(R_2 - E) + b((1 - k_2)R_2 - (1 - k_1)) + \\ b((1 - k_2)R_2 - E) + 2bs_2 + x_{CB} = 0$$

Equilibrium in the foreign exchange market

R2 up. Increase demand. E must go up (expected depreciation)

$$b((1 - k_1) - (1 - k_2)R_2 + (1 - k_1) - E) + \\ b((1 - k_2)R_2 - (1 - k_1) + (1 - k_2)R_2 - E)) + 2b(s_1 + s_2) = \\ = b(E - 1) + b(E - R_2) + b_{CB}^*$$

Basic Results

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- With no capital controls, no FX intervention, and keeping $R_1 = 1$ constant:

$$R_2 = 1 + \frac{1}{3}s_1 - \frac{1}{3}s_2$$

$$E = 1 + \frac{2}{3}s_1 + \frac{1}{3}s_2$$

If close with goods market equilibrium $Y = Y(E, R_2)$:

- Bond inflows $\rightarrow E \uparrow, R_2 \uparrow$, so $Y \downarrow$
- Equity inflows $\rightarrow E \uparrow, R_2 \downarrow$, so Y ambiguous
 - Decrease in R_2 for given R_1 is an additional effect relative to standard Mundell-Flemming model.

Extensions

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- **Different elasticities**
 - Between domestic bonds and domestic equities
 - Between domestic and foreign assets (equities, or bonds)

Managing the Flows



Managing capital inflows

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- **Why manage? What are the distortions?**
Again need for reconciliation of policy makers' beliefs and academic formalizations. (bounded rationality versus pecuniary externalities for example).
- **Two main worries**
 - Financial stability? (excessive inflows)
 - Macroeconomic stability (excessive appreciation)
 - So desired R_2 and E in response to s_1, s_2 may differ from market outcome.
- (Will take the policy rate R_1 as given. So as to focus on the other two instruments. In principle, need to look at all 3)

Optimal (E, R2) is Likely Country-Specific

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- Countries with limited currency mismatches can afford more exchange rate volatility.
- Labor-intensive industries with small margins are more vulnerable to exchange rate volatility than industries with higher margins or commodity producers.
- Financial development/depth can also help firms/banks cope with shocks/absorb flows.

Using Capital Controls

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- k_1 decreases bond flows and increases equity flows (as E appreciates less, implying lower expected depreciation). It reduces the appreciation, and leads to a larger decrease in $R2$.
- k_2 decreases equity flows and increases bond flows (as E appreciates less, implying lower expected depreciation). It reduces the appreciation, and leads to a smaller decrease in $R2$.
- Hard to see the case for not using k_1 . What is good about bond flows?

Using Sterilized FX Intervention

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- Effect of FX Intervention depends on nature of flows and nature of sterilization
- If bond flows: Sterilization through bonds completely cancels the effect of flows on both E and R_2 .
 - Just change in ownership (fiscal effects not taken into account)
 - Foreigners hold more B (less B^*), the central bank holds less B (more B^*)
- If equity flows: Sterilization through bonds causes relative decline in E and R_2 .
 - Increase in the demand for equities (by foreigners), not offset by a decrease in demand for equities by central bank.
Decrease in R_2 .

Controls or FX intervention? An Equivalence Proposition

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- Rather trivially:
- For given shocks s_1, s_2
- For given desired $R_2(s_1, s_2), E(s_1, s_2)$
- Can achieve desired R_2 and E through:
- Either : sterilized intervention, b_{cb}^* and x_{cb}
- Or : capital controls k_1 and k_2

An Example

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- Assume $s_2 > 0$, $s_1 = 0$.
- Want to achieve same R_2 as under no policy, but E constant
- If use capital controls $k_1 = s_2/3$, $k_2 = (s_2/3)/R_2$
- If sterilized intervention $b^*_{cb} = 4bs_2/3$, $x_{cb} = -2bs_2/3$

But clear limits:

- Controls. Limited flexibility wrt size of s_1 and s_2 .
- Controls. Limited ability to separate between s_1 and s_2 .
- FX: Fiscal costs of sterilization.
- FX: No credit risk, so sterilization through bonds only.
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Another Example, with constraints

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- Assume $s_2 > 0$,
- Assume cannot distinguish between flows, so $k = k_1 = k_2$
- Assume sterilization only through bonds, so $x_{cb} = 0$
- Assume you want to keep R_2 and E constant.

- $k = 2s_2$
- $b_{cb}^* = -2bs_2$ (Note the sign)

- Use controls to keep equity flows constant. But this also decreases bond flows, leading to a decrease in E . To offset it, central bank needs to sell foreign bonds (do negative FX intervention)

Reintroducing the Policy Rate

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- **If bond flows: Lower policy rate can discourage flows and counter contractionary effect of flows. As in Mundell Fleming.**
- **If equity flows: Response should depend on whether flows are:**
 - **Contractionary → Lower policy rate**
 - **Expansionary → Raise policy rate.**

Conclusions 1

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- A simple (simplistic, old fashioned, ad hoc?) structure to think about flows and policies.
- Only a starting point:
 - Ad hoc in many ways, e.g. no current account in equilibrium conditions, no explicit treatment of distortions
- But some progress:
 - A framework that extends MF model and reconciles policy makers' and academic views of the effects of inflows.
 - A clear distinction between bond flows and equity (wholesale funding, etc...) flows.
 - An equivalence proposition between CFM and FX as a starting point.

Conclusions 2

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Many factors left out:

- A continuum of assets. From short government bonds to long government bonds, to corporate bonds, to equities, to various forms of wholesale funding.
- Horizon of flows (carry trade/“bad” flows). Use a toll tax.
- Flexibility of instruments: FX more flexible than CFM.
- Political economy considerations.
- Distortions created by the instruments.
- Fiscal cost of sterilized FX intervention.

Conclusions 3

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- **Happy 25th Birthday**
- **May you continue to be a role model for both emerging markets and advanced economies.**