FX Policy when Financial Markets are Imperfect

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Expanding the Toolkit of Central Banks

- Three big crises in rapid succession:
  1. Global financial crisis
  2. European sovereign debt crisis
  3. Covid-19 pandemic

- Reduced scope for traditional monetary policy: ZLB

- Rethink of a broader set of tools:
  - Domestic quantitative easing (QE)
  - **Foreign exchange intervention (FXI)**
  - Capital controls
  - Negative rates

The Plan for Today's Talk

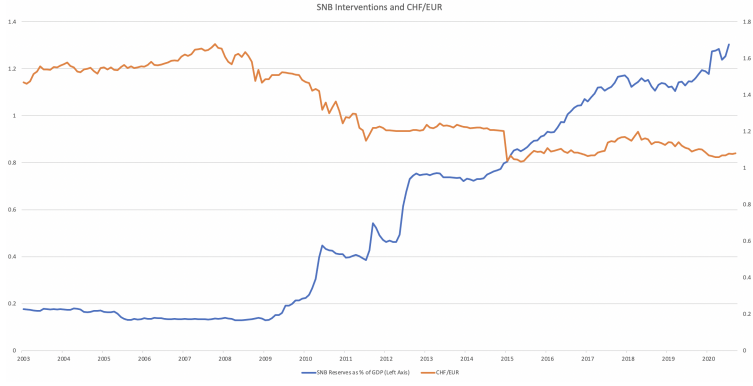
- A very brief history of FXI as a policy
- A simple policy framework
- Some more speculative thoughts
- Remaining challenges

A Very Brief History of the Policy

- Sterilized FX intervention heavily used by many emerging economies
- In a class of models, thought to be ineffective. A combination of:
  - Modigliani and Miller logic applied to central bank balance sheet
  - Ricardian equivalence
- Early empirical investigations were inconclusive
  - Little data and endogeneity problems

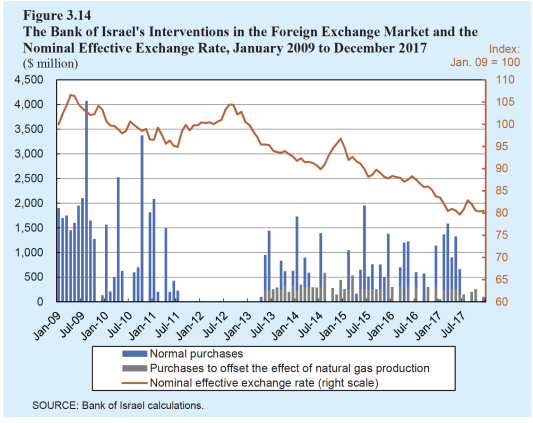
FX Intervention Used on a Grand Scale: Switzerland

- Developed economies using FXI to respond to crises
- The Swiss case:



"*Interventions in the foreign exchange market [...] play a central role in our policy mix*"
SNB President **Thomas Jordan**, IMF Camdessus Lecture July 2020

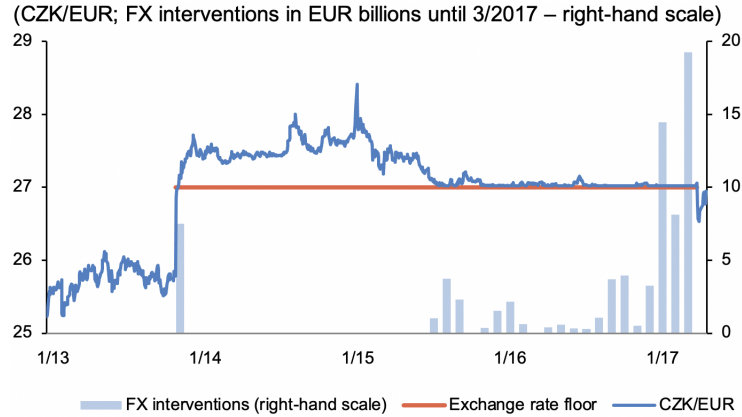
FX Intervention Used on a Grand Scale: Israel



"I have no doubt that the massive purchases [of foreign exchange] we made between July 2008 and into 2010 [...] had a serious effect on the exchange rate which I think is part of the reason that we succeeded in having a relatively short recession."

Stanley Fischer (WSJ 2010)

FX Intervention Used on a Grand Scale: Czech Republic



Source: CNB

A Change in the Consensus

- Capital controls and FXI traditionally discouraged by international policy institutions
- Recent theoretical frameworks focused on determination of exchange rates when financial markets are imperfect
  - In a model of currency market segmentation FXI becomes effective

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  - In a model of currency market segmentation FXI becomes effective
- Policy institutions rethinking FXI:
  - BIS new policy frameworks in EMEs:

    Whether such FX intervention, unaccompanied by policy rate changes, can affect exchange rates at all has long been questioned. But recent theoretical contributions have shown it can be effective under realistic assumptions about the functioning of financial markets. Empirical evidence is consistent with these results. **BIS Annual Economic Report 2019**
  - IMF new Integrated Policy Framework incorporates a role for FXI

Imperfect Finance and the Determination of Exchange Rates

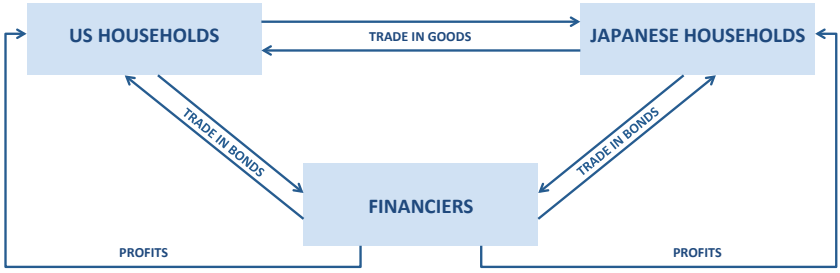
A basic framework of capital flows and exchange rates:

- Capital flows alter balance sheet of financiers who absorb resulting imbalances
- Financiers' balance sheets and risk bearing capacity determine the required compensation for absorbing unbalanced capital flows
- Such compensation determines both the level and dynamics of exchange rates
- Practical Example:

  US investors demand Brazilian Real bonds $\rightarrow$ Financiers provide these bonds in the short-medium run, Short Real and Long Dollar $\rightarrow$ To compensate financiers, the Real appreciates on impact and is expected to depreciate relative to the Dollar

- A basic theory in which a price, *the exchange rate*, has to move to *balance the demand/supply of assets in financial markets*

The Framework in One Picture



The Basic Model (Gabaix and Maggiori, QJE 2015)

I present here the simplest model: real model, imperfect capital markets

- Two countries (US, Japan (*)). Two periods ($t = 0, 1$)
- Unit measure of households in each country
- Four goods: 1 non-tradable (NT) and 1 tradable good in each country
- NT are endowments, tradables produced with int. immobile inelastically supplied labor
- NT good is the numéraire in each economy
- Incomplete Markets: two "risk-free" bonds that pay for sure one unit of the domestic numéraire (the NT good) for each economy
- Households borrow/lend in domestic "risk-free" bonds with the financiers
- Financiers absorb resulting imbalances in global capital flows

The Household Problem

US households' consumption/saving decision:

$$\max_{c} \quad \mathbb{E}\left[\theta_0 \ln C_0 + \beta\theta_1 \ln C_1\right]$$

$$\text{s.t.} \quad \sum_{t=0}^{1} \frac{C_{NT,t} + p_{H,t}C_{H,t} + p_{F,t}C_{F,t}}{R^t} \leq \sum_{t=0}^{1} \frac{Y_{NT,t} + p_{H,t}Y_{H,t}}{R^t}$$

where $C_t \equiv \left[(C_{NT,t})^{\chi_t}(C_{H,t})^{a_t}(C_{F,t})^{\iota_t}\right]^{\frac{1}{\theta_t}}$, and $\theta_t = \chi_t + a_t + \iota_t$

Analogous Japanese households' problem

Net Exports

US households' time t problem:

$$\max_{C_{i,t}} \quad \chi_t \ln C_{NT,t} + a_t \ln C_{H,t} + \iota_t \ln C_{F,t} - \lambda_t \left(C_{NT,t} + p_{H,t} C_{H,t} + p_{F,t} C_{F,t} \right)$$

Focus on two intra-temporal FOCs with respect to $C_{NT,t}$ and $C_{F,t}$:

$$\frac{\chi_t}{C_{NT,t}} = \lambda_t; \qquad \frac{\iota_t}{C_{F,t}} = \lambda_t p_{F,t}$$

Simplifying assumption: $Y_{NT} = \chi_t \Rightarrow \lambda_t = 1$

Dollar value of US imports: $p_{F,t} C_{F,t} = \iota_t$

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Dollar value of US imports: $p_{F,t} C_{F,t} = \iota_t$

Similarly, Yen value of Japanese imports: $p^*_{H,t} C_{H,t} = \xi_t$

So, Dollar value of US exports: $\xi_t e_t$

where e_t is the exchange rate: $e_t \uparrow$ is a Yen appreciation

Dollar value of US **net exports**: $NX_t = \xi_t e_t - \iota_t$

Interest Rates

US households' inter-temporal optimality condition (Euler Equation):

$$1 = \mathbb{E}\left[\beta R \frac{U'_{1,C_{NT}}}{U'_{0,C_{NT}}}\right] = \mathbb{E}\left[\beta R \frac{\chi_1 / C_{NT,1}}{\chi_0 / C_{NT,0}}\right] = \beta R,$$

Recall: simplifying assumption $C_{NT} = Y_{NT} \equiv \chi_t$

Hence: $R = \frac{1}{\beta}$

Likewise: $R^* = \frac{1}{\beta^*}$

Equilibrium Exchange Rate

From the three previous equations,

$$\xi_0 e_0 - \iota_0 + Q_0 = 0; \qquad \xi_1 e_1 - \iota_1 - RQ_0 = 0.$$

$$Q_0 = \frac{1}{\Gamma}\mathbb{E}\left[e_0 - \frac{R^*}{R}e_1\right]$$

the equilibrium exchange rate follows (assume $\xi_t = R = R^* = 1$):

$$e_0 = \frac{(1+\Gamma)\,\iota_0 + \mathbb{E}[\iota_1]}{2+\Gamma}; \qquad \mathbb{E}\left[\frac{e_0 - e_1}{e_0}\right] = \frac{\Gamma\left(\iota_0 - \mathbb{E}\left[\iota_1\right]\right)}{(1+\Gamma)\,\iota_0 + \mathbb{E}[\iota_1]}$$

- Financial Autarky ($\Gamma \uparrow \infty$): $e_0 = \iota_0$
- UIP ($\Gamma \downarrow 0$): $e_0 = \mathbb{E}[e_1] = \frac{\iota_0 + \mathbb{E}[\iota_1]}{2}$
- Exchange rate disconnect

Gross Portfolio Flows

- So far households only traded bonds in *domestic* currency
- For simplicity, assume that some Japanese households have a noise demand f^* for Dollar bonds (financed in Yen bonds), then the equilibrium exchange rate follows:

$$e_0 = \frac{(1+\Gamma)\,\iota_0 + \mathbb{E}[\iota_1] - f^*\Gamma}{2+\Gamma}$$

- $\frac{\partial e_0}{\partial f^*} = -\frac{\Gamma}{2+\Gamma}$: if Japanese households demand Dollar bonds ($f^* > 0$), then the Dollar appreciates ($\downarrow e_0$): supply and demand of assets matters!
- This effect is absent both in complete market models or in models that assume UIP

Foreign Exchange Interventions

- Simple environment: uncertainty $\mathbb{E}[\iota_1] = 1$, sticky prices $\bar{p}^*_{F,0}$
- The Japanese government buys q^* dollars and sells $\frac{q^*}{e_0}$ yen at time 0

$$e_0 - \iota_0 + q^* + Q_0 = 0; \qquad e_1 - \iota_1 - q^* - Q_0 = 0.$$

- $e_0(q^*) = 1 - \frac{\Gamma}{2+\Gamma} q^*$: Yen depreciates...

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- $e_0(q^*) = 1 - \frac{\Gamma}{2+\Gamma} q^*$: Yen depreciates...
- ...creating employment: $Y_{F,0}(e_0) = \min\left(\frac{a^*_0 + \iota_0/e_0}{\bar{p}^*_{F,0}}, L\right)$
- Japanese Welfare:

$$V^*(q^*) \equiv \mathbb{E}[U^*_0 + U^*_1] = V^{*FB} + \ln \frac{Y_{F,0}(e_0(q^*))}{L} + O(q^{*2})$$

- If $\Gamma > 0$ and $Y_{F,0}(q^* = 0) < L$, then welfare $V^*(q^*)$ is increasing in intervention $q^* \in [0, \overline{q}^*]$, where $e(\overline{q}^*)$ generates full employment

Some Remarks on the Nature of FX Interventions

- Interventions as a swap
- Less role for reserves; more role for fiscal capacity of central bank
- Potency of FX intervention depends on state of the FX market (Γ_t)
- Similar foundations as Quantitative Easing
- Capital controls are one way to segment the market
  - The government taxes financiers' profits at rate τ , rebates lump sum
  - Then, financiers' demand: $Q_0 = \frac{\mathbb{E}[e_0 - e_1](1-\tau)}{\Gamma} \equiv \frac{\mathbb{E}[e_0 - e_1]}{\Gamma^{eff}}$
  - Policy warning: financiers matter, effect of the tax on ER depends on the sign of Q_0 before the tax

What do the Data Say?

- Recent literature finds more success for interventions
- Still...endogeneity largely unaddressed. My view: little or no hard evidence thus far
- what is an intervention?
- Short run vs medium run; level vs volatility
- A call/plea for serious policy evaluation

FX Intervention, Capital Controls, and Floors

Much we still do not know:

- Revenue extraction motives and political economy
- Who should govern these policies? Central bank, treasury?
- Should we expect FX intervention to lose money on average?
- Signaling and the (mis-)use of floors on exchange rates
- Beggar thy neighbor policies

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