

Currency Manipulation

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Motivation

- ▶ Highly persistent differences in interest rates across developed economies:
 - account for majority of carry trade anomaly. (Lustig & al. 2011, Hassan & Mano 2017)
 - correlate with equally persistent differences in K/Y ratios. (Hassan, Mertens, Zhang 2016)
- ▶ Risk-based view of these “unconditional” differences in currency returns: **Currencies with low interest rates pay lower returns because they tend to appreciate in “bad” times.**
 - Various views of what makes a currency appreciate in bad times: *country size* (Hassan 2013, Martin 2012), financial development (Maggiore 2013), resilience to disaster risk (Farhi & Gabaix 2015), etc.

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 - ▶ This paper: **interventions in currency markets that change the stochastic properties of exchange rates should change interest rates, expected returns on currencies, and allocation of capital across countries.**
- ⇒ Policies that make your currency appreciate in bad times lower your interest rate and increase capital accumulation.

General Argument on one Slide

Risk-based view of unconditional violations of UIP:

- ▶ A country's CPI depends on a the world price of traded goods, λ_T , and a country-specific shock x^f .

$$p^f = a\lambda_T - bx^f$$

- ▶ The log real exchange rate is

$$s^{f,h} = p^f - p^h$$

- ▶ Consumption Euler equation: country that appreciates in bad times has a lower interest rate and accumulates more capital. UIP fails.

$$r^f + \mathbb{E}\Delta s^{f,h} - r^h = cov(\lambda_T, p^h - p^f)$$

General Argument on one Slide

Risk-based view of unconditional violations of UIP:

- ▶ A country's CPI depends on the world price of traded goods, λ_T , and a country-specific shock x^f .

$$p^f = a\lambda_T - bx^f + \pi\lambda_T$$

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- ▶ Consumption Euler equation: country that appreciates in bad times has a lower interest rate and accumulates more capital. UIP fails.

$$r^f + \mathbb{E}\Delta s^{f,h} - r^h = \text{cov}(\lambda_T, p^h - p^{f*}) - \pi\sigma_{\lambda_T}^2$$

General insight:

- ▶ A policy that alters the covariance between p^f and λ_T can alter interest rates, currency returns, and the allocation of capital across countries.
- ▶ Illustrate implications with an application to exchange rate stabilization.

Exchange rate stabilization

Three facts:

- 1. 88% of countries stabilize their exchange rates relative to some target currency** Reinhart & Rogoff (2007)
 - ▶ Exchange rate stabilization: set of policies that reduce the variance of the real exchange rate relative to a target country without distorting the level.
 - ▶ Not sure if they also manipulate the level, but certainly the variance.
 - ▶ Examples: China, India, Singapore, Denmark...
- 2. Almost all stabilizations are relative to the US dollar.**
- 3. Most small economies stabilize their exchange rate while most large economies do not.**
 - ▶ We provide a framework that can rationalize these facts.

Setup (1/2)

- ▶ Time periods 1, 2; Countries $n = \{m, t, o\}$
- ▶ Continuum of households $i \in [0, 1]$ of which measure θ^m live in the “stabilizing country”, θ^t live in the “target” country, and θ^o live in an “outside” country.
- ▶ CRRA utility over consumption in time=2

$$U(i) = E \left[\frac{1}{1-\gamma} C(i)^{1-\gamma} \right]$$

- ▶ Final consumption bundle is country-specific

$$C(i) = C_T(i)^\tau C_N(i)^{1-\tau}$$

- ▶ At time 2, each household has access to a technology that uses capital and (one unit of) labor in the production of the **non-traded good**

$$Y_N^n = \exp[\eta^n] (K^n)^\nu$$

where $\eta^n \sim N(0, \sigma^2)$.

Setup (2/2)

- ▶ At time 1, each household is endowed with one unit of the traded good and one unit of capital.
- ▶ Capital can be freely shipped internationally only at time 1.
- ▶ **Complete set of Arrow-Debreu securities is traded.**

Model solution:

- ▶ Choose the homogeneous traded good as numéraire.
- ▶ Log-linearize, lowercase variables denote logs.

Freely Floating Exchange Rates (1/2)

- ▶ Equilibrium variables under freely floating regime denoted with *.
- ▶ Households ship traded goods to share risk.
- ▶ Marginal utility from traded consumption equalized across countries

$$\lambda_T^* = -(1 - \tau)(\gamma - 1) \sum_{n=1}^N \theta^n y_N^n$$

- ▶ Real exchange rate is difference in prices of consumption

$$s^{t,m*} = p^{t*} - p^{m*} = \frac{(1 - \tau)\gamma}{(1 - \tau) + \gamma\tau} (y_N^m - y_N^t).$$

- ▶ All countries appreciate when they suffer a bad shock.
- ▶ Bad shocks in larger countries raise λ_T more (spill over to world price of traded good).

Freely Floating Exchange Rates (2/2)

- Large countries tend to appreciate when λ_T is higher
- ⇒ and provide a better hedge against consumption risk.
- ⇒ have lower interest rates & pay lower returns

$$r^t + \Delta E s^{t,m} - r^m = -cov(\lambda_T, p^t - p^m)$$

- ⇒ have lower cost of capital, accumulate more capital per capita.
- ⇒ Higher K/Y ratio increases wages.

Key Insight

- ▶ **A country can increase capital investment and wages by stabilizing its real exchange rate relative to a larger economy.**

Exchange Rate Stabilization

- ▶ The government has two objectives:

P1 Lower the variance of the real exchange rate relative to a target country

$$sd(s^{t,m}) = (1 - \zeta)sd(s^{t,m*})$$

P2 without distorting its conditional mean

$$E(s^{t,m} | \{K^n\}) = E(s^{t,m*} | \{K^n\}).$$

- ▶ To achieve these objectives

1. levy state contingent taxes on traded goods

2. make a lump-sum transfer.

- ▶ Government pays for the cost ΔRes of this intervention using currency reserves (an independent source of traded goods).

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- ▶ **How to stabilize:**

y_N^t ↓: target's marginal utility is higher than yours

→ sell extra traded goods to increase yours.

Effect on Capital Accumulation

Proposition

A country that stabilizes its real exchange rate relative to a target country sufficiently larger than itself lowers its risk-free rate, increases capital accumulation, and increases the average wage in its country relative to the target country.

Example: A small country

- ▶ Has no effect on prices outside its own country
- ▶ But it can increase its covariance of its exchange rate with λ_T by stabilizing relative to a large country

Cost of Stabilization

- ▶ Stabilization changes states in which you buy and sell traded goods.

$$\Delta Res = \int_{\omega} Q(\omega) C_T^m(\omega) d\omega - \int_{\omega} Q^*(\omega) C_T^{m*}(\omega) d\omega$$

- ▶ When $y_N^t \downarrow$, ship out additional traded goods.
- Stabilization relative to large country induces you to provide insurance to the world market.

Proposition

If the stabilizing country is small ($\theta^m = 0$),

- 1. the cost of stabilizing decreases with the size of the target country.*
- 2. the cost of stabilization is negative if the target country is sufficiently large.*

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Proposition

If the stabilizing country is small ($\theta^m = 0$),

- 1. the cost of stabilizing decreases with the size of the target country.*
 - 2. the cost of stabilization is negative if the target country is sufficiently large.*
- ▶ BUT: cost of stabilization increases with size of stabilizing country. Price impact. Do more of what you usually do.
- ⇒ Potential reason why most large countries do not stabilize.

Effect on the Target Country

- ▶ Currency manipulation by a large country changes prices everywhere.
 - ▶ Stabilizing country sells traded goods when $y_N^t \downarrow$, dampens shocks that affect target country, but amplifies world-wide effects of $y_N^m \downarrow$.
- ⇒ Reduces the covariance between the target country's real exchange rate and λ_T .

Proposition

A country that becomes the target of stabilization imposed by a large country experiences a rise in its risk-free interest rate, a fall in capital accumulation, and a fall in average wages relative to all other countries. If the stabilizing country is smaller than the target country ($\theta^m < \theta^t$), the stabilization lowers the volatility of consumption in the target country.

- ▶ When China stabilizes relative to the dollar, its peg diverts capital accumulation from the US to China, even if it does not distort the level of the real exchange rate!
- ▶ However, China also provides consumption insurance to the US.
- ▶ In the absence of valuation effects, overall positive effect on welfare in target country.

Nominal Stabilization when Prices are Sticky

- ▶ Extend our model to allow for the price of traded goods to be rigid in terms of local currency (Mussa (1986), Engel (1999), Cavallo et al (2014)).
- ▶ All consumed goods must be paid for in local currency and the Central Bank sets the money supply M^n .
- ▶ If Central Banks adjust money supply to neutralize nominal price rigidity, same allocation emerges as under freely floating regime.

Proposition

*If the price of the traded good is rigid in terms of the stabilizing country's currency a **nominal stabilization** implements a **real stabilization** of equal strength $\zeta = \tilde{\zeta}$*

- ▶ Can implement real exchange rate stabilization by announcing a set of nominal exchange rates at which Central Bank buys and sells currency.

Other Results

- ▶ Stabilization **can increase stabilizing country's welfare** due to valuation effects.
- ▶ Even if politicians are not be maximizing welfare, they may favor policies that generate revenues at the central bank and increase capital accumulation and wages (of the median voter).
- ▶ Floating bands and interventions with a lack of credibility are simply weaker stabilizations.
- ▶ Positive results are robust to a wide range of models of exchange rate determination (preference shocks, nominal frictions, market segmentation).
- ▶ Key ingredients:
 1. Shocks to price of consumption in large countries spill over more to the rest of the world.
 2. Risk premia determine long-term differences in interest rates across countries.
 3. Currency manipulation primarily operates by placing a wedge on the domestic and foreign prices of traded goods.

Conclusion

- ▶ Most countries stabilize their exchange rate. Existing theories give relatively little guidance on the effects of such stabilizations, on what might be special about the U.S. dollar as a target currency, and on the external effects of these stabilizations.
 - ▶ Proposed a risk-based transmission mechanism for the effects of currency manipulation.
1. Policies that induce a country's currency to appreciate in bad times lower its risk premium, lower the country's risk-free interest rate, and increase domestic capital accumulation and wages.
 2. Stabilizing the exchange rate relative to a larger country is such a policy.
 3. In addition, stabilizing towards larger countries is cheaper and can generate positive revenues, increase welfare.
 4. Exchange rate stabilization has external effects: Target country experiences a rise in interest rates, fall in investment and average wages. But stabilization lowers volatility of consumption in target country.