Exchange Rate Puzzles and Policies

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AFA Lecture
AEA Meetings, New Orleans
January 2023

Research Agenda on Exchange Rates

1. Itskhoki and Mukhin (2021a): "Exchange Rate Disconnect in General Equilibrium," JPE 129(8).
2. Itskhoki (2021): "The Story of the Real Exchange Rate," ARE 13.
3. Itskhoki and Mukhin (2021b): "Mussa Puzzle Redux."
4. Itskhoki and Mukhin (2022a): "Optimal Exchange Rate Policy."
5. Itskhoki and Mukhin (2022b): "Sanctions and the Exchange Rate."
6. Itskhoki and Mukhin (2023): "What Drives the Exchange Rate"
7. Summary: Society of Economic Dynamics, November 2022

Motivation

- Exchange rates offer some of the most pervasive and challenging puzzles in macroeconomics and macro-finance
  - exchange rates feature in all international macro and finance models
  - exchange rates are key to macroeconomic policy in open economies
  - yet, a satisfactory macroeconomic theory of exchange rates was illusive

- The goal is to provide a unifying theory of exchange rates
  1. capture simultaneously all stylized facts about their properties
     — rather than a patchwork of solutions for individual puzzles
  2. offer a policy analysis framework

Exchange Rate Facts: Puzzles

1. Exchange Rate Disconnect (Messe & Rogoff 1983, Engel & West 2005)

$$\mathbb{E}\{\Delta e_{t+1} | y_{t+1}, y_t, ...\} \approx 0 \quad \text{and} \quad \mathrm{var}_t(\Delta e_{t+1}) \gg \mathrm{var}_t(\Delta y_{t+1})$$

   - in finance (BCSC 2006, upcoming work with Chernov and Haddad) exchange rate too smooth: $\mathrm{var}_t(\Delta e_{t+1}) < \mathrm{var}_t(m_{t+1} - m^*_{t+1})$

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4. UIP and Forward Premium Puzzles (Fama 1980, Engel 2016; also CIP)

$$\Delta e_{t+1} = \alpha_F + \beta_F(i_t - i^*_t) + \varepsilon_t \quad \Rightarrow \quad \beta_F < 0, \; R^2_F \approx 0$$

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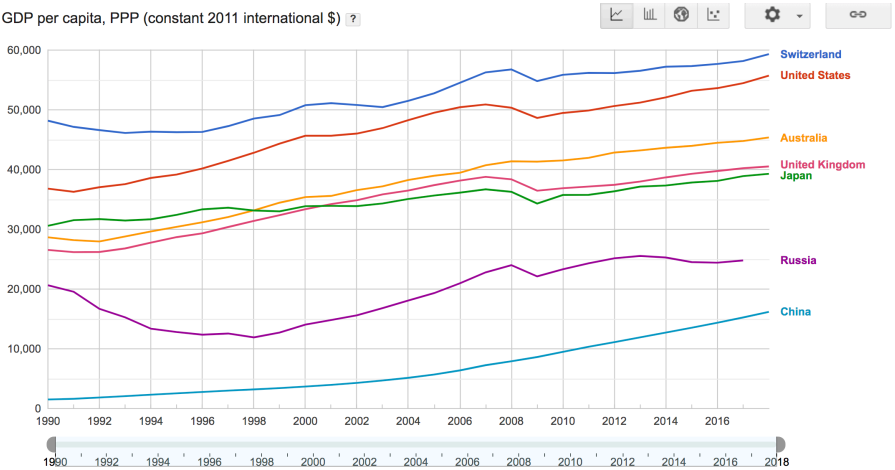
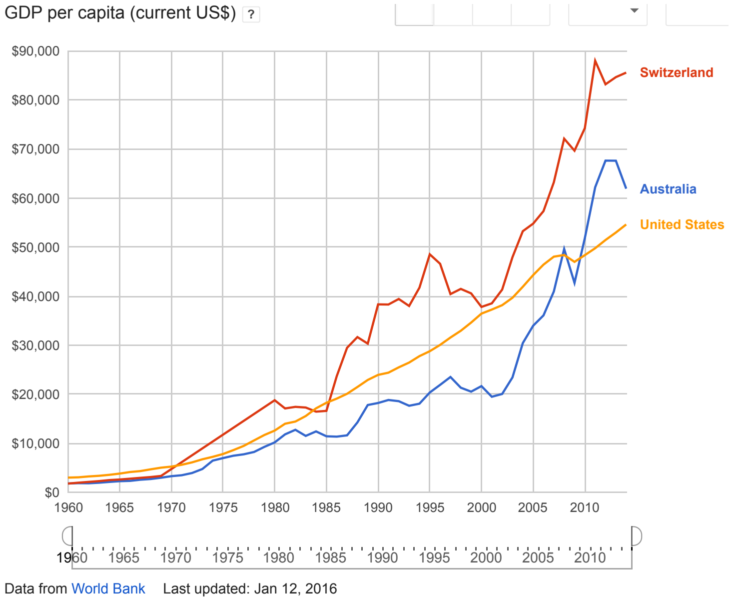
5. Mussa Puzzle (Mussa 1986, Baxter & Stockmann 1989)

GDP per capita, PPP (constant 2011 international $)

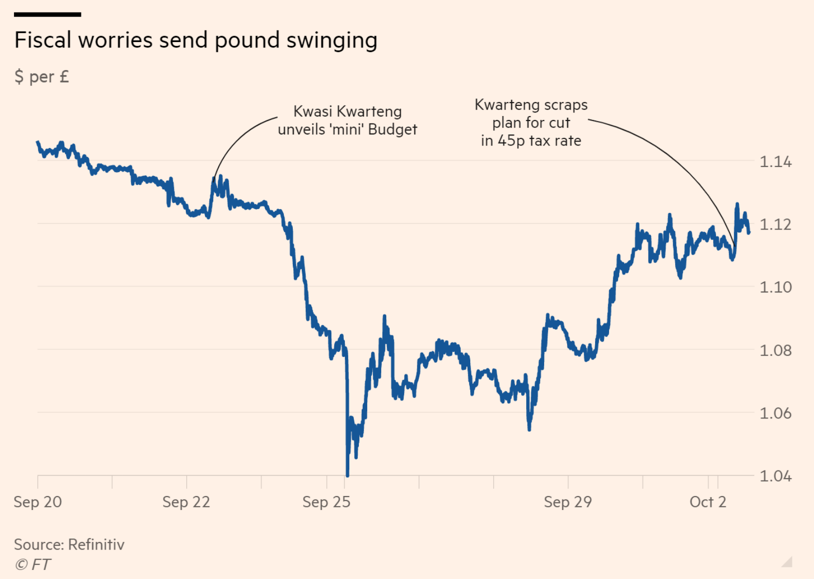


Data from World Bank Last updated: Apr 8, 2020



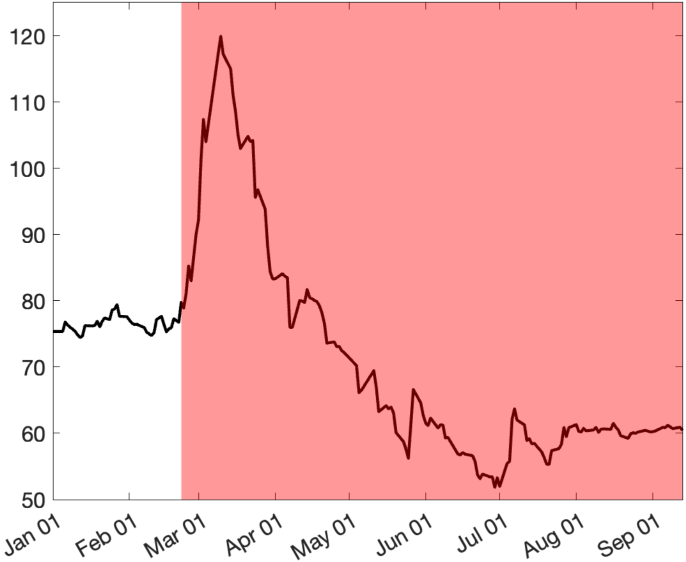
GDP per capita (current US$) ?
$90,000
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
Switzerland
Australia
United States
Data from World Bank
Last updated: Jan 12, 2016


GBP/USD (GBPUSD=X) 1.3304 -0.0047 (-0.3499%) As of 10:16 AM EDT. CCY Delayed Price. Market open.
Add Indicator
Compare
5y
Area
Settings
Reset
GBPUSD=X 1.3297
Open 1.3352
Close 1.3297
Low 1.3289
High 1.3371
Vol 0.00
% Chg -18.06%
YAHOO! FINANCE
1.7500
1.7000
1.6500
1.6000
1.5500
1.5000
1.4500
1.4000
1.3500
1.3297
1.3000
1.2500
Jan 2 '12
Jan 7 '13
Jan 6 '14
Jan 5 '15
Jan 4 '16

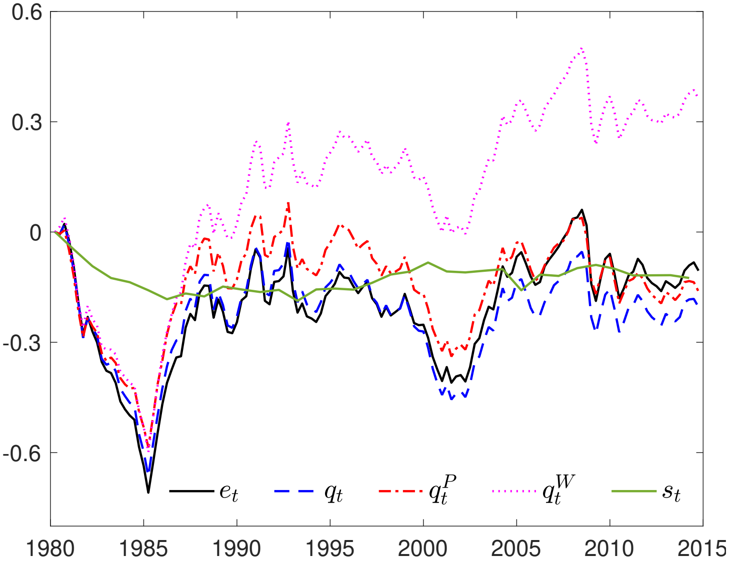

Fiscal worries send pound swinging
$ per £
Kwasi Kwarteng unveils 'mini' Budget
Kwarteng scraps plan for cut in 45p tax rate
1.14
1.12
1.10
1.08
1.06
1.04
Sep 20
Sep 22
Sep 25
Sep 29
Oct 2
Source: Refinitiv
© FT

Exchange Rate Disconnect in Pictures

3. Abenomics and the Japanese yen


120
110
100
90
80
70
60
50
Jan 01
Feb 01
Mar 01
Apr 01
May 01
Jun 01
Jul 01
Aug 01
Sep 01

Real Exchange Rate and PPP

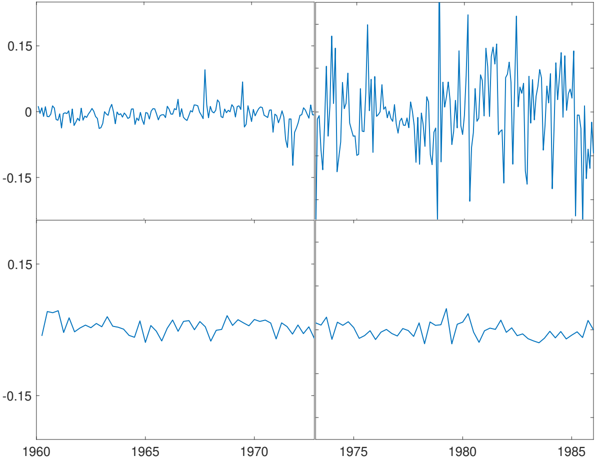


ER Disconnect and Mussa Puzzle

Peg (pre-1973) | Float (post-1973)

Δq_t: $\Rightarrow$ ✗ IRBC

Δc_t: $\Rightarrow$ ✗ NOEM

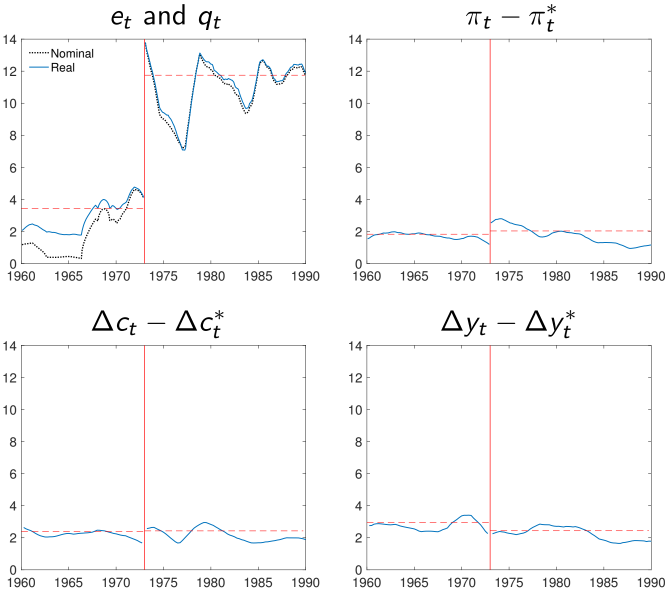


$\Downarrow$ ✓ Mussa Puzzle

$\Downarrow$ ✓ ER Disconnect

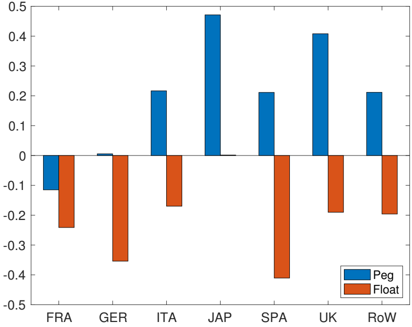
ER Disconnect and Mussa Puzzle

Standard deviations (annualized)



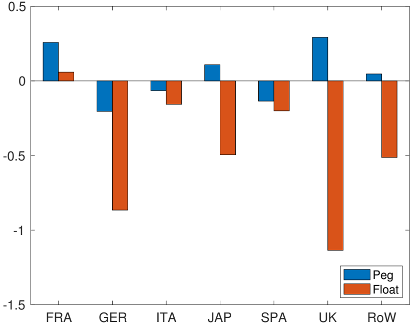
Backus-Smith correlation

$\mathrm{corr}(\Delta q_t, \Delta c_t - \Delta c_t^*)$



Fama coefficient, β_F

$\Delta e_{t+1} = \alpha_F + \beta_F(i_t - i_t^*) + \varepsilon$



Purchasing Power Parity

- Real exchange rate: $\mathcal{Q}_t = \frac{P_t^* \mathcal{E}_t}{P_t}$ or in logs $q_t \equiv e_t + p_t^* - p_t$
- Engel (1999) decomposition:

$$q_t = \underbrace{(p_{Tt}^* + e_t - p_{Tt})}_{\equiv q_t^T \text{ (tradable RER)}} + \omega \cdot \underbrace{[(p_{Nt}^* - p_{Tt}^*) - (p_{Nt} - p_{Tt})]}_{\equiv v_t^N \text{ (relative price of N)}}$$

  - e.g. $v_t^N = \nu_t^N \equiv (a_{Tt}^* - a_{Nt}^*) - (a_{Tt} - a_{Nt})$
  - under float, q_t^T dominates volatility of $q_t \longrightarrow$ LOP deviations?
  - under peg, ν_t^N is an important determinant of q_t (BDE 2018, 2020)

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- Aggregate relationship that is robust to LOP deviations (Itskhoki '21):

$$q_t = (1 - 2\gamma)\big[q_t^W - (a_{Tt}^* - a_{Tt})\big] + \omega \nu_t^N$$

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- An alternative view of PPP: shocks to q_t with p_t, p_t^* well anchored by monetary policy $\Rightarrow e_t \approx q_t$ (see also EJR 2021)

Is RER stationary?

- No robust theoretical reason for:

$$\lim_{j \to \infty} \mathbb{E}_t q_{t+j} = \bar{q}$$

  — e.g. accumulation of net foreign assets b_t^*

- Consistent with empirical challenges of confirming RER stationarity

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- Instead, theory requires transversality condition for net foreign assets:

$$\lim_{j\to\infty} \mathbb{E}_t b_{t+j}^*/(R^*)^j = 0$$

- Country budget constraint:

$$b_{t+1}^* - R_t^* b_t^* = nx_t^* = nx(q_t, \xi_t) \tag{1}$$

  — slow but robust feedback from q_t into nx_t (Alessandria and Choi, 2019)

- Complete asset markets+CRRA: $\sigma(c_t - c_t^*) = q_t$ (from $\frac{u_t}{P_t} = \frac{u_t^*}{P_t^* \mathcal{E}_t}$)
- Versus incomplete asset market:

$$\mathbb{E}_t\{\sigma(\Delta c_{t+1} - \Delta c_{t+1}^*) - \Delta q_{t+1}\} = \hat{\psi}_t \tag{2}$$

  - in a large class of models, $\hat{\psi}_t$ is equivalent to a UIP shock:

$$i_t - i_t^* - \mathbb{E}_t \Delta e_{t+1} = \hat{\psi}_t$$

  - also preference shocks as in Stockman and Tesar (1995)
  - Mussa puzzle suggests that $\hat{\psi}_t$ is endogenous to monetary regime (Kollmann 2005)

Backus-Smith Relationship

Asset market vs Expenditure switching

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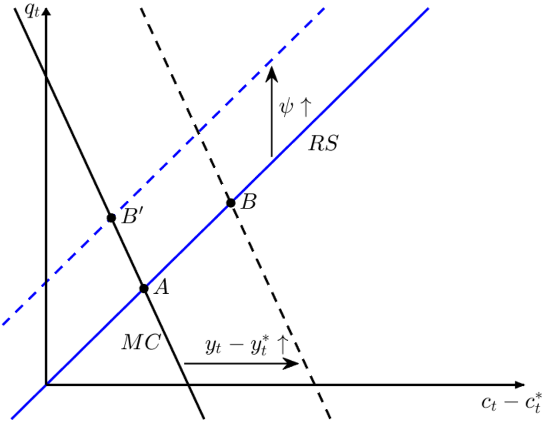
- Goods market clearing:

$$c_t - c_t^* = \frac{1}{1-2\gamma}\left[(y_t - y_t^*) - 2\gamma\theta(1-\alpha)q_t\right] \tag{3}$$

  - supply of output for consumption $y_t - y_t^*$ $\Rightarrow$ strong positive correlation (both IRBC and NOEM)
  - expenditure switching effect of RER q_t $\Rightarrow$ weak negative correlation

Equilibrium Comovement: Illustration



1. RS (risk sharing) — financial market equilibrium locus, $\hat{\psi}_t$ shocks
2. MC (market clearing) — goods market eqm locus, $y_t - y_t^*$ shocks

A Unifying Framework

- Goods market equilibrium — expenditure switching:

$$c_t - c_t^* = \frac{1}{1-2\gamma}\big[(y_t - y_t^*) - 2\gamma\theta(1-\alpha)q_t\big]$$

- Asset market clearing — with financial shocks:

$$\mathbb{E}_t\{\sigma(\Delta c_{t+1} - \Delta c_{t+1}^*) - \Delta q_{t+1}\} = \\ i_t - i_t^* - \mathbb{E}_t \Delta e_{t+1} = \hat{\psi}_t = \omega_t \sigma_t^2 \psi_t, \quad \sigma_t^2 = \mathrm{var}_t(\Delta e_{t+1})$$

- Country budget constraint:

$$\beta b_{t+1}^* - b_t^* = nx_t = \gamma[\lambda q_t - (c_t - c_t^*) + \xi_t]$$

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- Two key insights (propositions):
  1. Exchange rate disconnect: $\hat{\psi}_t$ is the key driver of the exchange rate
  2. Mussa puzzle: $\hat{\psi}_t$ is endogenous to monetary policy regime

Simple Model for Optimal Policy

1. Expenditure switching:

$$C_{Tt} = \frac{\gamma}{1-\gamma} \frac{P_{Nt} C_{Nt}}{P^*_{Tt} \mathcal{E}_t}$$

2. International risk sharing via segmented financial market:

$$-\frac{\mathbb{E}_t\{R_t \frac{\mathcal{E}_t}{\mathcal{E}_{t+1}} - R^*_t\}}{\omega_t \sigma_t^2} = D^*_t = B^*_t - N^*_t - F^*_t, \quad \sigma_t^2 = \mathrm{var}_t\left(\frac{\mathcal{E}_t}{\mathcal{E}_{t+1}}\right)$$

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$$\Rightarrow \qquad \frac{\mathcal{E}_t}{P_{Nt}} = \frac{\gamma}{1-\gamma} \frac{\tilde{Q}_t}{P^*_{Tt}} \cdot \frac{\overbrace{C_{Nt}/\tilde{C}_{Nt}}^{\text{output gap}}}{\underbrace{C_{Tt}/\tilde{C}_{Tt}}_{\text{risk sharing gap}}}$$

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$$\Rightarrow \qquad \beta R^*_t \mathbb{E}_t \frac{C_{Tt}}{C_{Tt+1}} = 1 + \underbrace{\omega_t \sigma^2_t (B^*_t - N^*_t - F^*_t)}_{\text{risk sharing wedge } \hat{\psi}_t}$$

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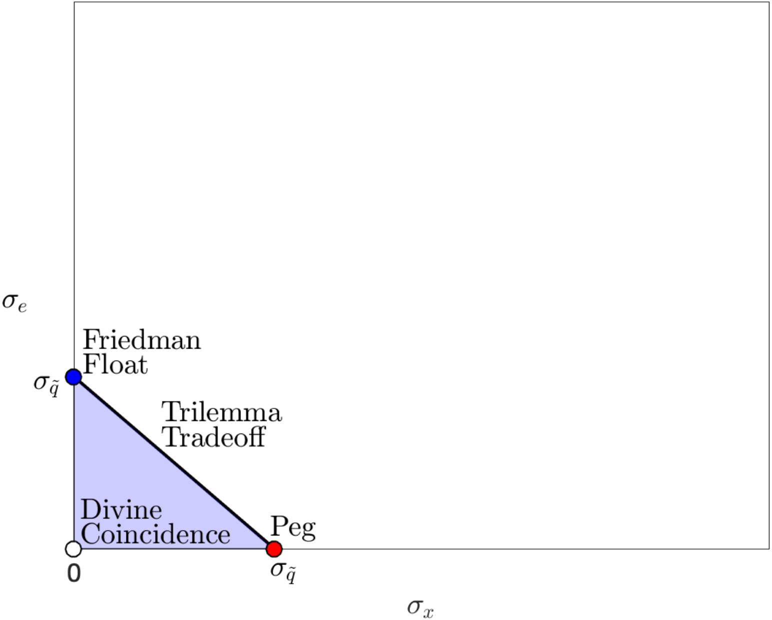
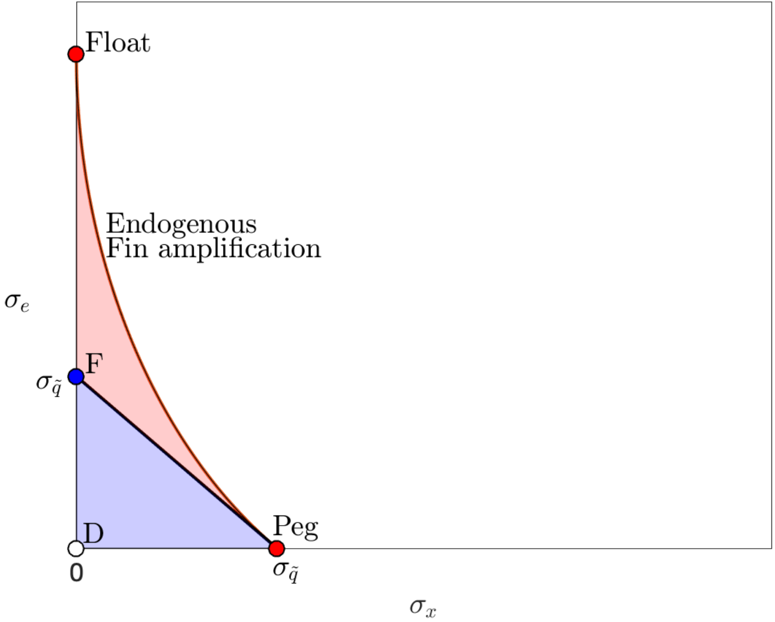
$$\Rightarrow \qquad \mathbb{E}_t \Delta z_{t+1} = \omega \sigma_t^2 (b^*_t - n^*_t - f^*_t)$$

$$\beta b^*_{t+1} - b^*_t = -z_t$$

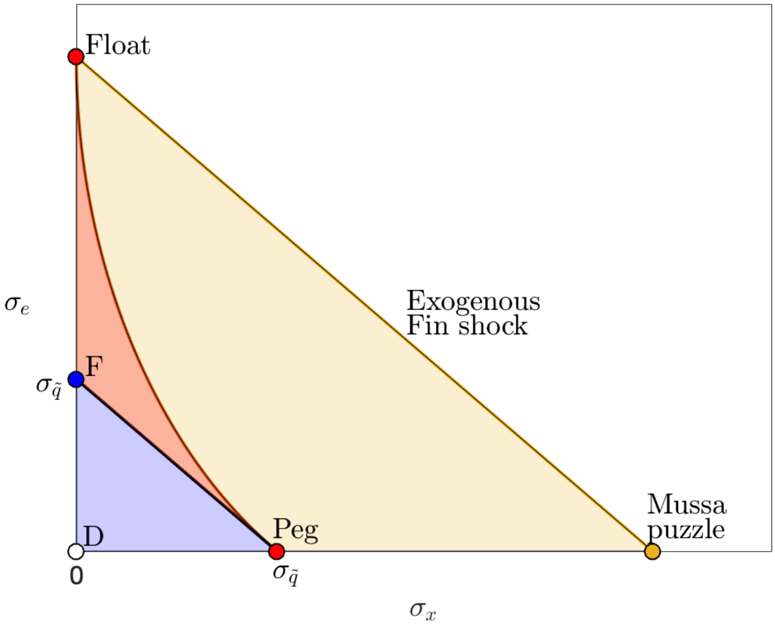
Illustration



Illustration



Illustration



Optimal Policy

1. **Relaxed Trilemma**

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2. **Optimal targets**: MP $\rightarrow$ inflation/output, FX policy $\rightarrow$ UIP deviations
   - implement efficient allocation ▸ Friedman
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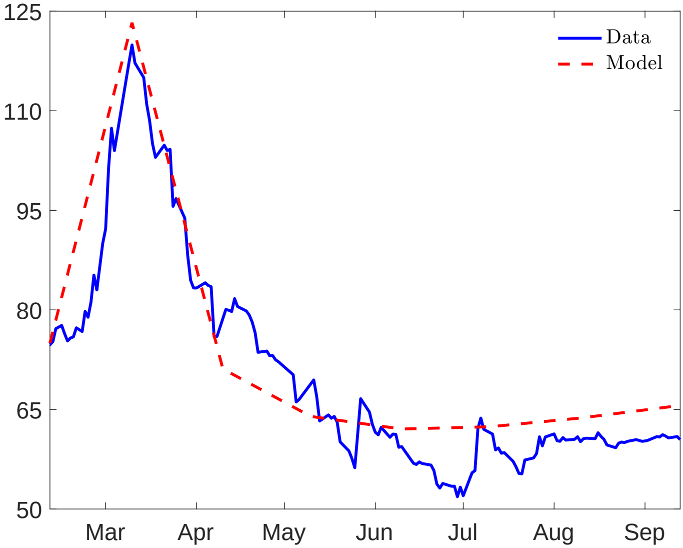
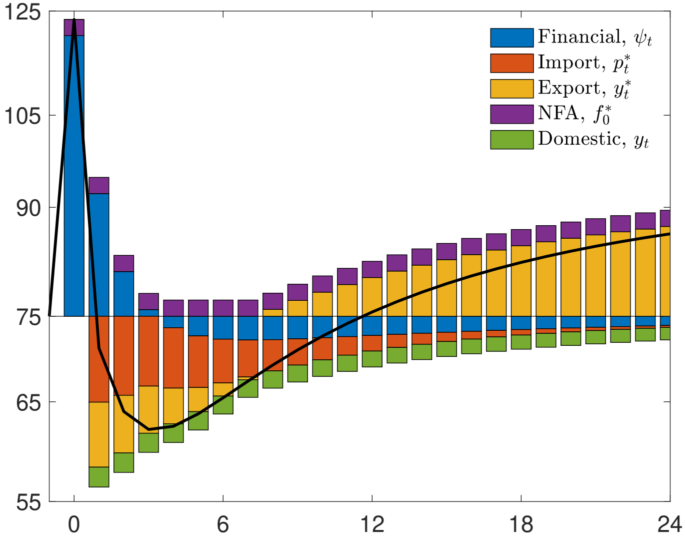
7. **Crawling peg**: optimal monetary policy smoothes movements in $\mathcal{E}_t$

Sanctions and the Exchange Rate



Sanctions and the Exchange Rate



Conclusion

- New **framework** to think about exchange rates and policies
  i) **realistic**: consistent with exchange rate puzzles
  ii) **tractable**: attains linear-quadratic representation
  iii) **practical**: revisits classical policy questions

- Motivates future research:
  — Nature of financial shocks? Do conventional shocks trigger financial shocks?
  — What is the elasticity of financial currency demand? (Koijen-Yogo'21, Camanho-Hau-Rey'21. . .)
  — How to measure UIP deviations? vs CIP deviations (Kalemli-Özcan-Varela'21, Engel'16, Kollmann'05, Bekaert'95. . .)
  — Financial channel in closed economy? (Caballero-Simsek'22, Kekre-Lenel'22, Lee'22. . .)

APPENDIX

Back to Friedman (1953)

1. **Flexible exchange rates** "combine interdependence among countries through trade with a maximum of internal monetary independence"
2. **Nominal peg**: "if internal prices were as flexible as exchange rates, it would make little economic difference whether adjustments were brought about by changes in exchange rates or by equivalent changes in internal prices. But this condition is clearly **not** fulfilled"
3. **Trade tariffs and capital controls** are the most realistic way to support a fixed exchange rate and is the least desirable one because of distortions, loopholes, and political economy issues

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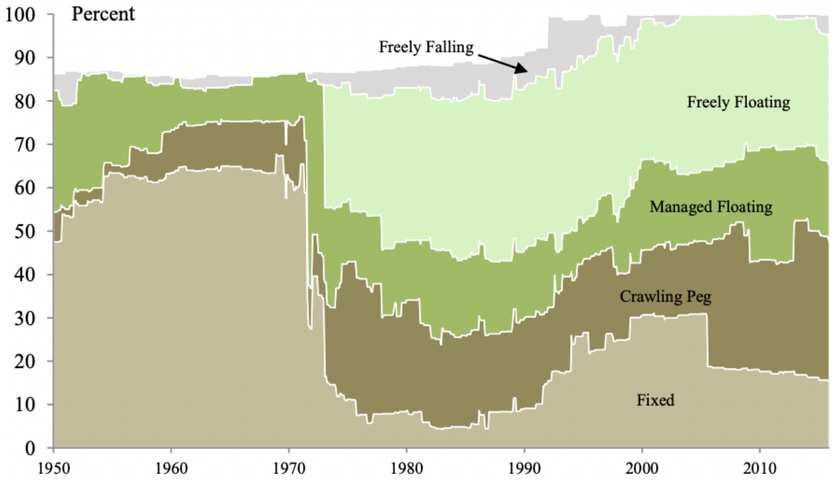
3. **Trade tariffs and capital controls** are the most realistic way to support a fixed exchange rate and is the least desirable one because of distortions, loopholes, and political economy issues

4. **FXI**: "it may be that private speculation is at times destabilizing"
   - "this device is **feasible and not undesirable**, though it is largely **unnecessary** since private speculative transactions will provide currency demand with only **minor movements** in exchange rates
   - "the objective of smoothing out **temporary fluctuations** and not interfering with fundamental adjustments
   - "there should be a **simple criterion of success – whether the agency makes or loses money**"

back

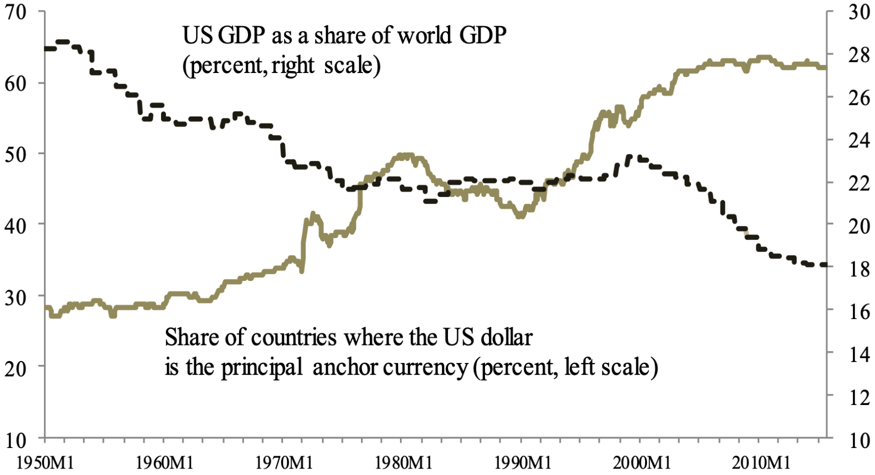
Exchange Rate Regime



Source: Ilzetzki, Reinhart, and Rogoff (2019)

back

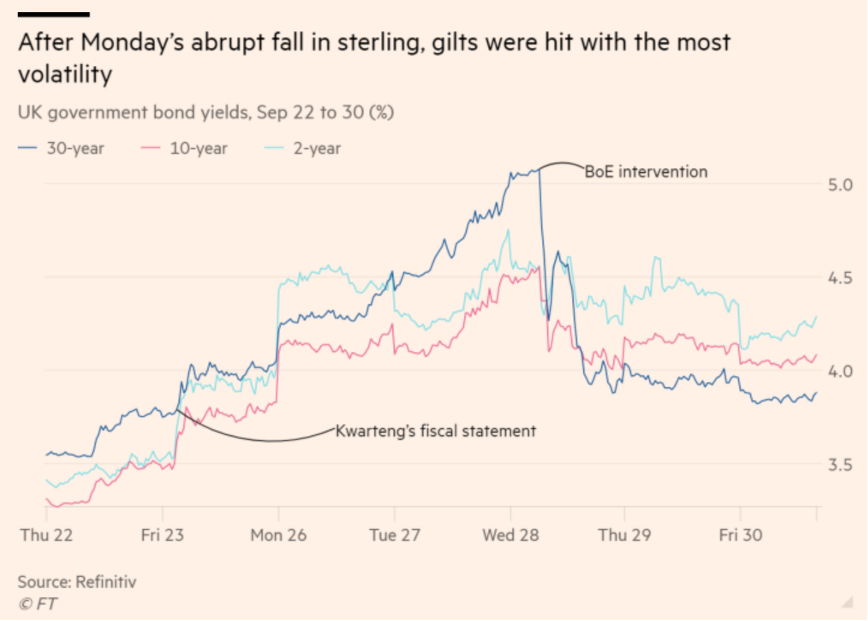
Anchor Currencies



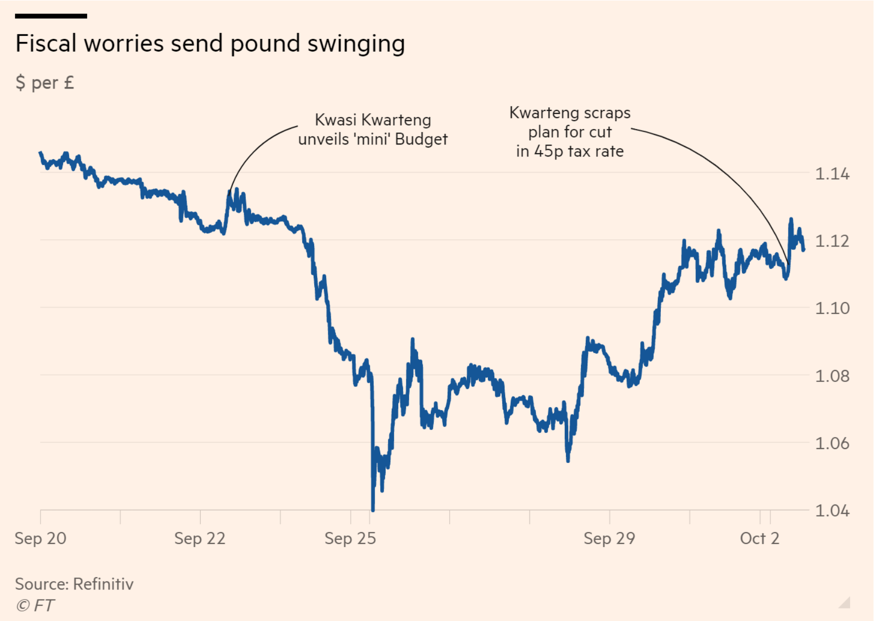
Source: Ilzetzki, Reinhart, and Rogoff (2019)

back

British Pound



British Pound



British Pound

- Equilibrium system:

$$\beta b_t^* = b_{t-1}^* - z_t - g_t$$
$$\mathbb{E}_t \Delta z_{t+1} = -\bar{\omega}\sigma_t^2 \left(b_t^* - n_t^* - f_t^* \right)$$
$$\sigma_t^2 = \mathrm{var}_t \left(\tilde{q}_{t+1} - z_{t+1} + x_{t+1} \right)$$

- Consider gov't spendings shock $g_t = -\mathbb{E}_t g_{t+1}/\beta > 0$, $\text{var}_t(g_{t+1}) \uparrow$: does not change PI, requires deviations from Ricardian equivalence

British Pound

- Equilibrium system:

$$\beta b^*_t = b^*_{t-1} - z_t - g_t$$
$$\mathbb{E}_t \Delta z_{t+1} = -\bar{\omega}\sigma^2_t \left(b^*_t - n^*_t - f^*_t \right)$$
$$\sigma^2_t = \mathrm{var}_t \left(\tilde{q}_{t+1} - z_{t+1} + x_{t+1} \right)$$

- Consider gov't spendings shock $g_t = -\mathbb{E}_t g_{t+1}/\beta > 0$, var$_t(g_{t+1}) \uparrow$: does not change PI, requires deviations from Ricardian equivalence
  - U.K. borrows internationally $b^*_t \downarrow$
  - arbitrageurs require risk premium $\mathbb{E}_t \Delta z_{t+1} \uparrow$
  - pound depreciates $e_t \uparrow$ and imports fall $z_t \downarrow$
  - amplification by $\sigma^2_t \uparrow$ given initial CA deficit $b^*_t < 0$
  - BoE intervention offsets increase in gov't debt and lowers uncertainty
  - QE is not inflationary as long as R_t does not change

back