

Sanctions and the Exchange Rate

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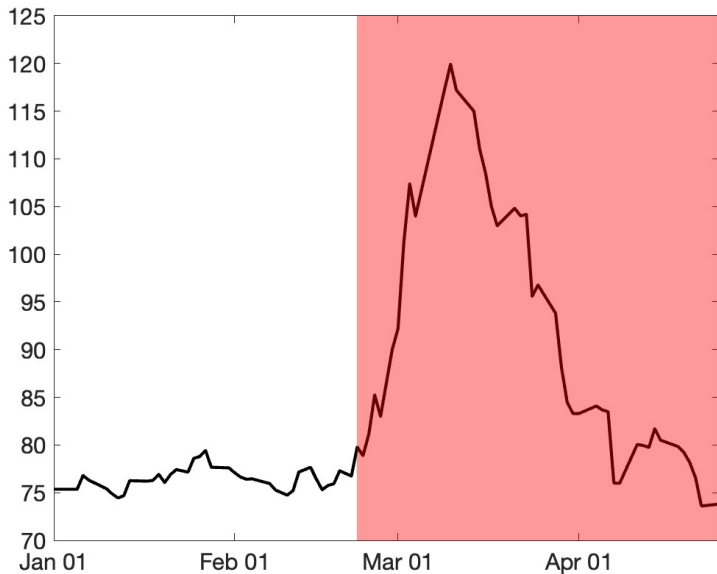
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Spillover Conference

April 28, 2022

Ruble Exchange Rate



- Address positive and normative questions:
 - why did the ruble depreciate initially?
 - why did the exchange rate reverse in mid-March?
 - are sanctions “not working”?
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 - why did the ruble depreciate initially?
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- Use the exchange rate model from Itskhoki-Mukhin'21,22
- Dual role of foreign currency:
 - ① goods market (exports and imports)
 - ② asset markets (foreign reserves and private savings)
- Augment with a rich set of sanctions and policy instruments
 - see also Lorenzoni-Werning'22, Sturm'22, Bianchi-Sosa-Padilla'22

MODEL

- SOE w/ T & NT endowment and demand for foreign currency
- **Households:**

$$\max \mathbb{E} \sum_{t=0}^{\infty} \beta^t \left[u(C_{Ht}, C_{Ft}) + v\left(\frac{B_{t+1}^*}{P_{t+1}^*}; \psi_t\right) \right]$$

$$\text{s.t. } P_t C_{Ht} + \varepsilon_t P_t^* C_{Ft} + \frac{\varepsilon_t B_{t+1}^*}{R_{Ht}^*} \leq W_t + \varepsilon_t B_t^*$$

- $u(C_H, C_F) = (1 - \gamma)^{1/\theta} C_H^{\frac{\theta-1}{\theta}} + \gamma^{1/\theta} C_F^{\frac{\theta-1}{\theta}}$, $v(b; \psi) = -\frac{\kappa}{2} \cdot (b - \psi)^2$
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- **Government, Firms & Financial sector:**

$$\underbrace{\varepsilon_t \left(\frac{F_{t+1}^*}{R_t^*} - F_t^* \right)}_{\Delta \text{NFA}} - \underbrace{\varepsilon_t \left(\frac{B_{t+1}^*}{R_{Ht}^*} - B_t^* \right)}_{\Delta \text{FC-deposits}} = \underbrace{\varepsilon_t Y_t^* + P_t Y_t - W_t}_{\text{primary surplus}}$$

- nominal wage commitment W_t , foreign reserves $F_t^* - B_t^*$
- segmented currency markets

- **Market clearing:** $C_{Ht} = Y_t$

Equilibrium

- Shocks: endowment Y_t, Y_t^* , foreign prices P_t^*, R_t^* , savings ψ_t

Equilibrium

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- **Policy:** monetary P_t , reserves $F_t^* - B_t^*$, financial repression R_{Ht}^*
- **Endogenous:** NFA F_t^* , imports C_{Ft}^* , exchange rate \mathcal{E}_t

- 1 country budget constraint:

$$\frac{F_{t+1}^*}{R_t^*} - F_t^* = \underbrace{Y_t^* - P_t^* C_{Ft}}_{NX_t}$$

- 2 demand for foreign currency savings (Euler equation):

$$\beta R_{Ht}^* \mathbb{E}_t \left\{ \frac{P_t^*}{P_{t+1}^*} \left[\left(\frac{C_{Ft}}{C_{F,t+1}} \right)^{1/\theta} + \tilde{\kappa} C_{Ft}^{1/\theta} \left(\psi_t - \frac{B_{t+1}^*}{P_{t+1}^*} \right) \right] \right\} = 1$$

- 3 import demand (expenditure switching):

$$\frac{C_{Ft}}{C_{Ht}} = \frac{\gamma}{1 - \gamma} \left(\frac{\mathcal{E}_t P_t^*}{P_t} \right)^{-\theta}$$

Sanctions

① Export sanctions $\Rightarrow Y_t^* \downarrow$

② Import sanctions $\Rightarrow P_t^* \uparrow$

③ Exit of multinationals $\Rightarrow Y_t \downarrow$

④ Foreign asset freeze $\Rightarrow F_0^* \downarrow$

⑤ Exclusion from financial markets $\Rightarrow R_t^* = 1, F_t^* \geq 0$

⑥ Limited access to safe assets $\Rightarrow \psi_t \uparrow$

SANCTIONS

Import vs. Export Sanctions

- **Proposition:** Permanent sanctions on imports $\{P_t^*\} \uparrow$ and a combination of sanctions on exports with a partial freeze of foreign assets $\{Y_t^*, F_0^*\} \downarrow$ result in
 - 1 same allocation and welfare, including reduced imports $\{C_{Ft}\} \downarrow$

$$\frac{1}{R_t^*} \cdot F_{t+1}^* = F_t^* + Y_t^* - P_t^* C_{Ft}$$

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- 2 opposite changes in the exchange rate

$$\mathcal{E}_t = \frac{P_t}{C_{Ft}^{1/\theta} P_t^*} \left(\frac{\gamma}{1-\gamma} Y_t \right)^{\frac{1}{\theta}}$$

- export sanctions $Y_t^* \downarrow \Rightarrow C_{Ft} \downarrow \Rightarrow$ depreciation $\mathcal{E}_t \uparrow$

- import sanctions $P_t^* \uparrow \Rightarrow C_{Ft} \downarrow \Rightarrow$ appreciation $\mathcal{E}_t \downarrow$

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- Exit of foreign multinationals $\{Y_t\} \downarrow$ has no effect on imports $\{C_{Ft}\}$, but appreciates the exchange rate $\{\mathcal{E}_t\} \downarrow$

- **Corollary:** The import and export sanctions of $x\%$ have **identical** effects on gov't revenues and cost of living:

$$d \log TR = -\frac{ER}{TR} \cdot \frac{\theta - 1}{\theta} \cdot x\%, \quad d \log CPI = \frac{\text{Import}}{GDP} \cdot \frac{1}{\theta} \cdot x\%,$$

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- Lerner symmetry for revenues:
 - export sanctions

$$Y_t^* \downarrow + \mathcal{E}_t^* \uparrow \Rightarrow d \log(\mathcal{E}_t Y_t^*) = \left(1 - \frac{1}{\theta}\right) d \log Y_t^*$$

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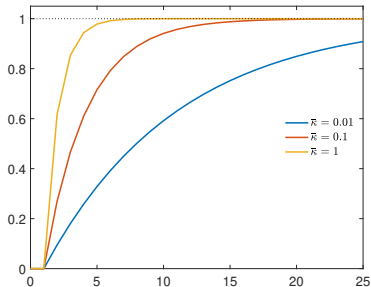
$$\mathcal{E}_t^* \downarrow \Rightarrow d \log(\mathcal{E}_t Y_t^*) = -\left(1 - \frac{1}{\theta}\right) d \log P_t^*$$

FINANCIAL SHOCK

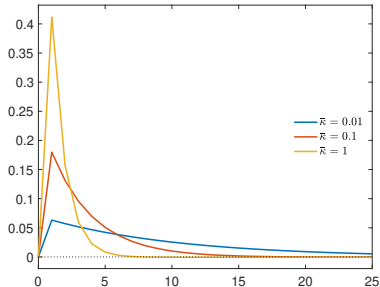
- **Proposition:** Consider an increase in foreign currency demand $\psi_t \uparrow$
 - ① **Passive gov't** ($F_{t+1}^* = B_{t+1}^*$, $R_{Ht}^* = R_t^*$): imports fall $C_{Ft} \downarrow$, exchange rate depreciates $\mathcal{E}_t \uparrow$, mean reverts, and eventually overshoots

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(a) Net foreign assets, $\frac{B_t^*}{P_t^* Y^*}$



(b) Exchange rate, $\log \mathcal{E}_t$



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 - *synthetic* FC deposits if reserves are not available

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- ③ **Financial repression:** there exists a tax on foreign currency purchases $R_{Ht}^* < R_t^*$, which leaves the path of $(B_{t+1}^*, F_{t+1}^*, C_{Ft}, \mathcal{E}_t)$ unchanged

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- if anything, relaxes the gov't budget constraint
- applies under financial autarky as well
- policy implemented by the Central Bank of Russia

▶ show

Heterogeneous Agents

- To disentangle two effects, consider extension with 2 types of agents
- **Hand-to-mouth**: receive $\alpha P_t Y_t$, no access to financial markets
- **Ricardian agents**: receive $(1 - \alpha)P_t Y_t + \mathcal{E}_t Y_t^*$, can hold foreign currency, subject to ψ_t shocks
- **Corollary**: Assume $\theta = 1$ and constant α . Then
 - ① aggregate dynamics does not depend on α (cf. Werning'15, ARSS'21),

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- **Corollary**: Assume $\theta = 1$ and constant α . Then
 - 1 aggregate dynamics does not depend on α (cf. Werning'15, ARSS'21),
 - 2 financial repression reduces welfare in a representative-agent economy,
 - 3 financial repression redistributes from RA to HtM (cf. Fanelli-Straub'21)

$$R_{Ht}^* < R_t^* \quad \Rightarrow \quad \mathcal{E}_t \downarrow \quad \Rightarrow \quad C_t^{HtM} \uparrow$$

- Why did the ruble depreciate initially?
 - overnight freeze of gov't reserves + threat of blocking exports
 - high home demand for foreign currency as a store of value
- Why did the exchange rate reverse in mid-March?
 - tougher sanctions on imports than exports \Rightarrow **supply of FC** \uparrow
 - capital controls + financial repression \Rightarrow **demand for FC** \downarrow
- Are the sanctions “not working”?
 - effectiveness cannot be inferred from exchange rate dynamics
 - **equivalence** of import & export sanctions for welfare & gov't revenues
- Is the exchange rate irrelevant?
 - **allocative** even under financial autarky
 - financial repression benefits consumers at the expense of savers

APPENDIX

Multiple Foreign Currencies

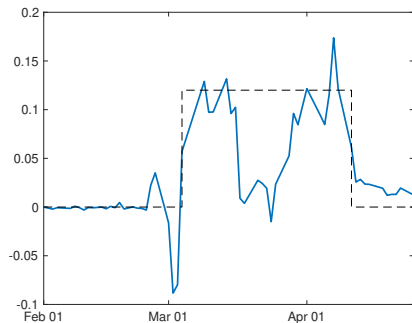
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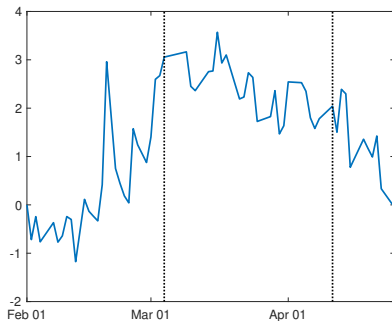
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Figure: Swiss franc vs U.S. dollar

(a) Exchange rates



(b) Relative turnover



Note: (a) exchange rate at the Moscow Exchange relative to its international value,
(b) Swiss franc turnover relative to the dollar at the Moscow Exchange.