UNCERTAIN EXCHANGE RATE EFFECTS IN A SMALL OPEN ECONOMY

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Opinions here are those of the authors and not necessarily belong the BCRP

Living SOEs - EMEs: Are exchange rate depreciations expansionary, contractionary or both?

- Standard case: Expenditure-switching effects are expansionary
- EMEs with financial dollarisation: Balance-sheet effects are contractionary

Why is that so?

- **Existing literature not conclusive**

- **Exchange rate effects are hard to estimate**
  - Evolving private agents expectations
  - Evolving policy makers views and deeds
  - Severity and propagation of shocks are endogenous

- **THEREFORE: THERE IS UNCERTAINTY**

  - **Endogenous: Economic policies**

  - **Exogenous: External factors, technology and preferences**

- **How should the Central Bank behave under this uncertainty?**

- Is "Fear of Floating" a rational response by Central Bankers?

TWO EXERCISES:

- Simple Model: Analytical Solutions, Easy to Solve, Intuitive conclusions

- Complex Model: No solution strategy yet - Work in progress

Agenda for the few coming minutes:

- Two alternative models - A) traditional small open economy model and B) contractionary exrate model

- Optimal monetary policy under certainty

- Balance sheet trap

- How to get out of the trap: Learning

- Conclusions

EXERCISE 1

Absolute Certainty

Model A

Phillips Curve (Naïve)

$$\pi_t = \gamma_1 y_t + \gamma_2 \delta_t + \varepsilon_{\pi,t} \tag{1}$$

Exchange rate

$$\delta_t = -i_t + \varepsilon_{\delta,t} \tag{2}$$

Aggregate Demand

$$y_t = \theta_1 i_t + \theta_2 \delta_t + \varepsilon_{y,t} \tag{3}$$

where the exchange rate shock is

$$\varepsilon_t^{\delta} = \rho \varepsilon_{t-1}^{\delta} + \mu_t \tag{4}$$

Central bank loss function:

$$L = E_t \sum_{s=t} \beta^{s-t} \left(\pi_s^2 + y_s^2 \right) \tag{5}$$

Optimal Rule is:

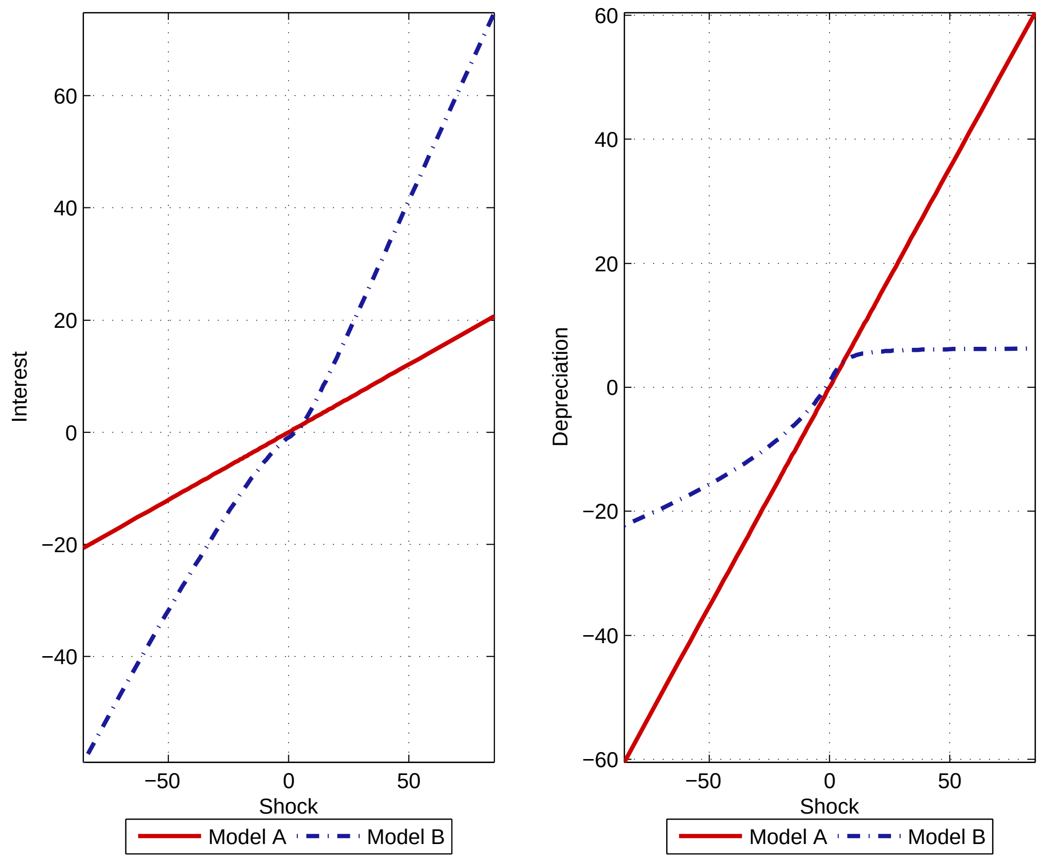
$$i_t = \Lambda \varepsilon_{t-1}^{\delta} \tag{6}$$

Model B

with Balance Sheet:

$$y_t = \theta_1 i_t + \theta_2 \delta_t + \theta_3 \delta_t^2 + \varepsilon_{y,t} \qquad (7)$$

Comparison



Optimal rule comparison - model A vs. model B

Monetary Policy under Model Uncertainty

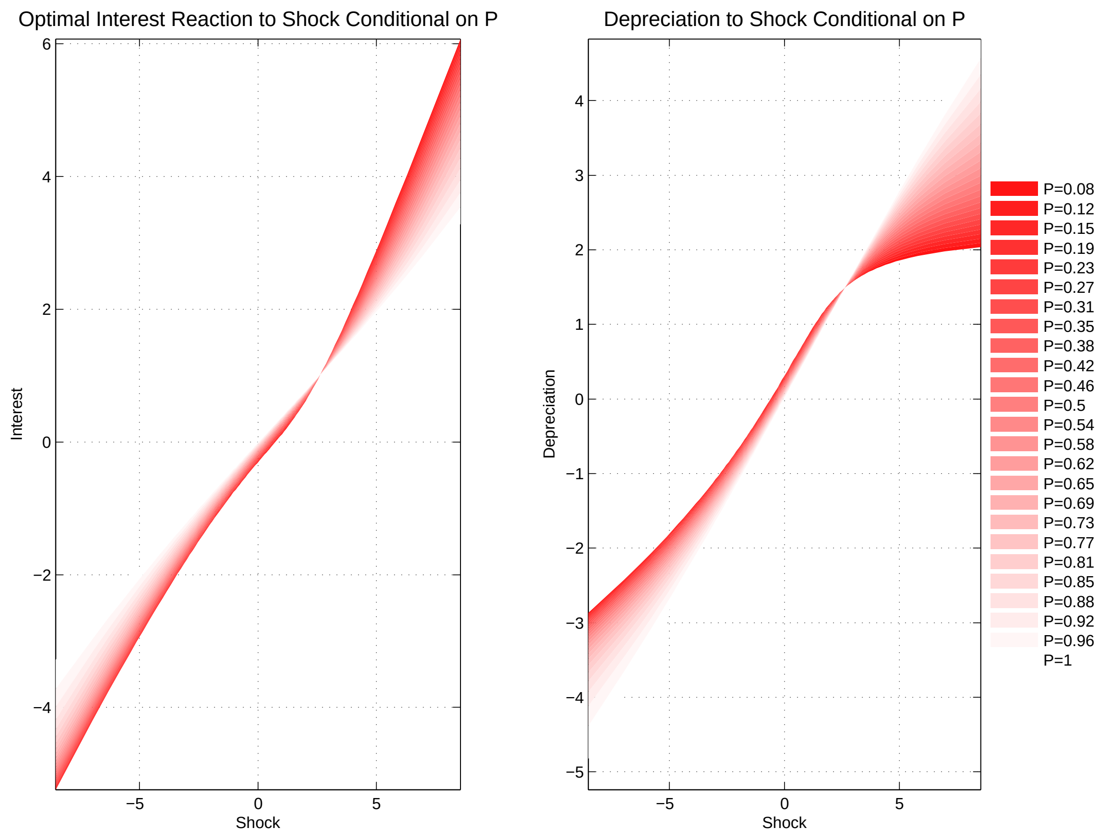
Bayesian Solution

Loss function under uncertainty:

$$L_t = p_t L_{t|A} + (1 - p_t) L_{t|B} \tag{8}$$

probabilities are assigned as follows (ODDS RATIO):

$$p_t = p\left(M^A|Data\right) = \frac{p\left(Data|M^A\right) p\left(M^A\right)}{p\left(Data|M^B\right) p\left(M^B\right) + p\left(Data|M^A\right) p\left(M^A\right)} \tag{9}$$

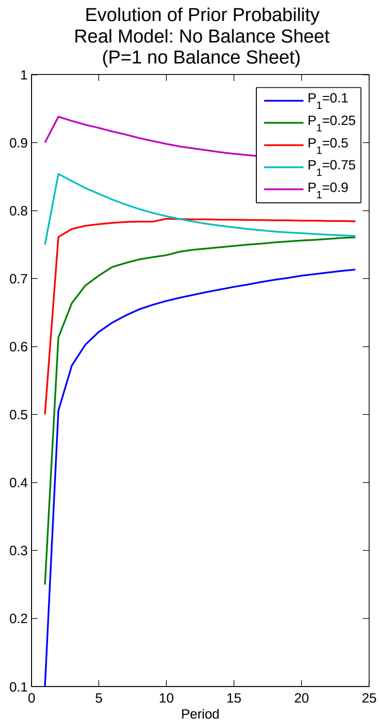


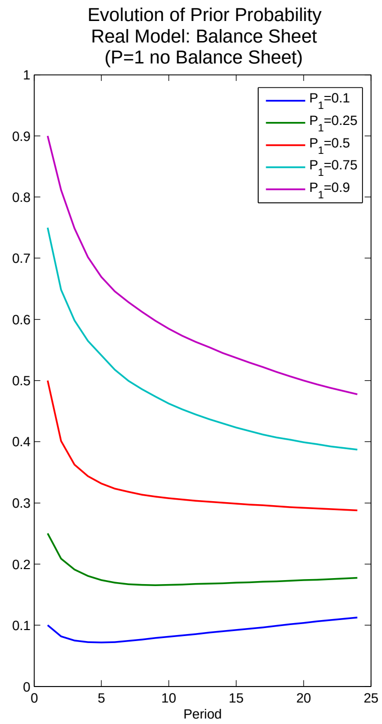
Optimal Rule (Bayesian) Depending on Probabilities

How do Prior Probabilities Evolve in time?:

$$P_t = \frac{P_{t-1} P \left(Data_t | Data_{t-1}, M^A \right)}{P_{t-1} P \left(Data_t | Data_{t-1}, M^A \right) + (1 - P_{t-1}) P \left(Data_t | Data_{t-1}, M^B \right)} \tag{10}$$

Balance Sheet Trap





Escaping the Trap: Dynamic Solution

Redefinition of the Problem:

$$L = E_t \left[\sum_{s=t} \beta^{s-t} (\pi_s^2 + y_s^2 \mid P_s) \right]$$

s.t. 10

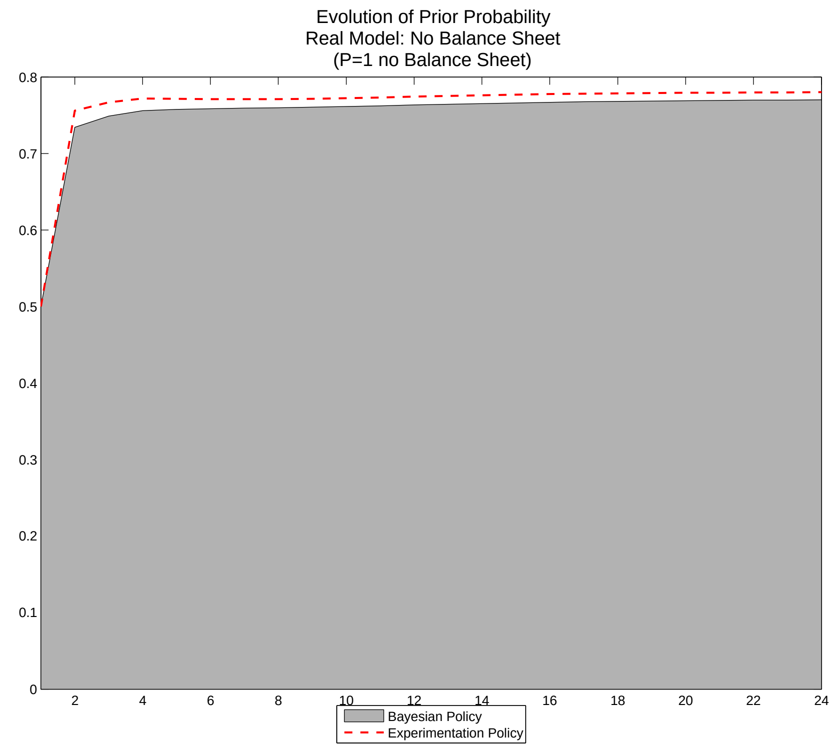
Bellman Equation:

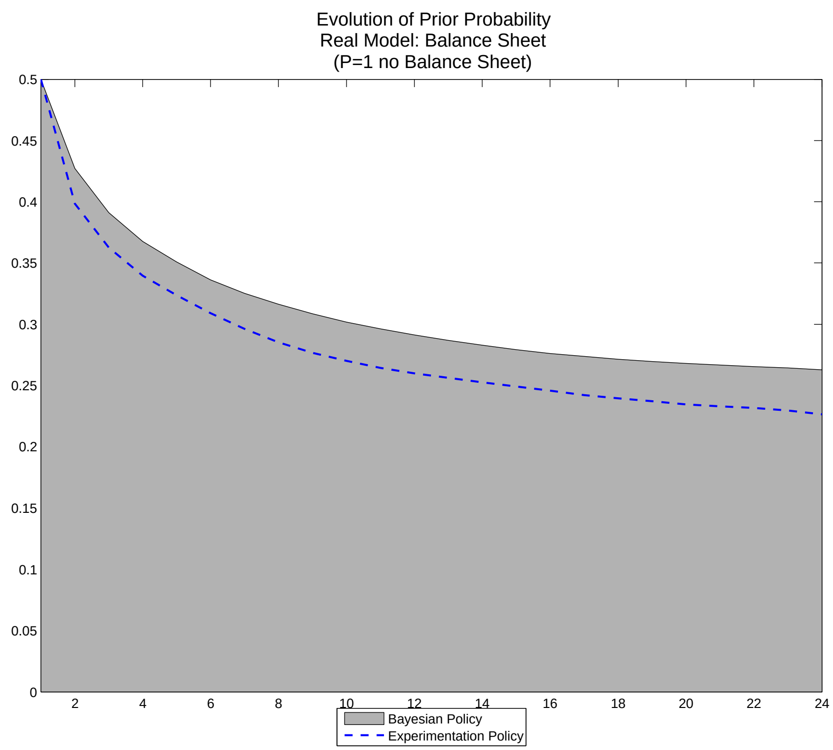
$$V(\varepsilon_{\delta,t}, P_t) = \min_{\{i_t\}} E[\pi_t^2(i_t) + y_t^2(i_t) | \; P_t] +$$
$$\beta E[P_t V(\varepsilon_t^\delta, P_{t+1}^1) + (1 - P_t) E[V(\varepsilon_t^\delta, P_{t+1}^2)]$$

Numerical Solution

Welfare Benefits?

True Model: SOE Evolution of Model Posterior Probabilities




Evolution of Prior Probability
Real Model: Balance Sheet
(P=1 no Balance Sheet)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2
4
6
8
10
12
14
16
18
20
22
24
Bayesian Policy
Experimentation Policy

Conclusions

- Central Banks can face Learning Traps in non-linear contexts
- Policy Rules should take into account Learning Dynamics
- Further Research:
- Solving the Complex Problem (we need an efficient algorithm)
- Estimating the Evolution of Priors