

Monetary and Fiscal Policy Interactions in an Emerging Open Economy Exposed to Sudden Stops Shock: A DSGE Approach

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Why policy interactions within DSGE?

- Monetary policy in DSGE as a synthesis of New Keynesian theory and RBC (Christiano, Eichenbaum & Evans, 2005)
- Active fiscal policy across countries: an increase of government debt in post-crisis period
- New literature: fiscal multiplier and stimulus at zero lower bound of interest rate (Woodford, 2011; Eggertsson, 2011)
- The fiscal theory of price level (Leeper, 1991; Sims, 1994)
- Analytical derivation of joint optimal policy (Benigno & Woodford, 2003): they are inter-related more than expected
- Two types of households (Mankiw, 2000): savers and spenders
- But emerging open economies are structurally different from the developed world

Three specifics of an emerging open economy

- 1 Foreign exchange intervention as an additional monetary policy instrument → managed floating, pegged exchange rate, crawling band, and currency board regimes
- 2 A heavily indebted private sector to the foreign world: a sudden stops shock related to collateral constraint (Mendoza, 2010; Kiyotaki & Moore, 1997) rather than to a financial accelerator mechanism (Bernanke, Gertler & Gilchrist, 1999)
- 3 An increase of government debt through government investment and consumption, not much cutting taxes

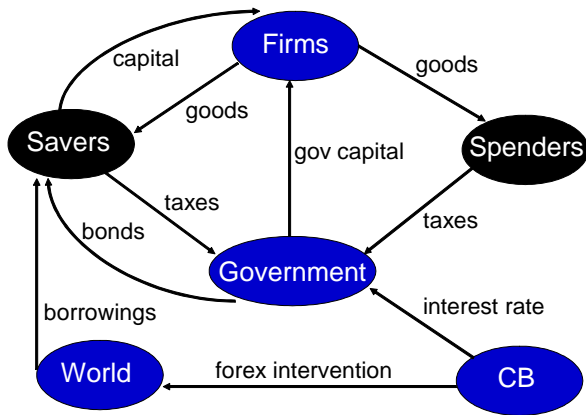
The objectives of model

- To build a DSGE model for an emerging open economy capturing the above three specifics
- To analyze the impulse response functions to 6 shocks: interest rate and foreign exchange intervention, government consumption and government investment, sudden stops and foreign interest rate
- Based on IRF, to answer the question of how multiple instruments of monetary and fiscal policy interact
- And to compare the effects of sudden stops shock related to the collateral constraint with the foreign interest rate shock as a risk premium
- Based on the model calibrated for Hungary

Why Hungary is for calibration?

- First economy among all emerging markets hardly hit by the global financial crisis and already felt in mid-October 2008
- In 2009, real GDP fell by 6.7%, the euro-forint exchange rate depreciated by 12%, unemployment increased to 9.8%, positive net exports were 10 times higher than in 2008 due to collapse in imports, and foreign reserves of CB dropped especially in 2009Q2
- High public and private sectors' debt: fiscal debt amounted to 66% of GDP, while external debt reached 97% of GDP at the end of 2007

The structure of model



Households (Schmitt-Grohe & Uribe, 2003)

$$E_0 \sum_{t=0}^{\infty} \beta(\tilde{C}_t, \tilde{N}_t) \frac{[C_t^S - \phi^{-1} N_t^\phi]^{1-\sigma} - 1}{1-\sigma}, \quad (1)$$

where $\beta(\tilde{C}_t, \tilde{N}_t) = [1 + \tilde{C}_t - \phi^{-1} \tilde{N}_t^\phi]^{-\chi}$

Savers' budget constraint: $C_t^S + I_t + b_t + R_{t-1}^* \frac{e_t}{e_{t-1}} \frac{b_{t-1}^*}{\pi_t} + T_t =$
 $W_t N_t + R_t^k K_{t-1} + R_{t-1} \frac{b_{t-1}}{\pi_t} + b_t^* + \Pi_t$

Collateral constraint:

$$R_t^* b_t^* \leq \Omega_t E_t \left\{ \frac{Q_{t+1} \pi_{t+1}}{e_{t+1}/e_t} K_t \right\} \quad (2)$$

Sudden stops shock:

$$\hat{\Omega}_t = \rho_w \hat{\Omega}_{t-1} - \epsilon_t^\Omega \quad (3)$$

Firms

The Cobb-Douglass production function:

$$Y_t = A_t K_{t-1}^\alpha N_t^{1-\alpha} K_{G,t-1}^\psi \quad (4)$$

Capital accumulation:

$$K_t = (1 - \delta) K_{t-1} + I_t - \frac{\kappa}{2} (K_t - K_{t-1})^2 \quad (5)$$

The Phillips curve:

$$\pi_t = \bar{\beta} E_t \pi_{t+1} + \lambda \widehat{mc}_t - \bar{\beta} \frac{1-\gamma}{\gamma} \Delta \ln RER_{t+1} + \frac{1-\gamma}{\gamma} \Delta \ln RER_t, \quad (6)$$

where $\Delta \ln RER_t = \Delta \ln e_t + \pi_t^* - \pi_t$

Fiscal policy

Government budget constraint:

$$b_t + T_t = G_t^I + G_t^C + R_{t-1}b_{t-1} \quad (7)$$

Government capital accumulation:

$$K_{G,t} = (1 - \delta^g)K_{G,t-1} + G_t^I \quad (8)$$

Fiscal policy rules:

$$\hat{T}_t = \varphi_b \hat{b}_{t-1} + \varphi_I \hat{G}_t^I + \varphi_C \hat{G}_t^C \quad (9)$$

$$\hat{G}_t^I = \rho_{GI} \hat{G}_{t-1}^I + (1 - \rho_{GI})(\vartheta_{GI} \hat{Y}_t - \gamma_{GI} \hat{b}_{t-1}) + \epsilon_t^{GI} \quad (10)$$

$$\hat{G}_t^C = \rho_{GC} \hat{G}_{t-1}^C + (1 - \rho_{GC})(\vartheta_{GC} \hat{Y}_t - \gamma_{GC} \hat{b}_{t-1}) + \epsilon_t^{GC} \quad (11)$$

Monetary policy

The Taylor rule:

$$\widehat{R}_t = \rho \widehat{R}_{t-1} + (1 - \rho) \left[\phi_\pi \pi_t + \phi_y \widehat{Y}_t + \phi_e \widehat{e}_t \right] + \epsilon_t \quad (12)$$

Foreign exchange intervention rule (Sarno & Taylor, 2001):

$$\widehat{Int}_t = \alpha_1 \widehat{e}_t + \alpha_2 \Delta \widehat{e}_t + \epsilon_t^{int}, \text{ where } \alpha_1 < 0, \alpha_2 < 0 \quad (13)$$

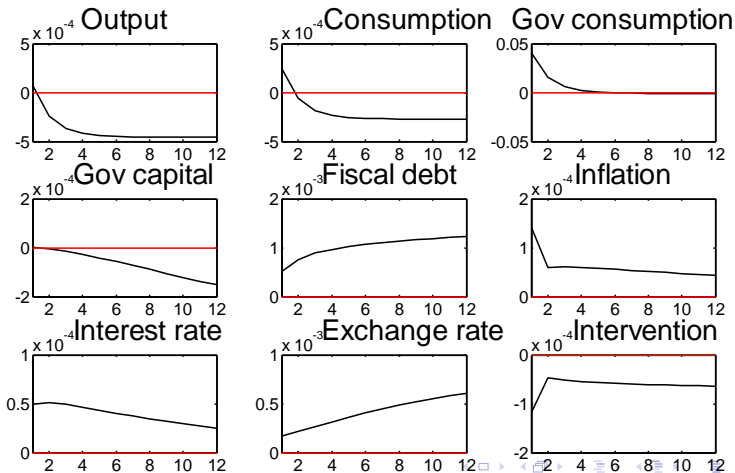
Reserves accumulation:

$$NFA_t = NFA_{t-1} + Int_t \quad (14)$$

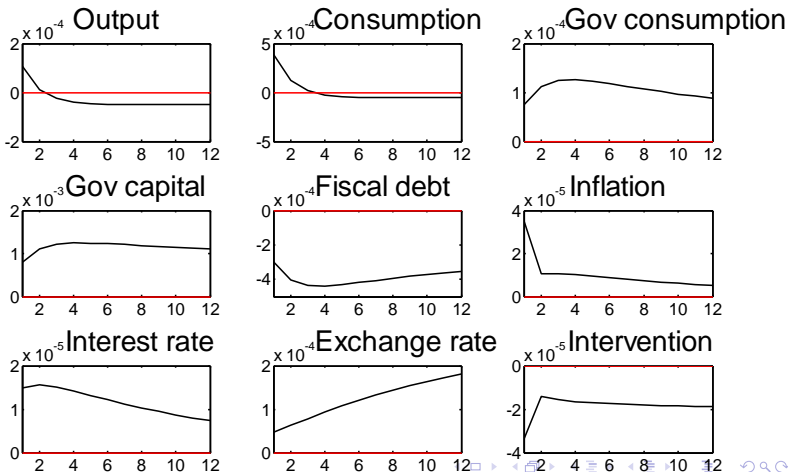
Balance of payments:

$$NX_t = (1 - \mu) \left(R_{t-1}^* \frac{e_t}{e_{t-1}} \frac{b_{t-1}^*}{\pi_t} - b_t^* \right) + Int_t \quad (15)$$

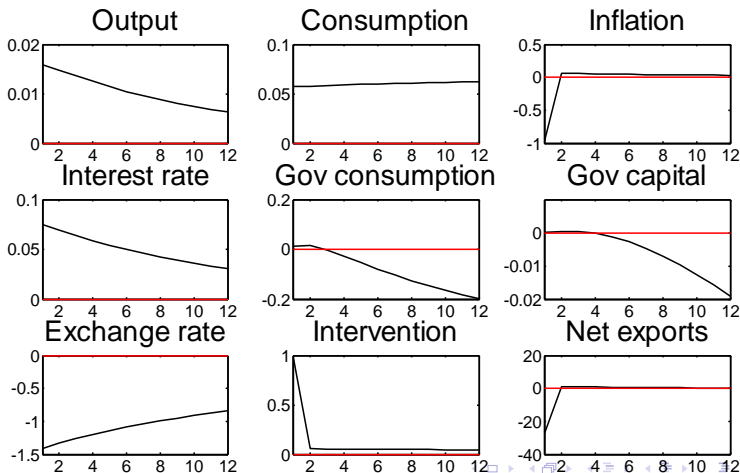
Impulse responses to a government consumption shock



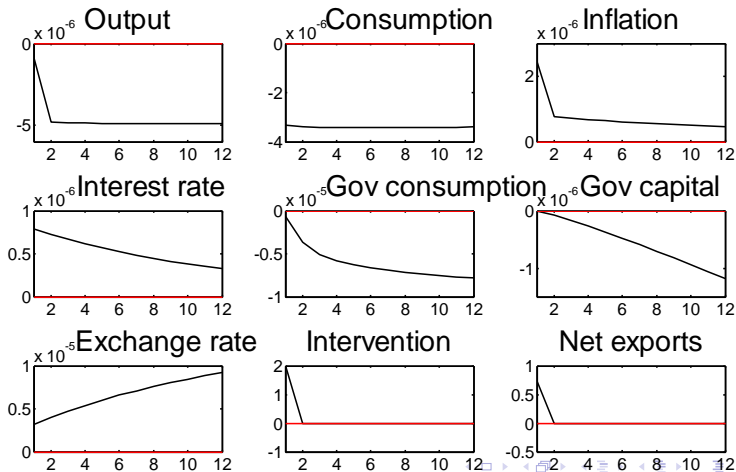
Impulse responses to a government investment shock



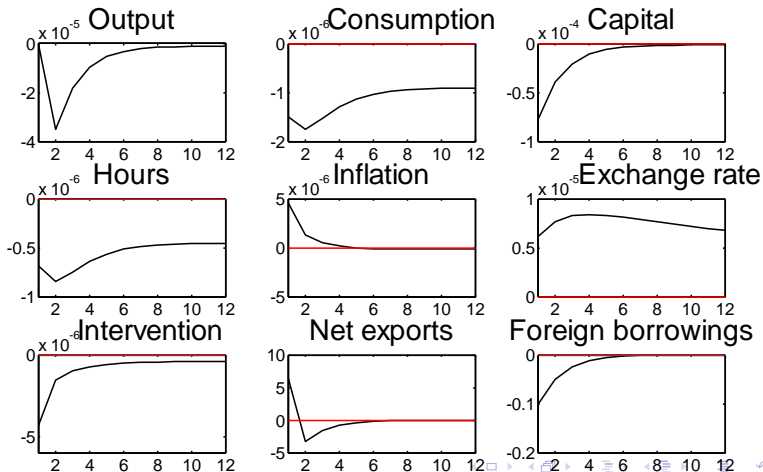
Impulse responses to a domestic interest rate shock



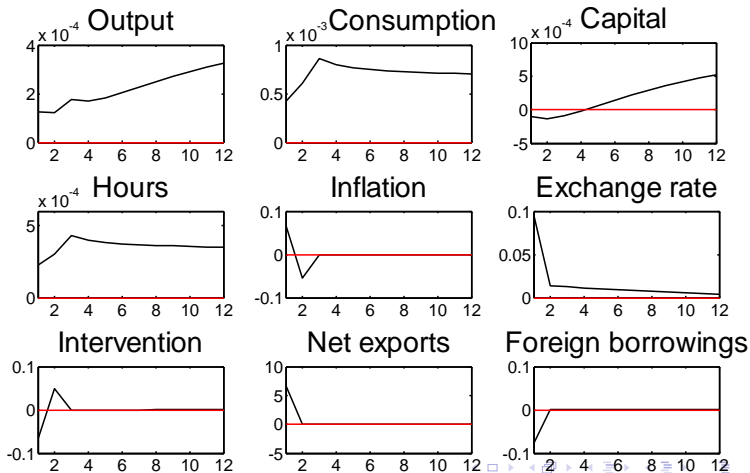
Impulse responses to a foreign exchange intervention shock



Impulse responses to a sudden stops shock







Impulse responses to a foreign interest rate shock







Concluding remarks

- Provides a DSGE framework for the emerging open economies, which structurally differ from the developed world
- Endogenously models the monetary and fiscal policy with their two instruments for each: in the short run, monetary policy responds to fiscal shocks; in the medium run, fiscal policy tends to adjust to monetary shocks
- Demonstrates that a simple negative shock to the upper bound of the leverage ratio in the collateral constraint is able to deliver realistic dynamics of a sudden stops crisis compared with the typical risk premium shock





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