News Shocks in RBC Models

Song Kaihong[1]

[1]Peking University HSBC Business School

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Model Setting

A simple version of Jaimovich and Rebelo's (2009) model can be described as a social planner's problem in which the planner solves

$$\max E_0 \sum_{t=0}^{\infty} \beta^t \log \left[C_t - \psi \frac{N_t^{1+\gamma}}{1+\gamma} \right]$$

subject to constraints:

$$\begin{aligned} C_t + I_t &= A_t \left(e_t K_t \right)^{\alpha} N_t^{1-\alpha} \\ K_{t+1} &= I_t \left[1 - \varphi \left(\frac{I_t}{I_{t-1}} \right) \right] + \left[1 - \delta \left(e_t \right) \right] K_t \qquad (1) \\ \delta \left(e_t \right) &= \delta_0 \frac{e_t^{1+\theta}}{1+\theta} \\ \varphi \left(\frac{I_t}{I_{t-1}} \right) &= \frac{s}{2} \left(\frac{I_t}{I_{t-1}} - 1 \right)^2 \\ \log \left(A_t \right) &= \rho \log \left(A_{t-1} \right) + \sigma^a \varepsilon_t + \sigma^u u_{t-4} \end{aligned}$$

FOC's

$$\beta\mathbb{E}_t\{\frac{\alpha A_{t+1}\left(e_{t+1}K_{t+1}\right)^{\alpha-1}N_{t+1}^{1-\alpha}e_{t+1}}{c_{t+1}-\psi\frac{N_{t+1}^{1+\gamma}}{1+\gamma}}+\lambda_{t+1}(1-\delta(e_{t+1}))\}=\lambda_t \tag{2}$$

$$\begin{aligned}\frac{1}{c_{t+1}-\psi\frac{N_{t+1}^{1+\gamma}}{1+\gamma}} =&\beta\mathbb{E}_t\{s\lambda_{t+1}(\frac{I_{t+1}}{I_t})^2(\frac{I_{t+1}}{I_t}-1)\}\\ &+\lambda_t[1-\frac{s}{2}(\frac{I_t}{I_{t-1}}-1)^2-s(\frac{I_t}{I_{t-1}}-1)\frac{I_t}{I_{t-1}}]\end{aligned} \tag{3}$$

$$\frac{\alpha A_t\left(e_tK_t\right)^{\alpha-1}N_t^{1-\alpha}}{c_{t+1}-\psi\frac{N_{t+1}^{1+\gamma}}{1+\gamma}}=\lambda_t\delta_0e_t^{\theta} \tag{4}$$

$$(1-\alpha)A_t\left(e_tK_t\right)^{\alpha}N_t^{-\alpha}=\psi N_t^{\gamma} \tag{5}$$

Steady State

$$(1) \Rightarrow I = \delta K \tag{6}$$

$$(5) \Rightarrow \psi N^{\gamma+\alpha} = (1-\alpha)(eK)^{\alpha} \tag{7}$$

$$(3) \Rightarrow \lambda = \frac{1}{c - \psi \frac{N^{1+\gamma}}{1+\gamma}} \tag{8}$$

$$(4) \Rightarrow \delta_0^{\theta} = \alpha(eK)^{\alpha-1} N^{1-\alpha} \tag{9}$$

$$(2) \Rightarrow 1 = \beta[\alpha(eK)^{\alpha-1} N^{1-\alpha} e + 1 - \delta] \tag{10}$$

Shocks: u_t

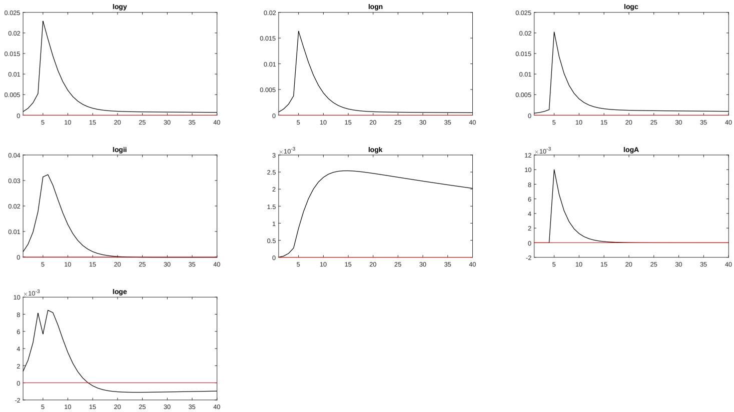

Figure 1: Impulse Response Function to u_t

Shocks: $\epsilon_t, \rho = 0.66$

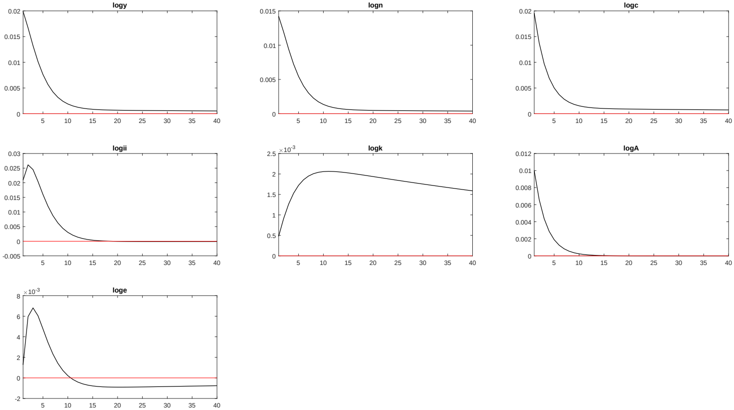

Figure 2: Impose Response Function to ϵ_t[1]

[1] Here we use parameter $\rho = .66$. If use $\rho = .90$, the shape of y with be humped.

Shocks: $\epsilon_t, \rho = 0.9$

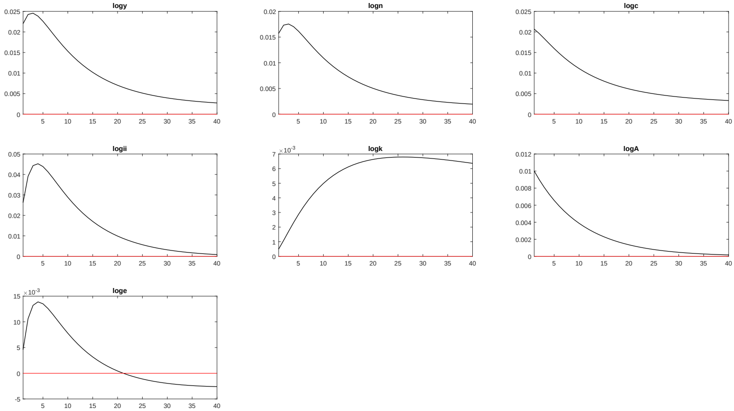

Figure 3: Impose Response Function to ϵ_t

No GHH: IRF w.r.t. u_t

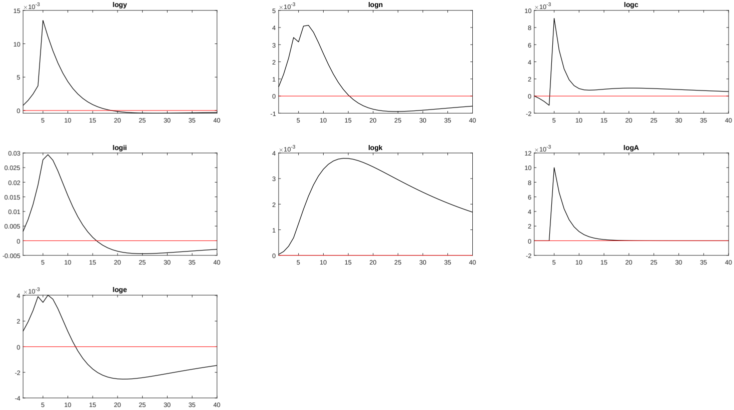

Figure 4: IRF wrt u_t without GHH

No GHH: IRF w.r.t. ϵ_t

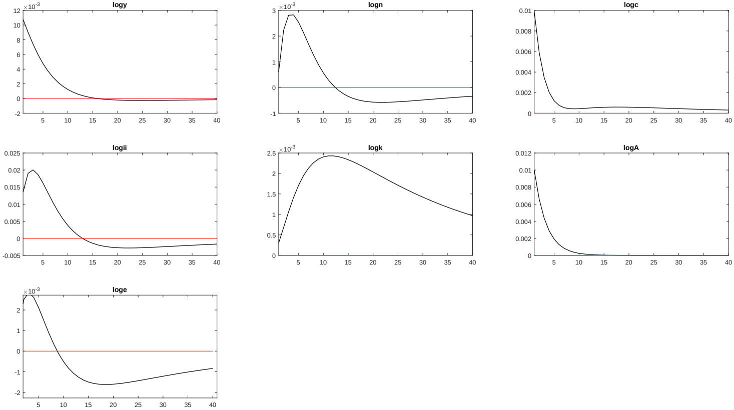

Figure 5: IRF wrt ϵ_t, without GHH

No Adj Cost: IRF w.r.t. u_t

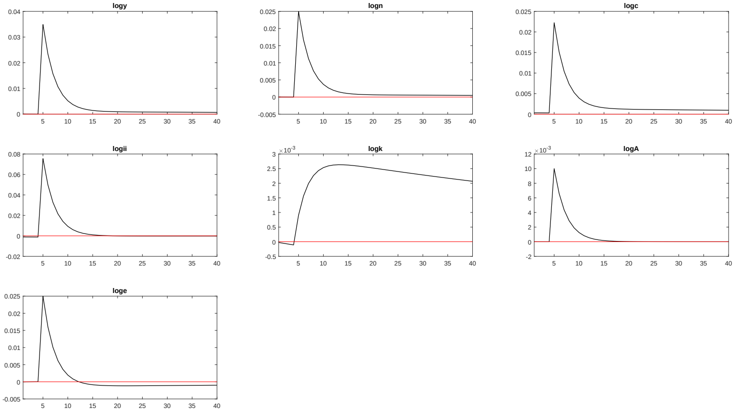

Figure 6: IRF wrt u_t without Adj Cost

No Adj Cost: IRF w.r.t. ϵ_t

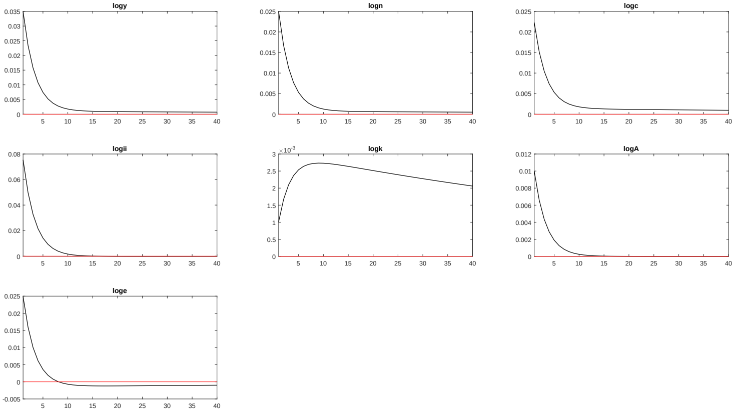

Figure 7: IRF wrt ϵ_t, without Adj Cost

No Variable Utilization: IRF w.r.t. u_t

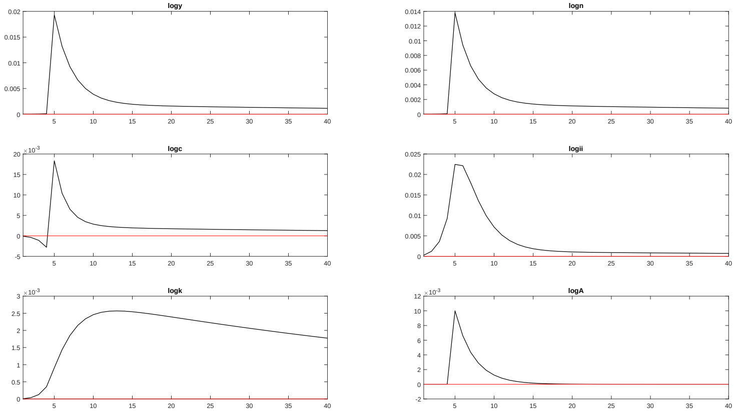

Figure 8: IRF wrt u_t without Variable Utilize

No Variable Utilization: IRF w.r.t. ϵ_t

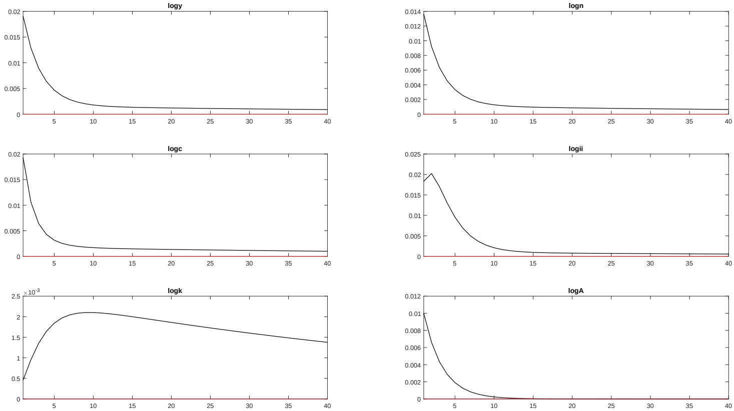

Figure 9: IRF wrt ϵ_t, without Variable Utilize