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1 CONSUMER

1.1 Optimisation problem

$$\max_{C_t, K_t^{\mathrm{s}}, I_t, B_t, L_t^{\mathrm{s}}} U_t = \beta \mathrm{E}_t\left[U_{t+1}\right] + (1-\eta)^{-1}\left(C_t{}^{\mu}(1-L_t^{\mathrm{s}})^{1-\mu}\right)^{1-\eta} \tag{1.1}$$

s.t. :

$$C_t + I_t + B_t R_t{}^{-1} = Dw_t - T_t + B_{t-1}\pi_t{}^{-1} + K_{t-1}^{\mathrm{s}} r_t + L_t^{\mathrm{s}} W_t \quad (\lambda_t) \tag{1.2}$$

$$K_t^{\mathrm{s}} = I_t + K_{t-1}^{\mathrm{s}}(1-\delta) \quad (q_t) \tag{1.3}$$

1.2 Identities

$$Q_t = \lambda_t{}^{-1} q_t \tag{1.4}$$

1.3 First order conditions

$$-\lambda_t + \mu C_t{}^{-1+\mu}(1-L_t^{\mathrm{s}})^{1-\mu}\left(C_t{}^{\mu}(1-L_t^{\mathrm{s}})^{1-\mu}\right)^{-\eta} = 0 \quad (C_t) \tag{1.5}$$

$$-q_t + \beta\left((1-\delta)\,\mathrm{E}_t\left[q_{t+1}\right] + \mathrm{E}_t\left[\lambda_{t+1} r_{t+1}\right]\right) = 0 \quad (K_t^{\mathrm{s}}) \tag{1.6}$$

$$-\lambda_t + q_t = 0 \quad (I_t) \tag{1.7}$$

$$\beta \mathrm{E}_t\left[\lambda_{t+1}\pi_{t+1}{}^{-1}\right] - \lambda_t R_t{}^{-1} = 0 \quad (B_t) \tag{1.8}$$

$$\lambda_t W_t + (-1+\mu)\, C_t{}^{\mu}(1-L_t^{\mathrm{s}})^{-\mu}\left(C_t{}^{\mu}(1-L_t^{\mathrm{s}})^{1-\mu}\right)^{-\eta} = 0 \quad (L_t^{\mathrm{s}}) \tag{1.9}$$

2 FIRM

2.1 Optimisation problem

$$\max_{K_t^{\mathrm{d}}, L_t^{\mathrm{d}}} tc_t^{\mathrm{j}} = -r_t K_t^{\mathrm{d}} - L_t^{\mathrm{d}} W_t \tag{2.1}$$

s.t. :

$$Y_t^{\mathrm{j}} = Z_t K_t^{\mathrm{d}\alpha} L_t^{\mathrm{d}\,1-\alpha} \quad (mc_t) \tag{2.2}$$

2.2 First order conditions

$$-r_t + \alpha mc_t Z_t {K_t^{\mathrm{d}}}^{-1+\alpha} {L_t^{\mathrm{d}}}^{1-\alpha} = 0 \quad \left(K_t^{\mathrm{d}}\right) \tag{2.3}$$

$$-W_t + mc_t Z_t \left(1-\alpha\right) {K_t^{\mathrm{d}}}^{\alpha} {L_t^{\mathrm{d}}}^{-\alpha} = 0 \quad \left(L_t^{\mathrm{d}}\right) \tag{2.4}$$

3 PRICE SETTING PROBLEM

3.1 Identities

$$g_t^1 = \eta_t^{\mathrm{p}} + g_t^2 \left(1+\lambda^{\mathrm{p}}\right) \tag{3.1}$$

$$g_t^1 = \lambda_t \pi_t^{\star} Y_t + \beta \xi^{\mathrm{p}} \pi_t^{\star} \mathrm{E}_t \left[g_{t+1}^1 {\pi_{t+1}^{\star}}^{-1} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}} \right] \tag{3.2}$$

$$g_t^2 = \beta \xi^{\mathrm{p}} \mathrm{E}_t \left[g_{t+1}^2 \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}\left(1+\lambda^{\mathrm{p}}\right)} \right] + \lambda_t mc_t Y_t \tag{3.3}$$

4 PRICE EVOLUTION

4.1 Identities

$$1 = \xi^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}} + \left(1-\xi^{\mathrm{p}}\right) {\pi_t^{\star}}^{-\lambda^{\mathrm{p}-1}} \tag{4.1}$$

5 PRODUCT AGGREGATION

5.1 Identities

$$Y_t^{\mathrm{s}} = Y_t^{\mathrm{j}} \tag{5.1}$$

$$\nu_t^{\mathrm{p}} = \left(1-\xi^{\mathrm{p}}\right) {\pi_t^{\star}}^{-\lambda^{\mathrm{p}-1}\left(1+\lambda^{\mathrm{p}}\right)} + \xi^{\mathrm{p}} \nu_{t-1}^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}\left(1+\lambda^{\mathrm{p}}\right)} \tag{5.2}$$

$$\nu_t^{\mathrm{p}} Y_t = Y_t^{\mathrm{s}} \tag{5.3}$$

6 EQUILIBRIUM

6.1 Identities

$$K_t^{\mathrm{d}} = K_{t-1}^{\mathrm{s}} \tag{6.1}$$

$$L_t^{\mathrm{d}} = L_t^{\mathrm{s}} \tag{6.2}$$

$$B_t = 0 \tag{6.3}$$

$$Div_t = Y_t - L_t^{\mathrm{d}} W_t - r_t K_t^{\mathrm{d}} \tag{6.4}$$

7 MONETARY POLICY AUTHORITY

7.1 Identities

$$addr^{\pi} + \log\left({R_{\mathrm{ss}}}^{-1} R_t\right) = \eta_t^{\mathrm{R}} + \rho \log\left({R_{\mathrm{ss}}}^{-1} R_{t-1}\right) + (1-\rho)\left(\log \pi_t^{\mathrm{obj}} + r^{\pi}\left(-\log \pi_t^{\mathrm{obj}} + \log\left({\pi_{\mathrm{ss}}}^{-1}\pi_{t-1}\right)\right) + r^{\mathrm{Y}} \log\left({Y_{\mathrm{ss}}}^{-1} Y_t\right)\right) \tag{7.1}$$

$$\log \pi_t^{\mathrm{obj}} = \eta_t^{\pi} + {\rho^{\pi}}^{\mathrm{bar}} \log \pi_{t-1}^{\mathrm{obj}} + \log addr^{\pi^{\mathrm{obj}}}\left(1 - {\rho^{\pi}}^{\mathrm{bar}}\right) \tag{7.2}$$

8 GOVERNMENT

8.1 Identities

$$G_t = {G}^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} \tag{8.1}$$

$$G_t + B_{t-1}{\pi_t}^{-1} = T_t + B_t {R_t}^{-1} \tag{8.2}$$

9 GOVERNMENT SPENDING SHOCK

9.1 Identities

$$\log \epsilon_t^{\mathrm{G}} = \eta_t^{\mathrm{G}} + \rho^{\mathrm{G}} \log \epsilon_{t-1}^{\mathrm{G}} \tag{9.1}$$

10 TECHNOLOGY

10.1 Identities

$$Z_t = e^{\epsilon_t^{\mathrm{Z}} + \rho^{\mathrm{a}} \log Z_{t-1}} \tag{10.1}$$

11 Equilibrium relationships (after reduction)

$$-B_t = 0 \tag{11.1}$$

$$-\lambda_t + q_t = 0 \tag{11.2}$$

$$-\lambda_t + \mu {C_t}^{-1+\mu} (1 - L_t^{\mathrm{s}})^{1-\mu} \left({C_t}^{\mu} (1 - L_t^{\mathrm{s}})^{1-\mu} \right)^{-\eta} = 0 \tag{11.3}$$

$$-q_t + \beta \left((1-\delta) \, \mathrm{E}_t \left[q_{t+1} \right] + \mathrm{E}_t \left[\lambda_{t+1} r_{t+1} \right] \right) = 0 \tag{11.4}$$

$$-r_t + \alpha mc_t Z_t {K_{t-1}^{\mathrm{s}}}^{-1+\alpha} L_t^{\mathrm{s}\,1-\alpha} = 0 \tag{11.5}$$

$$-G_t + G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} = 0 \tag{11.6}$$

$$-Q_t + {\lambda_t}^{-1} q_t = 0 \tag{11.7}$$

$$-W_t + mc_t Z_t \left(1 - \alpha \right) {K_{t-1}^{\mathrm{s}}}^{\alpha} L_t^{\mathrm{s}\,-\alpha} = 0 \tag{11.8}$$

$$-Y_t^{\mathrm{j}} + Z_t {K_{t-1}^{\mathrm{s}}}^{\alpha} L_t^{\mathrm{s}\,1-\alpha} = 0 \tag{11.9}$$

$$Y_t^{\mathrm{j}} - Y_t^{\mathrm{s}} = 0 \tag{11.10}$$

$$Y_t^{\mathrm{s}} - \nu_t^{\mathrm{p}} Y_t = 0 \tag{11.11}$$

$$-Z_t + e^{\epsilon_t^{\mathrm{Z}} + \rho^{\mathrm{a}} \log Z_{t-1}} = 0 \tag{11.12}$$

$$\beta \mathrm{E}_t \left[\lambda_{t+1} {\pi_{t+1}}^{-1} \right] - \lambda_t {R_t}^{-1} = 0 \tag{11.13}$$

$$\lambda_t W_t + \left(-1 + \mu \right) {C_t}^{\mu} (1 - L_t^{\mathrm{s}})^{-\mu} \left({C_t}^{\mu} (1 - L_t^{\mathrm{s}})^{1-\mu} \right)^{-\eta} = 0 \tag{11.14}$$

$$-1 + \xi^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1} + \left(1 - \xi^{\mathrm{p}} \right) {\pi_t^{\star}}^{-\lambda^{\mathrm{p}}-1} = 0 \tag{11.15}$$

$$\eta_t^{\mathrm{p}} - g_t^1 + g_t^2 \left(1 + \lambda^{\mathrm{p}} \right) = 0 \tag{11.16}$$

$$\eta_t^{\mathrm{G}} - \log \epsilon_t^{\mathrm{G}} + \rho^{\mathrm{G}} \log \epsilon_{t-1}^{\mathrm{G}} = 0 \tag{11.17}$$

$$-g_t^1 + \lambda_t \pi_t^{\star} Y_t + \beta \xi^{\mathrm{p}} \pi_t^{\star} \mathrm{E}_t \left[g_{t+1}^1 {\pi_{t+1}^{\star}}^{-1} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1} \right] = 0 \tag{11.18}$$

$$-g_t^2 + \beta \xi^{\mathrm{p}} \mathrm{E}_t \left[g_{t+1}^2 \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1(1+\lambda^{\mathrm{p}})} \right] + \lambda_t mc_t Y_t = 0 \tag{11.19}$$

$$-\nu_t^{\mathrm{p}} + \left(1 - \xi^{\mathrm{p}} \right) {\pi_t^{\star}}^{-\lambda^{\mathrm{p}}-1(1+\lambda^{\mathrm{p}})} + \xi^{\mathrm{p}} \nu_{t-1}^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1(1+\lambda^{\mathrm{p}})} = 0 \tag{11.20}$$

$$I_t - K_t^{\mathrm{s}} + K_{t-1}^{\mathrm{s}} \left(1 - \delta \right) = 0 \tag{11.21}$$

$$U_t - \beta \mathrm{E}_t \left[U_{t+1} \right] - \left(1 - \eta \right)^{-1} \left({C_t}^{\mu} (1 - L_t^{\mathrm{s}})^{1-\mu} \right)^{1-\eta} = 0 \tag{11.22}$$

$$\eta_t^{\pi} - \log \pi_t^{\mathrm{obj}} + \rho^{\pi^{\mathrm{bar}}} \log \pi_{t-1}^{\mathrm{obj}} + \log \mathit{add}r^{\pi^{\mathrm{obj}}} \left(1 - \rho^{\pi^{\mathrm{bar}}}\right) = 0 \tag{11.23}$$

$$-\mathit{Div}_t + Y_t - K_{t-1}^{\mathrm{s}} r_t - L_t^{\mathrm{s}} W_t = 0 \tag{11.24}$$

$$-G_t + T_t - B_{t-1} {\pi_t}^{-1} + B_t {R_t}^{-1} = 0 \tag{11.25}$$

$$-\mathit{add}r^{\pi} + \eta_t^{\mathrm{R}} - \log\left({R_{\mathrm{ss}}}^{-1} R_t\right) + \rho \log\left({R_{\mathrm{ss}}}^{-1} R_{t-1}\right) + (1-\rho)\left(\log \pi_t^{\mathrm{obj}} + r^{\pi}\left(-\log \pi_t^{\mathrm{obj}} + \log\left({\pi_{\mathrm{ss}}}^{-1}\pi_{t-1}\right)\right) + r^{\mathrm{Y}} \log\left({Y_{\mathrm{ss}}}^{-1} Y_t\right)\right) = 0 \tag{11.26}$$

$$-C_t + \mathit{Div}_t - I_t - T_t + B_{t-1} {\pi_t}^{-1} + K_{t-1}^{\mathrm{s}} r_t - B_t {R_t}^{-1} + L_t^{\mathrm{s}} W_t = 0 \tag{11.27}$$

12 Steady state relationships (after reduction)

$$-B_{\mathrm{ss}} = 0 \tag{12.1}$$

$$-\lambda_{\mathrm{ss}} + q_{\mathrm{ss}} = 0 \tag{12.2}$$

$$-\lambda_{\mathrm{ss}} + \mu {C_{\mathrm{ss}}}^{-1+\mu} (1 - L_{\mathrm{ss}}^{\mathrm{s}})^{1-\mu} \left({C_{\mathrm{ss}}}^{\mu} (1 - L_{\mathrm{ss}}^{\mathrm{s}})^{1-\mu}\right)^{-\eta} = 0 \tag{12.3}$$

$$-q_{\mathrm{ss}} + \beta\left(\lambda_{\mathrm{ss}} r_{\mathrm{ss}} + q_{\mathrm{ss}}\left(1-\delta\right)\right) = 0 \tag{12.4}$$

$$-r_{\mathrm{ss}} + \alpha \mathit{mc}_{\mathrm{ss}} Z_{\mathrm{ss}} {K_{\mathrm{ss}}^{\mathrm{s}}}^{-1+\alpha} {L_{\mathrm{ss}}^{\mathrm{s}}}^{1-\alpha} = 0 \tag{12.5}$$

$$-G_{\mathrm{ss}} + G^{\mathrm{bar}} \epsilon_{\mathrm{ss}}^{\mathrm{G}} = 0 \tag{12.6}$$

$$-Q_{\mathrm{ss}} + {\lambda_{\mathrm{ss}}}^{-1} q_{\mathrm{ss}} = 0 \tag{12.7}$$

$$-W_{\mathrm{ss}} + \mathit{mc}_{\mathrm{ss}} Z_{\mathrm{ss}} \left(1-\alpha\right) {K_{\mathrm{ss}}^{\mathrm{s}}}^{\alpha} {L_{\mathrm{ss}}^{\mathrm{s}}}^{-\alpha} = 0 \tag{12.8}$$

$$-Y_{\mathrm{ss}}^{\mathrm{j}} + Z_{\mathrm{ss}} {K_{\mathrm{ss}}^{\mathrm{s}}}^{\alpha} {L_{\mathrm{ss}}^{\mathrm{s}}}^{1-\alpha} = 0 \tag{12.9}$$

$$Y_{\mathrm{ss}}^{\mathrm{j}} - Y_{\mathrm{ss}}^{\mathrm{s}} = 0 \tag{12.10}$$

$$Y_{\mathrm{ss}}^{\mathrm{s}} - \nu_{\mathrm{ss}}^{\mathrm{p}} Y_{\mathrm{ss}} = 0 \tag{12.11}$$

$$-Z_{\mathrm{ss}} + e^{\rho^{\mathrm{a}} \log Z_{\mathrm{ss}}} = 0 \tag{12.12}$$

$$-\lambda_{\mathrm{ss}} {R_{\mathrm{ss}}}^{-1} + \beta \lambda_{\mathrm{ss}} {\pi_{\mathrm{ss}}}^{-1} = 0 \tag{12.13}$$

$$\lambda_{\mathrm{ss}} W_{\mathrm{ss}} + \left(-1+\mu\right) {C_{\mathrm{ss}}}^{\mu} (1 - L_{\mathrm{ss}}^{\mathrm{s}})^{-\mu} \left({C_{\mathrm{ss}}}^{\mu} (1 - L_{\mathrm{ss}}^{\mathrm{s}})^{1-\mu}\right)^{-\eta} = 0 \tag{12.14}$$

$$-1 + \xi^{\mathrm{p}} \left({\pi_{\mathrm{ss}}}^{-1} {\pi_{\mathrm{ss}}}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}-1}} + \left(1-\xi^{\mathrm{p}}\right) {\pi_{\mathrm{ss}}^{\star}}^{-\lambda^{\mathrm{p}-1}} = 0 \tag{12.15}$$

$$-g_{\mathrm{ss}}^{1} + g_{\mathrm{ss}}^{2} \left(1 + \lambda^{\mathrm{p}}\right) = 0 \tag{12.16}$$

$$-\log \epsilon_{\mathrm{ss}}^{\mathrm{G}} + \rho^{\mathrm{G}} \log \epsilon_{\mathrm{ss}}^{\mathrm{G}} = 0 \tag{12.17}$$

$$-g_{\mathrm{ss}}^{1} + \lambda_{\mathrm{ss}} \pi_{\mathrm{ss}}^{\star} Y_{\mathrm{ss}} + \beta \xi^{\mathrm{p}} g_{\mathrm{ss}}^{1} \left({\pi_{\mathrm{ss}}}^{-1} {\pi_{\mathrm{ss}}}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}-1}} = 0 \tag{12.18}$$

$$-g_{\mathrm{ss}}^{2}+\lambda_{\mathrm{ss}} mc_{\mathrm{ss}} Y_{\mathrm{ss}}+\beta\xi^{\mathrm{p}} g_{\mathrm{ss}}^{2}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})}=0 \tag{12.19}$$

$$-\nu_{\mathrm{ss}}^{\mathrm{p}}+\left(1-\xi^{\mathrm{p}}\right)\pi_{\mathrm{ss}}^{\star}{}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})}+\xi^{\mathrm{p}}\nu_{\mathrm{ss}}^{\mathrm{p}}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})}=0 \tag{12.20}$$

$$I_{\mathrm{ss}}-K_{\mathrm{ss}}^{\mathrm{s}}+K_{\mathrm{ss}}^{\mathrm{s}}\left(1-\delta\right)=0 \tag{12.21}$$

$$U_{\mathrm{ss}}-\beta U_{\mathrm{ss}}-\left(1-\eta\right)^{-1}\left(C_{\mathrm{ss}}{}^{\mu}(1-L_{\mathrm{ss}}^{\mathrm{s}})^{1-\mu}\right)^{1-\eta}=0 \tag{12.22}$$

$$-\log\pi_{\mathrm{ss}}^{\mathrm{obj}}+\rho^{\pi^{\mathrm{bar}}}\log\pi_{\mathrm{ss}}^{\mathrm{obj}}+\log addr^{\pi^{\mathrm{obj}}}\left(1-\rho^{\pi^{\mathrm{bar}}}\right)=0 \tag{12.23}$$

$$-Div_{\mathrm{ss}}+Y_{\mathrm{ss}}-r_{\mathrm{ss}}K_{\mathrm{ss}}^{\mathrm{s}}-L_{\mathrm{ss}}^{\mathrm{s}}W_{\mathrm{ss}}=0 \tag{12.24}$$

$$-G_{\mathrm{ss}}+T_{\mathrm{ss}}-\pi_{\mathrm{ss}}{}^{-1}B_{\mathrm{ss}}+B_{\mathrm{ss}}R_{\mathrm{ss}}{}^{-1}=0 \tag{12.25}$$

$$-addr^{\pi}+\left(1-\rho\right)\left(\log\pi_{\mathrm{ss}}^{\mathrm{obj}}-r^{\pi}\log\pi_{\mathrm{ss}}^{\mathrm{obj}}\right)=0 \tag{12.26}$$

$$-C_{\mathrm{ss}}+Div_{\mathrm{ss}}-I_{\mathrm{ss}}-T_{\mathrm{ss}}+\pi_{\mathrm{ss}}{}^{-1}B_{\mathrm{ss}}+r_{\mathrm{ss}}K_{\mathrm{ss}}^{\mathrm{s}}-B_{\mathrm{ss}}R_{\mathrm{ss}}{}^{-1}+L_{\mathrm{ss}}^{\mathrm{s}}W_{\mathrm{ss}}=0 \tag{12.27}$$

13 Calibrating equations

$$-1+\pi_{\mathrm{ss}}^{\mathrm{obj}}=0 \tag{13.1}$$

$$-0.18+G_{\mathrm{ss}}Y_{\mathrm{ss}}{}^{-1}=0 \tag{13.2}$$

$$\pi_{\mathrm{ss}}-\pi_{\mathrm{ss}}^{\mathrm{obj}}=0 \tag{13.3}$$

14 Parameter settings

$$\alpha=0.3 \tag{14.1}$$

$$\beta=0.99 \tag{14.2}$$

$$\delta=0.025 \tag{14.3}$$

$$\eta=2 \tag{14.4}$$

$$\gamma^{\mathrm{p}}=0.469 \tag{14.5}$$

$$\lambda^{\mathrm{p}}=0.5 \tag{14.6}$$

$$\mu=0.3 \tag{14.7}$$

$$r^{\pi}=1.684 \tag{14.8}$$

$$r^{\mathrm{Y}}=0.099 \tag{14.9}$$

$$\rho = 0.961 \tag{14.10}$$

$$\rho^{\pi^{\mathrm{bar}}} = 0.924 \tag{14.11}$$

$$\rho^{\mathrm{G}} = 0.949 \tag{14.12}$$

$$\rho^{\mathrm{a}} = 0.823 \tag{14.13}$$

$$\xi^{\mathrm{p}} = 0.908 \tag{14.14}$$

15 Steady-state values

	Steady-state value
ϵ^{G}	0.9
g^1	0.9
g^2	0.9
λ	0.9
mc	0.9
ν^{p}	0.9
π	0.9
$\pi^\star$	0.9
π^{obj}	0.9
q	0.9
r	0.9
B	0.9
C	0.9
Div	0.9
G	0.9
I	0.9
K^{s}	0.9
L^{s}	0.9
Q	0.9
R	0.9
T	0.9
U	0.9
W	0.9
Y	0.9
Y^{j}	0.9
Y^{s}	0.9
Z	0.9

16 The solution of the 1st order perturbation

Matrix P

	$\epsilon^{\mathrm{G}}_{t-1}$	ν^{p}_{t-1}	π_{t-1}	π^{obj}_{t-1}	B_{t-1}	K^{s}_{t-1}	R_{t-1}	Z_{t-1}
ϵ^{G}_t	0.949	0	0	0	0	0	0	0
ν^{p}_t	−0.092	0.0793	0.2373	−0.6273	0	0.4827	2.8695	0.7855
π_t	0.1307	0.978	0.1319	0.8913	0	−0.6858	−4.0769	−1.116
π^{obj}_t	0	0	0	0.924	0	0	0	0
B_t	0	0	0	0	0	0	0	0
K^{s}_t	0.0856	0.2781	0.2545	−0.6491	0	0.5181	1.8624	−0.3555
R_t	0.0004	−0.0003	0.0647	−0.0222	0	−0.0007	0.9496	0.0002
Z_t	0	0	0	0	0	0	0	0.8385

Matrix Q

	ϵ^{Z}	η^{p}	η^{R}	η^{π}	η^{G}
ϵ^{G}	0	0	0	0	1
ν^{p}	0.9544	0.0014	2.986	−0.6789	−0.0969
π	−1.356	−0.0021	−4.2424	0.9646	0.1377
π^{obj}	0	0	0	1	0
B	0	0	0	0	0
K^{s}	−0.4319	0.0016	1.938	−0.7025	0.0902
R	0.0002	0	0.9882	−0.024	0.0004
Z	1.0188	0	0	0	0

Matrix R

	$\epsilon^{\mathrm{G}}_{t-1}$	ν^{p}_{t-1}	π_{t-1}	π^{obj}_{t-1}	B_{t-1}	K^{s}_{t-1}	R_{t-1}	Z_{t-1}
g^1_t	1.6135	9.347	−4.5292	11.5569	0	−6.7553	−44.3936	−11.2804
g^2_t	1.0757	6.2313	−3.0195	7.7046	0	−4.5035	−29.5957	−7.5203
λ_t	0.191	0.9427	1.1212	−2.8972	0	−0.7142	10.6339	−1.0658
mc_t	1.5643	11.5434	−2.0392	6.665	0	−8.2439	−35.5872	−12.8739
$\pi^\star_t$	0.9342	6.9908	−2.4095	6.3709	0	−4.9019	−29.1422	−7.9772
q_t	0.191	0.9427	1.1212	−2.8972	0	−0.7142	10.6339	−1.0658
r_t	0.4224	3.1177	−0.5525	1.8047	0	−2.4154	−9.6296	−3.2505
C_t	−0.0755	−0.3539	−0.4987	1.2955	0	0.2721	−4.81	0.4052
Div_t	−1.1752	−9.4305	1.4165	−4.7768	0	5.5955	25.9784	9.8026
G_t	0.0821	0	0	0	0	0	0	0
I_t	0.0856	0.2781	0.2545	−0.6491	0	−0.4569	1.8624	−0.3555
L^{s}_t	0.0002	0.0051	−0.01	0.0273	0	−0.003	−0.1115	−0.0047
Q_t	0	0	0	0	0	0	0	0
T_t	−0.0628	−1.087	−0.0747	−1.0149	1.1111	0.7612	5.5851	1.2402
U_t	−0.718	−2.339	−1.8249	5.4146	0	1.4576	−14.154	3.2399
W_t	0.9855	7.2714	−1.2828	4.1938	0	−5.0041	−22.3988	−7.5814
Y_t	0.0922	−0.0758	−0.2443	0.6464	0	−0.1848	−2.9476	0.0497
Y^{j}_t	0.0002	0.0032	−0.0063	0.0172	0	0.2681	−0.0703	0.7517
Y^{s}_t	0.0002	0.0032	−0.0063	0.0172	0	0.2681	−0.0703	0.7517

Matrix S

	ϵ^{Z}	η^{p}	η^{R}	η^{π}	η^{G}
g^1	−13.7064	−0.0214	−46.1952	12.5074	1.7002
g^2	−9.1376	−0.755	−30.7968	8.3383	1.1335
λ	−1.2951	−0.0022	11.0654	−3.1355	0.2013
mc	−15.6427	−0.9387	−37.0314	7.2132	1.6484
$\pi^\star$	−9.6928	−0.0147	−30.3249	6.8949	0.9844
q	−1.2951	−0.0022	11.0654	−3.1355	0.2013
r	−3.9495	−0.2536	−10.0204	1.9531	0.4451
C	0.4923	−0.0037	−5.0052	1.4021	−0.0796
Div	11.9109	0.7591	27.0326	−5.1696	−1.2383
G	0	0	0	0	0.0865
I	−0.4319	0.0016	1.938	−0.7025	0.0902
L^{s}	−0.0057	−0.0009	−0.116	0.0295	0.0003
Q	0	0	0	0	0
T	1.5069	0.0023	5.8117	−1.0984	−0.0661
U	3.9367	0.0304	−14.7284	5.86	−0.7566
W	−9.2119	−0.5912	−23.3078	4.5387	1.0384
Y	0.0604	−0.0021	−3.0672	0.6996	0.0971
Y^{j}	0.9133	−0.0006	−0.0731	0.0186	0.0002
Y^{s}	0.9133	−0.0006	−0.0731	0.0186	0.0002

17 Model statistics

17.1 Basic statistics

	Steady-state value	Std. dev.	Variance	Loglin
ϵ^{G}	0.9	1.3033	1.6986	Y
g^1	0.9	48.3192	2334.743	Y
g^2	0.9	32.221	1038.1948	Y
λ	0.9	12.7587	162.7844	Y
mc	0.9	39.7072	1576.6623	Y
ν^{p}	0.9	4.5824	20.9986	Y
π	0.9	5.1772	26.8039	Y
$\pi^\star$	0.9	31.7329	1006.9793	Y
π^{obj}	0.9	1.2958	1.6792	Y
q	0.9	12.7587	162.7844	Y
r	0.9	10.6837	114.1408	Y
B	0.9	0	0	Y
C	0.9	5.7162	32.6746	Y
Dw	0.9	30.0911	905.4772	Y
G	0.9	0.1127	0.0127	Y
I	0.9	2.2734	5.1681	Y
K^{s}	0.9	4.2598	18.1462	Y
L^{s}	0.9	0.1247	0.0155	Y
Q	0.9	0	0	Y
R	0.9	1.1114	1.2353	Y
T	0.9	6.9169	47.843	Y
U	0.9	18.5085	342.5659	Y
W	0.9	24.9347	621.7387	Y
Y	0.9	3.8656	14.9431	Y
Y^{j}	0.9	1.5148	2.2946	Y
Y^{s}	0.9	1.5148	2.2946	Y
Z	0.9	1.2625	1.594	Y

17.2 Correlation matrix

	ϵ^{G}	g^1	g^2	λ	mc	ν^{p}	π	$\pi^\star$	π^{obj}	q	r	C	Dw	G
ϵ^{G}	1	0.012	0.012	0.019	0.009	-0.009	0.006	0.004	0	0.019	0.007	-0.018	-0.011	1
g^1		1	1	-0.837	0.99	-0.635	0.873	0.998	0.217	-0.837	0.99	0.848	-0.967	0.012
g^2			1	-0.837	0.991	-0.635	0.873	0.998	0.217	-0.837	0.99	0.848	-0.967	0.012
λ				1	-0.792	0.823	-0.933	-0.838	-0.24	1	-0.82	-1	0.699	0.019
mc					1	-0.625	0.87	0.995	0.139	-0.792	0.996	0.804	-0.98	0.009
ν^{p}						1	-0.888	-0.642	-0.255	0.823	-0.674	-0.821	0.462	-0.009
π							1	0.884	0.226	-0.933	0.892	0.937	-0.772	0.006
$\pi^\star$								1	0.171	-0.838	0.994	0.849	-0.971	0.004
π^{obj}									1	-0.24	0.157	0.238	-0.091	0
q										1	-0.82	-1	0.699	0.019
r											1	0.832	-0.962	0.007
C												1	-0.714	-0.018
Dw													1	-0.011
G														1
I														
K^{s}														
L^{s}														
R														
T														
U														
W														
Y														
Y^{j}														
Y^{s}														
Z														

17.3 Cross correlations with the reference variable (π)

	$\sigma[\cdot]$ rel. to $\sigma[\pi]$	π_{t-5}	π_{t-4}	π_{t-3}	π_{t-2}	π_{t-1}	π_t	π_{t+1}	π_{t+2}	π_{t+3}	π_{t+4}	π_{t+5}
ϵ_t^{G}	0.252	-0.002	-0.005	-0.009	-0.014	-0.015	0.006	0.006	0.005	0.004	0.004	0.003
g_t^1	9.333	-0.095	-0.044	0.054	0.224	0.496	0.873	0.037	-0.06	-0.1	-0.115	-0.118
g_t^2	6.224	-0.095	-0.044	0.054	0.224	0.496	0.873	0.037	-0.06	-0.1	-0.115	-0.118
λ_t	2.464	0.159	0.1	-0.017	-0.221	-0.539	-0.933	-0.459	-0.168	0.003	0.098	0.147
mc_t	7.67	-0.088	-0.04	0.051	0.213	0.478	0.87	0.035	-0.07	-0.114	-0.129	-0.128
ν_t^{p}	0.885	0.273	0.239	0.146	-0.042	-0.372	-0.888	-0.72	-0.511	-0.317	-0.155	-0.03
π_t	1	-0.166	-0.114	-0.006	0.19	0.517	1	0.517	0.19	-0.006	-0.114	-0.166
$\pi_t^\star$	6.129	-0.093	-0.042	0.055	0.225	0.499	0.884	0.056	-0.061	-0.111	-0.129	-0.131
π_t^{obj}	0.25	-0.074	-0.057	-0.02	0.043	0.135	0.226	0.17	0.122	0.082	0.048	0.021
q_t	2.464	0.159	0.1	-0.017	-0.221	-0.539	-0.933	-0.459	-0.168	0.003	0.098	0.147
r_t	2.064	-0.108	-0.06	0.035	0.204	0.483	0.892	0.084	-0.018	-0.071	-0.098	-0.11
C_t	1.104	-0.157	-0.099	0.018	0.223	0.54	0.937	0.446	0.16	-0.007	-0.1	-0.147
Dw_t	5.812	0.028	-0.017	-0.098	-0.235	-0.454	-0.772	0.129	0.213	0.221	0.198	0.164
G_t	0.022	-0.002	-0.005	-0.009	-0.014	-0.015	0.006	0.006	0.005	0.004	0.004	0.003
I_t	0.439	0.02	-0.041	-0.145	-0.309	-0.538	-0.763	-0.1	0.184	0.285	0.294	0.261
K_t^{s}	0.823	0.287	0.258	0.174	0.005	-0.283	-0.683	-0.719	-0.603	-0.435	-0.267	-0.121
L_t^{s}	0.024	-0.14	-0.082	0.032	0.232	0.546	0.954	0.335	0.091	-0.046	-0.118	-0.151
R_t	0.215	0.149	0.095	-0.014	-0.208	-0.517	-0.931	-0.453	-0.154	0.021	0.116	0.162
T_t	1.336	0.164	0.112	0.002	-0.196	-0.522	-0.998	-0.511	-0.186	0.009	0.115	0.167
U_t	3.575	-0.172	-0.114	0.002	0.206	0.517	0.882	0.491	0.218	0.048	-0.055	-0.115
W_t	4.816	-0.077	-0.029	0.062	0.222	0.482	0.858	0.009	-0.096	-0.136	-0.144	-0.138
Y_t	0.747	-0.221	-0.17	-0.059	0.147	0.482	0.938	0.602	0.345	0.157	0.025	-0.064
Y_t^{j}	0.293	0.237	0.258	0.261	0.224	0.094	-0.265	-0.578	-0.598	-0.501	-0.365	-0.229
Y_t^{s}	0.293	0.237	0.258	0.261	0.224	0.094	-0.265	-0.578	-0.598	-0.501	-0.365	-0.229
Z_t	0.244	0.039	0.059	0.085	0.107	0.084	-0.133	-0.102	-0.076	-0.055	-0.038	-0.024

17.4 Autocorrelations

	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
ϵ^{G}	0.713	0.471	0.271	0.109	-0.017
g^1	0.081	-0.014	-0.055	-0.072	-0.077
g^2	0.081	-0.014	-0.055	-0.072	-0.077
λ	0.508	0.196	0.009	-0.097	-0.152
mc	0.064	-0.022	-0.061	-0.077	-0.08
ν^{p}	0.732	0.457	0.219	0.033	-0.103
π	0.517	0.19	-0.006	-0.114	-0.166
$\pi^{\star}$	0.098	-0.01	-0.059	-0.079	-0.085
π^{obj}	0.703	0.456	0.253	0.092	-0.032
q	0.508	0.196	0.009	-0.097	-0.152
r	0.09	0.004	-0.041	-0.065	-0.076
C	0.497	0.19	0.006	-0.098	-0.151
Dw	0.018	-0.062	-0.088	-0.091	-0.082
G	0.713	0.471	0.271	0.109	-0.017
I	0.356	0.039	-0.107	-0.162	-0.17
K^{s}	0.854	0.605	0.345	0.116	-0.066
L^{s}	0.389	0.13	-0.018	-0.097	-0.135
R	0.524	0.209	0.015	-0.096	-0.154
T	0.518	0.192	-0.005	-0.113	-0.166
U	0.552	0.245	0.049	-0.071	-0.141
W	0.06	-0.03	-0.069	-0.082	-0.083
Y	0.633	0.339	0.123	-0.028	-0.128
Y^{j}	0.701	0.423	0.197	0.023	-0.102
Y^{s}	0.701	0.423	0.197	0.023	-0.102
Z	0.654	0.383	0.174	0.019	-0.092

18 Impulse response functions

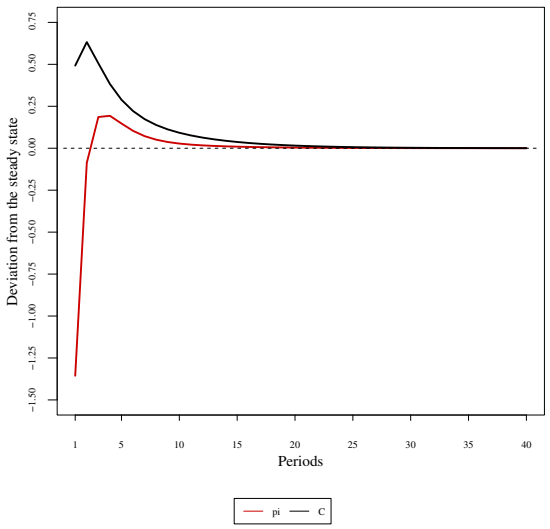

Figure 1: Impulse responses (π, C) to ϵ^{Z} shock

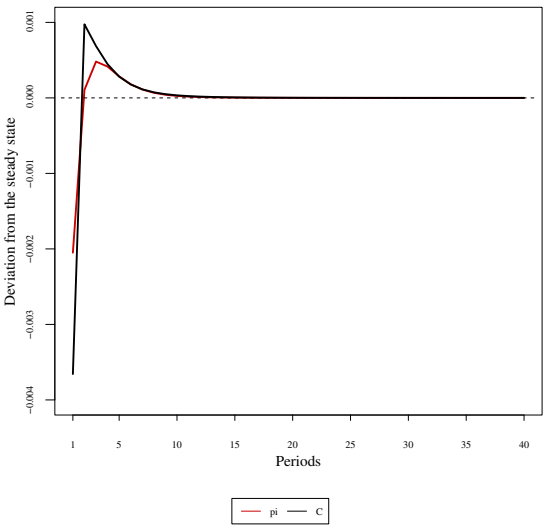

Figure 2: Impulse responses (π, C) to η^{P} shock

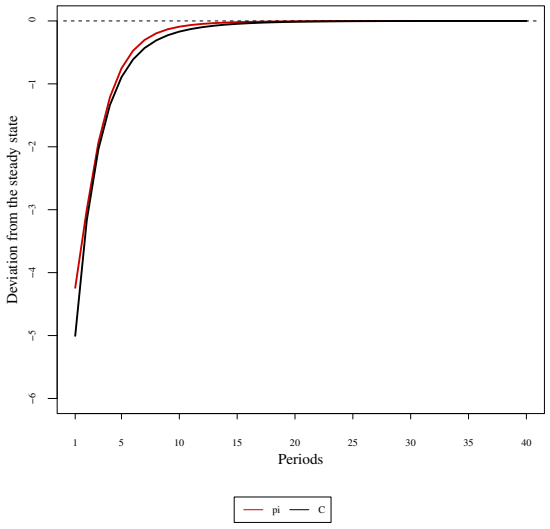

Figure 3: Impulse responses (π, C) to η^{R} shock

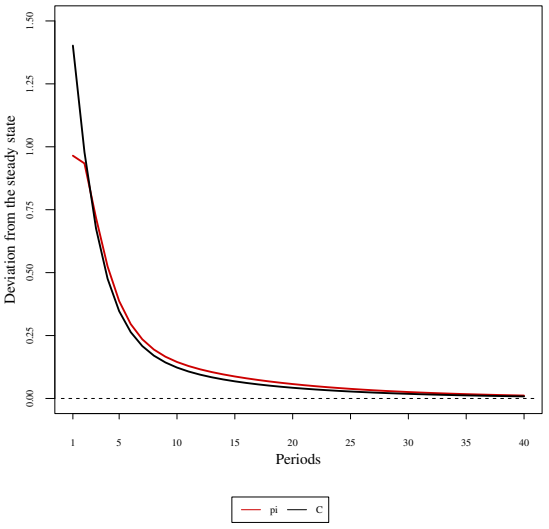

Figure 4: Impulse responses (π, C) to η^{π} shock

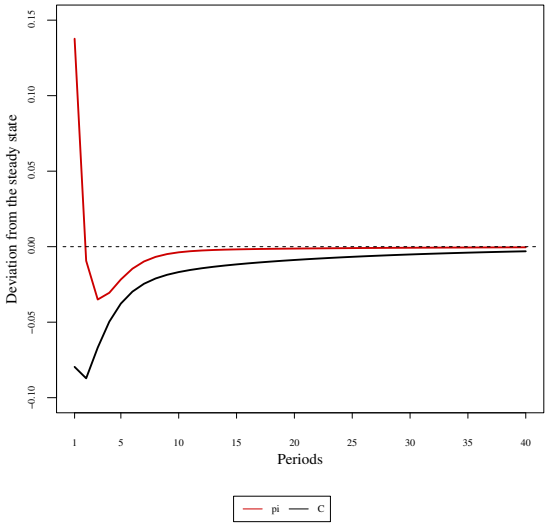

Figure 5: Impulse responses (π, C) to η^{G} shock