

1 CONSUMER

1.1 Optimisation problem

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

s.t. :

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

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

1.2 Identities

$$Q_t = \lambda_t^{-1} q_t \quad (1.4)$$

1.3 First order conditions

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

$$-q_t + \beta ((1 - \delta) E_t [q_{t+1}] + E_t [\lambda_{t+1} r_{t+1}]) = 0 \quad (K_t^s) \quad (1.6)$$

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

$$\beta E_t [\lambda_{t+1} \pi_{t+1}^{-1}] - \lambda_t R_t^{-1} = 0 \quad (B_t) \quad (1.8)$$

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

2 FIRM

2.1 Optimisation problem

$$\max_{K_t^d, L_t^d} tc_t^j = -r_t K_t^d - L_t^d W_t \quad (2.1)$$

s.t. :

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

2.2 First order conditions

$$-r_t + \alpha m c_t Z_t K_t^{\text{d}-1+\alpha} L_t^{\text{d}1-\alpha} = 0 \quad (K_t^{\text{d}}) \quad (2.3)$$

$$-W_t + m c_t Z_t (1 - \alpha) K_t^{\text{d}\alpha} L_t^{\text{d}-\alpha} = 0 \quad (L_t^{\text{d}}) \quad (2.4)$$

3 PRICE SETTING PROBLEM

3.1 Identities

$$g_t^1 = \eta_t^{\text{p}} + g_t^2 (1 + \lambda^{\text{p}}) \quad (3.1)$$

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

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

4 PRICE EVOLUTION

4.1 Identities

$$1 = \xi^{\text{p}} \left(\pi_t^{-1} \pi_{t-1}^{\gamma^{\text{p}}} \right)^{-\lambda^{\text{p}-1}} + (1 - \xi^{\text{p}}) \pi_t^{*- \lambda^{\text{p}-1}} \quad (4.1)$$

5 PRODUCT AGGREGATION

5.1 Identities

$$Y_t^{\text{s}} = Y_t^{\text{j}} \quad (5.1)$$

$$\nu_t^{\text{p}} = (1 - \xi^{\text{p}}) \pi_t^{*- \lambda^{\text{p}-1}(1+\lambda^{\text{p}})} + \xi^{\text{p}} \nu_{t-1}^{\text{p}} \left(\pi_t^{-1} \pi_{t-1}^{\gamma^{\text{p}}} \right)^{-\lambda^{\text{p}-1}(1+\lambda^{\text{p}})} \quad (5.2)$$

$$\nu_t^{\text{p}} Y_t = Y_t^{\text{s}} \quad (5.3)$$

6 EQUILIBRIUM

6.1 Identities

$$K_t^d = K_{t-1}^s \quad (6.1)$$

$$L_t^d = L_t^s \quad (6.2)$$

$$B_t = 0 \quad (6.3)$$

$$D\dot{w}_t = Y_t - L_t^d W_t - r_t K_t^d \quad (6.4)$$

7 MONETARY POLICY AUTHORITY

7.1 Identities

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

$$\log \pi_t^{\text{obj}} = \eta_t^{\pi} + \rho^{\pi^{\text{bar}}} \log \pi_{t-1}^{\text{obj}} + \log \text{perceived}^{\pi^{\text{obj}}} \left(1 - \rho^{\pi^{\text{bar}}} \right) \quad (7.2)$$

8 ENDOGENOUS REGIME PROB

8.1 Identities

$$\log \text{inflation}_t^{\text{gap}} = -\log \text{perceived}_t^{\pi^{\text{obj}}} + \log \pi_t \quad (8.1)$$

$$pL_t = \left(1 + e^{pL_{ss} - \kappa \log \text{inflation}_t^{\text{gap}}} \right)^{-1} \quad (8.2)$$

$$pH_t = 1 - pL_t \quad (8.3)$$

$$\log \text{perceived}_t^{\pi^{\text{obj}}} = pH_t \log \pi^H + pL_t \log \pi_t \quad (8.4)$$

9 GOVERNMENT

9.1 Identities

$$G_t = G^{\text{bar}} \epsilon_t^G \quad (9.1)$$

$$G_t + B_{t-1} \pi_t^{-1} = T_t + B_t R_t^{-1} \quad (9.2)$$

10 GOVERNMENT SPENDING SHOCK

10.1 Identities

$$\log \epsilon_t^G = \eta_t^G + \rho^G \log \epsilon_{t-1}^G \quad (10.1)$$

11 TECHNOLOGY

11.1 Identities

$$Z_t = e^{\epsilon_t^Z + \rho^a \log Z_{t-1}} \quad (11.1)$$

12 Equilibrium relationships (after reduction)

$$-B_t = 0 \quad (12.1)$$

$$-\lambda_t + q_t = 0 \quad (12.2)$$

$$-\lambda_t + \mu C_t^{-1+\mu} (1 - L_t^s)^{1-\mu} \left(C_t^\mu (1 - L_t^s)^{1-\mu} \right)^{-\eta} = 0 \quad (12.3)$$

$$-pL_t + \left(1 + e^{pLs - \kappa \log inflation_t^{\text{gap}}} \right)^{-1} = 0 \quad (12.4)$$

$$-q_t + \beta ((1 - \delta) E_t [q_{t+1}] + E_t [\lambda_{t+1} r_{t+1}]) = 0 \quad (12.5)$$

$$-r_t + \alpha m c_t Z_t K_{t-1}^{s-1+\alpha} L_t^{s1-\alpha} = 0 \quad (12.6)$$

$$-G_t + G^{\text{bar}} \epsilon_t^G = 0 \quad (12.7)$$

$$-Q_t + \lambda_t^{-1} q_t = 0 \quad (12.8)$$

$$-W_t + m c_t Z_t (1 - \alpha) K_{t-1}^{s-\alpha} L_t^{s-\alpha} = 0 \quad (12.9)$$

$$-Y_t^j + Z_t K_{t-1}^{s-\alpha} L_t^{s1-\alpha} = 0 \quad (12.10)$$

$$Y_t^j - Y_t^s = 0 \quad (12.11)$$

$$Y_t^s - \nu_t^p Y_t = 0 \quad (12.12)$$

$$-Z_t + e^{\epsilon_t^Z + \rho^a \log Z_{t-1}} = 0 \quad (12.13)$$

$$\beta E_t [\lambda_{t+1} \pi_{t+1}^{-1}] - \lambda_t R_t^{-1} = 0 \quad (12.14)$$

$$\lambda_t W_t + (-1 + \mu) C_t^\mu (1 - L_t^s)^{-\mu} \left(C_t^\mu (1 - L_t^s)^{1-\mu} \right)^{-\eta} = 0 \quad (12.15)$$

$$-1 + \xi^{\text{p}} \left(\pi_t^{-1} \pi_{t-1}^{\gamma^{\text{p}}} \right)^{-\lambda^{\text{p}-1}} + (1 - \xi^{\text{p}}) \pi_t^{\star - \lambda^{\text{p}-1}} = 0 \quad (12.16)$$

$$1 - p H_t - p L_t = 0 \quad (12.17)$$

$$\eta_t^{\text{p}} - g_t^1 + g_t^2 (1 + \lambda^{\text{p}}) = 0 \quad (12.18)$$

$$\eta_t^{\text{G}} - \log \epsilon_t^{\text{G}} + \rho^{\text{G}} \log \epsilon_{t-1}^{\text{G}} = 0 \quad (12.19)$$

$$-g_t^1 + \lambda_t \pi_t^{\star} Y_t + \beta \xi^{\text{p}} \pi_t^{\star} \text{E}_t \left[g_{t+1}^1 \pi_{t+1}^{\star -1} \left(\pi_{t+1}^{-1} \pi_t^{\gamma^{\text{p}}} \right)^{-\lambda^{\text{p}-1}} \right] = 0 \quad (12.20)$$

$$-g_t^2 + \beta \xi^{\text{p}} \text{E}_t \left[g_{t+1}^2 \left(\pi_{t+1}^{-1} \pi_t^{\gamma^{\text{p}}} \right)^{-\lambda^{\text{p}-1} (1 + \lambda^{\text{p}})} \right] + \lambda_t m c_t Y_t = 0 \quad (12.21)$$

$$-\nu_t^{\text{p}} + (1 - \xi^{\text{p}}) \pi_t^{\star - \lambda^{\text{p}-1} (1 + \lambda^{\text{p}})} + \xi^{\text{p}} \nu_{t-1}^{\text{p}} \left(\pi_t^{-1} \pi_{t-1}^{\gamma^{\text{p}}} \right)^{-\lambda^{\text{p}-1} (1 + \lambda^{\text{p}})} = 0 \quad (12.22)$$

$$I_t - K_t^{\text{s}} + K_{t-1}^{\text{s}} (1 - \delta) = 0 \quad (12.23)$$

$$U_t - \beta \text{E}_t [U_{t+1}] - (1 - \eta)^{-1} \left(C_t^{\mu} (1 - L_t^{\text{s}})^{1 - \mu} \right)^{1 - \eta} = 0 \quad (12.24)$$

$$-\log inflation_t^{\text{gap}} - \log perceived_t^{\pi^{\text{obj}}} + \log \pi_t = 0 \quad (12.25)$$

$$-\log perceived_t^{\pi^{\text{obj}}} + p H_t \log \pi^{\text{H}} + p L_t \log \pi_t = 0 \quad (12.26)$$

$$\eta_t^{\pi} - \log \pi_t^{\text{obj}} + \rho^{\pi^{\text{bar}}} \log \pi_{t-1}^{\text{obj}} + \log perceived_t^{\pi^{\text{obj}}} \left(1 - \rho^{\pi^{\text{bar}}} \right) = 0 \quad (12.27)$$

$$-Div_t + Y_t - K_{t-1}^{\text{s}} r_t - L_t^{\text{s}} W_t = 0 \quad (12.28)$$

$$-G_t + T_t - B_{t-1} \pi_t^{-1} + B_t R_t^{-1} = 0 \quad (12.29)$$

$$-adbr^{\pi} + \eta_t^{\text{R}} - \log (R_{\text{ss}}^{-1} R_t) + \rho \log (R_{\text{ss}}^{-1} R_{t-1}) + (1 - \rho) \left(\log \pi_t^{\text{obj}} + r^{\pi} \left(-\log \pi_t^{\text{obj}} + \log (\pi_{\text{ss}}^{-1} \pi_{t-1}) \right) + r^{\text{Y}} \log (Y_{\text{ss}}^{-1} Y_t) \right) = 0 \quad (12.30)$$

$$-C_t + Div_t - I_t - T_t + B_{t-1} \pi_t^{-1} + K_{t-1}^{\text{s}} r_t - B_t R_t^{-1} + L_t^{\text{s}} W_t = 0 \quad (12.31)$$

13 Steady state relationships (after reduction)

$$-B_{ss} = 0 \quad (13.1)$$

$$-\lambda_{ss} + q_{ss} = 0 \quad (13.2)$$

$$-\lambda_{ss} + \mu C_{ss}^{-1+\mu} (1 - L_{ss}^s)^{1-\mu} \left(C_{ss}^\mu (1 - L_{ss}^s)^{1-\mu} \right)^{-\eta} = 0 \quad (13.3)$$

$$-pL_{ss} + \left(1 + e^{pL_{ss} - \kappa \log inflation_{ss}^{gap}} \right)^{-1} = 0 \quad (13.4)$$

$$-q_{ss} + \beta (\lambda_{ss} r_{ss} + q_{ss} (1 - \delta)) = 0 \quad (13.5)$$

$$-r_{ss} + \alpha m c_{ss} Z_{ss} K_{ss}^{s-1+\alpha} L_{ss}^{s1-\alpha} = 0 \quad (13.6)$$

$$-G_{ss} + G^{\text{bar}} \epsilon_{ss}^G = 0 \quad (13.7)$$

$$-Q_{ss} + \lambda_{ss}^{-1} q_{ss} = 0 \quad (13.8)$$

$$-W_{ss} + m c_{ss} Z_{ss} (1 - \alpha) K_{ss}^{s\alpha} L_{ss}^{s-\alpha} = 0 \quad (13.9)$$

$$-Y_{ss}^j + Z_{ss} K_{ss}^{s\alpha} L_{ss}^{s1-\alpha} = 0 \quad (13.10)$$

$$Y_{ss}^j - Y_{ss}^s = 0 \quad (13.11)$$

$$Y_{ss}^s - \nu_{ss}^p Y_{ss} = 0 \quad (13.12)$$

$$-Z_{ss} + e^{\rho^a \log Z_{ss}} = 0 \quad (13.13)$$

$$-\lambda_{ss} R_{ss}^{-1} + \beta \lambda_{ss} \pi_{ss}^{-1} = 0 \quad (13.14)$$

$$\lambda_{ss} W_{ss} + (-1 + \mu) C_{ss}^\mu (1 - L_{ss}^s)^{-\mu} \left(C_{ss}^\mu (1 - L_{ss}^s)^{1-\mu} \right)^{-\eta} = 0 \quad (13.15)$$

$$-1 + \xi^p \left(\pi_{ss}^{-1} \pi_{ss}^{\gamma^p} \right)^{-\lambda^{p-1}} + (1 - \xi^p) \pi_{ss}^{\star -\lambda^{p-1}} = 0 \quad (13.16)$$

$$1 - pH_{ss} - pL_{ss} = 0 \quad (13.17)$$

$$-g_{ss}^1 + g_{ss}^2 (1 + \lambda^p) = 0 \quad (13.18)$$

$$-\log \epsilon_{ss}^G + \rho^G \log \epsilon_{ss}^G = 0 \quad (13.19)$$

$$-g_{ss}^1 + \lambda_{ss} \pi_{ss}^{\star} Y_{ss} + \beta \xi^p g_{ss}^1 \left(\pi_{ss}^{-1} \pi_{ss}^{\gamma^p} \right)^{-\lambda^{p-1}} = 0 \quad (13.20)$$

$$-g_{ss}^2 + \lambda_{ss} m c_{ss} Y_{ss} + \beta \xi^p g_{ss}^2 \left(\pi_{ss}^{-1} \pi_{ss}^{\gamma^p} \right)^{-\lambda^{p-1}(1+\lambda^p)} = 0 \quad (13.21)$$

$$-\nu_{ss}^p + (1 - \xi^p) \pi_{ss}^{\star -\lambda^{p-1}(1+\lambda^p)} + \xi^p \nu_{ss}^p \left(\pi_{ss}^{-1} \pi_{ss}^{\gamma^p} \right)^{-\lambda^{p-1}(1+\lambda^p)} = 0 \quad (13.22)$$

$$I_{ss} - K_{ss}^s + K_{ss}^s (1 - \delta) = 0 \quad (13.23)$$

$$U_{ss} - \beta U_{ss} - (1 - \eta)^{-1} \left(C_{ss}^\mu (1 - L_{ss}^s)^{1-\mu} \right)^{1-\eta} = 0 \quad (13.24)$$

$$-\log inflation_{ss}^{\text{gap}} - \log perceived_{ss}^{\pi^{\text{obj}}} + \log \pi_{ss} = 0 \quad (13.25)$$

$$-\log perceived_{ss}^{\pi^{\text{obj}}} + pH_{ss} \log \pi^H + pL_{ss} \log \pi_{ss} = 0 \quad (13.26)$$

$$-\log \pi_{ss}^{\text{obj}} + \rho^{\pi^{\text{bar}}} \log \pi_{ss}^{\text{obj}} + \log perceived_{ss}^{\pi^{\text{obj}}} \left(1 - \rho^{\pi^{\text{bar}}} \right) = 0 \quad (13.27)$$

$$-Div_{ss} + Y_{ss} - r_{ss} K_{ss}^s - L_{ss}^s W_{ss} = 0 \quad (13.28)$$

$$-G_{ss} + T_{ss} - \pi_{ss}^{-1} B_{ss} + B_{ss} R_{ss}^{-1} = 0 \quad (13.29)$$

$$-abr^\pi + (1 - \rho) (\log \pi_{ss}^{\text{obj}} - r^\pi \log \pi_{ss}^{\text{obj}}) = 0 \quad (13.30)$$

$$-C_{ss} + Div_{ss} - I_{ss} - T_{ss} + \pi_{ss}^{-1} B_{ss} + r_{ss} K_{ss}^s - B_{ss} R_{ss}^{-1} + L_{ss}^s W_{ss} = 0 \quad (13.31)$$

14 Calibrating equations

$$-0.18 + G_{ss} Y_{ss}^{-1} = 0 \quad (14.1)$$

$$-0.05 + pL_{ss} = 0 \quad (14.2)$$

$$\pi_{ss} - \pi_{ss}^{\text{obj}} = 0 \quad (14.3)$$

15 Parameter settings

$$\alpha = 0.3 \quad (15.1)$$

$$\beta = 0.99 \quad (15.2)$$

$$\delta = 0.025 \quad (15.3)$$

$$\eta = 2 \quad (15.4)$$

$$\gamma^p = 0.469 \quad (15.5)$$

$$\kappa = 1 \quad (15.6)$$

$$\lambda^p = 0.5 \quad (15.7)$$

$$\mu = 0.3 \quad (15.8)$$

$$\pi^H = 1 \quad (15.9)$$

$$r^\pi = 1.684 \quad (15.10)$$

$$r^{\mathrm{Y}} = 0.099 \tag{15.11}$$

$$\rho = 0.961 \tag{15.12}$$

$$\rho^{\pi^{\mathrm{bar}}} = 0.924 \tag{15.13}$$

$$\rho^{\mathrm{G}} = 0.949 \tag{15.14}$$

$$\rho^{\mathrm{a}} = 0.823 \tag{15.15}$$

$$\xi^{\mathrm{P}} = 0.908 \tag{15.16}$$

16 Steady-state values

	Steady-state value
ϵ^G	1
g^1	7.3514
g^2	4.9009
$inflation^{gap}$	1
λ	1.5467
mc	0.6667
ν^P	1
$perceived\pi^{obj}$	1
π	1
π^*	1
π^{obj}	1
pH	0.95
pL	0.05
q	1.5467
r	0.0351
B	0
C	0.3255
Div	0.1601
G	0.0865
I	0.0684
K^s	2.7374
L^s	0.2279
Q	1
R	1.0101
T	0.0865
U	-167.8256
W	0.9837
Y	0.4804
Y^j	0.4804
Y^s	0.4804
Z	1

17 The solution of the 1st order perturbation

Matrix P

$$\begin{matrix}
 \epsilon_t^G \\
 \nu_t^P \\
 \pi_t \\
 \pi_t^{obj} \\
 B_t \\
 K_t^s \\
 R_t \\
 Z_t
 \end{matrix}
 \begin{pmatrix}
 \epsilon_{t-1}^G & \nu_{t-1}^P & \pi_{t-1} & \pi_{t-1}^{obj} & B_{t-1} & K_{t-1}^s & R_{t-1} & Z_{t-1} \\
 0.949 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0.908 & 0 & 0 & 0 & 0 & 0 & 0 \\
 -0.0001 & 0.0552 & 0.3356 & 0.3458 & 0 & -0.0401 & -1.1166 & -0.0649 \\
 0 & 0.0002 & 0.0013 & 0.9253 & 0 & -0.0002 & -0.0042 & -0.0002 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0.0049 & 0.5559 & -1.2406 & 3.5323 & 0 & 0.4372 & -15.1169 & -0.4073 \\
 0.0006 & 0.0148 & 0.0315 & 0.0724 & 0 & -0.0135 & 0.5462 & -0.0111 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.823
 \end{pmatrix}$$

Matrix Q

$$\begin{matrix} \epsilon^G \\ \nu^P \\ \pi \\ \pi^{\text{obj}} \\ B \\ K^s \\ R \\ Z \end{matrix} \begin{pmatrix} \epsilon^Z & \eta^P & \eta^R & \eta^\pi & \eta^G \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ -0.0788 & 0.0121 & -1.1619 & 0.3743 & -0.0002 \\ -0.0003 & 0 & -0.0044 & 1.0014 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ -0.4949 & -0.0061 & -15.7304 & 3.8228 & 0.0052 \\ -0.0135 & -0.0002 & 0.5683 & 0.0784 & 0.0007 \\ 1 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Matrix R

$$\begin{matrix} g_t^1 \\ g_t^2 \\ inflation_t^{\text{gap}} \\ \lambda_t \\ mc_t \\ perceived_t^{\pi^{\text{obj}}} \\ \pi_t^* \\ pH_t \\ pL_t \\ q_t \\ r_t \\ C_t \\ Div_t \\ G_t \\ I_t \\ L_t^s \\ Q_t \\ T_t \\ U_t \\ W_t \\ Y_t \\ Y_t^j \\ Y_t^s \end{matrix} \begin{pmatrix} \epsilon_{t-1}^G & \nu_{t-1}^P & \pi_{t-1} & \pi_{t-1}^{\text{obj}} & B_{t-1} & K_{t-1}^s & R_{t-1} & Z_{t-1} \\ 0.1469 & 0.922 & -1.9629 & 5.5044 & 0 & -0.8847 & -15.7041 & -0.8699 \\ 0.1469 & 0.922 & -1.9629 & 5.5044 & 0 & -0.8847 & -15.7041 & -0.8699 \\ -0.0001 & 0.0525 & 0.3188 & 0.3285 & 0 & -0.0381 & -1.0608 & -0.0616 \\ 0.1181 & 0.1339 & 0.799 & -2.2065 & 0 & -0.2738 & 9.2154 & -0.0359 \\ 0.0842 & 4.9967 & -10.1446 & 28.7863 & 0 & -4.1911 & -122.869 & -4.7739 \\ 0 & 0.0028 & 0.0168 & 0.0173 & 0 & -0.002 & -0.0558 & -0.0032 \\ -0.0014 & 0.5452 & -1.3164 & 3.4131 & 0 & -0.3954 & -11.0204 & -0.6402 \\ 0 & -0.0026 & -0.0159 & -0.0164 & 0 & 0.0019 & 0.053 & 0.0031 \\ -0.0001 & 0.0499 & 0.3029 & 0.3121 & 0 & -0.0362 & -1.0077 & -0.0585 \\ 0.1181 & 0.1339 & 0.799 & -2.2065 & 0 & -0.2738 & 9.2154 & -0.0359 \\ 0.2466 & 9.7305 & -18.9907 & 53.9313 & 0 & -8.6985 & -230.34 & -7.644 \\ -0.054 & 0.9718 & -2.6232 & 7.4067 & 0 & -0.6539 & -31.4912 & -0.8109 \\ -0.0059 & -7.9837 & 11.4432 & -32.4278 & 0 & 4.8749 & 138.2671 & 6.6778 \\ 0.949 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0.1978 & 22.235 & -49.6236 & 141.292 & 0 & -21.5119 & -604.6777 & -16.2911 \\ 0.232 & 6.7625 & -12.6372 & 35.9213 & 0 & -5.4391 & -153.5299 & -5.2758 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0.949 & 0 & 0 & 0 & 11.5637 & 0 & 0 & 0 \\ -0.0107 & -0.0272 & -0.0232 & 0.0597 & 0 & 0.0226 & -0.1956 & 0.0161 \\ 0.0145 & 2.968 & -6.3535 & 18.0099 & 0 & -2.2594 & -76.8101 & -2.3682 \\ 0.1624 & 3.8258 & -8.846 & 25.1449 & 0 & -3.5073 & -107.4709 & -2.87 \\ 0.1624 & 4.7338 & -8.846 & 25.1449 & 0 & -3.5073 & -107.4709 & -2.87 \\ 0.1624 & 4.7338 & -8.846 & 25.1449 & 0 & -3.5073 & -107.4709 & -2.87 \end{pmatrix}$$

Matrix S

	ϵ^Z	η^P	η^R	η^π	η^G
g^1	-1.057	0.1099	-16.3414	5.9571	0.1548
g^2	-1.057	-0.0261	-16.3414	5.9571	0.1548
$inflation^{gap}$	-0.0749	0.0115	-1.1038	0.3556	-0.0001
λ	-0.0437	0.005	9.5894	-2.3879	0.1244
mc	-5.8006	-0.0514	-127.8554	31.154	0.0887
$perceived^{\pi^{obj}}$	-0.0039	0.0006	-0.0581	0.0187	0
π^*	-0.7779	0.1195	-11.4676	3.6938	-0.0015
pH	0.0037	-0.0006	0.0552	-0.0178	0
pL	-0.0711	0.0109	-1.0486	0.3378	-0.0001
q	-0.0437	0.005	9.5894	-2.3879	0.1244
r	-9.2879	-0.0955	-239.6878	58.3672	0.2598
C	-0.9853	-0.0138	-32.7692	8.0159	-0.0569
Div	8.114	0.0586	143.8784	-35.095	-0.0062
G	0	0	0	0	1
I	-19.7947	-0.2439	-629.2171	152.9134	0.2084
L^s	-6.4104	-0.063	-159.7605	38.8759	0.2445
Q	0	0	0	0	0
T	0	0	0	0	1
U	0.0196	-0.0003	-0.2036	0.0646	-0.0113
W	-2.8775	-0.0324	-79.9272	19.4913	0.0153
Y	-3.4873	-0.0441	-111.8324	27.2131	0.1712
Y^j	-3.4873	-0.0441	-111.8324	27.2131	0.1712
Y^s	-3.4873	-0.0441	-111.8324	27.2131	0.1712

18 Model statistics

18.1 Basic statistics

	Steady-state value	Std. dev.	Variance	Loglin
ϵ^G	1	1.3033	1.6986	Y
g^1	7.3514	20.4601	418.6148	Y
g^2	4.9009	20.4598	418.6044	Y
$inflation^{gap}$	1	1.1697	1.3683	Y
λ	1.5467	12.2999	151.2878	Y
mc	0.6667	128.0883	16406.6081	Y
ν^P	1	0	0	Y
$perceived^{\pi^{obj}}$	1	0.0616	0.0038	Y
π	1	1.2313	1.5161	Y
π^*	1	11.907	141.7766	Y
π^{obj}	1	1.2983	1.6857	Y
pH	0.95	0.0585	0.0034	Y
pL	0.05	1.1112	1.2349	Y
q	1.5467	12.2999	151.2878	Y
r	0.0351	246.4902	60757.4311	Y
B	0	0	0	N
C	0.3255	30.8891	954.1352	Y
Div	0.1601	145.3618	21130.0666	Y
G	0.0865	1.3033	1.6986	Y
I	0.0684	636.4875	405116.3562	Y
K^s	2.7374	20.0335	401.3391	Y
L^s	0.2279	161.4762	26074.5763	Y
Q	1	0	0	Y
R	1.0101	0.6888	0.4745	Y
T	0.0865	1.3033	1.6986	Y
U	-167.8256	0.5483	0.3006	Y
W	0.9837	77.8144	6055.0817	Y
Y	0.4804	110.9125	12301.5895	Y
Y^j	0.4804	110.9125	12301.5895	Y
Y^s	0.4804	110.9125	12301.5895	Y
Z	1	1.227	1.5056	Y

18.2 Correlation matrix

	ϵ^G	g^1	g^2	$inflation^{gap}$	λ	mc	$perceived^{\pi^{obj}}$	π	π^*	π^{obj}	pH	pL	q
ϵ^G	1	0.009	0.009	-0.001	0.013	0	-0.001	-0.001	-0.001	0	0.001	-0.001	0.0
g^1		1	1	0.771	-0.135	0.941	0.771	0.771	0.958	0.149	-0.771	0.771	-0.3
g^2			1	0.771	-0.135	0.941	0.771	0.771	0.958	0.149	-0.771	0.771	-0.3
$inflation^{gap}$				1	-0.626	0.899	1	1	0.888	0.287	-1	1	-0.6
λ					1	-0.445	-0.626	-0.626	-0.411	-0.25	0.626	-0.626	1
mc						1	0.899	0.899	0.994	0.111	-0.899	0.899	-0.4
$perceived^{\pi^{obj}}$							1	1	0.888	0.287	-1	1	-0.6
π								1	0.888	0.287	-1	1	-0.6
π^*									1	0.191	-0.888	0.888	-0.4
π^{obj}										1	-0.287	0.287	-0.3
pH											1	-1	0.6
pL												1	-0.6
q													1
r													
C													
Div													
G													
I													
K^s													
L^s													
R													
T													
U													
W													
Y													
Y^j													
Y^s													
Z													

18.3 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	1.058	0	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	0	0	0	0
g_t^1	16.617	0.015	0.037	0.075	0.152	0.329	0.771	-0.358	-0.245	-0.185	-0.146	-0.112
g_t^2	16.616	0.015	0.037	0.075	0.152	0.329	0.771	-0.358	-0.245	-0.185	-0.146	-0.112
$inflation_t^{\text{gap}}$	0.95	-0.116	-0.112	-0.083	0.012	0.277	1	0.277	0.012	-0.083	-0.112	-0.112
λ_t	9.989	0.276	0.319	0.342	0.3	0.08	-0.626	-0.476	-0.367	-0.279	-0.204	-0.146
mc_t	104.027	-0.075	-0.072	-0.047	0.034	0.265	0.899	-0.161	-0.113	-0.091	-0.078	-0.061
$perceived\pi_t^{\text{obj}}$	0.05	-0.116	-0.112	-0.083	0.012	0.277	1	0.277	0.012	-0.083	-0.112	-0.112
π_t	1	-0.116	-0.112	-0.083	0.012	0.277	1	0.277	0.012	-0.083	-0.112	-0.112
π_t^*	9.67	-0.066	-0.059	-0.031	0.051	0.277	0.888	-0.196	-0.121	-0.09	-0.075	-0.061
π_t^{obj}	1.054	-0.053	-0.037	-0.011	0.033	0.115	0.287	0.214	0.151	0.098	0.054	0.012
pH_t	0.048	0.116	0.112	0.083	-0.012	-0.277	-1	-0.277	-0.012	0.083	0.112	0.112
pL_t	0.902	-0.116	-0.112	-0.083	0.012	0.277	1	0.277	0.012	-0.083	-0.112	-0.112
q_t	9.989	0.276	0.319	0.342	0.3	0.08	-0.626	-0.476	-0.367	-0.279	-0.204	-0.146
r_t	200.187	-0.058	-0.051	-0.024	0.056	0.278	0.88	-0.2	-0.143	-0.114	-0.094	-0.078
C_t	25.087	-0.142	-0.151	-0.137	-0.057	0.2	0.933	0	0.009	0.003	-0.007	-0.012
Dv_t	118.055	0.07	0.065	0.039	-0.042	-0.27	-0.894	0.173	0.122	0.098	0.083	0.078
G_t	1.058	0	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	0	0	0	0
I_t	516.923	-0.068	-0.063	-0.038	0.043	0.27	0.891	-0.177	-0.126	-0.1	-0.085	-0.078
K_t^s	16.27	-0.275	-0.319	-0.341	-0.298	-0.076	0.634	0.477	0.365	0.276	0.202	0.146
L_t^s	131.143	-0.069	-0.064	-0.038	0.042	0.27	0.892	-0.175	-0.124	-0.099	-0.084	-0.078
R_t	0.559	0.255	0.305	0.336	0.307	0.109	-0.558	-0.394	-0.296	-0.226	-0.17	-0.126
T_t	1.058	0	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001	0	0	0	0
U_t	0.445	-0.27	-0.32	-0.357	-0.35	-0.219	0.254	0.606	0.467	0.359	0.27	0.19
W_t	63.197	-0.099	-0.099	-0.078	0.003	0.245	0.917	-0.107	-0.072	-0.06	-0.054	-0.049
Y_t	90.078	-0.083	-0.08	-0.057	0.024	0.258	0.905	-0.145	-0.101	-0.082	-0.07	-0.061
Y_t^j	90.078	-0.083	-0.08	-0.057	0.024	0.258	0.905	-0.145	-0.101	-0.082	-0.07	-0.061
Y_t^s	90.078	-0.083	-0.08	-0.057	0.024	0.258	0.905	-0.145	-0.101	-0.082	-0.07	-0.061
Z_t	0.997	0.009	0.003	-0.006	-0.02	-0.04	-0.072	-0.047	-0.027	-0.013	-0.002	0.003

18.4 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	-0.072	-0.04	-0.035	-0.037	-0.04
g^2	-0.072	-0.04	-0.035	-0.037	-0.04
$inflation^{\text{gap}}$	0.277	0.012	-0.083	-0.112	-0.116
λ	0.682	0.438	0.246	0.095	-0.022
mc	-0.121	-0.08	-0.062	-0.052	-0.045
$perceived\pi^{\text{obj}}$	0.277	0.012	-0.083	-0.112	-0.116
π	0.277	0.012	-0.083	-0.112	-0.116
π^*	-0.142	-0.08	-0.056	-0.045	-0.039
π^{obj}	0.704	0.456	0.254	0.093	-0.032
pH	0.277	0.012	-0.083	-0.112	-0.116
pL	0.277	0.012	-0.083	-0.112	-0.116
q	0.682	0.438	0.246	0.095	-0.022
r	-0.123	-0.082	-0.063	-0.053	-0.045
C	-0.034	-0.024	-0.028	-0.036	-0.042
Div	-0.122	-0.081	-0.062	-0.052	-0.045
G	0.713	0.471	0.271	0.109	-0.017
I	-0.122	-0.081	-0.063	-0.053	-0.045
K^s	0.677	0.433	0.243	0.093	-0.023
L^s	-0.122	-0.081	-0.063	-0.052	-0.045
R	0.651	0.406	0.221	0.078	-0.03
T	0.713	0.471	0.271	0.109	-0.017
U	0.832	0.539	0.308	0.125	-0.016
W	-0.105	-0.069	-0.056	-0.049	-0.045
Y	-0.117	-0.078	-0.061	-0.052	-0.045
Y^j	-0.117	-0.078	-0.061	-0.052	-0.045
Y^s	-0.117	-0.078	-0.061	-0.052	-0.045
Z	0.644	0.368	0.159	0.006	-0.102

19 Impulse response functions

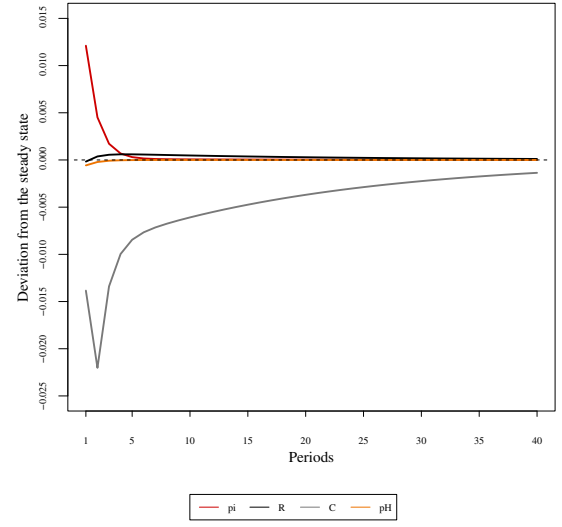
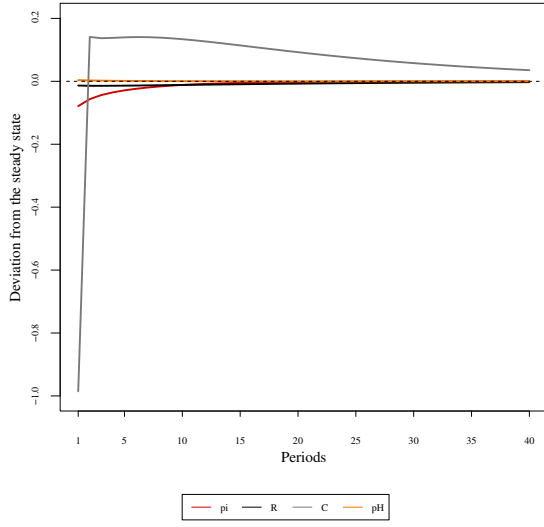


Figure 1: Impulse responses (π, R, C, pH) to ϵ^Z shock Figure 2: Impulse responses (π, R, C, pH) to η^P shock

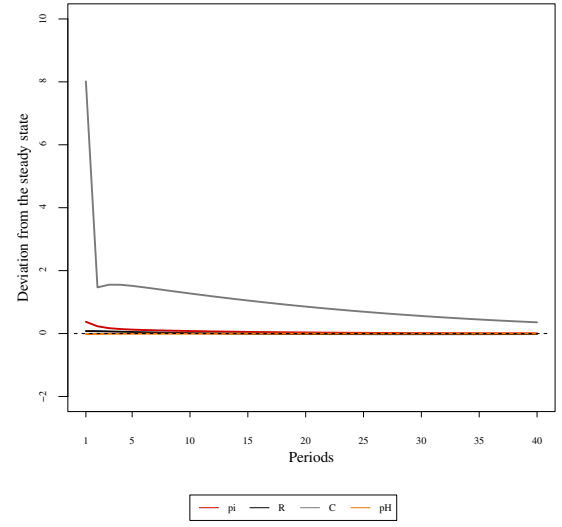
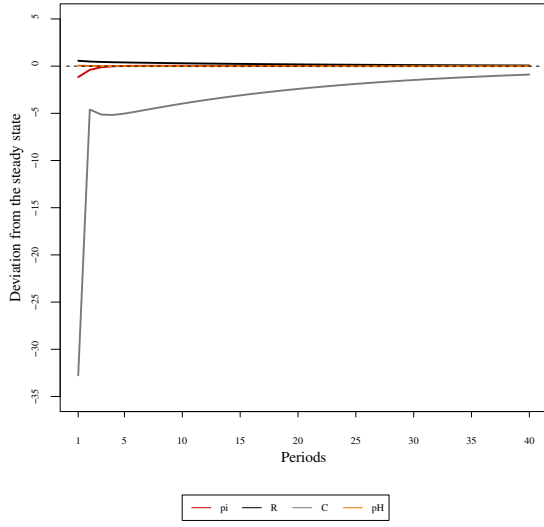


Figure 3: Impulse responses (π, R, C, pH) to η^R shock Figure 4: Impulse responses (π, R, C, pH) to η^π shock

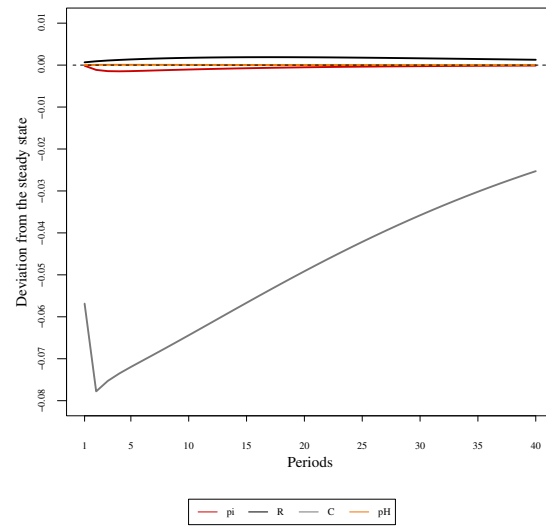


Figure 5: Impulse responses (π, R, C, pH) to η^G shock