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1 CONSUMER

1.1 Optimisation problem

$$\max_{C_t,K_t,I_t,B_t,z_t} U_t = \beta \mathrm{E}_t\left[U_{t+1}\right] + \epsilon_t^{\mathrm{b}}\left(\left(1-\sigma^{\mathrm{c}}\right)^{-1}\left(C_t - H_t\right)^{1-\sigma^{\mathrm{c}}} - \omega\epsilon_t^{\mathrm{L}}\left(1+\sigma^{\mathrm{l}}\right)^{-1} L_t^{\mathrm{s}\,1+\sigma^{\mathrm{l}}}\right) \tag{1.1}$$

s.t. :

$$C_t + I_t + B_t R_t^{-1} = Dw_t - T_t + B_{t-1}\pi_t^{-1} + L_t W_t + K_{t-1} r_t^{\mathrm{k}} z_t - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k}} K_{t-1}\left(-1 + e^{\psi(-1+z_t)}\right) \quad (\lambda_t) \tag{1.2}$$

$$K_t = K_{t-1}\left(1-\tau\right) + I_t\left(1 - 0.5\varphi\left(-1 + I_{t-1}^{-1}\epsilon_t^{\mathrm{I}} I_t\right)^2\right) \quad (q_t) \tag{1.3}$$

1.2 Identities

$$H_t = hC_{t-1} \tag{1.4}$$

$$Q_t = \lambda_t^{-1} q_t \tag{1.5}$$

1.3 First order conditions

$$-\lambda_t + \epsilon_t^{\mathrm{b}}(C_t - H_t)^{-\sigma^{\mathrm{c}}} = 0 \quad (C_t) \tag{1.6}$$

$$-q_t + \beta\left(\left(1-\tau\right)\mathrm{E}_t\left[q_{t+1}\right] + \mathrm{E}_t\left[\lambda_{t+1}\left(r_{t+1}^{\mathrm{k}} z_{t+1} - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k}}\left(-1 + e^{\psi(-1+z_{t+1})}\right)\right)\right]\right) = 0 \quad (K_t) \tag{1.7}$$

$$-\lambda_t + q_t\left(1 - 0.5\varphi\left(-1 + I_{t-1}^{-1}\epsilon_t^{\mathrm{I}} I_t\right)^2 - \varphi I_{t-1}^{-1}\epsilon_t^{\mathrm{I}} I_t\left(-1 + I_{t-1}^{-1}\epsilon_t^{\mathrm{I}} I_t\right)\right) + \beta\varphi I_t^{-2}\mathrm{E}_t\left[\epsilon_{t+1}^{\mathrm{I}} q_{t+1} I_{t+1}^2\left(-1 + I_t^{-1}\epsilon_{t+1}^{\mathrm{I}} I_{t+1}\right)\right] = 0 \quad (I_t) \tag{1.8}$$

$$\beta\mathrm{E}_t\left[\lambda_{t+1}\pi_{t+1}^{-1}\right] - \lambda_t R_t^{-1} = 0 \quad (B_t) \tag{1.9}$$

$$\lambda_t\left(K_{t-1} r_t^{\mathrm{k}} - r_{\mathrm{ss}}^{\mathrm{k}} K_{t-1} e^{\psi(-1+z_t)}\right) = 0 \quad (z_t) \tag{1.10}$$

2 PREFERENCE SHOCKS

2.1 Identities

$$\log\epsilon_t^{\mathrm{b}} = \eta_t^{\mathrm{b}} + \rho^{\mathrm{b}}\log\epsilon_{t-1}^{\mathrm{b}} \tag{2.1}$$

$$\log\epsilon_t^{\mathrm{L}} = -\eta_t^{\mathrm{L}} + \rho^{\mathrm{L}}\log\epsilon_{t-1}^{\mathrm{L}} \tag{2.2}$$

3 INVESTMENT COST SHOCKS

3.1 Identities

$$\log \epsilon_t^{\mathrm{I}} = \eta_t^{\mathrm{I}} + \rho^{\mathrm{I}} \log \epsilon_{t-1}^{\mathrm{I}} \tag{3.1}$$

4 WAGE SETTING PROBLEM

4.1 Identities

$$f_t^1 = \beta \xi^{\mathrm{w}} \mathrm{E}_t \left[f_{t+1}^1 \left(w_t^{\star -1} w_{t+1}^{\star} \right)^{\lambda^{\mathrm{w}-1}} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}} \right] + \lambda_t w_t^{\star} L_t \left(1+\lambda^{\mathrm{w}}\right)^{-1} {\pi_t^{\star}}^{\mathrm{w}-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} \tag{4.1}$$

$$f_t^2 = \beta \xi^{\mathrm{w}} \mathrm{E}_t \left[f_{t+1}^2 \left(w_t^{\star -1} w_{t+1}^{\star} \right)^{\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})(1+\sigma^{\mathrm{l}})} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})(1+\sigma^{\mathrm{l}})} \right] + \omega \epsilon_t^{\mathrm{b}} \epsilon_t^{\mathrm{L}} \left(L_t {\pi_t^{\star}}^{\mathrm{w}-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} \right)^{1+\sigma^{\mathrm{l}}} \tag{4.2}$$

$$f_t^1 = \eta_t^{\mathrm{w}} + f_t^2 \tag{4.3}$$

$$\pi_t^{\star^{\mathrm{w}}} = w_t^{\star} {W_t}^{-1} \tag{4.4}$$

5 WAGE EVOLUTION

5.1 Identities

$$1 = \left(1-\xi^{\mathrm{w}}\right) {\pi_t^{\star}}^{\mathrm{w}-\lambda^{\mathrm{w}-1}} + \xi^{\mathrm{w}} \left(W_{t-1} {W_t}^{-1} \right)^{-\lambda^{\mathrm{w}-1}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}} \tag{5.1}$$

6 LABOUR AGGREGATION

6.1 Identities

$$\nu_t^{\mathrm{w}} = \left(1-\xi^{\mathrm{w}}\right) {\pi_t^{\star}}^{\mathrm{w}-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} + \xi^{\mathrm{w}} \nu_{t-1}^{\mathrm{w}} \left(W_{t-1} {\pi_t}^{-1} {W_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} \tag{6.1}$$

$$L_t = {\nu_t^{\mathrm{w}}}^{-1} L_t^{\mathrm{s}} \tag{6.2}$$

7 CONSUMER FLEXIBLE

7.1 Optimisation problem

$$\max_{C_t^{\mathrm{f}},K_t^{\mathrm{f}},I_t^{\mathrm{f}},B_t^{\mathrm{f}},z_t^{\mathrm{f}},L_t^{\mathrm{s^f}}} U_t^{\mathrm{f}} = \beta \mathrm{E}_t\left[U_{t+1}^{\mathrm{f}}\right] + \epsilon_t^{\mathrm{b}}\left((1-\sigma^{\mathrm{c}})^{-1}\left(C_t^{\mathrm{f}} - H_t^{\mathrm{f}}\right)^{1-\sigma^{\mathrm{c}}} - \omega\epsilon_t^{\mathrm{L}}\left(1+\sigma^{\mathrm{l}}\right)^{-1} {L_t^{\mathrm{s^f}}}^{1+\sigma^{\mathrm{l}}}\right) \tag{7.1}$$

s.t. :

$$C_t^{\mathrm{f}} + I_t^{\mathrm{f}} + B_t^{\mathrm{f}} {R_t^{\mathrm{f}}}^{-1} = B_{t-1}^{\mathrm{f}} + D\dot{w}_t^{\mathrm{f}} + \Pi_t^{\mathrm{ws^f}} - T_t^{\mathrm{f}} + L_t^{\mathrm{s^f}} W_t^{\mathrm{disutil^f}} + K_{t-1}^{\mathrm{f}} r_t^{\mathrm{k^f}} z_t^{\mathrm{f}} - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k^f}} K_{t-1}^{\mathrm{f}}\left(-1 + e^{\psi\left(-1+z_t^{\mathrm{f}}\right)}\right) \quad \left(\lambda_t^{\mathrm{f}}\right) \tag{7.2}$$

$$K_t^{\mathrm{f}} = K_{t-1}^{\mathrm{f}}(1-\tau) + I_t^{\mathrm{f}}\left(1 - 0.5\varphi\left(-1 + {I_{t-1}^{\mathrm{f}}}^{-1}\epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}}\right)^2\right) \quad \left(q_t^{\mathrm{f}}\right) \tag{7.3}$$

7.2 Identities

$$H_t^{\mathrm{f}} = hC_{t-1}^{\mathrm{f}} \tag{7.4}$$

$$Q_t^{\mathrm{f}} = {\lambda_t^{\mathrm{f}}}^{-1} q_t^{\mathrm{f}} \tag{7.5}$$

7.3 First order conditions

$$-\lambda_t^{\mathrm{f}} + \epsilon_t^{\mathrm{b}}\left(C_t^{\mathrm{f}} - H_t^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} = 0 \quad \left(C_t^{\mathrm{f}}\right) \tag{7.6}$$

$$-q_t^{\mathrm{f}} + \beta\left((1-\tau)\,\mathrm{E}_t\left[q_{t+1}^{\mathrm{f}}\right] + \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{f}}\left(r_{t+1}^{\mathrm{k^f}} z_{t+1}^{\mathrm{f}} - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k^f}}\left(-1 + e^{\psi\left(-1+z_{t+1}^{\mathrm{f}}\right)}\right)\right)\right]\right) = 0 \quad \left(K_t^{\mathrm{f}}\right) \tag{7.7}$$

$$-\lambda_t^{\mathrm{f}} + q_t^{\mathrm{f}}\left(1 - 0.5\varphi\left(-1 + {I_{t-1}^{\mathrm{f}}}^{-1}\epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}}\right)^2 - \varphi {I_{t-1}^{\mathrm{f}}}^{-1}\epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}}\left(-1 + {I_{t-1}^{\mathrm{f}}}^{-1}\epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}}\right)\right) + \beta\varphi {I_t^{\mathrm{f}}}^{-2}\mathrm{E}_t\left[\epsilon_{t+1}^{\mathrm{I}} q_{t+1}^{\mathrm{f}} {I_{t+1}^{\mathrm{f}}}^2\left(-1 + {I_t^{\mathrm{f}}}^{-1}\epsilon_{t+1}^{\mathrm{I}} I_{t+1}^{\mathrm{f}}\right)\right] = 0 \quad \left(I_t^{\mathrm{f}}\right) \tag{7.8}$$

$$\beta\mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{f}}\right] - \lambda_t^{\mathrm{f}} {R_t^{\mathrm{f}}}^{-1} = 0 \quad \left(B_t^{\mathrm{f}}\right) \tag{7.9}$$

$$\lambda_t^{\mathrm{f}}\left(K_{t-1}^{\mathrm{f}} r_t^{\mathrm{k^f}} - r_{\mathrm{ss}}^{\mathrm{k^f}} K_{t-1}^{\mathrm{f}} e^{\psi\left(-1+z_t^{\mathrm{f}}\right)}\right) = 0 \quad \left(z_t^{\mathrm{f}}\right) \tag{7.10}$$

$$\lambda_t^{\mathrm{f}} W_t^{\mathrm{disutil^f}} - \omega\epsilon_t^{\mathrm{b}}\epsilon_t^{\mathrm{L}} {L_t^{\mathrm{s^f}}}^{\sigma^{\mathrm{l}}} = 0 \quad \left(L_t^{\mathrm{s^f}}\right) \tag{7.11}$$

8 FLEXIBLE MONOPOLISTIC WORKER

8.1 Optimisation problem

$$\max_{W_t^{\mathrm{i^f}}, L_t^{\mathrm{i^{\star f}}}} \Pi_t^{\mathrm{ws^f}} = L_t^{\mathrm{i^{\star f}}} \left(-W_t^{\mathrm{disutil^f}} + W_t^{\mathrm{i^f}} \right) \tag{8.1}$$

s.t. :

$$L_t^{\mathrm{i^{\star f}}} = L_t^{\mathrm{f}} \left(W_t^{\mathrm{i^f}} W_t^{\mathrm{f}\,-1} \right)^{\lambda^{\mathrm{w}\,-1}(-1-\lambda^{\mathrm{w}})} \quad \left(\lambda_t^{\mathrm{FLEXIBLE^{MONOPOLISTIC^{WORKER^1}}}} \right) \tag{8.2}$$

8.2 Identities

$$L_t^{\mathrm{i^{\star f}}} = L_t^{\mathrm{i^f}} \tag{8.3}$$

8.3 First order conditions

$$L_t^{\mathrm{i^{\star f}}} + \lambda^{\mathrm{w}\,-1} \lambda_t^{\mathrm{FLEXIBLE^{MONOPOLISTIC^{WORKER^1}}}} L_t^{\mathrm{f}} W_t^{\mathrm{f}\,-1} (-1-\lambda^{\mathrm{w}}) \left(W_t^{\mathrm{i^f}} W_t^{\mathrm{f}\,-1} \right)^{-1+\lambda^{\mathrm{w}\,-1}(-1-\lambda^{\mathrm{w}})} = 0 \quad \left(W_t^{\mathrm{i^f}} \right) \tag{8.4}$$

$$-\lambda_t^{\mathrm{FLEXIBLE^{MONOPOLISTIC^{WORKER^1}}}} - W_t^{\mathrm{disutil^f}} + W_t^{\mathrm{i^f}} = 0 \quad \left(L_t^{\mathrm{i^{\star f}}} \right) \tag{8.5}$$

8.4 First order conditions after reduction

$$L_t^{\mathrm{i^{\star f}}} + \lambda^{\mathrm{w}\,-1} L_t^{\mathrm{f}} W_t^{\mathrm{f}\,-1} (-1-\lambda^{\mathrm{w}}) \left(-W_t^{\mathrm{disutil^f}} + W_t^{\mathrm{i^f}} \right) \left(W_t^{\mathrm{i^f}} W_t^{\mathrm{f}\,-1} \right)^{-1+\lambda^{\mathrm{w}\,-1}(-1-\lambda^{\mathrm{w}})} = 0 \quad \left(W_t^{\mathrm{i^f}} \right) \tag{8.6}$$

9 LABOUR AGGREGATION FLEXIBLE

9.1 Identities

$$L_t^{\mathrm{s^f}} = L_t^{\mathrm{i^f}} \tag{9.1}$$

$$L_t^{\mathrm{f}} = L_t^{\mathrm{s^f}} \tag{9.2}$$

10 FIRM

10.1 Optimisation problem

$$\max_{K_t^{\mathrm{j^d}},L_t^{\mathrm{j^d}}} tc_t^{\mathrm{j}} = -r_t^{\mathrm{k}} K_t^{\mathrm{j^d}} - L_t^{\mathrm{j^d}} W_t \tag{10.1}$$

s.t. :

$$Y_t^{\mathrm{j}} = -\Phi + \epsilon_t^{\mathrm{a}} {K_t^{\mathrm{j^d}}}^{\alpha} {L_t^{\mathrm{j^d}}}^{1-\alpha} \qquad (mc_t) \tag{10.2}$$

10.2 First order conditions

$$-r_t^{\mathrm{k}} + \alpha \epsilon_t^{\mathrm{a}} mc_t {K_t^{\mathrm{j^d}}}^{-1+\alpha} {L_t^{\mathrm{j^d}}}^{1-\alpha} = 0 \quad \left(K_t^{\mathrm{j^d}}\right) \tag{10.3}$$

$$-W_t + \epsilon_t^{\mathrm{a}} mc_t \left(1-\alpha\right) {K_t^{\mathrm{j^d}}}^{\alpha} {L_t^{\mathrm{j^d}}}^{-\alpha} = 0 \quad \left(L_t^{\mathrm{j^d}}\right) \tag{10.4}$$

11 TECHNOLOGY

11.1 Identities

$$\log \epsilon_t^{\mathrm{a}} = \eta_t^{\mathrm{a}} + \rho^{\mathrm{a}} \log \epsilon_{t-1}^{\mathrm{a}} \tag{11.1}$$

12 PRICE SETTING PROBLEM

12.1 Identities

$$g_t^1 = \eta_t^{\mathrm{p}} + g_t^2 \left(1+\lambda^{\mathrm{p}}\right) \tag{12.1}$$

$$g_t^1 = \lambda_t \pi_t^{\star} Y_t + \beta \xi^{\mathrm{p}} \pi_t^{\star} \mathrm{E}_t \left[g_{t+1}^1 \pi_{t+1}^{\star\,-1} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1} \right] \tag{12.2}$$

$$g_t^2 = \beta \xi^{\mathrm{p}} \mathrm{E}_t \left[g_{t+1}^2 \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1-\lambda^{\mathrm{p}}} \right] + \lambda_t mc_t Y_t \tag{12.3}$$

13 PRICE EVOLUTION

13.1 Identities

$$1 = \xi^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}}-1} + \left(1-\xi^{\mathrm{p}}\right) \pi_t^{\star\,-\lambda^{\mathrm{p}}-1} \tag{13.1}$$

14 FACTOR DEMAND AGGREGATION

14.1 Identities

$$K_t^{\mathrm{d}} = K_t^{\mathrm{j^d}} \tag{14.1}$$

$$L_t^{\mathrm{d}} = L_t^{\mathrm{j^d}} \tag{14.2}$$

15 PRODUCT AGGREGATION

15.1 Identities

$$Y_t^{\mathrm{s}} = Y_t^{\mathrm{j}} \tag{15.1}$$

$$\nu_t^{\mathrm{p}} = (1-\xi^{\mathrm{p}})\,\pi_t^{\star\,-\lambda^{\mathrm{p}}-1(1+\lambda^{\mathrm{p}})} + \xi^{\mathrm{p}}\nu_{t-1}^{\mathrm{p}}\left(\pi_t{}^{-1}\pi_{t-1}{}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}}-1(1+\lambda^{\mathrm{p}})} \tag{15.2}$$

$$\nu_t^{\mathrm{p}} Y_t = Y_t^{\mathrm{s}} \tag{15.3}$$

16 FIRM FLEXIBLE

16.1 Optimisation problem

$$\max_{K_t^{\mathrm{j^{df}}},L_t^{\mathrm{j^{df}}}} tc_t^{\mathrm{j^f}} = -r_t^{\mathrm{k^f}} K_t^{\mathrm{j^{df}}} - L_t^{\mathrm{j^{df}}} W_t^{\mathrm{f}} \tag{16.1}$$

s.t. :

$$Y_t^{\mathrm{j^f}} = -\Phi + \epsilon_t^{\mathrm{a}} K_t^{\mathrm{j^{df}}\,\alpha} L_t^{\mathrm{j^{df}}\,1-\alpha} \qquad \left(mc_t^{\mathrm{f}}\right) \tag{16.2}$$

16.2 First order conditions

$$-r_t^{\mathrm{k^f}} + \alpha\epsilon_t^{\mathrm{a}} mc_t^{\mathrm{f}} K_t^{\mathrm{j^{df}}\,-1+\alpha} L_t^{\mathrm{j^{df}}\,1-\alpha} = 0 \quad \left(K_t^{\mathrm{j^{df}}}\right) \tag{16.3}$$

$$-W_t^{\mathrm{f}} + \epsilon_t^{\mathrm{a}} mc_t^{\mathrm{f}} (1-\alpha)\, K_t^{\mathrm{j^{df}}\,\alpha} L_t^{\mathrm{j^{df}}\,-\alpha} = 0 \quad \left(L_t^{\mathrm{j^{df}}}\right) \tag{16.4}$$

17 PRICE SETTING PROBLEM FLEXIBLE

17.1 Optimisation problem

$$\max_{Y_t^{\mathrm{j^f}}, P_t^{\mathrm{j^f}}} \Pi_t^{\mathrm{ps^f}} = Y_t^{\mathrm{j^f}} \left(-mc_t^{\mathrm{f}} + P_t^{\mathrm{j^f}} \right) \tag{17.1}$$

s.t. :

$$Y_t^{\mathrm{j^f}} = Y_t^{\mathrm{f}} \left(P_t^{\mathrm{f}\,-1} P_t^{\mathrm{j^f}} \right)^{-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} \quad \left(\lambda_t^{\mathrm{PRICE^{SETTING^{PROBLEM^{FLEXIBLE^1}}}}} \right) \tag{17.2}$$

17.2 First order conditions

$$-\lambda_t^{\mathrm{PRICE^{SETTING^{PROBLEM^{FLEXIBLE^1}}}}} - mc_t^{\mathrm{f}} + P_t^{\mathrm{j^f}} = 0 \quad \left(Y_t^{\mathrm{j^f}} \right) \tag{17.3}$$

$$Y_t^{\mathrm{j^f}} - \lambda^{\mathrm{p}\,-1} \lambda_t^{\mathrm{PRICE^{SETTING^{PROBLEM^{FLEXIBLE^1}}}}} P_t^{\mathrm{f}\,-1} Y_t^{\mathrm{f}} \left(1+\lambda^{\mathrm{p}}\right) \left(P_t^{\mathrm{f}\,-1} P_t^{\mathrm{j^f}} \right)^{-1-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} = 0 \quad \left(P_t^{\mathrm{j^f}} \right) \tag{17.4}$$

17.3 First order conditions after reduction

$$Y_t^{\mathrm{j^f}} - \lambda^{\mathrm{p}\,-1} P_t^{\mathrm{f}\,-1} Y_t^{\mathrm{f}} \left(1+\lambda^{\mathrm{p}}\right) \left(-mc_t^{\mathrm{f}} + P_t^{\mathrm{j^f}} \right) \left(P_t^{\mathrm{f}\,-1} P_t^{\mathrm{j^f}} \right)^{-1-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} = 0 \quad \left(P_t^{\mathrm{j^f}} \right) \tag{17.5}$$

18 FACTOR DEMAND AGGREGATION FLEXIBLE

18.1 Identities

$$K_t^{\mathrm{d^f}} = K_t^{\mathrm{j^{d^f}}} \tag{18.1}$$

$$L_t^{\mathrm{d^f}} = L_t^{\mathrm{j^{d^f}}} \tag{18.2}$$

19 PRODUCT AGGREGATION FLEXIBLE

19.1 Identities

$$Y_t^{\mathrm{s^f}} = Y_t^{\mathrm{j^f}} \tag{19.1}$$

$$Y_t^{\mathrm{f}} = Y_t^{\mathrm{s^f}} \tag{19.2}$$

20 PRICE EVOLUTION FLEXIBLE

20.1 Identities

$$P_t^{\mathrm{f}} = 1 \tag{20.1}$$

21 GOVERNMENT

21.1 Identities

$$G_t = G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} \tag{21.1}$$

$$G_t + B_{t-1} {\pi_t}^{-1} = T_t + B_t {R_t}^{-1} \tag{21.2}$$

22 GOVERNMENT SPENDING SHOCK

22.1 Identities

$$\log \epsilon_t^{\mathrm{G}} = \eta_t^{\mathrm{G}} + \rho^{\mathrm{G}} \log \epsilon_{t-1}^{\mathrm{G}} \tag{22.1}$$

23 GOVERNMENT FLEXIBLE

23.1 Identities

$$G_t^{\mathrm{f}} = G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} \tag{23.1}$$

$$B_{t-1}^{\mathrm{f}} + G_t^{\mathrm{f}} = T_t^{\mathrm{f}} + B_t^{\mathrm{f}} {R_t^{\mathrm{f}}}^{-1} \tag{23.2}$$

24 MONETARY POLICY AUTHORITY

24.1 Identities

$$\mathit{addr}^{\pi} + \log\left({R_{\mathrm{ss}}}^{-1} R_t\right) = \eta_t^{\mathrm{R}} + r^{\Delta^{\pi}} \left(-\log\left({\pi_{\mathrm{ss}}}^{-1} \pi_{t-1}\right) + \log\left({\pi_{\mathrm{ss}}}^{-1} \pi_t\right)\right) + r^{\Delta^{\mathrm{y}}} \left(-\log\left({Y_{\mathrm{ss}}}^{-1} Y_{t-1}\right) + \log\left({Y_{\mathrm{ss}}}^{-1} Y_t\right) + \log\left({Y_{\mathrm{ss}}^{\mathrm{f}}}^{-1} Y_{t-1}^{\mathrm{f}}\right) - \log\left({Y_{\mathrm{ss}}^{\mathrm{f}}}^{-1} Y_t^{\mathrm{f}}\right)\right) + \rho \log\left({R_{\mathrm{ss}}}^{-1} R_{t-1}\right) + (1-\rho)\left(\log \right. \tag{24.1}$$

$$\log \pi_t^{\mathrm{obj}} = \eta_t^{\pi} + {\rho^{\pi}}^{\mathrm{bar}} \log \pi_{t-1}^{\mathrm{obj}} + \log \mathit{addr}^{\pi^{\mathrm{obj}}} \left(1 - {\rho^{\pi}}^{\mathrm{bar}}\right) \tag{24.2}$$

25 EQUILIBRIUM

25.1 Identities

$$K_t^{\mathrm{d}} = K_{t-1} z_t \tag{25.1}$$

$$L_t = L_t^{\mathrm{d}} \tag{25.2}$$

$$B_t = 0 \tag{25.3}$$

$$Div_t = Y_t - L_t^{\mathrm{d}} W_t - r_t^{\mathrm{k}} K_t^{\mathrm{d}} \tag{25.4}$$

26 EQUILIBRIUM FLEXIBLE

26.1 Identities

$$K_t^{\mathrm{d^f}} = K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}} \tag{26.1}$$

$$L_t^{\mathrm{f}} = L_t^{\mathrm{d^f}} \tag{26.2}$$

$$B_t^{\mathrm{f}} = 0 \tag{26.3}$$

$$Div_t^{\mathrm{f}} = Y_t^{\mathrm{f}} - L_t^{\mathrm{d^f}} W_t^{\mathrm{f}} - r_t^{\mathrm{k^f}} K_t^{\mathrm{d^f}} \tag{26.4}$$

27 Equilibrium relationships (after reduction)

$$-q_t + \beta \left((1-\tau) \, \mathrm{E}_t \left[q_{t+1} \right] + \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{b}} \left(r_{t+1}^{\mathrm{k}} z_{t+1} - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k}} \left(-1 + e^{\psi(-1+z_{t+1})} \right) \right) \left(C_{t+1} - hC_t \right)^{-\sigma^{\mathrm{c}}} \right] \right) = 0 \tag{27.1}$$

$$-q_t^{\mathrm{f}} + \beta \left((1-\tau) \, \mathrm{E}_t \left[q_{t+1}^{\mathrm{f}} \right] + \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{b}} \left(r_{t+1}^{\mathrm{k^f}} z_{t+1}^{\mathrm{f}} - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k^f}} \left(-1 + e^{\psi\left(-1+z_{t+1}^{\mathrm{f}}\right)} \right) \right) \left(C_{t+1}^{\mathrm{f}} - hC_t^{\mathrm{f}} \right)^{-\sigma^{\mathrm{c}}} \right] \right) = 0 \tag{27.2}$$

$$-r_t^{\mathrm{k}} + \alpha \epsilon_t^{\mathrm{a}} mc_t {L_t}^{1-\alpha} \left(K_{t-1} z_t \right)^{-1+\alpha} = 0 \tag{27.3}$$

$$-r_t^{\mathrm{k^f}} + \alpha \epsilon_t^{\mathrm{a}} mc_t^{\mathrm{f}} {L_t^{\mathrm{f}}}^{1-\alpha} \left(K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}} \right)^{-1+\alpha} = 0 \tag{27.4}$$

$$-G_t + T_t = 0 \tag{27.5}$$

$$-G_t + G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} = 0 \tag{27.6}$$

$$-G_t^{\mathrm{f}} + T_t^{\mathrm{f}} = 0 \tag{27.7}$$

$$-G_t^{\mathrm{f}} + G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} = 0 \tag{27.8}$$

$$-L_t + {\nu_t^{\mathrm{w}}}^{-1} L_t^{\mathrm{s}} = 0 \tag{27.9}$$

$$-L_t^{\mathrm{s^f}} + L_t^{\mathrm{f}} \left(W_t^{\mathrm{i^f}} {W_t^{\mathrm{f}}}^{-1} \right)^{\lambda^{\mathrm{w}-1}(-1-\lambda^{\mathrm{w}})} = 0 \tag{27.10}$$

$$L_t^{\mathrm{s}^{\mathrm{f}}} - L_t^{\mathrm{f}} = 0 \tag{27.11}$$

$$L_t^{\mathrm{s}^{\mathrm{f}}} + \lambda^{\mathrm{w}-1} L_t^{\mathrm{f}} {W_t^{\mathrm{f}}}^{-1} \left(-1-\lambda^{\mathrm{w}}\right) \left(-W_t^{\mathrm{disutil}^{\mathrm{f}}} + W_t^{\mathrm{i}^{\mathrm{f}}}\right) \left(W_t^{\mathrm{i}^{\mathrm{f}}} {W_t^{\mathrm{f}}}^{-1}\right)^{-1+\lambda^{\mathrm{w}-1}(-1-\lambda^{\mathrm{w}})} = 0 \tag{27.12}$$

$$\Pi_t^{\mathrm{ws}^{\mathrm{f}}} - L_t^{\mathrm{s}^{\mathrm{f}}} \left(-W_t^{\mathrm{disutil}^{\mathrm{f}}} + W_t^{\mathrm{i}^{\mathrm{f}}}\right) = 0 \tag{27.13}$$

$$\Pi_t^{\mathrm{ps}^{\mathrm{f}}} - Y_t^{\mathrm{f}} \left(-mc_t^{\mathrm{f}} + P_t^{\mathrm{j}^{\mathrm{f}}}\right) {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{27.14}$$

$$-Q_t + {\epsilon_t^{\mathrm{b}}}^{-1} q_t (C_t - hC_{t-1})^{\sigma^{\mathrm{c}}} = 0 \tag{27.15}$$

$$-Q_t^{\mathrm{f}} + {\epsilon_t^{\mathrm{b}}}^{-1} q_t^{\mathrm{f}} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}}\right)^{\sigma^{\mathrm{c}}} = 0 \tag{27.16}$$

$$-W_t + \epsilon_t^{\mathrm{a}} mc_t \left(1-\alpha\right) {L_t}^{-\alpha} (K_{t-1} z_t)^{\alpha} = 0 \tag{27.17}$$

$$-W_t^{\mathrm{f}} + \epsilon_t^{\mathrm{a}} mc_t^{\mathrm{f}} \left(1-\alpha\right) {L_t^{\mathrm{f}}}^{-\alpha} \left(K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}}\right)^{\alpha} = 0 \tag{27.18}$$

$$-Y_t^{\mathrm{f}} + Y_t^{\mathrm{s}^{\mathrm{f}}} = 0 \tag{27.19}$$

$$Y_t^{\mathrm{s}} - \nu_t^{\mathrm{p}} Y_t = 0 \tag{27.20}$$

$$-Y_t^{\mathrm{s}^{\mathrm{f}}} + Y_t^{\mathrm{f}} {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{27.21}$$

$$\beta \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{b}} \left(C_{t+1}^{\mathrm{f}} - hC_t^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}}\right] - \epsilon_t^{\mathrm{b}} {R_t^{\mathrm{f}}}^{-1} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{27.22}$$

$$\beta \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{b}} {\pi_{t+1}}^{-1} (C_{t+1} - hC_t)^{-\sigma^{\mathrm{c}}}\right] - \epsilon_t^{\mathrm{b}} {R_t}^{-1} (C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} = 0 \tag{27.23}$$

$$Y_t^{\mathrm{f}} {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} - \lambda^{\mathrm{p}-1} Y_t^{\mathrm{f}} \left(1+\lambda^{\mathrm{p}}\right) \left(-mc_t^{\mathrm{f}} + P_t^{\mathrm{j}^{\mathrm{f}}}\right) {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-1-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{27.24}$$

$$\epsilon_t^{\mathrm{b}} {W_t^{\mathrm{disutil}^{\mathrm{f}}}} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} - \omega \epsilon_t^{\mathrm{b}} \epsilon_t^{\mathrm{L}} {L_t^{\mathrm{s}^{\mathrm{f}}}}^{\sigma^{\mathrm{l}}} = 0 \tag{27.25}$$

$$-1 + \xi^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}-1}} + \left(1-\xi^{\mathrm{p}}\right) {\pi_t^{\star}}^{-\lambda^{\mathrm{p}-1}} = 0 \tag{27.26}$$

$$-1 + \left(1-\xi^{\mathrm{w}}\right) \left(w_t^{\star} {W_t}^{-1}\right)^{-\lambda^{\mathrm{w}-1}} + \xi^{\mathrm{w}} \left(W_{t-1} {W_t}^{-1}\right)^{-\lambda^{\mathrm{w}-1}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{w}}}\right)^{-\lambda^{\mathrm{w}-1}} = 0 \tag{27.27}$$

$$-\Phi - Y_t^{\mathrm{s}} + \epsilon_t^{\mathrm{a}} {L_t}^{1-\alpha} (K_{t-1} z_t)^{\alpha} = 0 \tag{27.28}$$

$$-\Phi - Y_t^{\mathrm{f}} {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} + \epsilon_t^{\mathrm{a}} {L_t^{\mathrm{f}}}^{1-\alpha} \left(K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}}\right)^{\alpha} = 0 \tag{27.29}$$

$$\eta_t^{\mathrm{b}} - \log \epsilon_t^{\mathrm{b}} + \rho^{\mathrm{b}} \log \epsilon_{t-1}^{\mathrm{b}} = 0 \tag{27.30}$$

$$-\eta_t^{\mathrm{L}} - \log \epsilon_t^{\mathrm{L}} + \rho^{\mathrm{L}} \log \epsilon_{t-1}^{\mathrm{L}} = 0 \tag{27.31}$$

$$\eta_t^{\mathrm{I}} - \log \epsilon_t^{\mathrm{I}} + \rho^{\mathrm{I}} \log \epsilon_{t-1}^{\mathrm{I}} = 0 \tag{27.32}$$

$$\eta_t^{\mathrm{w}} - f_t^1 + f_t^2 = 0 \tag{27.33}$$

$$\eta_t^{\mathrm{a}} - \log \epsilon_t^{\mathrm{a}} + \rho^{\mathrm{a}} \log \epsilon_{t-1}^{\mathrm{a}} = 0 \tag{27.34}$$

$$\eta_t^{\mathrm{p}} - g_t^1 + g_t^2 \left(1 + \lambda^{\mathrm{p}}\right) = 0 \tag{27.35}$$

$$\eta_t^{\mathrm{G}} - \log \epsilon_t^{\mathrm{G}} + \rho^{\mathrm{G}} \log \epsilon_{t-1}^{\mathrm{G}} = 0 \tag{27.36}$$

$$-f_t^1 + \beta \xi^{\mathrm{w}} \mathrm{E}_t \left[f_{t+1}^1 \left(w_t^{\star -1} w_{t+1}^{\star} \right)^{\lambda^{\mathrm{w}-1}} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}} \right] + \epsilon_t^{\mathrm{b}} w_t^{\star} L_t \left(1 + \lambda^{\mathrm{w}}\right)^{-1} \left(C_t - hC_{t-1}\right)^{-\sigma^{\mathrm{c}}} \left(w_t^{\star} {W_t}^{-1} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} = 0 \tag{27.37}$$

$$-f_t^2 + \beta \xi^{\mathrm{w}} \mathrm{E}_t \left[f_{t+1}^2 \left(w_t^{\star -1} w_{t+1}^{\star} \right)^{\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})\left(1+\sigma^{\mathrm{l}}\right)} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})\left(1+\sigma^{\mathrm{l}}\right)} \right] + \omega \epsilon_t^{\mathrm{b}} \epsilon_t^{\mathrm{L}} \left(L_t \left(w_t^{\star} {W_t}^{-1} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} \right)^{1+\sigma^{\mathrm{l}}} = 0 \tag{27.38}$$

$$-g_t^1 + \beta \xi^{\mathrm{p}} \pi_t^{\star} \mathrm{E}_t \left[g_{t+1}^1 {\pi_{t+1}^{\star}}^{-1} \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}} \right] + \epsilon_t^{\mathrm{b}} \pi_t^{\star} Y_t (C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} = 0 \tag{27.39}$$

$$-g_t^2 + \beta \xi^{\mathrm{p}} \mathrm{E}_t \left[g_{t+1}^2 \left({\pi_{t+1}}^{-1} {\pi_t}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} \right] + \epsilon_t^{\mathrm{b}} mc_t Y_t (C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} = 0 \tag{27.40}$$

$$-\nu_t^{\mathrm{w}} + \left(1 - \xi^{\mathrm{w}}\right) \left(w_t^{\star} {W_t}^{-1} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} + \xi^{\mathrm{w}} \nu_{t-1}^{\mathrm{w}} \left(W_{t-1} {\pi_t}^{-1} {W_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{w}}} \right)^{-\lambda^{\mathrm{w}-1}(1+\lambda^{\mathrm{w}})} = 0 \tag{27.41}$$

$$-\nu_t^{\mathrm{p}} + \left(1 - \xi^{\mathrm{p}}\right) {\pi_t^{\star}}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} + \xi^{\mathrm{p}} \nu_{t-1}^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}} \right)^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{27.42}$$

$$-K_t + K_{t-1}\left(1 - \tau\right) + I_t \left(1 - 0.5\varphi \left(-1 + {I_{t-1}}^{-1} \epsilon_t^{\mathrm{I}} I_t \right)^2 \right) = 0 \tag{27.43}$$

$$-K_t^{\mathrm{f}} + K_{t-1}^{\mathrm{f}}\left(1 - \tau\right) + I_t^{\mathrm{f}} \left(1 - 0.5\varphi \left(-1 + {I_{t-1}^{\mathrm{f}}}^{-1} \epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}} \right)^2 \right) = 0 \tag{27.44}$$

$$U_t - \beta \mathrm{E}_t \left[U_{t+1} \right] - \epsilon_t^{\mathrm{b}} \left(\left(1 - \sigma^{\mathrm{c}}\right)^{-1} \left(C_t - hC_{t-1} \right)^{1-\sigma^{\mathrm{c}}} - \omega \epsilon_t^{\mathrm{L}} \left(1 + \sigma^{\mathrm{l}}\right)^{-1} L_t^{\mathrm{s}\,1+\sigma^{\mathrm{l}}} \right) = 0 \tag{27.45}$$

$$U_t^{\mathrm{f}} - \beta \mathrm{E}_t \left[U_{t+1}^{\mathrm{f}} \right] - \epsilon_t^{\mathrm{b}} \left(\left(1 - \sigma^{\mathrm{c}}\right)^{-1} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}} \right)^{1-\sigma^{\mathrm{c}}} - \omega \epsilon_t^{\mathrm{L}} \left(1 + \sigma^{\mathrm{l}}\right)^{-1} {L_t^{\mathrm{s}}}^{\mathrm{f}\,1+\sigma^{\mathrm{l}}} \right) = 0 \tag{27.46}$$

$$-\epsilon_t^{\mathrm{b}} (C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} + q_t \left(1 - 0.5\varphi \left(-1 + {I_{t-1}}^{-1} \epsilon_t^{\mathrm{I}} I_t \right)^2 - \varphi {I_{t-1}}^{-1} \epsilon_t^{\mathrm{I}} I_t \left(-1 + {I_{t-1}}^{-1} \epsilon_t^{\mathrm{I}} I_t \right) \right) + \beta \varphi {I_t}^{-2} \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{I}} q_{t+1} {I_{t+1}}^2 \left(-1 + {I_t}^{-1} \epsilon_{t+1}^{\mathrm{I}} I_{t+1} \right) \right] = 0 \tag{27.47}$$

$$-\epsilon_t^{\mathrm{b}} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}} \right)^{-\sigma^{\mathrm{c}}} + q_t^{\mathrm{f}} \left(1 - 0.5\varphi \left(-1 + {I_{t-1}^{\mathrm{f}}}^{-1} \epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}} \right)^2 - \varphi {I_{t-1}^{\mathrm{f}}}^{-1} \epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}} \left(-1 + {I_{t-1}^{\mathrm{f}}}^{-1} \epsilon_t^{\mathrm{I}} I_t^{\mathrm{f}} \right) \right) + \beta \varphi {I_t^{\mathrm{f}}}^{-2} \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{I}} q_{t+1}^{\mathrm{f}} {I_{t+1}^{\mathrm{f}}}^2 \left(-1 + {I_t^{\mathrm{f}}}^{-1} \epsilon_{t+1}^{\mathrm{I}} I_{t+1}^{\mathrm{f}} \right) \right] = 0 \tag{27.48}$$

$$\eta_t^{\pi} - \log \pi_t^{\mathrm{obj}} + \rho^{\pi^{\mathrm{bar}}} \log \pi_{t-1}^{\mathrm{obj}} + \log \mathit{adhr}^{\pi^{\mathrm{obj}}} \left(1 - \rho^{\pi^{\mathrm{bar}}} \right) = 0 \tag{27.49}$$

$$-C_t - I_t - T_t + Y_t - \psi^{-1} r_{\mathrm{ss}}^{\mathrm{k}} K_{t-1} \left(-1 + e^{\psi(-1+z_t)} \right) = 0 \tag{27.50}$$

$$-\text{addr}^{\pi}+\eta_t^{\mathrm{R}}-\log\left({R_{\mathrm{ss}}}^{-1}R_t\right)+r^{\Delta^{\pi}}\left(-\log\left({\pi_{\mathrm{ss}}}^{-1}\pi_{t-1}\right)+\log\left({\pi_{\mathrm{ss}}}^{-1}\pi_t\right)\right)+r^{\Delta^{\mathrm{y}}}\left(-\log\left({Y_{\mathrm{ss}}}^{-1}Y_{t-1}\right)+\log\left({Y_{\mathrm{ss}}}^{-1}Y_t\right)+\log\left({Y_{\mathrm{ss}}^{\mathrm{f}}}^{-1}Y_{t-1}^{\mathrm{f}}\right)-\log\left({Y_{\mathrm{ss}}^{\mathrm{f}}}^{-1}Y_t^{\mathrm{f}}\right)\right)+\rho\log\left({R_{\mathrm{ss}}}^{-1}R_{t-1}\right)+(1-\rho)\left(\log\right. \tag{27.51}$$

$$-C_t^{\mathrm{f}}-I_t^{\mathrm{f}}+\Pi_t^{\mathrm{ws}^{\mathrm{f}}}-T_t^{\mathrm{f}}+Y_t^{\mathrm{f}}+L_t^{\mathrm{s}^{\mathrm{f}}}W_t^{\mathrm{disutil}^{\mathrm{f}}}-L_t^{\mathrm{f}}W_t^{\mathrm{f}}-\psi^{-1}r_{\mathrm{ss}}^{\mathrm{k}^{\mathrm{f}}}K_{t-1}^{\mathrm{f}}\left(-1+e^{\psi\left(-1+z_t^{\mathrm{f}}\right)}\right)=0 \tag{27.52}$$

$$\epsilon_t^{\mathrm{b}}\left(K_{t-1}r_t^{\mathrm{k}}-r_{\mathrm{ss}}^{\mathrm{k}}K_{t-1}e^{\psi(-1+z_t)}\right)\left(C_t-hC_{t-1}\right)^{-\sigma^{\mathrm{c}}}=0 \tag{27.53}$$

$$\epsilon_t^{\mathrm{b}}\left(K_{t-1}^{\mathrm{f}}r_t^{\mathrm{k}^{\mathrm{f}}}-r_{\mathrm{ss}}^{\mathrm{k}^{\mathrm{f}}}K_{t-1}^{\mathrm{f}}e^{\psi\left(-1+z_t^{\mathrm{f}}\right)}\right)\left(C_t^{\mathrm{f}}-hC_{t-1}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}}=0 \tag{27.54}$$

28 Steady state relationships (after reduction)

$$-q_{\mathrm{ss}}+\beta\left(q_{\mathrm{ss}}\left(1-\tau\right)+\epsilon_{\mathrm{ss}}^{\mathrm{b}}\left(r_{\mathrm{ss}}^{\mathrm{k}}z_{\mathrm{ss}}-\psi^{-1}r_{\mathrm{ss}}^{\mathrm{k}}\left(-1+e^{\psi(-1+z_{\mathrm{ss}})}\right)\right)\left(C_{\mathrm{ss}}-hC_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}}\right)=0 \tag{28.1}$$

$$-q_{\mathrm{ss}}^{\mathrm{f}}+\beta\left(q_{\mathrm{ss}}^{\mathrm{f}}\left(1-\tau\right)+\epsilon_{\mathrm{ss}}^{\mathrm{b}}\left(r_{\mathrm{ss}}^{\mathrm{k}^{\mathrm{f}}}z_{\mathrm{ss}}^{\mathrm{f}}-\psi^{-1}r_{\mathrm{ss}}^{\mathrm{k}^{\mathrm{f}}}\left(-1+e^{\psi\left(-1+z_{\mathrm{ss}}^{\mathrm{f}}\right)}\right)\right)\left(C_{\mathrm{ss}}^{\mathrm{f}}-hC_{\mathrm{ss}}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}}\right)=0 \tag{28.2}$$

$$-r_{\mathrm{ss}}^{\mathrm{k}}+\alpha\epsilon_{\mathrm{ss}}^{\mathrm{a}}mc_{\mathrm{ss}}{L_{\mathrm{ss}}}^{1-\alpha}(z_{\mathrm{ss}}K_{\mathrm{ss}})^{-1+\alpha}=0 \tag{28.3}$$

$$-r_{\mathrm{ss}}^{\mathrm{k}^{\mathrm{f}}}+\alpha\epsilon_{\mathrm{ss}}^{\mathrm{a}}mc_{\mathrm{ss}}^{\mathrm{f}}{L_{\mathrm{ss}}^{\mathrm{f}}}^{1-\alpha}\left(z_{\mathrm{ss}}^{\mathrm{f}}K_{\mathrm{ss}}^{\mathrm{f}}\right)^{-1+\alpha}=0 \tag{28.4}$$

$$-G_{\mathrm{ss}}+T_{\mathrm{ss}}=0 \tag{28.5}$$

$$-G_{\mathrm{ss}}+G^{\mathrm{bar}}\epsilon_{\mathrm{ss}}^{\mathrm{G}}=0 \tag{28.6}$$

$$-G_{\mathrm{ss}}^{\mathrm{f}}+T_{\mathrm{ss}}^{\mathrm{f}}=0 \tag{28.7}$$

$$-G_{\mathrm{ss}}^{\mathrm{f}}+G^{\mathrm{bar}}\epsilon_{\mathrm{ss}}^{\mathrm{G}}=0 \tag{28.8}$$

$$-L_{\mathrm{ss}}+{\nu_{\mathrm{ss}}^{\mathrm{w}}}^{-1}L_{\mathrm{ss}}^{\mathrm{s}}=0 \tag{28.9}$$

$$-L_{\mathrm{ss}}^{\mathrm{s}^{\mathrm{f}}}+L_{\mathrm{ss}}^{\mathrm{f}}\left(W_{\mathrm{ss}}^{\mathrm{i}^{\mathrm{f}}}{W_{\mathrm{ss}}^{\mathrm{f}}}^{-1}\right)^{\lambda^{\mathrm{w}-1}(-1-\lambda^{\mathrm{w}})}=0 \tag{28.10}$$

$$L_{\mathrm{ss}}^{\mathrm{s}^{\mathrm{f}}}-L_{\mathrm{ss}}^{\mathrm{f}}=0 \tag{28.11}$$

$$L_{\mathrm{ss}}^{\mathrm{s}^{\mathrm{f}}}+\lambda^{\mathrm{w}-1}L_{\mathrm{ss}}^{\mathrm{f}}{W_{\mathrm{ss}}^{\mathrm{f}}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)\left(-W_{\mathrm{ss}}^{\mathrm{disutil}^{\mathrm{f}}}+W_{\mathrm{ss}}^{\mathrm{i}^{\mathrm{f}}}\right)\left(W_{\mathrm{ss}}^{\mathrm{i}^{\mathrm{f}}}{W_{\mathrm{ss}}^{\mathrm{f}}}^{-1}\right)^{-1+\lambda^{\mathrm{w}-1}(-1-\lambda^{\mathrm{w}})}=0 \tag{28.12}$$

$$\Pi_{\mathrm{ss}}^{\mathrm{ws}^{\mathrm{f}}}-L_{\mathrm{ss}}^{\mathrm{s}^{\mathrm{f}}}\left(-W_{\mathrm{ss}}^{\mathrm{disutil}^{\mathrm{f}}}+W_{\mathrm{ss}}^{\mathrm{i}^{\mathrm{f}}}\right)=0 \tag{28.13}$$

$$\Pi_{\mathrm{ss}}^{\mathrm{ps}^{\mathrm{f}}}-Y_{\mathrm{ss}}^{\mathrm{f}}\left(-mc_{\mathrm{ss}}^{\mathrm{f}}+P_{\mathrm{ss}}^{\mathrm{j}^{\mathrm{f}}}\right){P_{\mathrm{ss}}^{\mathrm{j}^{\mathrm{f}}}}^{-\lambda^{\mathrm{p}-1}(1+\lambda^{\mathrm{p}})}=0 \tag{28.14}$$

$$-Q_{\mathrm{ss}}+{\epsilon_{\mathrm{ss}}^{\mathrm{b}}}^{-1}q_{\mathrm{ss}}(C_{\mathrm{ss}}-hC_{\mathrm{ss}})^{\sigma^{\mathrm{c}}}=0 \tag{28.15}$$

$$-Q_{\mathrm{ss}}^{\mathrm{f}}+{\epsilon_{\mathrm{ss}}^{\mathrm{b}}}^{-1}q_{\mathrm{ss}}^{\mathrm{f}}\left(C_{\mathrm{ss}}^{\mathrm{f}}-hC_{\mathrm{ss}}^{\mathrm{f}}\right)^{\sigma^{\mathrm{c}}}=0 \tag{28.16}$$

$$-W_{\rm ss}+\epsilon^{\rm a}_{\rm ss}mc_{\rm ss}\left(1-\alpha\right){L_{\rm ss}}^{-\alpha}(z_{\rm ss}K_{\rm ss})^{\alpha}=0 \tag{28.17}$$

$$-W^{\rm f}_{\rm ss}+\epsilon^{\rm a}_{\rm ss}mc^{\rm f}_{\rm ss}\left(1-\alpha\right){L^{\rm f}_{\rm ss}}^{-\alpha}\left(z^{\rm f}_{\rm ss}K^{\rm f}_{\rm ss}\right)^{\alpha}=0 \tag{28.18}$$

$$-Y^{\rm f}_{\rm ss}+Y^{\rm s^f}_{\rm ss}=0 \tag{28.19}$$

$$Y^{\rm s}_{\rm ss}-\nu^{\rm p}_{\rm ss}Y_{\rm ss}=0 \tag{28.20}$$

$$-Y^{\rm s^f}_{\rm ss}+Y^{\rm f}_{\rm ss}{P^{\rm j^f}_{\rm ss}}^{-\lambda^{\rm p-1}(1+\lambda^{\rm p})}=0 \tag{28.21}$$

$$\beta\epsilon^{\rm b}_{\rm ss}\left(C^{\rm f}_{\rm ss}-hC^{\rm f}_{\rm ss}\right)^{-\sigma^{\rm c}}-\epsilon^{\rm b}_{\rm ss}{R^{\rm f}_{\rm ss}}^{-1}\left(C^{\rm f}_{\rm ss}-hC^{\rm f}_{\rm ss}\right)^{-\sigma^{\rm c}}=0 \tag{28.22}$$

$$-\epsilon^{\rm b}_{\rm ss}{R_{\rm ss}}^{-1}(C_{\rm ss}-hC_{\rm ss})^{-\sigma^{\rm c}}+\beta\epsilon^{\rm b}_{\rm ss}{\pi_{\rm ss}}^{-1}(C_{\rm ss}-hC_{\rm ss})^{-\sigma^{\rm c}}=0 \tag{28.23}$$

$$Y^{\rm f}_{\rm ss}{P^{\rm j^f}_{\rm ss}}^{-\lambda^{\rm p-1}(1+\lambda^{\rm p})}-\lambda^{\rm p-1}Y^{\rm f}_{\rm ss}\left(1+\lambda^{\rm p}\right)\left(-mc^{\rm f}_{\rm ss}+P^{\rm j^f}_{\rm ss}\right){P^{\rm j^f}_{\rm ss}}^{-1-\lambda^{\rm p-1}(1+\lambda^{\rm p})}=0 \tag{28.24}$$

$$\epsilon^{\rm b}_{\rm ss}W^{\rm disutil^f}_{\rm ss}\left(C^{\rm f}_{\rm ss}-hC^{\rm f}_{\rm ss}\right)^{-\sigma^{\rm c}}-\omega\epsilon^{\rm b}_{\rm ss}\epsilon^{\rm L}_{\rm ss}{L^{\rm s^f}_{\rm ss}}^{\sigma^{\rm l}}=0 \tag{28.25}$$

$$-1+\xi^{\rm p}\left({\pi_{\rm ss}}^{-1}{\pi_{\rm ss}}^{\gamma^{\rm p}}\right)^{-\lambda^{\rm p-1}}+\left(1-\xi^{\rm p}\right){\pi^{\star}_{\rm ss}}^{-\lambda^{\rm p-1}}=0 \tag{28.26}$$

$$-1+\left(1-\xi^{\rm w}\right)\left(w^{\star}_{\rm ss}{W_{\rm ss}}^{-1}\right)^{-\lambda^{\rm w-1}}+\xi^{\rm w}1^{-\lambda^{\rm w-1}}\left({\pi_{\rm ss}}^{-1}{\pi_{\rm ss}}^{\gamma^{\rm w}}\right)^{-\lambda^{\rm w-1}}=0 \tag{28.27}$$

$$-\Phi-Y^{\rm s}_{\rm ss}+\epsilon^{\rm a}_{\rm ss}{L_{\rm ss}}^{1-\alpha}(z_{\rm ss}K_{\rm ss})^{\alpha}=0 \tag{28.28}$$

$$-\Phi-Y^{\rm f}_{\rm ss}{P^{\rm j^f}_{\rm ss}}^{-\lambda^{\rm p-1}(1+\lambda^{\rm p})}+\epsilon^{\rm a}_{\rm ss}{L^{\rm f}_{\rm ss}}^{1-\alpha}\left(z^{\rm f}_{\rm ss}K^{\rm f}_{\rm ss}\right)^{\alpha}=0 \tag{28.29}$$

$$-\log\epsilon^{\rm b}_{\rm ss}+\rho^{\rm b}\log\epsilon^{\rm b}_{\rm ss}=0 \tag{28.30}$$

$$-\log\epsilon^{\rm L}_{\rm ss}+\rho^{\rm L}\log\epsilon^{\rm L}_{\rm ss}=0 \tag{28.31}$$

$$-\log\epsilon^{\rm I}_{\rm ss}+\rho^{\rm I}\log\epsilon^{\rm I}_{\rm ss}=0 \tag{28.32}$$

$$-f^{1}_{\rm ss}+f^{2}_{\rm ss}=0 \tag{28.33}$$

$$-\log\epsilon^{\rm a}_{\rm ss}+\rho^{\rm a}\log\epsilon^{\rm a}_{\rm ss}=0 \tag{28.34}$$

$$-g^{1}_{\rm ss}+g^{2}_{\rm ss}\left(1+\lambda^{\rm p}\right)=0 \tag{28.35}$$

$$-\log\epsilon^{\rm G}_{\rm ss}+\rho^{\rm G}\log\epsilon^{\rm G}_{\rm ss}=0 \tag{28.36}$$

$$-f^{1}_{\rm ss}+\beta\xi^{\rm w}f^{1}_{\rm ss}1^{\lambda^{\rm w-1}}\left({\pi_{\rm ss}}^{-1}{\pi_{\rm ss}}^{\gamma^{\rm w}}\right)^{-\lambda^{\rm w-1}}+\epsilon^{\rm b}_{\rm ss}w^{\star}_{\rm ss}L_{\rm ss}\left(1+\lambda^{\rm w}\right)^{-1}\left(C_{\rm ss}-hC_{\rm ss}\right)^{-\sigma^{\rm c}}\left(w^{\star}_{\rm ss}{W_{\rm ss}}^{-1}\right)^{-\lambda^{\rm w-1}(1+\lambda^{\rm w})}=0 \tag{28.37}$$

$$-f^{2}_{\rm ss}+\omega\epsilon^{\rm b}_{\rm ss}\epsilon^{\rm L}_{\rm ss}\left(L_{\rm ss}\left(w^{\star}_{\rm ss}{W_{\rm ss}}^{-1}\right)^{-\lambda^{\rm w-1}(1+\lambda^{\rm w})}\right)^{1+\sigma^{\rm l}}+\beta\xi^{\rm w}f^{2}_{\rm ss}1^{\lambda^{\rm w-1}(1+\lambda^{\rm w})\left(1+\sigma^{\rm l}\right)}\left({\pi_{\rm ss}}^{-1}{\pi_{\rm ss}}^{\gamma^{\rm w}}\right)^{-\lambda^{\rm w-1}(1+\lambda^{\rm w})\left(1+\sigma^{\rm l}\right)}=0 \tag{28.38}$$

$$-g_{ss}^{1}+\beta\xi^{p}g_{ss}^{1}\left({\pi_{ss}}^{-1}{\pi_{ss}}^{\gamma^{p}}\right)^{-\lambda^{p-1}}+\epsilon_{ss}^{b}\pi_{ss}^{\star}Y_{ss}(C_{ss}-hC_{ss})^{-\sigma^{c}}=0 \tag{28.39}$$

$$-g_{ss}^{2}+\beta\xi^{p}g_{ss}^{2}\left({\pi_{ss}}^{-1}{\pi_{ss}}^{\gamma^{p}}\right)^{-\lambda^{p-1}(1+\lambda^{p})}+\epsilon_{ss}^{b}mc_{ss}Y_{ss}(C_{ss}-hC_{ss})^{-\sigma^{c}}=0 \tag{28.40}$$

$$-\nu_{ss}^{w}+(1-\xi^{w})\left(w_{ss}^{\star}{W_{ss}}^{-1}\right)^{-\lambda^{w-1}(1+\lambda^{w})}+\xi^{w}\nu_{ss}^{w}\left({\pi_{ss}}^{-1}{\pi_{ss}}^{\gamma^{w}}\right)^{-\lambda^{w-1}(1+\lambda^{w})}=0 \tag{28.41}$$

$$-\nu_{ss}^{p}+(1-\xi^{p})\,{\pi_{ss}^{\star}}^{-\lambda^{p-1}(1+\lambda^{p})}+\xi^{p}\nu_{ss}^{p}\left({\pi_{ss}}^{-1}{\pi_{ss}}^{\gamma^{p}}\right)^{-\lambda^{p-1}(1+\lambda^{p})}=0 \tag{28.42}$$

$$-K_{ss}+I_{ss}\left(1-0.5\varphi\left(-1+\epsilon_{ss}^{I}\right)^{2}\right)+K_{ss}\left(1-\tau\right)=0 \tag{28.43}$$

$$-K_{ss}^{f}+I_{ss}^{f}\left(1-0.5\varphi\left(-1+\epsilon_{ss}^{I}\right)^{2}\right)+K_{ss}^{f}\left(1-\tau\right)=0 \tag{28.44}$$

$$U_{ss}-\beta U_{ss}-\epsilon_{ss}^{b}\left(\left(1-\sigma^{c}\right)^{-1}\left(C_{ss}-hC_{ss}\right)^{1-\sigma^{c}}-\omega\epsilon_{ss}^{L}\left(1+\sigma^{l}\right)^{-1}{L_{ss}^{s}}^{1+\sigma^{l}}\right)=0 \tag{28.45}$$

$$U_{ss}^{f}-\beta U_{ss}^{f}-\epsilon_{ss}^{b}\left(\left(1-\sigma^{c}\right)^{-1}\left(C_{ss}^{f}-hC_{ss}^{f}\right)^{1-\sigma^{c}}-\omega\epsilon_{ss}^{L}\left(1+\sigma^{l}\right)^{-1}{L_{ss}^{s^{f}}}^{1+\sigma^{l}}\right)=0 \tag{28.46}$$

$$-\epsilon_{ss}^{b}(C_{ss}-hC_{ss})^{-\sigma^{c}}+q_{ss}\left(1-0.5\varphi\left(-1+\epsilon_{ss}^{I}\right)^{2}-\varphi\epsilon_{ss}^{I}\left(-1+\epsilon_{ss}^{I}\right)\right)+\beta\varphi\epsilon_{ss}^{I}q_{ss}\left(-1+\epsilon_{ss}^{I}\right)=0 \tag{28.47}$$

$$-\epsilon_{ss}^{b}\left(C_{ss}^{f}-hC_{ss}^{f}\right)^{-\sigma^{c}}+q_{ss}^{f}\left(1-0.5\varphi\left(-1+\epsilon_{ss}^{I}\right)^{2}-\varphi\epsilon_{ss}^{I}\left(-1+\epsilon_{ss}^{I}\right)\right)+\beta\varphi\epsilon_{ss}^{I}q_{ss}^{f}\left(-1+\epsilon_{ss}^{I}\right)=0 \tag{28.48}$$

$$-\log\pi_{ss}^{obj}+\rho^{\pi^{bar}}\log\pi_{ss}^{obj}+\log addr^{\pi^{obj}}\left(1-\rho^{\pi^{bar}}\right)=0 \tag{28.49}$$

$$-C_{ss}-I_{ss}-T_{ss}+Y_{ss}-\psi^{-1}r_{ss}^{k}K_{ss}\left(-1+e^{\psi(-1+z_{ss})}\right)=0 \tag{28.50}$$

$$-addr^{\pi}+(1-\rho)\left(\log\pi_{ss}^{obj}-r^{\pi}\log\pi_{ss}^{obj}\right)=0 \tag{28.51}$$

$$-C_{ss}^{f}-I_{ss}^{f}+\Pi_{ss}^{ws^{f}}-T_{ss}^{f}+Y_{ss}^{f}+L_{ss}^{s^{f}}W_{ss}^{disutil^{f}}-L_{ss}^{f}W_{ss}^{f}-\psi^{-1}r_{ss}^{k^{f}}K_{ss}^{f}\left(-1+e^{\psi\left(-1+z_{ss}^{f}\right)}\right)=0 \tag{28.52}$$

$$\epsilon_{ss}^{b}\left(r_{ss}^{k}K_{ss}-r_{ss}^{k}K_{ss}e^{\psi(-1+z_{ss})}\right)\left(C_{ss}-hC_{ss}\right)^{-\sigma^{c}}=0 \tag{28.53}$$

$$\epsilon_{ss}^{b}\left(r_{ss}^{k^{f}}K_{ss}^{f}-r_{ss}^{k^{f}}K_{ss}^{f}e^{\psi\left(-1+z_{ss}^{f}\right)}\right)\left(C_{ss}^{f}-hC_{ss}^{f}\right)^{-\sigma^{c}}=0 \tag{28.54}$$

29 Calibrating equations

$$-1.408+{Y_{ss}^{s}}^{-1}\left(\Phi+Y_{ss}^{s}\right)=0 \tag{29.1}$$

$$-1+\pi_{ss}^{obj}=0 \tag{29.2}$$

$$-0.6+C_{ss}^{f}{Y_{ss}^{f}}^{-1}=0 \tag{29.3}$$

$$-0.18+G_{ss}{Y_{ss}}^{-1}=0 \tag{29.4}$$

$$\pi_{ss}-\pi_{ss}^{obj}=0 \tag{29.5}$$

30 Parameter settings

$$\alpha = 0.3 \tag{30.1}$$

$$\beta = 0.99 \tag{30.2}$$

$$\gamma^{\mathrm{w}} = 0.763 \tag{30.3}$$

$$\gamma^{\mathrm{p}} = 0.469 \tag{30.4}$$

$$h = 0.573 \tag{30.5}$$

$$\lambda^{\mathrm{w}} = 0.5 \tag{30.6}$$

$$\omega = 1 \tag{30.7}$$

$$\psi = 0.169 \tag{30.8}$$

$$r^{\pi} = 1.684 \tag{30.9}$$

$$r^{\mathrm{Y}} = 0.099 \tag{30.10}$$

$$r^{\Delta^{\pi}} = 0.14 \tag{30.11}$$

$$r^{\Delta^{\mathrm{y}}} = 0.159 \tag{30.12}$$

$$\rho = 0.961 \tag{30.13}$$

$$\rho^{\mathrm{b}} = 0.855 \tag{30.14}$$

$$\rho^{\mathrm{L}} = 0.889 \tag{30.15}$$

$$\rho^{\mathrm{I}} = 0.927 \tag{30.16}$$

$$\rho^{\mathrm{a}} = 0.823 \tag{30.17}$$

$$\rho^{\mathrm{G}} = 0.949 \tag{30.18}$$

$$\rho^{\pi^{\mathrm{bar}}} = 0.924 \tag{30.19}$$

$$\sigma^{\mathrm{c}} = 1.353 \tag{30.20}$$

$$\sigma^{\mathrm{l}} = 2.4 \tag{30.21}$$

$$\tau = 0.025 \tag{30.22}$$

$$\varphi = 6.771 \tag{30.23}$$

$$\xi^{\mathrm{w}} = 0.737 \tag{30.24}$$

$$\xi^{\mathrm{p}} = 0.908 \tag{30.25}$$

31 Steady-state values

	Steady-state value
ϵ^{G}	1
ϵ^{b}	1
ϵ^{L}	1
ϵ^{I}	1
ϵ^{a}	1
f^1	8.7708
f^2	8.7708
g^1	48.8253
g^2	35.7045
mc	0.7313
mc^{f}	0.7313
ν^{w}	1
ν^{p}	1
π	1
$\pi^\star$	1
π^{obj}	1
q	2.4577
q^{f}	2.4577
r^{k}	0.0351
$r^{\mathrm{k}^{\mathrm{f}}}$	0.0351
$w^\star$	1.1227
z	1
z^{f}	1
C	1.2049
C^{f}	1.2049
G	0.3615
G^{f}	0.3615
I	0.4418
I^{f}	0.4418
K	17.6712
K^{f}	17.6712
L	1.2891
L^{s}	1.2891
$L^{\mathrm{s}^{\mathrm{f}}}$	1.2891
L^{f}	1.2891
$P^{\mathrm{j}^{\mathrm{f}}}$	1
$\Pi^{\mathrm{ws}^{\mathrm{f}}}$	0.4824
$\Pi^{\mathrm{ps}^{\mathrm{f}}}$	0.5396
Q	1
Q^{f}	1
R	1.0101
R^{f}	1.0101
T	0.3615
T^{f}	0.3615
U	-427.937
U^{f}	-427.937
W	1.1227
$W^{\mathrm{disutil}^{\mathrm{f}}}$	0.7485
$W^{\mathrm{i}^{\mathrm{f}}}$	1.1227
W^{f}	1.1227
Y	2.0081
Y^{f}	2.0081
Y^{s}	2.0081
$Y^{\mathrm{s}^{\mathrm{f}}}$	2.0081

32 The solution of the 1st order perturbation

Matrix P

	$\epsilon^{\mathrm{G}}_{t-1}$	$\epsilon^{\mathrm{b}}_{t-1}$	$\epsilon^{\mathrm{L}}_{t-1}$	$\epsilon^{\mathrm{I}}_{t-1}$	$\epsilon^{\mathrm{a}}_{t-1}$	ν^{w}_{t-1}	ν^{p}_{t-1}	π_{t-1}	π^{obj}_{t-1}	C_{t-1}	C^{f}_{t-1}	I_{t-1}
ϵ^{G}_t	0.949	0	0	0	0	0	0	0	0	0	0	0
ϵ^{b}_t	0	0.855	0	0	0	0	0	0	0	0	0	0
ϵ^{L}_t	0	0	0.889	0	0	0	0	0	0	0	0	0
ϵ^{I}_t	0	0	0	0.927	0	0	0	0	0	0	0	0
ϵ^{a}_t	0	0	0	0	0.823	0	0	0	0	0	0	0
ν^{w}_t	0	0	0	0	0	0.737	0	0	0	0	0	0
ν^{p}_t	0	0	0	0	0	0	0.908	0	0	0	0	0
π_t	0.0024	0.0073	0.0041	−0.0067	−0.0394	0	0.0228	0.4946	0.1645	0.0019	−0.0003	0.003
π^{obj}_t	0	0	0	0	0	0	0	0	0.924	0	0	0
C_t	−0.0324	0.1846	−0.0529	0.0399	0.2119	0	−0.0342	0.144	0.4554	0.5364	0.0163	−0.0377
C^{f}_t	−0.0775	0.0319	−0.1757	0.0293	0.7993	0	0	0	0	0	0.4108	0
I_t	−0.0366	−0.1263	−0.0776	−0.2809	0.2914	0	−0.0118	0.1232	0.7412	−0.023	0.0055	0.8715
I^{f}_t	−0.0763	−0.288	−0.1823	−0.2646	0.7367	0	0	0	0	0	−0.0965	0
K_t	−0.0009	−0.0032	−0.0019	−0.007	0.0073	0	−0.0003	0.0031	0.0185	−0.0006	0.0001	0.0218
K^{f}_t	−0.0019	−0.0072	−0.0046	−0.0066	0.0184	0	0	0	0	0	−0.0024	0
R_t	0.008	0.0277	0.0205	−0.0006	−0.1412	0	0.0372	0.0274	0.0918	0.0649	−0.0429	0.035
W_t	0.0058	0.0265	0.0177	−0.0043	0.0069	0	0.0672	0.2413	0.1275	0.0108	0.0007	0.0083
Y_t	0.1797	0.1096	−0.0565	−0.0481	−0.0432	0	0.209	0.1993	0.5734	0.3967	0.0139	0.2124
Y^{f}_t	0.1324	−0.0545	−0.1792	−0.05	0.7899	0	0	0	0	0	0.2773	0

Matrix Q

	η^{b}	η^{L}	η^{I}	η^{w}	η^{a}	η^{p}	η^{G}	η^{R}	η^{π}
ϵ^{G}	0	0	0	0	0	0	1	0	0
ϵ^{b}	1	0	0	0	0	0	0	0	0
ϵ^{L}	0	−1	0	0	0	0	0	0	0
ϵ^{I}	0	0	1	0	0	0	0	0	0
ϵ^{a}	0	0	0	0	1	0	0	0	0
ν^{w}	0	0	0	0	0	0	0	0	0
ν^{p}	0	0	0	0	0	0	0	0	0
π	0.0085	−0.0046	−0.0072	0.0002	−0.0478	0.0019	0.0025	−0.4977	0.178
π^{obj}	0	0	0	0	0	0	0	0	1
C	0.2159	0.0595	0.043	−0.0001	0.2575	−0.0001	−0.0341	−2.3545	0.4928
C^{f}	0.0373	0.1977	0.0316	0	0.9712	0	−0.0816	0	0
I	−0.1477	0.0873	−0.303	−0.0001	0.3541	−0.0006	−0.0386	−3.5517	0.8022
I^{f}	−0.3369	0.2051	−0.2854	0	0.8952	0	−0.0804	0	0
K	−0.0037	0.0022	−0.0076	0	0.0089	0	−0.001	−0.0888	0.0201
K^{f}	−0.0084	0.0051	−0.0071	0	0.0224	0	−0.002	0	0
R	0.0324	−0.0231	−0.0007	0.0002	−0.1716	0.0002	0.0085	0.4614	0.0993
W	0.031	−0.0199	−0.0046	0.0042	0.0084	−0.002	0.0061	−0.6233	0.1379
Y	0.1282	0.0635	−0.0519	0.001	−0.0525	−0.0007	0.1894	−2.8795	0.6206
Y^{f}	−0.0637	0.2015	−0.054	0	0.9598	0	0.1395	0	0

Matrix R

	$\epsilon^{\mathrm{G}}_{t-1}$	$\epsilon^{\mathrm{b}}_{t-1}$	$\epsilon^{\mathrm{L}}_{t-1}$	$\epsilon^{\mathrm{I}}_{t-1}$	$\epsilon^{\mathrm{a}}_{t-1}$	ν^{w}_{t-1}	ν^{p}_{t-1}	π_{t-1}	π^{obj}_{t-1}	C_{t-1}	C^{f}_{t-1}
f^1_t	0.1646	0.206	0.0045	−0.2276	−0.7571	0	0.5698	0.1379	−0.6135	0.1277	−0.0153
f^2_t	0.1646	0.206	0.0045	−0.2276	−0.7571	0	0.5698	0.1379	−0.6135	0.1277	−0.0153
g^1_t	0.2158	0.364	0.1053	−0.4043	−0.7294	0	0.6712	0.5495	4.9089	0.1393	−0.0119
g^2_t	0.2158	0.364	0.1053	−0.4043	−0.7294	0	0.6712	0.5495	4.9089	0.1393	−0.0119
mc_t	0.0101	0.0229	0.0111	−0.0047	−0.8567	0	0.0851	0.183	0.1117	0.0207	0.001
mc^{f}_t	0	0	0	0	0	0	0	0	0	0	0
$\pi^\star_t$	0.0236	0.0718	0.0402	−0.0656	−0.3884	0	0.2248	0.253	1.6235	0.0191	−0.0031
q_t	0.0648	0.0955	0.0581	0.0073	−0.1656	0	0.1344	−0.0042	−0.5062	0.0056	0.0014
q^{f}_t	0.0745	0.1365	0.0808	−0.016	−0.2258	0	0	0	0	0	0.0132
r^{k}_t	0.0199	0.0146	−0.0042	−0.0056	−0.1283	0	0.127	0.0469	0.075	0.0437	0.0016
$r^{\mathrm{k^f}}_t$	0.0136	−0.0056	−0.0184	−0.0051	0.0811	0	0	0	0	0	0.0285
$w^\star_t$	0.0289	0.1212	0.0786	−0.0349	−0.0841	0	0.3193	0.1656	0.9456	0.0466	0.0018
z_t	0.1178	0.0862	−0.0248	−0.0333	−0.7591	0	0.7515	0.2776	0.444	0.2587	0.0092
z^{f}_t	0.0804	−0.0331	−0.1089	−0.0304	0.4799	0	0	0	0	0	0.1685
G_t	0.949	0	0	0	0	0	0	0	0	0	0
G^{f}_t	0.949	0	0	0	0	0	0	0	0	0	0
L_t	0.1319	0.0743	−0.0467	−0.0346	−0.8942	0	0.8113	0.0832	0.3915	0.2916	0.0101
L^{s}_t	0.1319	0.0743	−0.0467	−0.0346	−0.8942	0.737	0.8113	0.0832	0.3915	0.2916	0.0101
$L^{\mathrm{s^f}}_t$	0.0999	−0.0411	−0.1351	−0.0377	−0.5799	0	0	0	0	0	0.2091
L^{f}_t	0.0999	−0.0411	−0.1351	−0.0377	−0.5799	0	0	0	0	0	0.2091
$P^{\mathrm{j^f}}_t$	0	0	0	0	0	0	0	0	0	0	0
$\Pi^{\mathrm{ws^f}}_t$	0.094	−0.0387	−0.1272	−0.0355	0.561	0	0	0	0	0	0.1969
$\Pi^{\mathrm{ps^f}}_t$	0.1324	−0.0545	−0.1792	−0.05	0.7899	0	0	0	0	0	0.2773
Q_t	−0.0378	−0.1746	−0.1096	0.1337	0.5059	0	0.0261	0.4521	0.9367	−0.1103	0.0532
Q^{f}_t	−0.171	−0.6175	−0.476	0.0768	2.307	0	0	0	0	0	−0.5009
R^{f}_t	0.0733	0.1721	0.2023	0.0509	−1.0618	0	0	0	0	0	0.3294
T_t	0.949	0	0	0	0	0	0	0	0	0	0
T^{f}_t	0.949	0	0	0	0	0	0	0	0	0	0
U_t	−0.0147	−0.0561	−0.0122	−0.0026	0.0335	−0.0151	−0.0454	0.0017	0.0154	−0.004	0
U^{f}_t	−0.0149	−0.0568	−0.0126	−0.0019	0.0364	0	0	0	0	0	−0.0041
$W^{\mathrm{disutil^f}}_t$	−0.0058	0.0024	0.0079	0.0022	1.141	0	0	0	0	0	−0.0122
$W^{\mathrm{i^f}}_t$	−0.0058	0.0024	0.0079	0.0022	1.141	0	0	0	0	0	−0.0122
W^{f}_t	−0.0058	0.0024	0.0079	0.0022	1.141	0	0	0	0	0	−0.0122
Y^{s}_t	0.1797	0.1096	−0.0565	−0.0481	−0.0432	0	1.117	0.1993	0.5734	0.3967	0.0139
$Y^{\mathrm{s^f}}_t$	0.1324	−0.0545	−0.1792	−0.05	0.7899	0	0	0	0	0	0.2773

Matrix S

	η^{b}	η^{L}	η^{I}	η^{w}	η^{a}	η^{p}	η^{G}	η^{R}	η^{π}
f^1	0.2409	−0.0051	−0.2456	−0.0239	−0.9199	−0.001	0.1734	3.2101	−0.6639
f^2	0.2409	−0.0051	−0.2456	−0.1379	−0.9199	−0.001	0.1734	3.2101	−0.6639
g^1	0.4258	−0.1185	−0.4361	0.0029	−0.8863	0.0163	0.2274	−14.0411	5.3127
g^2	0.4258	−0.1185	−0.4361	0.0029	−0.8863	−0.0042	0.2274	−14.0411	5.3127
mc	0.0268	−0.0125	−0.0051	0.0031	−1.0409	−0.0015	0.0106	−0.5488	0.1209
mc^{f}	0	0	0	0	0	0	0	0	0
$\pi^{\star}$	0.084	−0.0452	−0.0708	0.0016	−0.472	0.0189	0.0249	−4.9118	1.757
q	0.1117	−0.0654	0.0079	0.0003	−0.2013	0.0004	0.0682	1.8211	−0.5478
q^{f}	0.1596	−0.0909	−0.0172	0	−0.2743	0	0.0785	0	0
r^{k}	0.017	0.0047	−0.0061	0.0005	−0.1559	−0.0003	0.021	−0.375	0.0812
$r^{\mathrm{k^f}}$	−0.0065	0.0207	−0.0055	0	0.0985	0	0.0143	0	0
$w^{\star}$	0.1418	−0.0884	−0.0377	0.0165	−0.1022	−0.0023	0.0304	−3.7644	1.0233
z	0.1008	0.0279	−0.0359	0.0032	−0.9223	−0.0017	0.1241	−2.2189	0.4805
z^{f}	−0.0387	0.1224	−0.0328	0	0.5831	0	0.0848	0	0
G	0	0	0	0	0	0	1	0	0
G^{f}	0	0	0	0	0	0	1	0	0
L	0.0869	0.0525	−0.0373	−0.0004	−1.0865	0	0.1389	−1.9706	0.4237
L^{s}	0.0869	0.0525	−0.0373	−0.0004	−1.0865	0	0.1389	−1.9706	0.4237
$L^{\mathrm{s^f}}$	−0.048	0.152	−0.0407	0	−0.7047	0	0.1052	0	0
L^{f}	−0.048	0.152	−0.0407	0	−0.7047	0	0.1052	0	0
$P^{\mathrm{j^f}}$	0	0	0	0	0	0	0	0	0
$\Pi^{\mathrm{ws^f}}$	−0.0452	0.1431	−0.0383	0	0.6817	0	0.0991	0	0
$\Pi^{\mathrm{ps^f}}$	−0.0637	0.2015	−0.054	0	0.9598	0	0.1395	0	0
Q	−0.2042	0.1233	0.1442	0.0002	0.6147	0	−0.0399	−5.6394	1.0138
Q^{f}	−0.7223	0.5354	0.0829	0	2.8032	0	−0.1802	0	0
R^{f}	0.2013	−0.2275	0.0549	0	−1.2901	0	0.0773	0	0
T	0	0	0	0	0	0	1	0	0
T^{f}	0	0	0	0	0	0	1	0	0
U	−0.0656	0.0137	−0.0028	0	0.0407	0	−0.0155	−0.0476	0.0167
U^{f}	−0.0664	0.0142	−0.0021	0	0.0442	0	−0.0157	0	0
$W^{\mathrm{disutil^f}}$	0.0028	−0.0089	0.0024	0	1.3863	0	−0.0061	0	0
$W^{\mathrm{i^f}}$	0.0028	−0.0089	0.0024	0	1.3863	0	−0.0061	0	0
W^{f}	0.0028	−0.0089	0.0024	0	1.3863	0	−0.0061	0	0
Y^{s}	0.1282	0.0635	−0.0519	0.001	−0.0525	−0.0007	0.1894	−2.8795	0.6206
$Y^{\mathrm{s^f}}$	−0.0637	0.2015	−0.054	0	0.9598	0	0.1395	0	0

33 Model statistics

33.1 Basic statistics

	Steady-state value	Std. dev.	Variance	Loglin
q	2.4577	0.3662	0.1341	Y
π	1	0.1145	0.0131	Y
r^{k}	0.0351	0.152	0.0231	Y
z	1	0.8992	0.8086	Y
C	1.2049	0.7154	0.5118	Y
G	0.3615	0.4236	0.1794	Y
I	0.4418	1.8279	3.3412	Y
K	17.6712	0.2275	0.0518	Y
L	1.2891	0.9894	0.9788	Y
Q	1	0.9374	0.8786	Y
R	1.0101	0.2153	0.0464	Y
W	1.1227	0.3847	0.148	Y
T	0.3615	0.4236	0.1794	Y
Y	2.0081	0.9158	0.8387	Y

33.2 Correlation matrix

	π	q	r^{k}	z	C	G	I	K	L	Q	R	T	W	Y
π	1	0.067	0.676	0.676	0.021	0.015	0.173	0.099	0.466	-0.047	0.594	0.015	0.688	0.292
q		1	-0.205	-0.205	-0.842	0.077	-0.591	0.229	-0.226	-0.91	0.771	0.077	0.23	-0.71
r^{k}			1	1	0.329	0.05	0.461	-0.058	0.93	0.056	0.33	0.05	0.249	0.664
z				1	0.329	0.05	0.461	-0.058	0.93	0.056	0.33	0.05	0.249	0.664
C					1	-0.032	0.663	-0.325	0.3	0.797	-0.666	-0.032	-0.151	0.857
G						1	-0.013	0.014	0.052	-0.018	0.021	1	0.015	0.078
I							1	0.223	0.465	0.326	-0.23	-0.013	0.078	0.889
K								1	0.048	-0.493	0.426	0.014	0.297	-0.071
L									1	0.002	0.263	0.052	-0.058	0.631
Q										1	-0.822	-0.018	-0.192	0.532
R											1	0.021	0.51	-0.311
T												1	0.015	0.078
W													1	0.04
Y														1

33.3 Autocorrelations

	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
π	0.881	0.675	0.452	0.245	0.067
q	0.67	0.408	0.204	0.049	-0.064
r^{k}	0.741	0.516	0.326	0.167	0.037
z	0.741	0.516	0.326	0.167	0.037
C	0.871	0.637	0.384	0.155	-0.034
G	0.713	0.471	0.271	0.109	-0.017
I	0.945	0.818	0.65	0.463	0.276
K	0.98	0.921	0.829	0.71	0.573
L	0.705	0.457	0.253	0.092	-0.032
Q	0.672	0.395	0.179	0.019	-0.096
R	0.771	0.496	0.253	0.062	-0.079
T	0.713	0.471	0.271	0.109	-0.017
W	0.95	0.831	0.669	0.485	0.298
Y	0.905	0.726	0.519	0.314	0.129

33.4 Variance decomposition

	η^{b}	η^{L}	η^{I}	η^{w}	η^{a}	η^{p}	η^{G}	η^{R}	η^{π}
π	0.003	0.109	0	0	0.214	0	0	0.669	0.004
q	0.016	0.599	0	0	0.149	0	0.006	0.229	0.001
r^{k}	0.005	0.109	0	0	0.463	0	0.003	0.419	0.001
z	0.005	0.109	0	0	0.463	0	0.003	0.419	0.001
C	0.046	0.427	0	0	0.214	0	0.001	0.31	0.001
G	0	0	0	0	0	0	1	0	0
I	0.012	0.431	0.003	0	0.178	0	0.001	0.374	0.001
K	0.011	0.44	0.003	0	0.164	0	0.001	0.379	0.001
L	0.003	0.256	0	0	0.569	0	0.003	0.167	0
Q	0.01	0.371	0	0	0.254	0	0	0.363	0.001
R	0.011	0.398	0	0	0.491	0	0	0.099	0
T	0	0	0	0	0	0	1	0	0
W	0.011	0.401	0	0	0.012	0	0	0.573	0.002
Y	0.009	0.408	0	0	0.112	0	0.006	0.462	0.001

34 Impulse response functions

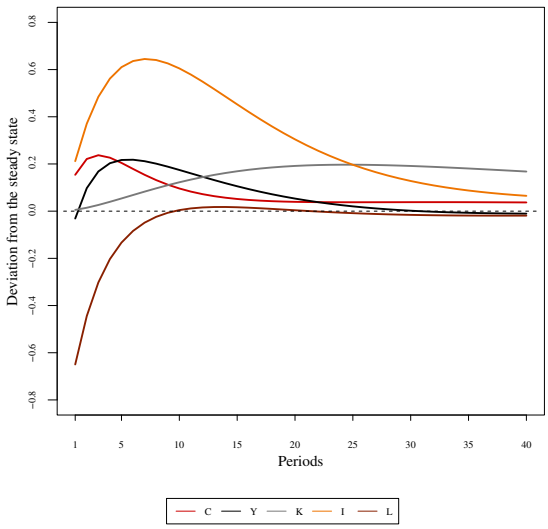

Figure 1: Impulse responses (C, Y, K, I, L) to η^{a} shock

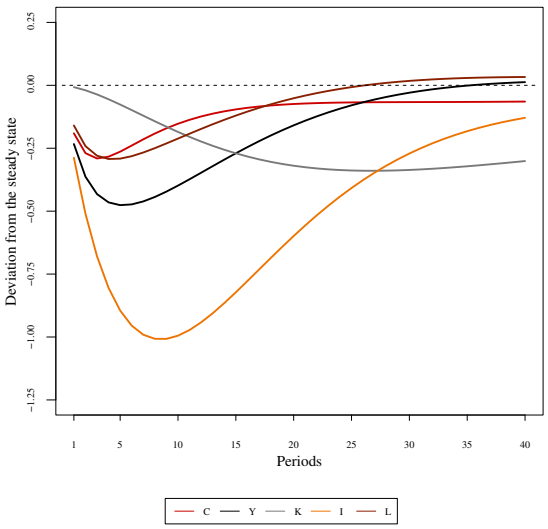

Figure 2: Impulse responses (C, Y, K, I, L) to η^{R} shock