Generated on 2016-11-06 00:21:15 by `gEcon` version 1.0.0 (2016-10-09)
Model name: `SW_03_est`

1 CONSUMER

1.1 Optimisation problem

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

s.t. :

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

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

1.2 Identities

$$H_t = h C_{t-1} \tag{1.4}$$

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

1.3 First order conditions

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

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

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

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

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

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

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

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

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

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

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

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

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

7 CONSUMER FLEXIBLE

7.1 Optimisation problem

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

s.t. :

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

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

7.2 Identities

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

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

7.3 First order conditions

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

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

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

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

$$\lambda^{\mathrm{f}}_{t}\left(K^{\mathrm{f}}_{t-1}r^{\mathrm{k}^{\mathrm{f}}}_{t} - r^{\mathrm{k}^{\mathrm{f}}}_{\mathrm{ss}}K^{\mathrm{f}}_{t-1}e^{\psi\left(-1+z^{\mathrm{f}}_{t}\right)}\right) = 0 \quad \left(z^{\mathrm{f}}_{t}\right) \tag{7.10}$$

$$\lambda^{\mathrm{f}}_{t}W^{\mathrm{disutil}^{\mathrm{f}}}_{t} - \omega\epsilon^{\mathrm{b}}_{t}\epsilon^{\mathrm{L}}_{t}{L^{\mathrm{s}^{\mathrm{f}}}_{t}}^{\sigma^{\mathrm{l}}} = 0 \quad \left(L^{\mathrm{s}^{\mathrm{f}}}_{t}\right) \tag{7.11}$$

8 FLEXIBLE MONOPOLISTIC WORKER

8.1 Optimisation problem

$$\max_{W^{\mathrm{i}^{\mathrm{f}}}_{t},\, L^{\mathrm{i}^{\star\mathrm{f}}}_{t}} \Pi^{\mathrm{ws}^{\mathrm{f}}}_{t} = L^{\mathrm{i}^{\star\mathrm{f}}}_{t}\left(-W^{\mathrm{disutil}^{\mathrm{f}}}_{t} + W^{\mathrm{i}^{\mathrm{f}}}_{t}\right) \tag{8.1}$$

s.t. :

$$L^{\mathrm{i}^{\star\mathrm{f}}}_{t} = L^{\mathrm{f}}_{t}\left(W^{\mathrm{i}^{\mathrm{f}}}_{t}{W^{\mathrm{f}}_{t}}^{-1}\right)^{{\lambda^{\mathrm{w}}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)} \quad \left(\lambda^{\mathrm{FLEXIBLE}^{\mathrm{MONOPOLISTIC}^{\mathrm{WORKER}^{1}}}}_{t}\right) \tag{8.2}$$

8.2 Identities

$$L^{\mathrm{i}^{\star\mathrm{f}}}_{t} = L^{\mathrm{i}^{\mathrm{f}}}_{t} \tag{8.3}$$

8.3 First order conditions

$$L^{\mathrm{i}^{\star\mathrm{f}}}_{t} + {\lambda^{\mathrm{w}}}^{-1}\lambda^{\mathrm{FLEXIBLE}^{\mathrm{MONOPOLISTIC}^{\mathrm{WORKER}^{1}}}}_{t}L^{\mathrm{f}}_{t}{W^{\mathrm{f}}_{t}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)\left(W^{\mathrm{i}^{\mathrm{f}}}_{t}{W^{\mathrm{f}}_{t}}^{-1}\right)^{-1+{\lambda^{\mathrm{w}}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)} = 0 \quad \left(W^{\mathrm{i}^{\mathrm{f}}}_{t}\right) \tag{8.4}$$

$$-\lambda^{\mathrm{FLEXIBLE}^{\mathrm{MONOPOLISTIC}^{\mathrm{WORKER}^{1}}}}_{t} - W^{\mathrm{disutil}^{\mathrm{f}}}_{t} + W^{\mathrm{i}^{\mathrm{f}}}_{t} = 0 \quad \left(L^{\mathrm{i}^{\star\mathrm{f}}}_{t}\right) \tag{8.5}$$

8.4 First order conditions after reduction

$$L^{\mathrm{i}^{\star\mathrm{f}}}_{t} + {\lambda^{\mathrm{w}}}^{-1}L^{\mathrm{f}}_{t}{W^{\mathrm{f}}_{t}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)\left(-W^{\mathrm{disutil}^{\mathrm{f}}}_{t} + W^{\mathrm{i}^{\mathrm{f}}}_{t}\right)\left(W^{\mathrm{i}^{\mathrm{f}}}_{t}{W^{\mathrm{f}}_{t}}^{-1}\right)^{-1+{\lambda^{\mathrm{w}}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)} = 0 \quad \left(W^{\mathrm{i}^{\mathrm{f}}}_{t}\right) \tag{8.6}$$

9 LABOUR AGGREGATION FLEXIBLE

9.1 Identities

$$L^{\mathrm{s}^{\mathrm{f}}}_{t} = L^{\mathrm{i}^{\mathrm{f}}}_{t} \tag{9.1}$$

$$L^{\mathrm{f}}_{t} = L^{\mathrm{s}^{\mathrm{f}}}_{t} \tag{9.2}$$

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

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

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

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

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

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

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

15 PRODUCT AGGREGATION

15.1 Identities

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

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

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

16 FIRM FLEXIBLE

16.1 Optimisation problem

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

s.t. :

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

16.2 First order conditions

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

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

17 PRICE SETTING PROBLEM FLEXIBLE

17.1 Optimisation problem

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

s.t. :

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

17.2 First order conditions

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

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

17.3 First order conditions after reduction

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

18 FACTOR DEMAND AGGREGATION FLEXIBLE

18.1 Identities

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

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

19 PRODUCT AGGREGATION FLEXIBLE

19.1 Identities

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

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

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

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

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

25 EQUILIBRIUM

25.1 Identities

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

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

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

$$Div_t = Y_t - L^{\mathrm{d}}_t W_t - r^{\mathrm{k}}_t K^{\mathrm{d}}_t \tag{25.4}$$

26 EQUILIBRIUM FLEXIBLE

26.1 Identities

$$K^{\mathrm{d^f}}_t = K^{\mathrm{f}}_{t-1} z^{\mathrm{f}}_t \tag{26.1}$$

$$L^{\mathrm{f}}_t = L^{\mathrm{d^f}}_t \tag{26.2}$$

$$B^{\mathrm{f}}_t = 0 \tag{26.3}$$

$$Div^{\mathrm{f}}_t = Y^{\mathrm{f}}_t - L^{\mathrm{d^f}}_t W^{\mathrm{f}}_t - r^{\mathrm{k^f}}_t K^{\mathrm{d^f}}_t \tag{26.4}$$

27 OBSERVATION VARIABLES

27.1 Identities

$$Emp_t = Emp_{t-1} - Emp_t + {\xi^{\mathrm{e}}}^{-1} \left(1 - \xi^{\mathrm{e}}\right) \left(1 - \beta \xi^{\mathrm{e}}\right) \left(-Emp_t + \log\left({L_{\mathrm{ss}}}^{-1} L_t\right)\right) + \mathrm{E}_t\left[Emp_{t+1}\right] \tag{27.1}$$

28 Equilibrium relationships (after reduction)

$$-q_t + \beta \left(\left(1 - \tau\right) \mathrm{E}_t\left[q_{t+1}\right] + \mathrm{E}_t\left[\epsilon^{\mathrm{b}}_{t+1} \left(r^{\mathrm{k}}_{t+1} z_{t+1} - \psi^{-1} r^{\mathrm{k}}_{\mathrm{ss}} \left(-1 + e^{\psi\left(-1 + z_{t+1}\right)}\right)\right) \left(C_{t+1} - h C_t\right)^{-\sigma^{\mathrm{c}}}\right]\right) = 0 \tag{28.1}$$

$$-q^{\mathrm{f}}_t + \beta \left(\left(1 - \tau\right) \mathrm{E}_t\left[q^{\mathrm{f}}_{t+1}\right] + \mathrm{E}_t\left[\epsilon^{\mathrm{b}}_{t+1} \left(r^{\mathrm{k^f}}_{t+1} z^{\mathrm{f}}_{t+1} - \psi^{-1} r^{\mathrm{k^f}}_{\mathrm{ss}} \left(-1 + e^{\psi\left(-1 + z^{\mathrm{f}}_{t+1}\right)}\right)\right) \left(C^{\mathrm{f}}_{t+1} - h C^{\mathrm{f}}_t\right)^{-\sigma^{\mathrm{c}}}\right]\right) = 0 \tag{28.2}$$

$$-r_t^{\mathrm{k}} + \alpha \epsilon_t^{\mathrm{a}} mc_t {L_t}^{1-\alpha} (K_{t-1} z_t)^{-1+\alpha} = 0 \tag{28.3}$$

$$-r_t^{\mathrm{k^f}} + \alpha \epsilon_t^{\mathrm{a}} mc_t^{\mathrm{f}} {L_t^{\mathrm{f}}}^{1-\alpha} \left(K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}}\right)^{-1+\alpha} = 0 \tag{28.4}$$

$$-G_t + T_t = 0 \tag{28.5}$$

$$-G_t + G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} = 0 \tag{28.6}$$

$$-G_t^{\mathrm{f}} + T_t^{\mathrm{f}} = 0 \tag{28.7}$$

$$-G_t^{\mathrm{f}} + G^{\mathrm{bar}} \epsilon_t^{\mathrm{G}} = 0 \tag{28.8}$$

$$-L_t + {\nu_t^{\mathrm{w}}}^{-1} L_t^{\mathrm{s}} = 0 \tag{28.9}$$

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

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

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

$$\Pi_t^{\mathrm{ws^f}} - L_t^{\mathrm{s^f}} \left(-W_t^{\mathrm{disutil^f}} + W_t^{\mathrm{i^f}}\right) = 0 \tag{28.13}$$

$$\Pi_t^{\mathrm{ps^f}} - Y_t^{\mathrm{f}} \left(-mc_t^{\mathrm{f}} + P_t^{\mathrm{j^f}}\right) {P_t^{\mathrm{j^f}}}^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{28.14}$$

$$-Q_t + {\epsilon_t^{\mathrm{b}}}^{-1} q_t (C_t - h C_{t-1})^{\sigma^{\mathrm{c}}} = 0 \tag{28.15}$$

$$-Q_t^{\mathrm{f}} + {\epsilon_t^{\mathrm{b}}}^{-1} q_t^{\mathrm{f}} \left(C_t^{\mathrm{f}} - h C_{t-1}^{\mathrm{f}}\right)^{\sigma^{\mathrm{c}}} = 0 \tag{28.16}$$

$$-W_t + \epsilon_t^{\mathrm{a}} mc_t \left(1 - \alpha\right) {L_t}^{-\alpha} (K_{t-1} z_t)^{\alpha} = 0 \tag{28.17}$$

$$-W_t^{\mathrm{f}} + \epsilon_t^{\mathrm{a}} mc_t^{\mathrm{f}} \left(1 - \alpha\right) {L_t^{\mathrm{f}}}^{-\alpha} \left(K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}}\right)^{\alpha} = 0 \tag{28.18}$$

$$Y_t^{\mathrm{s}} - \nu_t^{\mathrm{p}} Y_t = 0 \tag{28.19}$$

$$-Y_t^{\mathrm{f}} + Y_t^{\mathrm{s}^{\mathrm{f}}} = 0 \tag{28.20}$$

$$-Y_t^{\mathrm{s}^{\mathrm{f}}} + Y_t^{\mathrm{f}} {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{28.21}$$

$$\beta \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{b}} \left(C_{t+1}^{\mathrm{f}} - hC_t^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}}\right] - \epsilon_t^{\mathrm{b}} {R_t^{\mathrm{f}}}^{-1} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{28.22}$$

$$\beta \mathrm{E}_t \left[\epsilon_{t+1}^{\mathrm{b}} {\pi_{t+1}}^{-1} (C_{t+1} - hC_t)^{-\sigma^{\mathrm{c}}}\right] - \epsilon_t^{\mathrm{b}} {R_t}^{-1} (C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} = 0 \tag{28.23}$$

$$Y_t^{\mathrm{f}} {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} - {\lambda^{\mathrm{p}}}^{-1} Y_t^{\mathrm{f}} \left(1+\lambda^{\mathrm{p}}\right) \left(-mc_t^{\mathrm{f}} + P_t^{\mathrm{j}^{\mathrm{f}}}\right) {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-1-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{28.24}$$

$$\epsilon_t^{\mathrm{b}} W_t^{\mathrm{disutil}^{\mathrm{f}}} \left(C_t^{\mathrm{f}} - hC_{t-1}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} - \omega \epsilon_t^{\mathrm{b}} \epsilon_t^{\mathrm{L}} {L_t^{\mathrm{s}^{\mathrm{f}}}}^{\sigma^{\mathrm{l}}} = 0 \tag{28.25}$$

$$-1 + \xi^{\mathrm{p}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{p}}}\right)^{-{\lambda^{\mathrm{p}}}^{-1}} + \left(1-\xi^{\mathrm{p}}\right) {\pi_t^{\star}}^{-{\lambda^{\mathrm{p}}}^{-1}} = 0 \tag{28.26}$$

$$-1 + \left(1-\xi^{\mathrm{w}}\right) \left(w_t^{\star} {W_t}^{-1}\right)^{-{\lambda^{\mathrm{w}}}^{-1}} + \xi^{\mathrm{w}} \left(W_{t-1} {W_t}^{-1}\right)^{-{\lambda^{\mathrm{w}}}^{-1}} \left({\pi_t}^{-1} {\pi_{t-1}}^{\gamma^{\mathrm{w}}}\right)^{-{\lambda^{\mathrm{w}}}^{-1}} = 0 \tag{28.27}$$

$$-\Phi - Y_t^{\mathrm{s}} + \epsilon_t^{\mathrm{a}} {L_t}^{1-\alpha} (K_{t-1} z_t)^{\alpha} = 0 \tag{28.28}$$

$$-\Phi - Y_t^{\mathrm{f}} {P_t^{\mathrm{j}^{\mathrm{f}}}}^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} + \epsilon_t^{\mathrm{a}} {L_t^{\mathrm{f}}}^{1-\alpha} \left(K_{t-1}^{\mathrm{f}} z_t^{\mathrm{f}}\right)^{\alpha} = 0 \tag{28.29}$$

$$\eta_t^{\mathrm{b}} - \log \epsilon_t^{\mathrm{b}} + \rho^{\mathrm{b}} \log \epsilon_{t-1}^{\mathrm{b}} = 0 \tag{28.30}$$

$$-\eta_t^{\mathrm{L}} - \log \epsilon_t^{\mathrm{L}} + \rho^{\mathrm{L}} \log \epsilon_{t-1}^{\mathrm{L}} = 0 \tag{28.31}$$

$$\eta_t^{\mathrm{I}} - \log \epsilon_t^{\mathrm{I}} + \rho^{\mathrm{I}} \log \epsilon_{t-1}^{\mathrm{I}} = 0 \tag{28.32}$$

$$\eta_t^{\mathrm{a}} - \log \epsilon_t^{\mathrm{a}} + \rho^{\mathrm{a}} \log \epsilon_{t-1}^{\mathrm{a}} = 0 \tag{28.33}$$

$$\eta^{\mathrm{G}}_t - \log\epsilon^{\mathrm{G}}_t + \rho^{\mathrm{G}}\log\epsilon^{\mathrm{G}}_{t-1} = 0 \tag{28.34}$$

$$-f^1_t + f^2_t + \mathit{scale}^{\mathrm{factor}^{\mathrm{w}}}\eta^{\mathrm{w}}_t = 0 \tag{28.35}$$

$$-f^1_t + \beta\xi^{\mathrm{w}}\mathrm{E}_t\left[f^1_{t+1}\left({w^\star_t}^{-1}w^\star_{t+1}\right)^{\lambda^{\mathrm{w}^{-1}}}\left({\pi_{t+1}}^{-1}{\pi_t}^{\gamma^{\mathrm{w}}}\right)^{-\lambda^{\mathrm{w}^{-1}}}\right] + \epsilon^{\mathrm{b}}_t w^\star_t L_t\left(1+\lambda^{\mathrm{w}}\right)^{-1}\left(C_t - hC_{t-1}\right)^{-\sigma^{\mathrm{c}}}\left(w^\star_t {W_t}^{-1}\right)^{-\lambda^{\mathrm{w}^{-1}}(1+\lambda^{\mathrm{w}})} = 0 \tag{28.36}$$

$$-f^2_t + \beta\xi^{\mathrm{w}}\mathrm{E}_t\left[f^2_{t+1}\left({w^\star_t}^{-1}w^\star_{t+1}\right)^{\lambda^{\mathrm{w}^{-1}}(1+\lambda^{\mathrm{w}})\left(1+\sigma^{\mathrm{l}}\right)}\left({\pi_{t+1}}^{-1}{\pi_t}^{\gamma^{\mathrm{w}}}\right)^{-\lambda^{\mathrm{w}^{-1}}(1+\lambda^{\mathrm{w}})\left(1+\sigma^{\mathrm{l}}\right)}\right] + \omega\epsilon^{\mathrm{b}}_t\epsilon^{\mathrm{L}}_t\left(L_t\left(w^\star_t {W_t}^{-1}\right)^{-\lambda^{\mathrm{w}^{-1}}(1+\lambda^{\mathrm{w}})}\right)^{1+\sigma^{\mathrm{l}}} = 0 \tag{28.37}$$

$$-g^1_t + \mathit{scale}^{\mathrm{factor}^{\mathrm{p}}}\eta^{\mathrm{p}}_t + g^2_t\left(1+\lambda^{\mathrm{p}}\right) = 0 \tag{28.38}$$

$$-g^1_t + \beta\xi^{\mathrm{p}}\pi^\star_t\mathrm{E}_t\left[g^1_{t+1}{\pi^\star_{t+1}}^{-1}\left({\pi_{t+1}}^{-1}{\pi_t}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}^{-1}}}\right] + \epsilon^{\mathrm{b}}_t\pi^\star_t Y_t(C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} = 0 \tag{28.39}$$

$$-g^2_t + \beta\xi^{\mathrm{p}}\mathrm{E}_t\left[g^2_{t+1}\left({\pi_{t+1}}^{-1}{\pi_t}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}^{-1}}(1+\lambda^{\mathrm{p}})}\right] + \epsilon^{\mathrm{b}}_t mc_t Y_t(C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} = 0 \tag{28.40}$$

$$-\nu^{\mathrm{w}}_t + \left(1-\xi^{\mathrm{w}}\right)\left(w^\star_t {W_t}^{-1}\right)^{-\lambda^{\mathrm{w}^{-1}}(1+\lambda^{\mathrm{w}})} + \xi^{\mathrm{w}}\nu^{\mathrm{w}}_{t-1}\left(W_{t-1}{\pi_t}^{-1}{W_t}^{-1}{\pi_{t-1}}^{\gamma^{\mathrm{w}}}\right)^{-\lambda^{\mathrm{w}^{-1}}(1+\lambda^{\mathrm{w}})} = 0 \tag{28.41}$$

$$-\nu^{\mathrm{p}}_t + \left(1-\xi^{\mathrm{p}}\right){\pi^\star_t}^{-\lambda^{\mathrm{p}^{-1}}(1+\lambda^{\mathrm{p}})} + \xi^{\mathrm{p}}\nu^{\mathrm{p}}_{t-1}\left({\pi_t}^{-1}{\pi_{t-1}}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}^{-1}}(1+\lambda^{\mathrm{p}})} = 0 \tag{28.42}$$

$$-K_t + K_{t-1}\left(1-\tau\right) + I_t\left(1 - 0.5\varphi\left(-1 + {I_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I_t\right)^2\right) = 0 \tag{28.43}$$

$$-K^{\mathrm{f}}_t + K^{\mathrm{f}}_{t-1}\left(1-\tau\right) + I^{\mathrm{f}}_t\left(1 - 0.5\varphi\left(-1 + {I^{\mathrm{f}}_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I^{\mathrm{f}}_t\right)^2\right) = 0 \tag{28.44}$$

$$U_t - \beta\mathrm{E}_t\left[U_{t+1}\right] - \epsilon^{\mathrm{b}}_t\left(\left(1-\sigma^{\mathrm{c}}\right)^{-1}\left(C_t - hC_{t-1}\right)^{1-\sigma^{\mathrm{c}}} - \omega\epsilon^{\mathrm{L}}_t\left(1+\sigma^{\mathrm{l}}\right)^{-1}{L^{\mathrm{s}}_t}^{1+\sigma^{\mathrm{l}}}\right) = 0 \tag{28.45}$$

$$U^{\mathrm{f}}_t - \beta\mathrm{E}_t\left[U^{\mathrm{f}}_{t+1}\right] - \epsilon^{\mathrm{b}}_t\left(\left(1-\sigma^{\mathrm{c}}\right)^{-1}\left(C^{\mathrm{f}}_t - hC^{\mathrm{f}}_{t-1}\right)^{1-\sigma^{\mathrm{c}}} - \omega\epsilon^{\mathrm{L}}_t\left(1+\sigma^{\mathrm{l}}\right)^{-1}{L^{\mathrm{s}^{\mathrm{f}}}_t}^{1+\sigma^{\mathrm{l}}}\right) = 0 \tag{28.46}$$

$$-\epsilon^{\mathrm{b}}_t(C_t - hC_{t-1})^{-\sigma^{\mathrm{c}}} + q_t\left(1 - 0.5\varphi\left(-1 + {I_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I_t\right)^2 - \varphi {I_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I_t\left(-1 + {I_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I_t\right)\right) + \beta\varphi {I_t}^{-2}\mathrm{E}_t\left[\epsilon^{\mathrm{I}}_{t+1} q_{t+1} {I_{t+1}}^2\left(-1 + {I_t}^{-1}\epsilon^{\mathrm{I}}_{t+1} I_{t+1}\right)\right] = 0 \tag{28.47}$$

$$-\epsilon^{\mathrm{b}}_t\left(C^{\mathrm{f}}_t - hC^{\mathrm{f}}_{t-1}\right)^{-\sigma^{\mathrm{c}}} + q^{\mathrm{f}}_t\left(1 - 0.5\varphi\left(-1 + {I^{\mathrm{f}}_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I^{\mathrm{f}}_t\right)^2 - \varphi {I^{\mathrm{f}}_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I^{\mathrm{f}}_t\left(-1 + {I^{\mathrm{f}}_{t-1}}^{-1}\epsilon^{\mathrm{I}}_t I^{\mathrm{f}}_t\right)\right) + \beta\varphi {I^{\mathrm{f}}_t}^{-2}\mathrm{E}_t\left[\epsilon^{\mathrm{I}}_{t+1} q^{\mathrm{f}}_{t+1} {I^{\mathrm{f}}_{t+1}}^2\left(-1 + {I^{\mathrm{f}}_t}^{-1}\epsilon^{\mathrm{I}}_{t+1} I^{\mathrm{f}}_{t+1}\right)\right] = 0 \tag{28.48}$$

$$\mathit{Emp}_{t-1} - 2\mathit{Emp}_t + \xi^{\mathrm{e}-1}\left(1-\xi^{\mathrm{e}}\right)\left(1-\beta\xi^{\mathrm{e}}\right)\left(-\mathit{Emp}_t + \log\left({L_{\mathrm{ss}}}^{-1}L_t\right)\right) + \mathrm{E}_t\left[\mathit{Emp}_{t+1}\right] = 0 \tag{28.49}$$

$$\eta^{\pi}_t - \log\pi^{\mathrm{obj}}_t + \rho^{\pi^{\mathrm{bar}}}\log\pi^{\mathrm{obj}}_{t-1} + \log\mathit{calibr}^{\pi^{\mathrm{obj}}}\left(1-\rho^{\pi^{\mathrm{bar}}}\right) = 0 \tag{28.50}$$

$$-C_t - I_t - T_t + Y_t - \psi^{-1}r^{\mathrm{k}}_{\mathrm{ss}}K_{t-1}\left(-1+e^{\psi\left(-1+z_t\right)}\right) = 0 \tag{28.51}$$

$$-\mathit{calibr}^{\pi} + \eta^{\mathrm{R}}_t - \log\left({R_{\mathrm{ss}}}^{-1}R_t\right) + r^{\Delta^{\pi}}\left(-\log\left({\pi_{\mathrm{ss}}}^{-1}\pi_{t-1}\right) + \log\left({\pi_{\mathrm{ss}}}^{-1}\pi_t\right)\right) + r^{\Delta^{\mathrm{y}}}\left(-\log\left({Y_{\mathrm{ss}}}^{-1}Y_{t-1}\right) + \log\left({Y_{\mathrm{ss}}}^{-1}Y_t\right) + \log\left({Y^{\mathrm{f}}_{\mathrm{ss}}}^{-1}Y^{\mathrm{f}}_{t-1}\right) - \log\left({Y^{\mathrm{f}}_{\mathrm{ss}}}^{-1}Y^{\mathrm{f}}_t\right)\right) + \rho\log\left({R_{\mathrm{ss}}}^{-1}R_{t-1}\right) + \left(1-\rho\right)\left(\log \right. \tag{28.52}$$

$$-C^{\mathrm{f}}_t - I^{\mathrm{f}}_t + \Pi^{\mathrm{ws^f}}_t - T^{\mathrm{f}}_t + Y^{\mathrm{f}}_t + L^{\mathrm{s^f}}_t W^{\mathrm{disutil^f}}_t - L^{\mathrm{f}}_t W^{\mathrm{f}}_t - \psi^{-1}r^{\mathrm{k^f}}_{\mathrm{ss}}K^{\mathrm{f}}_{t-1}\left(-1+e^{\psi\left(-1+z^{\mathrm{f}}_t\right)}\right) = 0 \tag{28.53}$$

$$\epsilon^{\mathrm{b}}_t\left(K_{t-1}r^{\mathrm{k}}_t - r^{\mathrm{k}}_{\mathrm{ss}}K_{t-1}e^{\psi\left(-1+z_t\right)}\right)\left(C_t - hC_{t-1}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{28.54}$$

$$\epsilon^{\mathrm{b}}_t\left(K^{\mathrm{f}}_{t-1}r^{\mathrm{k^f}}_t - r^{\mathrm{k^f}}_{\mathrm{ss}}K^{\mathrm{f}}_{t-1}e^{\psi\left(-1+z^{\mathrm{f}}_t\right)}\right)\left(C^{\mathrm{f}}_t - hC^{\mathrm{f}}_{t-1}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{28.55}$$

29 Steady state relationships (after reduction)

$$-\xi^{\mathrm{e}-1}\mathit{Emp}_{\mathrm{ss}}\left(1-\xi^{\mathrm{e}}\right)\left(1-\beta\xi^{\mathrm{e}}\right) = 0 \tag{29.1}$$

$$-\mathit{calibr}^{\pi} + \left(1-\rho\right)\left(\log\pi^{\mathrm{obj}}_{\mathrm{ss}} - r^{\pi}\log\pi^{\mathrm{obj}}_{\mathrm{ss}}\right) = 0 \tag{29.2}$$

$$-f^{1}_{\mathrm{ss}} + f^{2}_{\mathrm{ss}} = 0 \tag{29.3}$$

$$-g^{1}_{\mathrm{ss}} + g^{2}_{\mathrm{ss}}\left(1+\lambda^{\mathrm{p}}\right) = 0 \tag{29.4}$$

$$-q_{\mathrm{ss}} + \beta\left(q_{\mathrm{ss}}\left(1-\tau\right) + \epsilon^{\mathrm{b}}_{\mathrm{ss}}\left(r^{\mathrm{k}}_{\mathrm{ss}}z_{\mathrm{ss}} - \psi^{-1}r^{\mathrm{k}}_{\mathrm{ss}}\left(-1+e^{\psi\left(-1+z_{\mathrm{ss}}\right)}\right)\right)\left(C_{\mathrm{ss}} - hC_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}}\right) = 0 \tag{29.5}$$

$$-q^{\mathrm{f}}_{\mathrm{ss}} + \beta\left(q^{\mathrm{f}}_{\mathrm{ss}}\left(1-\tau\right) + \epsilon^{\mathrm{b}}_{\mathrm{ss}}\left(r^{\mathrm{k^f}}_{\mathrm{ss}}z^{\mathrm{f}}_{\mathrm{ss}} - \psi^{-1}r^{\mathrm{k^f}}_{\mathrm{ss}}\left(-1+e^{\psi\left(-1+z^{\mathrm{f}}_{\mathrm{ss}}\right)}\right)\right)\left(C^{\mathrm{f}}_{\mathrm{ss}} - hC^{\mathrm{f}}_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}}\right) = 0 \tag{29.6}$$

$$-r^{\mathrm{k}}_{\mathrm{ss}} + \alpha\epsilon^{\mathrm{a}}_{\mathrm{ss}}\mathit{mc}_{\mathrm{ss}}{L_{\mathrm{ss}}}^{1-\alpha}\left(z_{\mathrm{ss}}K_{\mathrm{ss}}\right)^{-1+\alpha} = 0 \tag{29.7}$$

$$-r^{\mathrm{k^f}}_{\mathrm{ss}} + \alpha\epsilon^{\mathrm{a}}_{\mathrm{ss}}\mathit{mc}^{\mathrm{f}}_{\mathrm{ss}}{L^{\mathrm{f}}_{\mathrm{ss}}}^{1-\alpha}\left(z^{\mathrm{f}}_{\mathrm{ss}}K^{\mathrm{f}}_{\mathrm{ss}}\right)^{-1+\alpha} = 0 \tag{29.8}$$

$$-G_{\mathrm{ss}} + T_{\mathrm{ss}} = 0 \tag{29.9}$$

$$-G_{\mathrm{ss}} + G^{\mathrm{bar}}\epsilon^{\mathrm{G}}_{\mathrm{ss}} = 0 \tag{29.10}$$

$$-G^{\mathrm{f}}_{\mathrm{ss}} + T^{\mathrm{f}}_{\mathrm{ss}} = 0 \tag{29.11}$$

$$-G^{\mathrm{f}}_{\mathrm{ss}} + G^{\mathrm{bar}}\epsilon^{\mathrm{G}}_{\mathrm{ss}} = 0 \tag{29.12}$$

$$-L_{\mathrm{ss}} + {\nu^{\mathrm{w}}_{\mathrm{ss}}}^{-1} L^{\mathrm{s}}_{\mathrm{ss}} = 0 \tag{29.13}$$

$$-L^{\mathrm{s^f}}_{\mathrm{ss}} + L^{\mathrm{f}}_{\mathrm{ss}}\left(W^{\mathrm{i^f}}_{\mathrm{ss}} {W^{\mathrm{f}}_{\mathrm{ss}}}^{-1}\right)^{{\lambda^{\mathrm{w}}}^{-1}(-1-\lambda^{\mathrm{w}})} = 0 \tag{29.14}$$

$$L^{\mathrm{s^f}}_{\mathrm{ss}} - L^{\mathrm{f}}_{\mathrm{ss}} = 0 \tag{29.15}$$

$$L^{\mathrm{s^f}}_{\mathrm{ss}} + {\lambda^{\mathrm{w}}}^{-1} L^{\mathrm{f}}_{\mathrm{ss}} {W^{\mathrm{f}}_{\mathrm{ss}}}^{-1}\left(-1-\lambda^{\mathrm{w}}\right)\left(-W^{\mathrm{disutil^f}}_{\mathrm{ss}} + W^{\mathrm{i^f}}_{\mathrm{ss}}\right)\left(W^{\mathrm{i^f}}_{\mathrm{ss}} {W^{\mathrm{f}}_{\mathrm{ss}}}^{-1}\right)^{-1+{\lambda^{\mathrm{w}}}^{-1}(-1-\lambda^{\mathrm{w}})} = 0 \tag{29.16}$$

$$\Pi^{\mathrm{ws^f}}_{\mathrm{ss}} - L^{\mathrm{s^f}}_{\mathrm{ss}}\left(-W^{\mathrm{disutil^f}}_{\mathrm{ss}} + W^{\mathrm{i^f}}_{\mathrm{ss}}\right) = 0 \tag{29.17}$$

$$\Pi^{\mathrm{ps^f}}_{\mathrm{ss}} - Y^{\mathrm{f}}_{\mathrm{ss}}\left(-mc^{\mathrm{f}}_{\mathrm{ss}} + P^{\mathrm{j^f}}_{\mathrm{ss}}\right) {P^{\mathrm{j^f}}_{\mathrm{ss}}}^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{29.18}$$

$$-Q_{\mathrm{ss}} + {\epsilon^{\mathrm{b}}_{\mathrm{ss}}}^{-1} q_{\mathrm{ss}}\left(C_{\mathrm{ss}} - hC_{\mathrm{ss}}\right)^{\sigma^{\mathrm{c}}} = 0 \tag{29.19}$$

$$-Q^{\mathrm{f}}_{\mathrm{ss}} + {\epsilon^{\mathrm{b}}_{\mathrm{ss}}}^{-1} q^{\mathrm{f}}_{\mathrm{ss}}\left(C^{\mathrm{f}}_{\mathrm{ss}} - hC^{\mathrm{f}}_{\mathrm{ss}}\right)^{\sigma^{\mathrm{c}}} = 0 \tag{29.20}$$

$$-W_{\mathrm{ss}} + \epsilon^{\mathrm{a}}_{\mathrm{ss}} mc_{\mathrm{ss}}\left(1-\alpha\right) {L_{\mathrm{ss}}}^{-\alpha}\left(z_{\mathrm{ss}} K_{\mathrm{ss}}\right)^{\alpha} = 0 \tag{29.21}$$

$$-W^{\mathrm{f}}_{\mathrm{ss}} + \epsilon^{\mathrm{a}}_{\mathrm{ss}} mc^{\mathrm{f}}_{\mathrm{ss}}\left(1-\alpha\right) {L^{\mathrm{f}}_{\mathrm{ss}}}^{-\alpha}\left(z^{\mathrm{f}}_{\mathrm{ss}} K^{\mathrm{f}}_{\mathrm{ss}}\right)^{\alpha} = 0 \tag{29.22}$$

$$Y^{\mathrm{s}}_{\mathrm{ss}} - \nu^{\mathrm{p}}_{\mathrm{ss}} Y_{\mathrm{ss}} = 0 \tag{29.23}$$

$$-Y^{\mathrm{f}}_{\mathrm{ss}} + Y^{\mathrm{s^f}}_{\mathrm{ss}} = 0 \tag{29.24}$$

$$-Y_{\mathrm{ss}}^{\mathrm{s^f}} + Y_{\mathrm{ss}}^{\mathrm{f}} {P_{\mathrm{ss}}^{\mathrm{j^f}}}^{-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{29.25}$$

$$-\log\epsilon_{\mathrm{ss}}^{\mathrm{b}} + \rho^{\mathrm{b}}\log\epsilon_{\mathrm{ss}}^{\mathrm{b}} = 0 \tag{29.26}$$

$$-\log\epsilon_{\mathrm{ss}}^{\mathrm{L}} + \rho^{\mathrm{L}}\log\epsilon_{\mathrm{ss}}^{\mathrm{L}} = 0 \tag{29.27}$$

$$-\log\epsilon_{\mathrm{ss}}^{\mathrm{I}} + \rho^{\mathrm{I}}\log\epsilon_{\mathrm{ss}}^{\mathrm{I}} = 0 \tag{29.28}$$

$$-\log\epsilon_{\mathrm{ss}}^{\mathrm{a}} + \rho^{\mathrm{a}}\log\epsilon_{\mathrm{ss}}^{\mathrm{a}} = 0 \tag{29.29}$$

$$-\log\epsilon_{\mathrm{ss}}^{\mathrm{G}} + \rho^{\mathrm{G}}\log\epsilon_{\mathrm{ss}}^{\mathrm{G}} = 0 \tag{29.30}$$

$$Y_{\mathrm{ss}}^{\mathrm{f}} {P_{\mathrm{ss}}^{\mathrm{j^f}}}^{-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} - \lambda^{\mathrm{p}\,-1} Y_{\mathrm{ss}}^{\mathrm{f}} \left(1+\lambda^{\mathrm{p}}\right) \left(-mc_{\mathrm{ss}}^{\mathrm{f}} + P_{\mathrm{ss}}^{\mathrm{j^f}}\right) {P_{\mathrm{ss}}^{\mathrm{j^f}}}^{-1-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{29.31}$$

$$\beta\epsilon_{\mathrm{ss}}^{\mathrm{b}} \left(C_{\mathrm{ss}}^{\mathrm{f}} - hC_{\mathrm{ss}}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} - \epsilon_{\mathrm{ss}}^{\mathrm{b}} {R_{\mathrm{ss}}^{\mathrm{f}}}^{-1} \left(C_{\mathrm{ss}}^{\mathrm{f}} - hC_{\mathrm{ss}}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{29.32}$$

$$-\epsilon_{\mathrm{ss}}^{\mathrm{b}} {R_{\mathrm{ss}}}^{-1} \left(C_{\mathrm{ss}} - hC_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}} + \beta\epsilon_{\mathrm{ss}}^{\mathrm{b}} {\pi_{\mathrm{ss}}}^{-1} \left(C_{\mathrm{ss}} - hC_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{29.33}$$

$$\epsilon_{\mathrm{ss}}^{\mathrm{b}} W_{\mathrm{ss}}^{\mathrm{disutil^f}} \left(C_{\mathrm{ss}}^{\mathrm{f}} - hC_{\mathrm{ss}}^{\mathrm{f}}\right)^{-\sigma^{\mathrm{c}}} - \omega\epsilon_{\mathrm{ss}}^{\mathrm{b}}\epsilon_{\mathrm{ss}}^{\mathrm{L}} {L_{\mathrm{ss}}^{\mathrm{s^f}}}^{\sigma^{\mathrm{l}}} = 0 \tag{29.34}$$

$$-1 + \xi^{\mathrm{p}} \left({\pi_{\mathrm{ss}}}^{-1} {\pi_{\mathrm{ss}}}^{\gamma^{\mathrm{p}}}\right)^{-\lambda^{\mathrm{p}\,-1}} + \left(1-\xi^{\mathrm{p}}\right) {\pi_{\mathrm{ss}}^{\star}}^{-\lambda^{\mathrm{p}\,-1}} = 0 \tag{29.35}$$

$$-1 + \left(1-\xi^{\mathrm{w}}\right) \left(w_{\mathrm{ss}}^{\star} {W_{\mathrm{ss}}}^{-1}\right)^{-\lambda^{\mathrm{w}\,-1}} + \xi^{\mathrm{w}} 1^{-\lambda^{\mathrm{w}\,-1}} \left({\pi_{\mathrm{ss}}}^{-1} {\pi_{\mathrm{ss}}}^{\gamma^{\mathrm{w}}}\right)^{-\lambda^{\mathrm{w}\,-1}} = 0 \tag{29.36}$$

$$-\Phi - Y_{\mathrm{ss}}^{\mathrm{s}} + \epsilon_{\mathrm{ss}}^{\mathrm{a}} {L_{\mathrm{ss}}}^{1-\alpha} \left(z_{\mathrm{ss}} K_{\mathrm{ss}}\right)^{\alpha} = 0 \tag{29.37}$$

$$-\Phi - Y_{\mathrm{ss}}^{\mathrm{f}} {P_{\mathrm{ss}}^{\mathrm{j^f}}}^{-\lambda^{\mathrm{p}\,-1}(1+\lambda^{\mathrm{p}})} + \epsilon_{\mathrm{ss}}^{\mathrm{a}} {L_{\mathrm{ss}}^{\mathrm{f}}}^{1-\alpha} \left(z_{\mathrm{ss}}^{\mathrm{f}} K_{\mathrm{ss}}^{\mathrm{f}}\right)^{\alpha} = 0 \tag{29.38}$$

$$-f_{\mathrm{ss}}^{1} + \beta\xi^{\mathrm{w}} f_{\mathrm{ss}}^{1} 1^{\lambda^{\mathrm{w}\,-1}} \left({\pi_{\mathrm{ss}}}^{-1} {\pi_{\mathrm{ss}}}^{\gamma^{\mathrm{w}}}\right)^{-\lambda^{\mathrm{w}\,-1}} + \epsilon_{\mathrm{ss}}^{\mathrm{b}} w_{\mathrm{ss}}^{\star} L_{\mathrm{ss}} \left(1+\lambda^{\mathrm{w}}\right)^{-1} \left(C_{\mathrm{ss}} - hC_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}} \left(w_{\mathrm{ss}}^{\star} {W_{\mathrm{ss}}}^{-1}\right)^{-\lambda^{\mathrm{w}\,-1}(1+\lambda^{\mathrm{w}})} = 0 \tag{29.39}$$

$$-f^2_{\mathrm{ss}} + \omega\epsilon^{\mathrm{b}}_{\mathrm{ss}}\epsilon^{\mathrm{L}}_{\mathrm{ss}}\left(L_{\mathrm{ss}}\left(w^\star_{\mathrm{ss}} W_{\mathrm{ss}}{}^{-1}\right)^{-{\lambda^{\mathrm{w}}}^{-1}(1+\lambda^{\mathrm{w}})}\right)^{1+\sigma^{\mathrm{l}}} + \beta\xi^{\mathrm{w}} f^2_{\mathrm{ss}} 1^{{\lambda^{\mathrm{w}}}^{-1}(1+\lambda^{\mathrm{w}})\left(1+\sigma^{\mathrm{l}}\right)}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{w}}}\right)^{-{\lambda^{\mathrm{w}}}^{-1}(1+\lambda^{\mathrm{w}})\left(1+\sigma^{\mathrm{l}}\right)} = 0 \tag{29.40}$$

$$-g^1_{\mathrm{ss}} + \beta\xi^{\mathrm{p}} g^1_{\mathrm{ss}}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{p}}}\right)^{-{\lambda^{\mathrm{p}}}^{-1}} + \epsilon^{\mathrm{b}}_{\mathrm{ss}}\pi^\star_{\mathrm{ss}} Y_{\mathrm{ss}}(C_{\mathrm{ss}} - hC_{\mathrm{ss}})^{-\sigma^{\mathrm{c}}} = 0 \tag{29.41}$$

$$-g^2_{\mathrm{ss}} + \beta\xi^{\mathrm{p}} g^2_{\mathrm{ss}}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{p}}}\right)^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} + \epsilon^{\mathrm{b}}_{\mathrm{ss}} mc_{\mathrm{ss}} Y_{\mathrm{ss}}(C_{\mathrm{ss}} - hC_{\mathrm{ss}})^{-\sigma^{\mathrm{c}}} = 0 \tag{29.42}$$

$$-\nu^{\mathrm{w}}_{\mathrm{ss}} + (1 - \xi^{\mathrm{w}})\left(w^\star_{\mathrm{ss}} W_{\mathrm{ss}}{}^{-1}\right)^{-{\lambda^{\mathrm{w}}}^{-1}(1+\lambda^{\mathrm{w}})} + \xi^{\mathrm{w}}\nu^{\mathrm{w}}_{\mathrm{ss}}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{w}}}\right)^{-{\lambda^{\mathrm{w}}}^{-1}(1+\lambda^{\mathrm{w}})} = 0 \tag{29.43}$$

$$-\nu^{\mathrm{p}}_{\mathrm{ss}} + (1 - \xi^{\mathrm{p}})\,\pi^\star_{\mathrm{ss}}{}^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} + \xi^{\mathrm{p}}\nu^{\mathrm{p}}_{\mathrm{ss}}\left(\pi_{\mathrm{ss}}{}^{-1}\pi_{\mathrm{ss}}{}^{\gamma^{\mathrm{p}}}\right)^{-{\lambda^{\mathrm{p}}}^{-1}(1+\lambda^{\mathrm{p}})} = 0 \tag{29.44}$$

$$-K_{\mathrm{ss}} + I_{\mathrm{ss}}\left(1 - 0.5\varphi\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right)^2\right) + K_{\mathrm{ss}}(1 - \tau) = 0 \tag{29.45}$$

$$-K^{\mathrm{f}}_{\mathrm{ss}} + I^{\mathrm{f}}_{\mathrm{ss}}\left(1 - 0.5\varphi\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right)^2\right) + K^{\mathrm{f}}_{\mathrm{ss}}(1 - \tau) = 0 \tag{29.46}$$

$$U_{\mathrm{ss}} - \beta U_{\mathrm{ss}} - \epsilon^{\mathrm{b}}_{\mathrm{ss}}\left((1 - \sigma^{\mathrm{c}})^{-1}(C_{\mathrm{ss}} - hC_{\mathrm{ss}})^{1-\sigma^{\mathrm{c}}} - \omega\epsilon^{\mathrm{L}}_{\mathrm{ss}}\left(1 + \sigma^{\mathrm{l}}\right)^{-1} L^{\mathrm{s}}_{\mathrm{ss}}{}^{1+\sigma^{\mathrm{l}}}\right) = 0 \tag{29.47}$$

$$U^{\mathrm{f}}_{\mathrm{ss}} - \beta U^{\mathrm{f}}_{\mathrm{ss}} - \epsilon^{\mathrm{b}}_{\mathrm{ss}}\left((1 - \sigma^{\mathrm{c}})^{-1}\left(C^{\mathrm{f}}_{\mathrm{ss}} - hC^{\mathrm{f}}_{\mathrm{ss}}\right)^{1-\sigma^{\mathrm{c}}} - \omega\epsilon^{\mathrm{L}}_{\mathrm{ss}}\left(1 + \sigma^{\mathrm{l}}\right)^{-1} L^{\mathrm{s^f}}_{\mathrm{ss}}{}^{1+\sigma^{\mathrm{l}}}\right) = 0 \tag{29.48}$$

$$-\log\pi^{\mathrm{obj}}_{\mathrm{ss}} + \rho^{\pi^{\mathrm{bar}}}\log\pi^{\mathrm{obj}}_{\mathrm{ss}} + \log \mathit{calibr}^{\pi^{\mathrm{obj}}}\left(1 - \rho^{\pi^{\mathrm{bar}}}\right) = 0 \tag{29.49}$$

$$-\epsilon^{\mathrm{b}}_{\mathrm{ss}}(C_{\mathrm{ss}} - hC_{\mathrm{ss}})^{-\sigma^{\mathrm{c}}} + q_{\mathrm{ss}}\left(1 - 0.5\varphi\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right)^2 - \varphi\epsilon^{\mathrm{I}}_{\mathrm{ss}}\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right)\right) + \beta\varphi\epsilon^{\mathrm{I}}_{\mathrm{ss}} q_{\mathrm{ss}}\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right) = 0 \tag{29.50}$$

$$-\epsilon^{\mathrm{b}}_{\mathrm{ss}}\left(C^{\mathrm{f}}_{\mathrm{ss}} - hC^{\mathrm{f}}_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}} + q^{\mathrm{f}}_{\mathrm{ss}}\left(1 - 0.5\varphi\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right)^2 - \varphi\epsilon^{\mathrm{I}}_{\mathrm{ss}}\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right)\right) + \beta\varphi\epsilon^{\mathrm{I}}_{\mathrm{ss}} q^{\mathrm{f}}_{\mathrm{ss}}\left(-1 + \epsilon^{\mathrm{I}}_{\mathrm{ss}}\right) = 0 \tag{29.51}$$

$$-C_{\mathrm{ss}} - I_{\mathrm{ss}} - T_{\mathrm{ss}} + Y_{\mathrm{ss}} - \psi^{-1} r^{\mathrm{k}}_{\mathrm{ss}} K_{\mathrm{ss}}\left(-1 + e^{\psi(-1+z_{\mathrm{ss}})}\right) = 0 \tag{29.52}$$

$$-C^{\mathrm{f}}_{\mathrm{ss}} - I^{\mathrm{f}}_{\mathrm{ss}} + \Pi^{\mathrm{ws^f}}_{\mathrm{ss}} - T^{\mathrm{f}}_{\mathrm{ss}} + Y^{\mathrm{f}}_{\mathrm{ss}} + L^{\mathrm{s^f}}_{\mathrm{ss}} W^{\mathrm{disutil^f}}_{\mathrm{ss}} - L^{\mathrm{f}}_{\mathrm{ss}} W^{\mathrm{f}}_{\mathrm{ss}} - \psi^{-1} r^{\mathrm{k^f}}_{\mathrm{ss}} K^{\mathrm{f}}_{\mathrm{ss}}\left(-1 + e^{\psi\left(-1+z^{\mathrm{f}}_{\mathrm{ss}}\right)}\right) = 0 \tag{29.53}$$

$$\epsilon^{\mathrm{b}}_{\mathrm{ss}}\left(r^{\mathrm{k}}_{\mathrm{ss}} K_{\mathrm{ss}} - r^{\mathrm{k}}_{\mathrm{ss}} K_{\mathrm{ss}} e^{\psi(-1+z_{\mathrm{ss}})}\right)(C_{\mathrm{ss}} - hC_{\mathrm{ss}})^{-\sigma^{\mathrm{c}}} = 0 \tag{29.54}$$

$$\epsilon^{\mathrm{b}}_{\mathrm{ss}}\left(r^{\mathrm{k^f}}_{\mathrm{ss}} K^{\mathrm{f}}_{\mathrm{ss}} - r^{\mathrm{k^f}}_{\mathrm{ss}} K^{\mathrm{f}}_{\mathrm{ss}} e^{\psi\left(-1+z^{\mathrm{f}}_{\mathrm{ss}}\right)}\right)\left(C^{\mathrm{f}}_{\mathrm{ss}} - hC^{\mathrm{f}}_{\mathrm{ss}}\right)^{-\sigma^{\mathrm{c}}} = 0 \tag{29.55}$$

30 Calibrating equations

$$-1.408 + {Y^{\mathrm{s}}_{\mathrm{ss}}}^{-1} \left(\Phi + Y^{\mathrm{s}}_{\mathrm{ss}}\right) = 0 \tag{30.1}$$

$$-1 + \pi^{\mathrm{obj}}_{\mathrm{ss}} = 0 \tag{30.2}$$

$$-0.6 + C^{\mathrm{f}}_{\mathrm{ss}} {Y^{\mathrm{f}}_{\mathrm{ss}}}^{-1} = 0 \tag{30.3}$$

$$-0.18 + G_{\mathrm{ss}} {Y_{\mathrm{ss}}}^{-1} = 0 \tag{30.4}$$

$$\pi_{\mathrm{ss}} - \pi^{\mathrm{obj}}_{\mathrm{ss}} = 0 \tag{30.5}$$

31 Parameter settings

$$\alpha = 0.3 \tag{31.1}$$

$$\beta = 0.99 \tag{31.2}$$

$$\gamma^{\mathrm{w}} = 0.763 \tag{31.3}$$

$$\gamma^{\mathrm{p}} = 0.469 \tag{31.4}$$

$$h = 0.573 \tag{31.5}$$

$$\lambda^{\mathrm{w}} = 0.5 \tag{31.6}$$

$$\omega = 1 \tag{31.7}$$

$$\psi = 0.169 \tag{31.8}$$

$$r^{\pi} = 1.684 \tag{31.9}$$

$$r^{\mathrm{Y}} = 0.099 \tag{31.10}$$

$$r^{\Delta^{\pi}} = 0.14 \tag{31.11}$$

$$r^{\Delta^{\mathrm{y}}} = 0.159 \tag{31.12}$$

$$\rho^{\mathrm{b}} = 0.855 \tag{31.13}$$

$$\rho^{\mathrm{L}} = 0.889 \tag{31.14}$$

$$\rho^{\mathrm{I}} = 0.927 \tag{31.15}$$

$$\rho^{\mathrm{a}} = 0.823 \tag{31.16}$$

$$\rho^{\mathrm{G}} = 0.949 \tag{31.17}$$

$$\rho = 0.961 \tag{31.18}$$

$$\rho^{\pi^{\mathrm{bar}}} = 0.924 \tag{31.19}$$

$$scale^{\mathrm{factor}^{\mathrm{w}}} = 100 \tag{31.20}$$

$$scale^{\mathrm{factor}^{\mathrm{p}}} = 100 \tag{31.21}$$

$$\sigma^{\mathrm{c}} = 1.353 \tag{31.22}$$

$$\sigma^{\mathrm{l}} = 2.4 \tag{31.23}$$

$$\tau = 0.025 \tag{31.24}$$

$$\varphi = 6.771 \tag{31.25}$$

$$\xi^{\mathrm{w}} = 0.737 \tag{31.26}$$

$$\xi^{\mathrm{p}} = 0.908 \tag{31.27}$$

$$\xi^{\mathrm{e}} = 0.5 \tag{31.28}$$

32 Posterior distributions

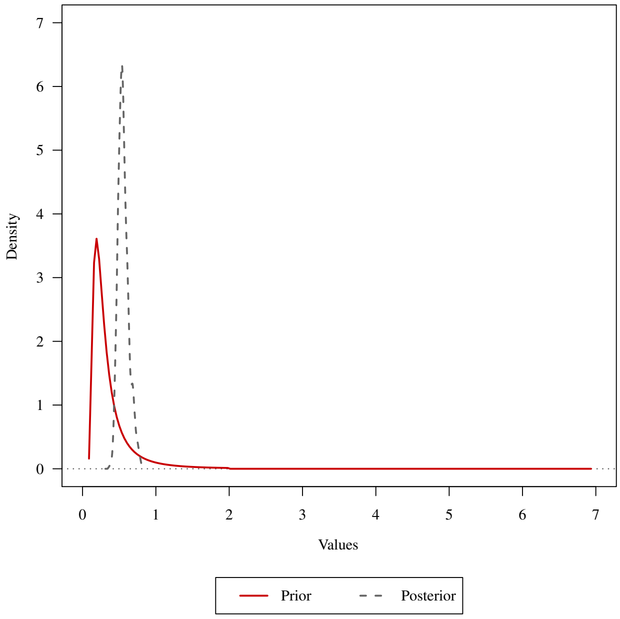

Figure 1: Prior and posterior distributions for: $sd(\eta^{\mathrm{a}})$

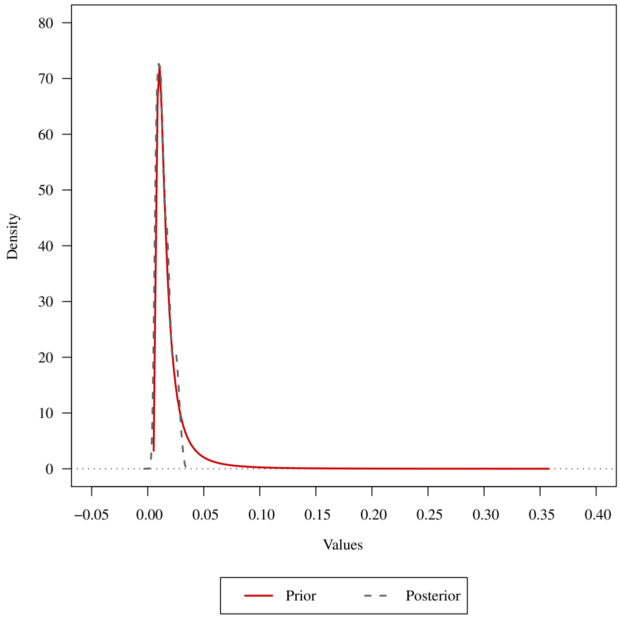

Figure 2: Prior and posterior distributions for: $sd(\eta^{\pi})$

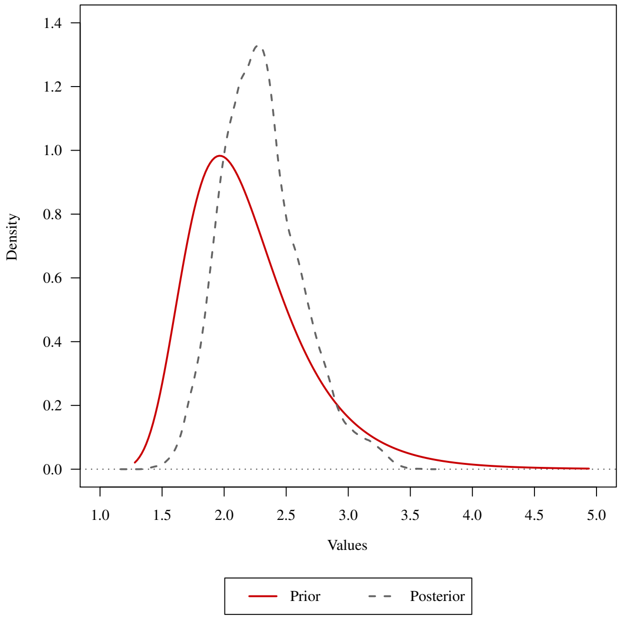

Figure 3: Prior and posterior distributions for: $sd(\eta^{\mathrm{b}})$

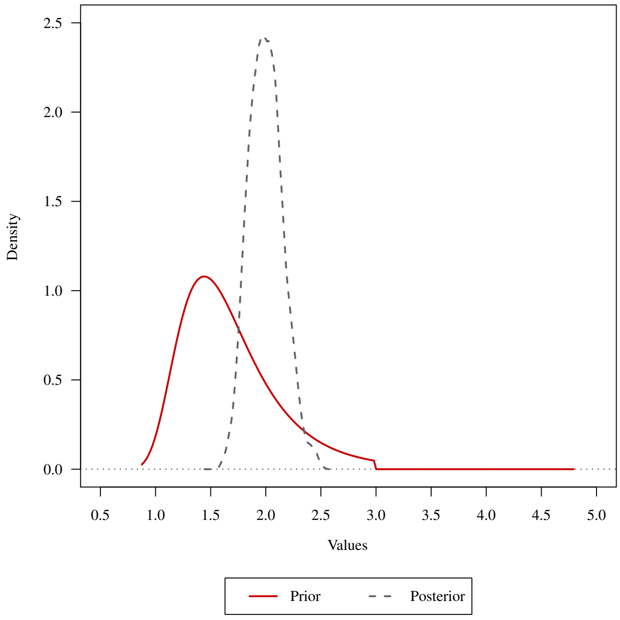

Figure 4: Prior and posterior distributions for: $sd(\eta^{\mathrm{G}})$

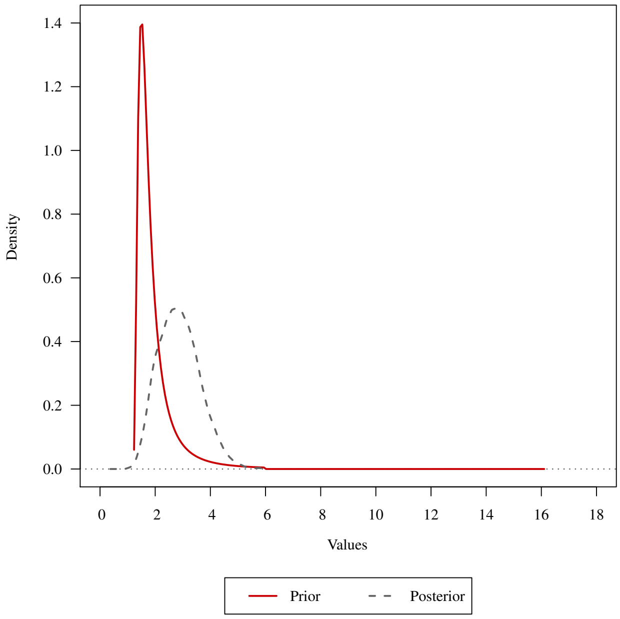

Figure 5: Prior and posterior distributions for: $sd(\eta^{\mathrm{L}})$

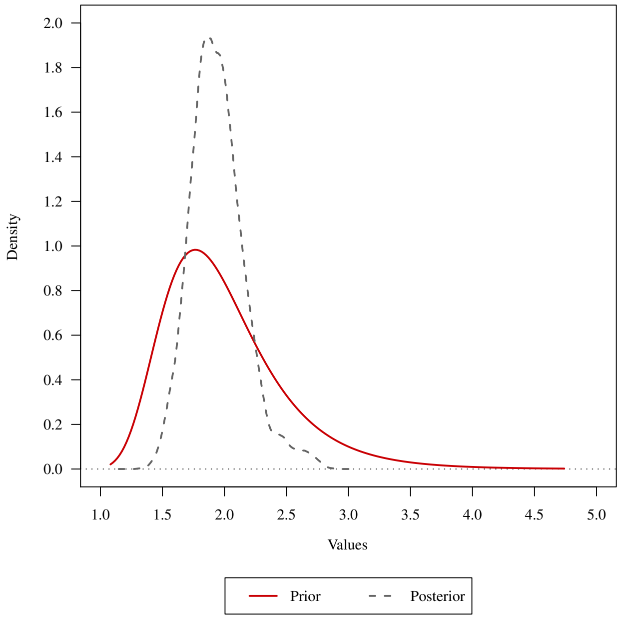

Figure 6: Prior and posterior distributions for: $sd(\eta^{\mathrm{I}})$

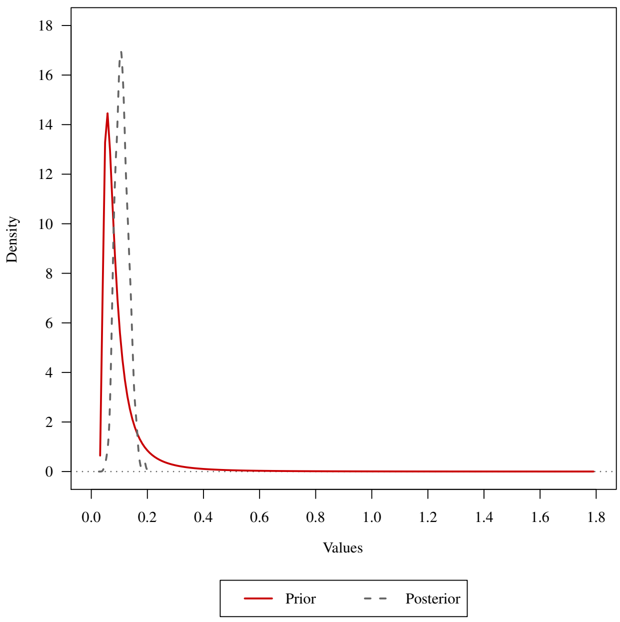

Figure 7: Prior and posterior distributions for: $sd(\eta^{\mathrm{R}})$

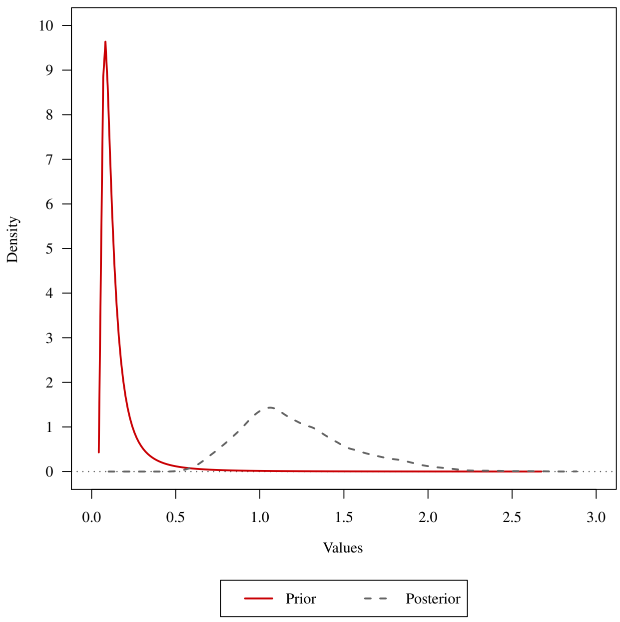

Figure 8: Prior and posterior distributions for: $sd(\eta^{\mathrm{P}})$

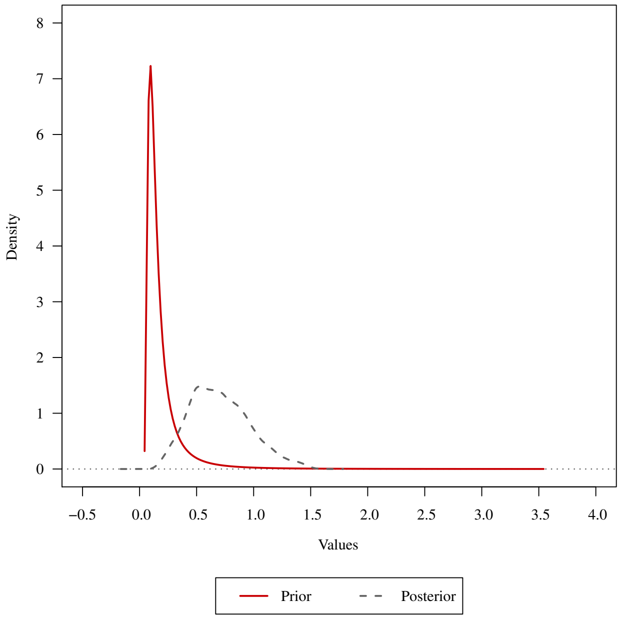

Figure 9: Prior and posterior distributions for: $sd(\eta^{\mathrm{w}})$

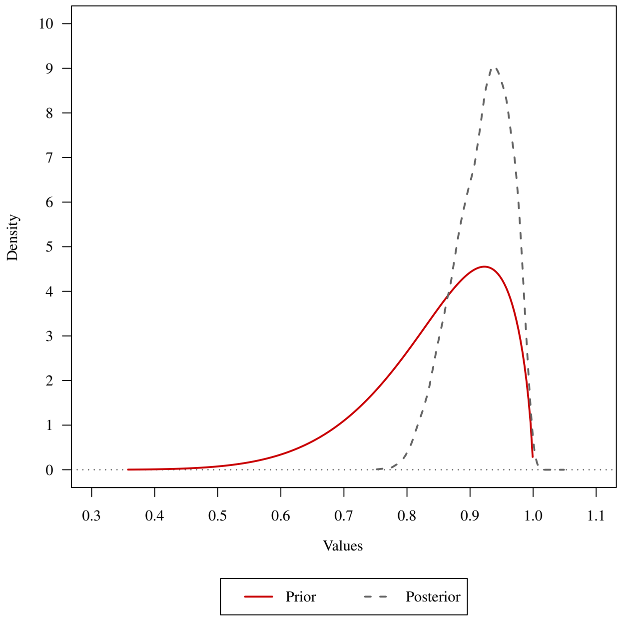

Figure 10: Prior and posterior distributions for: ρ

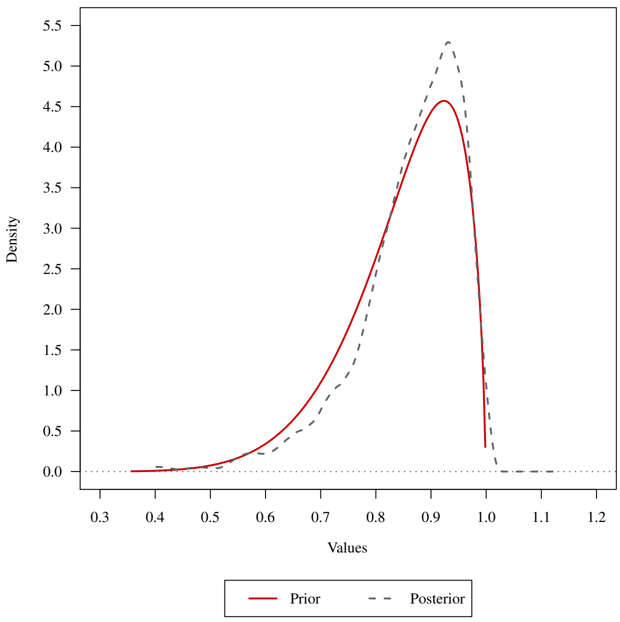

Figure 11: Prior and posterior distributions for: $scale^{\mathrm{factor}^{\mathrm{p}}}$

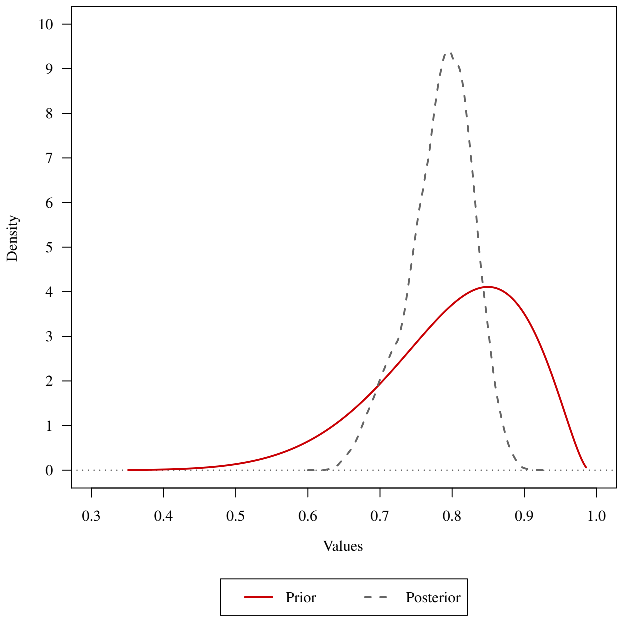

Figure 12: Prior and posterior distributions for: ρ^{I}

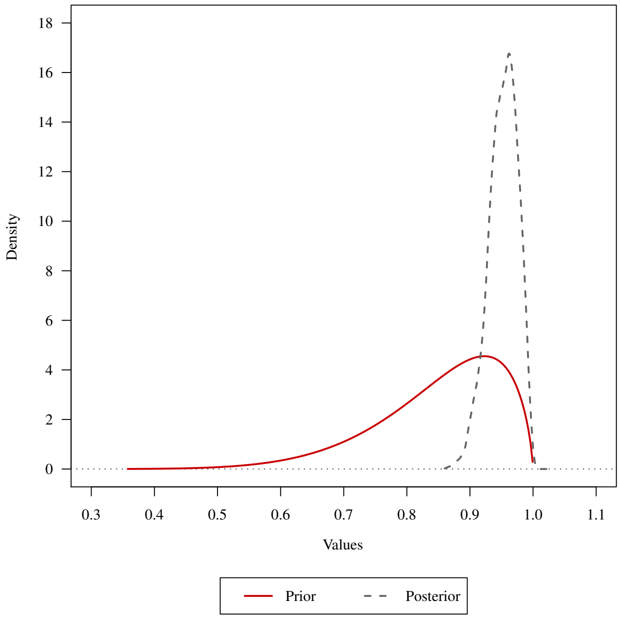

Figure 13: Prior and posterior distributions for: $\rho^{\pi^{\mathrm{bar}}}$

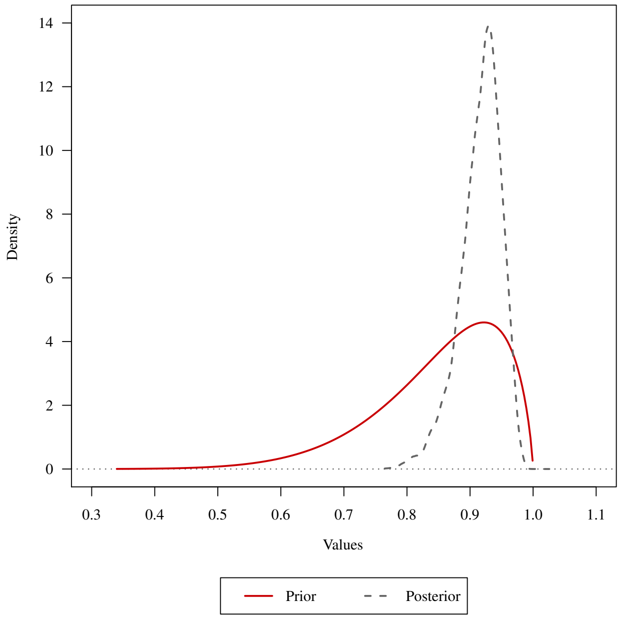

Figure 14: Prior and posterior distributions for: ρ^{a}

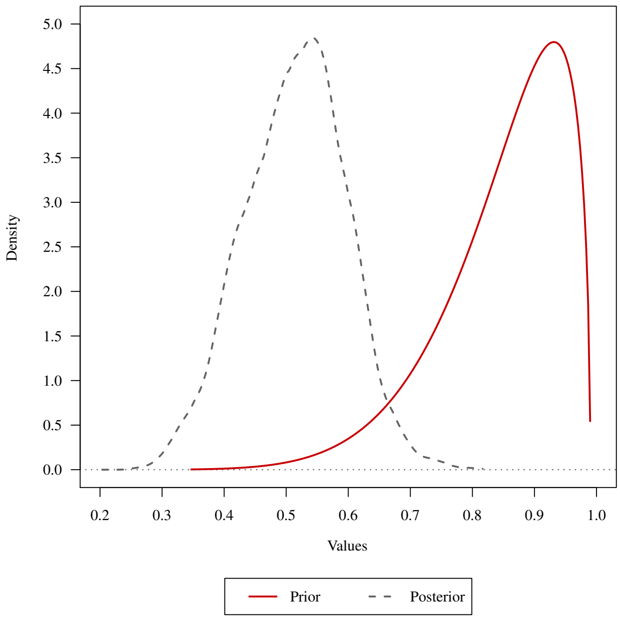

Figure 15: Prior and posterior distributions for: ρ^{G}

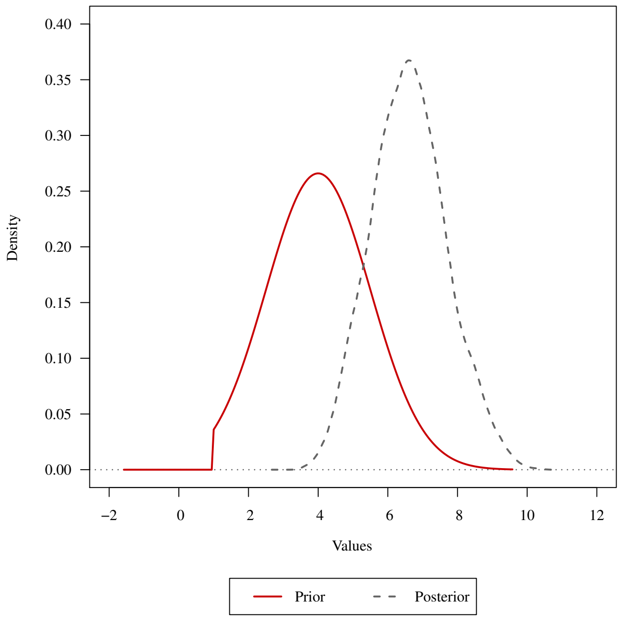

Figure 16: Prior and posterior distributions for: ξ^{p}

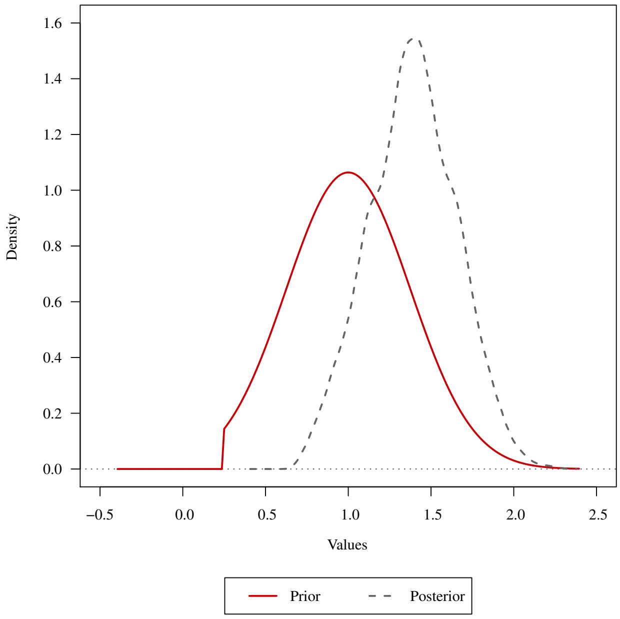

Figure 17: Prior and posterior distributions for: τ

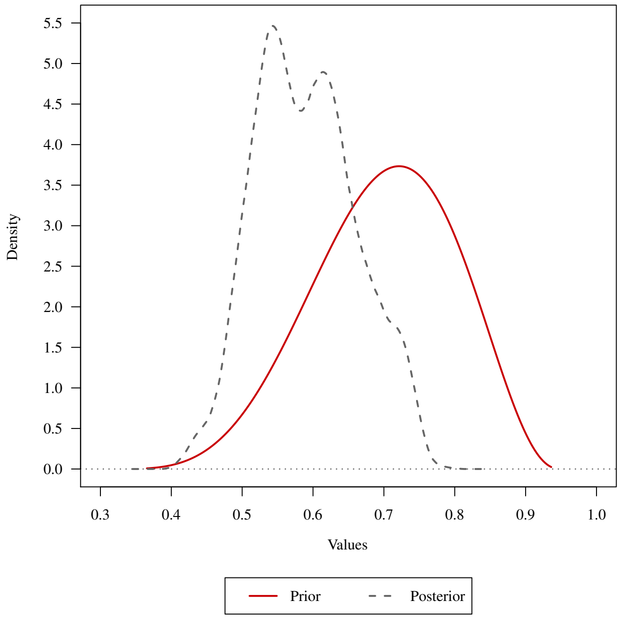

Figure 18: Prior and posterior distributions for: ω

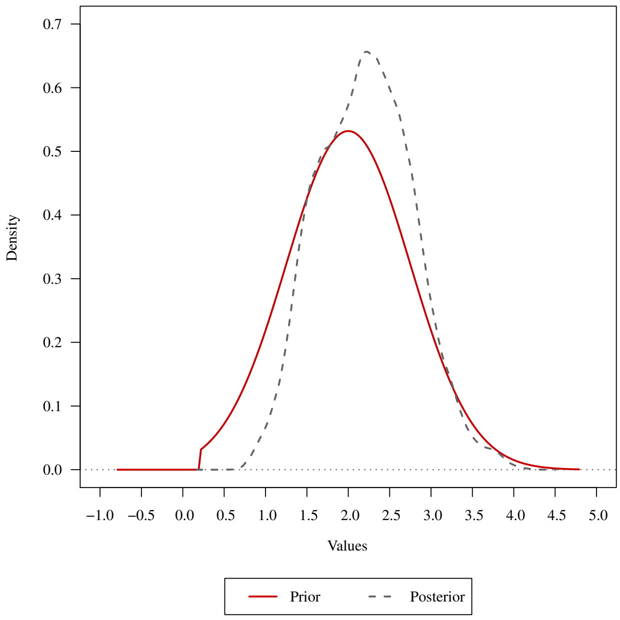

Figure 19: Prior and posterior distributions for: φ

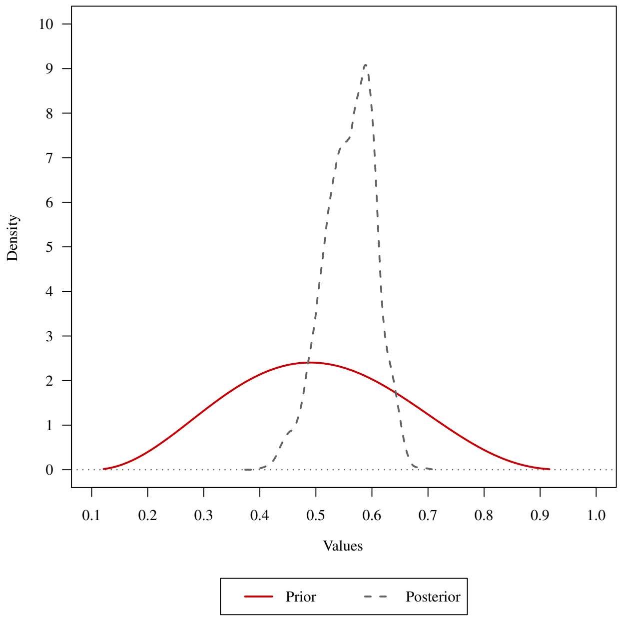

Figure 20: Prior and posterior distributions for: Φ

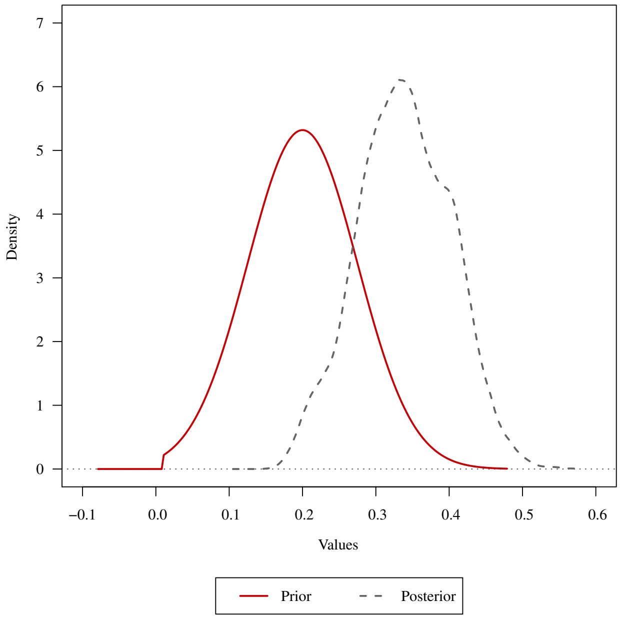

Figure 21: Prior and posterior distributions for: r^{Y}

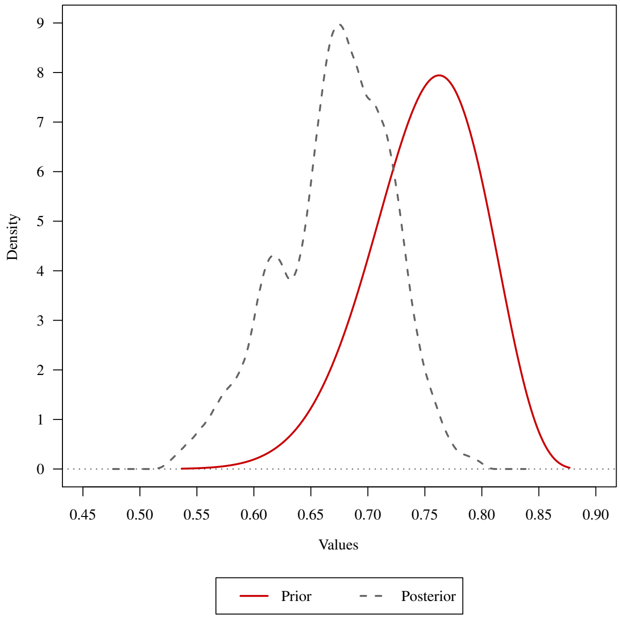

Figure 22: Prior and posterior distributions for: ξ^{e}

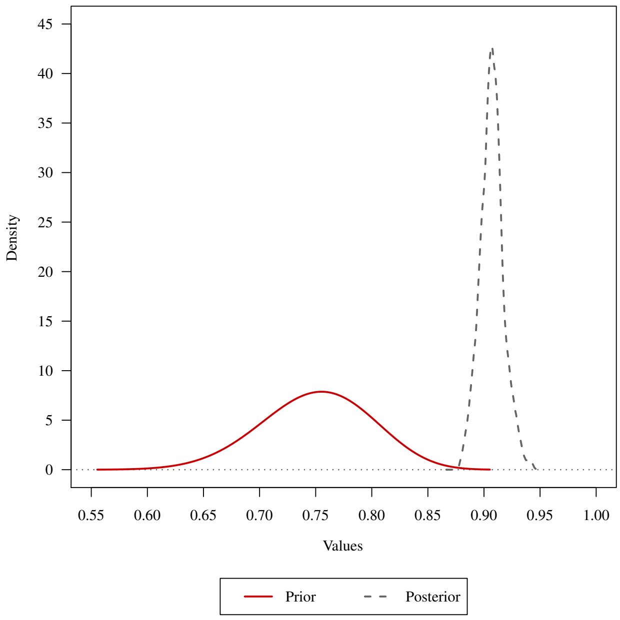

Figure 23: Prior and posterior distributions for: G^{bar}

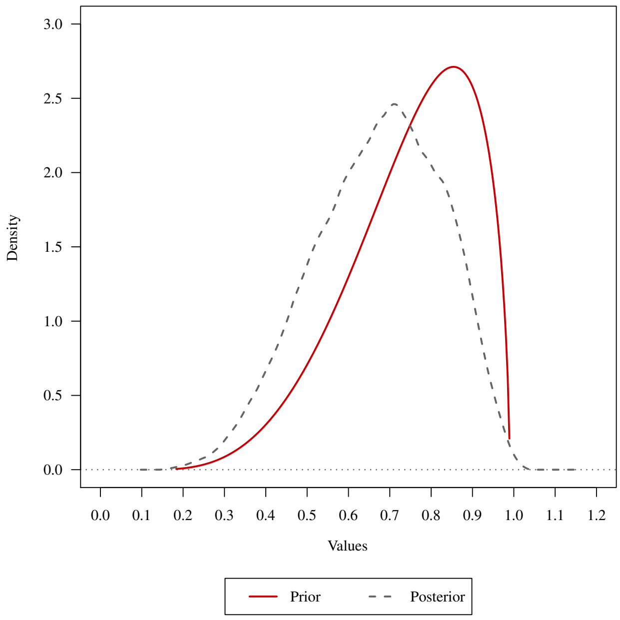

Figure 24: Prior and posterior distributions for: λ^{w}

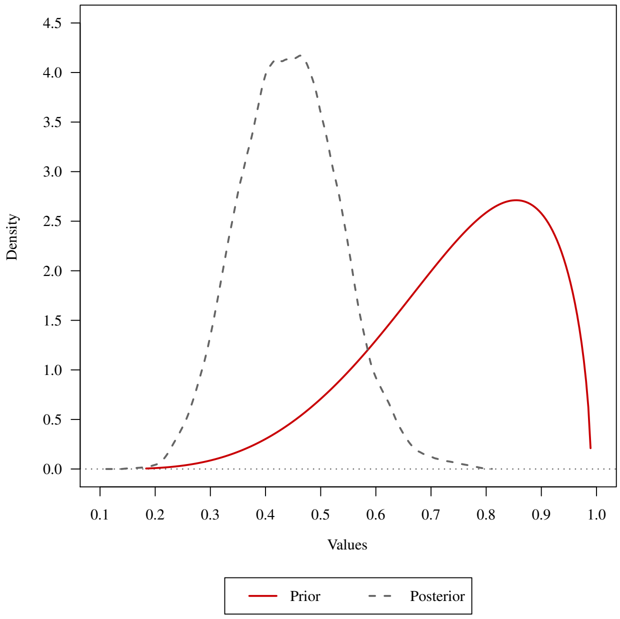

Figure 25: Prior and posterior distributions for: λ^{p}

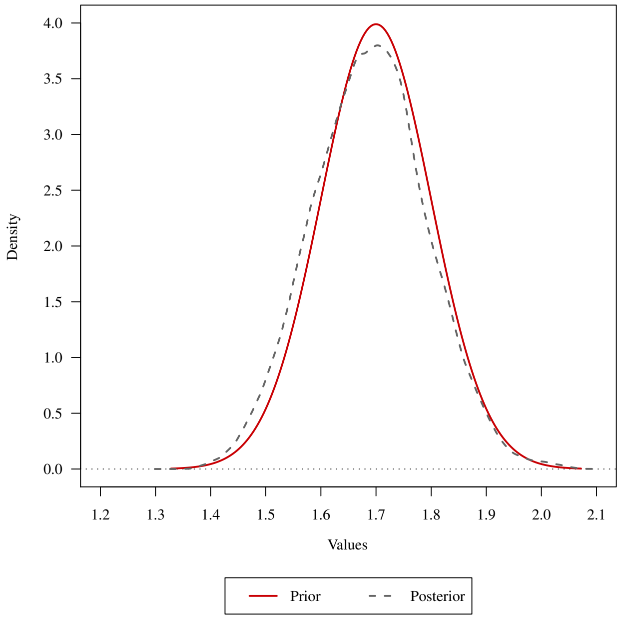

Figure 26: Prior and posterior distributions for: $r^{\Delta^{\pi}}$

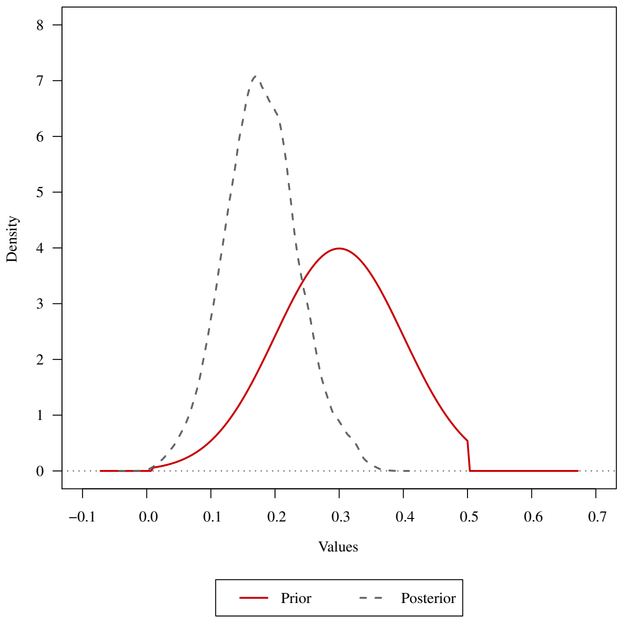

Figure 27: Prior and posterior distributions for: ρ^{b}

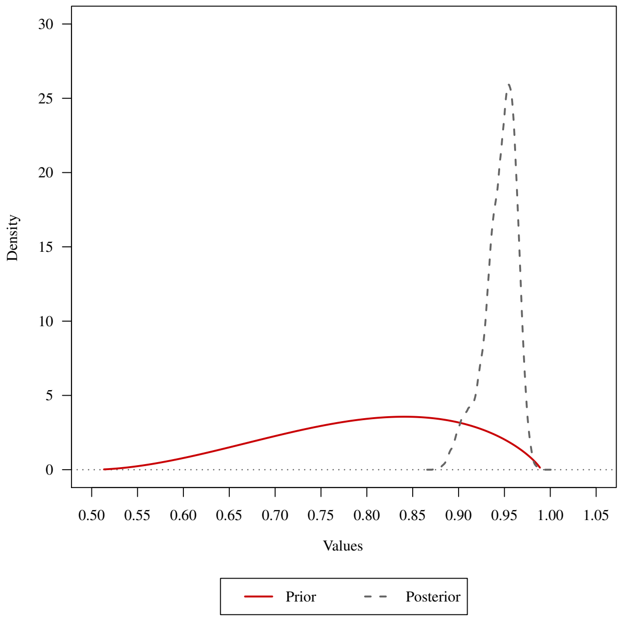

Figure 28: Prior and posterior distributions for: $scale^{\mathrm{factor}^{\mathrm{w}}}$

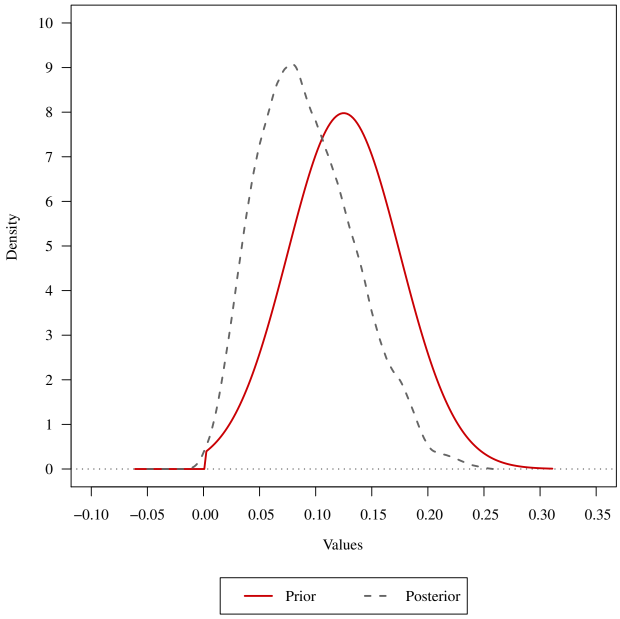

Figure 29: Prior and posterior distributions for: $r^{\Delta^{\mathrm{y}}}$

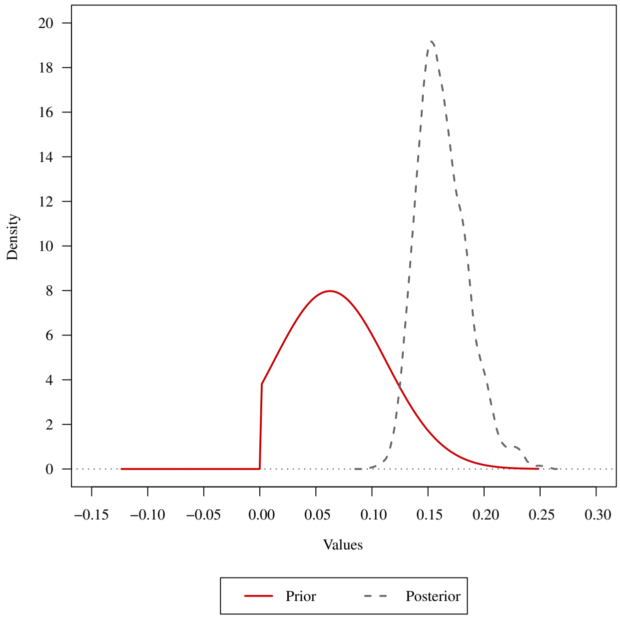

Figure 30: Prior and posterior distributions for: ρ^{L}

33 Model forecasts

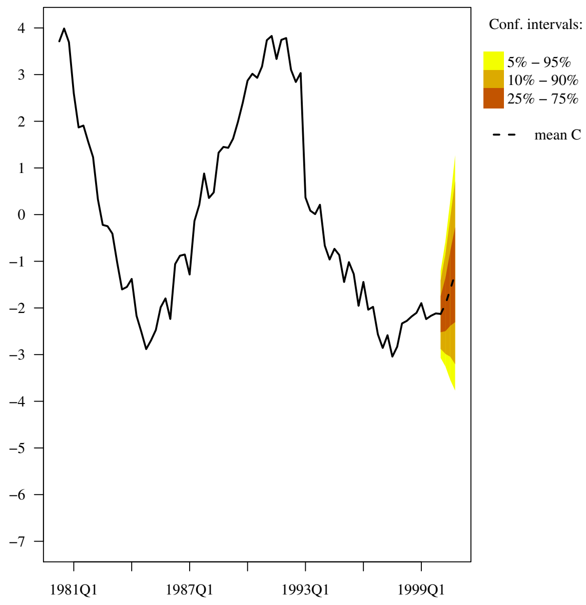

Figure 31: Forecast for: C

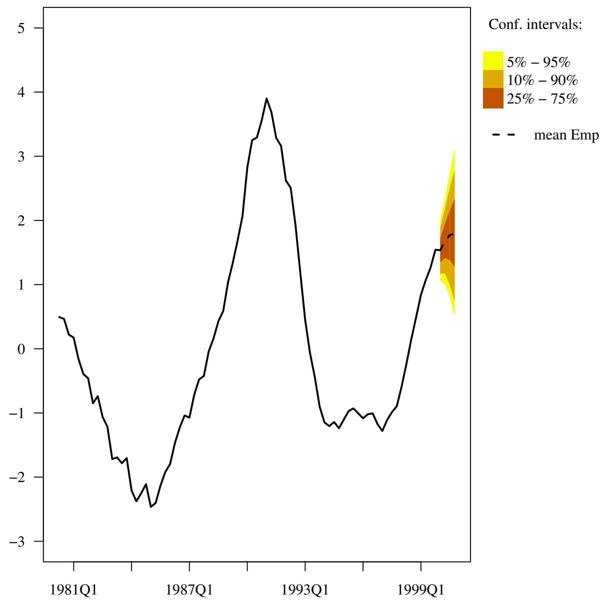

Figure 32: Forecast for: Emp

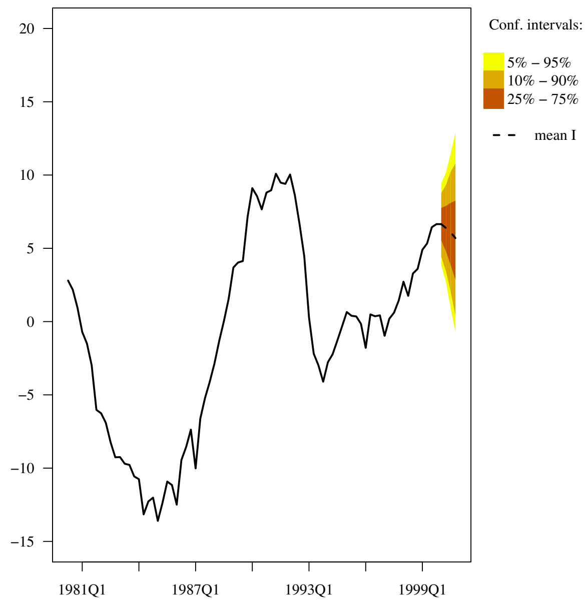

Figure 33: Forecast for: I

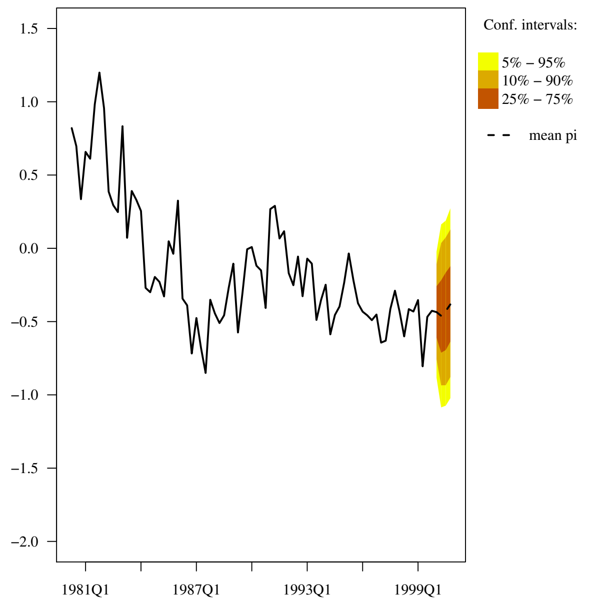

Figure 34: Forecast for: π

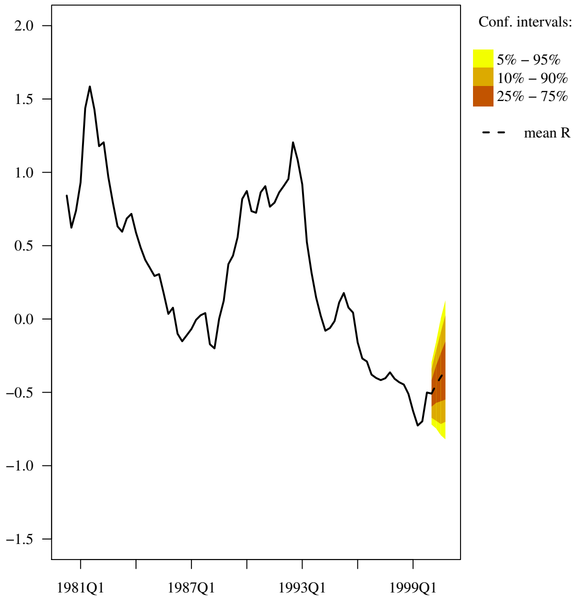

Figure 35: Forecast for: R

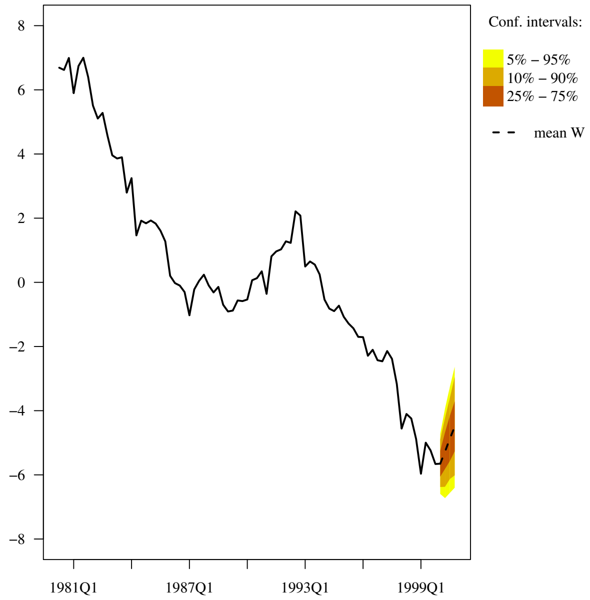

Figure 36: Forecast for: W

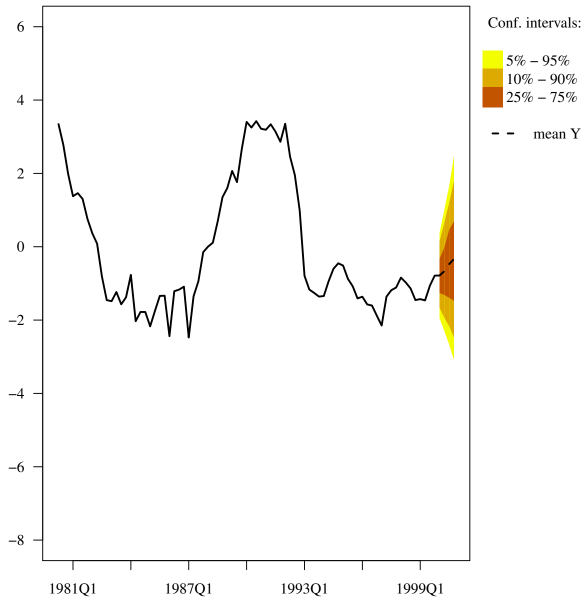

Figure 37: Forecast for: Y

34 Shock decompositions

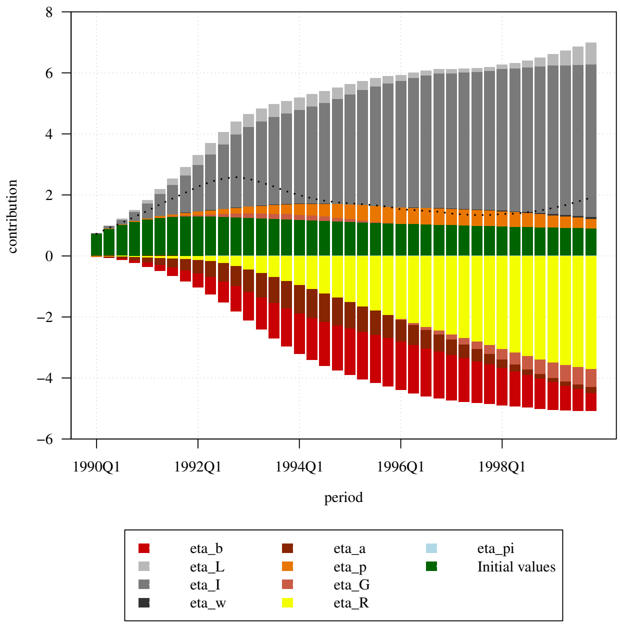

Figure 38: Shock decomposition for: K

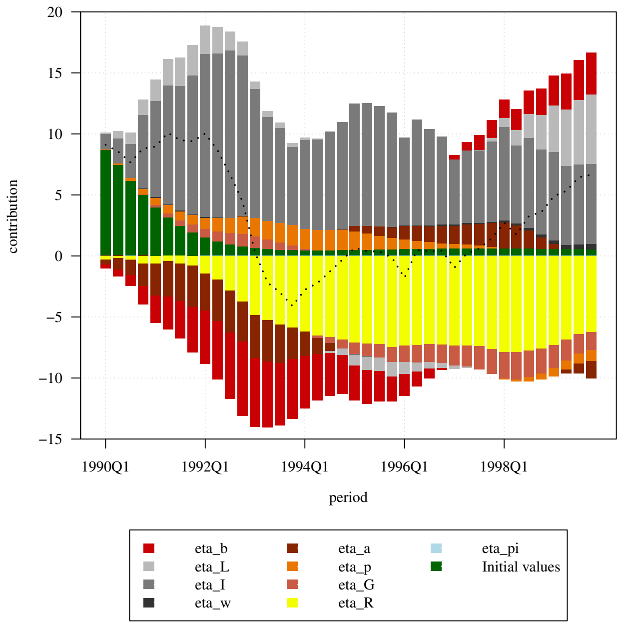

Figure 39: Shock decomposition for: I

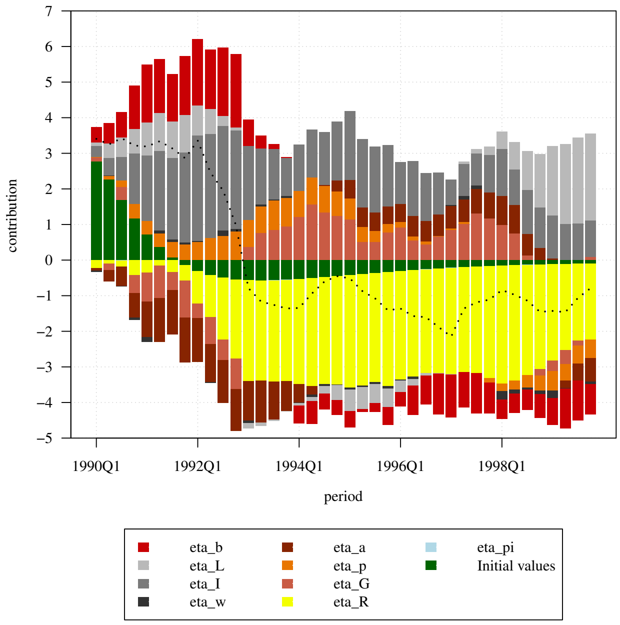

Figure 40: Shock decomposition for: Y