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Model name: `RSW_PC_only`

1 OPTIMALMP

1.1 Optimisation problem

$$\max_{piH_t, piL_t, yH_t, yL_t, i_t} U_t = -0.25\left(pitH - pitCB + piH_t\right)^2 - 0.25\left(-pitCB + pitL + piL_t\right)^2 + \beta \mathrm{E}_t\left[U_{t+1}\right] - 0.25\kappa\theta^{-1} {yH_t}^2 - 0.25\kappa\theta^{-1} {yL_t}^2 \tag{1.1}$$

s.t. :

$$piH_{t-1} = \log etapi_{t-1} + \beta\left(pHpiH_t + piL_t\left(1 - pH\right)\right) + \kappa yH_{t-1} \quad \left(\lambda_t^{\mathrm{OPTIMALMP}^1}\right) \tag{1.2}$$

$$piL_{t-1} = \log etapi_{t-1} + \beta\left(pLpiL_t + piL_t\left(1 - pL\right)\right) + \kappa yL_{t-1} \quad \left(\lambda_t^{\mathrm{OPTIMALMP}^2}\right) \tag{1.3}$$

$$yH_{t-1} = pHyH_t + yL_t\left(1 - pH\right) - \sigma\left(i_{t-1} - pHpiH_t - piL_t\left(1 - pH\right)\right) \quad \left(\lambda_t^{\mathrm{OPTIMALMP}^3}\right) \tag{1.4}$$

$$yL_{t-1} = pLyL_t + yH_t\left(1 - pL\right) - \sigma\left(i_{t-1} - pLpiL_t - piH_t\left(1 - pL\right)\right) \quad \left(\lambda_t^{\mathrm{OPTIMALMP}^4}\right) \tag{1.5}$$

1.2 First order conditions

$$-0.5pitH + 0.5pitCB - 0.5piH_t - \beta \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^1}\right] + \beta pH\lambda_t^{\mathrm{OPTIMALMP}^1} + pH\sigma\lambda_t^{\mathrm{OPTIMALMP}^3} - \sigma\lambda_t^{\mathrm{OPTIMALMP}^4}\left(-1 + pL\right) = 0 \quad (piH_t) \tag{1.6}$$

$$0.5pitCB - 0.5pitL - 0.5piL_t + \beta\lambda_t^{\mathrm{OPTIMALMP}^2} - \beta \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^2}\right] + \beta\lambda_t^{\mathrm{OPTIMALMP}^1}\left(1 - pH\right) + pL\sigma\lambda_t^{\mathrm{OPTIMALMP}^4} - \sigma\lambda_t^{\mathrm{OPTIMALMP}^3}\left(-1 + pH\right) = 0 \quad (piL_t) \tag{1.7}$$

$$\beta\left(\kappa \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^1}\right] - \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^3}\right]\right) + pH\lambda_t^{\mathrm{OPTIMALMP}^3} + \lambda_t^{\mathrm{OPTIMALMP}^4}\left(1 - pL\right) - 0.5\kappa\theta^{-1} yH_t = 0 \quad (yH_t) \tag{1.8}$$

$$\beta\left(\kappa \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^2}\right] - \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^4}\right]\right) + pL\lambda_t^{\mathrm{OPTIMALMP}^4} + \lambda_t^{\mathrm{OPTIMALMP}^3}\left(1 - pH\right) - 0.5\kappa\theta^{-1} yL_t = 0 \quad (yL_t) \tag{1.9}$$

$$\beta\left(-\sigma \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^3}\right] - \sigma \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^4}\right]\right) = 0 \quad (i_t) \tag{1.10}$$

2 EXOG

2.1 Identities

$$etapi_t = e^{\epsilon_t^{\pi} + \phi \log etapi_{t-1}} \tag{2.1}$$

3 Equilibrium relationships (after reduction)

$$-etapi_t + e^{\epsilon_t^{\pi} + \phi \log etapi_{t-1}} = 0 \tag{3.1}$$

$$-piH_{t-1} + \log etapi_{t-1} + \beta \left(pHpiH_t + piL_t \left(1 - pH\right)\right) + \kappa yH_{t-1} = 0 \tag{3.2}$$

$$-piL_{t-1} + \log etapi_{t-1} + \beta \left(pLpiL_t + piL_t \left(1 - pL\right)\right) + \kappa yL_{t-1} = 0 \tag{3.3}$$

$$-yH_{t-1} + pHyH_t - \sigma \left(i_{t-1} - pHpiH_t - piL_t \left(1 - pH\right)\right) + yL_t \left(1 - pH\right) = 0 \tag{3.4}$$

$$-yL_{t-1} + pLyL_t - \sigma \left(i_{t-1} - pLpiL_t - piH_t \left(1 - pL\right)\right) + yH_t \left(1 - pL\right) = 0 \tag{3.5}$$

$$\beta \left(\kappa \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{1}}\right] - \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{3}}\right]\right) + pH\lambda_t^{\mathrm{OPTIMALMP}^{3}} + \lambda_t^{\mathrm{OPTIMALMP}^{4}} \left(1 - pL\right) - 0.5\kappa\theta^{-1} yH_t = 0 \tag{3.6}$$

$$\beta \left(\kappa \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{2}}\right] - \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{4}}\right]\right) + pL\lambda_t^{\mathrm{OPTIMALMP}^{4}} + \lambda_t^{\mathrm{OPTIMALMP}^{3}} \left(1 - pH\right) - 0.5\kappa\theta^{-1} yL_t = 0 \tag{3.7}$$

$$U_t + 0.25 \left(pitH - pitCB + piH_t\right)^2 + 0.25 \left(-pitCB + pitL + piL_t\right)^2 - \beta \mathrm{E}_t \left[U_{t+1}\right] + 0.25\kappa\theta^{-1} {yH_t}^2 + 0.25\kappa\theta^{-1} {yL_t}^2 = 0 \tag{3.8}$$

$$-0.5pitH + 0.5pitCB - 0.5piH_t - \beta \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{1}}\right] + \beta pH\lambda_t^{\mathrm{OPTIMALMP}^{1}} + pH\sigma\lambda_t^{\mathrm{OPTIMALMP}^{3}} - \sigma\lambda_t^{\mathrm{OPTIMALMP}^{4}} \left(-1 + pL\right) = 0 \tag{3.9}$$

$$0.5pitCB - 0.5pitL - 0.5piL_t + \beta\lambda_t^{\mathrm{OPTIMALMP}^{2}} - \beta \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{2}}\right] + \beta\lambda_t^{\mathrm{OPTIMALMP}^{1}} \left(1 - pH\right) + pL\sigma\lambda_t^{\mathrm{OPTIMALMP}^{4}} - \sigma\lambda_t^{\mathrm{OPTIMALMP}^{3}} \left(-1 + pH\right) = 0 \tag{3.10}$$

$$\beta \left(-\sigma \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{3}}\right] - \sigma \mathrm{E}_t \left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^{4}}\right]\right) = 0 \tag{3.11}$$

4 Steady state relationships (after reduction)

$$-etapi_{\mathrm{ss}} + e^{\phi \log etapi_{\mathrm{ss}}} = 0 \tag{4.1}$$

$$-piH_{\mathrm{ss}} + \log etapi_{\mathrm{ss}} + \beta \left(pHpiH_{\mathrm{ss}} + piL_{\mathrm{ss}} \left(1 - pH\right)\right) + \kappa yH_{\mathrm{ss}} = 0 \tag{4.2}$$

$$-piL_{\mathrm{ss}} + \log etapi_{\mathrm{ss}} + \beta \left(pLpiL_{\mathrm{ss}} + piL_{\mathrm{ss}} \left(1 - pL\right)\right) + \kappa yL_{\mathrm{ss}} = 0 \tag{4.3}$$

$$-yH_{\mathrm{ss}} + pHyH_{\mathrm{ss}} - \sigma \left(i_{\mathrm{ss}} - pHpiH_{\mathrm{ss}} - piL_{\mathrm{ss}} \left(1 - pH\right)\right) + yL_{\mathrm{ss}} \left(1 - pH\right) = 0 \tag{4.4}$$

$$-yL_{\mathrm{ss}} + pLyL_{\mathrm{ss}} - \sigma \left(i_{\mathrm{ss}} - pLpiL_{\mathrm{ss}} - piH_{\mathrm{ss}} \left(1 - pL\right)\right) + yH_{\mathrm{ss}} \left(1 - pL\right) = 0 \tag{4.5}$$

$$\beta \left(-\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{3}} + \kappa\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{1}}\right) + pH\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{3}} + \lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{4}} \left(1 - pL\right) - 0.5\kappa\theta^{-1} yH_{\mathrm{ss}} = 0 \tag{4.6}$$

$$\beta \left(-\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{4}} + \kappa\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{2}}\right) + pL\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{4}} + \lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{3}} \left(1 - pH\right) - 0.5\kappa\theta^{-1} yL_{\mathrm{ss}} = 0 \tag{4.7}$$

$$U_{\mathrm{ss}} + 0.25 \left(pitH - pitCB + piH_{\mathrm{ss}}\right)^2 + 0.25 \left(-pitCB + pitL + piL_{\mathrm{ss}}\right)^2 - \beta U_{\mathrm{ss}} + 0.25\kappa\theta^{-1} {yH_{\mathrm{ss}}}^2 + 0.25\kappa\theta^{-1} {yL_{\mathrm{ss}}}^2 = 0 \tag{4.8}$$

$$-0.5pitH + 0.5pitCB - 0.5piH_{\mathrm{ss}} - \beta\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{1}} + \beta pH\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{1}} + pH\sigma\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{3}} - \sigma\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{4}} \left(-1 + pL\right) = 0 \tag{4.9}$$

$$0.5pitCB - 0.5pitL - 0.5piL_{\mathrm{ss}} + \beta\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{1}} \left(1 - pH\right) + pL\sigma\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{4}} - \sigma\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{3}} \left(-1 + pH\right) = 0 \tag{4.10}$$

$$\beta \left(-\sigma\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{3}} - \sigma\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^{4}}\right) = 0 \tag{4.11}$$

5 Parameter settings

$$\beta = 0.99 \tag{5.1}$$

$$\kappa = 0.2465 \tag{5.2}$$

$$\phi = 0.95 \tag{5.3}$$

$$pitH = 2 \tag{5.4}$$

$$pitCB = 2 \tag{5.5}$$

$$pitL = 4 \tag{5.6}$$

$$pH = 0.99 \tag{5.7}$$

$$pL = 0.99 \tag{5.8}$$

$$\sigma = 1 \tag{5.9}$$

$$\theta = 6 \tag{5.10}$$