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Model name: `RSW_RP_ONEOBJ_ENDO_COMMITMENT`

1 OPTIMALMP

1.1 Optimisation problem

$$\max_{\mathit{piH}_t,\mathit{yH}_t,\mathit{piL}_t,\mathit{yL}_t} U_t = -0.25\left(\mathit{pitH}-\mathit{pitCB}+\mathit{piH}_t\right)^2-0.25\left(-\mathit{pitCB}+\mathit{pitL}+\mathit{piL}_t\right)^2+\beta \mathrm{E}_t\left[U_{t+1}\right]-0.25\lambda {\mathit{yH}_t}^2-0.25\lambda {\mathit{yL}_t}^2 \quad (1.1)$$

s.t. :

$$\mathit{piH}_{t-1}=\log \mathit{etapi}_{t-1}+\beta \mathit{piH}_t+\kappa \mathit{yH}_{t-1}+\beta\left(-\mathit{piH}_t+\mathit{piL}_t\right)\left(1-\mathit{pHss}-\tau\left(-\mathit{pitCB}+\mathit{piH}_t\right)^2\right) \quad \left(\lambda_t^{\mathrm{OPTIMALMP}^1}\right) \quad (1.2)$$

$$\mathit{piL}_{t-1}=\log \mathit{etapi}_{t-1}+\beta \mathit{piL}_t+\kappa \mathit{yL}_{t-1}+\beta\left(\mathit{piH}_t-\mathit{piL}_t\right)\left(1-\mathit{pLss}+\tau\left(-\mathit{pitCB}+\mathit{piL}_t\right)^2\right) \quad \left(\lambda_t^{\mathrm{OPTIMALMP}^2}\right) \quad (1.3)$$

1.2 First order conditions

$$-0.5\mathit{pitH}+0.5\mathit{pitCB}-0.5\mathit{piH}_t-\beta \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^1}\right]+\lambda_t^{\mathrm{OPTIMALMP}^1}\left(\beta-\beta\left(1-\mathit{pHss}-\tau\left(-\mathit{pitCB}+\mathit{piH}_t\right)^2\right)-2\beta\tau\left(-\mathit{pitCB}+\mathit{piH}_t\right)\left(-\mathit{piH}_t+\mathit{piL}_t\right)\right)+\beta\lambda_t^{\mathrm{OPTIMALMP}^2}\left(1-\mathit{pLss}+\tau\left(-\mathit{pi}\right.\right. \quad (1.4)$$

$$-0.5\lambda \mathit{yH}_t+\beta\kappa \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^1}\right]=0 \quad \left(\mathit{yH}_t\right) \quad (1.5)$$

$$0.5\mathit{pitCB}-0.5\mathit{pitL}-0.5\mathit{piL}_t-\beta \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^2}\right]+\lambda_t^{\mathrm{OPTIMALMP}^2}\left(\beta-\beta\left(1-\mathit{pLss}+\tau\left(-\mathit{pitCB}+\mathit{piL}_t\right)^2\right)+2\beta\tau\left(-\mathit{pitCB}+\mathit{piL}_t\right)\left(\mathit{piH}_t-\mathit{piL}_t\right)\right)+\beta\lambda_t^{\mathrm{OPTIMALMP}^1}\left(1-\mathit{pHss}-\tau\left(-\mathit{pitCB}+\right.\right. \quad (1.6)$$

$$-0.5\lambda \mathit{yL}_t+\beta\kappa \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^2}\right]=0 \quad \left(\mathit{yL}_t\right) \quad (1.7)$$

2 EXOG

2.1 Identities

$$\mathit{etapi}_t=e^{\epsilon_t^\pi+\phi\log \mathit{etapi}_{t-1}} \quad (2.1)$$

3 Equilibrium relationships (after reduction)

$$-\mathit{etapi}_t+e^{\epsilon_t^\pi+\phi\log \mathit{etapi}_{t-1}}=0 \quad (3.1)$$

$$-0.5\lambda \mathit{yH}_t+\beta\kappa \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^1}\right]=0 \quad (3.2)$$

$$-0.5\lambda \mathit{yL}_t+\beta\kappa \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^2}\right]=0 \quad (3.3)$$

$$-piH_{t-1} + \log etapi_{t-1} + \beta piH_t + \kappa yH_{t-1} + \beta \left(-piH_t + piL_t\right) \left(1 - pHss - \tau \left(-pitCB + piH_t\right)^2\right) = 0 \tag{3.4}$$

$$-piL_{t-1} + \log etapi_{t-1} + \beta piL_t + \kappa yL_{t-1} + \beta \left(piH_t - piL_t\right) \left(1 - pLss + \tau \left(-pitCB + piL_t\right)^2\right) = 0 \tag{3.5}$$

$$-0.5 pitH + 0.5 pitCB - 0.5 piH_t - \beta \mathrm{E}_t \left[\lambda^{\mathrm{OPTIMALMP}^1}_{t+1}\right] + \lambda^{\mathrm{OPTIMALMP}^1}_t \left(\beta - \beta \left(1 - pHss - \tau \left(-pitCB + piH_t\right)^2\right) - 2\beta\tau \left(-pitCB + piH_t\right)\left(-piH_t + piL_t\right)\right) + \beta \lambda^{\mathrm{OPTIMALMP}^2}_t \left(1 - pLss + \tau \left(-pi\right.\right. \tag{3.6}$$

$$0.5 pitCB - 0.5 pitL - 0.5 piL_t - \beta \mathrm{E}_t \left[\lambda^{\mathrm{OPTIMALMP}^2}_{t+1}\right] + \lambda^{\mathrm{OPTIMALMP}^2}_t \left(\beta - \beta \left(1 - pLss + \tau \left(-pitCB + piL_t\right)^2\right) + 2\beta\tau \left(-pitCB + piL_t\right)\left(piH_t - piL_t\right)\right) + \beta \lambda^{\mathrm{OPTIMALMP}^1}_t \left(1 - pHss - \tau \left(-pitCB + \right.\right. \tag{3.7}$$

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

4 Steady state relationships (after reduction)

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

$$-0.5 \lambda yH_{\mathrm{ss}} + \beta \kappa \lambda^{\mathrm{OPTIMALMP}^1}_{\mathrm{ss}} = 0 \tag{4.2}$$

$$-0.5 \lambda yL_{\mathrm{ss}} + \beta \kappa \lambda^{\mathrm{OPTIMALMP}^2}_{\mathrm{ss}} = 0 \tag{4.3}$$

$$-piH_{\mathrm{ss}} + \log etapi_{\mathrm{ss}} + \beta piH_{\mathrm{ss}} + \kappa yH_{\mathrm{ss}} + \beta \left(-piH_{\mathrm{ss}} + piL_{\mathrm{ss}}\right) \left(1 - pHss - \tau \left(-pitCB + piH_{\mathrm{ss}}\right)^2\right) = 0 \tag{4.4}$$

$$-piL_{\mathrm{ss}} + \log etapi_{\mathrm{ss}} + \beta piL_{\mathrm{ss}} + \kappa yL_{\mathrm{ss}} + \beta \left(piH_{\mathrm{ss}} - piL_{\mathrm{ss}}\right) \left(1 - pLss + \tau \left(-pitCB + piL_{\mathrm{ss}}\right)^2\right) = 0 \tag{4.5}$$

$$-0.5 pitH + 0.5 pitCB - 0.5 piH_{\mathrm{ss}} - \beta \lambda^{\mathrm{OPTIMALMP}^1}_{\mathrm{ss}} + \lambda^{\mathrm{OPTIMALMP}^1}_{\mathrm{ss}} \left(\beta - \beta \left(1 - pHss - \tau \left(-pitCB + piH_{\mathrm{ss}}\right)^2\right) - 2\beta\tau \left(-pitCB + piH_{\mathrm{ss}}\right)\left(-piH_{\mathrm{ss}} + piL_{\mathrm{ss}}\right)\right) + \beta \lambda^{\mathrm{OPTIMALMP}^2}_{\mathrm{ss}} \left(1 - pLss + \tau \left(-pitC\right.\right. \tag{4.6}$$

$$0.5 pitCB - 0.5 pitL - 0.5 piL_{\mathrm{ss}} - \beta \lambda^{\mathrm{OPTIMALMP}^2}_{\mathrm{ss}} + \lambda^{\mathrm{OPTIMALMP}^2}_{\mathrm{ss}} \left(\beta - \beta \left(1 - pLss + \tau \left(-pitCB + piL_{\mathrm{ss}}\right)^2\right) + 2\beta\tau \left(-pitCB + piL_{\mathrm{ss}}\right)\left(piH_{\mathrm{ss}} - piL_{\mathrm{ss}}\right)\right) + \beta \lambda^{\mathrm{OPTIMALMP}^1}_{\mathrm{ss}} \left(1 - pHss - \tau \left(-pitCB + p\right.\right. \tag{4.7}$$

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

5 Parameter settings

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

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

$$\lambda = 0.04106 \tag{5.3}$$

$$\phi = 0.95 \tag{5.4}$$

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

$$pitCB = 2 \tag{5.6}$$

$$pitL = 4 \tag{5.7}$$

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

$$pLss = 0.99 \tag{5.9}$$

$$\sigma = 1 \tag{5.10}$$

$$\tau = 0.001 \tag{5.11}$$

$$\theta = 6 \tag{5.12}$$

6 Steady-state values

	Steady-state value
$etapi$	1
$\lambda^{\text{OPTIMALMP}^1}$	0.004
$\lambda^{\text{OPTIMALMP}^2}$	-0.0243
piH	-0.0014
piL	-1.9979
yH	0.048
yL	-0.2894
U	-0.0885

7 The solution of the 1st order perturbation

Matrix P

$$\begin{array}{c|c} & \begin{array}{ccccc} etapi_{t-1} & piH_{t-1} & piL_{t-1} & yH_{t-1} & yL_{t-1} \end{array} \\ \begin{array}{c} etapi_t \\ piH_t \\ piL_t \\ yH_t \\ yL_t \end{array} & \begin{pmatrix} 0.95 & 0 & 0 & 0 & 0 \\ -746.2354 & 1.0246 & -9.3875 & -8.8874 & 0.3352 \\ -0.5139 & 0 & 1.0545 & 0.0002 & -0.0377 \\ -137.0217 & 0.0819 & -2.1381 & -0.7104 & 0.0763 \\ -23.2817 & -0.0005 & 20.864 & 0.0046 & -0.745 \end{pmatrix} \end{array}$$

Matrix Q

$$\begin{array}{cc} & \epsilon^{\pi} \\ \begin{array}{c} etapi \\ piH \\ piL \\ yH \\ yL \end{array} & \begin{pmatrix} 1 \\ 0 \\ 0 \\ -82.1797 \\ -13.9222 \end{pmatrix} \end{array}$$

Matrix R

$$\begin{array}{cc} & \begin{array}{ccccc} etapi_{t-1} & piH_{t-1} & piL_{t-1} & yH_{t-1} & yL_{t-1} \end{array} \\ \begin{array}{c} \lambda_t^{\text{OPTIMALMP}^1} \\ \lambda_t^{\text{OPTIMALMP}^2} \\ U_t \end{array} & \begin{pmatrix} -260.6825 & 0.2606 & -14.6188 & -2.2605 & 0.522 \\ -46.2734 & -0.0017 & 67.4542 & 0.0144 & -2.4085 \\ -3.8568 & -0.0001 & 0.5497 & 0.0005 & -0.0196 \end{pmatrix} \end{array}$$

Matrix S

$$\begin{array}{cc} & \epsilon^{\pi} \\ \begin{array}{c} \lambda^{\text{OPTIMALMP}^1} \\ \lambda^{\text{OPTIMALMP}^2} \\ U \end{array} & \begin{pmatrix} -81.0505 \\ -14.4476 \\ -3.8182 \end{pmatrix} \end{array}$$

8 Model statistics

8.1 Basic statistics

	Steady-state value	Std. dev.	Variance	Loglin
$etapi$	1	0.1303	0.017	Y
$\lambda^{\text{OPTIMALMP}^1}$	0.004	11.186	125.126	Y
$\lambda^{\text{OPTIMALMP}^2}$	-0.0243	1.9061	3.6331	Y
piH	-0.0014	3.5273	12.4415	Y
piL	-1.9979	0	0	Y
yH	0.048	10.9038	118.8936	Y
yL	-0.2894	1.8217	3.3185	Y
U	-0.0885	0.4978	0.2478	Y

8.2 Correlation matrix

	etapi	$\lambda^{\text{OPTIMALMP}^1}$	$\lambda^{\text{OPTIMALMP}^2}$	*piH*	*yH*	*yL*	*U*
etapi	1	-0.998	-1	-0.677	-1	-1	-1
$\lambda^{\text{OPTIMALMP}^1}$		1	0.999	0.719	0.999	0.999	0.998
$\lambda^{\text{OPTIMALMP}^2}$			1	0.686	1	1	1
piH				1	0.691	0.68	0.677
yH					1	1	1
yL						1	1
U							1

8.3 Cross correlations with the reference variable (*piH*)

	$\sigma[\cdot]$ rel. to $\sigma[piH]$	piH_{t-5}	piH_{t-4}	piH_{t-3}	piH_{t-2}	piH_{t-1}	piH_t	piH_{t+1}	piH_{t+2}	piH_{t+3}	piH_{t}
$etapi_t$	0.037	-0.211	-0.403	-0.625	-0.848	-0.973	-0.677	-0.429	-0.226	-0.064	0.06
$\lambda_t^{\text{OPTIMALMP}^1}$	3.171	0.199	0.394	0.619	0.848	0.985	0.719	0.471	0.26	0.089	-0.0
$\lambda_t^{\text{OPTIMALMP}^2}$	0.54	0.208	0.401	0.624	0.849	0.976	0.686	0.438	0.234	0.07	-0.0
piH_t	1	0.005	0.161	0.357	0.587	0.829	1	0.829	0.587	0.357	0.16
yH_t	3.091	0.207	0.4	0.624	0.849	0.977	0.691	0.443	0.237	0.072	-0.0
yL_t	0.516	0.21	0.403	0.625	0.849	0.974	0.68	0.432	0.228	0.066	-0.0
U_t	0.141	0.211	0.403	0.625	0.848	0.973	0.677	0.429	0.226	0.064	-0.0

8.4 Autocorrelations

	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
etapi	0.713	0.471	0.271	0.11	-0.016
$\lambda^{\text{OPTIMALMP}^1}$	0.747	0.505	0.296	0.125	-0.01
$\lambda^{\text{OPTIMALMP}^2}$	0.721	0.479	0.277	0.113	-0.015
piH	0.829	0.587	0.357	0.161	0.005
yH	0.724	0.482	0.279	0.115	-0.014
yL	0.716	0.474	0.273	0.111	-0.016
U	0.713	0.471	0.271	0.11	-0.016

9 Impulse response functions

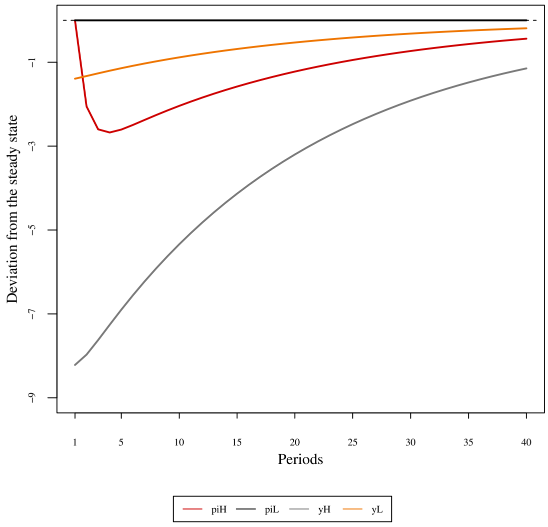

Figure 1: Impulse responses (piH, piL, yH, yL) to ϵ^{π} shock