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Model name: `RSW_RP_ONEOBJ_ENDO_COMMITMENT`

1 OPTIMALMP

1.1 Optimisation problem

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

s.t. :

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

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

1.2 First order conditions

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

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

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

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

2 EXOG

2.1 Identities

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

3 Equilibrium relationships (after reduction)

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

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

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

$$-\mathit{piH}_{t-1} + \log \mathit{etapi}_{t-1} + \beta \mathit{piH}_t + \kappa \mathit{yH}_{t-1} + \beta\left(-\mathit{piH}_t + \mathit{piL}_t\right)\left(1 - \mathit{pHss} - \tau\left(-\mathit{pitCB} + \mathit{piH}_t\right)^2\right) = 0 \tag{3.4}$$

$$-\mathit{piL}_{t-1} + \log \mathit{etapi}_{t-1} + \beta \mathit{piL}_t + \kappa \mathit{yL}_{t-1} + \beta\left(\mathit{piH}_t - \mathit{piL}_t\right)\left(1 - \mathit{pLss} - \tau\left(-\mathit{pitCB} + \mathit{piL}_t\right)^2\right) = 0 \tag{3.5}$$

$$-0.5\mathit{pitH} + 0.5\mathit{pitCB} - 0.5\mathit{piH}_t - \beta \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^1}\right] + \lambda_t^{\mathrm{OPTIMALMP}^1}\left(\beta - \beta\left(1 - \mathit{pHss} - \tau\left(-\mathit{pitCB} + \mathit{piH}_t\right)^2\right) - 2\beta\tau\left(-\mathit{pitCB} + \mathit{piH}_t\right)\left(-\mathit{piH}_t + \mathit{piL}_t\right)\right) + \beta\lambda_t^{\mathrm{OPTIMALMP}^2}\Big(1 - \mathit{pLss} - \tau\,(-\mathit{pi} \tag{3.6}$$

$$0.5\mathit{pitCB} - 0.5\mathit{pitL} - 0.5\mathit{piL}_t - \beta \mathrm{E}_t\left[\lambda_{t+1}^{\mathrm{OPTIMALMP}^2}\right] + \lambda_t^{\mathrm{OPTIMALMP}^2}\left(\beta - \beta\left(1 - \mathit{pLss} - \tau\left(-\mathit{pitCB} + \mathit{piL}_t\right)^2\right) - 2\beta\tau\left(-\mathit{pitCB} + \mathit{piL}_t\right)\left(\mathit{piH}_t - \mathit{piL}_t\right)\right) + \beta\lambda_t^{\mathrm{OPTIMALMP}^1}\Big(1 - \mathit{pHss} - \tau\,(-\mathit{pitCB} + \tag{3.7}$$

$$U_t + 0.25\left(\mathit{pitH} - \mathit{pitCB} + \mathit{piH}_t\right)^2 + 0.25\left(-\mathit{pitCB} + \mathit{pitL} + \mathit{piL}_t\right)^2 - \beta \mathrm{E}_t\left[U_{t+1}\right] + 0.25\lambda {\mathit{yH}_t}^2 + 0.25\lambda {\mathit{yL}_t}^2 = 0 \tag{3.8}$$

4 Steady state relationships (after reduction)

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

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

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

$$-\mathit{piH}_{\mathrm{ss}} + \log \mathit{etapi}_{\mathrm{ss}} + \beta \mathit{piH}_{\mathrm{ss}} + \kappa \mathit{yH}_{\mathrm{ss}} + \beta\left(-\mathit{piH}_{\mathrm{ss}} + \mathit{piL}_{\mathrm{ss}}\right)\left(1 - \mathit{pHss} - \tau\left(-\mathit{pitCB} + \mathit{piH}_{\mathrm{ss}}\right)^2\right) = 0 \tag{4.4}$$

$$-\mathit{piL}_{\mathrm{ss}} + \log \mathit{etapi}_{\mathrm{ss}} + \beta \mathit{piL}_{\mathrm{ss}} + \kappa \mathit{yL}_{\mathrm{ss}} + \beta\left(\mathit{piH}_{\mathrm{ss}} - \mathit{piL}_{\mathrm{ss}}\right)\left(1 - \mathit{pLss} - \tau\left(-\mathit{pitCB} + \mathit{piL}_{\mathrm{ss}}\right)^2\right) = 0 \tag{4.5}$$

$$-0.5\mathit{pitH} + 0.5\mathit{pitCB} - 0.5\mathit{piH}_{\mathrm{ss}} - \beta\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^1} + \lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^1}\left(\beta - \beta\left(1 - \mathit{pHss} - \tau\left(-\mathit{pitCB} + \mathit{piH}_{\mathrm{ss}}\right)^2\right) - 2\beta\tau\left(-\mathit{pitCB} + \mathit{piH}_{\mathrm{ss}}\right)\left(-\mathit{piH}_{\mathrm{ss}} + \mathit{piL}_{\mathrm{ss}}\right)\right) + \beta\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^2}\Big(1 - \mathit{pLss} - \tau\,(-\mathit{pitC} \tag{4.6}$$

$$0.5\mathit{pitCB} - 0.5\mathit{pitL} - 0.5\mathit{piL}_{\mathrm{ss}} - \beta\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^2} + \lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^2}\left(\beta - \beta\left(1 - \mathit{pLss} - \tau\left(-\mathit{pitCB} + \mathit{piL}_{\mathrm{ss}}\right)^2\right) - 2\beta\tau\left(-\mathit{pitCB} + \mathit{piL}_{\mathrm{ss}}\right)\left(\mathit{piH}_{\mathrm{ss}} - \mathit{piL}_{\mathrm{ss}}\right)\right) + \beta\lambda_{\mathrm{ss}}^{\mathrm{OPTIMALMP}^1}\Big(1 - \mathit{pHss} - \tau\,(-\mathit{pitCB} + \mathit{p} \tag{4.7}$$

$$U_{\mathrm{ss}} + 0.25\left(\mathit{pitH} - \mathit{pitCB} + \mathit{piH}_{\mathrm{ss}}\right)^2 + 0.25\left(-\mathit{pitCB} + \mathit{pitL} + \mathit{piL}_{\mathrm{ss}}\right)^2 - \beta U_{\mathrm{ss}} + 0.25\lambda {\mathit{yH}_{\mathrm{ss}}}^2 + 0.25\lambda {\mathit{yL}_{\mathrm{ss}}}^2 = 0 \tag{4.8}$$

5 Parameter settings

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

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

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

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

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

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

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

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

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

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

$$\tau = 0.01 \tag{5.11}$$

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

6 Steady-state values

	Steady-state value
$etapi$	1
$\lambda^{\text{OPTIMALMP}^1}$	-0.0202
$\lambda^{\text{OPTIMALMP}^2}$	0.0881
piH	-0.0236
piL	-1.9469
yH	-0.24
yL	1.0471
U	-1.269

7 The solution of the 1st order perturbation

Matrix P

$$\begin{array}{cc} & \begin{array}{ccccc} etapi_{t-1} & piH_{t-1} & piL_{t-1} & yH_{t-1} & yL_{t-1} \end{array} \\ \begin{array}{c} etapi_t \\ piH_t \\ piL_t \\ yH_t \\ yL_t \end{array} & \begin{pmatrix} 0.95 & 0 & 0 & 0 & 0 \\ -46.2428 & 1.0637 & 2.0971 & -2.6721 & -0.278 \\ -0.4627 & 0.0014 & 0.7813 & -0.0036 & -0.1036 \\ -30.5425 & 0.3024 & 1.4628 & -0.7597 & -0.1939 \\ -5.1426 & 0.0093 & 3.2707 & -0.0234 & -0.4336 \end{pmatrix} \end{array}$$

Matrix Q

$$\begin{array}{cc} & \epsilon^{\pi} \\ \begin{array}{c} etapi \\ piH \\ piL \\ yH \\ yL \end{array} & \begin{pmatrix} 1 \\ 0 \\ 0 \\ -17.8426 \\ -3.2281 \end{pmatrix} \end{array}$$

Matrix R

$$\begin{array}{cc} & \begin{array}{ccccc} etapi_{t-1} & piH_{t-1} & piL_{t-1} & yH_{t-1} & yL_{t-1} \end{array} \\ \begin{array}{c} \lambda_t^{\text{OPTIMALMP}^1} \\ \lambda_t^{\text{OPTIMALMP}^2} \\ U_t \end{array} & \begin{pmatrix} -65.8827 & 0.9888 & 8.6937 & -2.4839 & -1.1526 \\ -8.3814 & 0.0241 & 9.5166 & -0.0606 & -1.2616 \\ 0.8992 & 0.0004 & -0.1351 & -0.0009 & 0.0179 \end{pmatrix} \end{array}$$

Matrix S

$$\begin{array}{cc} & \epsilon^{\pi} \\ \begin{array}{c} \lambda^{\text{OPTIMALMP}^1} \\ \lambda^{\text{OPTIMALMP}^2} \\ U \end{array} & \begin{pmatrix} -20.455 \\ -2.5996 \\ 0.8902 \end{pmatrix} \end{array}$$

8 Model statistics

8.1 Basic statistics

	Steady-state value	Std. dev.	Variance	Loglin
$etapi$	1	0.1303	0.017	Y
$\lambda^{\text{OPTIMALMP}^1}$	-0.0202	2.4833	6.1668	Y
$\lambda^{\text{OPTIMALMP}^2}$	0.0881	0.44	0.1936	Y
piH	-0.0236	0.421	0.1772	Y
piL	-1.9469	0.0112	0.0001	Y
yH	-0.24	2.2561	5.0901	Y
yL	1.0471	0.4526	0.2048	Y
U	-1.269	0.1175	0.0138	Y

8.2 Correlation matrix

	etapi	$\lambda^{\text{OPTIMALMP}^1}$	$\lambda^{\text{OPTIMALMP}^2}$	*piH*	*piL*	*yH*	*yL*	*U*
etapi	1	-0.996	-0.974	0.666	-0.671	-0.999	-0.997	1
$\lambda^{\text{OPTIMALMP}^1}$		1	0.951	-0.599	0.604	0.999	0.987	-0.995
$\lambda^{\text{OPTIMALMP}^2}$			1	-0.817	0.821	0.966	0.988	-0.977
piH				1	-1	-0.64	-0.72	0.677
piL					1	0.645	0.725	-0.681
yH						1	0.994	-0.999
yL							1	-0.998
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
$etapi_t$	0.31	0.234	0.431	0.652	0.863	0.963	0.666	0.418	0.216	0.054	-0.0
$\lambda_t^{\text{OPTIMALMP}^1}$	5.899	-0.25	-0.442	-0.656	-0.856	-0.936	-0.599	-0.351	-0.16	-0.014	0.09
$\lambda_t^{\text{OPTIMALMP}^2}$	1.045	-0.185	-0.386	-0.617	-0.851	-0.999	-0.817	-0.575	-0.346	-0.152	0.00
piH_t	1	0.012	0.174	0.374	0.606	0.843	1	0.843	0.606	0.374	0.17
piL_t	0.027	-0.017	-0.179	-0.379	-0.611	-0.846	-1	-0.833	-0.593	-0.361	-0.1
yH_t	5.359	-0.241	-0.436	-0.654	-0.861	-0.953	-0.64	-0.391	-0.193	-0.038	0.0
yL_t	1.075	-0.219	-0.418	-0.644	-0.864	-0.98	-0.72	-0.473	-0.26	-0.087	0.04
U_t	0.279	0.232	0.429	0.651	0.864	0.967	0.677	0.429	0.224	0.06	-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
$\lambda^{\text{OPTIMALMP}^1}$	0.661	0.416	0.229	0.084	-0.028
$\lambda^{\text{OPTIMALMP}^2}$	0.826	0.587	0.358	0.163	0.006
piH	0.843	0.606	0.374	0.174	0.012
piL	0.837	0.598	0.366	0.168	0.009
yH	0.693	0.449	0.254	0.099	-0.021
yL	0.755	0.514	0.303	0.13	-0.008
U	0.721	0.479	0.277	0.114	-0.015

9 Impulse response functions

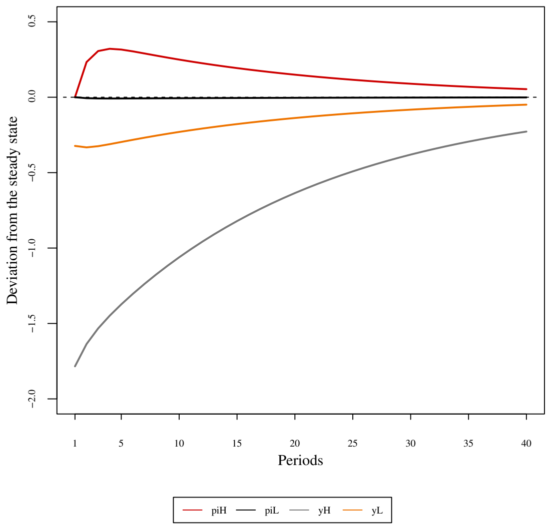

Figure 1: Impulse responses (piH, piL, yH, yL) to ϵ^{π} shock