Labor Extension

$$y_t = Y_t - \overline{Y}_t \tag{1}$$

$$y_t = \rho_1 y_{t-1} - \frac{\rho_2}{100}(\pi 4_{t-1} - \pi 4_{t-1}^{LTE}) + \varepsilon_t^y \tag{2}$$

$$\pi 4_t = \pi 4_{t-1} + \beta y_t + \Omega(y_t - y_{t-1}) + \varepsilon_t^{\pi 4} \tag{3}$$

$$\pi 4_t^{LTE} = \pi 4_{t-1}^{LTE} + \varepsilon_t^{\pi 4^{LTE}} \tag{4}$$

$$u_t = \overline{U}_t - U_t \tag{5}$$

$$\overline{U}_t = \overline{U}_{t-1} + G_t^{\overline{U}} - \frac{\omega}{100} y_{t-1} - \frac{\lambda}{100}(\overline{U}_{t-1} - U^{ss}) + \varepsilon_t^{\overline{U}} \tag{6}$$

$$G_t^{\overline{U}} = (1-\alpha) G_{t-1}^{\overline{U}} + \varepsilon_t^{G^{\overline{U}}} \tag{7}$$

$$u_t = \phi_1 u_{t-1} + \phi_2 y_t + \varepsilon_t^u \tag{8}$$

$$c_t = C_t - \overline{C}_t \tag{9}$$

$$\overline{C}_t = \overline{C}_{t-1} + G_t^{\overline{C}} + \varepsilon_t^{\overline{C}} \tag{10}$$

$$G_t^{\overline{C}} = (1-\delta) G_{t-1}^{\overline{C}} + \varepsilon_t^{G^{\overline{C}}} \tag{11}$$

$$c_t = \kappa_1 c_{t-1} + \kappa_2 y_t + \varepsilon_t^c \tag{12}$$

$$\overline{Q}_t = \overline{Q}_{t-1} + G_t^{\overline{Q}}/4 + \varepsilon_t^{\overline{Q}} \tag{13}$$

$$G_t^{\overline{Q}} = \tau G_{SS}^{\overline{Q}} + (1-\tau) G_{t-1}^{\overline{Q}} + \varepsilon_t^{G^{\overline{Q}}} \tag{14}$$

$$\overline{Q}_t = \overline{Y}_t - \overline{E}_t \tag{15}$$

$$G_t^N = \zeta G_{SS}^N + (1-\zeta) G_{t-1}^N + \varepsilon_t^{G^N} \tag{16}$$

$$G_t^N = 4(N_t - N_{t-1}) \tag{17}$$

$$p_t = P_t - \overline{P}_t \tag{18}$$

$$\overline{P}_t = \eta 100 \ln\left(\frac{P_{SS}}{100}\right) + (1-\eta)\overline{P}_{t-1} + \varepsilon_t^{\overline{P}} \tag{19}$$

$$p_t = \theta_1 p_{t-1} + \frac{100}{P_{SS}} \theta_2 u_t + \varepsilon_t^p \tag{20}$$

$$\overline{L}_t = N_t + \overline{P}_t \tag{21}$$

$$L_t = N_t + P_t \tag{22}$$

$$\overline{U}_t - U^{ss} = -\left(1 - \frac{U^{ss}}{100}\right)\left(\overline{E}_t - \overline{L}_t - 100 \ln\left(1 - \frac{U^{ss}}{100}\right)\right) \tag{23}$$

Labor Extension in IRIS

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LGDP = LGDP_BAR + Y;
Y = rho1*Y{-1} - rho2/100*(PIE4{-1} - PIELTE{-1}) + RES_Y;
GROWTH4 = LGDP - LGDP{-4};
GROWTH = 4*(LGDP - LGDP{-1});
GROWTH4_BAR = LGDP_BAR - LGDP_BAR{-4};
GROWTH_BAR = 4*(LGDP_BAR - LGDP_BAR{-1});

PIE4 = PIE4{-1} + beta*Y + omega*(Y - Y{-1}) + RES_PIE;
PIELTE = PIELTE{-1} + RES_PIELTE;

UNR = UNR_BAR - UNR_GAP;
UNR_BAR = UNR_BAR{-1} + UNR_G
    - parhist/100*Y{-1} - lambda/100*(UNR_BAR{-1} - unr_ss) + RES_UNR_BAR;
UNR_G = (1-alpha)*UNR_G{-1} + RES_UNR_G;
UNR_GAP = phi1*UNR_GAP{-1} + phi2*Y + RES_UNR_GAP;

CAPU = CAPU_BAR + CAPU_GAP;
CAPU_BAR = CAPU_BAR{-1} + CU_G + RES_CAPU_BAR;
CU_G = (1 - delta)*CU_G{-1} + RES_CU_G;
CAPU_GAP = kappa1*CAPU_GAP{-1} + kappa2*Y + RES_CAPU_GAP;

APL_BAR = APL_BAR{-1} + G/4 + RES_LGDP_BAR;
G = (1-tau)*G{-1} + tau*growth_ss + RES_G;
DAPL_BAR = 4*(APL_BAR - APL_BAR{-1});

APL_BAR = LGDP_BAR - LE_BAR;

DLN = (1-zeta)*DLN{-1} + zeta*popgrowth_ss + RES_DLN;
DLN = 4*(LN - LN{-1});

LP_GAP = theta1*LP_GAP{-1} -100/part_ss*theta2*(UNR - UNR_BAR) + RES_LP;
LP_GAP = LP - LP_BAR;

LP_BAR = (1-eta)*LP_BAR{-1} + eta*100*log(part_ss/100) + RES_LP_BAR;

LLF_BAR = LN + LP_BAR;
DLLF_BAR = 4*(LLF_BAR - LLF_BAR{-1});
LLF = LN + LP;
DLLF = 4*(LLF - LLF{-1});

UNR_BAR - unr_ss = -(1-unr_ss/100)*(LE_BAR - LLF_BAR - 100*log(1-unr_ss/100));
DLE_BAR = 4*(LE_BAR - LE_BAR{-1});
```