%% Kooma-model file.
% Valtiovarainministeriö
% Kansantalousosasto
% Mika Kuismanen & Mikko Sariola &
% Samuli Pietiläinen September 2013
%----------------------------------
% Meri Obstbaum November 2013
% adds frictional labour market

%linear

!transition_variables

%Households
'Private consumption' cp
'Transitory UIP shock process (risk premium)' i_e

% Ricardian Households
'Consumption of forward looking households' cp_fl
'Marginal utility of consumption' muc
'Shadow value of consumption' iso_lambda
'Capital-labour ratio in production' k
'Effective capital' K
'Physical capital' Kp
'Capacity utilisation rate' nu
'Investment' ip
'Rental rate on capital k' yint_roc
'Real value of installed capital - Tobin Q' tobin_q
'Nominal interest rate' i
'Price of domestic wholesale good' pyint
'Consumer price' p
'CPI inflation' pie_p
'Producer price inflation' pie_yint
'Real price of K-L product' preal_kl
'Price of K-L product in terms of the CPI' pyint_kl
'Marginal productivity of capital' mpk
'Shock process of household consumption' cp_fl_e
'Shock process of investment adjustment costs' eps_ip
'Shock process of Tobin Q ' eps_tobin_q
'Process of TFP shock' yint_z
'Operating surplus / dividends' D

% Rule of thumb households
'Consumption of hand-to-mouth households' cp_lc

% Labour Market matching
% PRODUCTION
'Output of labour and capital intermediate' yint_kl
'Aggregate output n*yint_kl' yint

% LABOUR MARKET
'number of matches' match
'unemployment' u
'Employment, number of workers' n
'Working hours, per person' h
'Total hours =n*h' total_h
'Vacancies' v
'Job destruction rate' rhohat
'Firms vacancy-filling probability' qf
'Workers job-finding probability' qw
'Labour market tightness' theta
'Shock process of labour shock' n_e

% Wage bargaining
'Firm surplus' J
'Worker surplus' H
'Marginal Productivity of Labour' mpl
'Contract wage' w_contract
'Nominal wage' w
'Employers social contribution' tau_sc
'Marginal rate of substitution between consumption and labour' mrs
'Workers tax on earned income' tau_w
'Value added tax' tau_cp
'Bargaining strength of workers' etahat

% Job creation and determination of hours worked (per person)
'Vacancy posting cost' kappahat

% Marginal cost of wholesale firm
'Price mark-up domestic market' yint_phi

% RETAILERS, final goods producers
% Retailer of investment good
'Price of composite investment good' pip
'Demand of domestic intermediate investment good' iph
'Imported investment good' mi

% Importer price setting: consumption good
  'PCP price of imported consumption good' pmc_pcp % PCP price equation for imported intermediate input ($)
  'LCP price of imported consumption good' pmc_lcp % LCP price equation for imported intermediate input (€)
  'Price of imported consumption good' pmc % aggregate import price equation of consumption good

% Retailer of consumption good
'Price of composite consumption good' pcp
'Imported consumption good' mc
% 'Price of domestic intermediate good' pcp
'Demand of domestic intermediate consumption good' cph

% Retailer of export good
'Demand for imports used in exports' mex
'Demand for domestic goods used in exports' hex

% Importer price setting: export good
'PCP price of imported intermediate good used in exports ($)'
pmex_pcp

'LCP price of imported intermediate good used in exports (€)'
pmex_lcp

'price of composite import good used in exports' pmex

% EXTERNAL SECTOR: Exports, imports

%Total imports
'imports' m
'import price' pm

%%Importer price setting: investment good

'PCP price equation for imported intermediate input ($)’ pmi_pcp
'LCP price equation for imported intermediate input (€)' pmi_lcp
'aggregate import price equation of investment good' pmi

% Exports
'marginal cost of exports' mcex
'export market size' xd
'aggregate export price level' px
'LCP export price' px_lcp
'PCP export price' px_pcp
'aggregate exports' x
'LCP export volume' x_lcp
'PCP export volume' x_pcp

'Foreign price level ($) competing with finnish exporters' f_pex
% one foreign price level, $ equal to f_pim

% Some general variables

'exchange rate' e
'foreign price level ($) competing with finnish importers'
f_pim % foreign price level

'Trade balance' tb;
'Foreign bond' BF;
'Foreign interest rate' istar

% Shock processes to imports and exports

'Transitory price shock process to imported consumption goods' pmc_e
'Transitory price shock process to mc of exports' mcex_e
'Transitory price shock process to imported investment goods' pmi_e
'Transitory price shock process to imported goods used in exports'

'Foreign price level ($) competing with finnish importers' f_pim

% Public sector / General government

'General government bonds' BH
'Tax on dividends' tau_d
'Tax on investment/ investment tax credit' tau_ip
'Tax on capital' tau_k
'general government consumption (real)' cg
'transfers to households' ott

% Some reporting variables
'General government income' GG_income
'General government income, VAT' GG_income_VAT
'General government income, tau_W+tau_SC' GG_income_W_SC
'General government income, tau_W' GG_income_W
'General government income, tau_SC' GG_income_SC
'General government income, tau_D' GG_income_D

'price of oil, $' poil
'export price aggegation' px_e

'general government investment (real)' ig

!transition_shocks

'UIP shock (risk premium)' e_i_e
'Transitory shock to investments' e_ip
'Transitory shock to Tobin q' e_eps_q
'Transitory household consumption preference shock' e_cp_fl
'Transitory shock in productivity' e_yint_z
'Labour shock' e_n
  'Shock to job destruction rate' e_rhohat
'Shock to vacancy costs' e_kappahat
'Shock to workers negotiation weight' e_etahat
'Shock to average wage process' e_w
'Shock to unemployment rate' e_u

'Price markup shock of intermediate firm' e_yint_phi

'exchange rate shock' e_e
'foreign price shock' e_f_pim
'export demand shock' e_xd
'Price shock to imported consumption goods' e_pmc
'Price shock to MC of exports' e_MCex
'Price shock to imported investment goods' e_pmi
'Price shock to imported goods used in exports' e_pmex
'Shock to aggregate imports' e_m_e
'Shock to imported consumption goods' e_MC_e
'Shock to imported investment goods' e_MI_e
'Shock to imported consumption goods used in exports' e_Mex_e

  'Shock to wage tax parameter' e_tau_w
  'Shock to VAT tax parameter' e_tau_cp
'Shock to capital tax' e_tk
'Shock to employers social contributions' e_tk_sc
'Shock to dividend tax' e_tk_d
'Shock to investment tax or subsidy if minus sign' e_tk_ip
'Shock to government transfers' e_ott
'Shock to government consumption' e_cg
'Shock to government investment' e_ig

'Shock to oil price' e_poil
'shock to export price aggregation' e_px

% parameters

omega_lc % share of liquidity constrained households, set != 0 with matching istar_ss % SS foreign interest rate gamma_sastar % debt elastic interest rate penalty parameter

rho_i_e % AR-coefficient of UIP shock process tau_cp_ss % SS VAT on consumption sigma_cp % household risk aversion varkappa % habit persistence rho_cp_fl_e % AR coefficient of consumption shock beta % discount factor cp_ss % SS consumption cp_lc_ss % SS consumption of liquidity constraint households

cp_fl_ss % SS consumption of forward-looking households ott_ss % SS transfers to households

% Investment and capital

kappa_i % investment adjustment cost parameter rho_ip % AR coefficient of investment shock delta_k % depreciation of capital gamma_yint % share of capital in intermediate goods production

eta_nu % capital utilization rate yint_roc_ss % SS return on capital rho_tobin_q % AR coefficient of equity premium shock rho_z % AR coefficient of transitory technology

% Labour market matching and wage bargaining

sigma_M % elasticity of matches w.r.t. unemployment rho % SS job destruction rate match_ss % SS matches n_ss % SS employment u_ss % SS unemployment

pyint_kl_ss % SS price of K-L good, = preal_kl_ss mpl_ss % SS marginal productivity of labour

h_ss % SS hours worked per person J_ss % SS firm surplus w_ss % SS wage b % unemployment benefit

tau_sc_ss % SS employer's social contribution k_ss % SS operative capital tau_w_ss % SS worker's tax on earned income H_ss % SS worker surplus mrs_ss % SS marginal rate of substitution
sigma_n % Frish elasticity of labour
qw_ss % SS job-finding probability
eta % SS bargaining power
omega_w % Weight of contract wage
rho_n_e % AR of labour supply shock
rho_rhohat % AR of job destruction shock
rho_kappahat % AR of vacancy cost shock
rho_etahat % AR of shock to workers' negotiation weight
% Wholesale firm
%-------------------
rho_yint_phi % AR-coeff. of markup shock%
pyint_ksi % probability of taking the price as given
(calvo)
pyint_ss % SS price of domestic intermediate input
SAMULI
yint_ss % SS production of intermediate firm

%-----------------------------------
f_pim_ss % foreign SS price level ($) for intermediate
import input market.
rhoe % ar coefficient in exchange rate shock
rho_f_pim % ar coefficient in foreign price shock
i_ss % SS nominal interest rate
% importer price setting: investment good
%-----------------------------------
omegai % share of LCP importing firms. (1-omegai) is the
share of pcp firms
gammai_lcp % calvo parameter, share of LCP import firms that are
NOT allowed to change price at period t
gammai_pcp % calvo parameter, share of PCP import firms that are
NOT allowed to change price at period t

% retailer of investment good
thetapi % demand elasticity for domestic and foreign interme-
diate investment good
omegap % share of domestic intermediate investment good in
production of composite investment good
%-----------------------------------

% Importer price setting: consumption good
%-----------------------------------

omegac % share of LCP importing firms. (1-omegac) is
the share of pcp firms
gammaclcp % calvo parameter, share of LCP import firms
that are NOT allowed to change price at period t
gammacp % calvo parameter, share of PCP import firms
that are NOT allowed to change price at period t

% Retailer of consumption good
thetacp % demand elasticity for domestic and foreign interme-
diate consumption good
omegacp % share of domestic intermediate consumption good in
production of composite consumption good

%Exporter
%------------

\[\text{gammax}_{\text{pcp}}\] % calvo parameter, share of PCP firms that are NOT allowed to change price at period t,
\[\text{gammax}_{\text{lcp}}\] % calvo parameter, share of LCP firms that are NOT allowed to change price at period t
\[\text{omegax}\] % share of LCP firms in exports
\[\text{thetax}\] % price elasticity of demand for the export product.

Determined by \(\text{rho}_{\text{ox}}\)

\[x_{\text{ss}}\] % SS of exports
\[\text{rhostar}\]
\[\text{thetax}\]
\[\text{deltax}\]
\[\text{mex}_{\text{ss}}\]

%Importer price setting: export good
%-----------------------------------
\[\text{mcex}_{\text{ss}}\] % SS marginal cost of exports
\[\text{pmex}_{\text{ss}}\] % aggregate steady state import price level for goods used in export production(€)
\[\text{omegax}\] % share of LCP importing firms. \((1-\text{omegax})\) is the share of pcp firms
\[\text{gammaex}_{\text{lcp}}\] % calvo parameter, share of LCP import firms that are NOT allowed to change price at period t
\[\text{gammaex}_{\text{pcp}}\] % calvo parameter, share of PCP import firms that are NOT allowed to change price at period t

\[m_{\text{ss}}\] % SS imports
\[mc_{\text{ss}}\] % SS imported C goods share of total imports
\[mi_{\text{ss}}\] % SS imported I goods share of total imports
\[\text{rho}_{\text{pmc}_e}\] % ar coefficient in imported consumption good price shock
\[\text{rho}_{\text{mcex}_e}\] % ar coefficient in mc of exports shock
\[\text{rho}_{\text{pmi}_e}\] % ar coefficient in imported investment good price shock
\[\text{rho}_{\text{pmex}_e}\] % ar coefficient in imported goods used in exports price shock
\[\text{rho}_{\text{mc}_e}\]
\[\text{rho}_{\text{mi}_e}\]
\[\text{rho}_{\text{mex}_e}\]

% Public sector
%------------
\[\text{BH}_{\text{ss}}\] % General government bonds in SS
\[\text{tau}_{\text{d}_\text{ss}}\] % Tax on dividends in SS
\[\text{tau}_{\text{k}_\text{ss}}\] % Tax on effective capital in SS
\[\text{tau}_{\text{ip}_\text{ss}}\] % Tax on investments in SS
\[\text{rho}_{\text{cg}}\] % AR of public spending shock
\[\text{rho}_{\text{ig}}\] % AR of public investment shock
\[\text{rho}_{\text{ott}}\] % AR-coeff of transfers to households (ott_e) shock
\[\text{rho}_{\text{tau}_w}\]
\[\text{rho}_{\text{tau}_\text{cp}}\]
rho_tau_k
rho_tau_sc
rho_tau_d
rho_tau_ip
rho_poil

% Closing the model
%------------------
ip_ss % Investment in SS
cg_ss % Government consumption
ig_ss % Government investment
v_ss % Vacancies in SS
kappa % Vacancy posting cost in SS
K_ss % Effective capital in SS
rho_istar % AR coefficient of foreign interest
D_ss % Dividends in SS
total_h_ss % Total hours worked in SS

% shock magnitude parameters
std_e_rhohat % std error of job destruction shock
std_e_kappahat % std error of vacancy cost shock
std_e_etahat % std error of shock to negotiation weight
std_e_pmc % st. error of the shock
std_e_mcex % st. error of the shock
std_e_pmi % st. error of the shock
std_e_pmex % st. error of the shock
std_e_m_e
std_e_mc_e
std_e_mi_e
std_e_mex_e
std_e_e % st. error of the shock
std_e_f_pim % st. error of the shock
std_e_i_e % st. error of the shock
std_e_xd % st. error of the shock
std_e_px

std_e_n

std_e_ott % St. error of transfers to households (ott_e) shock
std_e_tau_w
std_e_tau_k
std_e_tau_cp
std_e_tau_sc
std_e_tau_d
std_e_tau_ip
std_e_cg

!transition_equations
%% Debt-elastic interest rate
\[ i = \text{istar} - \gamma_{sastar} \ast (BF - \text{yint} - \text{pyint}) + i_e; \]

\[ i_e = \rho_{i_e} \ast i_e(-1) + e_{i_e}; \]

\[ \text{poil} = \rho_{\text{poil}} \ast \text{poil}(-1) + e_{\text{poil}}; \]

%% Ricardian Households

% Consumption
\[ \text{iso}_{\lambda} = \text{iso}_{\lambda}(+1) + i - (p(+1) - p); \quad \% \ \text{Euler equation} \]
\[ \text{iso}_{\lambda} = \mu_{c} - \frac{\tau_{cp}}{1 + \tau_{cp}} \ast \tau_{cp}; \quad \% \ \text{Marginal utility of wealth} \]
\[ \mu_{c} = -\frac{\sigma_{cp}}{1 - \nu} \ast (cp_{fl} - \nu) + cp_{fr}; \quad \% \ \text{where } \mu_{c} \text{ is marginal utility of consumption} \]

% Investment and capital accumulation
\[ \nu = \eta_{nu} \ast \text{yint}_{roc}; \quad \% \ \text{Capital utilization rate} \]
\[ \text{ip} = \frac{1}{1 + \beta} \ast \text{ip}(-1) + \frac{\beta}{1 + \beta} \ast \text{ip}(+1) + \frac{1}{1 + \beta} \ast (1 - \delta_{k}) \ast \text{tobin}_q - \frac{1}{1 + \beta} \ast \beta \ast \text{eps}_{ip}(+1) - \text{eps}_p; \quad \% \ \text{Investment} \]
\[ \text{K}_p = (1 - \delta_{k}) \ast \text{K}_p(-1) + \delta_{k} \ast \text{ip}(-1); \quad \% \ \text{(physical)} \]
Capital accumulation equation
\[ \text{K} = \nu + \text{K}_p(-1); \quad \% \ \text{Effective capital} \]
\[ \text{tobin}_q = -(i - (p(+1) - p)) + ((1 - \delta_{k})/(1 - \delta_{k} + \text{yint}_{roc} - \mu_{c})) \ast \text{tobin}_q(+1) + ((\text{yint}_{roc} - \mu_{c})/(1 - \delta_{k} + \text{yint}_{roc} - \mu_{c})) \ast \text{yint}_{roc}(+1) + \text{eps}_{tobin}_q; \quad \% \ \text{Real value of capital, Tobin Q} \]
\[ \text{yint}_{roc} = \text{pyint}_{kl} + \text{mpk}; \quad \% \ \text{Rental rate for capital} \]

for capital
\[ \text{pyint}_{kl} = \text{pyint} - \text{p} + \text{preal}_{kl}; \]
\[ \text{mpk} = (1 - \gamma_{yint}) \ast (h - k) + \text{yint}_{z}; \]
\[ k = K - n; \quad \% \ \text{Capital-Labour ratio} \]

% shocks
\[ \text{cp}_{fl} = \rho_{cp}_{fl} \ast \text{cp}_{fl}(-1) + e_{cp}_{fl}; \quad \% \ \text{AR consumption shock process} \]
\[ \text{eps}_{ip} = \rho_{ip} \ast \text{eps}_{ip}(-1) + e_{ip}; \quad \% \ \text{Investment AR1-Shock} \]
\[ \text{eps}_{tobin}_q = \rho_{tobin}_q \ast \text{eps}_{tobin}_q(-1) + e_{eps}_q; \quad \% \ \text{Technology shock} \]

%% Rule of thumb households

% Liquidity constrained households consume all their income
\[
\text{cp}_{lc} = \frac{(n_{ss} w_{ss} h_{ss} (1-tau_{w_{ss}}))}{(1+tau_{cp_{ss}}) cp_{lc_{ss}}}) \times (w+h) + \frac{(n_{ss} (w_{ss} h_{ss} (1-tau_{w_{ss}})-b))}{(1+tau_{cp_{ss}}) cp_{lc_{ss}}}) \times n + \frac{(ott_{ss}}{(1+tau_{cp_{ss}}) cp_{lc_{ss}}}) \times ott - (1-\frac{(b \times (1-n_{ss})}{(1+tau_{cp_{ss}}) cp_{lc_{ss}}})) \times p - \frac{(tau_{cp_{ss}}}{(1+tau_{cp_{ss}})) \times tau_{cp} - \frac{(n_{ss} w_{ss} h_{ss} tau_{w_{ss}})}{(1+tau_{cp_{ss}}) cp_{lc_{ss}}}) \times tau_{w};
\]

% Aggregate consumption
\[
\text{cp} = \frac{(omega_{lc} cp_{lc_{ss}}/cp_{ss}) \times cp_{lc} + ((1-omega_{lc}) cp_{fl_{ss}}/cp_{ss}) \times cp_{fl};
\]

%Labour Market matching

% On intermediate firms:
% Matching and employment dynamics
match = sigma_M*u+(1-sigma_M)*v; % Nr of new matches in each period
n = (1-rho)*n{-1}+(match_{ss}/n_{ss})*match{-1}-rho*rhohat; % Total nr of matches that enter each period = employment
u = -(1-u_{ss}/u_{ss})*n + e_u; % unemployment, e_u added to be able to exogenise in conditional forecast
qf = match-v; % vacancy-filling probability
qw = match-u; % job-finding probability
theta = v-u; % labour market tightness
rhohat = rho_rhohat*rhohat{-1}+e_rhohat; % Shock to job destruction rate
%rhohat = -7.79*yint_{z}+e_rhohat;

% Wage bargaining

% Firm surplus
\[
J = \frac{((pyint_{kl_{ss}} mpl_{ss} h_{ss})/(1-gamma_{yint}) J_{ss})) * (pyint_{kl} + mpl + h) - ((w_{ss} h_{ss} (1+tau_{sc_{ss}})/J_{ss}) *(w+h-p) - ((w_{ss} h_{ss} tau_{sc_{ss}})/J_{ss}) * tau_{sc} - (((yint_{roc_{ss}})*k_{ss})/J_{ss}) * (yint_{roc} + k) + (beta*(1-rho)) * (J{+1}+iso_{lambda}{+1}-iso_{lambda}) - (beta*rho) * (rhohat{+1});
\]

% where the marginal productivity of labour is
mpl = gamma_{yint} * (k-h) + yint_{z}
\%

% Worker surplus
\[
H = \frac{((w_{ss} h_{ss} (1-tau_{w_{ss}})/H_{ss}) *(w+h-p) - ((w_{ss} h_{ss} tau_{w_{ss}})/H_{ss}) * tau_{w} - ((mrs_{ss} h_{ss} (1+tau_{cp_{ss}})/(1+sigma_{n}) H_{ss}) *(mrs+h))
\]
\[-(\text{mrs}_ss*\text{h}_ss*\text{tau}_cp_ss)/((1+\sigma_n)*\text{H}_ss))*\text{tau}_cp+(\beta*(1-\rho_qw)_ss)*((\text{H}_ss+1)\text{-iso}_\lambda)=-(\beta)\rho_h\hat{+1}-(\beta*qw)_ss)*qw;\]

% where the marginal rate of substitution is
\[\text{mrs} = \sigma_n*\text{h}+(1-\sigma_n)*n_e-\mu_c;\]

% Negotiated wage
\[
\text{w}_\text{contract} = \left((\eta*\text{pyint}_kl_ss*\text{mpl}_ss)/((1+\tau_sc_ss)*(1-\gamma_yint)*\text{w}_ss))\right)\left((\text{pyint}_kl+\text{mpl})-\right)\left((\text{yint}_roc_ss*\text{k}_ss)/(\text{w}_ss*\text{h}_ss*(1+\tau_w_ss))\right)-(\eta*\text{tau}_sc_ss)/((1-\tau_w_ss)*(1+\sigma_n)*\text{w}_ss)*\text{mrs}\]

% Average wage
\[\text{w} = \omega_w*\text{w}_\text{contract} + (1-\omega_w)*\text{w}_{\text{-1}} + \epsilon_w;\]

% Shock to workers' negotiation weight
\[\text{etahat} = \rho_{\text{etahat}}*\text{etahat}_{\text{-1}}+\epsilon_{\text{etahat}};\]

% Hours supply shock process
\[n_e = \rho_{n_e}*n_e_{\text{-1}}+\epsilon_n;\]

% Job creation and determination of hours worked (per person)
% --------------------------
% Comments here
% Vacancy posting / job creation condition (analogous to labour demand in conventional models)
\[\kappa_{\text{hat}}-qf = J\text{(}+1\text{)}+\text{iso}_\lambda\text{(}+1\text{)}-\text{iso}_\lambda;\]

% Hours worked \text{xmpl}(1-\tau_w) = \text{mrs}(1+\tau_w)\text{ (1+}\text{tau}_cp\text{)}
\[
\text{pyint}_kl+\text{mpl} = \text{mrs}*(\tau_w*\text{ss}/(1-\tau_w*\text{ss}))*\text{tau}_w+(1-\text{tau}_w)*((\text{H}_ss+1)\text{-iso}\_\lambda);\]

% Shock to vacancy costs
\[\kappa_{\text{hat}} = \rho*\kappa_{\text{hat}}-qf\text{-1}+e_{\kappa_{\text{hat}}};\]
%% Wholesale firm, price setting
%-------------------------------

% New Keynesian Phillips curve
pie_yint = (((1-pyint_ksi)*(1-(pyint_ksi*beta))/(pyint_ksi)))*preal_kl+yint_phi+beta*pie_yint{1};
pie_yint = pyint-pyint{-1};
yint_phi = rho_yint_phi*yint_phi{-1}+e_yint_phi;

%% External sector: Imports, Exports
% Comments here
%
% Aggregate imports
m = (mex_ss/m_ss)*mex+(mc_ss/m_ss)*mc+(mi_ss/m_ss)*mi+e_m_e;

pm = (mex_ss/m_ss)*pmex+(mc_ss/m_ss)*pmc+(mi_ss/m_ss)*pmi;

% Importer price setting: INVESTMENT good

pmi = omegai*pmi_lcp - omegai*e +(1-omegai)*pmi_pcp + pm_e; % aggregate

pmi_lcp - pmi_lcp{-1} = (1/(1+beta))*(pmi_lcp{-1} - pmi_lcp{-2}) + (((1-gammai_lcp)*(1-beta*gammai_lcp))/((1+beta)*gammai_lcp))*(f_pim-e-pmi_lcp)+(beta/(1+beta))*(pmi_lcp{+1}-pmi_lcp); %LCP

pmi_pcp - pmi_pcp{-1} = (1/(1+beta))*(pmi_pcp{-1} - pmi_pcp{-2}) + (((1-gammai_pcp)*(1-beta*gammai_pcp))/((1+beta)*gammai_pcp))*(f_pim-pmi_pcp)+(beta/(1+beta))*(pmi_pcp{+1}-pmi_pcp); %PCP

pmi_e = rho_pmi_e*pmi_e{-1} + e_pmi;

% Importer price setting: CONSUMPTION good

pmc = omegac*pmc_lcp - omegac*e +(1-omegac)*pmc_pcp +0.0463*poil + pmc_e;

pmc_lcp - pmc_lcp{-1} = (1/(1+beta))*(pmc_lcp{-1} - pmc_lcp{-2}) + (((1-gammaac_lcp)*(1-beta*gammaac_lcp))/((1+beta)*gammaac_lcp))*(f_pim-e-pmc_lcp)+(beta/(1+beta))*(pmc_lcp{+1}-pmc_lcp); %LCP

pmc_pcp - pmc_pcp{-1} = (1/(1+beta))*(pmc_pcp{-1} - pmc_pcp{-2}) + (((1-gammaac_pcp)*(1-beta*gammaac_pcp))/((1+beta)*gammaac_pcp))*(f_pim-pmc_pcp)+(beta/(1+beta))*(pmc_pcp{+1}-pmc_pcp); %PCP

pmc_e = rho_pmc_e*pmc_e{-1} + e_pmc;

% Importer price setting: EXPORT good
\[ \text{pmex} = \omega_{\text{ex}} \cdot \text{pmex}_{\text{lcp}} - \omega_{\text{ex}} \cdot e + (1 - \omega_{\text{ex}}) \cdot \text{pmex}_{\text{pcp}} + 0.1043 \cdot \text{poil} + \text{pmex}_e; \] % aggregate import price equation that combines PCP and LCP price levels
\[ \text{pmex}_{\text{lcp}} - \text{pmex}_{\text{lcp}}[{-1}] = \frac{1}{1+(1+\beta))}(\text{pmex}_{\text{lcp}}[{-1}] - \text{pmex}_{\text{lcp}}[{-2}]) + (((1-\gamma_{\text{ex}} \cdot \text{lcp}) \cdot (1-\beta \cdot \gamma_{\text{ex}} \cdot \text{lcp})/(1+\beta) \cdot \gamma_{\text{ex}} \cdot \text{lcp})) \cdot (f_{\text{pim}} - \text{pmex}_{\text{lcp}}) + (\beta/(1+\beta)) \cdot (\text{pmex}_{\text{lcp}}^[+1]-\text{pmex}_{\text{lcp}}); \]
\[ \text{pmex}_{\text{pcp}} - \text{pmex}_{\text{pcp}}[{-1}] = \frac{1}{1+(1+\beta))}(\text{pmex}_{\text{pcp}}[{-1}] - \text{pmex}_{\text{pcp}}[{-2}]) + (((1-\gamma_{\text{ex}} \cdot \text{pcp}) \cdot (1-\beta \cdot \gamma_{\text{ex}} \cdot \text{pcp})/(1+\beta) \cdot \gamma_{\text{ex}} \cdot \text{pcp})) \cdot (f_{\text{pim}} - \text{pmex}_{\text{pcp}}) + (\beta/(1+\beta)) \cdot (\text{pmex}_{\text{pcp}}^[+1]-\text{pmex}_{\text{pcp}}); \]
\[ \text{pmex}_e = \rho_{\text{pmex}_e} \cdot \text{pmex}_{e[{-1}]} + e_{\text{pmex}}; \] % price shock AR to imported good used in exports

\[ \text{px} = \omega_{\text{x}} \cdot \text{px}_{\text{lcp}} - \omega_{\text{x}} \cdot e + (1 - \omega_{\text{x}}) \cdot \text{px}_{\text{pcp}} + \text{px}_e; \] % Export price setting
\[ \text{px}_{\text{lcp}} - \text{px}_{\text{lcp}}[{-1}] = \frac{1}{1+(1+\beta))}(\text{px}_{\text{lcp}}[{-1}] - \text{px}_{\text{lcp}}[{-2}]) + (((1-\gamma_{\text{x}} \cdot \text{lcp}) \cdot (1-\beta \cdot \gamma_{\text{x}} \cdot \text{lcp})/(1+\beta) \cdot \gamma_{\text{x}} \cdot \text{lcp})) \cdot (\text{mcex} - e - \text{px}_{\text{lcp}}) + (\beta/(1+\beta)) \cdot (\text{px}_{\text{lcp}}^[+1]-\text{px}_{\text{lcp}}); \]
\[ \text{px}_{\text{pcp}} - \text{px}_{\text{pcp}}[{-1}] = \frac{1}{1+(1+\beta))}(\text{px}_{\text{pcp}}[{-1}] - \text{px}_{\text{pcp}}[{-2}]) + (((1-\gamma_{\text{x}} \cdot \text{pcp}) \cdot (1-\beta \cdot \gamma_{\text{x}} \cdot \text{pcp})/(1+\beta) \cdot \gamma_{\text{x}} \cdot \text{pcp})) \cdot (\text{mcex} - \text{px}_{\text{pcp}}) + (\beta/(1+\beta)) \cdot (\text{px}_{\text{pcp}}^[+1]-\text{px}_{\text{pcp}}); \]
\[ \text{f}_e = \rho_{\text{e}} \cdot \text{e}[{-1}] + \text{e}_e; \] % Exchange rate shock
\[ \text{f}_{\text{pim}} = \rho_{\text{f}_{\text{pim}}} \cdot \text{f}_{\text{pim}}[{-1}] + \text{e}_{\text{pim}}; \] % foreign price shock
\[ \text{f}_{\text{pex}} = \text{f}_{\text{pim}}; \] % Final goods producers
% % Comments here
% The public consumption-good is in the section on the public sector
%
% Investment good retailer
\[ \text{iph} = \theta_{\text{ip}} \cdot (\text{pip} - \text{pyint}) + \text{ip}; \] % demand for domestic intermediate good in investment-good production
\[ \text{mi} = \theta_{\text{ip}} \cdot (\text{pip} - \text{pmi}) + \text{mi}_e; \] % demand for foreign intermediate good in investment-good production
\[ \text{mi}_e = \rho_{\text{mi}_e} \cdot \text{mi}_e[{-1}] + \text{e}_{\text{mi}_e}; \] % shock to the volume of imported investment good
\[ \text{pip} = \omega_{\text{ip}} \cdot \text{pyint} + (1 - \omega_{\text{ip}}) \cdot \text{pmi}; \] % price of composite investment good
%
% Consumption good retailer
\[ \text{cph} = \theta_{\text{tcp}} \cdot (\text{pcp} - \text{pyint}) + \text{cp}; \] % demand for domestic intermediate good
\[ \text{mc} = \theta_{\text{tcp}} \cdot (\text{pcp} - \text{pmc}) + \text{mc}_e; \] % demand for foreign intermediate good
\[ \text{mc}_e = \rho_{\text{mc}_e} \cdot \text{mc}_e[{-1}] + \text{e}_{\text{mc}_e}; \] % shock to the volume of imported consumption good
\[ \text{pcp} = \omega_{\text{tcp}} \cdot \text{pyint} + (1 - \omega_{\text{tcp}}) \cdot \text{pmc}; \] % price of composite consumption good = CPI
% Export good retailer: volumes
hex = thetaex*(mcex-pyint)+x; % demand for domestic intermediate good used in exports
mex = thetaex*(mcex-pmex)+x+mex_e; % demand for imported foreign goods used in export-good production
mex_e = rho_mex_e*mex_e{-1} + e_mex_e; % shock to the volume of imported export good

% Export good retailer: marginal costs
mcex = ((delta-ex^thetaex)*(pyint_ss/mcex_ss)^(rhostar/(rhostar+1)))*pyint + (((1-deltaex)^thetaex)*(pmex_ss/mcex_ss)^(rhostar/(rhostar+1)))*pmex + mcex_e; % mcex of exports
mcex_e = rho_mcex_e*mcex_e{-1} + e_mcex; % Price shock to marginal costs of exports

% Export volumes
x_lcp = thetax*(f_pex-px_lcp)+xd; % LCP export demand equation
x_pcp = thetax*(f_pex-px_pcp-e)+xd; % PCP export demand equation

% CHECK THESE
% aggr. export demand = aggr. export supply, i.e. the aggregator!
x = omegax*x_lcp+(1-omegax)*x_pcp; % aggregate export demand, assumes linear combination
xd = rhoxd*xd{-1}+e_xd; % Export demand / foreign market AR

%% Public sector
%
% General government

% Government budget constraint / Evolution of gvmt REAL debt

BH = i_ss*(BH{-1}+i-pie_p) + (cg_ss/BH_ss)*(pyint+cg) + ((b'tu_ss*u)/BH_ss) + ((-cg_ss-ig_ss-ott_ss)/BH_ss)*p + (ig_ss/BH_ss)*(pyint+ig) + (ott_ss/BH_ss)*ott - (((n_ss*w_ss*h_ss)*(tau_w_ss+tau_sc_ss))/BH_ss)*(n+w+h) - (((n_ss*w_ss*h_ss*tau_w_ss)/BH_ss)*tau_w - (((n_ss*w_ss*h_ss*tau_sc_ss)/BH_ss)*tau_sc - ((tau_cp_ss*cp_ss)/BH_ss)*(tau_cp+cp) - ((tau_d_ss*D_ss)/BH_ss)*(tau_d+D) - ((yint_roc_ss*tau_k_ss*K_ss)/BH_ss)*(yint_roc+tau_k+K);

% where dividends to domestic households
(D_ss/yint_ss)*D = yint - (((1+tau_sc_ss)*w_ss*total_h_ss)/(yint_ss))*(w+total_h) - (((tau_sc_ss*w_ss*total_h_ss)/(yint_ss))*(tau_sc) - (yint_roc_ss*K_ss/yint_ss)*(yint_roc+K)+(1- (kappa*v_ss/yint_ss))*pyint_kl-(kappa*v_ss/yint_ss)*(kappahat+v)
\[ (x_{ss}/y_{int}_{ss}) * px - (m_{ces}_{ss} * x_{ss}/y_{int}_{ss}) * m_{ces} + ((1-m_{ces}_{ss}) * x_{ss}/y_{int}_{ss}) * x + (m_{ss}/y_{int}_{ss}) * pm - (f_{pim}_{ss} * m_{ss}/y_{int}_{ss}) * f_{pim} + (1-f_{pim}_{ss}/y_{int}_{ss}) * f_{pim} + (l-f_{pim}_{ss}/y_{int}_{ss}) * m_{ss} * m; \]

% For reporting purposes: General government income
\[
GG\text{\_income} = (\tau_{cp}_{ss} * cp_{ss}) * (\tau_{cp} + p + cp) + \\
(\tau_{ip}_{ss} * ip_{ss}) * (\tau_{ip} + pip + ip) + \\
(n_{ss} * w_{ss} * h_{ss} * \tau_{sc}_{ss}) * (\tau_{sc} + n + w + h) + \\
(n_{ss} * w_{ss} * h_{ss} * \tau_{w}_{ss}) * (\tau_{w} + n + w + h) + \\
(yint_{roc}_{ss} * \tau_{k}_{ss} * K_{ss}) * (yint_{roc} + \tau_{k} + K) + \\
(D_{ss} * \tau_{d}_{ss}) * (\tau_{d} + D);
\]

% Expenditure
\[
ott = \rho_{ott} * ott(-1) + e_{ott};
\]
\[
ng = \rho_{ng} * ng(-1) + e_{ng};
\]
\[
ig = \rho_{ig} * ig(-1) + e_{ig};
\]
\[
\tau_{w} = \rho_{\tau_{w}} * \tau_{w}(-1) + e_{\tau_{w}};
\]
\[
\tau_{cp} = \rho_{\tau_{cp}} * \tau_{cp}(-1) + e_{\tau_{cp}};
\]
\[
\tau_{k} = \rho_{\tau_{k}} * \tau_{k}(-1) + e_{\tau_{k}};
\]
\[
\tau_{sc} = \rho_{\tau_{sc}} * \tau_{sc}(-1) + e_{\tau_{sc}};
\]
\[
\tau_{d} = \rho_{\tau_{d}} * \tau_{d}(-1) + e_{\tau_{d}};
\]
\[
\tau_{ip} = \rho_{\tau_{ip}} * \tau_{ip}(-1) + e_{\tau_{ip}};
\]

%% Closing the model
%
% Comments here
%
% Trade Balance
\[
tb = yint - cp_{ss} * cp - ip_{ss} * ip - cg_{ss} * cg + ((1-m_{ces}_{ss}) * x_{ss}) * x + \\
((1-f_{pim}_{ss}) * m_{ss}) * m + x_{ss} * px - (m_{ces}_{ss} * x_{ss}) * m_{ces} \\
+ m_{ss} * pm - (f_{pim}_{ss} * m_{ss}) * f_{pim} - cp_{ss} * p - ip_{ss} * pip + (1-cg_{ss} - \\
(kappa * v_{ss})) * pyint - (kappa * v_{ss}) * (kappahat + v) - (yint_{roc}_{ss} * K_{ss}) * nu;
\]
\[
BF = tb + i_{ss} * istar(-1) + i_{ss} * (1-gamma_{sastar}) * BF(-1) + \\
i_{ss} * gamma_{sastar} * f_{pim}(-1) + i_{ss} * gamma_{sastar} * f_{pim}(-1); \]
istar=rho_istar*istar(-1)+i_e;

% Economy wide resource constraint

\[
yint = (omegacp*cp_ss)*cp + (omegacp*cp_ss*thetacp)*p + (om

gaip*ip_ss)*ip + (omgaip*ip_ss*thetaip)*pip + (omgaex*x_ss)*x + (om

gacp*cp_ss*thetacp+omgaip*ip_ss*thetaip+omgaex*x_ss*thetaex)*pyint;
\]

%Production
yint_kl = gamma_yint*k+(1-gamma_yint)*h+yint_z;
yint = n+yint_kl;
total_h=n + h;

p = pcp;
pie_p = p-p(-1);

%% Measurement / Data
%
% Comments here
%
!measurement_variables

'Consumption' cp_
'Output' yint_
'Imports' m_
'Exports' x_
'Private investment' ip_

'Interest rate' i_
'Nominal wage' w_
'Exchange rate' e_
'Consumption good price level' pcp_

'Labour force, total hours' total_h_
'Unemployment' u_
'Operating surplus / Dividents (nominal)' D_

'Import price level' pm_  %%%hankala
'Export price level' px_  %%%hankala
'price of composite investment good' pip_
'Foreign price level ($) competing with finnish importers' f_pim_
  %%%hankala
'Foreign price level ($) competing with finnish exporters' f_pex_

'External demand' xd_
'Price of imported consumption good' pmc_
'Price of imported investment good' pmi_
'Price of imported good used in exports' pmex_

'General government consumption (real)' cg_

'Price of oil' poil_

!measurement_shocks

'measurement error on foreign prices competing with importers' m_f_pim
'measurement error on foreign prices competing with exporter' m_f_pex
'measurement error on price of imported consumption good' m_pmc
'measurement error on price of imported investment good' m_pmi
'measurement error on price of imported good used in exports' m_pmex
'measurement error on external demand' m_xd
'measurement error on output' m_yint

!measurement_equations

\[
\begin{align*}
\text{cp}_\_ &= \text{cp}; \\
\text{yint}_\_ &= \text{yint}; \\
\text{m}_\_ &= \text{m}; \\
\text{x}_\_ &= \text{x}; \\
\text{ip}_\_ &= \text{ip}; \\
\text{e}_\_ &= \text{e}; \\
\text{i}_\_ &= \text{i}; \\
\text{w}_\_ &= \text{w}; \\
\text{pcp}_\_ &= \text{pcp}; \\
\text{total}_h_\_ &= \text{total}_h; \\
\text{u}_\_ &= \text{u}; \\
\text{D}_\_ &= \text{D}; \text{osv} \\
\text{cg}_\_ &= \text{cg}; \\
\text{pm}_\_ &= \text{pm}; \\
\text{px}_\_ &= \text{px}; \\
\text{pip}_\_ &= \text{pip}; \% \\
\text{f}_\text{pim}_\_ &= \text{f}_\text{pim} + \text{m}_\text{f}_\text{pim}; \\
\text{f}_\text{pex}_\_ &= \text{f}_\text{pex} + \text{m}_\text{f}_\text{pex}; \% \\
\text{xd}_\_ &= \text{xd} + \text{m}_\text{xd}; \% \\
\text{pmc}_\_ &= \text{pmc} + \text{m}_\text{pmc}; \% \\
\text{pmi}_\_ &= \text{pmi} + \text{m}_\text{pmi}; \% \\
\text{pmex}_\_ &= \text{pmex} + \text{m}_\text{pmex}; \% \\
\text{poil}_\_ &= \text{poil}; \\
\end{align*}
\]

%%
%% Set parameters

omega_lc = 0.2; \quad \% \text{share of liquidity constrained households} \\
i_ss=0.03/4; \quad \% \text{SS nominal interest rate}
istar_ss = i_ss; % SS foreign interest rate

gamma_sastar = 0.01; % debt elastic interest rate penalty parameter
rho_i_e = 0.8; % AR-coefficient of UIP shock process
tau_cp_s = 0.11; % " SS VAT on consumption"
sigma_cp = 1.6; % household risk aversion
var kappa = 0.6; % habit persistence
rho_cp_fl_e = 0.8; % AR coefficient of consumption shock
beta = 0.99; % discount factor
BH_ss = 0.6; % SS gvmt debt

% Investment and capital
% -----------------------
kappa_i = 6.617; % investment adjustment cost parameter
rho_ip= 0.485; % AR coefficient of investment shock
delta_k= 0.025; % depreciation of capital
gamma_yint = 0.33; % share of capital in intermediate goods production
eta_nu = 0.43; % capital utilization rate
yint_roc_ss = i_ss+delta_k; % SS return on capital
rho_tobin_q = 0.3; % AR coefficient of equity premium shock
rho_z = 0.9; % AR coefficient of transitory technology shock
tau_ip_ss = 0.1; % check this value
tau_k_ss = 0.1; % check this value
tau_d_ss = 0.1; % check this value

% Labour market matching and wage bargaining
% -------------------------------------------
sigma_n = 10; % Frish elasticity of labour
eta = 0.5; % SS bargaining power
b = 0.3; % unemployment benefit
tau_w_ss = 0.15; % SS worker's tax on earned income 0.30
tau_sc_ss = 0.12; % SS employer's social contribution 0.23
tau_cp_ss = 0.11; % SS Consumption tax
omega_w = 0.3; % Ad hoc wage rigidity parameter
sigma_M = 0.6; % Elasticity of matching w.r.t unemployment (exponent of Cobb-Douglas matching function
rho = 0.06; % SS job destruction rate

gf_ss = 0.7; % Steady state vacancy filling rate
u_ss = 0.1; % Steady state unemployment, keskiarvio 1994-2010 = 10.2
n_ss = 1-u_ss; % Steady state employment rate
match_ss = rho*n_ss; % Steady state matches are equal to ss separations
v_ss = match_ss/gf_ss; % Steady state vacancies
theta_ss = v_ss/u_ss; % Labour market tightness; vacancies per unemployed searching workers
eff_match = match_ss/((u_ss^sigma_M)*(v_ss^(1-sigma_M)));

qw_ss = match_ss/u_ss; % Steady state job finding rate, 1994-2010 datan keskiarvo = 0.28

h_ss = 0.33; % SS hours worked per person

preal_kl_ss = (5-1)/5; % =1/markup => implies a markup of 20 %
pyint_kl_ss = P.preal_kl_ss; % SS price of K-L good, = preal_kl_ss. Equal to marginal cost of wholesale firm
mpk_ss = yint_roc_ss/pyint_kl_ss; % SS marginal productivity of capital
k_ss = gamma_yint*(1/(n_ss*mpk_ss)); % SS capital-labour ratio in the firm-level production function
K_ss = k_ss*n_ss; % SS aggregate capital

yint_z_ss = 1/((K_ss^(gamma_yint))*((n_ss*h_ss)^(1-gamma_yint))); % Technology
yint_kl_ss=P.yint_z_ss*(k_ss)^gamma_yint*(h_ss)^(1-gamma_yint); % SS output of K-L good
mpl_ss = yint_z_ss*(1-gamma_yint)*k_ss^gamma_yint*(h_ss)^(-gamma_yint); % SS marginal productivity of labour

mrs_ss = ((1-tau_w_ss)/((1+tau_sc_ss)*(1+tau_cp_ss)))*preal_kl_ss*mpl_ss; % SS marginal rate of substitution

w_ss = 1.5849;
kappa = 0.0976;

% The resulting Firm and Worker surpluses are
H_ss = (1/1-beta*(1-rho-qw_ss))*(w_ss*h_ss*(1-tau_w_ss) - (mrs_ss*h_ss*(1+tau_cp_ss))/(1+sigma_n)-b); % SS worker surplus
J_ss = (1/(1-beta*(1-rho)))*(pyint_kl_ss*yint_kl_ss - (1+tau_sc_ss)*w_ss*h_ss - yint_roc_ss*k_ss); % SS firm surplus
R_rate = b/(w_ss*h_ss*(1-tau_w_ss));

% Fiscal policy rule parameters
tau_share = 0.5;
w_para = 1;

% % Closing the model
%------------------
ip_ss = 0.172; % Investment in SS
cg_ss = 0.28; % Government consumption
ig_ss = 0.04; % Government investment
yint_ss = yint_kl_ss*n_ss; % Aggregate SS production of intermediate firm

cp_ss = yint_ss-ip_ss-cg_ss-kappa*v_ss; % SS consumption
\[
\begin{align*}
\text{cp lc ss} & = 0.2 \times \text{cp ss}; \quad \text{\% SS consumption of liquidity constrained households} \\
\text{cp fl ss} & = 0.8 \times \text{cp ss}; \quad \text{\% SS consumption of forward-looking households} \\
D_{ss} & = yint_{kl ss} - ((1+\tau_{sc ss}) \times n_{ss} \times w_{ss} \times h_{ss}) - (yint_{roc ss} \times K_{ss}) - (kappa \times v_{ss}); \\
\text{ott ss} & = (\tau_{cp ss} \times \text{cp ss}) + (\tau_{ip ss} \times ip_{ss}) + ((\tau_{w ss}+\tau_{sc ss}) \times n_{ss} \times w_{ss} \times h_{ss}) + (\tau_{k ss} \times yint_{roc ss} \times K_{ss}) + (\tau_{d ss} \times D_{ss}) - cg_{ss} - (1-n_{ss}) \times b - (1-i_{ss}) \times BH_{ss}; \\
\text{total h ss} & = n_{ss} \times h_{ss}; \quad \text{\% Total hours worked in SS} \\
\end{align*}
\]

%%% parameter values
\[
\begin{align*}
\rho_{istar} & = 0.95; \quad \text{\% AR coefficient of foreign interest} \\
\rho_{n e} & = 0.37; \quad \text{\% AR of labour supply shock} \\
\rho_{rhat} & = 0.75; \quad \text{\% AR of job destruction shock} \\
\rho_{kappa hat} & = 0.75; \quad \text{\% AR of vacancy cost shock} \\
\rho_{eta hat} & = 0.75; \quad \text{\% AR of shock to workers' negotiation weight} \\
\rho_{yint phi} & = 0.80; \quad \text{\% AR-coeff. of markup shock} \\
\rho_{yint ksi} & = 0.75; \quad \text{\% probability of taking the price as given (calvo)} \\
\rho_{yint ss} & = 5; \quad \text{\% SS price of domestic intermediate input} \\
\rho_{f pim ss} & = 1; \quad \text{\% foreign SS price level ($)} \text{ for intermediate import input market.} \\
\rho_{f pex} & = 0.4; \quad \text{\% AR coefficient in exchange rate shock} \\
\rho_{f pim} & = 0.4; \quad \text{\% AR coefficient in foreign price shock} \\
\rho_{f pex} & = 0.4; \quad \text{\% AR coefficient in foreign price shock} \\
\omega_{lcp} & = 0.15; \quad \% \text{share of LCP importing firms. (1-omega lcp) is the share of pcp firms} \\
\omega_{lcp} & = 0.4; \quad \% \text{calvo parameter, share of LCP import firms that are NOT allowed to change price at period t} \\
\omega_{pcp} & = 0.5; \quad \% \text{calvo parameter, share of PCP import firms that are NOT allowed to change price at period t} \\
\omega_{eta p} & = 0.67; \quad \% \text{share of domestic intermediate investment good in production of composite investment good} \\
\omega_{eta p} & = 0.67; \quad \% \text{share of domestic intermediate investment good in production of composite investment good} \\
\end{align*}
\]
\%----------------------------------------
omegac=0.15; \% 0.8; \% "share of LCP importing firms. (1-
omegac) is the share of pcp firms
gammac_lcp=0.4; \% 0.5; \% " calvo parameter, share of LCP import
firms that are NOT allowed to change price at period t
gammac_pcp=0.5; \% " calvo parameter, share of PCP import firms
that are NOT allowed to change price at period t

\%Retailer of consumption good
thetacp=0.45; \% demand elasticity for domestic and foreign
intermediate consumption good, previously 4.5
omegacp=0.65; \% share of domestic intermediate consumption
good in production of composite consumption good

\% Exporter
\%------------
gammax_pcp=0.65; \% 0.5; \% calvo parameter, share of PCP firms
that are NOT allowed to change price at period t,
gammax_lcp=0.65; \% 0.5; \% calvo parameter, share of LCP firms
that are NOT allowed to change price at period t
omegax=0.1; \% 0.5; \% share of LCP firms in exports
thetax=0.5882; \% price elasticity of demand for the export
product. Determined by rhox
x_ss=0.39; \% SS of exports
rhoxd=0.7346; \% ar-parameter of foreign market shock
rhostar=1;
thetaex=0.4545; \% phi
deltaex=0.8; \% delta
mex_ss=0.22; \% SS imports used in export production

\% Importer price setting: export good
\%-----------------------------------
mce_x=0.15; \% SS marginal cost of exports
pmex_sS=1; \% aggregate steady state import price level for
goods used in export production(€)
omegaex=0.15; \% share of LCP importing firms. (1-omegaex)
is the share of pcp firms
gammaex_lcp=0.4; \% calvo parameter, share of LCP import firms
that are NOT allowed to change price at period t
gammaex_pcp=0.5; \% calvo parameter, share of PCP import firms
that are NOT allowed to change price at period t

m_sS=0.39; \% SS imports
mc_sS=0.09; \% SS imported C goods share of total imports
mi_sS=0.08; \% SS imported I goods share of total imports

rho_pmc_e=0.7; \% ar coefficient in imported consumption good
price shock
rho_mce_x=0.4; \% ar coefficient in mc of exports shock
rho_pni_e=0.7; \% ar coefficient in imported investment good
price shock
rho_pme_x=0.7; \% ar coefficient in imported goods used in ex-
ports price shock
rho_me_x=0.7; \%
rho_mi_e=0.7;            %
rho_mex_e=0.7;            %
rho_cg= 0.9;              % AR of public spending shock
rho_ig= 0.9;              % AR of public investment shock
rho_ott=0.9;              % AR-coeff of transfers to households (ott_e) shock
rho_tau_w=0.9;
rho_tau_cp=0.9;
rho_tau_k=0.9;
rho_tau_sc=0.9;
rho_tau_d=0.9;
rho_tau_ip=0.9;
 rho_poil=0.6;

std_e_tau_w= 0.01;
std_e_tau_cp= 0.01;
std_e_tau_k= 0.01;
std_e_tau_sc= 0.01;
std_e_tau_d= 0.01;
std_e_tau_ip= 0.01;
std_e_ott= 0.01;
std_e_cg= 0.01;