

```

close all
// Linear Version
/*
-----
This a DSGE model for economy with partial reserves
-----
*/

//-----
//
//                               Endogenous variable's
//-----

var cp rd pic m_cp hp w I q phi_I rk pi_I cI m_cI hI rh cD cm c phi_d phi_cm
pi_cm iD im phi_Id phi_Im pi_m y a h k mc pid pi_xim mc_xim phi_xim e x
y_star phi_starx pi_starx pi_star delta_EX or lm zb lh d rr kB dc rc rm l sigma mb
fr dg rmb pi_T g T m eps_I eps_sigma eps_zb eps_rmb;

//-----
//
//                               Exogenous variable's
//-----

varexo
u_a $\u^{\textit{a}}$ (long_name='Pure Technology Shock')
u_pistar $\eps^{\textit{pistar}}$ (long_name='Foreign Inflation Shock')
u_ystar $\eps^{\textit{ystar}}$ (long_name='Foreign Product Shock')
u_or $\eps^{\textit{or}}$ (long_name='Oil Shock')
u_dc $\eps^{\textit{dc}}$ (long_name='Bank Debt to Central Bank Shock')
u_dg $\eps^{\textit{dg}}$ (long_name='Government Debt to Central Bank
Shock')
u_rmb $\varepsilon^{\textit{pi}}$ (long_name='Pure Monetary Base Shock')
u_I $\u_I$ (long_name='Pure Investment Shock')
u_sigma $\u_sigma$ (long_name='Pure Non-Current Receivable Shock')
u_zb $\u_zb$ (long_name='Pure Frozen Assets Shock')
u_EX $\u_EX$ (long_name='Exchange Rate Shock')
u_pi_T $\u_pi_T$ (long_name='Target Inflation Shock')
u_g $\u_g$ (long_name='Exchange Rate Growth Shock')
u_rr $\u_rr$ (long_name='Reserves Shock')

;
//-----
//
//                               Parameter's
//-----

parameters
//Utility Function parameters

```

SigC  $\sigma_c$  (long\_name='inverse of intertemporal elasticity of consumption')  
 SigH  $\sigma_h$  (long\_name='inverse of Frisch elasticity')  
 betta  $\beta$  (long\_name='Consumer subjective Discount Factor')  
 Itv  $\text{Itv}$  (long\_name='household loan restrictions')

// Capital Formation  
 psiI  $\psi^i$  (long\_name='Investment Adj. Parameter')  
 delta  $\delta_k$  (long\_name='Capital Dep. Rate')

// Import of Consumer Goods  
 muc  $\mu^c$  (long\_name='elasticity of Domestic and Imported Consumption')  
 omag\_Dc  $\omega_{Dc}$  (long\_name='Share of Domestic Consumer Goods')

// Import of Capital Goods  
 mui  $\mu^i$  (long\_name='elasticity of Domestic and Imported Capital Goods')  
 omag\_DI  $\omega_{DI}$  (long\_name='Share of Domestic Capital Goods')

// Production  
 alfa  $\alpha$  (long\_name='Capital Share in Production')  
 Itvm  $\text{Itv}_m$  (long\_name='Firms loan restrictions')  
 gaama  $\gamma$  (long\_name='Degree of Price Stickness')

//Import Goods  
 gaama\_xi  $\gamma_{xi}$  (long\_name='Percentage of Firms Import Good')

//Non Oil Exports  
 thetax  $\theta_x$  (long\_name='Substitution Elasticity of Produced and Exported Goods')

//Bank  
 car  $\text{car}$  (long\_name='Minimum Capital Adequacy Requirements')  
 kappa  $\kappa$  (long\_name='Ajustment Cost')  
 sai\_sigma\_y  $\text{sai\_sigma\_y}$  (long\_name='Coefficient Non-Current Receivable')  
 sai\_zb\_y  $\text{sai\_zb\_y}$  (long\_name='Coefficient Frozen Assets 2')  
 sai\_zb\_q  $\text{sai\_zb\_q}$  (long\_name='Coefficient Frozen Assets 3')

//Central Bank & Governer  
 omagy\_rmb  $\omega_{y\_rmb}$  (long\_name='Inpute Weight of Monetary Base Growth Rate')  
 omagpic\_rmb  $\omega_{pic\_rmb}$  (long\_name='Inflation Weight of Monetary Base Growth Rate')  
 rho\_EX  $\rho_s$  (long\_name='Exchange Rate Coefficient')

omagpic\_EX  $\omega_{pic\_EX}$  (long\_name='Inflation Weight of Exchange Growth Rate')  
omagfr\_EX  $\omega_{fr\_EX}$  (long\_name='Foreign Assets Weight of Exchange Growth Rate')  
tau  $\tau$  (long\_name='Tax Revenue Elasticity')

//Market Clearing Condition

omag  $\omega$  (long\_name='Household Saving Share')

// Exp proc

aI  $\alpha_I$  (long\_name='Smoothing Parameter of investment shock')  
rhoa  $\rho_a$  (long\_name='Smoothing Parameter of Technology shock')  
rho\_pistar  $\rho_{\pi\_star}$  (long\_name='Smoothing Parameter of Foreign Inflation')  
rho\_ystar  $\rho_{y\_star}$  (long\_name='Smoothing Parameter of Foreign Production')  
rho\_or  $\rho_{or}$  (long\_name='Smoothing Parameter of oil shock')  
rho\_sigma  $\rho_{\sigma}$  (long\_name='Smoothing Parameter of Non-Current Receivable')  
rho\_zb  $\rho_{zb}$  (long\_name='Smoothing Parameter of Frozen Assets1')  
rho\_dc  $\rho_{dc}$  (long\_name='Smoothing Parameter of Bank Debt to Central Bank')  
rho\_dg  $\rho_{dg}$  (long\_name='Smoothing Parameter of Governer Debt to Central Bank')  
rho\_rmb  $\rho_{rmb}$  (long\_name='Smoothing Parameter of Monetary Base Growth Rate')  
rho\_pi\_T  $\rho_{\pi\_T}$  (long\_name='Smoothing Parameter of Gold Inflation')  
rho\_g  $\rho_g$  (long\_name='Smoothing Parameter of Govrner Expendicher')  
rho\_rr  $\rho_{rr}$  (long\_name='Smoothing Parameter of Reserve')

sw  $w_{ss}$  (long\_name='Steadystate w')  
shI  $hI_{ss}$  (long\_name='Steadystate hI')  
scI  $cI_{ss}$  (long\_name='Steadystate cI')  
srh  $rh_{ss}$  (long\_name='Steadystate rh')  
srd  $rd_{ss}$  (long\_name='Steadystate rd')  
srk  $rk_{ss}$  (long\_name='Steadystate rk')  
slm  $lm_{ss}$  (long\_name='Steadystate lm Bank')  
szb  $zb_{ss}$  (long\_name='Steadystate zb Bank')  
slh  $lh_{ss}$  (long\_name='Steadystate lh Bank')  
sd  $d_{ss}$  (long\_name='Steadystate d')  
srr  $rr_{ss}$  (long\_name='Steadystate rr')

```

skB  $\{kB_{ss}\}$  (long_name='Steadystate kb Bank')
src  $\{rc_{ss}\}$  (long_name='Steadystate rc Bank')
ssigma  $\{\sigma_{ss}\}$  (long_name='Steadystate ssigma')
se  $\{e_{ss}\}$  (long_name='Steadystate e')
sor  $\{or_{ss}\}$  (long_name='Steadystate or')
sfr  $\{fr_{ss}\}$  (long_name='Steadystate fr')
sdg  $\{dg_{ss}\}$  (long_name='Steadystate dg')
sdc  $\{dc_{ss}\}$  (long_name='Steadystate dc')
smb  $\{mb_{ss}\}$  (long_name='Steadystate mb')
sphi_starx  $\{\phi_{ic\_starx_{ss}}\}$  (long_name='Steadystate phixstar')
sx  $\{x_{ss}\}$  (long_name='Steadystate x')
sphi_xim  $\{\phi_{-xim_{ss}}\}$  (long_name='Steadystate phic')
sl  $\{l_{ss}\}$  (long_name='Steadystate l')
sg  $\{g_{ss}\}$  (long_name='Steadystate g')
sy  $\{y_{ss}\}$  (long_name='Steadystate y')
sT  $\{T_{ss}\}$  (long_name='Steadystate T')
scp  $\{cp_{ss}\}$  (long_name='Steadystate cp')
shp  $\{hp_{ss}\}$  (long_name='Steadystate hp')
sh  $\{h_{ss}\}$  (long_name='Steadystate h')
sm  $\{m_{ss}\}$  (long_name='Steadystate Total Cash')
sm_cp  $\{m_{cp_{ss}}\}$  (long_name='Steadystate m_cp')
sm_cI  $\{m_{cI_{ss}}\}$  (long_name='Steadystate m_cI')
sc  $\{c_{ss}\}$  (long_name='Steadystate c')
scD  $\{cD_{ss}\}$  (long_name='Steadystate cd')
scm  $\{cm_{ss}\}$  (long_name='Steadystate cm')
siD  $\{iD_{ss}\}$  (long_name='Steadystate Domestic Investment')
sim  $\{im_{ss}\}$  (long_name='Steadystate Import Investment')
sI  $\{I_{ss}\}$  (long_name='Steadystate Investment')
srm  $\{rm_{ss}\}$  (long_name='Steadystate Intrest Rate Firm to Bank')
sphi_d  $\{\phi_{d_{ss}}\}$  (long_name='Steadystate ppi to Cpi')
sphi_Id  $\{\phi_{Id_{ss}}\}$  (long_name='Steadystate ppi to i')
sphi_Im  $\{\phi_{Im_{ss}}\}$  (long_name='Steadystate im to i')
;
//-----
//          Parameters Calibration's
//-----
SigC=1.52;
SigH=2.2;
ltv=0.6;
delta=0.027;
betta=0.969;
psiI=50;
aI=0.90;

```

muc=2.904;  
omag\_Dc=0.9;  
mui=1.31;  
omag\_DI=0.84;  
alfa=0.412;  
ltvm=0.6;  
gaama=0.756;  
rhoa=0.95;  
gaama\_xi=0.5;  
theetax=2.90;  
rho\_pistar=0.276;  
rho\_ystar=0.27;  
rho\_or=0.95;  
car=0.1;  
kappa=2.1;  
rho\_sigma=0.4;  
rho\_zb=0.4;  
sai\_sigma\_y= -1.6;  
sai\_zb\_y=-1.5;  
sai\_zb\_q=-1.6;  
rho\_dc=0.90;  
rho\_dg=0.95;  
rho\_rmb=0.4;  
omag\_y\_rmb= -1.7;  
omagpic\_rmb= -1.54;  
rho\_EX=0.7;  
omagpic\_EX=-0.40;  
omagfr\_EX=-0.80;  
tau=0.16;  
omag=0.3;  
rho\_pi\_T=0.70;  
rho\_g=0.95;  
rho\_rr=0.85;

// -----

//    Steady State Calibration's

// -----

sw=0.2987;  
shI=0.55;  
scI=0.40;  
srh=1;  
srd=1.02040;  
srk=0.0627;

```
slm=1.45;
szb=0.65;
slh=1.30;
sd=1.43;
srr=1;
skB=2.65;
src=0.13;
ssigma=0.14;
se=1;
sor=0.212;
sfr=0.084;
sdg=0.026;
sdc=0.0468;
smb=0.12;
sx=0.0859;
sphi_starx=1.25;
sphi_xim=0.9991;
sl=1.23;
sg=1.27;
sy=1;
sT=0.0945;
scp=0.55;
shp=0.50;
sh=1.23;
sm=0.0396;
sm_cp=1.30;
sm_cI=1.35;
sc=0.446;
scD=0.422;
scm=0.26;
siD=0.0221;
sim=0.016;
sI=0.23;
srm=0.15;
sphi_d=0.9849;
sphi_Id=1.131;
sphi_Im=1.94;
```

```
//-----
//          linear Model Declaration
//-----
model(linear);
// ----- Household
```

[name = 'Euler Equation']  
 $cp = cp(+1) - (1/SigC) * (rd - pic(+1));$   
 $cI = cI(+1) - (1/SigC) * (rd - pic(+1));$   
[name = 'labour Supply']  
 $hp = (1/SigH) * w - (SigC/SigH) * cp;$   
 $hI = (sw / (SigH * shI^{(SigH-1)} * scI^{SigC})) * ((w - (cI * SigC)) * (1 - ((srh - srd) * ltv) / (1 + srd)) + rh * ((ltv * srh) / (1 + srd)) + rd * ((srd * (1 - srh) * ltv) / (1 + srd)^2));$

[name = 'Money Demand']  
 $m\_cp = SigC * cp - rd;$   
 $m\_cI = SigC * cI - rd;$   
[name = 'Accumulaton of capital stock']  
 $k = (1 - delta) * k(-1) + delta * I + delta * eps\_I;$   
[name = 'Rent Price']  
 $q = beta * (1 - delta) * q(+1) + pic(+1) - rk + ((1 - (beta * (1 - delta))) / srk) * rk(+1);$   
[name = 'Investment Demand']  
 $I = (1 / ((1 + beta) * psiI)) * q + (1 / (1 + beta)) * I(-1) - (beta / (1 + beta)) * I(+1) - (1 / (1 + beta)) * phi\_I;$   
 $phi\_I = pi\_I - pic + phi\_I(-1);$

// -----Demand Imports Goods

[name = 'Import Consumer Goods']  
 $cD = c - muc * phi\_d;$   
 $cm = c - muc * phi\_cm;$   
 $phi\_d = pid - pic + phi\_d(-1);$   
 $phi\_cm = pi\_cm - pic + phi\_cm(-1);$   
 $pic = omag\_Dc * sphi\_d^{(1 - muc)} * pid + (1 - omag\_Dc) * se^{(1 - muc)} * (delta\_EX + pi\_star);$   
 $e = delta\_EX + pi\_star - pic + e(-1);$   
 $phi\_cm = e;$

[name = 'Import Capital Good']  
 $iD = I - mui * phi\_Id;$   
 $im = I - mui * phi\_Im;$   
 $phi\_Im = pi\_m - pi\_I + phi\_Im(-1);$   
 $phi\_Id = pid - pi\_I + phi\_Id(-1);$   
 $pi\_I = omag\_DI * sphi\_Id^{(1 - mui)} * pid + (1 - omag\_DI) * sphi\_Im^{(1 - mui)} * (delta\_EX + pi\_star);$   
 $phi\_Im = e - phi\_I;$   
 $phi\_Id = phi\_d - phi\_I;$

// ----- Production Sector

[name = 'Prodduction Function']

```

y=alfa+(1-alfa)*h+alfa*k;
[name = 'Inputs Demand']
h=rk+rk(-1)-w;
[name = 'Marginal Cost']
mc=alfa*rk+(1-alfa)*w-(1+ltvm)*alfa;
[name = 'philips Curve']
pid=(1/(1+beta))*pid(+1)+(((1-beta)*gaama)*(1-gaama))/gaama)*mc;

// ----- Imports Goods
[name = 'philips Curve for Import Goods']
pi_xim=(1/(1+beta))*pi_xim(+1)+((1-(beta*gaama_xi))*(1-
gaama_xi)/gaama_xi)*mc_xim;
[name = 'Marginal Cost for Import Goods']
mc_xim=e-phi_xim;
// ----- Non Oil Exports
x=y_star-theetax*phi_starx;
phi_starx=pi_starx-pi_star+phi_starx(-1);
pi_starx=pid-delta_EX;

// ----- Bank
[name = 'Banking Balance Sheet']
slm*lm-(szb*slm)*(zb+lm)+slh*lh=sd*d-(srr*sd)*(rr+d)+skB*kB+sdc*dc;
[name = 'Optimal Relationship Between Deposit and Loan Rate']
rd=(src/srd)*(rc-(srr*(rr+rc)));
[name = 'Optimal Relationship Between Houshol and Loan Rate']
(srh/(src-srh))*rh-(src/(src-srh))*rc=(2+1/(1-car))*(kB-1);
[name = 'Optimal Relationship Between Firm and Loan Rate']
rm=(1/srm)*((sigma*(ssigma/(1-ssigma)^2))*((src*(1+szb))-(kappa*((skB/sl)^3-
(skB/sl)^2*car)))+(rc*src)*((1+szb)/(1-ssigma))+zb*((szb*src)/(1-ssigma))+((1-
kB)*(kappa/(1-ssigma)))*(3*(skB/sl)^3-2*(skB/sl)^2*car));
[name = 'Lone']
l=(slm*lm)/sl+(slh*lh)/sl;
sigma=rho_sigma*sigma(-1)+sai_sigma_y*y+eps_sigma;
zb=rho_zb*zb(-1)+sai_zb_y*y+sai_zb_q+eps_zb;

// ----- Central Bank & Governer
[name = 'Central Bank']
mb=((se*sfr)/smb)*(fr+e)+(sdg*smb)*dg+(sdc/smb)*dc;
fr=fr(-1)-pi_star+(sor/sfr)*or+((sphi_starx*sx)/sfr)*(phi_starx+x)-
((sphi_xim*(scm+sim))/se)*(phi_xim+cm+im-e);

[name = 'Monetary & Exchange Rate Policy']

```



$rmb = \rho_{rmb} * rmb(-1) + \omega_{magy\_rmb} * y + \omega_{magpic\_rmb} * pic + \epsilon_{rmb}$ ;  $\Delta EX = \rho_{EX} * \Delta EX(-1) + \omega_{magpic\_EX} * (pic - \pi_T) + \omega_{magfr\_EX} * (e + fr - mb)$ ;

[name = 'Government Budget Constraint']  
 $g = ((se * sor) / sg) * (e + or) + (sT / sg) * T + (sdg / sg) * dg + smb / sg * (mb - mb(-1) - pic)$ ;  
 $T = \tau * y$ ;

//----- Market clearance

$y = (sc / sy) * c + (sI / sy) * I + (sg / sy) * g + ((se * sor) / sy) * (e + or) + ((se * \phi_{starx} * sx) / sy) * (e + \phi_{starx} * x) - (\phi_{xim} * (scm + sim)) / sy * (\phi_{xim} + cm + im)$ ;  
 $c = \omega_{mag} * (scp / sc) * cp + (1 - \omega_{mag}) * (scl / sc) * cI$ ;  
 $h = \omega_{mag} * (shp / sh) * hp + (1 - \omega_{mag}) * (shI / sh) * hI$ ;  
 $m = \omega_{mag} * (sm_{cp} / sm) * m_{cp} + (1 - \omega_{mag}) * (sm_{cI} / sm) * m_{cI}$ ;  
 $c = (scD / sc) * cD + (scm / sc) * cm$ ;  
 $I = (siD / sI) * iD + (sim / sI) * im$ ;

-----// Exo. Process

[name = 'Investment shock']  
 $\epsilon_I = a_I * \epsilon_I(-1) + u_I$ ;  
 [name = 'Tecnology Proce']  
 $a = \rho_a * a(-1) + u_a$ ;  
 [name = 'Foreign Inflation Proce']  
 $\pi_{star} = \rho_{\pi_{star}} * \pi_{star}(-1) + u_{\pi_{star}}$ ;  
 [name = 'Foreign Prudaction Proce']  
 $y_{star} = \rho_{y_{star}} * y_{star}(-1) + u_{y_{star}}$ ;  
 [name = 'oil revenue proc']  
 $or = \rho_{or} * or(-1) + u_{or}$ ;  
 [name = 'Non-Current Receivable shock']  
 $\epsilon_{\sigma} = \rho_{\sigma} * \epsilon_{\sigma}(-1) + u_{\sigma}$ ;  
 [name = 'Frozen Assets Shock shock']  
 $\epsilon_{zb} = \rho_{zb} * \epsilon_{zb}(-1) + u_{zb}$ ;  
 [name = 'Bank Debt to Central Bank proc']  
 $dc = \rho_{dc} * dc(-1) + u_{dc}$ ;  
 [name = 'Government Debt to Central Bank proc']  
 $dg = \rho_{dg} * dg(-1) + u_{dg}$ ;  
 [name = 'Monetary Base shock']  
 $\epsilon_{rmb} = \rho_{rmb} * \epsilon_{rmb}(-1) + u_{rmb}$ ;  
 [name = 'Exchange Rate Growth Proce']  
 $\Delta EX = \rho_{EX} * \Delta EX(-1) + u_{EX}$ ;  
 [name = 'Target Inflation Proce']  
 $\pi_T = \rho_{\pi_T} * \pi_T(-1) + u_{\pi_T}$ ;  
 [name = 'Government Expendicher Proce']

```
g=rho_g*g(-1)+u_g;
[name = 'Reserves Proce']
rr=rho_rr*rr(-1)+u_rr;
end;
```

```
//-----
//                Steady States
//-----
```

```
steady;
check;
```

```
//-----
//                Determine Shock Size
//-----
```

```
shocks;
var u_I= 0.1^2;
var u_a= 0.1^2;
var u_pistar= 0.1^2;
var u_ystar= 0.1^2;
var u_or= 0.1^2;
var u_sigma= 0.1^2;
var u_zb= 0.1^2;
var u_dc= 0.1^2;
var u_dg= 0.1^2;
var u_rmb= 0.1^2;
var u_EX=0.1^2;
var u_pi_T=0.1^2;
var u_g=0.1^2;
var u_rr=0.1^2;
```

```
end;
```

```
//-----
//                Simulation
//-----
```

```
stoch_simul c y pic rmb;
//relative_irf,irf=100,nodisplay,conditional_variance_decomposition[1:5]=
```

