

# Estimated Dynamic Optimization (EDO) Model

Gary Young (editor)

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# Chapter 1

## EDO model packages

The Estimated Dynamic Optimization (EDO) Model is available from the Federal Reserve Board of Governors website:

The model package zip file (link below) contains the following files:

- A readme file with basic instructions.
- Dynare mod files to run two versions of the EDO model, one with variables in levels and the other with variables in log deviations from steady state. Both versions include the nonlinear equations derived from household and firm optimization problems. The version in levels more closely follows the derivations described in the article "Unemployment During the Great Recession in the EDO Model of the U.S. Economy", while the version in log deviations facilitates the reporting of simulation results. These programs solve the model, report some basic model statistics, and run some basic impulse response simulations.

Notice that the edo (zip) is actually contained in the "EDO variable listing (ZIP)" link and the mentioned "variable listing zip file" doesn't seem to be available anywhere:

The variable listing zip file (link below) contains an HTML representation of the EDO model, showing linkages between variables, parameters, and equations.

EDO variable listing (ZIP)

NOTE: The programs for simulating the EDO model are written for use with the Dynare software package. The Dynare package can be downloaded without cost at [www.dynare.org](http://www.dynare.org). While Dynare itself is free, it requires the installation of either Matlab or Octave. Matlab is a commercial product available at [www.mathworks.com](http://www.mathworks.com). Octave is free-ware, and is available at [www.gnu.org/software/octave](http://www.gnu.org/software/octave).

Dynare and octave were available in The Ubuntu Software Center for my computer. From the readme file, to execute the model:

5) Run the command "dynare linearized" or "dynare Dynare.edo" from the Matlab/Octave command line to run the two model versions

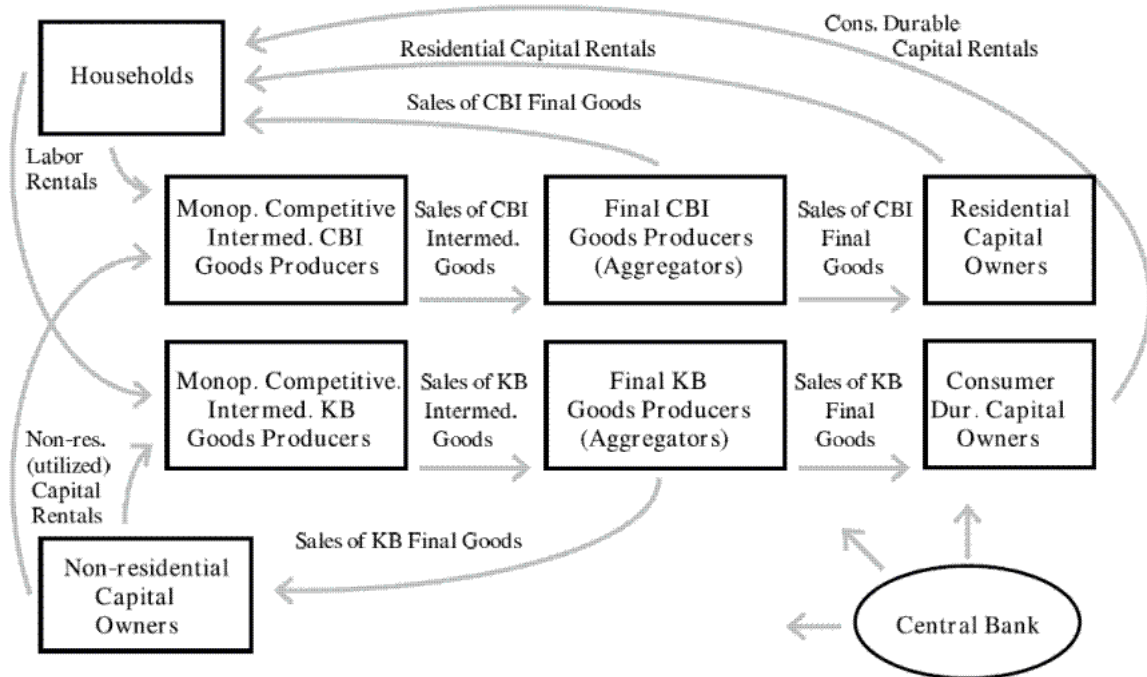
The model fails for me and when googling for the error "dynare linearized trans\_A undefined" we get

At the moment, Octave 4 is not supported yet. See <https://github.com/DynareTeam/dynare/issues/1113>

at "Trans\_A Matrix error" and "Make Dynare compatible with Octave 4.0 #1113".

## Chapter 2

# Documentation







# Appendices



# Appendix A

## Original Files

### A.1 Dynare\_edo.mod

11     $\langle \text{srcedo}/\text{Dynare.edo.mod } 11 \rangle \equiv$   
           $\langle \text{common setup } 32 \rangle$   
           $\langle \text{edo model } 12 \rangle$   
           $\langle \text{common stoch sim } 33 \rangle$   
This code is written to file `srcedo/Dynare.edo.mod`.

### A.1.1 Dynare EDO Model

12  $\langle edo\ model\ 12 \rangle \equiv$  (11)

$\langle edo\ model\ prelim\ 13 \rangle$

// XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

// labor block

// TOTAL LABOR INPUT (called "L" in the paper, I kept the "H" notation of the original)

$\langle edo\ model\ labor\ 14a \rangle$

// Identities

$\langle edo\ model\ identities\ 14b \rangle$

// XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

// Aggregate hours equals agg hours in each sector

$\langle edo\ model\ hours\ 15a \rangle$

// See Section 8: Data Identities

// new equations

// Durable Block

$\langle edo\ model\ durables\ 15b \rangle$

// Housing Block

$\langle edo\ model\ housing\ 16 \rangle$

//measurement\_equations;

$\langle edo\ model\ measurement\ 17 \rangle$

//end\_measurement\_equations;

end;

Uses L 34.

### A.1.2 Dynare EDO Model Prelim

13

*(edo model prelim 13)*≡

(12)

```

RC-MCC*YC/UC/KC(-1)*alpha_*MUK=0;
RK-MCK*YK/UK/KK(-1)*alpha_*MUK=0;
WC-MCC*YC/HC*(1-alpha_)=0;
WK-MCK*YK/HK*(1-alpha_)=0;
YC-(UC*KC(-1)/MUK)^alpha_*(HC)^(1-alpha_)=0;
YK-(UK*KK(-1)/MUK)^alpha_*(HK)^(1-alpha_)=0;
MCC*YC*theta_c-(theta_c-1)*YC-100*phi_pc*(INFC-gam_pc*INFC(-1)-(1-gam_pc)*INFCSS)*INFC*YC+beta_
MCK*YK*theta_k/PKB-(theta_k-1)*YK-100*phi_pc*(INFK-gam_pc*INFK(-1)-(1-gam_pc)*INFKSS)*INFK*YK+b
QK-beta_*(1/EFFK)*(((1-delta_)*QK(+1)+RC(+1)*UC(+1))*L(+1)/MUK(+1)/L)=0;
QK-beta_*(1/EFFK)*(((1-delta_)*QK(+1)+RK(+1)*UK(+1))*L(+1)/MUK(+1)/L)=0;
L-betas*R/rpr/INFC(+1)/MUC(+1)*L(+1)=0;
ln(R/RSS)-rho_R*ln(R(-1)/RSS)-(1-rho_R)*(r_inf*ln(INFCNA/INFCNASS)+r_dinf*(ln(INFCNA)-ln(INFCNA
L-eta_cnn/(EC-h*EC(-1)/MUC)+eta_cnn*beta_*h/(MUC(+1)*EC(+1)-h*EC)=0;
KK-(1-delta_)*KK(-1)/MUK+KC-(1-delta_)*KC(-1)/MUK-1*EIK+mu_*((UK^(1+1/phi_u)-1)/(1+1/phi_u))*KK

```

Uses alpha\_ 37, beta\_ 37, betas 34, delta\_ 37, EC 34, EFFK 34, EIK 34, ePMKC 36, ePMKK 36,  
eR 36, eta\_cnn 37, gam\_pc 37, h 37, HC 34, HK 34, INFC 34, INFCNA 34, INFCNASS 37,  
INFCSS 37, INFK 34, INFKSS 37, KC 34, KCSS 37, KK 34, KKSS 37, L 34, MCC 34, MCK 34, mu\_ 37,  
MUC 34, MUK 34, PFGAP 34, phi\_pc 37, phi\_u 37, PKB 34, QK 34, R 34, r\_dinf 37, r\_inf 37,  
r\_y 37, RC 34, rho\_R 37, RK 34, rpr 37, RSS 37, theta\_c 37, theta\_k 37, UC 34, UK 34, WC 34,  
WK 34, YC 34, YCSS 37, YK 34, and YKSS 37.

### A.1.3 Dynare EDO Model Labor

14a  $\langle \text{edo model labor } 14a \rangle \equiv$  (12)

```

-100+UHC*theta_wc-(theta_wc-1)*WC-100*phi_wc*(INFWC-gam_wc*INFWC(-1)-(1-gam_wc)*INFWC
UHSC-WC+phi_H/10*(HSC/HSK-gam_h*HSC(-1)/HSK(-1)-(1-gam_h)*HSCSS/HSKSS);//+100*eXiL=0;
-100+UHK*theta_wk-(theta_wk-1)*WK-100*phi_wc*(INFWK-gam_wc*INFWK(-1)-(1-gam_wc)*INFWK
UHSK-WK+phi_H/10*(HSC/HSK-gam_h*HSC(-1)/HSK(-1)-(1-gam_h)*HSCSS/HSKSS);//+100*eXiL=0;
UHC*L*lpref-A_HC*((1+sigman)/(1+sigman/(1+sigmah)))*(HC)^(-1+(1+sigman)/(1+sigman/(1+
UHSC*L*lpref-A_HC*((1+sigman)/(1+sigman/(1+sigmah)))*(HSC)^(-1+(1+sigman)/(1+sigman/(1+
UHK*L*lpref-A_HK*((1+sigman)/(1+sigman/(1+sigmah)))*(HK)^(-1+(1+sigman)/(1+sigman/(1+
UHSK*L*lpref-A_HK*((1+sigman)/(1+sigman/(1+sigmah)))*(HSK)^(-1+(1+sigman)/(1+sigman/(1+
empC-((1+sigmah)/sigmah*xsi_NC/xsi_HrC)^(-1/(1+sigmah+sigman))*HC^(1/(1+sigman/(1+sig
HrC-((1+sigmah)/sigmah*xsi_NC/xsi_HrC)^(1/(1+sigmah))*empC^(sigman/(1+sigmah))=0;
empK-((1+sigmah)/sigmah*xsi_NK/xsi_HrK)^(-1/(1+sigmah+sigman))*HK^(1/(1+sigman/(1+sig
HrK-((1+sigmah)/sigmah*xsi_NK/xsi_HrK)^(1/(1+sigmah))*empK^(sigman/(1+sigmah))=0;
empSC-((1+sigmah)/sigmah*xsi_NC/xsi_HrC)^(-1/(1+sigmah+sigman))*HSC^(1/(1+sigman/(1+sig
HrSC-((1+sigmah)/sigmah*xsi_NC/xsi_HrC)^(1/(1+sigmah))*empSC^(sigman/(1+sigmah))=0;
empSK-((1+sigmah)/sigmah*xsi_NK/xsi_HrK)^(-1/(1+sigmah+sigman))*HSK^(1/(1+sigman/(1+sig
HrSK-((1+sigmah)/sigmah*xsi_NK/xsi_HrK)^(1/(1+sigmah))*empSK^(sigman/(1+sigmah))=0;
unemp-(empSC+empSK-(empC+empK))/(empSC+empSK)=0;
PKB-(1-100*phi_ic*(EIK-gam_ic*EIK(-1)-(1-gam_ic)*EIKSS)/(KC(-1)+KK(-1))*MUK)*QK-beta_
YC-EC-ECH-0.2*YCSS*HG=0;
ln(INFWC)-ln(WC)+ln(WC(-1))-ln(MUC)-ln(INFC)=0;
ln(INFWK)-ln(WK)+ln(WK(-1))-ln(MUC)-ln(INFC)=0;
ln(INFK)-ln(INFC)-ln(PKB)+ln(PKB(-1))+ln(MUK)-ln(MUC)=0;
YK-EIK-ECD-0.2*YKSS*HG=0;
ln(DIFFNORMGDP)-(1-s_k)*(ln(YC)-ln(YC(-1)))-s_k*(ln(YK)-ln(YK(-1)))=0;
ln(NORMINFGDP)-s_k*(ln(PKB)-ln(PKB(-1)))=0;
ln(DIFFREALGDP)-ln(DIFFNORMGDP)-(1-s_k)*ln(MUC)-s_k*ln(MUK)=0;
ln(DIFFFREALGDP)-ln(EC)+ln(EC(-1))-ln(MUC)=0;
ln(DIFFFREALGDP)-ln(EIK)+ln(EIK(-1))-ln(MUK)=0;

```

Uses A\_HC 37, A\_HK 37, beta\_ 37, DIFFNORMGDP 34, DIFFFREALGDP 34, DIFFFREALGDP 34, EC 34, ECD 34, ECH 34, EFFK 34, EIK 34, EIKSS 37, empC 34, empK 34, empSC 34, empSK 34, eXiL 36, gam\_h 37, gam\_ic 37, gam\_wc 37, HC 34, HCSS 37, HG 34, HK 34, HKSS 37, HrC 34, HrK 34, HrSC 34, HrSK 34, HSC 34, HSCSS 37, HSK 34, HSKSS 37, INFC 34, INFK 34, INFWC 34, INFWCSS 37, INFWK 34, INFWKSS 37, KC 34, KK 34, L 34, Lpref 34, MUC 34, MUK 34, NORMINFGDP 34, phi\_H 37, phi\_ic 37, phi\_wc 37, PKB 34, QK 34, s\_k 37, sigmah 37, sigman 37, theta\_wc 37, theta\_wk 37, UHC 34, UHK 34, UHSC 34, UHSK 34, unemp 34, WC 34, WK 34, XiL 34, xsi\_HrC 37, xsi\_HrK 37, xsi\_NC 37, xsi\_NK 37, YC 34, YCSS 37, YK 34, and YKSS 37.

### A.1.4 Dynare EDO Model Identities

14b  $\langle \text{edo model identities } 14b \rangle \equiv$  (12)

```

ln(DIFFFREALW)-HCSS/AHSS*(ln(INFWC))-HKSS/AHSS*(ln(INFWK))+ln(INFC)=0;

```

Uses AHSS 37, DIFFFREALW 34, HCSS 37, HKSS 37, INFC 34, INFWC 34, and INFWK 34.

### A.1.5 Dynare EDO Model Hours

15a  $\langle edo\ model\ hours\ 15a \rangle \equiv$  (12)

$$\begin{aligned}
 &AH-HC-HK=0; \\
 &\ln(INFGDP)-\ln(INFC)-\ln(YC*MUC/YC(-1))+\ln(DIFFREALGDP)-\ln((1+PKB*YK/YC)/(1+PKB(-1)*YK(-1)/YC(-1))) \\
 &\ln(INFCNA)-(1-s\_ecdc)*\ln(INFC)-s\_ecdc*\ln(INFK)=0; \\
 &\ln(INFCOR)-(1-s\_ecdc)*\ln(INFC)-s\_ecdc*\ln(INFK)=0; \\
 &\ln(GAP)-(1-s\_k)*\ln(YC/YCSS)-s\_k*\ln(YK/YKSS)=0; \\
 &\ln(PFGAP)-(1-alpha\_)*((1-s\_k)*\ln(HC/HCSS)+s\_k*\ln(HK/HKSS))-alpha\_*((1-s\_k)*\ln(UC/USS)+s\_k*\ln(UK/UKSS)) \\
 &\ln(INFC10)-betarl*\ln(INFC10(+1))-(1-betarl)*\ln(INFCOR)=0;
 \end{aligned}$$

Uses AH 34, alpha\_ 37, betarl 37, DIFFREALGDP 34, GAP 34, HC 34, HCSS 37, HK 34, HKSS 37, INFC 34, INFC10 34, INFCNA 34, INFCOR 34, INFGDP 34, INFK 34, MUC 34, PFGAP 34, PKB 34, s\\_ecdc 37, s\\_k 37, UC 34, UK 34, USS 37, YC 34, YCSS 37, YK 34, and YKSS 37.

### A.1.6 Dynare EDO Model Durables

15b  $\langle edo\ model\ durables\ 15b \rangle \equiv$  (12)

$$\begin{aligned}
 &KD-(1-\delta_{cd})*KD(-1)/MUK-ECD=0; \\
 &L*RCD-\eta_{cd}/(KD(-1)/MUK-h_{cd}*LAGKD(-1)/(MUK(-1)*MUK))+\beta_{\eta_{cd}}*\eta_{cd}*h_{cd}/(KD-h_{cd}*KD(-1)/MUK)=0; \\
 &QCD-\beta_{\eta_{cd}}*(1/EFECd)*L(+1)/L/MUK(+1)*(RCD(+1)+(1-\delta_{cd})*QCD(+1))=0; \\
 &PKB-QCD*(1-100*\phi_{cd}*(ECD-gam_{icd}*ECD(-1)-(1-gam_{icd})*ECDSS)/KD(-1)*MUK) - \beta_{\eta_{cd}}*(1/EFECd)*100*QCD(-1)=0;
 \end{aligned}$$

Uses beta\_ 37, delta\_cd 37, ECD 34, ECDSS 37, EFECd 34, eta\_cd 37, gam\_icd 37, h\_cd 37, KD 34, L 34, LAGKD 34, MUK 34, phi\_cd 37, PKB 34, QCD 34, and RCD 34.

## A.1.7 Dynare EDO Model Housing

16  $\langle \text{edo model housing } 16 \rangle \equiv$  (12)

```

L*RCH-eta_ch/(KCH(-1)/MUC-h_ch*LAGKCH(-1)/(MUC*MUC(-1)))+beta_*eta_ch*h_ch/(KCH-h_ch)
QCH-beta_*(1/EFFECH)*L(+1)/L/MUC(+1)*(RCH(+1)+(1-delta_ch)*QCH(+1))=0;
1*ECH+(1-delta_ch)*KCH(-1)/MUC-KCH=0;
1-QCH*(1-100*phi_ech*(ECH-gam_ech*ECH(-1)-(1-gam_ech)*ECHSS)/KCH(-1)*MUC) - beta_*(1
ln(KD(-1))-ln(LAGKD)=0;
ln(KCH(-1))-ln(LAGKCH)=0;
RK-QK*mu_*UK^(1/phi_u)=0;
RC-QK*mu_*UC^(1/phi_u)=0;
ln(DIFFREALECH)-ln(MUC)-ln(ECH)+ln(ECH(-1))=0;
ln(DIFFREALECD)-ln(MUK)-ln(ECD)+ln(ECD(-1))=0;
ln(betas/beta_)-rho_B*ln(betas(-1)/beta_)-eB=0;
ln(XiL)-rho_XiL*ln(XiL(-1))-eXiL=0;
ln(Lpref)-rho_lpref*ln(Lpref(-1))-eLpref=0;
ln(EFFK)-rho_EFFK*ln(EFFK(-1))-eEFFK=0;
ln(MUZK/MUZKSS)-eMUZK=0;
ln(MUZM/MUZMSS)-eMUZM=0;
ln(HG)-rho_HG*ln(HG(-1))-eHG=0;
ln(MUC)-ln(MUZM)-alpha_*ln(MUZK)=0;
ln(MUK)-ln(MUZM)-ln(MUZK)=0;
ln(EFFECD)-rho_EFFECD*ln(EFFECD(-1))-eEFFECD=0;
ln(EFFECH)-rho_EFFECH*ln(EFFECH(-1))-eEFFECH=0;
ln(STAR)-rho_STAR*ln(STAR(-1))-eSTAR=0;
ln(RL1) - ln(R(+1))=0;
ln(RL2) - ln(RL1(+1))=0;
ln(RL3) - ln(RL2(+1))=0;
ln(RL4) - ln(RL3(+1))=0;
ln(RL5) - ln(RL4(+1))=0;
ln(RL6) - ln(RL5(+1))=0;
ln(RL7) - ln(RL6(+1))=0;
ln(RT2) - tp2 - 0.125*(ln(R) + ln(RL1) + ln(RL2) + ln(RL3) + ln(RL4) + ln(RL5) + ln(RL6) + ln(RL7))=0;

```

Uses alpha\_ 37, beta\_ 37, betas 34, delta\_ch 37, DIFFREALECD 34, DIFFREALECH 34, eB 36, ECD 34, ECH 34, ECHSS 37, eEFFECD 36, eEFFECH 36, eEFFK 36, EFFECD 34, EFFECH 34, EFFK 34, eHG 36, eLpref 36, eMUZK 36, eMUZM 36, eSTAR 36, eta\_ch 37, eXiL 36, gam\_ech 37, h\_ch 37, HG 34, KCH 34, KD 34, L 34, LAGKCH 34, LAGKD 34, Lpref 34, mu\_ 37, MUC 34, MUK 34, MUZK 34, MUZKSS 37, MUZM 34, MUZMSS 37, phi\_ech 37, phi\_u 37, QCH 34, QK 34, R 34, RC 34, RCH 34, rho\_B 37, rho\_EFFECD 37, rho\_EFFECH 37, rho\_EFFK 37, rho\_HG 37, rho\_lpref 37, rho\_STAR 37, rho\_XiL 37, RK 34, RL1 34, RL2 34, RL3 34, RL4 34, RL5 34, RL6 34, RL7 34, RT2 34, STAR 34, tp2 37, UC 34, UK 34, and XiL 34.



### A.1.8 Dynare EDO Model Measurement

$$\begin{aligned}
 17 \quad \langle \text{edo model measurement } 17 \rangle &\equiv (12) \\
 \ln(\text{DIFFREALGDP\_obs}/\text{DIFFREALGDPSS\_obs}) &= \ln(\text{DIFFREALGDP}/\text{DIFFREALGDPSS}); \\
 \ln(\text{DIFFREALEC\_obs}/\text{DIFFREALECSS\_obs}) &= \ln(\text{DIFFREALEC}/\text{DIFFREALECSS}); \\
 \ln(\text{DIFFREALEIK\_obs}/\text{DIFFREALEIKSS\_obs}) &= \ln(\text{DIFFREALEIK}/\text{DIFFREALEIKSS}); \\
 \ln(\text{DIFFREALECD\_obs}/\text{DIFFREALECDSS\_obs}) &= \ln(\text{DIFFREALECD}/\text{DIFFREALECDSS}); \\
 \ln(\text{DIFFREALECH\_obs}/\text{DIFFREALECHSS\_obs}) &= \ln(\text{DIFFREALECH}/\text{DIFFREALECHSS}); \\
 \ln(\text{DIFFREALW\_obs}/\text{DIFFREALWSS\_obs}) &= \ln(\text{DIFFREALW}/\text{DIFFREALWSS}); \\
 \ln(\text{AH\_obs}) &= \ln(\text{AH}/\text{AHSS}); \\
 \ln(\text{INFCNA\_obs}/\text{INFCNASS\_obs}) &= \ln(\text{INFCNA}/\text{INFCNASS}); \\
 \ln(\text{INFCOR\_obs}/\text{INFCORSS\_obs}) &= \ln(\text{INFCOR}/\text{INFCORSS}); \\
 \ln(\text{INFK\_obs}/\text{INFKSS\_obs}) &= \ln(\text{INFK}/\text{INFKSS}); \\
 \ln(\text{R\_obs}/\text{RSS\_obs}) &= \ln(\text{R}/\text{RSS}); \\
 \ln(\text{RT2\_obs}/\text{RT2SS\_obs}) &= \ln(\text{RT2}/\text{RT2SS}); \\
 \ln(\text{unemp\_obs}/\text{unempSS\_obs}) &= \ln(\text{unemp}/\text{unempSS});
 \end{aligned}$$

Uses AH 34, AH\_obs 34, AHSS 37, DIFFREALEC 34, DIFFREALEC\_obs 34, DIFFREALECD 34, DIFFREALECD\_obs 34, DIFFREALECDSS 37, DIFFREALECDSS\_obs 37, DIFFREALECH 34, DIFFREALECH\_obs 34, DIFFREALECHSS 37, DIFFREALECHSS\_obs 37, DIFFREALECSS 37, DIFFREALECSS\_obs 37, DIFFREALEIK 34, DIFFREALEIK\_obs 34, DIFFREALEIKSS 37, DIFFREALEIKSS\_obs 37, DIFFREALGDP 34, DIFFREALGDP\_obs 34, DIFFREALGDPSS 37, DIFFREALGDPSS\_obs 37, DIFFREALW 34, DIFFREALW\_obs 34, DIFFREALWSS 37, DIFFREALWSS\_obs 37, INFCNA 34, INFCNA\_obs 34, INFCNASS 37, INFCNASS\_obs 37, INFCOR 34, INFCOR\_obs 34, INFCORSS 37, INFCORSS\_obs 37, INFK 34, INFK\_obs 34, INFKSS 37, INFKSS\_obs 37, R 34, R\_obs 34, RSS 37, RSS\_obs 37, RT2 34, RT2\_obs 34, RT2SS 37, RT2SS\_obs 37, unemp 34, unemp\_obs 34, unempSS 37, and unempSS\_obs 37.

## A.2 Dynare\_edo\_steadystate.m

```

18  <srcedo/Dynare.edo.steadystate.m 18>≡
    function [ys,check] = unlinearized_edo_steadystate(ys,exe)
        global M_

        check = 0;

        NumberofParameters=M_.param_nbr;
        for i=1:NumberofParameters
            paramname=deblank(M_.param_names(i,:));
            eval([paramname ' =M_.params(' int2str(i) ');']);
        end;

        %start_steady_state;

        <common steady state values 47>

        %end_steady_state;

        %trends;

        <common steady state trends 50>

        %end_trends;

        for i=1:NumberofParameters
            paramname=deblank(M_.param_names(i,:));
            eval(['M_.params(' int2str(i) ')=' paramname ';']);
        end;

        <edo steady state result return 19>

```

This code is written to file `srcedo/Dynare.edo.steadystate.m`.

Defines:

`unlinearized_edo_steadystate`, never used.

### A.2.1 EDO Steady State Result Return

19  $\langle edo\ steady\ state\ result\ return\ 19 \rangle \equiv$  (18)

```

ys = [
  RCSS
  RKSS
  WCSS
  WKSS
  YCSS
  YKSS
  MCCSS
  MCKSS
  KCSS
  KKSS
  PKBSS
  RSS
  LSS
  QKSS
  HCSS
  HSCSS
  HKSS
  HSKSS
  UHCSS
  UHSCSS
  UHKSS
  UHSKSS
  empCSS
  HrCSS
  empKSS
  HrKSS
  empSCSS
  HrSCSS
  empSKSS
  HrSKSS
  unempSS
  EIKSS
  ECSS
  INFWCSS
  INFWKSS
  INFCSS
  INFKSS
  ONE
  ONE
  DIFFREALGDPSS
  DIFFREALECSS
  DIFFREALEIKSS

```

DIFFREALWSS  
AHSS  
INFGDPSS  
INFCNASS  
INFCORSS  
ONE  
ONE  
INFC10SS  
ECDSS  
KCDSS  
RCDSS  
QCDSS  
KCHSS  
RCHSS  
ECHSS  
QCHSS  
KCDSS  
KCHSS  
USS  
USS  
DIFFREALECHSS  
DIFFREALECDSS  
beta\_  
ONE  
ONE  
ONE  
MUZKSS  
MUZMSS  
ONE  
MUCSS  
MUKSS  
ONE  
ONE  
ONE  
RL1SS  
RL2SS  
RL3SS  
RL4SS  
RL5SS  
RL6SS  
RL7SS  
RT2SS  
DIFFREALGDPSS\_obs  
DIFFREALECSS\_obs  
DIFFREALEIKSS\_obs  
DIFFREALECDSS\_obs

```

DIFFREALECHSS_obs
DIFFREALWSS_obs
ONE
INFCNASS_obs
INFCORSS_obs
INFKSS_obs
RSS_obs
RT2SS_obs
unempSS_obs
];

```

Uses AHSS 37, beta\_ 37, DIFFREALECDSS 37, DIFFREALECDSS\_obs 37, DIFFREALECHSS 37, DIFFREALECHSS\_obs 37, DIFFREALECSCSS 37, DIFFREALECSCSS\_obs 37, DIFFREALEIKSS 37, DIFFREALEIKSS\_obs 37, DIFFREALGDPSS 37, DIFFREALGDPSS\_obs 37, DIFFREALWSS 37, DIFFREALWSS\_obs 37, ECDSS 37, ECHSS 37, ECSS 37, EIKSS 37, empCSS 37, empKSS 37, empSCSS 37, empSKSS 37, HCSS 37, HKSS 37, HrCSS 37, HrKSS 37, HrSCSS 37, HrSKSS 37, HSCSS 37, HSKSS 37, INFC10SS 37, INFCNASS 37, INFCNASS\_obs 37, INFCORSS 37, INFCORSS\_obs 37, INFCSS 37, INFGDPSS 37, INFKSS 37, INFKSS\_obs 37, INFWCSS 37, INFWKSS 37, KCDSS 37, KCHSS 37, KCSS 37, KKSS 37, LSS 37, MCCSS 37, MCKSS 37, MUCSS 37, MUKSS 37, MUZKSS 37, MUZMSS 37, ONE 37, PKBSS 37, QCDSS 37, QCHSS 37, QKSS 37, RCDSS 37, RCHSS 37, RCSS 37, RKSS 37, RL1SS 37, RL2SS 37, RL3SS 37, RL4SS 37, RL5SS 37, RL6SS 37, RL7SS 37, RSS 37, RSS\_obs 37, RT2SS 37, RT2SS\_obs 37, UHCSS 37, UHKSS 37, UHSCSS 37, UHSKSS 37, unempSS 37, unempSS\_obs 37, USS 37, WCSS 37, WKSS 37, YCSS 37, and YKSS 37.

### A.3 linearized.mod

```

21  <srcedo/linearized.mod 21>≡
    <common setup 32>
    <linearized model 22>
    <common stoch sim 33>

```

This code is written to file `srcedo/linearized.mod`.

### A.3.1 Linearized Model

22  $\langle \text{linearized model 22} \rangle \equiv$  (21)  
 $\langle \text{linearized model prelim 23} \rangle$

```
// XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
// labor block
// TOTAL LABOR INPUT (called "(LSS*exp(L))" in the paper, I kept the "H" notation of
 $\langle \text{linearized model labor 24} \rangle$ 
```

```
// Identities
 $\langle \text{linearized model identities 25a} \rangle$ 
```

```
// XXXXXXXXXXXXXXXXXXXXXXXX
// Aggregate hours equals agg hours in each sector
 $\langle \text{linearized model hours 25b} \rangle$ 
```

```
// See Section 8: Data Identities
```

```
// new equations
// Durable Block
```

```
 $\langle \text{linearized model durables 25c} \rangle$ 
```

```
// Housing Block
 $\langle \text{linearized model housing 26} \rangle$ 
```

```
//measurement_equations;
 $\langle \text{linearized model measurement 27} \rangle$ 
```

```
//end_measurement_equations;
```

```
end;
```

Uses L 34 and LSS 37.

### A.3.2 Linearized Model Prelim

23

 $\langle \text{linearized model prelim 23} \rangle \equiv$ 

(22)

$$\begin{aligned}
& (\text{RCSS} \cdot \exp(\text{RC})) - (\text{MCCSS} \cdot \exp(\text{MCC})) * (\text{YCSS} \cdot \exp(\text{YC})) / (\text{USS} \cdot \exp(\text{UC})) / (\text{KCSS} \cdot \exp(\text{KC}(-1))) * \alpha_ * (\text{MUKSS} \cdot \exp(\text{MUK})) \\
& (\text{RKSS} \cdot \exp(\text{RK})) - (\text{MCKSS} \cdot \exp(\text{MCK})) * (\text{YKSS} \cdot \exp(\text{YK})) / (\text{USS} \cdot \exp(\text{UK})) / (\text{KKSS} \cdot \exp(\text{KK}(-1))) * \alpha_ * (\text{MUKSS} \cdot \exp(\text{MUK})) \\
& (\text{WCSS} \cdot \exp(\text{WC})) - (\text{MCCSS} \cdot \exp(\text{MCC})) * (\text{YCSS} \cdot \exp(\text{YC})) / (\text{HCSS} \cdot \exp(\text{HC})) * (1 - \alpha_ ) = 0; \\
& (\text{WKSS} \cdot \exp(\text{WK})) - (\text{MCKSS} \cdot \exp(\text{MCK})) * (\text{YKSS} \cdot \exp(\text{YK})) / (\text{HKSS} \cdot \exp(\text{HK})) * (1 - \alpha_ ) = 0; \\
& (\text{YCSS} \cdot \exp(\text{YC})) - ((\text{USS} \cdot \exp(\text{UC})) * (\text{KCSS} \cdot \exp(\text{KC}(-1))) / (\text{MUKSS} \cdot \exp(\text{MUK})))^{\alpha_} * ((\text{HCSS} \cdot \exp(\text{HC}))^{(1 - \alpha_ )} \\
& (\text{YKSS} \cdot \exp(\text{YK})) - ((\text{USS} \cdot \exp(\text{UK})) * (\text{KKSS} \cdot \exp(\text{KK}(-1))) / (\text{MUKSS} \cdot \exp(\text{MUK})))^{\alpha_} * ((\text{HKSS} \cdot \exp(\text{HK}))^{(1 - \alpha_ )} \\
& (\text{MCCSS} \cdot \exp(\text{MCC})) * (\text{YCSS} \cdot \exp(\text{YC})) * \theta_c - (\theta_c - 1) * (\text{YCSS} \cdot \exp(\text{YC})) - 100 * \phi_{pc} * ((\text{INFCSS} \cdot \exp(\text{INFC}))^{(1 - \alpha_ )} \\
& (\text{MCKSS} \cdot \exp(\text{MCK})) * (\text{YKSS} \cdot \exp(\text{YK})) * \theta_k / (\text{PKBSS} \cdot \exp(\text{PKB})) - (\theta_k - 1) * (\text{YKSS} \cdot \exp(\text{YK})) - 100 * \phi_{pc} * ((\text{PKBSS} \cdot \exp(\text{PKB}))^{(1 - \alpha_ )} \\
& (\text{QKSS} \cdot \exp(\text{QK})) - \beta_ * (1 / (\text{ONE} \cdot \exp(\text{EFFK}))) * (((1 - \delta_ ) * (\text{QKSS} \cdot \exp(\text{QK}(+1))) + (\text{RCSS} \cdot \exp(\text{RC}(+1)))) * (\text{USS} \cdot \exp(\text{UC})) \\
& (\text{QKSS} \cdot \exp(\text{QK})) - \beta_ * (1 / (\text{ONE} \cdot \exp(\text{EFFK}))) * (((1 - \delta_ ) * (\text{QKSS} \cdot \exp(\text{QK}(+1))) + (\text{RKSS} \cdot \exp(\text{RK}(+1)))) * (\text{USS} \cdot \exp(\text{UK})) \\
& (\text{LSS} \cdot \exp(\text{L})) - (\beta_ * \exp(\beta_ )) * (\text{RSS} \cdot \exp(\text{R})) / \text{rpr} / ((\text{INFCSS} \cdot \exp(\text{INFC}(+1))) / (\text{MUCSS} \cdot \exp(\text{MUC}(+1)))) * (\text{LSS} \cdot \exp(\text{L})) \\
& \ln((\text{RSS} \cdot \exp(\text{R})) / \text{RSS}) - \rho_R * \ln((\text{RSS} \cdot \exp(\text{R}(-1))) / \text{RSS}) - (1 - \rho_R) * (\text{r}_{inf} * \ln((\text{INFCNASS} \cdot \exp(\text{INFCNA})) / \text{INFCNASS})) \\
& (\text{LSS} \cdot \exp(\text{L})) - \eta_{cnn} / ((\text{ECSS} \cdot \exp(\text{EC})) - h * (\text{ECSS} \cdot \exp(\text{EC}(-1))) / (\text{MUCSS} \cdot \exp(\text{MUC}))) + \eta_{cnn} * \beta_ * h / ((\text{MUCSS} \cdot \exp(\text{MUC})) - \beta_ * h) \\
& (\text{KKSS} \cdot \exp(\text{KK})) - (1 - \delta_ ) * (\text{KKSS} \cdot \exp(\text{KK}(-1))) / (\text{MUKSS} \cdot \exp(\text{MUK})) + (\text{KCSS} \cdot \exp(\text{KC})) - (1 - \delta_ ) * (\text{KCSS} \cdot \exp(\text{KC}))
\end{aligned}$$

Uses  $\alpha_$  37,  $\beta_$  37,  $\beta_$  34,  $\delta_$  37, EC 34, ECSS 37, EFFK 34, EIK 34, EIKSS 37, ePMKC 36, ePMKK 36, eR 36,  $\eta_{cnn}$  37,  $\gamma_{pc}$  37, h 37, HC 34, HCSS 37, HK 34, HKSS 37, INFC 34, INFCNA 34, INFCNASS 37, INFCSS 37, INFK 34, INFKSS 37, KC 34, KCSS 37, KK 34, KKSS 37, L 34, LSS 37, MCC 34, MCCSS 37, MCK 34, MCKSS 37,  $\mu_$  37, MUC 34, MUCSS 37, MUK 34, MUKSS 37, ONE 37, PFGAP 34,  $\phi_{pc}$  37,  $\phi_u$  37, PKB 34, PKBSS 37, QK 34, QKSS 37, R 34,  $r_{dinf}$  37,  $r_{inf}$  37,  $r_y$  37, RC 34, RCSS 37,  $\rho_R$  37, RK 34, RKSS 37, rpr 37, RSS 37,  $\theta_c$  37,  $\theta_k$  37, UC 34, UK 34, USS 37, WC 34, WCSS 37, WK 34, WKSS 37, YC 34, YCSS 37, YK 34, and YKSS 37.

$$\begin{aligned}
& -100+(\text{UHCSS}*\exp(\text{UHC}))*\text{theta\_wc}-(\text{theta\_wc}-1)*(\text{WCSS}*\exp(\text{WC}))-100*\text{phi\_wc}*((\text{INFWCSS}*\exp(\text{INFWC})) \\
& (\text{UHSCSS}*\exp(\text{UHSC}))-(\text{WCSS}*\exp(\text{WC}))+\text{phi\_H}/10*((\text{HSCSS}*\exp(\text{HSC}))/(\text{HSKSS}*\exp(\text{HSK}))- \text{gam\_h}* \\
& -100+(\text{UHKSS}*\exp(\text{UHK}))*\text{theta\_wk}-(\text{theta\_wk}-1)*(\text{WKSS}*\exp(\text{WK}))-100*\text{phi\_wc}*((\text{INFWKSS}*\exp(\text{INFWK})) \\
& (\text{UHSKSS}*\exp(\text{UHSK}))-(\text{WKSS}*\exp(\text{WK}))- \text{phi\_H}/10*((\text{HSCSS}*\exp(\text{HSC}))/(\text{HSKSS}*\exp(\text{HSK}))- \text{gam\_h}* \\
& (\text{UHCSS}*\exp(\text{UHC}))*(\text{LSS}*\exp(\text{L}))*(\text{ONE}*\exp(\text{Lpref}))- \text{A\_HC}*((1+\text{sigman})/(1+\text{sigman}/(1+\text{sigmah}))) \\
& (\text{UHSCSS}*\exp(\text{UHSC}))*(\text{LSS}*\exp(\text{L}))*(\text{ONE}*\exp(\text{Lpref}))- \text{A\_HC}*((1+\text{sigman})/(1+\text{sigman}/(1+\text{sigmah}))) \\
& (\text{UHKSS}*\exp(\text{UHK}))*(\text{LSS}*\exp(\text{L}))*(\text{ONE}*\exp(\text{Lpref}))- \text{A\_HK}*((1+\text{sigman})/(1+\text{sigman}/(1+\text{sigmah}))) \\
& (\text{UHSKSS}*\exp(\text{UHSK}))*(\text{LSS}*\exp(\text{L}))*(\text{ONE}*\exp(\text{Lpref}))- \text{A\_HK}*((1+\text{sigman})/(1+\text{sigman}/(1+\text{sigmah}))) \\
& (\text{empCSS}*\exp(\text{empC}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NC}/\text{xsi\_HrC})^{-(1/(1+\text{sigmah}+\text{sigman}))}*(\text{HCSS}*\exp(\text{HC})) \\
& (\text{HrCSS}*\exp(\text{HrC}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NC}/\text{xsi\_HrC})^{(1/(1+\text{sigmah}))}*(\text{empCSS}*\exp(\text{empC}))- \\
& (\text{empKSS}*\exp(\text{empK}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NK}/\text{xsi\_HrK})^{-(1/(1+\text{sigmah}+\text{sigman}))}*(\text{HKSS}*\exp(\text{HK})) \\
& (\text{HrKSS}*\exp(\text{HrK}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NK}/\text{xsi\_HrK})^{(1/(1+\text{sigmah}))}*(\text{empKSS}*\exp(\text{empK}))- \\
& (\text{empSCSS}*\exp(\text{empSC}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NC}/\text{xsi\_HrC})^{-(1/(1+\text{sigmah}+\text{sigman}))}*(\text{HSCSS}*\exp(\text{HSC})) \\
& (\text{HrSCSS}*\exp(\text{HrSC}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NC}/\text{xsi\_HrC})^{(1/(1+\text{sigmah}))}*(\text{empSCSS}*\exp(\text{empSC}))- \\
& (\text{empSKSS}*\exp(\text{empSK}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NK}/\text{xsi\_HrK})^{-(1/(1+\text{sigmah}+\text{sigman}))}*(\text{HSKSS}*\exp(\text{HSK})) \\
& (\text{HrSKSS}*\exp(\text{HrSK}))-((1+\text{sigmah})/\text{sigmah}* \text{xsi\_NK}/\text{xsi\_HrK})^{(1/(1+\text{sigmah}))}*(\text{empSKSS}*\exp(\text{empSK}))- \\
& (\text{unempSS}*\exp(\text{unemp}))-((\text{empSCSS}*\exp(\text{empSC}))+(\text{empSKSS}*\exp(\text{empSK}))-((\text{empCSS}*\exp(\text{empC}))+ \\
& (\text{PKBSS}*\exp(\text{PKB}))- (1-100*\text{phi\_ic}*((\text{EIKSS}*\exp(\text{EIK}))- \text{gam\_ic}*(\text{EIKSS}*\exp(\text{EIK}(-1))))-(1-\text{gam\_ic})* \\
& (\text{YCSS}*\exp(\text{YC}))-(\text{ECSS}*\exp(\text{EC}))-(\text{ECHSS}*\exp(\text{ECH}))-0.2*\text{YCSS}*(\text{ONE}*\exp(\text{HG})))=0; \\
& \ln((\text{INFWCSS}*\exp(\text{INFWC}))) - \ln((\text{WCSS}*\exp(\text{WC}))) + \ln((\text{WCSS}*\exp(\text{WC}(-1)))) - \ln((\text{MUCSS}*\exp(\text{MUC}))) \\
& \ln((\text{INFWKSS}*\exp(\text{INFWK}))) - \ln((\text{WKSS}*\exp(\text{WK}))) + \ln((\text{WKSS}*\exp(\text{WK}(-1)))) - \ln((\text{MUCSS}*\exp(\text{MUC}))) \\
& \ln((\text{INFKSS}*\exp(\text{INFK}))) - \ln((\text{INFCSS}*\exp(\text{INFC}))) - \ln((\text{PKBSS}*\exp(\text{PKB}))) + \ln((\text{PKBSS}*\exp(\text{PKB}(-1)))) \\
& (\text{YKSS}*\exp(\text{YK}))-(\text{EIKSS}*\exp(\text{EIK}))-(\text{ECDSS}*\exp(\text{ECD}))-0.2*\text{YKSS}*(\text{ONE}*\exp(\text{HG})))=0; \\
& \ln((\text{ONE}*\exp(\text{DIFFNORMGDP}))) - (1-\text{s\_k})*(\ln((\text{YCSS}*\exp(\text{YC}))) - \ln((\text{YCSS}*\exp(\text{YC}(-1))))) - \text{s\_k}*(\ln((\text{MUCSS}*\exp(\text{MUC}))) \\
& \ln((\text{ONE}*\exp(\text{NORMINFGDP}))) - \text{s\_k}*(\ln((\text{PKBSS}*\exp(\text{PKB}))) - \ln((\text{PKBSS}*\exp(\text{PKB}(-1)))))=0; \\
& \ln((\text{DIFFREALGDPSS}*\exp(\text{DIFFREALGDP}))) - \ln((\text{ONE}*\exp(\text{DIFFNORMGDP}))) - (1-\text{s\_k})*\ln((\text{MUCSS}*\exp(\text{MUC}))) \\
& \ln((\text{DIFFREALECSS}*\exp(\text{DIFFREALEC}))) - \ln((\text{ECSS}*\exp(\text{EC}))) + \ln((\text{ECSS}*\exp(\text{EC}(-1)))) - \ln((\text{MUCSS}*\exp(\text{MUC}))) \\
& \ln((\text{DIFFREALEIKSS}*\exp(\text{DIFFREALEIK}))) - \ln((\text{EIKSS}*\exp(\text{EIK}))) + \ln((\text{EIKSS}*\exp(\text{EIK}(-1)))) - \ln((\text{MUCSS}*\exp(\text{MUC})))
\end{aligned}$$

Uses A\_HC 37, A\_HK 37, beta\_ 37, DIFFNORMGDP 34, DIFFREALEC 34, DIFFREALECSS 37, DIFFREALEIK 34, DIFFREALEIKSS 37, DIFFREALGDP 34, DIFFREALGDPSS 37, EC 34, ECD 34, ECDSS 37, ECH 34, ECHSS 37, ECSS 37, EFFK 34, EIK 34, EIKSS 37, empC 34, empCSS 37, empK 34, empKSS 37, empSC 34, empSCSS 37, empSK 34, empSKSS 37, eXiL 36, gam\_h 37, gam\_ic 37, gam\_wc 37, HC 34, HCSS 37, HG 34, HK 34, HKSS 37, HrC 34, HrCSS 37, HrK 34, HrKSS 37, HrSC 34, HrSCSS 37, HrSK 34, HrSKSS 37, HSC 34, HSCSS 37, HSK 34, HSKSS 37, INFC 34, INFCSS 37, INFK 34, INFKSS 37, INFWC 34, INFWCSS 37, INFWK 34, INFWKSS 37, KC 34, KCSS 37, KK 34, KKSS 37, L 34, Lpref 34, LSS 37, MUC 34, MUCSS 37, MUK 34, MUKSS 37, NORMINFGDP 34, ONE 37, phi\_H 37, phi\_ic 37, phi\_wc 37, PKB 34, PKBSS 37, QK 34, QKSS 37, s\_k 37, sigmah 37, sigman 37, theta\_wc 37, theta\_wk 37, UHC 34, UHCSS 37, UHK 34, UHKSS 37, UHSC 34, UHSCSS 37, UHSK 34, UHSKSS 37, unemp 34, unempSS 37, WC 34, WCSS 37, WK 34, WKSS 37, XiL 34, xsi\_HrC 37, xsi\_HrK 37, xsi\_NC 37, xsi\_NK 37, YC 34, YCSS 37, YK 34, and YKSS 37.



### A.3.4 Linearized Model Identities

25a  $\langle \text{linearized model identities 25a} \rangle \equiv$  (22)

$$\ln((\text{DIFFREALWSS} * \exp(\text{DIFFREALW})) - \text{HCSS} / \text{AHSS} * (\ln((\text{INFWCSS} * \exp(\text{INFWC}))) - \text{HKSS} / \text{AHSS} * (\ln((\text{INFWKSS} * \exp(\text{INFWK})))))) = 0;$$

Uses AHSS 37, DIFFREALW 34, DIFFREALWSS 37, HCSS 37, HKSS 37, INFC 34, INFCSS 37, INFWC 34, INFWCSS 37, INFWK 34, and INFWKSS 37.

### A.3.5 Linearized Model Hours

25b  $\langle \text{linearized model hours 25b} \rangle \equiv$  (22)

$$\begin{aligned} & (\text{AHSS} * \exp(\text{AH})) - (\text{HCSS} * \exp(\text{HC})) - (\text{HKSS} * \exp(\text{HK})) = 0; \\ & \ln((\text{INFGDPSS} * \exp(\text{INFGDP})) - \ln((\text{INFCSS} * \exp(\text{INFC}))) - \ln((\text{YC} * \exp(\text{YC})) * (\text{MUCSS} * \exp(\text{MUC})) / (\text{YC} * \exp(\text{YC})))) = 0; \\ & \ln((\text{INFCNASS} * \exp(\text{INFCNA})) - (1 - s_{\text{ecdc}}) * \ln((\text{INFCSS} * \exp(\text{INFC}))) - s_{\text{ecdc}} * \ln((\text{INFKSS} * \exp(\text{INFK})))) = 0; \\ & \ln((\text{INFCORSS} * \exp(\text{INFCOR})) - (1 - s_{\text{ecdc}}) * \ln((\text{INFCSS} * \exp(\text{INFC}))) - s_{\text{ecdc}} * \ln((\text{INFKSS} * \exp(\text{INFK})))) = 0; \\ & \ln((\text{ONE} * \exp(\text{GAP})) - (1 - s_k) * \ln((\text{YC} * \exp(\text{YC})) / \text{YC})) - s_k * \ln((\text{YKSS} * \exp(\text{YK})) / \text{YK}) = 0; \\ & \ln((\text{ONE} * \exp(\text{PFGAP})) - (1 - \alpha_k) * ((1 - s_k) * \ln((\text{HCSS} * \exp(\text{HC})) / \text{HCSS}) + s_k * \ln((\text{HKSS} * \exp(\text{HK})) / \text{HKSS}))) - \alpha_k * \ln((\text{INFC10SS} * \exp(\text{INFC10})) - \text{betarl} * \ln((\text{INFC10SS} * \exp(\text{INFC10} + 1)))) - (1 - \text{betarl}) * \ln((\text{INFCORSS} * \exp(\text{INFCOR})) - \text{betarl} * \ln((\text{INFCORSS} * \exp(\text{INFCOR} + 1)))) = 0; \end{aligned}$$

Uses AH 34, AHSS 37, alpha\_k 37, betarl 37, DIFFREALGDP 34, DIFFREALGDPSS 37, GAP 34, HC 34, HCSS 37, HK 34, HKSS 37, INFC 34, INFC10 34, INFC10SS 37, INFCNA 34, INFCNASS 37, INFCOR 34, INFCORSS 37, INFCSS 37, INFGDP 34, INFGDPSS 37, INFK 34, INFKSS 37, MUC 34, MUCSS 37, ONE 37, PFGAP 34, PKB 34, PKBSS 37, s\_ecdc 37, s\_k 37, UC 34, UK 34, USS 37, YC 34, YCSS 37, YK 34, and YKSS 37.

### A.3.6 Linearized Model Durables

25c  $\langle \text{linearized model durables 25c} \rangle \equiv$  (22)

$$\begin{aligned} & (\text{KCDSS} * \exp(\text{KD})) - (1 - \text{delta\_cd}) * (\text{KCDSS} * \exp(\text{KD}(-1))) / (\text{MUKSS} * \exp(\text{MUK})) - (\text{ECDSS} * \exp(\text{ECD})) = 0; \\ & (\text{LSS} * \exp(\text{L})) * (\text{RCDSS} * \exp(\text{RCD})) - \text{eta\_cd} / ((\text{KCDSS} * \exp(\text{KD}(-1))) / (\text{MUKSS} * \exp(\text{MUK})) - \text{h\_cd} * (\text{KCDSS} * \exp(\text{LAGKD}))) = 0; \\ & (\text{QCDSS} * \exp(\text{QCD})) - \text{beta\_} * (1 / (\text{ONE} * \exp(\text{EFFECD}))) * (\text{LSS} * \exp(\text{L} + 1)) / (\text{LSS} * \exp(\text{L})) / (\text{MUKSS} * \exp(\text{MUK} + 1))) = 0; \\ & (\text{PKBSS} * \exp(\text{PKB})) - (\text{QCDSS} * \exp(\text{QCD})) * (1 - 100 * \text{phi\_cd} * ((\text{ECDSS} * \exp(\text{ECD})) - \text{gam\_icd} * (\text{ECDSS} * \exp(\text{ECD}(-1)))) = 0; \end{aligned}$$

Uses beta\_ 37, delta\_cd 37, ECD 34, ECDSS 37, EFFECD 34, eta\_cd 37, gam\_icd 37, h\_cd 37, KCDSS 37, KD 34, L 34, LAGKD 34, LSS 37, MUK 34, MUKSS 37, ONE 37, phi\_cd 37, PKB 34, PKBSS 37, QCD 34, QCDSS 37, RCD 34, and RCDSS 37.

### A.3.7 Linearized Model Housing

$$\begin{aligned}
 \langle \text{linearized model housing } 26 \rangle \equiv & \quad (22) \\
 & (\text{LSS} \cdot \exp(L)) \cdot (\text{RCHSS} \cdot \exp(\text{RCH})) - \text{eta\_ch} / ((\text{KCHSS} \cdot \exp(\text{KCH}(-1))) / (\text{MUCSS} \cdot \exp(\text{MUC})) - \text{h\_ch} \cdot (\text{KCH} \\
 & (\text{QCHSS} \cdot \exp(\text{QCH})) - \text{beta\_} \cdot (1 / (\text{ONE} \cdot \exp(\text{EFFECH}))) \cdot (\text{LSS} \cdot \exp(L(+1))) / (\text{LSS} \cdot \exp(L)) / (\text{MUCSS} \cdot \exp(\text{MUC})) \\
 & 1 \cdot (\text{ECHSS} \cdot \exp(\text{ECH})) + (1 - \text{delta\_ch}) \cdot (\text{KCHSS} \cdot \exp(\text{KCH}(-1))) / (\text{MUCSS} \cdot \exp(\text{MUC})) - (\text{KCHSS} \cdot \exp(\text{KCH} \\
 & 1 - (\text{QCHSS} \cdot \exp(\text{QCH})) \cdot (1 - 100 \cdot \text{phi\_ech} \cdot ((\text{ECHSS} \cdot \exp(\text{ECH})) - \text{gam\_ech} \cdot (\text{ECHSS} \cdot \exp(\text{ECH}(-1)))) - (1 - \text{g} \\
 & \ln((\text{KCDSS} \cdot \exp(\text{KD}(-1)))) - \ln((\text{KCDSS} \cdot \exp(\text{LAGKD}))) = 0; \\
 & \ln((\text{KCHSS} \cdot \exp(\text{KCH}(-1)))) - \ln((\text{KCHSS} \cdot \exp(\text{LAGKCH}))) = 0; \\
 & (\text{RKSS} \cdot \exp(\text{RK})) - (\text{QKSS} \cdot \exp(\text{QK})) \cdot \text{mu\_} \cdot (\text{USS} \cdot \exp(\text{UK}))^{(1/\text{phi\_u})} = 0; \\
 & (\text{RCSS} \cdot \exp(\text{RC})) - (\text{QKSS} \cdot \exp(\text{QK})) \cdot \text{mu\_} \cdot (\text{USS} \cdot \exp(\text{UC}))^{(1/\text{phi\_u})} = 0; \\
 & \ln((\text{DIFFREALECHSS} \cdot \exp(\text{DIFFREALECH}))) - \ln((\text{MUCSS} \cdot \exp(\text{MUC}))) - \ln((\text{ECHSS} \cdot \exp(\text{ECH}))) + \ln((\text{E} \\
 & \ln((\text{DIFFREALECDSS} \cdot \exp(\text{DIFFREALECD}))) - \ln((\text{MUKSS} \cdot \exp(\text{MUK}))) - \ln((\text{ECDSS} \cdot \exp(\text{ECD}))) + \ln((\text{E} \\
 & \ln((\text{beta\_} \cdot \exp(\text{betas})) / \text{beta\_}) - \text{rho\_B} \cdot \ln((\text{beta\_} \cdot \exp(\text{betas}(-1))) / \text{beta\_}) - \text{eB} = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{XiL}))) - \text{rho\_XiL} \cdot \ln((\text{ONE} \cdot \exp(\text{XiL}(-1)))) - \text{eXiL} = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{Lpref}))) - \text{rho\_lpref} \cdot \ln((\text{ONE} \cdot \exp(\text{Lpref}(-1)))) - \text{eLpref} = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{EFFK}))) - \text{rho\_EFFK} \cdot \ln((\text{ONE} \cdot \exp(\text{EFFK}(-1)))) - \text{eEFFK} = 0; \\
 & \ln((\text{MUZKSS} \cdot \exp(\text{MUZK})) / \text{MUZKSS}) - \text{eMUZK} = 0; \\
 & \ln((\text{MUZMSS} \cdot \exp(\text{MUZM})) / \text{MUZMSS}) - \text{eMUZM} = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{HG}))) - \text{rho\_HG} \cdot \ln((\text{ONE} \cdot \exp(\text{HG}(-1)))) - \text{eHG} = 0; \\
 & \ln((\text{MUCSS} \cdot \exp(\text{MUC}))) - \ln((\text{MUZMSS} \cdot \exp(\text{MUZM}))) - \text{alpha\_} \cdot \ln((\text{MUZKSS} \cdot \exp(\text{MUZK}))) = 0; \\
 & \ln((\text{MUKSS} \cdot \exp(\text{MUK}))) - \ln((\text{MUZMSS} \cdot \exp(\text{MUZM}))) - \ln((\text{MUZKSS} \cdot \exp(\text{MUZK}))) = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{EFFECD}))) - \text{rho\_EFFECD} \cdot \ln((\text{ONE} \cdot \exp(\text{EFFECD}(-1)))) - \text{eEFFECD} = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{EFFECH}))) - \text{rho\_EFFECH} \cdot \ln((\text{ONE} \cdot \exp(\text{EFFECH}(-1)))) - \text{eEFFECH} = 0; \\
 & \ln((\text{ONE} \cdot \exp(\text{STAR}))) - \text{rho\_STAR} \cdot \ln((\text{ONE} \cdot \exp(\text{STAR}(-1)))) - \text{eSTAR} = 0; \\
 & \ln((\text{RL1SS} \cdot \exp(\text{RL1}))) - \ln((\text{RSS} \cdot \exp(\text{R}(+1)))) = 0; \\
 & \ln((\text{RL2SS} \cdot \exp(\text{RL2}))) - \ln((\text{RL1SS} \cdot \exp(\text{RL1}(+1)))) = 0; \\
 & \ln((\text{RL3SS} \cdot \exp(\text{RL3}))) - \ln((\text{RL2SS} \cdot \exp(\text{RL2}(+1)))) = 0; \\
 & \ln((\text{RL4SS} \cdot \exp(\text{RL4}))) - \ln((\text{RL3SS} \cdot \exp(\text{RL3}(+1)))) = 0; \\
 & \ln((\text{RL5SS} \cdot \exp(\text{RL5}))) - \ln((\text{RL4SS} \cdot \exp(\text{RL4}(+1)))) = 0; \\
 & \ln((\text{RL6SS} \cdot \exp(\text{RL6}))) - \ln((\text{RL5SS} \cdot \exp(\text{RL5}(+1)))) = 0; \\
 & \ln((\text{RL7SS} \cdot \exp(\text{RL7}))) - \ln((\text{RL6SS} \cdot \exp(\text{RL6}(+1)))) = 0; \\
 & \ln((\text{RT2SS} \cdot \exp(\text{RT2}))) - \text{tp2} - 0.125 \cdot (\ln((\text{RSS} \cdot \exp(\text{R}))) + \ln((\text{RL1SS} \cdot \exp(\text{RL1}))) + \ln((\text{RL}
 \end{aligned}$$

Uses alpha\_ 37, beta\_ 37, betas 34, delta\_ch 37, DIFFREALECD 34, DIFFREALECDSS 37, DIFFREALECH 34, DIFFREALECHSS 37, eB 36, ECD 34, ECDSS 37, ECH 34, ECHSS 37, eEFFECD 36, eEFFECH 36, eEFFK 36, EFFECD 34, EFFECH 34, EFFK 34, eHG 36, eLpref 36, eMUZK 36, eMUZM 36, eSTAR 36, eta\_ch 37, eXiL 36, gam\_ech 37, h\_ch 37, HG 34, KCDSS 37, KCH 34, KCHSS 37, KD 34, L 34, LAGKCH 34, LAGKD 34, Lpref 34, LSS 37, mu\_ 37, MUC 34, MUCSS 37, MUK 34, MUKSS 37, MUZK 34, MUZKSS 37, MUZM 34, MUZMSS 37, ONE 37, phi\_ech 37, phi\_u 37, QCH 34, QCHSS 37, QK 34, QKSS 37, R 34, RC 34, RCH 34, RCHSS 37, RCSS 37, rho\_B 37, rho\_EFFECD 37, rho\_EFFECH 37, rho\_EFFK 37, rho\_HG 37, rho\_lpref 37, rho\_STAR 37, rho\_XiL 37, RK 34, RKSS 37, RL1 34, RL1SS 37, RL2 34, RL2SS 37, RL3 34, RL3SS 37, RL4 34, RL4SS 37, RL5 34, RL5SS 37, RL6 34, RL6SS 37, RL7 34, RL7SS 37, RSS 37, RT2 34, RT2SS 37, STAR 34, tp2 37, UC 34, UK 34, USS 37, and XiL 34.

### A.3.8 Linearized Model Measurement

27  $\langle \text{linearized model measurement } 27 \rangle \equiv$  (22)

$$\begin{aligned}
 \text{DIFFREALGDP\_obs} &= \text{DIFFREALGDP} + \text{DIFFREALGDPSS\_obs}; \\
 \text{DIFFREALEC\_obs} &= \text{DIFFREALEC} + \text{DIFFREALECSS\_obs}; \\
 \text{DIFFREALEIK\_obs} &= \text{DIFFREALEIK} + \text{DIFFREALEIKSS\_obs}; \\
 \text{DIFFREALECD\_obs} &= \text{DIFFREALECD} + \text{DIFFREALECDSS\_obs}; \\
 \text{DIFFREALECH\_obs} &= \text{DIFFREALECH} + \text{DIFFREALECHSS\_obs}; \\
 \text{DIFFREALW\_obs} &= \text{DIFFREALW} + \text{DIFFREALWSS\_obs}; \\
 \text{AH\_obs} &= \text{AH}; \\
 \text{INFCNA\_obs} &= \text{INFCNA} + \text{INFCNASS\_obs}; \\
 \text{INFCOR\_obs} &= \text{INFCOR} + \text{INFCORSS\_obs}; \\
 \text{INFK\_obs} &= \text{INFK} + \text{INFKSS\_obs}; \\
 \text{R\_obs} &= \text{R} + \text{RSS\_obs}; \\
 \text{RT2\_obs} &= \text{RT2} + \text{RT2SS\_obs}; \\
 \text{unemp\_obs} &= \text{unemp} + \text{unempSS\_obs};
 \end{aligned}$$

Uses AH 34, AH\_obs 34, DIFFREALEC 34, DIFFREALEC\_obs 34, DIFFREALECD 34, DIFFREALECD\_obs 34, DIFFREALECDSS\_obs 37, DIFFREALECH 34, DIFFREALECH\_obs 34, DIFFREALECHSS\_obs 37, DIFFREALECSS\_obs 37, DIFFREALEIK 34, DIFFREALEIK\_obs 34, DIFFREALEIKSS\_obs 37, DIFFREALGDP 34, DIFFREALGDP\_obs 34, DIFFREALGDPSS\_obs 37, DIFFREALW 34, DIFFREALW\_obs 34, DIFFREALWSS\_obs 37, INFCNA 34, INFCNA\_obs 34, INFCNASS\_obs 37, INFCOR 34, INFCOR\_obs 34, INFCORSS\_obs 37, INFK 34, INFK\_obs 34, INFKSS\_obs 37, R 34, R\_obs 34, RSS\_obs 37, RT2 34, RT2\_obs 34, RT2SS\_obs 37, unemp 34, unemp\_obs 34, and unempSS\_obs 37.

## A.4 linearized\_steadystate.m

```

28  <srcedo/linearized.steadystate.m 28>≡
    function [ys,check] = linearized_steadystate(ys,exe)
        global M_

    check = 0;

    NumberofParameters=M_.param_nbr;
    for i=1:NumberofParameters
        paramname=deblank(M_.param_names(i,:));
        eval([paramname ' =M_.params(' int2str(i) ');']);
    end;

    %start_steady_state;

    <common steady state values 47>

    %end_steady_state;

    %trends;

    <common steady state trends 50>

    %end_trends;

    for i=1:NumberofParameters
        paramname=deblank(M_.param_names(i,:));
        eval(['M_.params(' int2str(i) ')=' paramname ';']);
    end;

    <linearized steady state result return 29>

```

This code is written to file srcedo/linearized.steadystate.m.

#### A.4.1 Linearized Steady State Result Return

[illegible]

[illegible]

```
DIFFREALECHSS_obs  
DIFFREALWSS_obs  
0  
INFCNASS_obs  
INFCORSS_obs  
INFKSS_obs  
RSS_obs  
RT2SS_obs  
unempSS_obs  
];
```

Uses DIFFREALECDSS\_obs 37, DIFFREALECHSS\_obs 37, DIFFREALECSS\_obs 37,  
DIFFREALEIKSS\_obs 37, DIFFREALGDPSS\_obs 37, DIFFREALWSS\_obs 37, INFCNASS\_obs 37,  
INFCORSS\_obs 37, INFKSS\_obs 37, RSS\_obs 37, RT2SS\_obs 37, and unempSS\_obs 37.

## A.5 Common Model Routines

### A.5.1 Common Model Setup

32      $\langle common\ setup\ 32 \rangle \equiv$  (11 21)

$\langle common\ var\ 34 \rangle$

$\langle common\ varexo\ 36 \rangle$

$\langle common\ parameters\ 37 \rangle$

          //estimated\_params;  
           $\langle common\ estimated\ params\ 41 \rangle$   
          //end\_estimated\_params;

          //calibrated\_params;  
           $\langle common\ calibrated\ params\ 42 \rangle$   
          //end\_calibrated\_params;

          //free\_params;  
           $\langle common\ free\ params\ 43a \rangle$   
          //end\_free\_params;

          //calibrated ME

          //\*\*\*\*\*  
          //MODEL BLOCK  
          //\*\*\*\*\*

model;



### A.5.2 Common Stochastic Simulation

33  $\langle \text{common stoch sim } 33 \rangle \equiv$  (11 21)

$\langle \text{common varobs } 43b \rangle$

```
shocks;
 $\langle \text{common shocks } 44 \rangle$ 
end;
```

```
steady;
```

```
estimated_params;
 $\langle \text{common steady estimated params } 45 \rangle$ 
```

```
 $\langle \text{common stderr } 46 \rangle$ 
end;
```

```
options_.order = 1;
options_.jacobian_flag = 1;
options_.nonlin = 1;
```

```
stoch_simul(order=1,irf=40,nograph);
```

Defines:

```
jacobian_flag, never used.
nonlin, never used.
options_, never used.
order, never used.
stoch_simul, never used.
```

$$\langle common\ var\ 34 \rangle \equiv$$

var	RC	RK	WC	WK	YC	YK	MCC	MCK	KC	KK	PKB	R	L	QK	HC	HSC	HK	HSK	UHC	UHSC	UHK	UHSK	er		
	DIFFREALGDP_obs		DIFFFREALEC_obs		DIFFFREALEIK_obs		DIFFFREALECD_obs		DIFFFREALECH_obs		DIFFFREALEDI_obs		DIFFFREALES_obs		DIFFFREALET_obs		DIFFFREALETOT_obs		DIFFFREALETOTC_obs		DIFFFREALETOTDI_obs		DIFFFREALETOTDIT_obs		DIFFFREALETOTIT_obs

(32)

AH, used in chunks 15a, 17, 25b, and 27.  
 AH\_obs, used in chunks 17, 27, 43b, and 44.  
 betas, used in chunks 13, 16, 23, and 26.  
 DIFFNORMGDP, used in chunks 14a and 24.  
 DIFFFREALEC, used in chunks 14a, 17, 24, and 27.  
 DIFFFREALEC\_obs, used in chunks 17, 27, 43b, and 44.  
 DIFFFREALECD, used in chunks 16, 17, 26, and 27.  
 DIFFFREALECD\_obs, used in chunks 17, 27, 43b, and 44.  
 DIFFFREALECH, used in chunks 16, 17, 26, and 27.  
 DIFFFREALECH\_obs, used in chunks 17, 27, 43b, and 44.  
 DIFFFREALEIK, used in chunks 14a, 17, 24, and 27.  
 DIFFFREALEIK\_obs, used in chunks 17, 27, 43b, and 44.  
 DIFFFREALGDP, used in chunks 14a, 15a, 17, 24, 25b, and 27.  
 DIFFFREALGDP\_obs, used in chunks 17, 27, 43b, and 44.  
 DIFFFREALW, used in chunks 14b, 17, 25a, and 27.  
 DIFFFREALW\_obs, used in chunks 17, 27, 43b, and 44.  
 EC, used in chunks 13, 14a, 23, and 24.  
 ECD, used in chunks 14–16 and 24–26.  
 ECH, used in chunks 14a, 16, 24, and 26.  
 EFFECD, used in chunks 15b, 16, 25c, and 26.  
 EFFECH, used in chunks 16 and 26.  
 EFFK, used in chunks 13, 14a, 16, 23, 24, and 26.  
 EIK, used in chunks 13, 14a, 23, and 24.  
 empC, used in chunks 14a and 24.  
 empK, used in chunks 14a and 24.  
 empSC, used in chunks 14a and 24.  
 empSK, used in chunks 14a and 24.  
 GAP, used in chunks 15a and 25b.  
 HC, used in chunks 13–15 and 23–25.  
 HG, used in chunks 14a, 16, 24, and 26.  
 HK, used in chunks 13–15 and 23–25.  
 HrC, used in chunks 14a and 24.  
 HrK, used in chunks 14a and 24.  
 HrSC, used in chunks 14a and 24.  
 HrSK, used in chunks 14a and 24.  
 HSC, used in chunks 14a and 24.  
 HSK, used in chunks 14a and 24.  
 INFC, used in chunks 13–15 and 23–25.  
 INFC10, used in chunks 15a and 25b.  
 INFCNA, used in chunks 13, 15a, 17, 23, 25b, and 27.  
 INFCNA\_obs, used in chunks 17, 27, 43b, and 44.  
 INFCOR, used in chunks 15a, 17, 25b, and 27.  
 INFCOR\_obs, used in chunks 17, 27, 43b, and 44.  
 INFGDP, used in chunks 15a and 25b.  
 INFK, used in chunks 13–15, 17, 23–25, and 27.  
 INFK\_obs, used in chunks 17, 27, 43b, and 44.  
 INFWC, used in chunks 14, 24, and 25a.  
 INFWK, used in chunks 14, 24, and 25a.  
 KC, used in chunks 13, 14a, 23, and 24.  
 KCH, used in chunks 16 and 26.  
 KD, used in chunks 15b, 16, 25c, and 26.

KK, used in chunks 13, 14a, 23, and 24.  
L, used in chunks 12–16 and 22–26.  
LAGKCH, used in chunks 16 and 26.  
LAGKD, used in chunks 15b, 16, 25c, and 26.  
Lpref, used in chunks 14a, 16, 24, and 26.  
MCC, used in chunks 13 and 23.  
MCK, used in chunks 13 and 23.  
MUC, used in chunks 13–16 and 23–26.  
MUK, used in chunks 13–16 and 23–26.  
MUZK, used in chunks 16 and 26.  
MUZM, used in chunks 16 and 26.  
NORMINFGDP, used in chunks 14a and 24.  
PFGAP, used in chunks 13, 15a, 23, and 25b.  
PKB, used in chunks 13–15 and 23–25.  
QCD, used in chunks 15b and 25c.  
QCH, used in chunks 16 and 26.  
QK, used in chunks 13, 14a, 16, 23, 24, and 26.  
R, used in chunks 13, 16, 17, 23, 26, and 27.  
R\_obs, used in chunks 17, 27, and 43b.  
RC, used in chunks 13, 16, 23, and 26.  
RCD, used in chunks 15b and 25c.  
RCH, used in chunks 16 and 26.  
RK, used in chunks 13, 16, 23, and 26.  
RL1, used in chunks 16 and 26.  
RL2, used in chunks 16 and 26.  
RL3, used in chunks 16 and 26.  
RL4, used in chunks 16 and 26.  
RL5, used in chunks 16 and 26.  
RL6, used in chunks 16 and 26.  
RL7, used in chunks 16 and 26.  
RT2, used in chunks 16, 17, 26, and 27.  
RT2\_obs, used in chunks 17, 27, 43b, and 44.  
STAR, used in chunks 16 and 26.  
UC, used in chunks 13, 15a, 16, 23, 25b, and 26.  
UHC, used in chunks 14a and 24.  
UHK, used in chunks 14a and 24.  
UHSC, used in chunks 14a and 24.  
UHSK, used in chunks 14a and 24.  
UK, used in chunks 13, 15a, 16, 23, 25b, and 26.  
unemp, used in chunks 14a, 17, 24, and 27.  
unemp\_obs, used in chunks 17, 27, 43b, and 44.  
WC, used in chunks 13, 14a, 23, and 24.  
WK, used in chunks 13, 14a, 23, and 24.  
XiL, used in chunks 14a, 16, 24, and 26.  
YC, used in chunks 13–15 and 23–25.  
YK, used in chunks 13–15 and 23–25.

#### A.5.4 Common VarExo

36  $\langle \text{common varexo } 36 \rangle \equiv$  (32)  
       varexo eHG eXiL eLpref eR eMUZK eMUZM ePMKC ePMKK eEFFECH eEFFECD eEFFK eB eSTAR;

Defines:

eB, used in chunks 16, 26, 44, and 46.  
 eEFFECD, used in chunks 16, 26, 44, and 46.  
 eEFFECH, used in chunks 16, 26, 44, and 46.  
 eEFFK, used in chunks 16, 26, 44, and 46.  
 eHG, used in chunks 16, 26, 44, and 46.  
 eLpref, used in chunks 16, 26, 44, and 46.  
 eMUZK, used in chunks 16, 26, 44, and 46.  
 eMUZM, used in chunks 16, 26, 44, and 46.  
 ePMKC, used in chunks 13, 23, 44, and 46.  
 ePMKK, used in chunks 13, 23, 44, and 46.  
 eR, used in chunks 13, 23, 44, and 46.  
 eSTAR, used in chunks 16, 26, 44, and 46.  
 eXiL, used in chunks 14a, 16, 24, 26, 44, and 46.

### A.5.5 Common Parameters

37  $\langle \text{common parameters } 37 \rangle \equiv$

(32)

```

parameters
h r_inf r_y r_dy phi_pc phi_H phi_wc phi_ic phi_cd phi_ech gam_pc gam_wc gam_ic gam_icd rho_R r
rho_EFFECD rho_HG rho_EFFECH tp2 ONE MUZMSS MUZKSS r_dinf rpr phi_u rho_MUZK rho_MUZZM pbeta de
theta_k theta_wc theta_wk g_y a_ks s_AS gam_h gam_ech s_k s_ecdc eta_cnn eta_cd eta_ch
icoef mu_betarl MUZCSS RCSS RKSS WCSS WKSS YCSS YKSS MCCSS MCKSS KCSS KKSS LSS HCSS HKSS QKSS
MUCSS MUKSS AHSS ECDSS KCDSS QCDSS RCDSS ECHSS KCHSS QCHSS RCHSS UKSS UCSS USS MUKSShabit MUCSS
INFCNASS INFCORSS INFC10SS RT2SS beta_0 beta_2 beta_ PYSS AA DD RR
eta_cd_eta_cnn eta_ch_eta_cnn Rnr ycbi_ykb hc_hk HSS ycbi ykb YYSS s_k_ecd s_c_ech s_k_eik s_yc
sig_HG sig_XiL sig_lpref sig_R sig_MUZK sig_MUZZM sig_PMKC sig_PMKK sig_EFFECH sig_EFFECD sig_E
HSKSS HSCSS HrcSS HrKSS A_HC sigman sigmah A_HK xsi_NC xsi_HrC xsi_NK xsi_HrK rho_XiL rho_lpref
empCSS empKSS HrSKSS HrSCSS empSCSS empSKSS UHCSS UHKSS UHSCSS UHSKSS unempSS DIFFREALGDPSS DIF
DIFFREALECHSS DIFFREALEIKSS DIFFREALWSS RL1SS RL2SS RL3SS RL4SS RL5SS
RL6SS RL7SS DIFFREALGDPSS_obs DIFFREALECSS_obs DIFFREALEIKSS_obs DIFFREALECDSS_obs
DIFFREALECHSS_obs DIFFREALWSS_obs INFCNASS_obs INFCORSS_obs INFKSS_obs
RSS_obs RT2SS_obs unempSS_obs;

```

Defines:

A\_HC, used in chunks 14a, 24, 43a, and 47.  
 A\_HK, used in chunks 14a, 24, 43a, and 47.  
 a\_ks, used in chunk 42.  
 AA, used in chunk 47.  
 AHSS, used in chunks 14b, 17, 19, 25, and 47.  
 alpha\_, used in chunks 13, 15a, 16, 23, 25b, 26, 42, and 47.  
 beta\_, used in chunks 13–16, 19, 23–26, and 47.  
 beta\_0, used in chunk 47.  
 beta\_2, used in chunk 47.  
 betarl, used in chunks 15a, 25b, and 42.  
 DD, used in chunk 47.  
 delta\_, used in chunks 13, 23, 42, and 47.  
 delta\_cd, used in chunks 15b, 25c, 42, and 47.  
 delta\_ch, used in chunks 16, 26, 42, and 47.  
 DIFFREALECDSS, used in chunks 17, 19, 26, and 47.  
 DIFFREALECDSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 DIFFREALECHSS, used in chunks 17, 19, 26, and 47.  
 DIFFREALECHSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 DIFFREALECSS, used in chunks 17, 19, 24, and 47.  
 DIFFREALECSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 DIFFREALEIKSS, used in chunks 17, 19, 24, and 47.  
 DIFFREALEIKSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 DIFFREALGDPSS, used in chunks 17, 19, 24, 25b, and 47.  
 DIFFREALGDPSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 DIFFREALWSS, used in chunks 17, 19, 25a, and 47.  
 DIFFREALWSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 ECDSS, used in chunks 15b, 19, 24–26, and 47.  
 ECHSS, used in chunks 16, 19, 24, 26, and 47.  
 ECSS, used in chunks 19, 23, 24, and 47.  
 EIKSS, used in chunks 14a, 19, 23, 24, and 47.  
 empCSS, used in chunks 19, 24, and 47.  
 empKSS, used in chunks 19, 24, and 47.  
 empSCSS, used in chunks 19, 24, and 47.  
 empSKSS, used in chunks 19, 24, and 47.

eta\_cd, used in chunks 15b, 25c, 43a, and 47.  
 eta\_cd\_eta\_cnn, used in chunk 47.  
 eta\_ch, used in chunks 16, 26, 43a, and 47.  
 eta\_ch\_eta\_cnn, used in chunk 47.  
 eta\_cnn, used in chunks 13, 23, 43a, and 47.  
 g\_y, used in chunk 42.  
 gam\_ech, used in chunks 16, 26, and 42.  
 gam\_h, used in chunks 14a, 24, and 42.  
 gam\_ic, used in chunks 14a, 24, and 42.  
 gam\_icd, used in chunks 15b, 25c, and 42.  
 gam\_pc, used in chunks 13, 23, 41, and 45.  
 gam\_wc, used in chunks 14a, 24, 41, and 45.  
 h, used in chunks 13, 23, 41, 45, and 47.  
 h\_cd, used in chunks 15b, 25c, 42, and 47.  
 h\_ch, used in chunks 16, 26, 42, and 47.  
 hc\_hk, used in chunk 47.  
 HCSS, used in chunks 14, 15a, 19, 23–25, and 47.  
 HKSS, used in chunks 14, 15a, 19, 23–25, and 47.  
 HrCSS, used in chunks 19, 24, and 47.  
 HrKSS, used in chunks 19, 24, and 47.  
 HrSCSS, used in chunks 19, 24, and 47.  
 HrSKSS, used in chunks 19, 24, and 47.  
 HSCSS, used in chunks 14a, 19, 24, and 47.  
 HSKSS, used in chunks 14a, 19, 24, and 47.  
 HSS, used in chunk 47.  
 icoef, used in chunk 42.  
 IMPHSSS, used in chunk 47.  
 INFC10SS, used in chunks 19, 25b, and 47.  
 INFCNASS, used in chunks 13, 17, 19, 23, 25b, and 47.  
 INFCNASS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 INFCORSS, used in chunks 17, 19, 25b, and 47.  
 INFCORSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 INFCSS, used in chunks 13, 19, 23–25, 47, and 50.  
 INFGDPSS, used in chunks 19, 25b, and 47.  
 INFKSS, used in chunks 13, 17, 19, 23–25, 47, and 50.  
 INFKSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 INFWCSS, used in chunks 14a, 19, 24, 25a, and 47.  
 INFWKSS, used in chunks 14a, 19, 24, 25a, and 47.  
 KCDSS, used in chunks 19, 25c, 26, and 47.  
 KCHSS, used in chunks 19, 26, and 47.  
 KCSS, used in chunks 13, 19, 23, 24, and 47.  
 KKSS, used in chunks 13, 19, 23, 24, and 47.  
 LSS, used in chunks 19, 22–26, and 47.  
 MCCSS, used in chunks 19, 23, and 47.  
 MCKSS, used in chunks 19, 23, and 47.  
 mu\_, used in chunks 13, 16, 23, 26, 43a, and 47.  
 MUCSS, used in chunks 19, 23–26, 47, and 50.  
 MUCSShabit, used in chunk 47.  
 MUKSS, used in chunks 19, 23–26, 47, and 50.  
 MUKSShabit, used in chunk 47.  
 MUZCSS, used in chunk 47.  
 MUZKSS, used in chunks 16, 19, 26, 42, and 47.  
 MUZMSS, used in chunks 16, 19, 26, 42, and 47.  
 ONE, used in chunks 19, 23–26, 42, and 47.  
 pbeta, used in chunks 42 and 47.  
 phi\_cd, used in chunks 15b, 25c, 41, and 45.  
 phi\_ech, used in chunks 16, 26, 41, and 45.

phi\_H, used in chunks 14a, 24, 41, and 45.  
 phi\_ic, used in chunks 14a, 24, 41, and 45.  
 phi\_pc, used in chunks 13, 23, 41, and 45.  
 phi\_u, used in chunks 13, 16, 23, 26, and 42.  
 phi\_wc, used in chunks 14a, 24, 41, and 45.  
 PKBSS, used in chunks 19, 23–25, and 47.  
 PYSS, used in chunk 47.  
 QCDSS, used in chunks 19, 25c, and 47.  
 QCHSS, used in chunks 19, 26, and 47.  
 QKSS, used in chunks 19, 23, 24, 26, and 47.  
 r\_dinf, used in chunks 13, 23, and 42.  
 r\_dy, used in chunk 42.  
 r\_inf, used in chunks 13, 23, 41, and 45.  
 r\_y, used in chunks 13, 23, 41, and 45.  
 RCDSS, used in chunks 19, 25c, and 47.  
 RCHSS, used in chunks 19, 26, and 47.  
 RCSS, used in chunks 19, 23, 26, and 47.  
 rho\_B, used in chunks 16, 26, 41, and 45.  
 rho\_EFFECD, used in chunks 16, 26, 41, and 45.  
 rho\_EFFECH, used in chunks 16, 26, 41, and 45.  
 rho\_EFFK, used in chunks 16, 26, 41, and 45.  
 rho\_HG, used in chunks 16, 26, 41, and 45.  
 rho\_lpref, used in chunks 16, 26, 41, and 45.  
 rho\_MUZZ, used in chunk 42.  
 rho\_MUZZ, used in chunk 42.  
 rho\_R, used in chunks 13, 23, 41, and 45.  
 rho\_STAR, used in chunks 16, 26, 41, and 45.  
 rho\_XiL, used in chunks 16, 26, 41, and 45.  
 RKSS, used in chunks 19, 23, 26, and 47.  
 RL1SS, used in chunks 19, 26, and 47.  
 RL2SS, used in chunks 19, 26, and 47.  
 RL3SS, used in chunks 19, 26, and 47.  
 RL4SS, used in chunks 19, 26, and 47.  
 RL5SS, used in chunks 19, 26, and 47.  
 RL6SS, used in chunks 19, 26, and 47.  
 RL7SS, used in chunks 19, 26, and 47.  
 Rnr, used in chunk 47.  
 rpr, used in chunks 13, 23, 42, and 47.  
 RR, used in chunk 47.  
 RSS, used in chunks 13, 17, 19, 23, 26, 47, and 50.  
 RSS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 RT2SS, used in chunks 17, 19, 26, 47, and 50.  
 RT2SS\_obs, used in chunks 17, 19, 27, 29, and 50.  
 s\_AS, used in chunks 42 and 47.  
 s\_c\_ech, used in chunk 47.  
 s\_ecdc, used in chunks 15a, 25b, 43a, 47, and 50.  
 s\_k, used in chunks 14a, 15a, 24, 25b, 43a, 47, and 50.  
 s\_k\_ecd, used in chunk 47.  
 s\_k\_eik, used in chunk 47.  
 s\_yc, used in chunk 47.  
 sig\_B, used in chunks 41 and 44.  
 sig\_EFFECD, used in chunks 41 and 44.  
 sig\_EFFECH, used in chunks 41 and 44.  
 sig\_EFFK, used in chunks 41 and 44.  
 sig\_HG, used in chunks 41 and 44.  
 sig\_lpref, used in chunks 41 and 44.  
 sig\_MUZZ, used in chunks 41 and 44.

`sig_MUZH`, used in chunks 41 and 44.  
`sig_PMKC`, used in chunks 41 and 44.  
`sig_PMKK`, used in chunks 41 and 44.  
`sig_R`, used in chunks 41 and 44.  
`sig_STAR`, used in chunks 41 and 44.  
`sig_XiL`, used in chunks 41 and 44.  
`sigmah`, used in chunks 14a, 24, 41, 45, and 47.  
`sigman`, used in chunks 14a, 24, 41, 45, and 47.  
`theta_c`, used in chunks 13, 23, 42, and 47.  
`theta_k`, used in chunks 13, 23, 42, and 47.  
`theta_wc`, used in chunks 14a, 24, 43a, and 47.  
`theta_wk`, used in chunks 14a, 24, 43a, and 47.  
`tp2`, used in chunks 16, 26, 41, 45, and 47.  
`UCSS`, used in chunk 47.  
`UHCSS`, used in chunks 19, 24, and 47.  
`UHKSS`, used in chunks 19, 24, and 47.  
`UHSCSS`, used in chunks 19, 24, and 47.  
`UHSKSS`, used in chunks 19, 24, and 47.  
`UKSS`, used in chunk 47.  
`unempSS`, used in chunks 17, 19, 24, 42, 47, and 50.  
`unempSS_obs`, used in chunks 17, 19, 27, 29, and 50.  
`USS`, used in chunks 15a, 19, 23, 25b, 26, and 47.  
`WCSS`, used in chunks 19, 23, 24, and 47.  
`WKSS`, used in chunks 19, 23, 24, and 47.  
`xsi_HrC`, used in chunks 14a, 24, 43a, and 47.  
`xsi_HrK`, used in chunks 14a, 24, 43a, and 47.  
`xsi_NC`, used in chunks 14a, 24, 43a, and 47.  
`xsi_NK`, used in chunks 14a, 24, 43a, and 47.  
`ycbi`, used in chunk 47.  
`ycbi_ykb`, used in chunk 47.  
`YCSS`, used in chunks 13–15, 19, 23–25, and 47.  
`ykb`, used in chunk 47.  
`YKSS`, used in chunks 13–15, 19, 23–25, and 47.  
`YYSS`, used in chunk 47.



### A.5.6 Common Estimated Params

$$\begin{aligned}
 41 \quad \langle \text{common estimated params } 41 \rangle \equiv & \quad (32) \\
 & \begin{aligned}
 h &= 0.715162417869797; \\
 r_{\text{inf}} &= 1.46344163969035; \\
 r_y &= 0.263123294207851; \\
 \text{phi}_{\text{pc}} &= 3.54471453295450; \\
 \text{phi}_H &= 3.22894079106560; \\
 \text{phi}_{\text{wc}} &= 5.49395755514723; \\
 \text{phi}_{\text{ic}} &= 0.253308786976374; \\
 \text{phi}_{\text{cd}} &= 0.470089385005009; \\
 \text{phi}_{\text{ech}} &= 9.13986886546163; \\
 \text{gam}_{\text{pc}} &= 0.314488926051065; \\
 \text{gam}_{\text{wc}} &= -0.230018833252054; \\
 \text{sigman} &= 39.4075260618789; \\
 \text{sigmah} &= 21.8859803402692; \\
 \text{rho}_R &= 0.833200065745674; \\
 \text{rho}_{\text{XiL}} &= 0.263567746111198; \\
 \text{rho}_{\text{lpref}} &= 0.979092048897712; \\
 \text{rho}_B &= 0.895267027146152; \\
 \text{rho}_{\text{STAR}} &= 0.909187927454138; \\
 \text{rho}_{\text{EFFK}} &= 0.937829274540004; \\
 \text{rho}_{\text{EFFECD}} &= -0.240286975088701; \\
 \text{rho}_{\text{HG}} &= 0.582395471123139; \\
 \text{rho}_{\text{EFFECH}} &= 0.877235725078934; \\
 \text{tp2} &= 0.000307314910763576; \\
 \text{sig}_{\text{HG}} &= 0.579315931803017; \\
 \text{sig}_{\text{XiL}} &= 2.49313873916751; \\
 \text{sig}_{\text{lpref}} &= 5.66476748114241; \\
 \text{sig}_R &= 0.124100461010359; \\
 \text{sig}_{\text{MUZK}} &= 0.936167718269030; \\
 \text{sig}_{\text{MUZM}} &= 0.597390920898135; \\
 \text{sig}_{\text{PMKC}} &= 0.451830653200989; \\
 \text{sig}_{\text{PMKK}} &= 0.685376191952156; \\
 \text{sig}_{\text{EFFECH}} &= 0.514704527091087; \\
 \text{sig}_{\text{EFFECD}} &= 9.11199585973990; \\
 \text{sig}_{\text{EFFK}} &= 0.402779878811407; \\
 \text{sig}_B &= 0.295232712196573; \\
 \text{sig}_{\text{STAR}} &= 0.104877885500673;
 \end{aligned}
 \end{aligned}$$

Uses gam\_pc 37, gam\_wc 37, h 37, phi\_cd 37, phi\_ech 37, phi\_H 37, phi\_ic 37, phi\_pc 37, phi\_wc 37, r\_inf 37, r\_y 37, rho\_B 37, rho\_EFFECD 37, rho\_EFFECH 37, rho\_EFFK 37, rho\_HG 37, rho\_lpref 37, rho\_R 37, rho\_STAR 37, rho\_XiL 37, sig\_B 37, sig\_EFFECD 37, sig\_EFFECH 37, sig\_EFFK 37, sig\_HG 37, sig\_lpref 37, sig\_MUZK 37, sig\_MUZM 37, sig\_PMKC 37, sig\_PMKK 37, sig\_R 37, sig\_STAR 37, sig\_XiL 37, sigmah 37, sigman 37, and tp2 37.

### A.5.7 Common Calibrated params

42      $\langle \text{common calibrated params } 42 \rangle \equiv$  (32)

```

r_dy = 0;
ONE = 1;
MUZKSS = 1.009250;
MUZMSS = 1.001000;
gam_ic = 1.0;
gam_icd = 1.0;
r_dinf = 0;
rpr = 0.965;
phi_u = 1;
rho_MUZK = 0;
rho_MUZM = 0;
pbeta = 0.99862;
delta_ = 0.03;
h_cd = 0.0;
h_ch = 0.0;
delta_cd = 0.055;
delta_ch = 0.0035;
alpha_ = 0.26;
theta_c = 7;
theta_k = 7;
unempSS = .06;
g_y = 0.0;
a_ks = 0.2;
s_AS = 0.2;
gam_h = 1;
gam_ech = 1;
icoef = 3;
betarl = .958;

```

Uses a\_ks 37, alpha\_ 37, betarl 37, delta\_ 37, delta\_cd 37, delta\_ch 37, g\_y 37, gam\_ech 37, gam\_h 37, gam\_ic 37, gam\_icd 37, h\_cd 37, h\_ch 37, icoef 37, MUZKSS 37, MUZMSS 37, ONE 37, pbeta 37, phi\_u 37, r\_dinf 37, r\_dy 37, rho\_MUZK 37, rho\_MUZM 37, rpr 37, s\_AS 37, theta\_c 37, theta\_k 37, and unempSS 37.

### A.5.8 Common Free Params

43a  $\langle \text{common free params 43a} \rangle \equiv$  (32)

```

//A_HC;
//A_HK;
//xsi_NC;
//xsi_HrC;
//xsi_NK;
//xsi_HrK;
//theta_wc;
//theta_wk;
//infkbar;
//infcbars;
//infwcbar;
//infwkbar;
//Pybar;
//Yybar;
//mu_yc;
//mu_yk;
//s_k;
//s_ecdc;
//eta_cnn;
//eta_cd;
//eta_ch;
//mu_;

```

Uses A\_HC 37, A\_HK 37, eta\_cd 37, eta\_ch 37, eta\_cnn 37, mu\_ 37, s\_ecdc 37, s\_k 37, theta\_wc 37, theta\_wk 37, xsi\_HrC 37, xsi\_HrK 37, xsi\_NC 37, and xsi\_NK 37.

### A.5.9 common Varobs

43b  $\langle \text{common varobs 43b} \rangle \equiv$  (33)

```

varobs DIFFREALGDP_obs DIFFREALEC_obs DIFFREALEIK_obs DIFFREALECD_obs DIFFREALECH_obs DIFFREALW_obs

```

Uses AH\_obs 34, DIFFREALEC\_obs 34, DIFFREALECD\_obs 34, DIFFREALECH\_obs 34, DIFFREALEIK\_obs 34, DIFFREALGDP\_obs 34, DIFFREALW\_obs 34, INFCNA\_obs 34, INFCOR\_obs 34, INFK\_obs 34, R\_obs 34, RT2\_obs 34, and unemp\_obs 34.

## A.5.10 Common Shocks

44  $\langle \text{common shocks } 44 \rangle \equiv$  (33)

```

var eHG;
stderr sig_HG;
var eXiL;
stderr sig_XiL;
var eLpref;
stderr sig_lpref;
var eR;
stderr sig_R;
var eMUZK;
stderr sig_MUZK;
var eMUZM;
stderr sig_MUZM;
var ePMKC;
stderr sig_PMKC;
var ePMKK;
stderr sig_PMKK;
var eEFFECH;
stderr sig_EFFECH;
var eEFFECD;
stderr sig_EFFECD;
var eEFFK;
stderr sig_EFFK;
var eB;
stderr sig_B;
var eSTAR;
stderr sig_STAR;

var DIFFREALGDP_obs;
stderr 0.3;
var DIFFFREALEC_obs;
stderr 0.1;
var DIFFFREALEIK_obs;
stderr 1.5;
var DIFFFREALECD_obs;
stderr 1.5;
var DIFFFREALECH_obs;
stderr 1.5;
var DIFFREALW_obs;
stderr 0.3;
var AH_obs;
stderr 0.3;
var INFCNA_obs;
```

```

stderr 0.5;
var INFCOR_obs;
stderr 0.05;
var INFK_obs;
stderr 0.2;
var RT2_obs;
stderr 0.1;
var unemp_obs;
stderr 4;

```

Uses AH\_obs 34, DIFFREALEC\_obs 34, DIFFREALECD\_obs 34, DIFFREALECH\_obs 34,  
 DIFFREALEIK\_obs 34, DIFFREALGDP\_obs 34, DIFFREALW\_obs 34, eB 36, eEFFECD 36,  
 eEFFECH 36, eEFFK 36, eHG 36, eLpref 36, eMUZK 36, eMUZM 36, ePMKC 36, ePMKK 36,  
 eR 36, eSTAR 36, eXiL 36, INFCNA\_obs 34, INFCOR\_obs 34, INFK\_obs 34, RT2\_obs 34,  
 sig\_B 37, sig\_EFFECD 37, sig\_EFFECH 37, sig\_EFFK 37, sig\_HG 37, sig\_lpref 37,  
 sig\_MUZK 37, sig\_MUZM 37, sig\_PMKC 37, sig\_PMKK 37, sig\_R 37, sig\_STAR 37, sig\_XiL 37,  
 and unemp\_obs 34.

### A.5.11 Common Steady Estimated params

45

(common steady estimated params 45)≡

(33)

h	, .673	, -1	, 1	, uniform_pdf	, , , -1	, 1;
r_inf	, 1.461	, -999	, 999	, normal_pdf	, 1.5000	, 0.062
r_y	, 0.214	, -999	, 999	, normal_pdf	, 0.125	, 0.125
phi_pc	, 3.126	, 0	, 999	, gamma_pdf	, 4.0000	, 4.000
phi_H	, 4.064	, 0	, 999	, gamma_pdf	, 4.0000	, 4.000
phi_wc	, 5.119	, 0	, 999	, gamma_pdf	, 4.0000	, 4.000
phi_ic	, .325	, 0	, 999	, gamma_pdf	, 4.0000	, 4.000
phi_cd	, .651	, 0	, 999	, gamma_pdf	, 4.0000	, 4.000
phi_ech	, 10.948	, 0	, 999	, gamma_pdf	, 4.0000	, 4.000
gam_pc	, 0.386	, -999	, 999	, normal_pdf	, 0.000	, 0.250
gam_wc	, 0.213	, -999	, 999	, normal_pdf	, 0.000	, 0.250
sigman	, 1.25	, 0	, 999	, gamma_pdf	, 1.25	, 12.5
sigmah	, 10	, 0	, 999	, gamma_pdf	, 10	, 100
rho_R	, 0.654	, -1	, 1	, normal_pdf	, 0.5	, 0.25
rho_XiL	, 0.654	, -1	, 1	, normal_pdf	, 0.5	, 0.25
rho_lpref	, 0.954	, -1	, 1	, normal_pdf	, 0.5	, 0.25
rho_B	, 0.825	, -1	, 1	, normal_pdf	, 0	, 0.5
rho_STAR	, 0.825	, -1	, 1	, normal_pdf	, 0	, 0.5
rho_EFFK	, 0.850	, -1	, 1	, normal_pdf	, 0	, 0.5
rho_EFFECD	, .230	, -1	, 1	, normal_pdf	, 0	, 0.5
rho_HG	, 0.596	, 0	, 1	, beta_pdf	, 0.5	, 0.015
rho_EFFECH	, 0.844	, -1	, 1	, normal_pdf	, 0	, 0.5
tp2	, 0.001	, -999	, 999	, normal_pdf	, 0.0	, 0.000

Uses gam\_pc 37, gam\_wc 37, h 37, phi\_cd 37, phi\_ech 37, phi\_H 37, phi\_ic 37, phi\_pc 37,  
 phi\_wc 37, r\_inf 37, r\_y 37, rho\_B 37, rho\_EFFECD 37, rho\_EFFECH 37, rho\_EFFK 37,  
 rho\_HG 37, rho\_lpref 37, rho\_R 37, rho\_STAR 37, rho\_XiL 37, sigmah 37, sigman 37,  
 and tp2 37.

### A.5.12 Common Stderr

46	$\langle \text{common stderr } 46 \rangle \equiv$	(33)
	stderr eHG , .745 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eXiL , 3.621 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eLpref , 1.621 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eR , 0.165 , 0.0001 , 999 , inv_gamma_pdf , 0.354491	
	stderr eMUZK , .834 , 0.0001 , 999 , inv_gamma_pdf , 0.443113	
	stderr eMUZM , .484 , 0.0001 , 999 , inv_gamma_pdf , 0.443113	
	stderr ePMKC , .391 , 0.0001 , 999 , inv_gamma_pdf , 0.354491	
	stderr ePMKK , .552 , 0.0001 , 999 , inv_gamma_pdf , 0.354491	
	stderr eEFFECH , .526 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eEFFECD , 13.349 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eEFFK , .499 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eB , 0.5 , 0.0001 , 999 , inv_gamma_pdf , 1.772454	
	stderr eSTAR , 0.05 , 0.0001 , 999 , inv_gamma_pdf , 0.354491	

Uses eB 36, eEFFECD 36, eEFFECH 36, eEFFK 36, eHG 36, eLpref 36, eMUZK 36, eMUZM 36, ePMKC 36, ePMKK 36, eR 36, eSTAR 36, and eXiL 36.

## A.6 Common Steady State Routines

### A.6.1 Common Steady State Values

```

47  <common steady state values 47>≡ (18 28)
    beta_0 = pbeta;
    beta_2 = pbeta*rpr; % s.s. funds rate premium
    beta_ = beta_2;
    MUZCSS=1;
    ONE=1;
    USS=1;
    MUKSS=MUKKSS*MUZMSS;
    MUCSS=MUKKSS^alpha_*MUZMSS;
    MUKSShabit=MUKSS;
    MUCSShabit=MUCSS;
    PKBSS=theta_k/(theta_k-1)*(theta_c-1)/theta_c;
    PYSS=1;
    MCCSS=(theta_c-1)/theta_c;
    MCKSS=(theta_k-1)/theta_k;
    RKSS=MUKSS/beta_2-(1-delta_);
    RCSS=MUKSS/beta_2-(1-delta_);
    RCHSS=MUCSS/beta_2-(1-delta_ch); % Housing sector
    RCDSS=MUKSS/beta_2-(1-delta_cd); % Durable sector
    USS=1;
    mu_=RCSS;
    AA=alpha_/RKSS*MCKSS;
    DD = 0.135;
    RR = 0.075;
    eta_cnn=1;
    eta_cd_eta_cnn=DD/((MUKSShabit-beta_2*h_cd)/(1-beta_2*h/MUCSShabit)*(1-h/MUCSShabit)/(1-h_cd/MUCSShabit));
    eta_ch_eta_cnn=RR/((MUCSShabit-beta_2*h_ch)/(1-beta_2*h/MUCSShabit)*(1-h/MUCSShabit)/(1-h_ch/MUCSShabit));
    eta_ch=eta_ch_eta_cnn;
    eta_cd=eta_cd_eta_cnn;
    DD=eta_cd_eta_cnn*(MUKSShabit-beta_2*h_cd)/(1-beta_2*h/MUCSShabit)*(1-h/MUCSShabit)/(1-h_cd/MUCSShabit);
    RR=eta_ch_eta_cnn*(MUCSShabit-beta_2*h_ch)/(1-beta_2*h/MUCSShabit)*(1-h/MUCSShabit)/(1-h_ch/MUCSShabit);
    Rnr=(1-(1-delta_)/MUKSS)*AA*MUKSS;
    ycbi_ykb=((1-s_AS)-Rnr)/((DD*(1-s_AS)/(1+RR))+Rnr);
    hc_hk=ycbi_ykb*(RCSS*MCKSS/(RKSS*MCCSS))^(alpha_/(1-alpha_));
    HSS=0.25;
    AHSS=HSS;
    HKSS=HSS/(1+hc_hk);
    HCSS=HSS-HKSS;
    HrCSS=1/3;
    HrKSS=1/3;
    empCSS=HCSS/HrCSS;
    empKSS=HKSS/HrKSS;

```

```

ycbi=HCSS*(AA)^(alpha_/(1-alpha_));
ykb=HKSS*(AA)^(alpha_/(1-alpha_));
YCSS=ycbi;
YKSS=ykb;
KCSS=AA*ycbi*MUKSS;
KKSS=AA*ykb*MUKSS;
ECHSS=RR/(1+RR)*ycbi*(1-s_AS);
ECSS=1/(1+RR)*ycbi*(1-s_AS);
ECDSS=DD*PKBSS*ECSS;
EIKSS=(1-(1-delta_)/MUKSS)*(KCSS+KKSS);
KCDSS=ECDSS/(1-(1-delta_cd)/MUKSS);
KCHSS=ECHSS/(1-(1-delta_ch)/MUCSS);
YYSS=(YCSS+YKSS*PKBSS)/PYSS;
s_k_ecd=ECDSS/YKSS;
s_c_ech=ECHSS/YCSS;
s_k_eik=EIKSS/YKSS;
s_yc = (YCSS/YYSS);
s_ecdc=PKBSS*ECDSS/(ECSS+PKBSS*ECDSS+(MUCSS/beta_2-1+delta_ch)*KCHSS);
INFCNASS=exp(.02/4);
INFCSS = INFCNASS*((MUZCSS/MUZKSS)^(1-alpha_))^(s_ecdc);
INFCORSS=INFCNASS;
INFKSS=INFCSS*(MUZCSS/MUZKSS)^(1-alpha_);
INFWCSS=INFCSS*MUZKSS^alpha_*MUZMSS;
INFWKSS=INFWCSS;
RSS=INFCSS/beta_0*MUCSS;
RT2SS=exp(tp2)*RSS;
INFC10SS = INFCNASS;
IMPHSSS = RCHSS*KCHSS;
s_k=PKBSS*YKSS/YYSS;
INFGDPSS=INFCSS*(YCSS/YYSS)*INFKSS^(YKSS*PKBSS/(YYSS));
LSS=eta_cnn/(ECSS*(1-h/MUCSShabit))-eta_cnn*beta_2*h/(ECSS*(MUCSShabit-h));
WCSS=MCCSS*(1-alpha_)*YCSS/HCSS;
WKSS=MCKSS*(1-alpha_)*YKSS/HKSS;
xsiN_xsiH_C = ((HrCSS/empCSS)^(1+sigmah))/(1+1/sigmah);
xsiN_xsiH_K = ((HrKSS/empKSS)^(1+sigmah))/(1+1/sigmah);
gC = (1/(1+sigman) + 1/sigmah)*(xsiN_xsiH_C*(1+sigmah)/sigmah)^(-(1+sigman)/(1+sigman));
markup_xsiN_C = (HCSS^((1+sigmah)*(1+sigman)/(1+sigmah+sigman)-1))*gC/(LSS*WCSS);
gK = (1/(1+sigman) + 1/sigmah)*(xsiN_xsiH_K*(1+sigmah)/sigmah)^(-(1+sigman)/(1+sigman));
markup_xsiN_K = (HKSS^((1+sigmah)*(1+sigman)/(1+sigmah+sigman)-1))*gK/(LSS*WKSS);
markup_w = (1-unempSS)^((1+sigmah+sigman)/(1+sigmah) - 1 - sigman);
theta_wc = markup_w/(markup_w - 1); theta_wk = theta_wc;
A_HC=LSS*(theta_wc-1)/theta_wc*WCSS/(((1+sigman)/(1+sigman/(1+sigmah))))*HCSS^(-1+(1+sigman));
A_HK=LSS*(theta_wk-1)/theta_wk*WKSS/(((1+sigman)/(1+sigman/(1+sigmah))))*HKSS^(-1+(1+sigman));
xsi_NC=A_HC/((1/(1+sigman))+1/sigmah)*(HCSS^sigman/HrCSS^(1+sigman+sigmah))^((1+sigman)/(1+sigman));
xsi_NK=A_HK/((1/(1+sigman))+1/sigmah)*(HKSS^sigman/HrKSS^(1+sigman+sigmah))^((1+sigman)/(1+sigman));
xsi_HrC=xsi_NC*(1+sigmah)/sigmah*(HCSS^sigman/HrCSS^(1+sigman+sigmah));

```



```

xsi_HrK=xsi_NK*(1+sigmah)/sigmah*(HKSS^sigman/HrKSS^(1+sigman+sigmah));
UHCSS=A_HC*((1+sigman)/(1+sigman/(1+sigmah)))*HCSS^(-1+(1+sigman)/(1+sigman/(1+sigmah)))/LSS;
UHKSS=A_HK*((1+sigman)/(1+sigman/(1+sigmah)))*HKSS^(-1+(1+sigman)/(1+sigman/(1+sigmah)))/LSS;
HSCSS=(WCSS*LSS/(A_HC*((1+sigman)/(1+sigman/(1+sigmah)))))^(1/(-1+(1+sigman)/(1+sigman/(1+sigmah))));
HSKSS=(WKSS*LSS/(A_HK*((1+sigman)/(1+sigman/(1+sigmah)))))^(1/(-1+(1+sigman)/(1+sigman/(1+sigmah))));
empSCSS=((1+sigmah)/sigmah*xsi_NC/xsi_HrC)^(-1/(1+sigmah+sigman))*HSCSS^(1/(1+sigman/(1+sigmah)));
empSKSS=((1+sigmah)/sigmah*xsi_NK/xsi_HrK)^(-1/(1+sigmah+sigman))*HSKSS^(1/(1+sigman/(1+sigmah)));
HrSCSS=HSCSS/empSCSS;
HrSKSS=HSKSS/empSKSS;
UHSCSS=A_HC*((1+sigman)/(1+sigman/(1+sigmah)))*HSCSS^(-1+(1+sigman)/(1+sigman/(1+sigmah)))/LSS;
UHSKSS=A_HK*((1+sigman)/(1+sigman/(1+sigmah)))*HSKSS^(-1+(1+sigman)/(1+sigman/(1+sigmah)))/LSS;
unempSS=(empSCSS+empSKSS-(empCSS+empKSS))/(empSCSS+empSKSS);
QKSS=1;
QCDSS=1;
QCHSS=1;
UCSS=1;
UKSS=1;
XiBSS=1;
XiDSS=1;
XiHSS=1;
RL1SS=RSS;
RL2SS=RSS;
RL3SS=RSS;
RL4SS=RSS;
RL5SS=RSS;
RL6SS=RSS;
RL7SS=RSS;
DIFFREALECSS =exp( log(MUCSS));
DIFFREALEIKSS =exp( log(MUKSS));
DIFFREALECDSS =exp( log(MUKSS));
DIFFREALECHSS =exp( log(MUCSS));
DIFFREALWSS =exp( log(MUCSS) );
DIFFREALGDPSS =exp( (1-s_k)*log(MUCSS)+(s_k)*log(MUKSS));

```

Uses A\_HC 37, A\_HK 37, AA 37, AHSS 37, alpha\_ 37, beta\_ 37, beta\_0 37, beta\_2 37, DD 37, delta\_ 37, delta\_cd 37, delta\_ch 37, DIFFREALECDSS 37, DIFFREALECHSS 37, DIFFREALECSS 37, DIFFREALEIKSS 37, DIFFREALGDPSS 37, DIFFREALWSS 37, ECDSS 37, ECHSS 37, ECSS 37, EIKSS 37, empCSS 37, empKSS 37, empSCSS 37, empSKSS 37, eta\_cd 37, eta\_cd\_eta\_cnn 37, eta\_ch 37, eta\_ch\_eta\_cnn 37, eta\_cnn 37, h 37, h\_cd 37, h\_ch 37, hc\_hk 37, HCSS 37, HKSS 37, HrCSS 37, HrKSS 37, HrSCSS 37, HrSKSS 37, HSCSS 37, HSKSS 37, HSS 37, IMPHSS 37, INFC1OSS 37, INFCNASS 37, INFCORSS 37, INFCSS 37, INFGDPSS 37, INFKSS 37, INFCSS 37, INFCSS 37, KCDSS 37, KCHSS 37, KCSS 37, KKSS 37, LSS 37, MCCSS 37, MCKSS 37, mu\_ 37, MUCSS 37, MUCSShabit 37, MUKSS 37, MUKSShabit 37, MUZCSS 37, MUZKSS 37, MUZMSS 37, ONE 37, pbeta 37, PKBSS 37, PYSS 37, QCDSS 37, QCHSS 37, QKSS 37, RCDSS 37, RCHSS 37, RCSS 37, RKSS 37, RL1SS 37, RL2SS 37, RL3SS 37, RL4SS 37, RL5SS 37, RL6SS 37, RL7SS 37, Rnr 37, rpr 37, RR 37, RSS 37, RT2SS 37, s\_AS 37, s\_c\_ech 37, s\_ecdc 37, s\_k 37, s\_k\_eed 37, s\_k\_eik 37, s\_yc 37, sigmah 37, sigman 37, theta\_c 37, theta\_k 37, theta\_wc 37, theta\_wk 37, tp2 37, UCSS 37, UHCSS 37, UHKSS 37, UHSCSS 37, UHSKSS 37, UKSS 37, unempSS 37, USS 37, WCSS 37, WKSS 37, xsi\_HrC 37, xsi\_HrK 37, xsi\_NC 37, xsi\_NK 37, ycbi 37, ycbi\_ykb 37, YCSS 37, ykb 37, YKSS 37, and YYSS 37.

### A.6.2 Common Steady State Trends

50  $\langle \text{common steady state trends } 50 \rangle \equiv$  (18 28)

```

DIFFREALGDPSS_obs=(1-s_k)*log(MUCSS)*100+(s_k)*log(MUKSS)*100;
DIFFREALECSS_obs=log(MUCSS)*100;
DIFFREALEIKSS_obs=log(MUKSS)*100;
DIFFREALECDSS_obs=log(MUKSS)*100;
DIFFREALECHSS_obs=log(MUCSS)*100;
DIFFREALWSS_obs=log(MUCSS)*100;
INFCNASS_obs=(1-s_ecdc)*log(INFCSS)*100+s_ecdc*log(INFKSS)*100;
INFCORSS_obs=(1-s_ecdc)*log(INFCSS)*100+s_ecdc*log(INFKSS)*100;
INFKSS_obs=log(INFCSS)*100-log(MUKSS)*100+log(MUCSS)*100;
RSS_obs=log(RSS)*100;
RT2SS_obs=log(RT2SS)*100;
unempSS_obs=100*log(unempSS);

```

Uses DIFFREALECDSS\_obs 37, DIFFREALECHSS\_obs 37, DIFFREALECSS\_obs 37,  
DIFFREALEIKSS\_obs 37, DIFFREALGDPSS\_obs 37, DIFFREALWSS\_obs 37, INFCNASS\_obs 37,  
INFCORSS\_obs 37, INFCSS 37, INFKSS 37, INFKSS\_obs 37, MUCSS 37, MUKSS 37, RSS 37,  
RSS\_obs 37, RT2SS 37, RT2SS\_obs 37, s\_ecdc 37, s\_k 37, unempSS 37, and unempSS\_obs 37.

## A.7 readme.txt

51 `<srcedo/readme.txt 51>≡`

How to run the model:  
=====

In Matlab/Octave:

- 1) Download Dynare Version 4 from the Dynare website: <http://www.dynare.org/>
- 2) Download the EDO files in a folder you choose.
- 3) Start Matlab/Octave and change the current directory to the folder in step 2.
- 4) Link in Matlab/Octave the Dynare folder in the menu under file/Set Path (or use the command "addpath path/to/dynare").
- 5) Run the command "dynare linearized" or "dynare Dynare\_edo" from the Matlab/Octave command li

Content of the EDO folder:  
=====

Dynare\_edo.mod: Dynare model file containing the latest estimated parameters and nonlinear mode

Dynare\_edo\_steadystate.mod: Dynare steady-state file computes the steady state of the model var

linearized.mod: Dynare model file containing the latest estimated parameters and nonlinear mode

linearized\_steadystate.mod: Dynare steady-state file computes the steady state of the model var

readme.txt: The file you are currently reading.

This code is written to file `srcedo/readme.txt`.



## Appendix B

# Notes, Bibliography and Indexes

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