```
1   var Y Z mutx muta u K h w r q s v C g zeta mu lam zi deltau PI I xg dY dC dI dw dq dr dh;
2
3   varexo ez ezi emua emux ezeta emu eg ez4 ez8 eg4 eg8 ezi4 ezi8 emua4 emua8 emux4 emux8
    emu4 emu8 ezeta4 ezeta8 em;
4
5   parameters beta alphak alphah delta0 mua mux gs mus delta1 psi theta gamma
6   kappa delta2 b rhoxg rhoz rhomua rhomux rhog rhomu rhozeta rhozi sz smua
7   smux smu szeta szi sg mui sz4 sz8 smua4 smua8 smux4 smux8 sg4 sg8 szi4 szi8
8    smu4 smu8 szeta4 szeta8;
9
10
11  load parameter_sgu;
12  set_param_value('alphak',alphak);
13  set_param_value('alphah',alphah);
14  set_param_value('beta',beta);
15  set_param_value('delta0',delta0);
16  set_param_value('mua',mua);
17  set_param_value('mux',mux);
18  set_param_value('gs',gs);
19  set_param_value('mus',mus);
20  set_param_value('delta1',delta1);
21  set_param_value('psi',psi);
22  set_param_value('theta',theta);
23  set_param_value('gamma',gamma);
24  set_param_value('kappa',kappa);
25  set_param_value('delta2',delta2);
26  set_param_value('b',b);
27  set_param_value('rhoxg',rhoxg);
28  set_param_value('rhoz',rhoz);
29  set_param_value('rhomua',rhomua);
30  set_param_value('rhomux',rhomux);
31  set_param_value('rhog',rhog);
32  set_param_value('rhomu',rhomu);
33  set_param_value('rhozeta',rhozeta);
34  set_param_value('rhozi',rhozi);
35  set_param_value('sz',sz);
36  set_param_value('smua',smua);
37  set_param_value('smux',smux);
38  set_param_value('smu',smu);
39  set_param_value('szeta',szeta);
40  set_param_value('szi',szi);
41  set_param_value('sg',sg);
42  set_param_value('mui',mui);
43
44  set_param_value('sg4',sg4);
45  set_param_value('sg8',sg8);
46
47  set_param_value('sz4',sz4);
48  set_param_value('sz8',sz8);
49
50  set_param_value('szi4',szi4);
51  set_param_value('szi8',szi8);
52
53  set_param_value('smua4',smua4);
54  set_param_value('smua8',smua8);
55
56  set_param_value('smux4',smux4);
57  set_param_value('smux8',smux8);
58
59  set_param_value('smu4',smu4);
60  set_param_value('smu8',smu8);
61
62  set_param_value('szeta4',szeta4);
63  set_param_value('szeta8',szeta8);
64
65  model;
66
67  % (1) Production function
68  exp(Y) =
```

```
      exp(Z)*exp(mutx)^(-alphak)*exp(muta)^(-alphak/(alphak-1))*(exp(u)*exp(K(-1)))^(alphak)*ex
      p(h)^(alphah);
 69
 70   % (2) Labor demand
 71   exp(w) =
      alphah*exp(Z)*exp(mutx)^(-alphak)*exp(muta)^(-alphak/(alphak-1))*(exp(u)*exp(K(-1)))^(alp
      hak)*exp(h)^(alphah-1);
 72   %exp(w) =
      (1-alphah-alphak)*exp(Z)*exp(mutx)^(-alphak)*exp(muta)^(-alphak/(alphak-1))*(exp(u)*exp(K
      (-1)))^(alphak)*exp(h)^(alphah-1);
 73
 74   % (3) Capital demand
 75   exp(r) =
      alphak*exp(Z)*exp(mutx)^(1-alphak)*exp(muta)^(-1)*(exp(u)*exp(K(-1)))^(alphak-1)*exp(h)^(
      alphah);
 76
 77   % (4) FOC for utilization
 78   exp(r) = exp(q)*(delta1 + delta2*(exp(u) - 1));
 79
 80   % (5) FOC for s
 81   exp(s) = (exp(C) -
      b*exp(mutx)^(-1)*exp(muta)^(-alphak/(alphak-1))*exp(C(-1)))^(gamma)*exp(mutx)^(gamma-1)*e
      xp(muta)^(alphak*(gamma-1)/(alphak-1))*exp(s(-1))^(1-gamma);
 82
 83   % (6) v
 84   exp(v) = exp(C) - b*exp(mutx)^(-1)*exp(muta)^(-alphak/(alphak-1))*exp(C(-1)) -
      psi*exp(h)^(theta)*exp(s);
 85
 86   % (7) FOC for labor
 87   %theta*psi*exp(zeta)*exp(h)^(theta-1)*exp(s)/exp(v) = exp(lam)*exp(w)/(1+exp(mu));
 88   theta*psi*exp(zeta)*exp(h)^(theta-1)*exp(s)/exp(v) = exp(lam)*exp(w)/exp(mu);
 89
 90
 91   % (8) Capital accumulation
 92   exp(K) = exp(zi)*exp(I)*(1 -
      (kappa/2)*((exp(I)/exp(I(-1)))*exp(mutx)*exp(muta)^(1/(alphak-1)) - mui)) +
      (1-deltau)*exp(mutx)^(-1)*exp(muta)^(-1/(alphak-1))*exp(K(-1));
 93
 94   % (9) Depreciation
 95   deltau = delta0 + delta1*(exp(u) - 1) + (delta2/2)*(exp(u) - 1)^2;
 96
 97   % (10) FOC for future capital
 98   exp(q)*exp(lam) =
      beta*exp(mutx(+1))^(-1)*exp(muta(+1))^(-1/(alphak-1))*exp(lam(+1))*(exp(r(+1))*exp(u(+1))
       + exp(q(+1))*(1-deltau(+1)));
 99   %exp(q)*exp(lam) = beta*exp(muta(+1))^(-1)*exp(lam(+1))*(exp(r(+1))*exp(u(+1)) +
      exp(q(+1))*(1-deltau(+1)));
100
101   % (11) MU of C
102   exp(lam) = exp(zeta)/exp(v) - gamma*exp(PI)*exp(s)/(exp(C) -
      b*exp(mutx)^(-1)*exp(muta)^(-alphak/(alphak-1))*exp(C(-1))) -
      b*beta*exp(mutx(+1))^(-1)*exp(muta(+1))^(-alphak/(alphak-1))*(exp(zeta(+1))/exp(v(+1))
      -
      gamma*exp(PI(+1))*exp(s(+1))/(exp(C(+1))-b*exp(mutx(+1))^(-1)*exp(muta(+1))^(-alphak/(alp
      hak-1))*exp(C)));
103
104   % (12) Evolution of PI
105   exp(PI) = exp(zeta)*exp(v)^(-1)*psi*exp(h)^(theta) +
      beta*(1-gamma)*exp(PI(+1))*exp(s(+1))/exp(s);
106
107   % (13) FOC for investment
108   1 = exp(q)*exp(zi)*(1 -
      (kappa/2)*((exp(I)/exp(I(-1)))*exp(mutx)*exp(muta)^(1/(alphak-1)) - mui) -
      kappa*((exp(I)/exp(I(-1)))*exp(mutx)*exp(muta)^(1/(alphak-1))-mui)*(exp(I)/exp(I(-1)))*ex
      p(mutx)*exp(muta)^(1/(alphak-1))) +
      beta*exp(q(+1))*(exp(lam(+1))/exp(lam))*exp(mutx(+1))^(-1)*exp(muta(+1))^(-1/(alphak-1))*
      exp(zi(+1))*kappa*((exp(I(+1))/exp(I))*exp(mutx(+1))*exp(muta(+1))^(1/(alphak-1))-mui)*((
      exp(I(+1))/exp(I))*exp(mutx(+1))*exp(muta(+1))^(1/(alphak-1)))^(2);
109
```

```
110    % (14) Resource constraint
111    exp(Y) = exp(C) + exp(I) + exp(g)*exp(xg);
112
113    % (15) Evolution of xg
114    exp(xg) = (exp(xg(-1)))^(rhoxg)*exp(mutx)^(-1)*exp(muta)^(-alphak/(alphak-1));
115
116    % (16) Process z
117    Z = rhoz*Z(-1) + ez + ez4(-4) + ez8(-8);
118
119    % (17) Process for zeta
120    zeta = rhozeta*zeta(-1) + ezeta + ezeta4(-4) + ezeta8(-8);
121
122    % (18) Process for zi
123    zi = rhozi*zi(-1) + ezi + ezi4(-4) + ezi8(-8);
124
125    % (19) Process for g
126    g = (1-rhog)*log(gs) + rhog*g(-1) + eg + eg4(-4) + eg8(-8);
127
128    % (20) Process for mu
129    %mu = (1-rhomu)*log(mus) + rhomu*mu(-1) + emu + emu4(-4) + emu8(-8);
130    mu = (1-rhomu)*log(1+mus) + rhomu*mu(-1) + emu + emu4(-4) + emu8(-8);
131
132
133    % (21) Process for muta
134    muta = (1-rhomua)*log(mua) + rhomua*muta(-1) + emua + emua4(-4) + emua8(-8);
135
136    % (22) Process for mutx
137    mutx = (1-rhomux)*log(mux) + rhomux*mutx(-1) + emux + emux4(-4) + emux8(-8);
138
139    % (23) Output growth
140    dY = Y - Y(-1) + mutx + (alphak/(alphak-1))*muta;
141
142    % (24) Consumption growth
143    dC = C - C(-1) + mutx + (alphak/(alphak-1))*muta;
144
145    % (25) Consumption growth
146    dI = I - I(-1) + mutx + (1/(alphak-1))*muta;
147
148    % (26) Wage growth
149    dw = w - w(-1) + mutx + (alphak/(alphak-1))*muta;
150
151    % (27) Q growth
152    dq = q - q(-1) + muta;
153
154    % (28) r growth
155    dr = r - r(-1) + muta;
156
157    % (29) hours growth
158    dh = h - h(-1);
159
160    end;
161
162    shocks;
163    var ez = sz^2;
164    var emua = smua^2;
165    var emux = smux^2;
166    var emu = smu^2;
167    var ezeta = szeta^2;
168    var ezi = szi^2;
169    var eg = sg^2;
170    var ez4 = sz4^2;
171    var ez8 = sz8^2;
172    var ezi4 = szi4^2;
173    var ezi8 = szi8^2;
174    var eg4 = sg4^2;
175    var eg8 = sg8^2;
176    var ezeta4 = szeta4^2;
177    var ezeta8 = szeta8^2;
178    var emu4 = smu4^2;
```

```
179    var emu8 = smu8^2;
180    var emua4 = smua4^2;
181    var emua8 = smua8^2;
182    var emux4 = smux4^2;
183    var emux8 = smux8^2;
184    var em = (0.3/100)^2;
185    end;
186
187    initval;
188    Y = -0.5;
189    Z = 0;
190    mutx = 0.0057;
191    muta = -0.0043;
192    u = 0;
193    K = 1;
194    h = -1;
195    w = 0.2;
196    r = -3;
197    q = 0;
198    s = -8;
199    v = -4;
200    C = -1.2;
201    I = -2.25;
202    g = -1.6;
203    zeta = 0;
204    mu = 0.15;
205    lam = 1.6;
206    zi = 0;
207    deltau = 0.025;
208    PI = 11;
209    xg = 0;
210    end;
211
212    steady;
213
214    stoch_simul(order=1,irf=20,nograph);
215
```