Comparative Statics:

1-1:

var Pi Pishar mc i x1 x2 w v N Y m c A X Yf ;

varexo ea ei;

parameters theta psi phi sigmae epsilon beta rhoi phix phipi rhoa istar Pistar x;

beta = 0.99;

epsilon = 10;

theta = 1;

rhoi=0.8;

sigmae = 0.01;

phi=0.25;

phipi= 1.5;

phix= 0.0;

psi=0.5 ;

istar = (1/beta) - 1 ;

Pistar = 0 ;

x = 1 ;

rhoa = 0.95 ;

model;

(theta / (1 - N)) = w / c ;//1

(1/m)^(psi) = (1/c) \* (i/(i+1));//2

(1/c) = beta \* (1+ i) /((1+Pi(+1))\* c(+1));//3

mc = w / A ;//4

c = Y ;//5

Y = A \* N / v ;//6

v = (((1-phi)\*((1+Pi)^(epsilon)) )/((1+Pishar)^(epsilon))) + ((1 + Pi) ^ (epsilon))\* phi\*v(-1) ;//7

(1+Pi)^(1-epsilon) = (1 - phi) \* ((1 +Pishar)^(1-epsilon)) + phi;//8

x1 = ((mc\*Y)/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon)) \* x1(+1);//9

x2 = (Y/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon-1)) \* x2(+1);//10

1+Pishar = (epsilon/(epsilon-1)) \* (1+Pi)\*(x1/x2) ;//11

ln(X) = ln(N/v) - ln((epsilon-1)/(epsilon-1 + epsilon \* theta)) ;//12

i = (1-rhoi) \* istar + rhoi \* i (-1) + (1-rhoi) \* (phipi \* (Pi- Pistar) + phix\*(ln(X) - ln(x))) + ei ;//13

Yf = A \* (((epsilon-1)/epsilon)/((epsilon-1)/epsilon) + theta) ;//14

ln(A) = rhoa \* ln(A(-1)) + ea ;//15

end ;

initval ;

A= 1 ;

i=1/beta-1;

Pishar = 0 ;

Pi =Pistar ;

v=((1-phi)\*((1+Pistar)/(1+Pishar))^epsilon)/((1-(1+Pistar)^epsilon\*phi));

mc=((epsilon-1)/epsilon)\*((1+Pishar)/(1+Pistar))\*((1-phi\*beta\*(1+Pistar)^epsilon)/(1-phi\*beta\*(1+Pistar)^(epsilon-1)));

w=mc;

x1=mc/(1-phi\*beta\*(1+Pistar)^epsilon) ;

x2=1/(1-phi\*beta\*(1+Pistar)^(epsilon-1));

N = (mc\*v)/(mc\*v+theta);

Y = N/v;

c = Y;

m=Y^(1/psi)\*(1+1/i)^(1/psi);

X = x ;

end ;

steady;

1-2:

var Pi Pishar mc i x1 x2 w v N Y m c A X Yf ;

varexo ea ei;

parameters theta psi phi sigmae epsilon beta rhoi phix phipi rhoa istar Pistar x;

beta = 0.99;

epsilon = 10;

theta = 1;

rhoi=0.8;

sigmae = 0.01;

phi=0.25;

phipi= 1.5;

phix= 0.0;

psi=0.5 ;

istar = (1/beta) - 1 ;

Pistar = 0 ;

x = 1 ;

rhoa = 0.95 ;

model;

(theta / (1 - N)) = w / c ;//1

(1/m)^(psi) = (1/c) \* (i/(i+1));//2

(1/c) = beta \* (1+ i) /((1+Pi(+1))\* c(+1));//3

mc = w / A ;//4

c = Y ;//5

Y = A \* N / v ;//6

v = (((1-phi)\*((1+Pi)^(epsilon)) )/((1+Pishar)^(epsilon))) + ((1 + Pi) ^ (epsilon))\* phi\*v(-1) ;//7

(1+Pi)^(1-epsilon) = (1 - phi) \* ((1 +Pishar)^(1-epsilon)) + phi;//8

x1 = ((mc\*Y)/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon)) \* x1(+1);//9

x2 = (Y/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon-1)) \* x2(+1);//10

1+Pishar = (epsilon/(epsilon-1)) \* (1+Pi)\*(x1/x2) ;//11

ln(X) = ln(N/v) - ln((epsilon-1)/(epsilon-1 + epsilon \* theta)) ;//12

i = (1-rhoi) \* istar + rhoi \* i (-1) + (1-rhoi) \* (phipi \* (Pi- Pistar) + phix\*(ln(X) - ln(x))) + ei ;//13

Yf = A \* (((epsilon-1)/epsilon)/((epsilon-1)/epsilon) + theta) ;//14

ln(A) = rhoa \* ln(A(-1)) + ea ;//15

end ;

phi\_array = linspace(0.1,0.99,10);

for count =1:10

phi=phi\_array(count);

initval ;

A= 1 ;

i=1/beta-1;

Pishar = 0 ;

Pi =Pistar ;

v=((1-phi)\*((1+Pistar)/(1+Pishar))^epsilon)/((1-(1+Pistar)^epsilon\*phi));

mc=((epsilon-1)/epsilon)\*((1+Pishar)/(1+Pistar))\*((1-phi\*beta\*(1+Pistar)^epsilon)/(1-phi\*beta\*(1+Pistar)^(epsilon-1)));

w=mc;

x1=mc/(1-phi\*beta\*(1+Pistar)^epsilon) ;

x2=1/(1-phi\*beta\*(1+Pistar)^(epsilon-1));

N = (mc\*v)/(mc\*v+theta);

Y = N/v;

c = Y;

m=Y^(1/psi)\*(1+1/i)^(1/psi);

X = x ;

end ;

steady;

Pi\_s(1,count) = oo\_.steady\_state(1,1)

Pishar\_s(1,count) = oo\_.steady\_state(2,1)

mc\_s(1,count) = oo\_.steady\_state(3,1)

i\_s(1,count) = oo\_.steady\_state(4,1)

x1\_s(1,count) = oo\_.steady\_state(5,1)

x2\_s(1,count) = oo\_.steady\_state(6,1)

w\_s(1,count) = oo\_.steady\_state(7,1)

v\_s(1,count) = oo\_.steady\_state(8,1)

N\_s(1,count) = oo\_.steady\_state(9,1)

Y\_s(1,count) = oo\_.steady\_state(10,1)

m\_s(1,count) = oo\_.steady\_state(11,1)

c\_s(1,count) = oo\_.steady\_state(12,1)

A\_s(1,count) = oo\_.steady\_state(13,1)

X\_s(1,count) = oo\_.steady\_state(14,1)

Yf\_s(1,count) = oo\_.steady\_state(15,1)

phi\_s(1,count) = phi

end;

figure

subplot(3,5,1);plot(phi\_s(1,:),Pi\_s(1,:));xlabel('phi');ylabel('value');title("Pi")

subplot(3,5,2);plot(phi\_s(1,:),Pishar\_s(1,:));xlabel('phi');ylabel('value');title("Pisharar")

subplot(3,5,3);plot(phi\_s(1,:),mc\_s(1,:));xlabel('phi');ylabel('value');title("mc")

subplot(3,5,4);plot(phi\_s(1,:),i\_s(1,:));xlabel('phi');ylabel('value');title("i")

subplot(3,5,5);plot(phi\_s(1,:),x1\_s(1,:));xlabel('phi');ylabel('value');title("x1")

subplot(3,5,6);plot(phi\_s(1,:),x2\_s(1,:));xlabel('phi');ylabel('value');title("x2")

subplot(3,5,7);plot(phi\_s(1,:),w\_s(1,:));xlabel('phi');ylabel('value');title("w")

subplot(3,5,8);plot(phi\_s(1,:),v\_s(1,:));xlabel('phi');ylabel('value');title("v")

subplot(3,5,9);plot(phi\_s(1,:),N\_s(1,:));xlabel('phi');ylabel('value');title("N")

subplot(3,5,10);plot(phi\_s(1,:),Y\_s(1,:));xlabel('phi');ylabel('value');title("Y")

subplot(3,5,11);plot(phi\_s(1,:),m\_s(1,:));xlabel('phi');ylabel('value');title("m")

subplot(3,5,12);plot(phi\_s(1,:),c\_s(1,:));xlabel('phi');ylabel('value');title("c")

subplot(3,5,13);plot(phi\_s(1,:),A\_s(1,:));xlabel('phi');ylabel('value');title("A")

subplot(3,5,14);plot(phi\_s(1,:),X\_s(1,:));xlabel('phi');ylabel('value');title("X")

subplot(3,5,15);plot(phi\_s(1,:),Yf\_s(1,:));xlabel('phi');ylabel('value');title("Yf")

IRF

2-1:

var Pi Pishar mc i x1 x2 w v N Y m c A X Yf ;

varexo ea ei;

parameters theta psi phi sigmae epsilon beta rhoi phix phipi rhoa istar Pistar x;

beta = 0.99;

epsilon = 10;

theta = 1;

rhoi=0.8;

sigmae = 0.01;

phi=0.25;

phipi= 1.5;

phix= 0.0;

psi=0.5 ;

istar = (1/beta) - 1 ;

Pistar = 0 ;

x = 1 ;

rhoa = 0.95 ;

model;

(theta / (1 - N)) = w / c ;//1

(1/m)^(psi) = (1/c) \* (i/(i+1));//2

(1/c) = beta \* (1+ i) /((1+Pi(+1))\* c(+1));//3

mc = w / A ;//4

c = Y ;//5

Y = A \* N / v ;//6

v = (((1-phi)\*((1+Pi)^(epsilon)) )/((1+Pishar)^(epsilon))) + ((1 + Pi) ^ (epsilon))\* phi\*v(-1) ;//7

(1+Pi)^(1-epsilon) = (1 - phi) \* ((1 +Pishar)^(1-epsilon)) + phi;//8

x1 = ((mc\*Y)/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon)) \* x1(+1);//9

x2 = (Y/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon-1)) \* x2(+1);//10

1+Pishar = (epsilon/(epsilon-1)) \* (1+Pi)\*(x1/x2) ;//11

ln(X) = ln(N/v) - ln((epsilon-1)/(epsilon-1 + epsilon \* theta)) ;//12

i = (1-rhoi) \* istar + rhoi \* i (-1) + (1-rhoi) \* (phipi \* (Pi- Pistar) + phix\*(ln(X) - ln(x))) + ei ;//13

Yf = A \* (((epsilon-1)/epsilon)/((epsilon-1)/epsilon) + theta) ;//14

ln(A) = rhoa \* ln(A(-1)) + ea ;//15

end ;

initval ;

A= 1 ;

i=1/beta-1;

Pishar = 0 ;

Pi =Pistar ;

v=((1-phi)\*((1+Pistar)/(1+Pishar))^epsilon)/((1-(1+Pistar)^epsilon\*phi));

mc=((epsilon-1)/epsilon)\*((1+Pishar)/(1+Pistar))\*((1-phi\*beta\*(1+Pistar)^epsilon)/(1-phi\*beta\*(1+Pistar)^(epsilon-1)));

w=mc;

x1=mc/(1-phi\*beta\*(1+Pistar)^epsilon) ;

x2=1/(1-phi\*beta\*(1+Pistar)^(epsilon-1));

N = (mc\*v)/(mc\*v+theta);

Y = N/v;

c = Y;

m=Y^(1/psi)\*(1+1/i)^(1/psi);

X = x ;

end ;

shocks;

var ea = sigmae^2;

var ei = sigmae^2;

end;

steady;

//Solve for the stochastic dynamics, 10 as for ps1

set\_dynare\_seed=7;

stoch\_simul(order=1,irf=100);

2-2:

var Pi Pishar mc i x1 x2 w v N Y m c A X Yf ;

varexo ea ei;

parameters theta psi phi sigmae epsilon beta rhoi phix phipi rhoa istar Pistar x;

beta = 0.99;

epsilon = 10;

theta = 1;

rhoi=0.8;

sigmae = 0.01;

phi=0.25;

phipi= 1.5;

phix= 0.0;

psi=0.5 ;

istar = (1/beta) - 1 ;

Pistar = 0 ;

x = 1 ;

rhoa = 0.95 ;

model;

(theta / (1 - N)) = w / c ;//1

(1/m)^(psi) = (1/c) \* (i/(i+1));//2

(1/c) = beta \* (1+ i) /((1+Pi(+1))\* c(+1));//3

mc = w / A ;//4

c = Y ;//5

Y = A \* N / v ;//6

v = (((1-phi)\*((1+Pi)^(epsilon)) )/((1+Pishar)^(epsilon))) + ((1 + Pi) ^ (epsilon))\* phi\*v(-1) ;//7

(1+Pi)^(1-epsilon) = (1 - phi) \* ((1 +Pishar)^(1-epsilon)) + phi;//8

x1 = ((mc\*Y)/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon)) \* x1(+1);//9

x2 = (Y/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon-1)) \* x2(+1);//10

1+Pishar = (epsilon/(epsilon-1)) \* (1+Pi)\*(x1/x2) ;//11

ln(X) = ln(N/v) - ln((epsilon-1)/(epsilon-1 + epsilon \* theta)) ;//12

i = (1-rhoi) \* istar + rhoi \* i (-1) + (1-rhoi) \* (phipi \* (Pi- Pistar) + phix\*(ln(X) - ln(x))) + ei ;//13

Yf = A \* (((epsilon-1)/epsilon)/((epsilon-1)/epsilon) + theta) ;//14

ln(A) = rhoa \* ln(A(-1)) + ea ;//15

end ;

x\_array = [2,10,15];

for count = 1:3

epsilon=x\_array(count);

initval ;

A= 1 ;

i=1/beta-1;

Pishar = 0 ;

Pi =Pistar ;

v=((1-phi)\*((1+Pistar)/(1+Pishar))^epsilon)/((1-(1+Pistar)^epsilon\*phi));

mc=((epsilon-1)/epsilon)\*((1+Pishar)/(1+Pistar))\*((1-phi\*beta\*(1+Pistar)^epsilon)/(1-phi\*beta\*(1+Pistar)^(epsilon-1)));

w=mc;

x1=mc/(1-phi\*beta\*(1+Pistar)^epsilon) ;

x2=1/(1-phi\*beta\*(1+Pistar)^(epsilon-1));

N = (mc\*v)/(mc\*v+theta);

Y = N/v;

c = Y;

m=Y^(1/psi)\*(1+1/i)^(1/psi);

X = x ;

end ;

shocks;

var ea = sigmae^2;

var ei = sigmae^2;

end;

steady;

//Solve for the stochastic dynamics, 10 as for ps1

set\_dynare\_seed=7;

stoch\_simul(order=1,irf=100,nograph);

Pii(:,count)=Pi\_ea;

Pishari(:,count)=Pishar\_ea;

mci(:,count)=mc\_ea;

ii(:,count)=i\_ea;

x1i(:,count)=x1\_ea;

x2i(:,count)=x2\_ea;

wi(:,count)=w\_ea;

vi(:,count)=v\_ea;

Ni(:,count)=N\_ea;

Yi(:,count)=Y\_ea;

mi(:,count)=m\_ea;

ci(:,count)=c\_ea;

Ai(:,count)=A\_ea;

Xi(:,count)=X\_ea;

Yfi(:,count)=Yf\_ea;

Piii(:,count)=Pi\_ei;

Pisharii(:,count)=Pishar\_ei;

mcii(:,count)=mc\_ei;

iii(:,count)=i\_ei;

x1ii(:,count)=x1\_ei;

x2ii(:,count)=x2\_ei;

wii(:,count)=w\_ei;

vii(:,count)=v\_ei;

Nii(:,count)=N\_ei;

Yii(:,count)=Y\_ei;

mii(:,count)=m\_ei;

cii(:,count)=c\_ei;

Aii(:,count)=A\_ei;

Xii(:,count)=X\_ei;

Yfii(:,count)=Yf\_ei;

end;

t = linspace(0,100);

for i =1:100

line(i) = 0;

end

line=line.';

figure

subplot(5,3,1)

plot(t,line,'red',t,Pii(:,2),'black',t,Pii(:,3),'--red',t,Pii(:,1),'--blue','LineWidth',1)

title("(Pi)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,2)

plot(t,line,'red',t,Pishari(:,2),'black',t,Pishari(:,3),'--red',t,Pishari(:,1),'--blue','LineWidth',1)

title("(Pishar)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,3)

plot(t,line,'red',t,mci (:,2),'black',t,mci (:,3),'--red',t,mci (:,1),'--blue','LineWidth',1)

title("(mc )")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,4)

plot(t,line,'red',t,ii(:,2),'black',t,ii(:,3),'--red',t,ii(:,1),'--blue','LineWidth',1)

title("(i)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,5)

plot(t,line,'red',t,x1i(:,2),'black',t,x1i(:,3),'--red',t,x1i(:,1),'--blue','LineWidth',1)

title("(x1)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,6)

plot(t,line,'red',t,x2i(:,2),'black',t,x2i(:,3),'--red',t,x2i(:,1),'--blue','LineWidth',1)

title("(x2)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,7)

plot(t,line,'red',t,wi(:,2),'black',t,wi(:,3),'--red',t,wi(:,1),'--blue','LineWidth',1)

title("(w)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,8)

plot(t,line,'red',t,vi(:,2),'black',t,vi(:,3),'--red',t,vi(:,1),'--blue','LineWidth',1)

title("(v)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,9)

plot(t,line,'red',t,Ni(:,2),'black',t,Ni(:,3),'--red',t,Ni(:,1),'--blue','LineWidth',1)

title("(N)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,10)

plot(t,line,'red',t,Yi(:,2),'black',t,Yi(:,3),'--red',t,Yi(:,1),'--blue','LineWidth',1)

title("(Y)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,11)

plot(t,line,'red',t,mi(:,2),'black',t,mi(:,3),'--red',t,mi(:,1),'--blue','LineWidth',1)

title("(m)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,12)

plot(t,line,'red',t,ci(:,2),'black',t,ci(:,3),'--red',t,ci(:,1),'--blue','LineWidth',1)

title("(c)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,13)

plot(t,line,'red',t,Ai(:,2),'black',t,Ai(:,3),'--red',t,Ai(:,1),'--blue','LineWidth',1)

title("(A)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,14)

plot(t,line,'red',t,Xi(:,2),'black',t,Xi(:,3),'--red',t,Xi(:,1),'--blue','LineWidth',1)

title("(X)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,15)

plot(t,line,'red',t,Yfi(:,2),'black',t,Yfi(:,3),'--red',t,Yfi(:,1),'--blue','LineWidth',1)

title("(Yf)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

figure

subplot(5,3,1)

plot(t,line,'red',t,Piii(:,2),'black',t,Piii(:,3),'--red',t,Piii(:,1),'--blue','LineWidth',1)

title("(Pi)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,2)

plot(t,line,'red',t,Pisharii(:,2),'black',t,Pisharii(:,3),'--red',t,Pisharii(:,1),'--blue','LineWidth',1)

title("(Pishar)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,3)

plot(t,line,'red',t,mcii (:,2),'black',t,mcii (:,3),'--red',t,mcii (:,1),'--blue','LineWidth',1)

title("(mc )")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,4)

plot(t,line,'red',t,iii(:,2),'black',t,iii(:,3),'--red',t,iii(:,1),'--blue','LineWidth',1)

title("(i)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,5)

plot(t,line,'red',t,x1ii(:,2),'black',t,x1ii(:,3),'--red',t,x1ii(:,1),'--blue','LineWidth',1)

title("(x1)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,6)

plot(t,line,'red',t,x2ii(:,2),'black',t,x2ii(:,3),'--red',t,x2ii(:,1),'--blue','LineWidth',1)

title("(x2)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,7)

plot(t,line,'red',t,wii(:,2),'black',t,wii(:,3),'--red',t,wii(:,1),'--blue','LineWidth',1)

title("(w)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,8)

plot(t,line,'red',t,vii(:,2),'black',t,vii(:,3),'--red',t,vii(:,1),'--blue','LineWidth',1)

title("(v)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,9)

plot(t,line,'red',t,Nii(:,2),'black',t,Nii(:,3),'--red',t,Nii(:,1),'--blue','LineWidth',1)

title("(N)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,10)

plot(t,line,'red',t,Yii(:,2),'black',t,Yii(:,3),'--red',t,Yii(:,1),'--blue','LineWidth',1)

title("(Y)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,11)

plot(t,line,'red',t,mii(:,2),'black',t,mii(:,3),'--red',t,mii(:,1),'--blue','LineWidth',1)

title("(m)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,12)

plot(t,line,'red',t,cii(:,2),'black',t,cii(:,3),'--red',t,cii(:,1),'--blue','LineWidth',1)

title("(c)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,13)

plot(t,line,'red',t,Aii(:,2),'black',t,Aii(:,3),'--red',t,Aii(:,1),'--blue','LineWidth',1)

title("(A)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,14)

plot(t,line,'red',t,Xii(:,2),'black',t,Xii(:,3),'--red',t,Xii(:,1),'--blue','LineWidth',1)

title("(X)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

subplot(5,3,15)

plot(t,line,'red',t,Yfii(:,2),'black',t,Yfii(:,3),'--red',t,Yfii(:,1),'--blue','LineWidth',1)

title("(Yf)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

2-3:

Taylor Rule

3-1:

var Pi Pishar mc i x1 x2 w v N Y m c A X Yf ;

varexo ea ei;

parameters theta psi phi sigmae epsilon beta rhoi phix phipi rhoa istar Pistar x;

beta = 0.99;

epsilon = 10;

theta = 1;

rhoi=0.8;

sigmae = 0.01;

phi=0.25;

phipi= 1.5;

phix= 0.0;

psi=0.5 ;

istar = (1/beta) - 1 ;

Pistar = 0 ;

x = 1 ;

rhoa = 0.95 ;

model;

(theta / (1 - N)) = w / c ;//1

(1/m)^(psi) = (1/c) \* (i/(i+1));//2

(1/c) = beta \* (1+ i) /((1+Pi(+1))\* c(+1));//3

mc = w / A ;//4

c = Y ;//5

Y = A \* N / v ;//6

v = (((1-phi)\*((1+Pi)^(epsilon)) )/((1+Pishar)^(epsilon))) + ((1 + Pi) ^ (epsilon))\* phi\*v(-1) ;//7

(1+Pi)^(1-epsilon) = (1 - phi) \* ((1 +Pishar)^(1-epsilon)) + phi;//8

x1 = ((mc\*Y)/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon)) \* x1(+1);//9

x2 = (Y/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon-1)) \* x2(+1);//10

1+Pishar = (epsilon/(epsilon-1)) \* (1+Pi)\*(x1/x2) ;//11

ln(X) = ln(N/v) - ln((epsilon-1)/(epsilon-1 + epsilon \* theta)) ;//12

i = (1-rhoi) \* istar + rhoi \* i (-1) + (1-rhoi) \* (phipi \* (Pi- Pistar) + phix\*(ln(X) - ln(x))) + ei ;//13

Yf = A \* (((epsilon-1)/epsilon)/((epsilon-1)/epsilon) + theta) ;//14

ln(A) = rhoa \* ln(A(-1)) + ea ;//15

end ;

x\_array = [1.02,1.2,1.5];

for count = 1:3

phipi=x\_array(count);

initval ;

A= 1 ;

i=1/beta-1;

Pishar = 0 ;

Pi =Pistar ;

v=((1-phi)\*((1+Pistar)/(1+Pishar))^epsilon)/((1-(1+Pistar)^epsilon\*phi));

mc=((epsilon-1)/epsilon)\*((1+Pishar)/(1+Pistar))\*((1-phi\*beta\*(1+Pistar)^epsilon)/(1-phi\*beta\*(1+Pistar)^(epsilon-1)));

w=mc;

x1=mc/(1-phi\*beta\*(1+Pistar)^epsilon) ;

x2=1/(1-phi\*beta\*(1+Pistar)^(epsilon-1));

N = (mc\*v)/(mc\*v+theta);

Y = N/v;

c = Y;

m=Y^(1/psi)\*(1+1/i)^(1/psi);

X = x ;

end ;

shocks;

var ea = sigmae^2;

var ei = sigmae^2;

end;

steady;

//Solve for the stochastic dynamics, 10 as for ps1

set\_dynare\_seed=7;

stoch\_simul(order=1,irf=100,nograph);

Pii(:,count)=Pi\_ea;

Pishari(:,count)=Pishar\_ea;

mci(:,count)=mc\_ea;

ii(:,count)=i\_ea;

x1i(:,count)=x1\_ea;

x2i(:,count)=x2\_ea;

wi(:,count)=w\_ea;

vi(:,count)=v\_ea;

Ni(:,count)=N\_ea;

Yi(:,count)=Y\_ea;

mi(:,count)=m\_ea;

ci(:,count)=c\_ea;

Ai(:,count)=A\_ea;

Xi(:,count)=X\_ea;

Yfi(:,count)=Yf\_ea;

Piii(:,count)=Pi\_ei;

Pisharii(:,count)=Pishar\_ei;

mcii(:,count)=mc\_ei;

iii(:,count)=i\_ei;

x1ii(:,count)=x1\_ei;

x2ii(:,count)=x2\_ei;

wii(:,count)=w\_ei;

vii(:,count)=v\_ei;

Nii(:,count)=N\_ei;

Yii(:,count)=Y\_ei;

mii(:,count)=m\_ei;

cii(:,count)=c\_ei;

Aii(:,count)=A\_ei;

Xii(:,count)=X\_ei;

Yfii(:,count)=Yf\_ei;

end;

t = linspace(0,100);

for i =1:100

line(i) = 0;

end

line=line.';

figure

subplot(5,3,1)

plot(t,line,'red',t,Pii(:,3),'black',t,Pii(:,2),'--red',t,Pii(:,1),'--blue','LineWidth',1)

title("(Pi)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,2)

plot(t,line,'red',t,Pishari(:,3),'black',t,Pishari(:,2),'--red',t,Pishari(:,1),'--blue','LineWidth',1)

title("(Pishar)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,3)

plot(t,line,'red',t,mci (:,3),'black',t,mci (:,2),'--red',t,mci (:,1),'--blue','LineWidth',1)

title("(mc )")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,4)

plot(t,line,'red',t,ii(:,3),'black',t,ii(:,2),'--red',t,ii(:,1),'--blue','LineWidth',1)

title("(i)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,5)

plot(t,line,'red',t,x1i(:,3),'black',t,x1i(:,2),'--red',t,x1i(:,1),'--blue','LineWidth',1)

title("(x1)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,6)

plot(t,line,'red',t,x2i(:,3),'black',t,x2i(:,2),'--red',t,x2i(:,1),'--blue','LineWidth',1)

title("(x2)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,7)

plot(t,line,'red',t,wi(:,3),'black',t,wi(:,2),'--red',t,wi(:,1),'--blue','LineWidth',1)

title("(w)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,8)

plot(t,line,'red',t,vi(:,3),'black',t,vi(:,2),'--red',t,vi(:,1),'--blue','LineWidth',1)

title("(v)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,9)

plot(t,line,'red',t,Ni(:,3),'black',t,Ni(:,2),'--red',t,Ni(:,1),'--blue','LineWidth',1)

title("(N)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,10)

plot(t,line,'red',t,Yi(:,3),'black',t,Yi(:,2),'--red',t,Yi(:,1),'--blue','LineWidth',1)

title("(Y)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,11)

plot(t,line,'red',t,mi(:,3),'black',t,mi(:,2),'--red',t,mi(:,1),'--blue','LineWidth',1)

title("(m)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,12)

plot(t,line,'red',t,ci(:,3),'black',t,ci(:,2),'--red',t,ci(:,1),'--blue','LineWidth',1)

title("(c)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,13)

plot(t,line,'red',t,Ai(:,3),'black',t,Ai(:,2),'--red',t,Ai(:,1),'--blue','LineWidth',1)

title("(A)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,14)

plot(t,line,'red',t,Xi(:,3),'black',t,Xi(:,2),'--red',t,Xi(:,1),'--blue','LineWidth',1)

title("(X)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,15)

plot(t,line,'red',t,Yfi(:,3),'black',t,Yfi(:,2),'--red',t,Yfi(:,1),'--blue','LineWidth',1)

title("(Yf)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

figure

subplot(5,3,1)

plot(t,line,'red',t,Piii(:,3),'black',t,Piii(:,2),'--red',t,Piii(:,1),'--blue','LineWidth',1)

title("(Pi)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,2)

plot(t,line,'red',t,Pisharii(:,3),'black',t,Pisharii(:,2),'--red',t,Pisharii(:,1),'--blue','LineWidth',1)

title("(Pishar)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,3)

plot(t,line,'red',t,mcii (:,3),'black',t,mcii (:,2),'--red',t,mcii (:,1),'--blue','LineWidth',1)

title("(mc )")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,4)

plot(t,line,'red',t,iii(:,3),'black',t,iii(:,2),'--red',t,iii(:,1),'--blue','LineWidth',1)

title("(i)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,5)

plot(t,line,'red',t,x1ii(:,3),'black',t,x1ii(:,2),'--red',t,x1ii(:,1),'--blue','LineWidth',1)

title("(x1)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,6)

plot(t,line,'red',t,x2ii(:,3),'black',t,x2ii(:,2),'--red',t,x2ii(:,1),'--blue','LineWidth',1)

title("(x2)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,7)

plot(t,line,'red',t,wii(:,3),'black',t,wii(:,2),'--red',t,wii(:,1),'--blue','LineWidth',1)

title("(w)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,8)

plot(t,line,'red',t,vii(:,3),'black',t,vii(:,2),'--red',t,vii(:,1),'--blue','LineWidth',1)

title("(v)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,9)

plot(t,line,'red',t,Nii(:,3),'black',t,Nii(:,2),'--red',t,Nii(:,1),'--blue','LineWidth',1)

title("(N)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,10)

plot(t,line,'red',t,Yii(:,3),'black',t,Yii(:,2),'--red',t,Yii(:,1),'--blue','LineWidth',1)

title("(Y)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,11)

plot(t,line,'red',t,mii(:,3),'black',t,mii(:,2),'--red',t,mii(:,1),'--blue','LineWidth',1)

title("(m)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,12)

plot(t,line,'red',t,cii(:,3),'black',t,cii(:,2),'--red',t,cii(:,1),'--blue','LineWidth',1)

title("(c)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,13)

plot(t,line,'red',t,Aii(:,3),'black',t,Aii(:,2),'--red',t,Aii(:,1),'--blue','LineWidth',1)

title("(A)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,14)

plot(t,line,'red',t,Xii(:,3),'black',t,Xii(:,2),'--red',t,Xii(:,1),'--blue','LineWidth',1)

title("(X)")

xlabel('t')

ylabel('value')

legend('Y=0','phipi=1.5','phipi=1.2','phipi=1.02')

subplot(5,3,15)

plot(t,line,'red',t,Yfii(:,3),'black',t,Yfii(:,2),'--red',t,Yfii(:,1),'--blue','LineWidth',1)

title("(Yf)")

xlabel('t')

ylabel('value')

legend('Y=0','epsil=10','epsil=15','epsil=2')

3-2:

var Pi Pishar mc i x1 x2 w v N Y m c A X Yf ;

varexo ea ei;

parameters theta psi phi sigmae epsilon beta rhoi phix phipi rhoa istar Pistar x;

beta = 0.99;

epsilon = 10;

theta = 1;

rhoi=0.8;

sigmae = 0.01;

phi=0.25;

phipi= 1.5;

phix= 0.0;

psi=0.5 ;

istar = (1/beta) - 1 ;

Pistar = 0 ;

x = 1 ;

rhoa = 0.95 ;

model;

(theta / (1 - N)) = w / c ;//1

(1/m)^(psi) = (1/c) \* (i/(i+1));//2

(1/c) = beta \* (1+ i) /((1+Pi(+1))\* c(+1));//3

mc = w / A ;//4

c = Y ;//5

Y = A \* N / v ;//6

v = (((1-phi)\*((1+Pi)^(epsilon)) )/((1+Pishar)^(epsilon))) + ((1 + Pi) ^ (epsilon))\* phi\*v(-1) ;//7

(1+Pi)^(1-epsilon) = (1 - phi) \* ((1 +Pishar)^(1-epsilon)) + phi;//8

x1 = ((mc\*Y)/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon)) \* x1(+1);//9

x2 = (Y/c ) + phi \* beta \* ((1+Pi(+1))^(epsilon-1)) \* x2(+1);//10

1+Pishar = (epsilon/(epsilon-1)) \* (1+Pi)\*(x1/x2) ;//11

ln(X) = ln(N/v) - ln((epsilon-1)/(epsilon-1 + epsilon \* theta)) ;//12

i = (1-rhoi) \* istar + rhoi \* i (-1) + (1-rhoi) \* (phipi \* (Pi- Pistar) + phix\*(ln(X) - ln(x))) + ei ;//13

Yf = A \* (((epsilon-1)/epsilon)/((epsilon-1)/epsilon) + theta) ;//14

ln(A) = rhoa \* ln(A(-1)) + ea ;//15

end ;

x\_array = [0,1,2];

for count = 1:3

phix=x\_array(count);

initval ;

A= 1 ;

i=1/beta-1;

Pishar = 0 ;

Pi =Pistar ;

v=((1-phi)\*((1+Pistar)/(1+Pishar))^epsilon)/((1-(1+Pistar)^epsilon\*phi));

mc=((epsilon-1)/epsilon)\*((1+Pishar)/(1+Pistar))\*((1-phi\*beta\*(1+Pistar)^epsilon)/(1-phi\*beta\*(1+Pistar)^(epsilon-1)));

w=mc;

x1=mc/(1-phi\*beta\*(1+Pistar)^epsilon) ;

x2=1/(1-phi\*beta\*(1+Pistar)^(epsilon-1));

N = (mc\*v)/(mc\*v+theta);

Y = N/v;

c = Y;

m=Y^(1/psi)\*(1+1/i)^(1/psi);

X = x ;

end ;

shocks;

var ea = sigmae^2;

var ei = sigmae^2;

end;

steady;

//Solve for the stochastic dynamics, 10 as for ps1

set\_dynare\_seed=7;

stoch\_simul(order=1,irf=100,nograph);

Pii(:,count)=Pi\_ea;

Pishari(:,count)=Pishar\_ea;

mci(:,count)=mc\_ea;

ii(:,count)=i\_ea;

x1i(:,count)=x1\_ea;

x2i(:,count)=x2\_ea;

wi(:,count)=w\_ea;

vi(:,count)=v\_ea;

Ni(:,count)=N\_ea;

Yi(:,count)=Y\_ea;

mi(:,count)=m\_ea;

ci(:,count)=c\_ea;

Ai(:,count)=A\_ea;

Xi(:,count)=X\_ea;

Yfi(:,count)=Yf\_ea;

Piii(:,count)=Pi\_ei;

Pisharii(:,count)=Pishar\_ei;

mcii(:,count)=mc\_ei;

iii(:,count)=i\_ei;

x1ii(:,count)=x1\_ei;

x2ii(:,count)=x2\_ei;

wii(:,count)=w\_ei;

vii(:,count)=v\_ei;

Nii(:,count)=N\_ei;

Yii(:,count)=Y\_ei;

mii(:,count)=m\_ei;

cii(:,count)=c\_ei;

Aii(:,count)=A\_ei;

Xii(:,count)=X\_ei;

Yfii(:,count)=Yf\_ei;

end;

t = linspace(0,100);

for i =1:100

line(i) = 0;

end

line=line.';

figure

subplot(5,3,1)

plot(t,line,'red',t,Pii(:,1),'black',t,Pii(:,2),'--red',t,Pii(:,1),'--blue','LineWidth',3)

title("(Pi)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,2)

plot(t,line,'red',t,Pishari(:,1),'black',t,Pishari(:,2),'--red',t,Pishari(:,1),'--blue','LineWidth',3)

title("(Pishar)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,3)

plot(t,line,'red',t,mci (:,1),'black',t,mci (:,2),'--red',t,mci (:,1),'--blue','LineWidth',3)

title("(mc )")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,4)

plot(t,line,'red',t,ii(:,1),'black',t,ii(:,2),'--red',t,ii(:,1),'--blue','LineWidth',3)

title("(i)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,5)

plot(t,line,'red',t,x1i(:,1),'black',t,x1i(:,2),'--red',t,x1i(:,1),'--blue','LineWidth',3)

title("(x1)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,6)

plot(t,line,'red',t,x2i(:,1),'black',t,x2i(:,2),'--red',t,x2i(:,1),'--blue','LineWidth',3)

title("(x2)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,7)

plot(t,line,'red',t,wi(:,1),'black',t,wi(:,2),'--red',t,wi(:,1),'--blue','LineWidth',3)

title("(w)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,8)

plot(t,line,'red',t,vi(:,1),'black',t,vi(:,2),'--red',t,vi(:,1),'--blue','LineWidth',3)

title("(v)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,9)

plot(t,line,'red',t,Ni(:,1),'black',t,Ni(:,2),'--red',t,Ni(:,1),'--blue','LineWidth',3)

title("(N)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,10)

plot(t,line,'red',t,Yi(:,1),'black',t,Yi(:,2),'--red',t,Yi(:,1),'--blue','LineWidth',3)

title("(Y)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,11)

plot(t,line,'red',t,mi(:,1),'black',t,mi(:,2),'--red',t,mi(:,1),'--blue','LineWidth',3)

title("(m)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,12)

plot(t,line,'red',t,ci(:,1),'black',t,ci(:,2),'--red',t,ci(:,1),'--blue','LineWidth',3)

title("(c)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,13)

plot(t,line,'red',t,Ai(:,1),'black',t,Ai(:,2),'--red',t,Ai(:,1),'--blue','LineWidth',3)

title("(A)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,14)

plot(t,line,'red',t,Xi(:,1),'black',t,Xi(:,2),'--red',t,Xi(:,1),'--blue','LineWidth',3)

title("(X)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,15)

plot(t,line,'red',t,Yfi(:,1),'black',t,Yfi(:,2),'--red',t,Yfi(:,1),'--blue','LineWidth',3)

title("(Yf)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

figure

subplot(5,3,1)

plot(t,line,'red',t,Piii(:,1),'black',t,Piii(:,2),'--red',t,Piii(:,1),'--blue','LineWidth',3)

title("(Pi)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,2)

plot(t,line,'red',t,Pisharii(:,1),'black',t,Pisharii(:,2),'--red',t,Pisharii(:,1),'--blue','LineWidth',3)

title("(Pishar)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,3)

plot(t,line,'red',t,mcii (:,1),'black',t,mcii (:,2),'--red',t,mcii (:,1),'--blue','LineWidth',3)

title("(mc )")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,4)

plot(t,line,'red',t,iii(:,1),'black',t,iii(:,2),'--red',t,iii(:,1),'--blue','LineWidth',3)

title("(i)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,5)

plot(t,line,'red',t,x1ii(:,1),'black',t,x1ii(:,2),'--red',t,x1ii(:,1),'--blue','LineWidth',3)

title("(x1)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,6)

plot(t,line,'red',t,x2ii(:,1),'black',t,x2ii(:,2),'--red',t,x2ii(:,1),'--blue','LineWidth',3)

title("(x2)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,7)

plot(t,line,'red',t,wii(:,1),'black',t,wii(:,2),'--red',t,wii(:,1),'--blue','LineWidth',3)

title("(w)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,8)

plot(t,line,'red',t,vii(:,1),'black',t,vii(:,2),'--red',t,vii(:,1),'--blue','LineWidth',3)

title("(v)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,9)

plot(t,line,'red',t,Nii(:,1),'black',t,Nii(:,2),'--red',t,Nii(:,1),'--blue','LineWidth',3)

title("(N)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,10)

plot(t,line,'red',t,Yii(:,1),'black',t,Yii(:,2),'--red',t,Yii(:,1),'--blue','LineWidth',3)

title("(Y)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,11)

plot(t,line,'red',t,mii(:,1),'black',t,mii(:,2),'--red',t,mii(:,1),'--blue','LineWidth',3)

title("(m)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,12)

plot(t,line,'red',t,cii(:,1),'black',t,cii(:,2),'--red',t,cii(:,1),'--blue','LineWidth',3)

title("(c)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,13)

plot(t,line,'red',t,Aii(:,1),'black',t,Aii(:,2),'--red',t,Aii(:,1),'--blue','LineWidth',3)

title("(A)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,14)

plot(t,line,'red',t,Xii(:,1),'black',t,Xii(:,2),'--red',t,Xii(:,1),'--blue','LineWidth',3)

title("(X)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')

subplot(5,3,15)

plot(t,line,'red',t,Yfii(:,1),'black',t,Yfii(:,2),'--red',t,Yfii(:,1),'--blue','LineWidth',3)

title("(Yf)")

xlabel('t')

ylabel('value')

legend('Y=0','phix=0','phix=1','phix=2')