```
% Government consumption and ξ=1.35

% Parameter values
tau_k=0.276; % Capital income tax rate
tau_w=0.224; % Labor income tax rate
tau_c=0.08;  % Consumption tax rate
g_I=0.035;   % Ratio of government investment to output
g_C=0.150;   % Ratio of government consumption to output
g_W=0;       % Ratio of wastful government expenditure to output
beta=1.4;    % Weight of leisure in utility
etha=0.12;   % Weight of real balances in utility
phai=0.22;   % Weight of government consumption in utility
share=0.6;   % Labor share in output
effic=0.9;   % TFP
rho=0.04;    % Time preference
ganmma=-1.5; % Elasticity of intertemporal substitution in consumption
epsiron=0.6; % Geometric weight of average externalities derived from private capital
kusai=1.35;  % Bonds-money ratio
t_ss=0.0137; % Lump-sum-tax-wealth ratio



nobs=200;    % periods

for i=1:11
g_C=0.10+(i-1)/100;   % Range of government consumption-GDP ratio
CMtheta(i,1)=g_C;

% Steady state values
fun = @rootGT1;
x0 = [0.7,0.7];

param=[tau_k tau_w tau_c g_I g_C g_W beta etha phai share effic rho ganmma epsiron];

x = fsolve(fun,x0,optimset,param);

zss=x(1); % Steady state public-private capital ratio, z*
lss=x(2); % Steady state value of leisure, l*
CMtheta(i,13)=lss;
CMtheta(i,16)=zss;

nobs=200; % periods


% Balanced growth equilibrium

css=((1-tau_w)/(1+tau_c))*share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron))*lss/beta;  % Consumption-capital ratio, c*

yss=effic*(1-lss)^share*zss^(share*(1-epsiron));                                             % Output-capital ratio, y*
(1-g_I-g_C-g_W)*yss;
(share*tau_w+(1-share)*tau_k-g_I-g_C)*yss;                                                   % (tax revenue-expenditure)/capital

rss=(1-share)*effic*(1-lss)^share*zss^(share*(1-epsiron));                                   % Before-tax return on private capital, r*
(1-tau_k)*rss;                                                                                % After-tax return on private capital, (1-tau_k)r*
Pai=1-ganmma-etha*ganmma-phai*ganmma;                                                         % A value of Π in (12c)
Gss=((1-tau_k)*rss-rho)/Pai;                                                                  % Balanced growth rate
CMtheta(i,2)=Gss;

mss=((tau_c+etha*(1+tau_c))*css+(tau_k*(1-share)+tau_w*share-g_I-g_C-g_W)*yss-t_ss)/((t_ss+(1-1/Pai)*(1-tau_k)*rss+rho/Pai)*(1+kusai)); % Real balances-capital ratio, m*
CMtheta(i,9)=mss;

mss/css;                                                                                      % Money-consumption ratio


theta=(etha*(1+tau_c)*css/mss-((1-1/Pai)*(1-tau_k)*rss+rho/Pai));                             % Money growth rate
CMtheta(i,10)=theta;

infl=etha*(1+tau_c)*css/mss-(1-tau_k)*rss;                                                    % Inflation rate
CMtheta(i,3)=infl;

Piketty=(Pai-1)*(1-tau_k)*rss/Pai-rho/Pai;                                                    % (1-tau_k)rss-Gss


% Local stability
theta_L=((1-share)*(1-ganmma-phai*ganmma)+phai*ganmma)*lss/(1-lss)+(1-ganmma-beta*ganmma); % Δ in (12c)
```

```
y_z=share*(1-epsiron)*yss/zss;   % dy/dz
y_l=-share*yss/(1-lss);          % dy/dl

c_z=share*(1-epsiron)*css/zss;         % dc/dz
c_l=((1-share)*lss/(1-lss)+1)*css/lss; % dc/dl

r_z=share*(1-epsiron)*rss/zss; % dr/dz
r_l=-share*rss/(1-lss);        % dr/dl

G_k=(1-g_I-g_C-g_W)*yss-css;                          % Growth rate of private capital
G_kp=g_I*effic*(1-lss)^share*zss^(share*(1-epsiron)-1); % Growth rate of public capital

G_kl=-share*(1-g_I-g_C-g_W)*yss/(1-lss)-((1-share)*lss/(1-lss)+1)*css/lss; % d(G_k)/dl
G_kz=share*(1-epsiron)*G_k/zss;                                            % d(G_k)/dz

G_kpz=-(1-share*(1-epsiron))*G_kp/zss; % d(G_kp)/dz
G_kpl=-share*G_kp/(1-lss);             % d(G_kp)/dl


% Elements of (15)
a_31=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_l+(1-tau_k)*r_l*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_l)/((1+kusai)*mss)-G_kl*mss;  % a_31
a_32=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_z+(1-tau_k)*r_z*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_z)/((1+kusai)*mss)-G_kz*mss;  % a_32
a_33=-((g_I+g_C-(1-share)*tau_k-share*tau_w)*yss-(tau_c+etha*(1+tau_c))*css+t_ss)/((1+kusai)*mss);                                      % a_33

a_21=(G_kpl-G_kl)*zss;              % a_21
a_22=(G_kpz-G_kz)*zss;              % a_22
a_23=0;                             % a_23

a_11=(etha*ganmma*a_31/mss-Pai*G_kl-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_21/zss+(1-tau_k)*r_l)*(lss/theta_L);  % a_11
a_12=(etha*ganmma*a_32/mss-Pai*G_kz-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_22/zss+(1-tau_k)*r_z)*(lss/theta_L);  % a_12
a_13=(etha*ganmma*a_33/mss)*(lss/theta_L);                                                                           % a_13


A=[a_11 a_12 a_13; a_21 a_22 a_23; a_31 a_32 a_33];   % Jacobian in (15)
e=eig(A);                                             % Three eigenvalues in jacobian

% Saddle path
Meig=sort(e);
lambda=diag(Meig);
lambda(1,1);                                          % Unique stable root

A_1=(lambda(1,1)-a_22)/a_21;                          % Coefficient of saddle path of leisure
A_2=a_32+a_31*A_1;                                    % Coefficient of saddle path of money, Numerator
A_3=lambda(1,1)-a_33;                                 % Coefficient of saddle path of money, Denominator

z0=0.5759;                  % A value of z(0) equal to pre-shock value, Public capital-private capital ratio
l0=lss+A_1*(z0-zss);        % A value of l(0)
m0=mss+(A_2/A_3)*(z0-zss);  % A value of m(0)
CMtheta(i,12)=m0;

y0=effic*z0^(share*(1-epsiron))*(1-l0)^share;         % A value of y(0)


% Inequality in a balnaced growth path
nyu=beta/(1+beta+etha);                                          % ν in (17)
wss_tild=share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron)); % w*/K*, Real wage-private capital ratio in a balanced growth

alpha_0=1+(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-l0/lss)/(-lambda(1,1)-(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-lss/nyu)); % Adjustment speed
of wealth in the period 0;
omega_0=1+(m0/(1+kusai*m0))*(alpha_0-1+nyu/lss)/alpha_0;        % Ratio of (i's private capital+real bonds) to i's total wealth in the period 0
omega_ss=1+(mss/(1+kusai*mss))*(nyu/lss);                       %  Ratio of i's (private capital+real bonds) to i's total wealth in a baalnced
growth
kapper=0.406;                                                    % (bonds+money)/wealth in the benchmark parameter values

sigma_aa=1+((2*kapper-1)*(1-kapper)*kapper/((1-kapper)^2+kapper^2))*(((1+kusai)*m0/0.6835-1)); % Pre-shock value of σ_a(0)
sigma_va=omega_0*sigma_aa;            % Initial vallue of σ_v(0)
sigma_ass=sigma_aa/alpha_0;           % Balanced growth value of σ_a, i.e., σ_a*
sigma_vss=omega_ss*sigma_ass/1.1634;   % Balanced growth value of σ_v, i.e., σ_v*
CMtheta(i,5)=sigma_ass;
CMtheta(i,6)=sigma_vss;


fey_ss=(rss*(1+kusai*mss)/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*omega_ss-(wss_tild*lss/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*(1-
nyu/lss)/alpha_0;  % Ratio of i's before-tax income to i's (private capital+real baonds) in a balanced growth path
sigma_yss=fey_ss*sigma_ass;
% Balanced growth value of σ_y
```

```
CMtheta(i,7)=sigma_yss/0.2837;

pusai_ss=((1-tau_k)*rss*(1+kusai*mss)/((1-tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*omega_ss-((1-tau_w)*wss_tild*lss/((1-
tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*(1-nyu/lss)/alpha_0; % Ratio of i's after-tax income to i's private capital in a balanced
growth
sigma_yss_a=pusai_ss*sigma_ass;         % Balanced growth value of σ_ya
CMtheta(i,8)=sigma_yss_a/0.2544;


end

% Government consumption and ξ=1.10


% Structual parameter values
tau_k=0.276; % Capital income tax rate
tau_w=0.224; % Labor income tax rate
tau_c=0.08;  % Consumption tax rate
g_I=0.035;   % Ratio of government investment to output
g_C=0.150;   % Ratioo of government consumption to output
g_W=0;       % Ratio of wastful government expenditure to output
beta=1.4;    % Weight of leisure in utility
etha=0.12;   % Weight of real balances in utility
phai=0.22;   % Weight of government consumption in utility
share=0.6;   % Labor share in output
effic=0.9;   % TFP
rho=0.04;    % Time preference
ganmma=-1.5; % Elasticity of intertemporal substitution in consumption
epsiron=0.6; % Geometric weight of average externalities derived from private capital
kusai=1.10;  % Bonds-money ratio
t_ss=0.0137; % Lump-sum-tax-wealth ratio




nobs=200;    % periods

for i=1:11
g_C=0.10+(i-1)/100;  % Government consumption-GDP ratio
nCMtheta(i,1)=g_C;

% Steady state values
fun = @rootGT1;
x0 = [0.7,0.7];

param=[tau_k tau_w tau_c g_I g_C g_W beta etha phai share effic rho ganmma epsiron];

x = fsolve(fun,x0,optimset,param);

zss=x(1); % Steady state public-private capital ratio, z*
lss=x(2); % Steady state value of leisure, l*
nCMtheta(i,13)=lss;
nCMtheta(i,16)=zss;

nobs=200;    % periods


% Balanced growth equilibrium

css=((1-tau_w)/(1+tau_c))*share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron))*lss/beta;  % Consumption-capital ratio, c*

yss=effic*(1-lss)^share*zss^(share*(1-epsiron));  % Output-capital ratio, y*
(1-g_I-g_C-g_W)*yss;
(share*tau_w+(1-share)*tau_k-g_I-g_C)*yss;        % (tax revenue-expenditure)/capital

rss=(1-share)*effic*(1-lss)^share*zss^(share*(1-epsiron));  % Before-tax return on private capital, r*
(1-tau_k)*rss;
Pai=1-ganmma-etha*ganmma-phai*ganmma;                       % % value of Π in (12c)
Gss=((1-tau_k)*rss-rho)/Pai;                                % Balanced growth rate
nCMtheta(i,2)=Gss;

mss=((tau_c+etha*(1+tau_c))*css+(tau_k*(1-share)+tau_w*share-g_I-g_C-g_W)*yss-t_ss)/((t_ss+(1-1/Pai)*(1-tau_k)*rss+rho/Pai)*(1+kusai)); % Real
balances-capital ratio
nCMtheta(i,9)=mss;

mss/css;
```

```
theta=(etha*(1+tau_c)*css/mss-((1-1/Pai)*(1-tau_k)*rss+rho/Pai));  % Money growth rate
nCMtheta(i,10)=theta;

infl=etha*(1+tau_c)*css/mss-(1-tau_k)*rss;                         % Inflation rate
nCMtheta(i,3)=infl;

Piketty=(Pai-1)*(1-tau_k)*rss/Pai-rho/Pai;                         % (1-tau_k)rss-Gss


% Local stability
theta_L=((1-share)*(1-ganmma-phai*ganmma)+phai*ganmma)*lss/(1-lss)+(1-ganmma-beta*ganmma); % Δ in (12c)

y_z=share*(1-epsiron)*yss/zss; % dy/dz
y_l=-share*yss/(1-lss);        % dy/dl

c_z=share*(1-epsiron)*css/zss;         % dc/dz
c_l=((1-share)*lss/(1-lss)+1)*css/lss; % dc/dl

r_z=share*(1-epsiron)*rss/zss; % dr/dz
r_l=-share*rss/(1-lss);        % dr/dl

G_k=(1-g_I-g_C-g_W)*yss-css;                           % Growth rate of private capital
G_kp=g_I*effic*(1-lss)^share*zss^(share*(1-epsiron)-1); % Growth rate of public capital

G_kl=-share*(1-g_I-g_C-g_W)*yss/(1-lss)-((1-share)*lss/(1-lss)+1)*css/lss; % d(G_k)/dl
G_kz=share*(1-epsiron)*G_k/zss;                                             % d(G_k)/dz

G_kpz=-(1-share*(1-epsiron))*G_kp/zss; % d(G_kp)/dz
G_kpl=-share*G_kp/(1-lss);             % d(G_kp)/dl

% Elements of (15)
a_31=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_l+(1-tau_k)*r_l*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_l)/((1+kusai)*mss)-G_kl*mss;
a_32=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_z+(1-tau_k)*r_z*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_z)/((1+kusai)*mss)-G_kz*mss;
a_33=-((g_I+g_C-(1-share)*tau_k-share*tau_w)*yss-(tau_c+etha*(1+tau_c))*css+t_ss)/((1+kusai)*mss);

a_21=(G_kpl-G_kl)*zss;
a_22=(G_kpz-G_kz)*zss;
a_23=0;

a_11=(etha*ganmma*a_31/mss-Pai*G_kl-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_21/zss+(1-tau_k)*r_l)*(lss/theta_L);
a_12=(etha*ganmma*a_32/mss-Pai*G_kz-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_22/zss+(1-tau_k)*r_z)*(lss/theta_L);
a_13=(etha*ganmma*a_33/mss)*(lss/theta_L);

A=[a_11 a_12 a_13; a_21 a_22 a_23; a_31 a_32 a_33];
e=eig(A);

% Saddle path
Meig=sort(e);
lambda=diag(Meig);
lambda(1,1);

A_1=(lambda(1,1)-a_22)/a_21;
A_2=a_32+a_31*A_1;
A_3=lambda(1,1)-a_33;

z0=0.5759;
l0=lss+A_1*(z0-zss);        % Initial value of leisure
m0=mss+(A_2/A_3)*(z0-zss);  % Initial value of real balances-capital ratio
nCMtheta(i,12)=m0;

y0=effic*z0^(share*(1-epsiron))*(1-l0)^share; % Initial value of GDP-capital ratio


% Inequality in a balnaced growth path
nyu=beta/(1+beta+etha);
wss_tild=share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron)); % w*/K*, Real wage-private capital ratio in a balanced growth

alpha_0=1+(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-l0/lss)/(-lambda(1,1)-(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-lss/nyu)); % Adjustment speed
of wealth in the period 0;
omega_0=1+(m0/(1+kusai*m0))*(alpha_0-1+nyu/lss)/alpha_0; % Ratio of (i's private capital+real bonds) to i's total wealth in the period 0
omega_ss=1+(mss/(1+kusai*mss))*(nyu/lss);                %  Ratio of i's (private capital+real bonds) to i's total wealth in a baalnced growth
kapper=0.406;                                            % (bonds+money)/wealth

sigma_aa=1+((2*kapper-1)*(1-kapper)*kapper/((1-kapper)^2+kapper^2))*(((1+kusai)*m0/0.6835-1)); %Initial value of σ_a(0)
sigma_va=omega_0*sigma_aa;           % Initial vallue of σ_v(0)
sigma_ass=sigma_aa/alpha_0;          % Balanced growth value of σ_a, i.e., σ_a*
```

```
sigma_vss=omega_ss*sigma_ass/1.1634; % Balanced growth value of σ_v, i.e., σ_v*
nCMtheta(i,5)=sigma_ass;
nCMtheta(i,6)=sigma_vss;


fey_ss=(rss*(1+kusai*mss)/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*omega_ss-(wss_tild*lss/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*(1-
nyu/lss)/alpha_0;  % Ratio of i's before-tax income to i's (private capital+real baonds) in a balanced growth path
sigma_yss=fey_ss*sigma_ass;          % Balanced growth value of σ_y
nCMtheta(i,7)=sigma_yss/0.2837;

pusai_ss=((1-tau_k)*rss*(1+kusai*mss)/((1-tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*omega_ss-((1-tau_w)*wss_tild*lss/((1-
tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*(1-nyu/lss)/alpha_0; % Ratio of i's after-tax income to i's private capital in a balanced
growth
sigma_yss_a=pusai_ss*sigma_ass;      % Balanced growth value of σ_ya
nCMtheta(i,8)=sigma_yss_a/0.2544;


end


% Government iinvestment and ξ=1.350

% Parameter values
tau_k=0.276; % Capital income tax rate
tau_w=0.224; % Labor income tax rate
tau_c=0.08;  % Consumption tax rate
g_I=0.035;   % Ratio of government investment to output
g_C=0.150;   % Ratioo of government consumption to output
g_W=0;       % Ratio of wastful government expenditure to output
beta=1.4;    % Weight of leisure in utility
etha=0.12;   % Weight of real balances in utility
phai=0.22;   % Weight of government consumption in utility
share=0.6;   % Labor share in output
effic=0.9;   % TFP
rho=0.04;    % Time preference
ganmma=-1.5; % Elasticity of intertemporal substitution in consumption
epsiron=0.6; % Geometric weight of average externalities derived from private capital
kusai=1.35;  % Bonds-money ratio
t_ss=0.0137; % Lump-sum-tax-wealth ratio


nobs=200;    % periods

for i=1:11
g_I=0.020+(i-1)/100; % Government investment-GDP ratio
IMtheta(i,1)=g_I;

% Steady state values
fun = @rootGT1;
x0 = [0.7,0.7];

param=[tau_k tau_w tau_c g_I g_C g_W beta etha phai share effic rho ganmma epsiron];

x = fsolve(fun,x0,optimset,param);

zss=x(1); % Steady state public-private capital ratio, z*
IMtheta(i,11)=zss;

lss=x(2); % Steady state value of leisure, l*
IMtheta(i,13)=lss;

nobs=200;    % periods


% Balanced growth equilibrium

css=((1-tau_w)/(1+tau_c))*share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron))*lss/beta;  % Consumption-capital ratio

yss=effic*(1-lss)^share*zss^(share*(1-epsiron));                                          % Output-capital ratio

(1-g_I-g_C-g_W)*yss;
rss=(1-share)*effic*(1-lss)^share*zss^(share*(1-epsiron));                                % Before-tax return on private capital

(1-tau_k)*rss;
Pai=1-ganmma-etha*ganmma-phai*ganmma;                                                      % A value of Π in (12c)
Gss=((1-tau_k)*rss-rho)/Pai;                                                               % Balanced growth rate
```

```
IMtheta(i,2)=Gss;

mss=((tau_c+etha*(1+tau_c))*css+(tau_k*(1-share)+tau_w*share-g_I-g_C-g_W)*yss-t_ss)/((t_ss+(1-1/Pai)*(1-tau_k)*rss+rho/Pai)*(1+kusai)); % Real balances-capital ratio
IMtheta(i,10)=mss;

mss/css;
theta=(etha*(1+tau_c)*css/mss-((1-1/Pai)*(1-tau_k)*rss+rho/Pai));                          % Money growth rate
IMtheta(i,9)=theta;

infl=etha*(1+tau_c)*css/mss-(1-tau_k)*rss;                                                 % Inflation rate
IMtheta(i,3)=infl;

Piketty=(Pai-1)*(1-tau_k)*rss/Pai-rho/Pai;                                                 % (1-tau_k)rss-Gss


% Local stability
theta_L=((1-share)*(1-ganmma-phai*ganmma)+phai*ganmma)*lss/(1-lss)+(1-ganmma-beta*ganmma); % Δ in (12c)

y_z=share*(1-epsiron)*yss/zss; % dy/dz
y_l=-share*yss/(1-lss);        % dy/dl

c_z=share*(1-epsiron)*css/zss;         % dc/dz
c_l=((1-share)*lss/(1-lss)+1)*css/lss; % dc/dl

r_z=share*(1-epsiron)*rss/zss; % dr/dz
r_l=-share*rss/(1-lss);        % dr/dl

G_k=(1-g_I-g_C-g_W)*yss-css;    % Growth rate of K (private capital)
G_kp=share*(1-epsiron)*G_k/zss; % Growth rate of K_g (Public capital)

G_kl=-share*(1-g_I-g_C-g_W)*yss/(1-lss)-((1-share)*lss/(1-lss)+1)*css/lss; % d(G_k)/dl
G_kz=share*(1-epsiron)*G_k/zss;                                            % d(G_k)/dz

G_kpz=-(1-share*(1-epsiron))*G_kp/zss; % d(G_kp)/dz
G_kpl=-share*G_kp/(1-lss);             % d(G_kp)/dl

% Elements of (15)
a_31=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_l+(1-tau_k)*r_l*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_l)/((1+kusai)*mss)-G_kl*mss;
a_32=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_z+(1-tau_k)*r_z*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_z)/((1+kusai)*mss)-G_kz*mss;
a_33=-((g_I+g_C-(1-share)*tau_k-share*tau_w)*yss-(tau_c+etha*(1+tau_c))*css+t_ss)/((1+kusai)*mss);

a_21=(G_kpl-G_kl)*zss;
a_22=(G_kpz-G_kz)*zss;
a_23=0;

a_11=(etha*ganmma*a_31/mss-Pai*G_kl-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_21/zss+(1-tau_k)*r_l)*(lss/theta_L);
a_12=(etha*ganmma*a_32/mss-Pai*G_kz-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_22/zss+(1-tau_k)*r_z)*(lss/theta_L);
a_13=(etha*ganmma*a_33/mss)*(lss/theta_L);

A=[a_11 a_12 a_13; a_21 a_22 a_23; a_31 a_32 a_33];
e=eig(A);

% Saddle path
Meig=sort(e);
lambda=diag(Meig);
lambda(1,1);

A_1=(lambda(1,1)-a_22)/a_21;
A_2=a_32+a_31*A_1;
A_3=lambda(1,1)-a_33;

z0=0.5759;
l0=lss+A_1*(z0-zss);        % Initial value of leisure
m0=mss+(A_2/A_3)*(z0-zss);  % Initial value of real balances-capital ratio

y0=effic*z0^(share*(1-epsiron))*(1-l0)^share; % Initial value of GDP-capital ratio

% Inequality in a balnaced growth path
nyu=beta/(1+beta+etha);
wss_tild=share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron)); % w*/K*, Real wage-private capital ratio in a balanced growth


alpha_0=1+(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-l0/lss)/(-lambda(1,1)-(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-lss/nyu)); % Adjustment speed of wealth in the period 0;
omega_0=1+(m0/(1+kusai*m0))*(alpha_0-1+nyu/lss)/alpha_0; % Ratio of (i's private capital+real bonds) to i's total wealth in the period 0
omega_ss=1+(mss/(1+kusai*mss))*(nyu/lss);                % Ratio of i's (private capital+real bonds) to i's total wealth in a baalnced growth
```

```
kapper=0.406;                                             % (bonds+money)/wealth

sigma_aa=1+((2*kapper-1)*(1-kapper)*kapper/((1-kapper)^2+kapper^2))*(((1+kusai)*m0/0.6835-1)); %Initial value of σ_a(0)
sigma_va=omega_0*sigma_aa;    % Initial vallue of σ_v(0)
sigma_ass=sigma_aa/alpha_0;   % Balanced growth value of σ_a, i.e., σ_ass
sigma_vss=omega_ss*sigma_ass; % Balanced growth value of σ_v, i.e., σ_vss
IMtheta(i,5)=sigma_ass;
IMtheta(i,6)=sigma_vss/1.1634;


fey_ss=(rss*(1+kusai*mss)/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*omega_ss-(wss_tild*lss/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*(1-
nyu/lss)/alpha_0;  % Ratio of i's before-tax income to i's (private capital+real baonds) in a balanced growth path
sigma_yss=fey_ss*sigma_ass;     % Balanced growth value of σ_y
IMtheta(i,7)=sigma_yss/0.2837;

pusai_ss=((1-tau_k)*rss*(1+kusai*mss)/((1-tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*omega_ss-((1-tau_w)*wss_tild*lss/((1-
tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*(1-nyu/lss)/alpha_0; % Ratio of i's after-tax income to i's private capital in a balanced
growth
sigma_yss_a=pusai_ss*sigma_ass; % Balanced growth value of σ_ya
IMtheta(i,8)=sigma_yss_a/0.2544;


end

% Government iinvestment and ξ=1.10

% Parameter values
tau_k=0.276; % Capital income tax rate
tau_w=0.224; % Labor income tax rate
tau_c=0.08;  % Consumption tax rate
g_I=0.035;   % Ratio of government investment to output
g_C=0.150;   % Ratio of government consumption to output
g_W=0;       % Ratio of wastful government expenditure to output
beta=1.4;    % Weight of leisure in utility
etha=0.12;   % Weight of real balances in utility
phai=0.22;   % Weight of government consumption in utility
share=0.6;   % Labor share in output
effic=0.9;   % TFP
rho=0.04;    % Time preference
ganmma=-1.5; % Elasticity of intertemporal substitution in consumption
epsiron=0.6; % Geometric weight of average externalities derived from private capital
kusai=1.1;   % Bonds-money ratio
t_ss=0.0137; % Lump-sum-tax-wealth ratio


nobs=200;    % periods

for i=1:11
g_I=0.020+(i-1)/100;  % Government investment=GDP ratio
nIMtheta(i,1)=g_I;

% Steady state values
fun = @rootGT1;
x0 = [0.7,0.7];

param=[tau_k tau_w tau_c g_I g_C g_W beta etha phai share effic rho ganmma epsiron];

x = fsolve(fun,x0,optimset,param);

zss=x(1); % Steady state public-private capital ratio, z*
nIMtheta(i,11)=zss;

lss=x(2); % Steady state value of leisure, l*
nIMtheta(i,13)=lss;

nobs=200;    % periods


% Balanced growth equilibrium

css=((1-tau_w)/(1+tau_c))*share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron))*lss/beta;  % Consumption-capital ratio

yss=effic*(1-lss)^share*zss^(share*(1-epsiron));                                  % Output-capital ratio

(1-g_I-g_C-g_W)*yss;
rss=(1-share)*effic*(1-lss)^share*zss^(share*(1-epsiron));                        % Before-tax return on private capital
```

```
(1-tau_k)*rss;
Pai=1-ganmma-etha*ganmma-phai*ganmma;                                      % value of Π in (12c)
Gss=((1-tau_k)*rss-rho)/Pai;                                               % Balanced growth rate
nIMtheta(i,2)=Gss;

mss=((tau_c+etha*(1+tau_c))*css+(tau_k*(1-share)+tau_w*share-g_I-g_C-g_W)*yss-t_ss)/((t_ss+(1-1/Pai)*(1-tau_k)*rss+rho/Pai)*(1+kusai)); % Real balances-capital ratio
nIMtheta(i,10)=mss;

mss/css;
theta=(etha*(1+tau_c)*css/mss-((1-1/Pai)*(1-tau_k)*rss+rho/Pai));          % Money growth rate
nIMtheta(i,9)=theta;

infl=etha*(1+tau_c)*css/mss-(1-tau_k)*rss;                                 % Inflation rate
nIMtheta(i,3)=infl;

Piketty=(Pai-1)*(1-tau_k)*rss/Pai-rho/Pai;                                 % (1-tau_k)rss-Gss


% Local stability
theta_L=((1-share)*(1-ganmma-phai*ganmma)+phai*ganmma)*lss/(1-lss)+(1-ganmma-beta*ganmma); % Δ in (12c)

y_z=share*(1-epsiron)*yss/zss; % dy/dz
y_l=-share*yss/(1-lss);        % dy/dl

c_z=share*(1-epsiron)*css/zss;         % dc/dz
c_l=((1-share)*lss/(1-lss)+1)*css/lss; % dc/dl

r_z=share*(1-epsiron)*rss/zss; % dr/dz
r_l=-share*rss/(1-lss);        % dr/dl

G_k=(1-g_I-g_C-g_W)*yss-css;    % Growth rate of private capital
G_kp=share*(1-epsiron)*G_k/zss; % Growth rate of public capital

G_kl=-share*(1-g_I-g_C-g_W)*yss/(1-lss)-((1-share)*lss/(1-lss)+1)*css/lss; % d(G_k)/dl
G_kz=share*(1-epsiron)*G_k/zss;                                            % d(G_k)/dz

G_kpz=-(1-share*(1-epsiron))*G_kp/zss; % d(G_kp)/dz
G_kpl=-share*G_kp/(1-lss);             % d(G_kp)/dl

% Elements of (15)
a_31=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_l+(1-tau_k)*r_l*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_l)/((1+kusai)*mss)-G_kl*mss;
a_32=mss*((g_I+g_C-(1-share)*tau_k-share*tau_w)*y_z+(1-tau_k)*r_z*(1+kusai)*mss-(tau_c+etha*(1+tau_c))*c_z)/((1+kusai)*mss)-G_kz*mss;
a_33=-((g_I+g_C-(1-share)*tau_k-share*tau_w)*yss-(tau_c+etha*(1+tau_c))*css+t_ss)/((1+kusai)*mss);

a_21=(G_kpl-G_kl)*zss;
a_22=(G_kpz-G_kz)*zss;
a_23=0;

a_11=(etha*ganmma*a_31/mss-Pai*G_kl-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_21/zss+(1-tau_k)*r_l)*(lss/theta_L);
a_12=(etha*ganmma*a_32/mss-Pai*G_kz-share*(1-epsiron)*(1-ganmma-phai*ganmma)*a_22/zss+(1-tau_k)*r_z)*(lss/theta_L);
a_13=(etha*ganmma*a_33/mss)*(lss/theta_L);

A=[a_11 a_12 a_13; a_21 a_22 a_23; a_31 a_32 a_33];
e=eig(A);

% Saddle path
Meig=sort(e);
lambda=diag(Meig);
lambda(1,1);

A_1=(lambda(1,1)-a_22)/a_21;
A_2=a_32+a_31*A_1;
A_3=lambda(1,1)-a_33;

z0=0.5759;
l0=lss+A_1*(z0-zss);        % Initial value of leisure
m0=mss+(A_2/A_3)*(z0-zss);  % Initial value of real balances-capital ratio

y0=effic*z0^(share*(1-epsiron))*(1-l0)^share; % Initial value of GDP-capital ratio

% Inequality in a balnaced growth path
nyu=beta/(1+beta+etha);
wss_tild=share*effic*(1-lss)^(share-1)*zss^(share*(1-epsiron)); % w*/K*, Real wage-private capital ratio in a balanced growth
```

```
alpha_0=1+(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-l0/lss)/(-lambda(1,1)-(1-tau_w)*(wss_tild/(1+(1+kusai)*mss))*(1-lss/nyu)); % Adjustment speed
of wealth in the period 0;
omega_0=1+(m0/(1+kusai*m0))*(alpha_0-1+nyu/lss)/alpha_0; % Ratio of (i's private capital+real bonds) to i's total wealth in the period 0
omega_ss=1+(mss/(1+kusai*mss))*(nyu/lss);                % Ratio of i's (private capital+real bonds) to i's total wealth in a baalnced growth
kapper=0.406;                                            % (bonds+money)/wealth

sigma_aa=1+((2*kapper-1)*(1-kapper)*kapper/((1-kapper)^2+kapper^2))*(((1+kusai)*m0/0.6835-1)); % Initial value of σ_a(0)
sigma_va=omega_0*sigma_aa;    % Initial vallue of σ_v(0)
sigma_ass=sigma_aa/alpha_0;   % Balanced growth value of σ_a, i.e., σ_ass
sigma_vss=omega_ss*sigma_ass; % Balanced growth value of σ_v, i.e., σ_vss
nIMtheta(i,5)=sigma_ass;
nIMtheta(i,6)=sigma_vss/1.1634;


fey_ss=(rss*(1+kusai*mss)/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*omega_ss-(wss_tild*lss/(rss*(1+kusai*mss)+wss_tild*(1-lss)))*(1-
nyu/lss)/alpha_0;  % Ratio of i's before-tax income to i's (private capital+real baonds) in a balanced growth path
sigma_yss=fey_ss*sigma_ass;     % Balanced growth value of σ_y
nIMtheta(i,7)=sigma_yss/0.2837;

pusai_ss=((1-tau_k)*rss*(1+kusai*mss)/((1-tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*omega_ss-((1-tau_w)*wss_tild*lss/((1-
tau_k)*rss*(1+kusai*mss)+(1-tau_w)*wss_tild*(1-lss)))*(1-nyu/lss)/alpha_0; % Ratio of i's after-tax income to i's private capital in a balanced
growth
sigma_yss_a=pusai_ss*sigma_ass; % Balanced growth value of σ_ya
nIMtheta(i,8)=sigma_yss_a/0.2544;

end




%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%Graphs
figure;
hold on

subplot(5,2,1)
plot(IMtheta(:,1),IMtheta(:,3));
hold on
plot(nIMtheta(:,1),nIMtheta(:,3));
title('1. Inflation π*');
xlabel('Government investment');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,2)
plot(CMtheta(:,1),CMtheta(:,3));
hold on
plot(nCMtheta(:,1),nCMtheta(:,3));
title('2. Inflation π*');
xlabel('Government consumption');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,3)
plot(IMtheta(:,1),IMtheta(:,2));
hold on
plot(nIMtheta(:,1),nIMtheta(:,2));
title('3. Growth Ψ*');
xlabel('Government investment');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,4)
plot(CMtheta(:,1),CMtheta(:,2));
hold on
plot(nCMtheta(:,1),nCMtheta(:,2));
title('4. Growth Ψ');
xlabel('Government consumption');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,5)
plot(IMtheta(:,1),IMtheta(:,5));
```

```
hold on
plot(nIMtheta(:,1),nIMtheta(:,5));
title('5. Stand. dev. of wealth σ*_a');
xlabel('Government investment');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,6)
plot(CMtheta(:,1),CMtheta(:,5));
hold on
plot(nCMtheta(:,1),nCMtheta(:,5));
title('6. Stand. dev. of wealth σ*_a');
xlabel('Government consumption');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,7)
plot(IMtheta(:,1),IMtheta(:,6));
hold on
plot(nIMtheta(:,1),nIMtheta(:,6));
title('7. Stand. dev. of income-earning assets σ*_v');
xlabel('Government investment');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,8)
plot(CMtheta(:,1),CMtheta(:,6));
hold on
plot(nCMtheta(:,1),nCMtheta(:,6));
title('8. Stand. dev. of income-earning assets σ*_v');
xlabel('Government consumption');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,9)
plot(IMtheta(:,1),IMtheta(:,7));
hold on
plot(nIMtheta(:,1),nIMtheta(:,7));
title('9. Stand. dev. of before-tax income σ*_y');
xlabel('Government investment');
legend('ξ=1.35','ξ=1.1');
axis('tight');

subplot(5,2,10)
plot(CMtheta(:,1),CMtheta(:,7));
hold on
plot(nCMtheta(:,1),nCMtheta(:,7));
title('10. Stand. dev. of before-tax income σ*_y');
xlabel('Government consumption');
legend('ξ=1.35','ξ=1.1');
axis('tight');


hold off
```