```
function CH6ans

% This function is designed to play around with simple AR1 process for g
% and tau and see what happens.

clc
clear all

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Part I: getting our shocks
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

T = 100;  % length of time

TT = 10000; % number of random epsilon shocks we drew

EP = randn(TT,1);

% Let's choose some basic moments for our model

mean_tau = .1; % so mean inflation is 10%

mean_g = .02; % so mean growth is 2%

rho_tau = 0.7;

rho_g = 0.95;

beta = 0.98;

B_tau = mean_tau*(1 - rho_tau)

B_g = mean_g*(1 - rho_g)

C_tau = .007; % governs how volatile tau is

C_g = .007; % governs how volatile g is

vf = 1/ (1+.5);  % setting gamma = .5 so Frisch elasticity is 2

% We need to initialize our matrices
% Generally good to use steady state values here

TAU = [mean_tau];

G = [mean_g];

Q = [beta/(1+mean_tau)];

L = [(beta/(1+mean_tau))^vf];

P = [1];

M = [1];

Z = [1];

Y_level = [Z(1)*L(1)];

infl = [(1+mean_tau)/(1+mean_g)];
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Y_gr = [1+mean_g];

for i=2:T,

    ep_tau = randn; % drawing a standard normal with mean o and std 1

    tau = rho_tau*TAU(i-1)+B_tau+C_tau*ep_tau;

    TAU(i) = tau;

    ep_g = randn;

    g = rho_g*G(i-1)+B_g+C_g*ep_g;

    G(i) = g;

    L(i) = (beta/(1+tau))^vf;

    M(i) = M(i-1)*(1+tau);

    Z(i) = Z(i-1)*(1+g);

    Y_level(i) = Z(i)*L(i);

    P(i) = M(i-1)/Y_level(i);  % careful money at beginning of period here

    infl(i) = P(i)/P(i-1); % Gross growth rate of prices

    Y_gr(i) = Y_level(i)/Y_level(i-1); % Gross growth rate of output

    newTau = rho_tau*tau+B_tau+C_tau*EP; % vector reflecting distribution of tau_{t+1}

    newTerm = .98./(1+newTau);

    Q(i) = mean(newTerm);


end

figure(1)
plot([1:T]',TAU','-b','LineWidth',3)
title('Money Growth Rates')
xlabel('Time')
ylabel('Growth Rates')

figure(2)
plot([1:T]',G','-b','LineWidth',3)
title('Productivity Growth Rates')
xlabel('Time')
ylabel('Growth Rates')

figure(3)
yyaxis left
plot([2:T]',P(2:T)','LineWidth',3)
yyaxis right
plot([2:T]', Y_level(2:T)','LineWidth',3)
xlabel('Time')
ylabel('Levels')
legend('Prices','Output')
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```
figure(4)
yyaxis left
plot([2:T]',infl(2:T)','LineWidth',3)
yyaxis right
plot([2:T]',Y_gr(2:T)','LineWidth',3)
xlabel('Time')
ylabel('Growth Rates')
legend('Inflation','Output Growth')

figure(5)
plot([1:T]',Q','-b','LineWidth',3)
title('Interest Rates')
xlabel('Time')
ylabel('Rates')



disp('Correlation between Money gr, Inflation, Y gr and Q')
corrcoef([1+TAU(2:T)' infl(2:T)' Y_gr(2:T)' Q(2:T)'])

% put everything here in gross growth terms so 1+tau
% dropped the first observation since not stochastic draw

disp('Correlation when we lag money growth')
corrcoef([1+TAU(1:T-1)' infl(2:T)' Y_gr(2:T)' Q(2:T)'])

% Note that the new money growth rate tau hits P_{t+1} through M so lag
% comes in too.


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Part 2: Correlations and Long-Run Growth rates
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%lrg_TAU = ((1+TAU(11:T))./(1+TAU(1:T-10))).^(1/10);

lrg_M = ((1+M(11:T))./(1+M(1:T-10))).^(1/10);

lrg_Y = (Y_level(11:T)./Y_level(1:T-10)).^(1/10);

lrg_P = (P(11:T)./P(1:T-10)).^(1/10);


disp('Correlation matrix for long-run money, output and inflation')

corrcoef([lrg_M' lrg_Y' lrg_P'])

% 10 year rolling windows


%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Part 3: Simulation Panels
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

TT = 30; % Using TT now for the length of data in each country

for i = 1:T,    % Using T for the number of countries 100 is pretty large

    % using p for panel. initializing matrix must do that for each year 1
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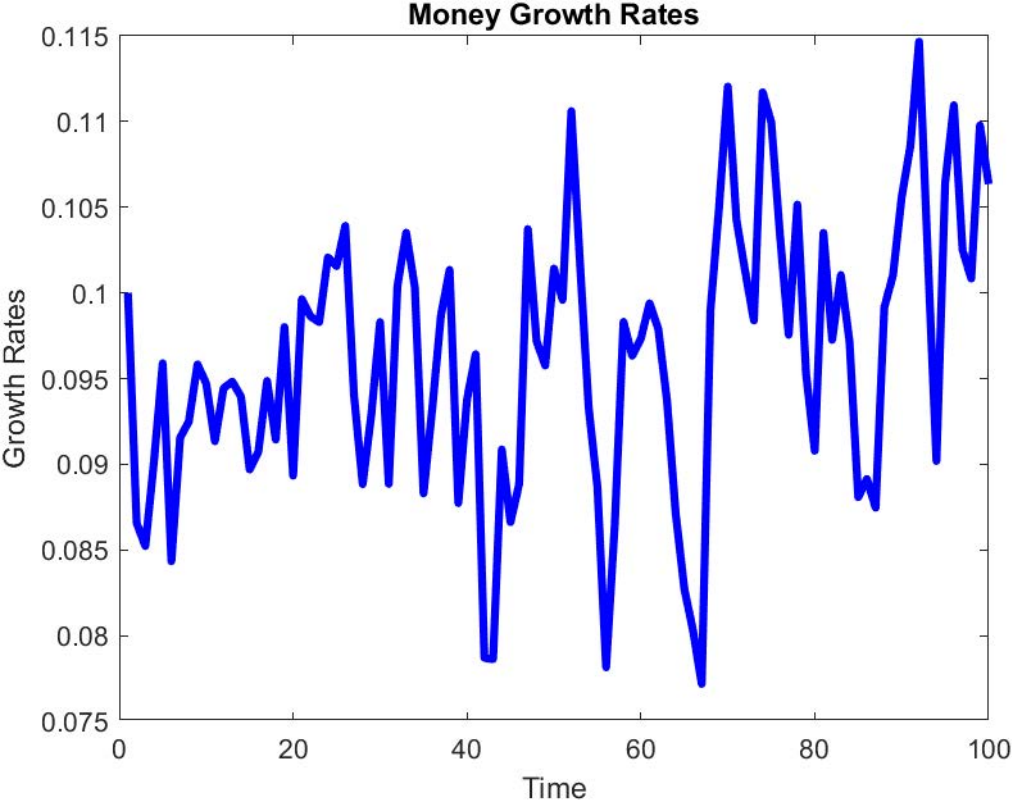
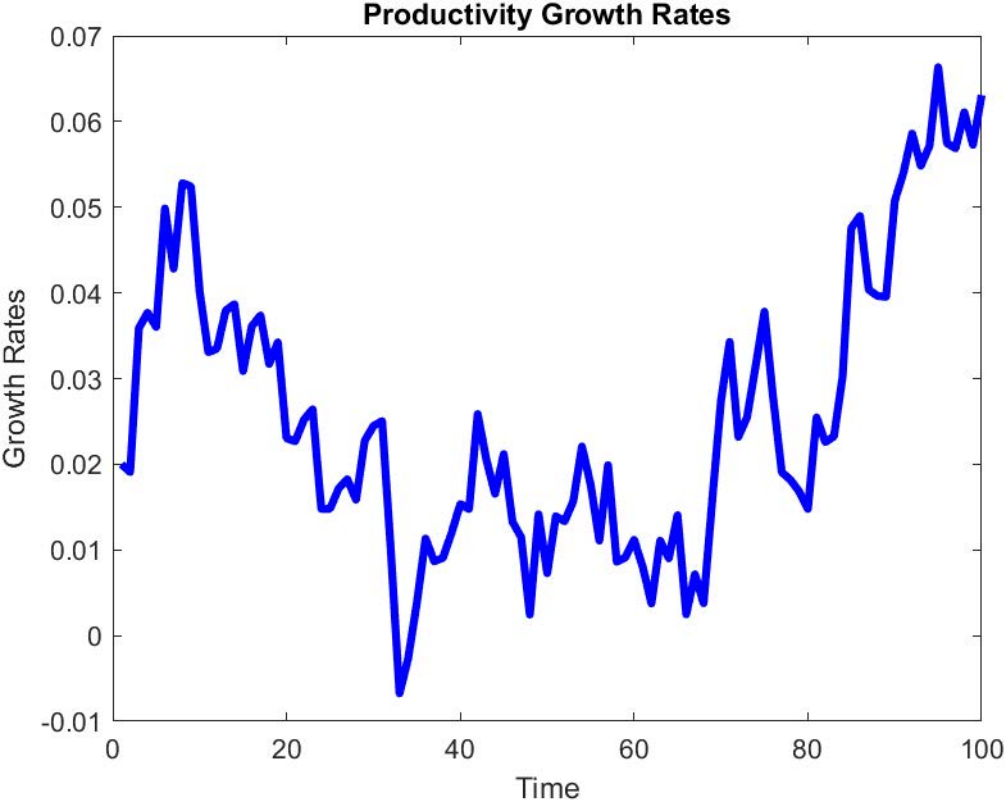
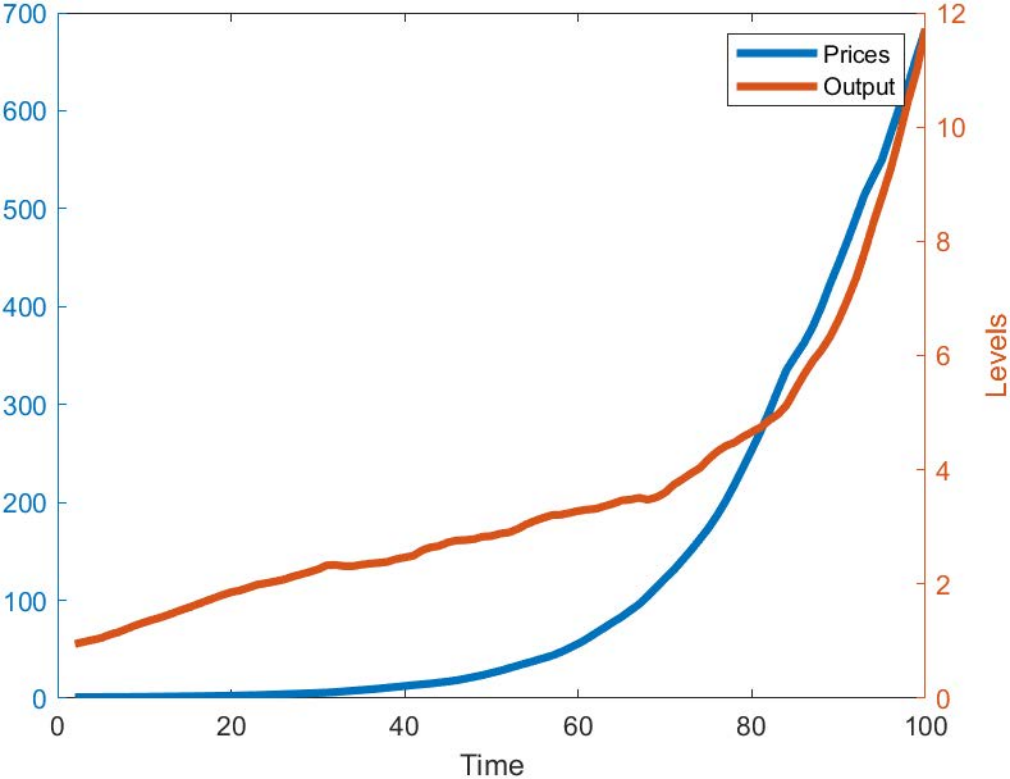
```
    pTAU(1,i) = mean_tau;
    pG(1,i) = mean_g;
    pLabor(1,i) = (beta/(1+mean_tau))^vf;
    Prod(1,i) = 1;
    pY(1,i) = Prod(1,i)*pLabor(1,i);
    Money(1,i) = 1;
    Prices(1,i) = Money(1,i)/pY(1,i);
    for j = 2:TT,
        tau = rho_tau*pTAU(j-1,i)+B_tau+C_tau*randn;
        pTAU(j,i) = tau;
        pLabor(j,i) = (beta/(1+tau))^vf;
        g = rho_g*pG(j-1,i)+B_g+C_g*randn;
        pG(j,i) = g;
        Prod(j,i) = Prod(j-1,i)*(1+g);
        pY(j,i) = Prod(j,i)*pLabor(j,i);
        Money(j,i) = (1+tau)*Money(j-1,i);
        Prices(j,i) = Money(j-1,i)/pY(j,i);  % again money at beginning of period
    end
end
for i = 1:T,
    lrg_TAU = ((1+pTAU(11:TT,i))./(1+pTAU(1:TT-10,i))).^(1/10);
    lrg_Money = ((1+Money(11:TT,i))./(1+Money(1:TT-10,i))).^(1/10);
    lrg_Y = (pY(11:TT,i)./pY(1:TT-10,i)).^(1/10);
    lrg_P = (Prices(11:TT,i)./Prices(1:TT-10,i)).^(1/10);
    A = corrcoef([lrg_Money lrg_P lrg_Y]);
    PCORR_1(i) = A(1,2);
    PCORR_2(i) = A(1,3);
    PCORR_3(i) = A(2,3);
end
```

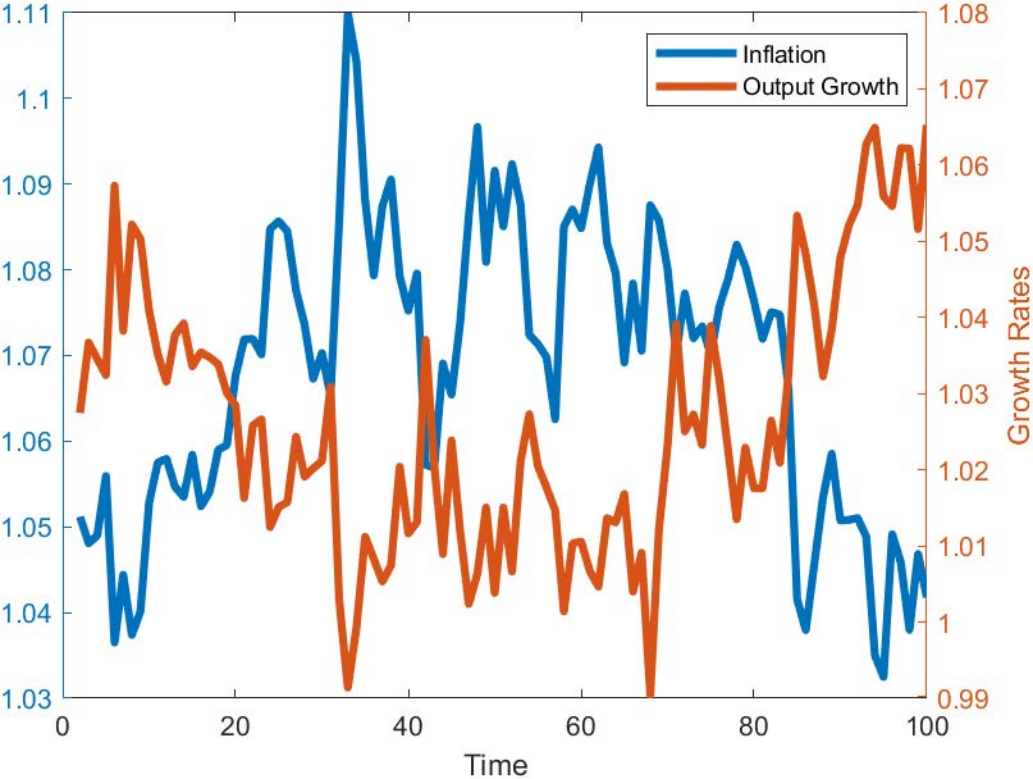
```
figure(6)
histogram(PCORR_1)
title('Histogram LR money growth vs. inflation')

figure(7)
histogram(PCORR_2)
title('Histogram LR money growth vs. output growth')

figure(8)
histogram(PCORR_3)
title('Histogram LR inflation vs. output growth')


end
```

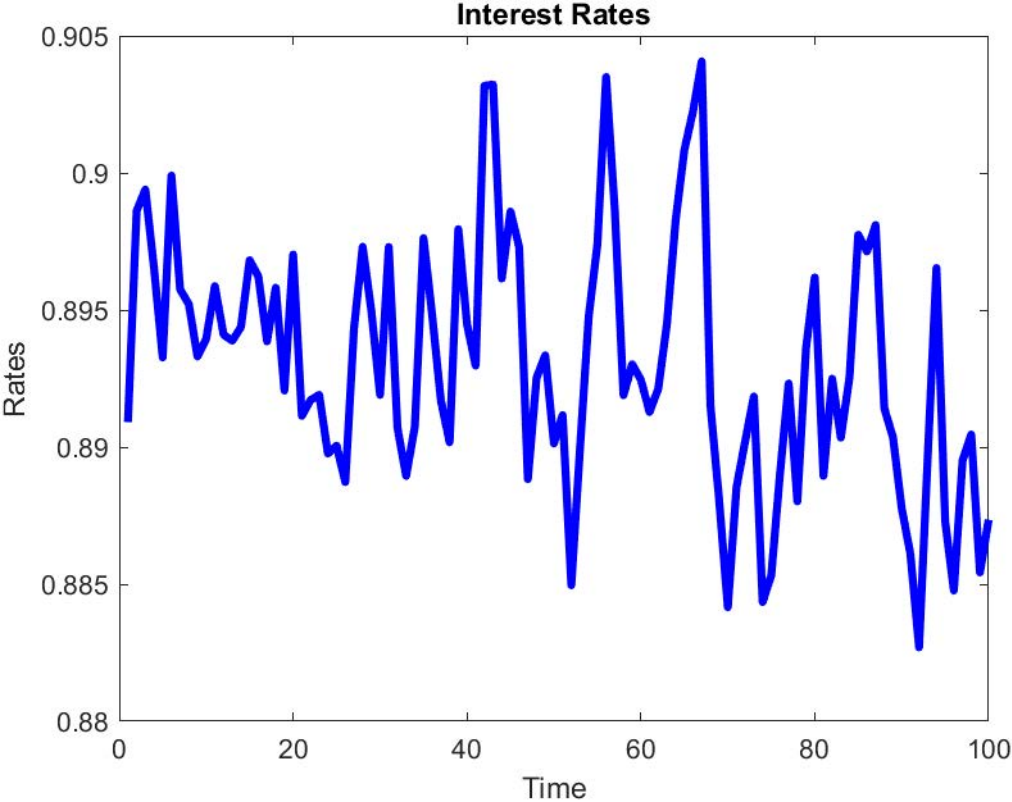
```
B_tau =

    0.0300


B_g =

    0.0010

Correlation between Money gr, Inflation, Y gr and Q

ans =

    1.0000    0.1741    0.0949   -1.0000
    0.1741    1.0000   -0.8990   -0.1750
    0.0949   -0.8990    1.0000   -0.0940
   -1.0000   -0.1750   -0.0940    1.0000

Correlation when we lag money growth

ans =

    1.0000    0.0916    0.3398   -0.5648
    0.0916    1.0000   -0.8990   -0.1750
    0.3398   -0.8990    1.0000   -0.0940
   -0.5648   -0.1750   -0.0940    1.0000

Correlation matrix for long-run money, output and inflation

ans =

    1.0000   -0.1367    0.3329
   -0.1367    1.0000   -0.9629
    0.3329   -0.9629    1.0000

>>
```

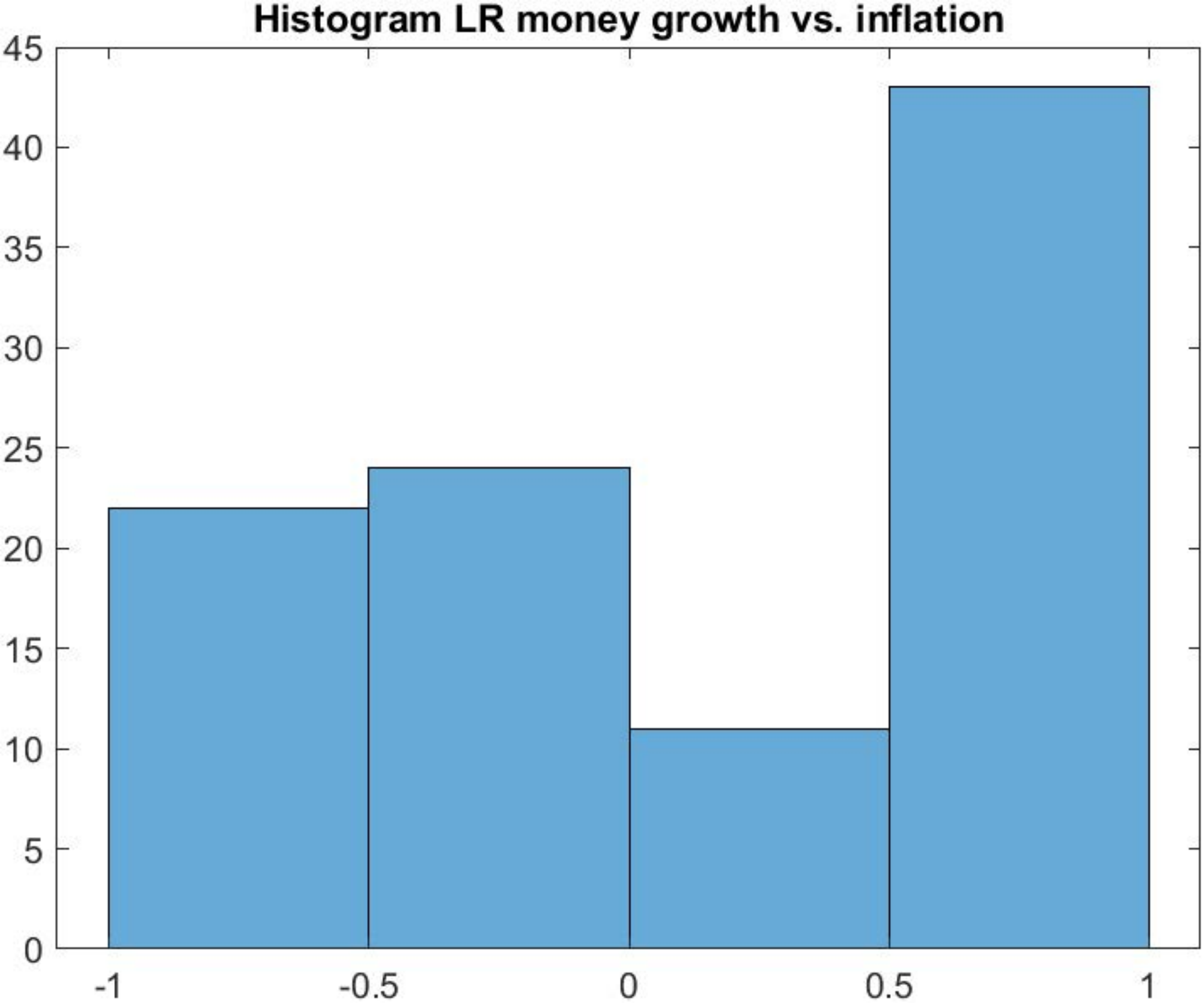

Money Growth Rates
Growth Rates
Time
0.115
0.11
0.105
0.1
0.095
0.09
0.085
0.08
0.075
0
20
40
60
80
100

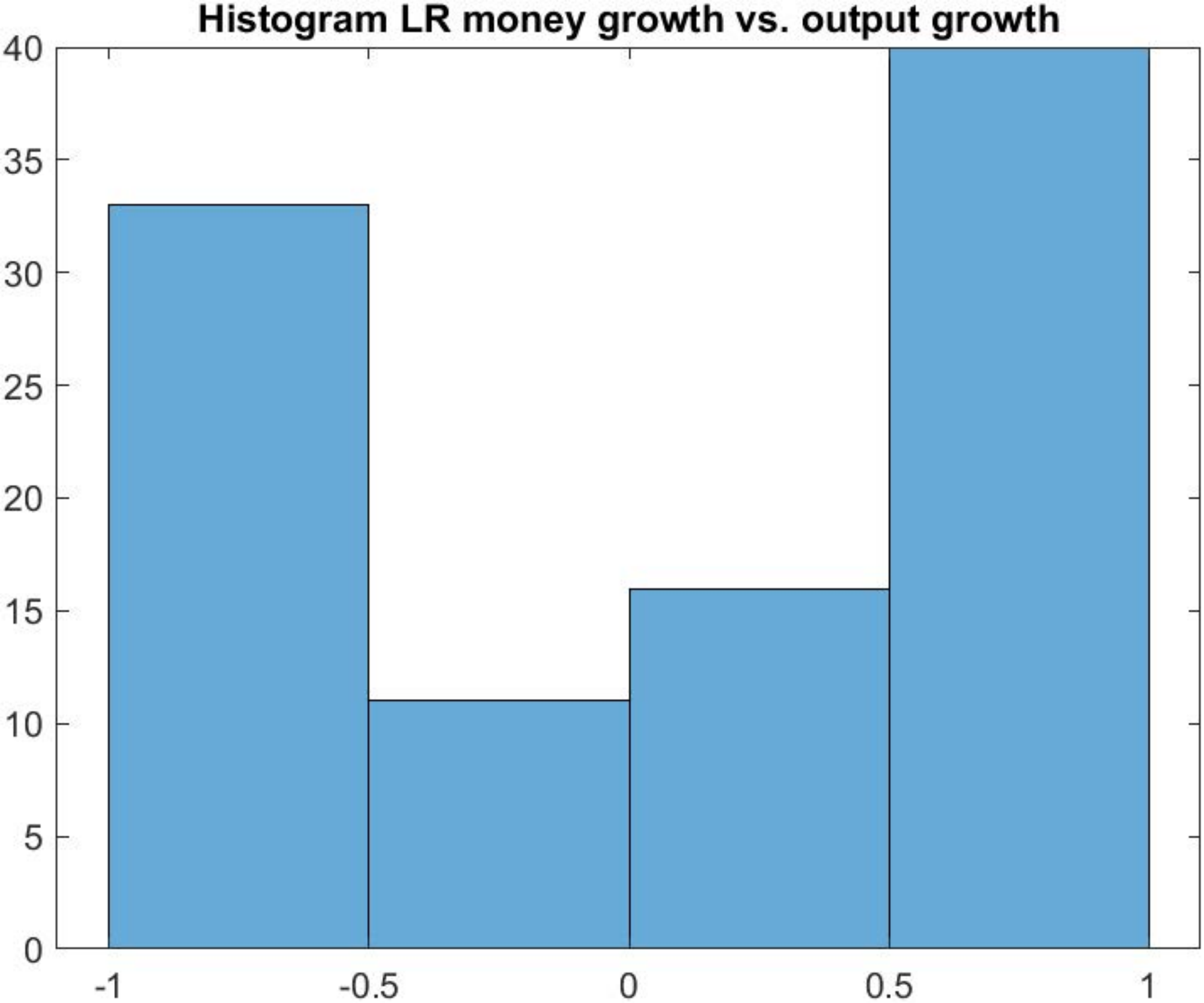

Productivity Growth Rates
Growth Rates
Time
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
0
20
40
60
80
100

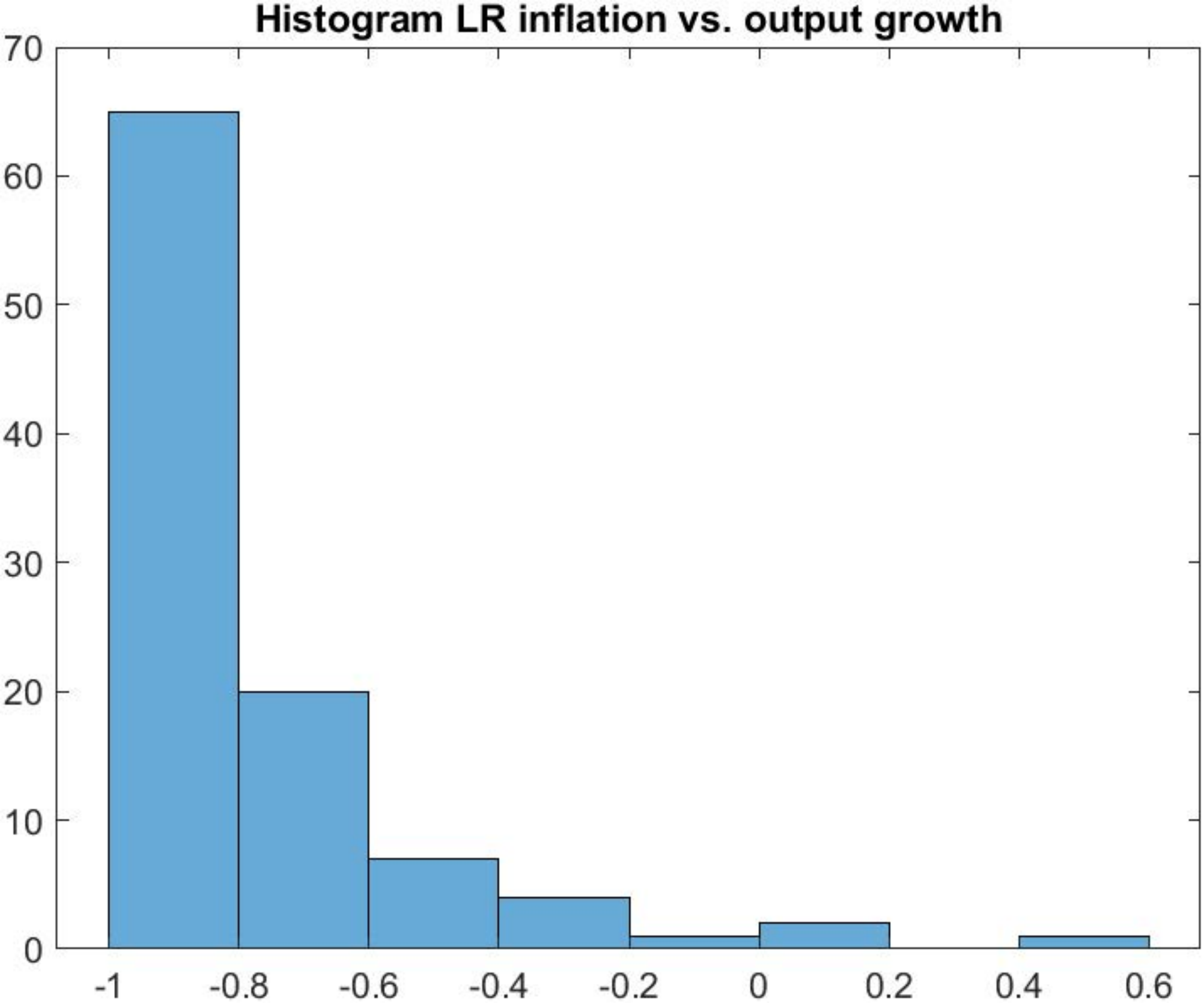

Prices
Output
700
600
500
400
300
200
100
0
12
10
8
6
4
2
0
Levels
0
20
40
60
80
100
Time


Inflation
Output Growth
1.11
1.1
1.09
1.08
1.07
1.06
1.05
1.04
1.03
1.08
1.07
1.06
1.05
1.04
1.03
1.02
1.01
1
0.99
Growth Rates
0
20
40
60
80
100
Time


Interest Rates
0.905
0.9
0.895
0.89
0.885
0.88
Rates
0
20
40
60
80
100
Time


Histogram LR money growth vs. inflation
45
40
35
30
25
20
15
10
5
0
-1
-0.5
0
0.5
1


Histogram LR money growth vs. output growth
40
35
30
25
20
15
10
5
0
-1
-0.5
0
0.5
1


Histogram LR inflation vs. output growth
70
60
50
40
30
20
10
0
-1
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6