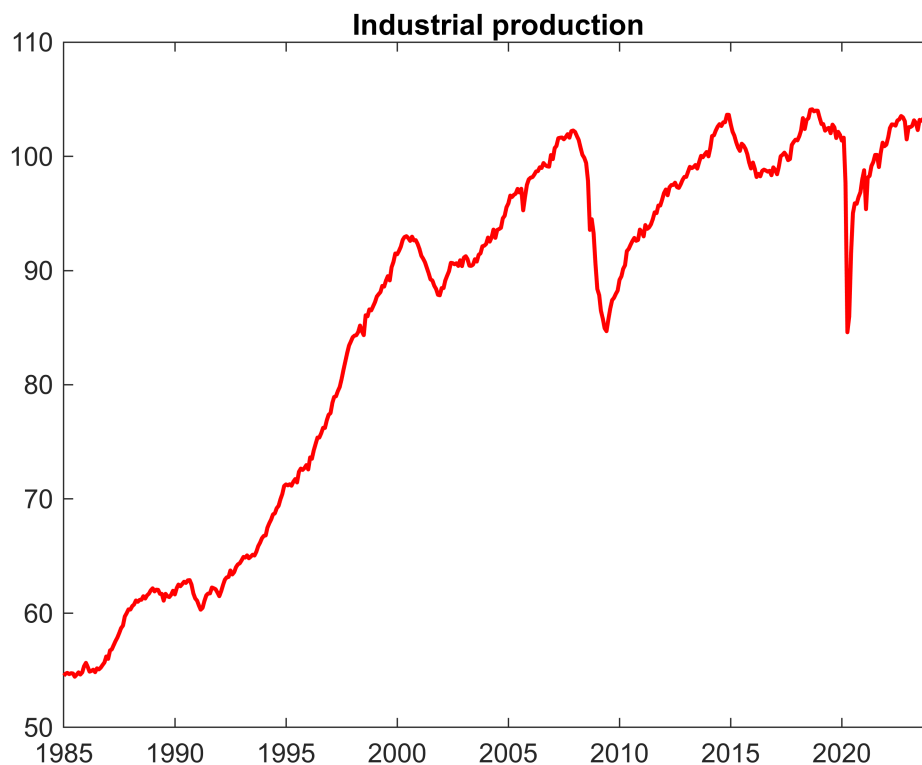


```

clear; clc;
%% ----- EXE1 -----
% Part a
% ===== import data: xlsread
Y = xlsread('USdata.xlsx'); % load dataset from excel file
[T, N] = size(Y); % dimensions of Y
varnames = {'Industrial production'; 'Unemployment rate'; 'Money supply'; 'Stock
prices (% change)'};
unit = {'index'; 'rate'; 'index'; 'rate'};
% to construct a sequence of time: datetime
time = (datetime(1985,01,01):calmonths(1):datetime(2024,02,01))';
% ===== plot the ts: plot
figure
plot(time,Y(:,1),'color','r','LineWidth',1.5);
title('Industrial production')

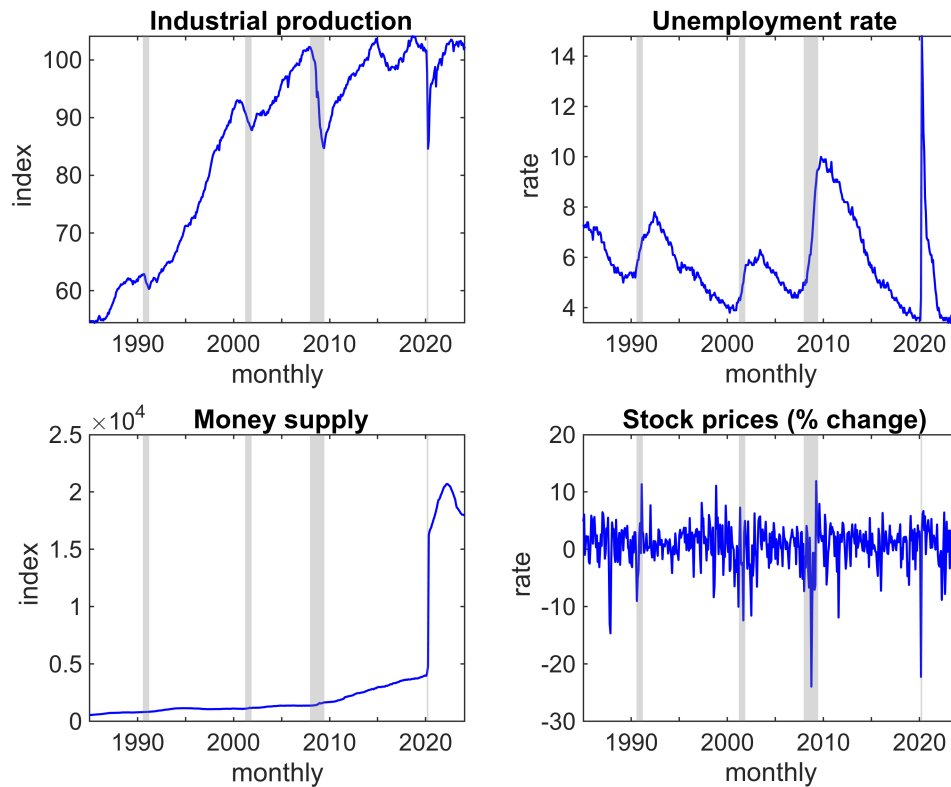
```



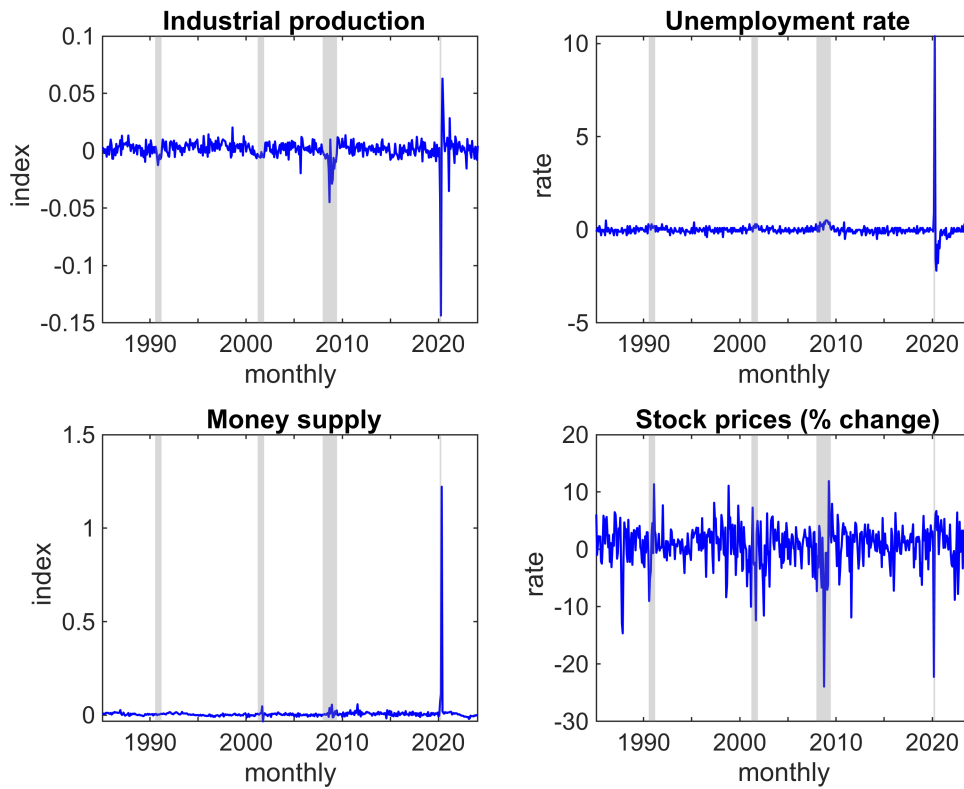
```

% multiple graphs in one figure: subplot
figure
for i=1:N
subplot(2,2,i)
plot(time,Y(:,i),'color','b','LineWidth',0.8);
recessionplot; % US business cycle
xlabel('monthly');
ylabel([' ' unit{i}])
title([' ' varnames{i}])
end

```

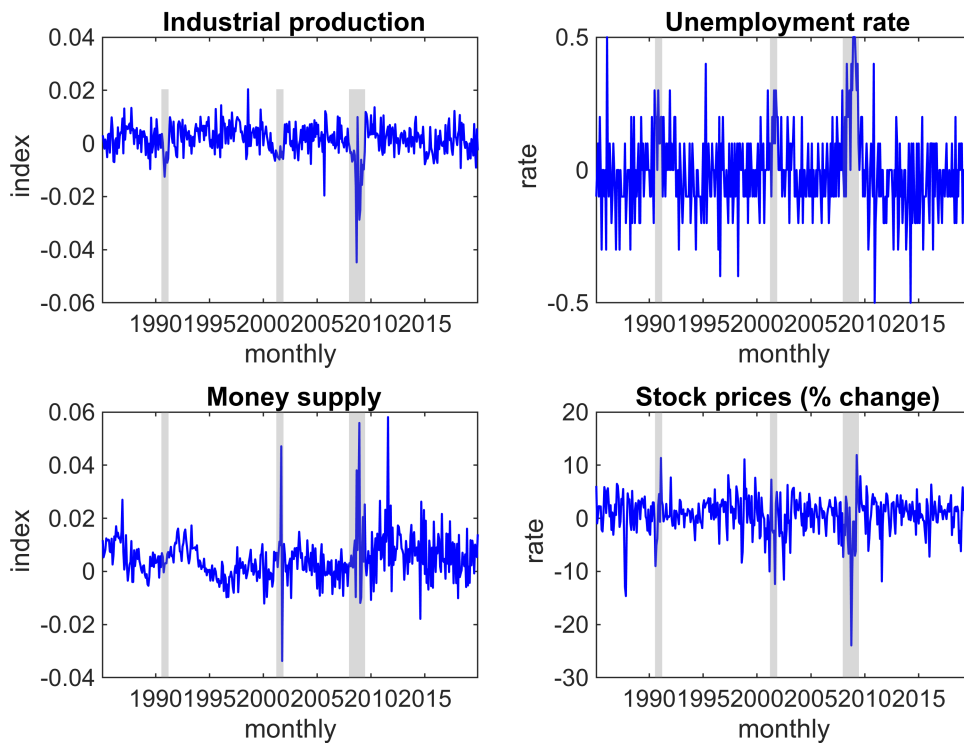


```
% Part b
% ===== Data transformation
tcode = [3;2;3;1]; % 3: first diff of log, 2: first diff, 1: no transform
Yn = zeros(T-1,N); % store data
for i=1:N
    if tcode(i)==3
        Yn(:,i) = diff(log(Y(:,i))); % log(Y_{t}) - log(Y_{t-1})
    elseif tcode(i)==2
        Yn(:,i) = diff(Y(:,i)); % Y_{t} - Y_{t-1}
    else
        Yn(:,i) = Y(2:end,i);
    end
end
time2 = time(2:end);
% plot time series
figure
for i=1:N
    subplot(2,2,i)
    plot(time2,Yn(:,i),'color','b','LineWidth',0.8);
    recessionplot; % US business cycle
    xlabel('monthly');
    ylabel([' ' unit{i}])
    title([' ' varnames{i}])
end
```

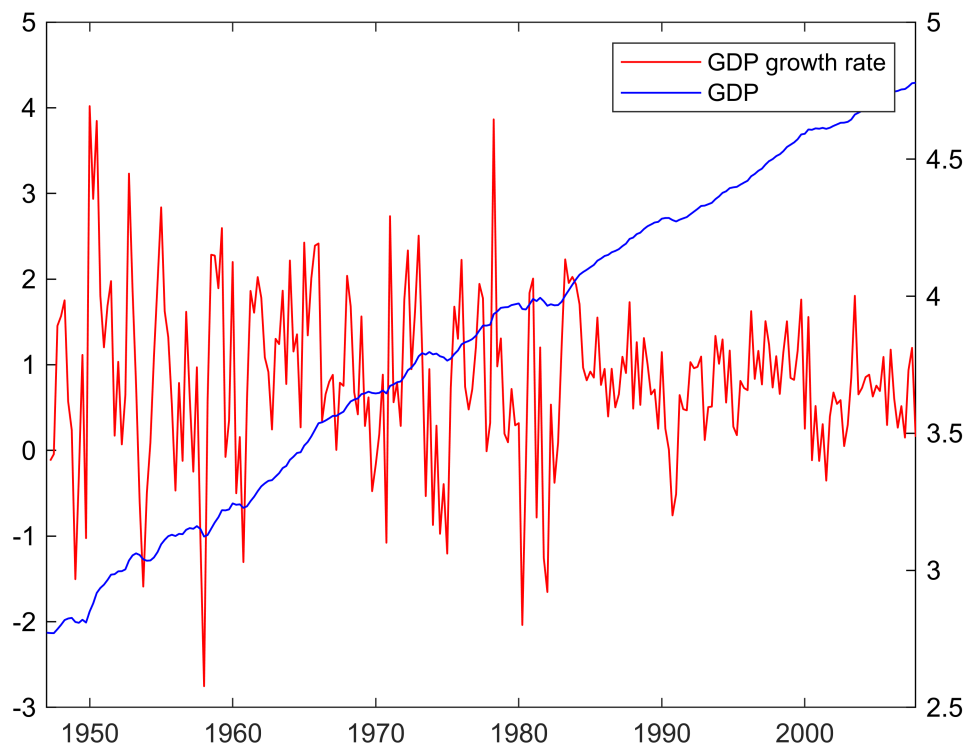


```
% ts before 2019 Dec
tind = find(time2==datetime(2019,12,01));
figure
for i=1:N
subplot(2,2,i)
plot(time2(1:tind),Yn(1:tind,i),'color','b','LineWidth',0.8);
recessionplot; % US business cycle
xlabel('monthly');
ylabel([' ' unit{i}])
title([' ' varnames{i}])
end
sgtitle('Time series before pandemic')
```

## Time series before pandemic



```
%% ----- EXE2-----
% ===== part a
clear; clc;
Y = xlsread('RRdata.xlsx');
PCGDP = Y(:,1); % real GDP
PCGDPl = Y(:,2); % first diff of log GDP
EXOGENRRATIO = Y(:,3); % exogenous tax changes
time = (datetime(1947,01,01):calquarters(1):datetime(2007,10,01))';
% plot
figure
colororder({'k','k'});
yyaxis left
plot(time,PCGDPl,'-r','LineWidth',0.7); hold on;
yyaxis right
plot(time,log(PCGDP),'-b','LineWidth',0.7);
legend('GDP growth rate','GDP');
```



```
%% part b
% ===== sample autocorrelation function: autocorr
[acf_s,lags,CI] = autocorr(EXOGENRRATIO,12);
disp([lags,acf_s])
```

```
0      1.0000
1.0000 -0.0151
2.0000 -0.0020
3.0000  0.0436
4.0000  0.0507
5.0000 -0.0372
6.0000  0.0358
7.0000 -0.0253
8.0000 -0.0587
9.0000  0.0037
10.0000 -0.0031
11.0000 -0.0578
12.0000 -0.0260
```

```
disp(CI)
```

```
0.1280
-0.1280
```

```
% ===== plot the autocorrelogram for the fiscal shock and GDP growth rate
figure
subplot(2,1,1)
autocorr(EXOGENRRATIO,12);
ylim([-0.5 1]);
```

```

title('ACF for the fiscal shock');
subplot(2,1,2)
autocorr(PCGDP1,12)
ylim([-0.5 1])
title('ACF for the GDP growth rate')

```

