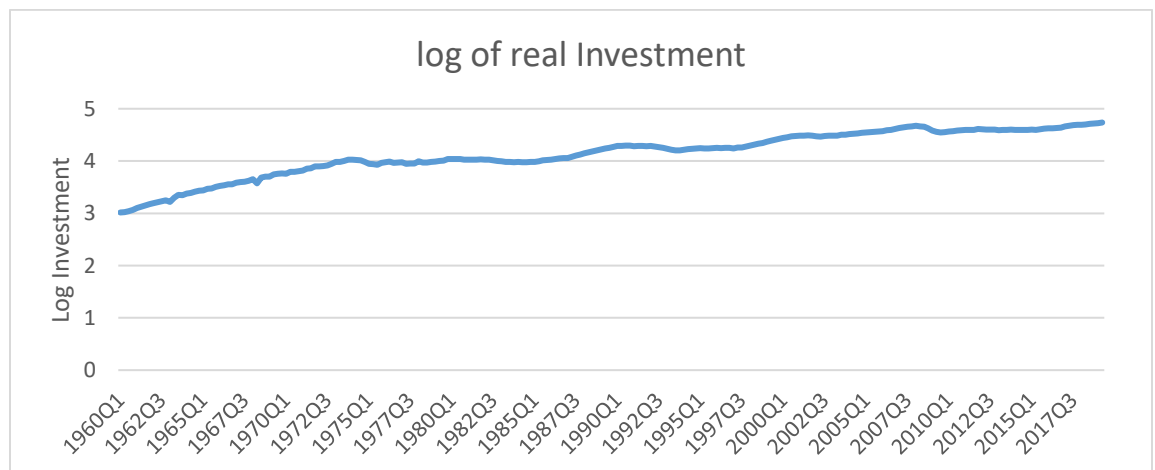
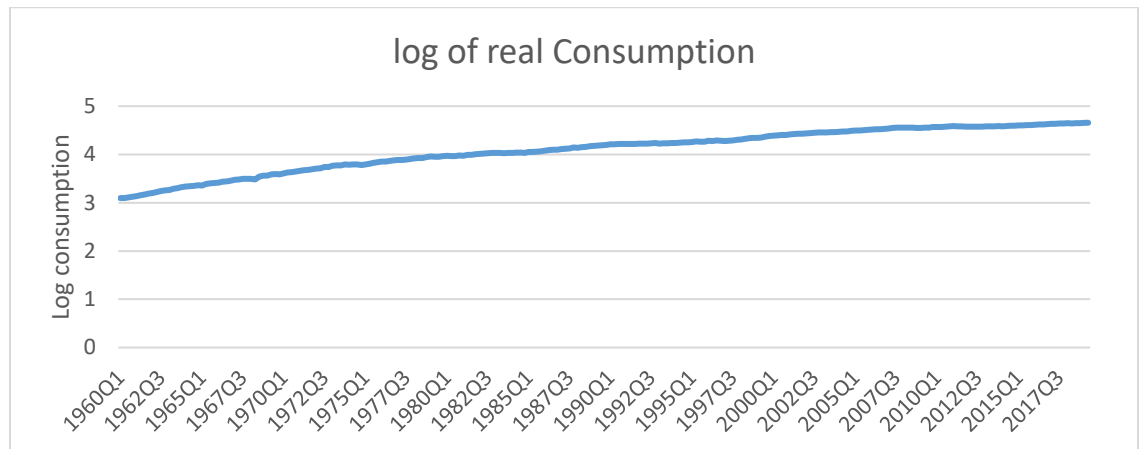
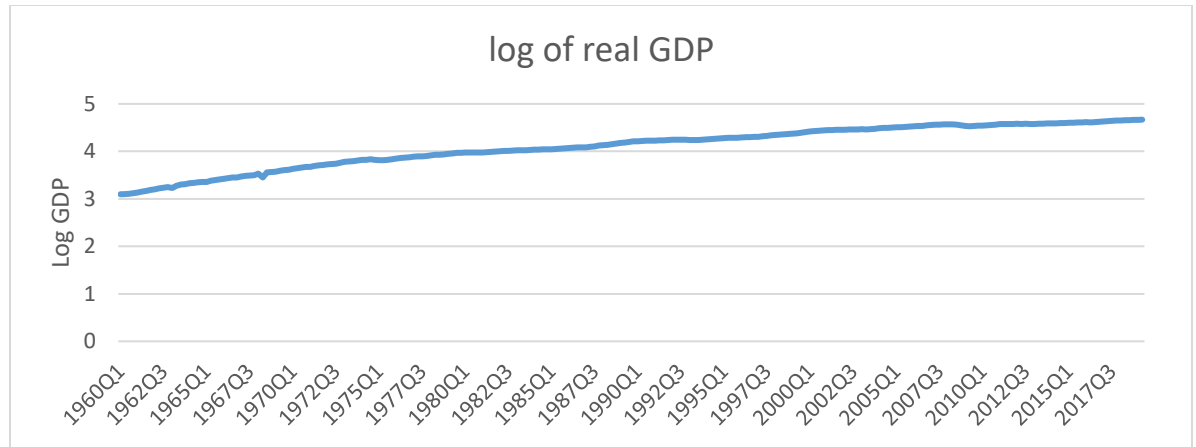


Homework 1

1. Download quarterly, seasonal adjusted data on real GDP, real Private final consumption expenditure, and real Gross Fixed Capital formation (Investment) of France for the period 1960Q1-2019Q2. All of this data can be downloaded from FRED, the Federal Reserve Bank of St. Louis data base: <https://fred.stlouisfed.org/>
(Note: For the following questions, you don't need to report data series in a spreadsheet. When you plot the series, be sure to label the graphs and put explanatory notes for the graphs.)

- a. Take the natural logarithm of each series and plot each against time. Which series appears to move around the most? Which series appears to move the least?
Answer:

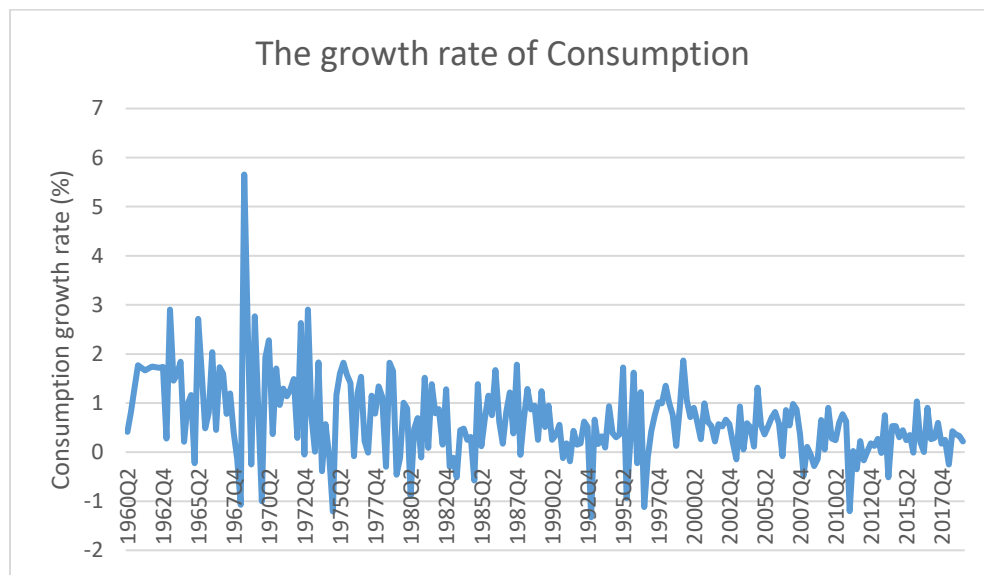


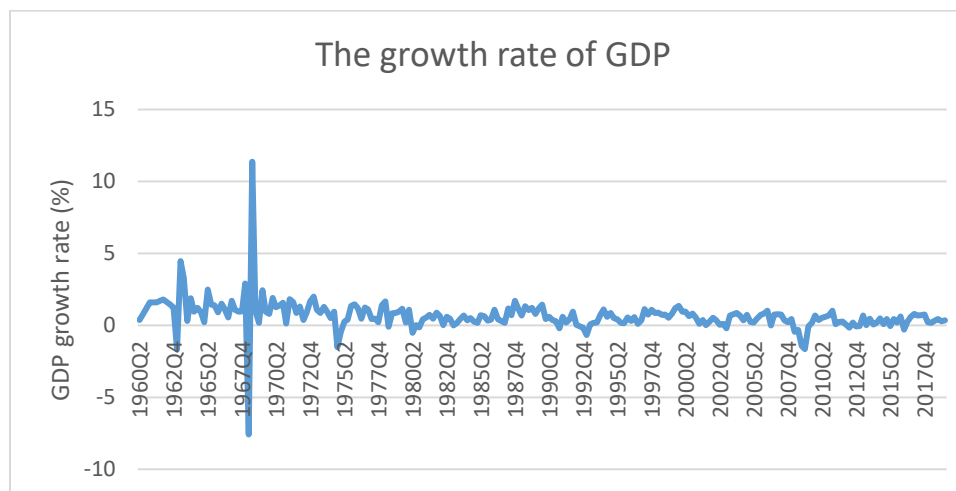
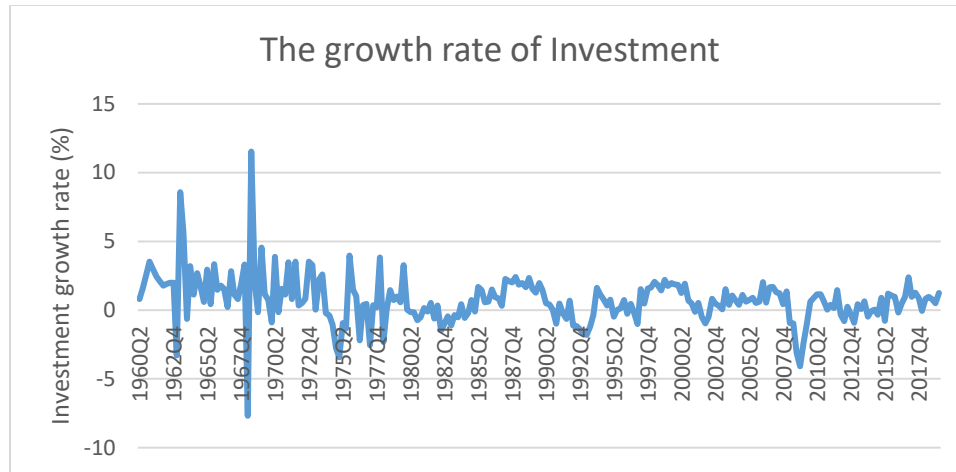


Investment series appears to move around most. Consumption and GDP appear to move the least.

- b. The growth rate of a random variable x , between dates $t - 1$ and t is defined as $g_t^x = \frac{x_t - x_{t-1}}{x_{t-1}}$. Calculate and plot the growth rate of each of the three series (using the raw series, not the logged series) and write down the average growth rate of each series over the entire sample period. Are the average growth rates of each series approximately the same?

Answer:





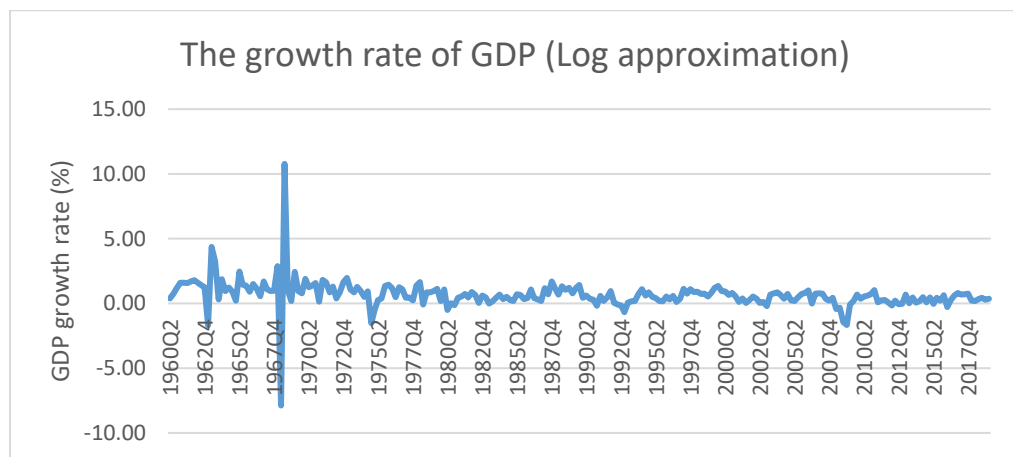
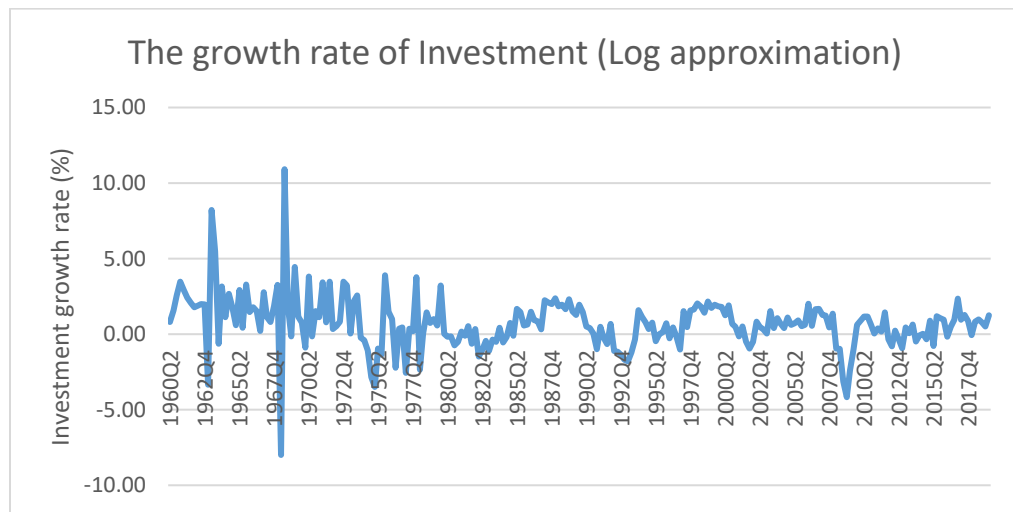
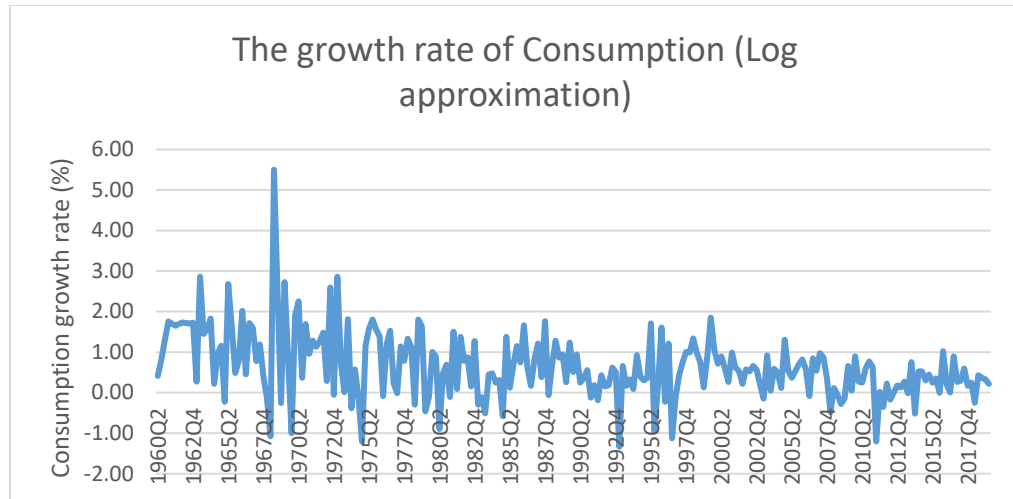
Average growth rate of

Consumption: 0.66%, Investment: 0.74%, GDP : 0.67%.

The growth rate of consumption and GDP are similar so they are approximately same but the investment increases faster.

- c. In Appendix A of textbook, the authors show that the first difference of the log is approximately equal to the growth rate: $g_t^x \approx \ln x_t - \ln x_{t-1}$. Compute and plot the approximate growth rate of each series this way. Comment on the quality of the approximation.

Answer:



We can find the quality of approximation is good when we compare the series in (b) and (c).

- d. The standard deviation of a series of random variables is a measure of how much the variable jumps around about its mean. Take the time series standard deviation of the growth rates of the three series mentioned above and rank them in terms of magnitude.

Answer: Standard deviation of Consumption, Investment and GDP growth rates are 0.83%, 1.75%, 1.12%, respectively. Thus, the rank of them is $STD(\text{Investment growth}) > STD(\text{GDP growth}) > STD(\text{Consumption growth})$

- e. A popular definition of a recession is a period of time in which real GDP declines for at least two consecutive quarters. Using this consecutive quarter decline definition, find and report recession dates for the entire post-war period.

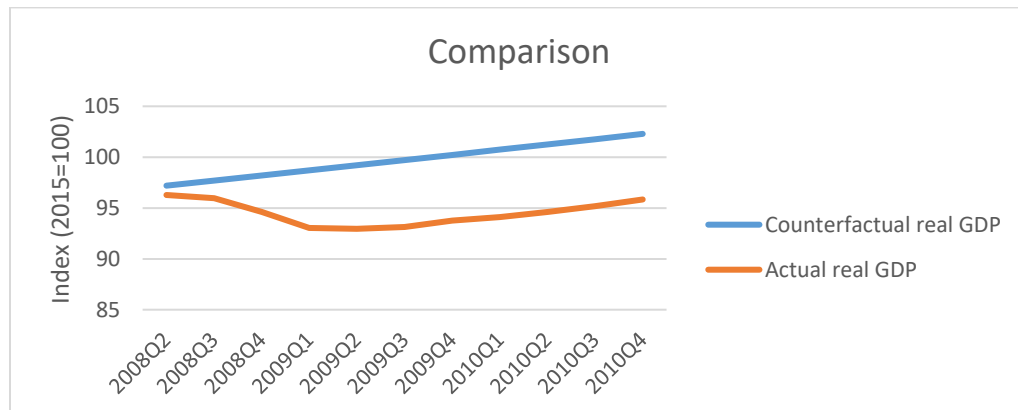
Answer: 1974Q4 – 1975Q1, 1992Q3 – 1993Q1, 2008Q2 – 2009Q2, 2012Q4 – 2013Q1

- f. During the Global financial crisis, France has entered the recession in the second quarter of 2008. Compute and report the average growth rate of real GDP for the period 2003Q1-2008Q1. Compute a counterfactual time path of the level of real GDP if it had grown at that rate over the period 2008Q2-2010Q4. Visually compare the counterfactual time path of GDP with the actual time path of GDP in one graph, and comment (intelligently) on the cost of the recession.

Answer: The average growth rate of real GDP over 2003Q1-2008Q1 is 0.5120%. Given this average rate, we can recursively calculate the counterfactual time path of the level of real GDP over 2008Q2 – 2010Q4 as

$$Y_{t+1} = 1.00512 \times Y_t$$

where t starts from 2008Q1.



The path of real GDP seems to restore the slope (growth rate) but not the intercept (level). Consider the last period 2010Q4. Then, counterfactual real GDP at 2010Q4 is 102.28, which is 6.73% higher than the actual real GDP at 2010Q4, 95.84. Thus, if there had been no recession, the real GDP would had been higher than actual real GDP by 6.73% at 2010Q4. Thus, the cost of recession would be 6.73% of 2010Q4 actual real GDP level at 2010Q4. We can do the similar calculation for the period over 2008Q2 – 2010Q3. Then, we have the cost of recession for each period as

0.95% of 2008Q2 real GDP at 2008Q2
1.80% of 2008Q3 real GDP at 2008Q3
3.80% of 2008Q4 real GDP at 2008Q4
6.09% of 2009Q1 real GDP at 2009Q1
6.72% of 2009Q2 real GDP at 2009Q2
7.08% of 2009Q3 real GDP at 2009Q3
6.89% of 2009Q4 real GDP at 2009Q4
7.04% of 2010Q1 real GDP at 2010Q1
7.02% of 2010Q2 real GDP at 2010Q2
6.93% of 2010Q3 real GDP at 2010Q3.