Macroeconomics Research Project III
U.S. Unemployment, GDP Growth, and Inflation

In this project, our task is threefold: 1) examine the unemployment situation in 2008 financial crisis; 2) explore the long run relation between real GDP growth rate and unemployment rate; 3) investigate the long run relation between inflation rate and unemployment rate. Please follow the steps below and download relevant dataset.

1. Review lectures on GDP, inflation, and unemployment.

2. Access Labor Force Statistics at BLS http://data.bls.gov/cgi-bin/surveymost?ln
   a. Select "Unemployment Rate - LNS14000000"
   b. Click "Retrieve data", select years from "2006 to 2020"
   c. Download the ".xlsx" file for this series in a spreadsheet

3. Access Labor Force Statistics at BLS http://data.bls.gov/cgi-bin/surveymost?ln
   a. Select Unemployment Rate - "White - LNS14000003", "Black or African American - LNS14000006", "Asian - LNS14032183", "Hispanic or Latino - LNS14000009"
   b. Click "Retrieve data", select years from "2006 to 2020"
   c. Download the ".xlsx" files for each series in separate spreadsheet

4. Access Labor Force Statistics at BLS http://data.bls.gov/cgi-bin/surveymost?ln
   a. Select Unemployment Rate – 25 Years & Over, "Less than a High School Diploma - LNS14027659", "High School Graduates No College - LNS14027660", "Some College or Associate Degree - LNS14027689", "Bachelor's Degree and Higher - LNS14027662"
   b. Click "Retrieve data", select years from "2006 to 2020"
   c. Download the ".xlsx" files for each series in separate spreadsheet

5. Access FRED Economic Data at Federal Reserve Bank of St. Louis and download the three series. From "Edit Graph" item, all select Frequency "Annual", Aggregation Method "Average", Data Range "1950 to 2020".
   a. Civilian Unemployment Rate (UNRATE), select "Percent" in Units https://research.stlouisfed.org/fred2/series/UNRATE/downloaddata
   b. Real Gross Domestic Product (GDPC1), select "Percent Change from Year Ago" https://research.stlouisfed.org/fred2/series/GDPC1/downloaddata
   c. Consumer Price Index: All Items (CPIAUCSL), select "Percent Change from Year Ago" https://research.stlouisfed.org/fred2/series/CPIAUCSL/downloaddata

I. Unemployment Situation during and after the 2008 financial Crisis

1. Employ the data from step 2 to analyze the overall unemployment situation during the sample period.
   a. Calculate the average unemployment rate for each year from 2006 to 2020 using the monthly data. Plot this newly calculated time series in a graph.
   b. What patterns can be observed from the calculated time series? What is the maximum and minimum? Any trends or cycles? Does the series coincide with the business cycle? Explain.
   c. From the data, can you estimate the natural rate of unemployment for the past 10 years? Explain.

2. Employ data from step 3 to analyze the unemployment rate by ethnicity during the sample period.
   a. For each ethnicity, calculate the average unemployment rate in each year using the monthly data.
   b. Open a new spreadsheet, copy and paste four calculated the unemployment rate series in it.
   c. Plot the average unemployment rate series (2006-2020) for the four ethnicities in one graph.
   d. What patterns can be observed? Any trends or cycles? Do they share any common features?
   e. Which ethnicity has the lowest unemployment rate in the sample period? Highest rate?
   f. Could you provide any explanations from the economic concepts or models studied?

3. Employ data from step 4 to analyze the unemployment rate by education in the sample period.
   a. For each education level, calculate the average unemployment rate in each year using the monthly data in the spreadsheet.
   b. Open a new spreadsheet, copy and paste four calculated the unemployment rate series in it.
   c. Plot the average annual unemployment rate series (2006-2020) for the four educational levels in one graph. Comment on the patterns. Any trends or cycles? Do they share any similarities?
   d. Which education level has the lowest unemployment rate in the sample period? Highest rate?
   e. Could you provide any explanations from the economic concepts or models studied?

II. U.S. Unemployment Rate, Output Growth, and Inflation Rate in the Long Run (1950-2020)

4. Employ data from step 5 to analyze the relations between unemployment rate and GDP growth rate.
   a. Plot the two time series in the same graph for the entire sample period. For each series, what patterns can be observed from the data or the graph? Any trends or cycles? Do they follow any similar or common patterns? Explain in detail.
   b. Do the unemployment series and real GDP growth rate series correlate with one another? Are they positively or negatively correlated? What is the economic explanation for such correlation?
   c. Which series is the first mover? Which is the second? Is one always leading or lagging the other in the same sample period? Which series is more likely to cause the change in the other? Explain.

5. Employ data from step 5 to analyze the relations between unemployment rate and inflation rate.
   a. Plot the two time series in the same graph for the sample period 1950-2020.What patterns can be observed from the data or the graph? Any trends or cycles? Explain in detail.
   b. Plot the inflation rate against unemployment rate for the whole sample period (71 years). Calculate the sample correlation coefficient between them. Is there a tradeoff between the two?
   c. Plot the inflation rate series against unemployment rate series in a graph for the period 1950 to 1959, and then for 1960 to 1969, and so on for every subsequent ten-year period until the last for last period 2010 to 2019. In total, there are seven graphs.
   d. For each of the sub-period graphs, do you observe a tradeoff relation between unemployment rate and inflation rate? Can you find a period when the trade-off relation is most evident?
   e. What are the economic models and explanations for the short-run and long-run relations between the two variables?