

Macroeconomics Research Project II Inflation, Interest Rates, and Market Expectation

In this project, our task is threefold: 1) calculating inflation rates through the GDP deflator method and the CPI methods; 2) compare various measures of inflation rate; 3) infer market inflation expectations from interest rate data and evaluate expectation errors. Follow the steps below and download relevant dataset first.

1. Review lectures on GDP deflator, CPI, and Inflation
2. Access National Income Account Database <http://unstats.un.org/unsd/snaama/selCountry.asp>
 - a. Select Country: United States
 - b. Select Series: Gross Domestic Product (GDP)
 - c. Select Years: 1970 - 2020
 - d. Submit selection and download the data in a spreadsheet
3. Access Bureau of Labor Statistics CPI Database <http://data.bls.gov/cgi-bin/surveymost?cu>
 - a. Select Series “U.S. city average, All Items”
 - b. Click “Retrieve data”, select years from 1970 to 2020 and “include annual averages”
 - c. Download the xlsx file for this series in a separate spreadsheet
4. Access the same CPI database from <http://data.bls.gov/cgi-bin/surveymost?cu>
 - a. Select Series “U.S., All items”, “U.S. All items less food and energy”, “U.S., Food”, “U.S., Energy”, “U.S., Gasoline”, “U.S., Medical care”, “U.S., Physicians' services”, “U.S., Hospital services”, “U.S., Prescription drugs”, “U.S., Shelter”.
 - b. Click “Retrieve data”, select years from “1970 to 2020” and “include annual averages”
 - c. Download the xlsx files for each of the above series
5. Access the interest rate data from <https://www.federalreserve.gov/datadownload/Build.aspx?rel=H15>
 - a. Data set choose “Selected Interest Rates” and then click “Continue”
 - b. Instrument choose “TCMNOM” and “TCMII” and then “Continue”
 - c. Maturity choose “Y1 1-Year” and “Y10 10-year”, then “Continue”
 - d. Frequency choose “Monthly” and then “Add to package”
 - e. Click “Format package” and then choose the “Dates” from 2003-01 to 2020-01
 - f. File type CSV or Excel 2003, Data Labels “Include”, Layout “Series in Columns”
 - g. Click “Go to download”

Note: “TCMNOM” (Treasury constant maturities nominal) and “TCMII” (Treasury constant maturities inflation indexed) are two measures for the nominal interest rate and the real interest rate, respectively, which the benchmark interest rates in the financial markets (presumably default-free) on the U.S. Treasury securities.

I. Inflation Measures: Calculation and Comparison

1. Employ the data from step 2 and calculate inflation rate through GDP deflator method in Excel.
 - a. Calculate the GDP deflator in each year from 1970 to 2020.
 - b. Calculate the percentage change in GDP deflator for the same periods.
 - c. Plot the time series of the percentage change in GDP deflator in a graph.
 - d. What patterns can be observed? In what years has U.S. experienced high inflation? Deflation?
2. Employ the data from step 3 and calculate inflation rate through CPI method in Excel.
 - a. Calculate the percentage change using the annual average CPI series from 1970 to 2020.
 - b. Plot the calculated series in a graph and compare it with 1b calculated from GDP deflator.
 - c. What are the similarities and differences between the two methods in measuring inflation rate?
 - d. Which series tend to be higher? Which series is a better measure of true inflation rate? Why?
3. Employ the data from step 4, calculate their percentage change and make comparisons.
 - a. Calculate the percentage change (inflation rate) using the annual average CPI for the “U.S. All items, 1982-84=100” and the “U.S. All Items Less Food and Energy”.
 - b. Plot the two inflation rates in a graph and compare their patterns.
 - c. What are their differences in two measurements and how are they reflected in the graph?
 - d. Which is the “core CPI”? Which series do you think can better measure true inflation? Why?
4. Employ the data from step 4, calculate their percentage change and make comparisons.
 - a. Calculate the percentage change (inflation rate) using the annual average CPI data for the “U.S., Food”, “U.S., Energy”, “U.S., Gasoline”, “U.S., Medical care”, “U.S., Physicians' services”, “U.S., Hospital services”, “U.S., Prescription drugs”, “U.S., Shelter”
 - b. Plot these calculated annual inflation rate series in a graph and compare them with the annual inflation rate calculated from the “U.S., All items”
 - c. Which series tend to overestimate inflation rate relative to “U.S., All items”? Explain.
 - d. Which series tend to underestimate inflation rate relative to “U.S., All items”? Explain.

II. Market Interest Rates and Inflation Expectations

1. Employ the data from step 3 and step 5 to calculate inflation rates in the Spreadsheet
 - a. Calculate the percentage change (inflation rate) from 12 months ago using the monthly CPI series from 2002-01 to 2020-01. Note that the calculated inflation rate is still a monthly series but starts from 2003-01. Define this series as the actual inflation rate.
 - b. Calculated the expected inflation rates using the “TCMNOM” and “TCMII” series from 2003-01 to 2020-01 for one-year and ten-year ahead, respectively. Why can we infer expected inflation rate this way? [Hint: Fisher equation and the difference between nominal and real interest rates]
 - c. For the one-year ahead expectation horizon, calculated the difference between the actual CPI inflation rate and expected inflation rate. Plot this time series and compute the average value of this series. Is it close to zero? What does it mean if the mean is greater or smaller than zero? How do you evaluate the accuracy of market expectations on the inflation rate?
 - d. Which market expectation horizon (1-year versus 10-year) is more accurate in predicting inflation?