Problem sets 1: Data and measuring business cycles

EE312: Intermediate macroeconomics

Semester 1/2019

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Due on Sept 13th , 2019 at the BE office. (in class 3 pm)

1. Consider an economy with two production sectors, namely private consumption sector (PCS) and private investment sector (PIS). The below tables give the total production and price of both sectors in 2017 and 2018. Consider the following problem

Consumption goods

Year	Wine		Cheese	
	price	units	price	units
2017	6	100	10	150
2018	8	100	2	400

Investment goods

Year	Computer		Truck	
	price	units	price	units
2017	200	4	50	13
2018	260	5	60	15

   a. Calculate nominal consumption, investment and GDP for 2017 and 2018
   b. Calculate the fixed-base year real consumption using 2017 as the base year. Calculate the private consumption deflator.
   c. Calculate the fixed-base year real investment using 2017 as the base year. Calculate the private investment deflator.
   d. Calculate the fixed-base year real GDP using 2017 as the base year. Calculate the GDP deflator.

2. (CPI index) As we discussed in class, the CPI is calculated for a fixed market basket. It measures the change in the cost of the market basket from the base year until the current year. An index with the market basket fixed in the first year, like the CPI, is technically called a *Laspeyres index*. An alternative index, the *Paasche Index*, is based on a market basket in the end year. It measures the change in the cost of a market basket fixed in the

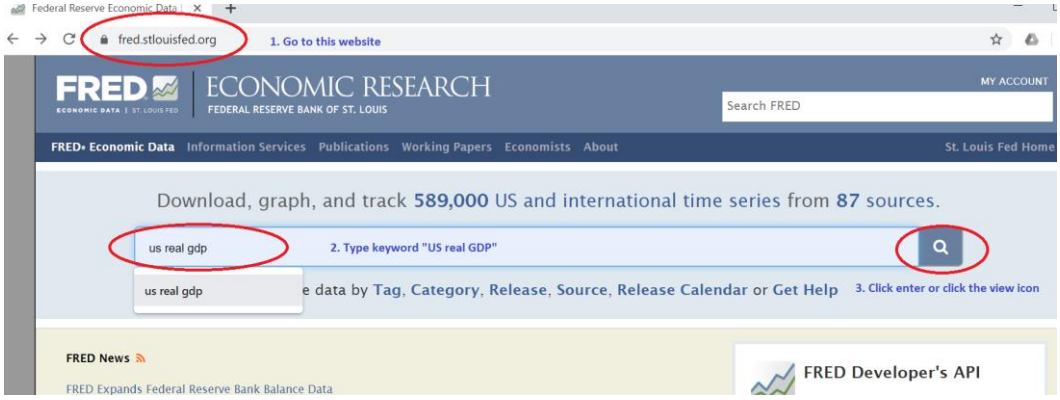
end year. Suppose that the base is 2017, and further that the market basket contains only two items, wine and cheese, and the quantities consumed and prices in 2017 and 2018 are

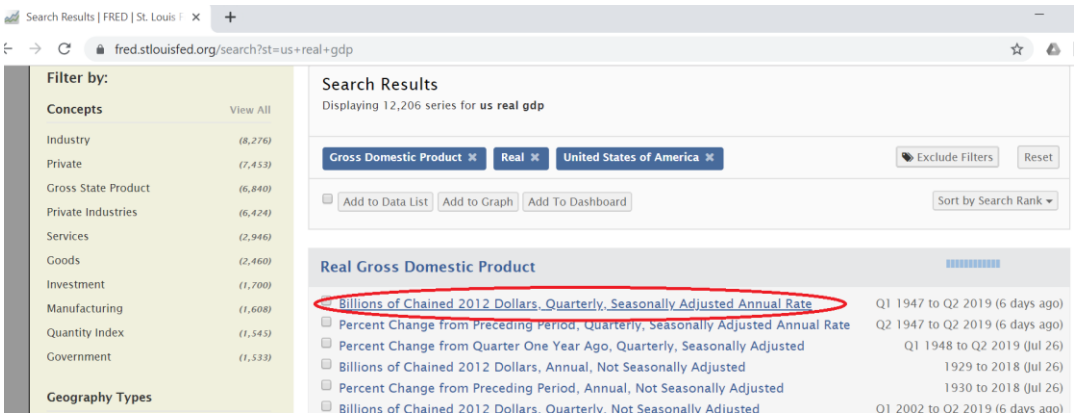
Year	Wine		Cheese	
	price	units	price	units
2017	0.5	50	1	100
2018	2	45	1.2	150

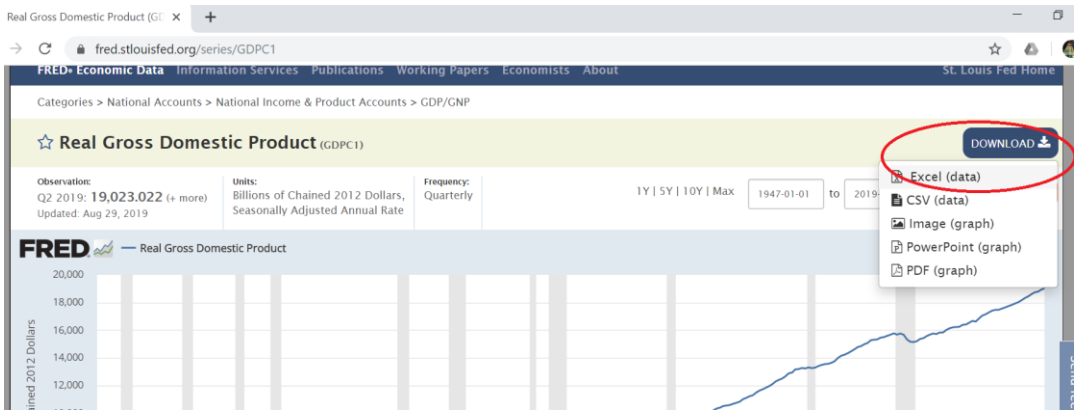
a. Calculate the rate of inflation for the Laspeyres (CPI) index and the Paasche Index.
b. Workers often receive an adjustment in their wages equal to only a fraction of inflation as calculated using the CPI. In view of the preceding analysis, explain why workers would likely be better off than they were before if they were fully compensated for inflation. Would this also be the case if inflation was calculated using the Paasche index?

3. Time-varying pattern of trend

This exercise introduces you a freely accessible database, so called St. Fred. Follow the process below and download the US real GDP series between 1947Q1 and 2019Q2.







Use the data and analyze the following questions.

3.1) Plot the series of the US real GDP in a figure. Use the command provided in the excel.

3.2) From the figure obtained in (3.1), construct the *trend line* of US real GDP using the trend command provided in the excel. Compare the trend equations generated by *linear trend command*, versus the one generated by *exponential trend command*. (You might need to search for more information in YouTube, https://www.youtube.com/watch?v=svFSKnmAIKQ.) Report the representation of the two trend equations. (Scroll down the command box and click at the tab labeled as "display trend equation".) Interpret the meaning of both equations. Which one of the two trend versions does it imply *a constant historical average growth*? Does the constant-trend-growth equation imply a *Y-o-Y average growth* or *Q-o-Q average growth*?

3.3) Based on the two construction methods of trend component, do you find the two approaches sensible in representing the trend of US real GDP? From the constructed figure (with trend and actuals), do you think which phase of business cycles has the US economy been experiencing during the past five years? Do you think it make senses?

3.4) Try to alternatively construct the trend using *Cubic polynomial trend (polynomial order 3)*. Does the cubic polynomial trend imply a constant average growth? Do you think that the cycle generated by the cubic trend more sensible? Why?

3.5) If not, what could this be implied in terms of the assumption gauging the calculation of trend component, and therefore the nature of trend component? Should trend be represented by a constant historical average growth?

4) Working with DATA

We will go through and analyze this problem using the real data. The excel file posted in the BEMoodle folder contains some data set downloaded from the CEIC database. The file has three sheets, namely "CEIC_data", "data_definition", and "USED_data". The first contains all the raw data originally downloaded from the CEIC. (you can disregard the sheet.) The second sheet lists down all the key variable names with the definition of each one provided. (shown in the table below.) The third sheet gives you the data that covers the period between 1993 and 2018 (the third quarter). Consider the following questions (some of the questions will require your excel skillset.)

Variable	Definition	Country
GDP_sa	seasonally adjusted nominal GDP	Thailand
GDP_CVM_sa	seasonally adjusted GDP (real CVM)	Thailand
PFCF_sa	seasonally adjusted private consumption	Thailand
PFCF_CVM_sa	seasonally adjusted private consumption (real CVM)	Thailand
GFCF_CON_SA	seasonally adjusted construction investment	Thailand
GFCF_CON_CVM_SA	seasonally adjusted construction investment (real CVM)	Thailand
GFCF_EQUIP_SA	seasonally adjusted equipment investment	Thailand
GFCF_EQUIP_CVM_SA	seasonally adjusted equipment investment (real CVM)	Thailand
GDP_USA_CVM_SA	seasonally adjusted real GDP	USA
GDP_EURO_CVM_SA	seasonally adjusted real GDP	Euro
GDP_AUS_CVM_SA	seasonally adjusted real GDP	Australia
GDP_BRAZIL_CVM_SA	seasonally adjusted real GDP	Brazil
GDP_JPN_CVM_SA	seasonally adjusted real GDP	Japan
NONCORE_CPI	NON core CPI (Headline CPI: Exclude food and energy)	Thailand
CORE_CPI	Core CPI	Thailand

a) If we plot the series of nominal GDP in the log-scale, what can we then interpret about the slope of the curve?
b) Calculate the Y-o-Y growth of both nominal GDP and real GDP during the past four quarters. What does the difference between the two figures obtained from each quarter imply?
c) Calculate the *investment price deflator* (overall prices of investment goods) for both equipment and construction. Show the figures for the past eight quarters. (In the real data, investment can be divided into two subcomponents, namely equipment and construction. This question is asking you to calculate the deflator for each type of investment.)
d) Calculate the core inflation and non-core inflation using the data between 2000 and 2018. What is the value of the standard deviation of both inflation measures, and its correlation? (**Hint:** you might find the link in this YouTube useful, https://www.youtube.com/watch?v=sGlsdHD-IcA)
e) In the table, we have real GDP data for 5 countries – Thailand, USA, Euro, Australia, Brazil, and Japan. Calculate the Y-o-Y growth of real GDP each country, report the standard deviation of each series and show the pairwise correlation. Use the data between 2000 and 2018.
f) From "e", do you find the perfect correlation among any pairwise figures obtained? Can you attribute this to any reason that might explain the finding? How tightly do

Thai GDP growth comove with US GDP growth? Compare with the figure obtained with respect to Japan GDP growth.