Université d'Ottawa · University of Ottawa

Faculté des sciences sociales | Faculty of Social Sciences
Science Économique | Economics

ECO1102C – Professor Gray
Introduction to macroeconomics

Assignment I: National Accounting and Deflators

Deadline: Monday 25 February 2013
The assignment has a weight of 10 % towards your final grade.

INSTRUCTIONS

1. This assignment is an individual project. It is not permissible to highlight someone else's work, copy it, and then paste it in the document that you submit. All responses should be provided in your own words.
2. You will be graded for the quality and accuracy of your answers and presentation of your results. Include on the cover page your name (use upper case for surnames e.g., John SMITH, and include your student number. Staple your sheets. Sloppy presentations will be penalized.
3. Return your assignment on 8.5 in. x 11 in. single sided paper. Use the "fit-to-one page" feature of Excel in order to respect the one table per page limit.
4. The assignment should be produced as an MS Word document. Copy and paste charts and tables from your Excel sheet to this document.
5. All charts must include clear series label and a title. Also include the axis labels (e.g. March-2001).
6. All tables should include a title, column headers, and the CANSIM code (or series number) corresponding to that series.

Visit the Assignment section of the website on a regular basis for any possible corrections or clarifications.

1. VISIT THE FOLLOWING THREE WEBSITES AT STATISTICS CANADA, AND ANSWER THE QUESTIONS WHICH FOLLOW. THEY CAN ALL BE ANSWERED EASILY BY SIMPLY BROWSING THROUGH THEM.

a) http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/dsbbcan-eng.htm

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i) Describe the contents of this table (revealed in its title)
ii) What are the level one headings (in upper case letters)?
iii) With the exception of the second and the fifth ones, there are major ‘P’ variables and major ‘Q’ variables. Name them.
iv) What does the fiscal sector consist of? (a phrase will do)

b) http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/econ04-eng.htm

i) Describe the contents of this table. It ought to look familiar.
ii) Give the nine level-one headings. Note that this categorization scheme is like the one that we did in class, but it is a little less aggregated. Read all of the headings, and pay attention to their structure.
iii) Verify the top-line figure by adding up these nine components.

c) http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/econ03-eng.htm

i) Describe the contents of this table. It ought to look familiar.
ii) Give the eleven headings that correspond to entries (Hint: one line is a sub-total). Note that this categorization scheme is like the one that we did in class, but it is a little less aggregated. Read all of the headings, and pay attention to their structure.
iii) Verify that the top-line figures for this table are consistent with the corresponding values from the previous table. Why is this so?
iv) For the year 2011, calculate labour’s share of national income as well as the share for corporate profits.

2. The Bank of Canada looks at measure called ‘core inflation’ when setting monetary policy. Explain why the Bank of Canada interested in this special measure of inflation. How is core inflation measured? How does the core inflation series generally behave compared to the official measure of inflation using the CPI? You can answer this question by going to their website, and the relevant information is near the home page.

Before I proceed to the primary problem, I am going to review a lot of what I did in class. Deflators always take the form of a time-series, which is simply a series of numbers arranged

chronologically. This means that there is a one-to-one correspondence between these numbers and points in time. Although the frequency can be daily, weekly, monthly, quarterly or annually, there is always a one-to-one correspondence between the data and chronological time.

There are two major functions for price deflators.

First, they indicate how, or by how much, prices change over time. To this end, one of the major objectives of this module is to learn how to present and interpret percentage changes in a correct and responsible fashion. Government officials (i.e. politicians), special interest groups, advertisers, etc. may use and abuse figures involving percentages as misleading evidence to advance their own positions. In other words, these numbers can be used to distort the truth to suit their own interests. For instance, an opposition party might claim that the expenditures on health care have dropped 10% (or whatever amount), neglecting to mention that it was not 10% over one year, but rather a cumulative drop of 10% spread out over 3 years. A producer of a product might claim that prices have been frozen, while conveniently neglecting to mention any time frame (i.e. have they been frozen for the past year or the past 5 minutes?) A union leader might claim that her members have only received a 1% pay raise in the past, but the question is whether that is per year, per 6-month period, or over the past 2 years.

When dealing with percent changes, there are two important points to consider:

- The time frame or the frequency: Are we talking about annual rates of change or a cumulative rate of change over a certain period?
- The base point, or reference point: All percentage figures are relative: X % of what? - The price of tea in China? The number of wins for the Toronto Blue Jays baseball team? Is it the value at the beginning of the period, the value at the end of the period, or perhaps an average of the two? That information must be specified.

The second major function of deflators is to convert real quantities (e.g., an economic variable such as GDP) from nominal quantities and vice versa at a particular point in time.

A few clarifications are in order. First, for the second major function of deflators, we are dealing with *levels* rather than percent *changes*. For example, let's suppose that you receive a pay raise (good luck on that). The amount of extra dollars of pay that you receive on your semi-monthly paycheck is your pay raise expressed as a level. The amount of extra pay relative to your former pay level gives the ratio of the new level to the old level. A simple arithmetic operation that we all had better know - ((new pay rate / old pay rate) - 1)*100 - gives your pay raise expressed as a percent change relative to your former pay. Any time that you see a 3-digit deflator, remember that you are dealing with levels and not with % changes.

This exercise to follow is somewhat more complicated than the first function for deflators (i.e. calculate by what % a price has risen) described above because we apply the technique to *three* distinct time series (the economic variable of GDP in nominal terms, the same economic variable in real terms, and the deflator or price index) rather than one time series. Real quantities expressed in levels are usually of little interest; what is meaningful are the *changes* in the real quantity between time periods, as that gives the evolution of the volume of economic activity over time after adjusting for inflation. Nominal quantities expressed in levels are meaningful, as they reflect the level of economic activity that actually occurred during that time period. On the other hand, a change in the nominal quantity between periods is typically not meaningful, as it confounds the effects of price inflation movements in prices with the movements in the volume of economic activity.

We will also be constructing and interpreting the graphs of deflators and certain economic variables. Graphs are designed to tell a story of some kind. Examples of relevant questions are: has the variable in question been relatively stable or quite variable over the time period? If there are any turning points, when did they occur? Has there been a trend towards an increase or a decrease? If the answer is neither, we say that the series is flat.

You should carry out your assignment in a single spreadsheet file. The easiest way to do this is to put each part of the analysis on its own datasheet or page within that one file. There is a single spreadsheet file but different worksheets.

3. Retrieve data at the following site, which is the university library network's primary site. Go to the university's home page, click on 'quick picks', then 'library', then on 'Databases A-Z', then select 'CANSIM Multi-dimensional@chass'. Go to the main menu, the click on 'locate series by series numbers or range'. You then add that series to your cart. You can either extract each series by itself, or place all four of them in your cart. When ready to download, check the interval. The easiest format to use is 'MSExcel Ready'. Then click on 'submit query'. VERIFY THAT YOU HAVE READ IN THE DATA PROPERLY, and that it is properly aligned.

1. CPI monthly, table # 3260022, vector # V41690914, runs until from 1992 to December of 2012, base year 2002
2. CPI annually, table # 3260021, vector # V41693271, runs from 1914 to 2012
3. real GDP, annually, table # 3800017, vector # V3860085, runs from 1961 to 2011 (constant 2002 $, series was terminated in 2011)
4. nominal GDP, annually, table # 3800017, vector # V646937, runs from 1961 to 2011 (series was terminated in 2011)

Note that you do not need the table number; the vector or series number will suffice. You only have to input the vector number ('V' stands for vector).

Tasks a-e consist of dealing with a single times series, namely the CPI.

a) Obtain the monthly CPI (consumer price index) from the CANSIM data base. That is the first series listed above. Use the interval 1992:01 to 2012:12. This 20-year interval includes the base year, but even if it does not, that does not matter. The period-to-period changes are not affected by the choice of base year.

Read the documentation for this series. It should list features such as the base year, the frequency (a monthly series in this case), the interval of availability, and the last time that the series was updated.

b. Calculate the inflation rate between

i) December of 2009 and December of 2008.
ii) December of 2012 and December of 1992 (cumulative over 20 years)

iii) October of 2012 and the corresponding month of base period. (cumulative inflation since the base year of 2002)

These are all easy. You should generate one figure for each part. As a reminder, the equation for the inflation rate between point in time t and an earlier point in time s is:

$$\textbf{Inflation rate}_{ts} = ((CPI_t/CPI_s) - 1)*100, \text{ for t later than s}$$

These give the cumulative price increases between the two periods (period t and period s). The base must always be specified. You do not plot anything here. Instead, just show the data series on the spreadsheet, and indicate how you calculated those 3 values.

(Make a new datasheet)

c. Now we move on to annual rather than monthly inflation rates. Retrieve the second series listed above, which gives the CPI at an annual frequency. These annual figures reflect averages taken over all 12 months of each year. Calculate the annual inflation rates from year 1972 to year 2012, and then plot this series on a graph. This means that you should generate about 40 figures, including the inflation rate between 1971 and 1972, 1972 and 1973, 1973 and 1974,....., 2011 and 2012.

Comment a bit on this graph. For instance, in which year was inflation the highest, and in which year was it the lowest? What can you say about overall trends during your period?

d. With this next part, you only generate two numbers. Calculate the average annual inflation rate over the entire period between the year 1990 and the year 2012 in two ways:

i) Take the simple arithmetic average for the annual inflation rates between each pair of years (e.g. 1990-1991, 1991-1992, 1992-1993, 1993-1994, 1994-1995, 1995-1996, 1996-1997, 1997-1998, 1998-1999, 1999-2000, 2000-2001, 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012). Sum up these year-over-year rates, which should be expressed in percentage terms, and divide by 22. You can take average over a column of figures using a formula in Excel (AVERAGE(firstcell:lastcell))

ii) Take the compounded inflation rate between the starting point and the endpoint of this interval using the following

formula. The 1/22 figure means that you raise that expression to the one-twenty-second power, which means that you are taking the 22nd root of that quantity.

((CPIyear2012/CPIyear1990)1/22 - 1)*100**

The latter measure is probably more useful, as it gives the annualized growth rate between 1990 and 2012, using the year 1990 as the reference point. The interpretation is that on average prices grew at this constant annual rate relative to price levels in 1990. For part a), the base changed each year, whereas for part b) the base, or reference point, was the same for each year. The figures for parts a) and b) should be slightly different. This time we are dealing with just one number - not a time series.

e. Calculate the following CPI values. Again, there is no graph, nor is there a data series.

i) Calculate the (would-be) *level* (not % change) of the CPI for the year 2012 had we experienced a 5% annual inflation rate over this entire period from 1990-2012. Just use the formula below, which is the inverse of the formula above. Note that we are taking the 22nd power of a quantity. This exercise is called an extrapolation, which is the opposite of interpolation. There is just one number to be produced.

CPIyear2012 = CPIyear1990*(1 + 0.05)22**

ii) Calculate the (would-be) value of the deflator in 2010 if we had experienced an annual deflation rate of 1% over this 22-year year period (heaven forbid):

CPIyear2012 = CPIyear1990*(1 - 0. 01)22**

Tasks f-g consist of multi-series analyses that involve the GDP deflator, GDP in real terms, and GDP in nominal terms. We are moving on to the final two series on the list above. (Make another new datasheet)

f. Now retrieve the two series:

i) Retrieve the nominal GDP and real GDP series.

ii) Take the time series of real GDP denominated in 2002 constant $ and plot it from year 1980 to 2011. Identify the stages of the business cycle. Note that the ordinate of the

graph reflects the level, and that the slope of this graph reflects changes in real GDP (but not the % change, which is the growth rate).

iii) Extract the time series of nominal GDP denominated in current dollars and plot it on the same graph over the same interval.

iv) Compare these 2 series and explain the discrepancy between them. They should intersect in 2002. Which series rises more quickly, and why?

g. Do not plot anything in this case.

i) Calculate the values for the implicit deflator by applying the identity: real GDP = nominal GDP / deflator * 100. This should generate another time series.

ii) For each of these three series, calculate the annual % change. This will generate three more time series. Note that you cannot calculate values for 1980 because you would need values for the preceding year of 1979. 1981 is the first year that is relevant.

iii) Next, verify that the percentage change in nominal GDP equals (approximately) the percentage change in real GDP plus the inflation rate (as measured by the GDP deflator). The formula is on page 108 in the textbook. Recall that when we take the first difference, or the derivative, of the following formula: real GDP = nominal GDP / deflator * 100, we obtain: % change in real terms = % change in nominal terms - inflation rate.) You do NOT use this formula; instead, you VERIFY it with these figures. They should only be APPROXIMATELY the same.