Introductory Macroeconomics

Pre-Tutorial #1
Week Starting 8th March 2021

The Tutorial. This week's tutorial looks at the concept of GDP.

Note that your tutor is under no obligation to go through the answers to the pre-tutorial work in detail. The focus in the tutorial will be on the tutorial work itself – the questions here are preparatory.

Reading Guide. You should look carefully over your lectures notes for Week 1. You may also find Chapters 1 and 2 of BOFAH useful.

Key Concepts. Measurement and meaning of GDP.

Problems.

1. Suppose total government spending over a year is $275 billion of which $150 billion is spending on a system of payments made to low income families, $75 billion is spent on the construction of roads and other infrastructure, and $50 billion is spent on salaries for workers in the education sector. What is the government's contribution to GDP in that year? Explain.

2. Over a three month period, not everything that is produced is necessarily purchased (i.e., there might be inventories of unsold stock). Yet economists maintain that in any period, the values of production and expenditure will be the equal. How can this be?

3. Distinguish between 'final' goods and services and 'intermediate' goods and services.

4. Consider the following data for a hypothetical economy that manufactures engines (the only intermediate good), motorcycles and cars.

Year	Commodity	Price	Quantity
2009	Engines	$2	150
2009	Cars	$15	100
2009	Motorcycles	$10	50
2010	Engines	$6	154
2010	Cars	$50	99
2010	Motorcycles	$9	55
2011	Engines	$10	160
2011	Cars	$90	90
2011	Motorcycles	$8	70

Using this data:

(a) Calculate nominal GDP for each year.

(b) Calculate a real GDP index for each year using 2009 base year prices.

(c) Calculate a real GDP index for each year using the chain-weighted method with real GDP in 2009 equal to 1.

Write your answers below:

		Real GDP	
Year	Nominal GDP	Base Year	Chain-Weighted
2009			
2010			
2011			

Solutions to Pre-Tutorial Work.

1. The government's contribution to GDP will be \$125 billion over the year; it consists of \$75 billion expenditure on roads and other infrastructure and \$50 billion expenditure on the salaries of workers in the education sector. Some output produced by the government is free. Education is a classic example. This is still viewed as a service and valued at the cost of production which is primarily the salary of the workers in the education sector.

   Transfer payments are a means of redistributing income across the economy. They are not a final good or service. The transfer payments of \$150 billion will eventually show up in GDP if and when the families that receive the transfer income spend the income. However, in that case it will be household consumption expenditure.

2. An item may be produced within a period but not necessarily purchased. This item is treated as adding to a firm's inventory stock and changes in inventories over a particular period are recorded as an investment expenditure by firms (or, to put it another way, the assumption is made that firms buy their own unsold output in a situation where not everything that is produced is sold).

3. A final good or service is one that will not be transformed further in the market sector in Australia. An intermediate good or service is sold to another firm in Australia to be further transformed.

4. The nominal GDP is the value of expenditure on cars and motorcycles in each year. Engines are an intermediate good and not included in the calculation of GDP. The nominal GDP in year t is $p_{ct} \cdot q_{ct} + p_{mt} \cdot q_{mt}$ where p_{ct} and p_{mt} are the year t price of cars and motorcycles, respectively and q_{ct} and q_{mt} are the corresponding quantities.

   The calculations for nominal GDP are:

$$\begin{aligned} \text{GDP}_{2009} &= 15 \cdot 100 + 10 \cdot 50 = 2000 \\ \text{GDP}_{2010} &= 50 \cdot 99 + 9 \cdot 55 = 5445 \\ \text{GDP}_{2011} &= 90 \cdot 90 + 8 \cdot 70 = 8660 \end{aligned}$$

   The calculations for real GDP using 2009 base year prices are as follows:

$$\begin{aligned} \text{real GDP}_{2009} &= 15 \cdot 100 + 10 \cdot 50 = 2000 \\ \text{real GDP}_{2010} &= 15 \cdot 99 + 10 \cdot 55 = 2035 \\ \text{real GDP}_{2011} &= 15 \cdot 90 + 10 \cdot 70 = 2050 \end{aligned}$$

   To create an index, we divide the value of real GDP by that of the base year. Doing so we would find that a real GDP index is 1 in 2009, 1.0175 in 2010 and 1.025 in 2011.

The calculations for the chain-weighted index are as follows. The value of the index in the base year (2009) is equal to one. The value of the index in 2010 equals,

$$\frac{p_{m,2009}\, q_{m,2010} + p_{c,2009}\, q_{c,2010}}{p_{m,2009}\, q_{m,2009} + p_{c,2009}\, q_{c,2009}} = 1.0175$$

This calculation is actually the same to calculate the value of real GDP in 2010 using 2009 as the base year price. The value of the index in 2011 is the value in 2010 multiplied by

$$\frac{p_{m,2010}\, q_{m,2011} + p_{c,2010}\, q_{c,2011}}{p_{m,2010}\, q_{m,2010} + p_{c,2010}\, q_{c,2010}} = \frac{50 \cdot 90 + 9 \cdot 70}{50 \cdot 99 + 9 \cdot 55}$$

This calculation yields $1.0175 \cdot 0.9421 = 0.9586$.

The numbers in the question are a nice illustration of the advantage of chain-weighting, chain indexes are more 'alert' to structural changes in the economy.

Using 2009 as a fixed base suggests that real GDP is 2.5 percent higher in 2011 than in 2009. Using the chain-weighted measure, however, shows that real GDP has fallen in 2011 relative to 2009.

What explains this is the following: motorcycles accounted for 25% of nominal GDP in 2009 but 9% in 2010 and only 6% in 2011. Therefore, using 2009 as a fixed base year uses information from a period in which motorcycles were relatively more important in GDP than is the case in later years. So, calculating real GDP in 2011 using 2009 prices gives what happens to motorcycles a disproportionately larger weight than is justified, using the 2009 base period gives a figure for real GDP in 2011 that is higher relative to 2009 because the quantity of motorcycles is growing since 2009. On the other hand, car production is falling from 2009 on. The 2011 chain-weighted index more accurately reflects what has happened to real GDP because it gives more weight to what has happened to cars (the quantity has fallen) than to motorcycles (the quantity has risen) in line with the shift in the relative shares of cars and motorcycles in nominal GDP.