Week 2

Solutions to Exercise 3 and Exercise 5.

There were no much time in our practical session in this week to go through all small details in the solutions to those two exercises, and so here we provide all details.

Exercise 3

See entries (a), (b), (c) and (d) in table 2.4 next page.

(a) Real GDP 2020 in 2018 prices =

$= 550 \times 1 + 6 \times 900 = 5950$

(b) Percentage change

$$g = \frac{5950}{5000} - 1 = 19\%$$

(c) Real GDP2018 in 2020 prices =

$= 500 \times 3 + 5 \times 1000 = 6500$

(d) Before we calculate the particular number of Real GDP2018 in chained prices of 2020, let's see how we arrived at the value associated with (e): 6483.

TABLE 2.4

Real and Nominal GDP in a Simple Economy, 2018–2020

	2018	2019	2020	Percentage change 2019–2020
Quantity of apples	500	500	550	10
Quantity of computers	5	5	6	20
Price of apples (dollars)	1	2	3	50
Price of computers (dollars)	900	1,000	1,000	0
Nominal GDP	5,000	6,000	7,650	27.5
Real GDP in 2018 prices	5,000	5,000	? (a)	? (b)
Real GDP in 2019 prices	6,000	6,000	7,100	18.3
Real GDP in 2020 prices	? (c)	6,500	7,650	17.7
Real GDP in chained prices, benchmarked to 2020	? (d)	6,483 (e)	7,650	18.0 (f)

So we have that Real GDP2019 in chained prices 2020 is 6483. How do we get this number? Just follow the slides (where we used year 1 and year 2), using now the years of 2019 and 2020. From the table we know that the growth rate of real GDP between 2019 and 2020, using each year as the base year, is given by

$$g_{b19} = 18.3\%$$

$$g_{b20} = 17.7\%$$

Therefore the geometric average is

$$g_c = \sqrt{1.183 \times 1.177} = 1.18$$

This means that real GDP in chain grows 18% between 2019 and 2020. If we want to start the chain backwards from 2020 to 2019, we will get Real GDP2019 in chained 2020 prices as follows:

$$\text{Real GDP}_{2019}\ (\text{chained 2020}) = \frac{\text{Real(GDP}_{2020}}{g_c}$$

$$= \frac{7650}{1.18} = 6483.$$

Et voilà, we know now how to get the value presented in entry (e) of Table 2.4.

Now, moving backwards from 2019 ~~and~~ to 2018 requires that we apply the same procedure, but now involving 2018 and 2019, instead of 2019 and 2020.

$$g_{b19} = \frac{6000}{6000} - 1 = 0\%$$

$$g_{b18} = \frac{5000}{5000} - 1 = 0\%$$

So $g_c = \sqrt{1 \times 1} = 1$

Therefore, in order to calculate the value of the entry in (d) is now easy:

$$\text{Real GDP 2018 (chained 2020)} = \frac{\text{Real GDP 2019}}{g_c}$$

$$= \frac{6483}{1} = 6483.$$

There you have all details. The logic is always the same: rolling over two consecutive years, either backwards or forward. In this particular exercise we move backwards:

2020 → 2019

2019 → 2018

....

Exercise 5

$$L_{PI} = \frac{\sum q_i(0) \times P_i(t)}{\sum q_i(0) \times P_i(0)} = \frac{(100 \times 1.1) + (20 \times 3.1)}{(100 \times 1 + (20 \times 3)} = 1.075$$

$$P_{PI} = \frac{\sum q_i(t) \times P_i(t)}{\sum q_i(t) \times P_i(0)} = \frac{(105 \times 1.1) + (22 \times 3.1)}{(105 \times 1) + (22 \times 3)} = 1.0742$$

The answer is simple for these two types of price indices: inflation is equal to 7.5% according to Laspeyres; and equal to 7.42% according to Paasche.

The chain weighted measure of inflation requires more articulate calculations. We will have to undertake 4 steps, as follows

1. Calculate the growth rate of real GDP using 2016 as the base year.

$$\text{real GDP 2016 (Prices 2016)} = 160$$
$$\text{real GDP 2017 (Prices 2016)} = 171$$

This implies that the growth rate of real GDP, between 2016 and 2017 (using 2016 as the base year) is

$$g_{16} = \frac{171}{160} - 1 = 6.875\%$$

2. Now the same, but considering the year 2017 as the base year:

$$\text{real GDP 2016 (Prices 2017)} = 172$$
$$\text{real GDP 2017 (Prices 2017)} = 183.7$$

then

$$g_{17} = \frac{183.7}{172} = 6.8\%$$

(3) Next, we calculate the real GDP of 2017 as a chain weighted process. Assume that we start rolling over the chain in 2016. Then

$$\text{Real GDP 2016 (chained 2016)} = 160$$

$$\text{Real GDP 2017 (chained 2016)} = 160 \times g_c$$

$$= 170.93$$

$$g_c = \sqrt{(1+6.875\%)\times(1+6.8\%)} = 1.06837$$

(4.) So now we have that

$$\text{Real GDP 2017 (chained 2016)} = 170.93$$

$$\text{Nominal GDP 2017} = 183.7$$

just apply the formula

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP Price Index}}$$

and so

$$\text{GDP Price Index}_{2017} = \frac{\text{Nominal GDP}_{2017}}{\text{Real GDP}_{2017}}$$

$$= \frac{183.7}{170.93}$$

$$= 1.07464.$$

We say that inflation (measured in chained 2016 prices) in 2017 was equal to 7.464%.