

Economics 102
Homework #2
Due: February 1st at the beginning of class

Complete **all** of the problems. Please do **not** write your answers on this sheet. Show all of your work.

1. Suppose people only consume 3 different goods. The following table shows the prices and quantities of each good consumed in 2006, 2007, and 2008.

Year	Price of Fish	Quantity of Fish	Price of Pork	Quantity of Pork	Price of Beef	Quantity of Beef
2006	\$7	400	\$8	225	\$10	175
2007	8	550	7	250	12	275
2008	9	900	6	275	15	275

- a. Calculate nominal GDP in each of the three years.

Nominal GDP is simply equal to the sum of the current year price * current year quantity of all the goods.

$$2006: (7 \cdot 400) + (8 \cdot 225) + (10 \cdot 175) = 2,800 + 1,800 + 1,750 = \mathbf{\$6,350}.$$

$$2007: (8 \cdot 550) + (7 \cdot 250) + (12 \cdot 275) = 4,400 + 1,750 + 3,300 = \mathbf{\$9,450}.$$

$$2008: (9 \cdot 900) + (6 \cdot 275) + (15 \cdot 275) = 8,100 + 1,650 + 4,125 = \mathbf{\$13,875}.$$

- b. Calculate Real GDP in each of the three years, using 2006 as the base year.

Real GDP is equal to the sum of the base year price * current year quantity of all the goods.

$$2006: (7 \cdot 400) + (8 \cdot 225) + (10 \cdot 175) = 2,800 + 1,800 + 1,750 = \mathbf{\$6,350}.$$

$$2007: (7 \cdot 550) + (8 \cdot 250) + (10 \cdot 275) = 3,850 + 2,000 + 2,750 = \mathbf{\$8,600}.$$

$$2008: (7 \cdot 900) + (8 \cdot 275) + (10 \cdot 275) = 6,300 + 2,200 + 2,750 = \mathbf{\$11,250}.$$

- c. Calculate the GDP deflator for each of the three years.

The GDP deflator is equal to $(\text{Nominal GDP} / \text{Real GDP}) \cdot 100$.

2006: **100**. Because 2006 is the base year we know the deflator has to equal 100 even without doing any calculations.

$$2007: (9,450 / 8,600) \cdot 100 = \mathbf{109.9}.$$

$$2008: (13,875 / 11,250) \cdot 100 = \mathbf{123.3}.$$

- d. Calculate inflation for 2007 and 2008.

Inflation is equal to the growth rate of the GDP deflator. The growth rate formula is: $((\text{Year2} - \text{Year1}) / \text{Year1}) \cdot 100$.

$$2007: ((109.9 - 100) / 100) \cdot 100 = \mathbf{9.9\%}.$$

2008: $((123.3 - 109.9)/109.9)*100 = 12.2\%$.

e. Calculate Real GDP for 2007 and 2008 using the chain-weighted method.

Using 2006 as the base year, we know that Real GDP is equal to nominal GDP. Thus Real GDP in 2006 is \$6,350. This gives us the starting point for the chain-weighted method of calculating real GDP.

To calculate chain-weighted Real GDP for 2007 we need the following four pieces of information:

2006 quantities at 2006 prices: See part a, \$6,350.

2007 quantities at 2006 prices: See part b, \$8,600.

2006 quantities at 2007 prices: $(8*400) + (7*225) + (12*175) = \$6,875$.

2007 quantities at 2007 prices: See part a, \$9,450.

Now we calculate the growth rate of GDP with 2006 prices:

$((8,600 - 6,350)/6,350)*100 = 35.4\%$,

Then the growth rate of GDP using 2007 prices:

$((9,450 - 6,875)/6,875)*100 = 37.5\%$.

The next step is to average the two growth rates: $(35.4 + 37.5)/2 = 36.45\%$.

This gives us the chain weighted growth rate of real GDP for 2007. So to calculate 2007 Real GDP we multiply 2006 real GDP by this growth rate: $(6,350 + (6,350*36.45\%)) = \mathbf{\$8,664.6}$.

Repeating the same process for 2008 gives us the following:

2007 quantities at 2007 prices: See part a, \$9,450.

2008 quantities at 2007 prices: $(8*900) + (7*275) + (12*275) = \$12,425$.

2007 quantities at 2008 prices: $(9*550) + (6*250) + (15*275) = \$10,575$.

2008 quantities at 2008 prices: See part a, \$13,875.

Growth rate with 2007 prices: $((12,425 - 9,450)/9,450)*100 = 31.5\%$

Growth rate with 2008 prices: $((13,875 - 10,575)/10,575)*100 = 31.2\%$

Average growth rate: $(31.5\% + 31.2\%)/2 = 31.35\%$.

We use the chain-weighted 2007 GDP as our starting point, and get:

$(8,664.6 + (8,664.6*31.35\%)) = \mathbf{\$11,381.0}$.

f. Calculate the GDP deflator and inflation using Real GDP from part e.

The GDP deflator is still $(\text{Nominal GDP}/\text{Real GDP}) \times 100$ but now we are using the chain-weighted measure of Real GDP.

GDP deflator

2006: 100. 2006 is still the base year, so the GDP deflator is still 100.

2007: $(9,450/8,664.6) \times 100 = \mathbf{109.1}$.

2008: $(13,875/11,381.0) \times 100 = \mathbf{121.9}$.

Inflation

2007: $((109.1 - 100)/100) \times 100 = \mathbf{9.1\%}$.

2008: $((121.9 - 109.1)/109.1) \times 100 = \mathbf{11.7\%}$.

g. Are your answers to part d and part f the same? Why or why not?

Your answers are not the same. They are close, but there are significant differences. The first thing that we note is that the chain-weighted method gives us a lower measure of inflation. In 2007, the chain-weighted method measures inflation almost 1% lower than the standard method, while at the same time measuring Real GDP as a higher number. So under the chain-weighted method, real GDP growth is higher, and inflation is lower.

This is not always the case. The example in your book shows a case where using the chain-weighting method lowers GDP and raises inflation. The difference between the two methods is that the original method only uses base year prices. This means that your choice of base year actually matters. In the chain-weighted method, because you are using two years worth of prices to calculate growth rates, the base year does not affect the measurement of inflation. To check this, calculate inflation in 2008 using 2007 as the base year using both methods. I will put the results below, but you should verify my calculations.

This table measures inflation for 2008 using the two different methods of calculating real GDP.

	<u>2006 Base Year</u>	<u>2007 Base Year</u>
Standard method:	12.2%	11.7%
Chaining method:	11.7%	11.7%