

Homework 1: Solutions  
Principles of Macroeconomics: ECO 212

**Question 1 (20 points).**

- a. Housework and cooking are not sold in the market and are thus not counted.
- b. Sales tax is part of the value or price of the good and is thus counted. Add \$2.13 to Consumption.
- c. The car is not resold, so the \$10,000 of accessories are finished goods (not resold). Add \$10,000 to consumption.
- d. Inventories are part of Investment Spending. Add \$6,000 to Consumption and \$2,000 to Investment Spending (Inventories), for a total of \$8,000. Alternatively, via the value added approach, HP has a value added of  $4 \cdot \$1,500 = \$6,000$  and Best Buy has a value added of  $\$8,000 - \$6,000 = \$2,000$ , so add  $\$6,000 + \$2,000 = \$8,000$  to the GDP.

**Question 2 (30 points).**

- a. For nominal GDP, we have:

$$NGDP_{2003} = 2 * \$50 + 30 * \$7 + 20 * \$40 + 50 * \$10 + 60 * \$1 = \$1,670 \quad (1)$$

Similarly, the nominal GDP for 2004 is \$1,970 and for 2005 is \$2030. 8

- b. The GDP deflator is always 100 for the base year, in this case 2003. For 2004, we have:

$$\begin{aligned} \text{GDP deflator}_{2004} &= \frac{NGDP}{2 * \$50 + 40 * \$7 + 22 * \$40 + 50 * \$10 + 40 * \$1} \times 100 \\ &= \frac{\$1,970}{\$1800} 100 = 109.4 \end{aligned} \quad (2)$$

For 2005, I get 114.7.

- c. Real GDP is equal to nominal GDP in the base year, hence real GDP for 2003 is \$1,670. For 2004, we have:

$$RGDP_{2004} = \frac{\$1,970}{\frac{109.4}{100}} = \$1,800 \quad (3)$$

One could arrive at the same answer by using current goods and base prices. For 2005, the real GDP is \$1,770.

d. The CPI for the base year (2003) is 100. For 2004, we have:

$$\begin{aligned} CPI_{2004} &= \frac{2 * \$50 + 30 * \$7 + 20 * \$45 + 50 * \$11 + 60 * \$1.25}{NGDP_{2003}} \times 100 \\ &= \frac{\$1,835}{\$1,670} 100 = 109.9 \end{aligned} \quad (4)$$

The CPI is 135.3 in 2005. The CPI higher than the GDP deflator in each year, because the CPI overstates inflation. The CPI does not account for the substitution. For example, concert tickets rose quite a bit in 2005, and dorm residents responded by buying less concert tickets and more beach towels, which did not increase in price. The GDP deflator accounts for substitution, but the CPI does not. The CPI also fails to take into account improvements in quality. Cell phone technology (blue tooth, downloadable music) may have improved between 2003 and 2004 (prices rose but quantity purchased also rose), accounting for some of the five dollar price increase, but the CPI assumes that all of the price increase is due to inflation.

e. The percent change in real GDP for 2004 is:

$$\text{change} = \frac{RGDP_{2004} - RGDP_{2003}}{RGDP_{2003}} \times 100 = \frac{\$1,800 - \$1,670}{\$1,670} \times 100\% = 7.8\% \quad (5)$$

For 2005, the GDP decreased by 1.7%. A recession with yearly data is defined as one year of negative real GDP growth. Thus there was a recession in 2005, but not in 2004.

### Question 3 (10 points).

Recall that the CPI gives the value of 100 base year dollars (here 100 1983 dollars) in the given year. Thus the table indicates that:

$$100 \text{ 1983 dollars} = 161.8 \text{ 1997 dollars} \quad (6)$$

$$100 \text{ 1983 dollars} = 197.7 \text{ 2005 dollars} \quad (7)$$

Looking at the above two equations, since  $a = b$  and  $a = c$ , then  $b = c$ : 161.8 1997 dollars are equivalent to 197.7 2005 dollars in terms of what the dollars in each year can buy.

Now look at the second column of the table. In 1997 “Titanic” made 601 million 1997 dollars. To convert to 2005 dollars, just remember to keep track of the units:

$$\text{Gross} = 601 \text{ 1997 dollars} \times \frac{197.7 \text{ 2005 dollars}}{161.8 \text{ 1997 dollars}} = 736 \text{ million 2005 dollars} \quad (8)$$

Notice how the units cancel out.

For the other movies, I get:

Movie	year	Gross (millions)	cpi	2005 value
Star Wars (episode 4)	1977	\$461	62.3	\$1,463
Gone With the Wind	1939	\$77	14.0	\$1,087
Titanic	1997	\$601	161.8	\$736
The Sound of Music	1965	\$114	31.9	\$707
Jaws	1975	\$191	55.6	\$679
Star Wars (episode 1)	1999	\$431	168.8	\$505
Jurassic Park	1993	\$345	146.3	\$466
The Godfather	1972	\$98	42.5	\$456
Shrek 2	2004	\$441	191.2	\$456

Table 1: Record Selling Movies

In *constant dollars*, the 1977 “Star Wars” movie is by far the best selling movie of all time, with sales that would be worth over a billion dollars today. The gross receipts of “Titanic” were \$601 million, in the year 1997, leading many to claim that “Titanic” was the best selling movie. However, this ignores the fact that a dollar in 1977 buys more than 3 times what a dollar today buys. In fact, “Titanic” is only third place all time (behind also “Gone With the Wind”), with similar sales in real terms to other major hit movies such as “The Sound of Music.” Note: some data sources result in “Gone With the Wind” outselling “Star Wars” in real dollars.

**Question 4 (20 points).**

- a. The GDP using market prices is:

$$\text{GDP} = \$50 \cdot 100 + \$5 \cdot 500 = \$7,500 \quad (9)$$

The GDP using controlled prices is:

$$\text{GDP} = \$10 \cdot 100 + \$10 \cdot 500 = \$6,000 \quad (10)$$

So the GDP rises after moving from government controlled to market prices (since the government dramatically lowered the price of AIDS drugs). This is not always the case. Sometimes the government raises prices, often in the agricultural sector.

- b. We said in class that we value goods using market prices, because market prices tell us what people are willing to pay for goods. If a good is expensive, that means people are willing to pay more and the good is more valuable, and thus counts more in the GDP. Government controlled prices are set in some other way (otherwise there is no need for the government to control prices). So using government prices in the GDP implies the GDP does not value goods in the same way as society.

**Question 5 (20 points).**

- a. The spending approach counts only finished goods. Here the Ipods are the only finished good. Households bought \$3 million worth of Ipods, so we have  $C = \$3$  million. However, the remaining \$1 million in inventories is also a finished good in that it is not resold as part of another product. We count inventories as part of investment spending (as if Apple sold the Ipods to itself), so we have  $I = \$1$  million. Thus, using the spending approach  $GDP = C + I = \$3 + \$1 = \$4$  million.
- b. Profits for Apple are:

$$\text{Profits} = \text{revenues} - \text{costs} \tag{11}$$

$$= \text{revenues} - \text{cost of goods} - \text{wages} \tag{12}$$

$$= \$4 - \$2 - \$0.3 - \$0.5 - \$0.2 = \$1 \tag{13}$$

So Apple made \$1 million in profits. Notice that I have included the inventory as part of the revenues. This is consistent with the idea that Apple sold the inventory to itself and has an inventory asset worth \$1 million.

- c. Scandisc and ABC have no costs so they made \$2 million and \$0.3 million in profits, respectively. Thus:

$$GDP = \text{wages} + \text{profits} \tag{14}$$

$$= (\$0.5 + \$0.2) + (\$1 + \$2 + \$0.3) = \$4 \tag{15}$$

So the GDP is \$4 million, which matches the spending approach.

- d. For value added we have:

$$\text{Value Added} = \text{revenues} - \text{Cost of goods} \tag{16}$$

$$\text{Apple Value Added} = \$4 - \$2 - \$0.3 = \$1.7 \tag{17}$$

$$\text{Scandisc Value Added} = \$2 - 0 = \$2 \tag{18}$$

$$\text{ABC Value Added} = \$0.3 - 0 = \$0.3 \tag{19}$$

$$\text{Total Value Added} = \$1.7 + \$2 + \$0.3 = \$4 \quad (20)$$

So the value added approach gives the same answer, \$4 million. Again we count Apple's inventory as a revenue, since Apple sold the inventory to itself. Next period the inventory becomes a capital good or asset.