Problem Set #2 Answer Key

Economics 305: Macroeconomic Theory

Spring 2007

1 Chapter 2, Problem #3

a) Following the product approach, value added by firm A is total revenue from wheat sales (note that the inventory accumulation is treated as if the firm sold the wheat to itself), or \$150 000. For firm B, value added is revenue from sales of bread minus the value of wheat purchased from firm A, or \$100 000-\$60 000 = \$40 000. Therefore, total GDP = \$150 000 + \$40 000 = \$190 000.

b) For the expenditure approach, consumption expenditure on bread, C = \$100 000 + \$15 000 = \$115 000 (note that imports of bread are included), investment in inventories is I = \$15,000, and net exports are NX = \$75 000 - \$15 000 = \$60 000. Government expenditures are G = 0. Therefore, GDP = C + I + G + NX = \$115 000 + \$15 000 + 0 + \$60 000 = \$190 000.

c) For the income approach, in this case GDP is the sum of profits and wage income. Profits for firm A are \$150 000 - \$50 000 = \$100 000 (revenue minus wage costs, where inventory accumulation is included as a positive amount) and profits for firm B are \$100 000 - \$20 000 - \$60 000 = \$20 000 (revenue minus wage costs minus the cost of the intermediate input). Total wages are \$50 000 + \$20 000 = \$70 000. Therefore, GDP = profits + wages = \$100 000 + \$20 000 + \$70 000 = \$190 000.

2 Chapter 2, Problem #4

Price and quantity data are given as the following.

Year 1

Good	Quantity	Price
Computers	20	\$1 000
Bread	10 000	\$1.00

Year 2

Good	Quantity	Price
Computers	25	\$1 500
Bread	12 000	\$1.10

a) Year 1 nominal $GDP = 20 * \$1000 + 10000 * \$1.00 = \$30000$. Year 2 nominal $GDP = 25 * \$1500 + 12000 * \$1.10 = \$50700$.

b) With year 1 as the base year, we need to value both years production at year 1 prices. In the base year, year 1, real GDP equals nominal GDP equals \$30 000. In year 2, we need to value year 2s output at year 1 prices. Year 2 real GDP = 25 * \$1000 + 12 000 * \$1.00 = \$37 000. The percentage change in real GDP equals (\$37 000 - \$30 000)/\$30 000 = 23.3%.

We next calculate chain-weighted real GDP. At year 1 prices, the ratio of year 2 real GDP to year 1 real GDP equals $g_1 = (\$37,000/\$30,000) = 1.2333$. We must next compute real GDP using year 2 prices. Year

2 GDP valued at year 2 prices equals year 2 nominal GDP = $\$50,700$. Year 1 GDP valued at year 2 prices equals $(20 \times \$1,500 + 10,000 \times \$1.10) = \$41,000$. The ratio of year 2 GDP at year 2 prices to year 1 GDP at year 2 prices equals $g_2 = (\$50,700/\$41,000) = 1.2367$. The chain-weighted ratio of real GDP in the two years therefore is equal to $g_c = \sqrt{g_1 g_2} = 1.23496$.The percentage change chain-weighted real GDP from year 1 to year 2 is therefore approximately 23.5%. If we (arbitrarily) designate year 1 as the base year, then year 1 chain-weighted GDP equals nominal GDP equals \$30,000.Year 2 chain-weighted real GDP is equal to $(1.23496 \times \$30,000) = \$37,049$, approximately.

c) To calculate the implicit GDP deflator, we divide nominal GDP by real GDP, and then multiply by 100 to express as an index number. With year 1 as the base year, base year nominal GDP equals base year real GDP, so the base year implicit GDP deflator is 100. For the year 2, the implicit GDP deflator is (\$50 700/\$37 000) * 100 = 137.0. The percentage change in the deflator is equal to 37.0%.

With chain weighting, the year 1 GDP deflator equals $(\$30000/\$30000) \times 100 = 84.5$. The year 2 GDP deflator equals $(\$50700/\$37049) * 100 = 136.9$. The percentage change in the chain-weighted deflator equals (136.9 - 100)/100 = 36.9%.

d) Next consider the possibility that year 2 computers are twice as productive as year 1 computers. As one possibility, let us define a computer as a year 1 computer. In this case, the 25 computers produced in year 2 are the equivalent of 50 year 1 computers. Each year 1 computer now sells for \$750 in year 2. We now revise the original data as:

Year 1

Good	Quantity	Price
Year 1 Computers	20	\$1 000
Bread	10 000	\$1.00

Year 2

Good	Quantity	Price
Year 1 Computers	50	\$750
Bread	12 000	\$1.10

Year 2 real GDP, in year 1 prices is now $50 * \$1000 + 12000 * \$1.00 = \$62000$. The percentage change in real GDP is equal to $(\$62000 - \$30000)/\$30000 = 106.7\%$.

We next revise the calculation of chain-weighted real GDP. From above, g_1 equals $(\$62,000/\$30,000) = 2.07$. The value of year 1 GDP at year 2 prices equals $\$26,000$. Therefore, g_2 equals $(\$50,700/\$26,000) = 1.95$. The chainweighted ratio of real GDP in the two years therefore is equal to $g_c = \sqrt{g_1 g_2} = 2.0075$. The percentage change chain-weighted real GDP from year 1 to year 2 is therefore 100.8%.

If we (arbitrarily) designate year 1 as the base year, then year 1 chain-weighted GDP equals nominal GDP equals \$30,000. Year 2 chain-weighted real GDP is equal to $(2.0075 \times \$30,000) = \$60,225$. The chain-weighted deflator for year 1 is automatically 100. The chain-weighted deflator for year 2 equals $(\$50,700/\$60,225) \times 100 = 84.2$. The percentage rate of change of the chainweighted deflator equals -15.8%.

When there is no quality change, the difference between using year 1 as the base year and using chain weighting is relatively small. Factoring in the increased performance of year 2 computers, the production of computers rises dramatically while its relative price falls. Compared with earlier practices, chain weighting provides a smaller estimate of the increase in production and a smaller estimate of the reduction in prices because the relative price of the good that increases most in quantity (computers) is much higher in year 1. Therefore, the use of historical prices puts more weight on the increase in quality-adjusted computer output.

3 Chapter 2, Problem #10

a) If the number of newspapers in metropolitan areas increases, we would expect that the number of job listings per newspaper would go down, since more newspapers should not imply that there is more advertising in total. As a result, there should be little difference in the degree of difficulty that firms face in hiring workers. Firms can reach workers just as well with 5 newspapers in a city as with 2. The measured unemployment rate should not be affected. However, the measured help-wanted index should decrease, as Statistics Canada measures the quantity of advertising in only a fixed number of newspapers.

b) If firms switch their advertising to the internet from newspapers, this would likely increase the ease with which firms can hire workers. The measured unemployment rate would likely decrease, as the rate at which firms and workers can match would increase. As well, the help-wanted index should decrease, both because the quantity of vacancies posted in newspapers would have decreased due to the change in firm advertising, and because firms would more quickly fill vacancies.

c) If unemployment insurance benefits increase, unemployed workers would tend to be more picky about the jobs they are willing to take. This would tend to lengthen the duration of unemployment. Firms would find it more difficult to hire workers, and the measured unemployment rate and help-wanted index would both increase.

d) If some unemployed people become discouraged and stop searching for work, this should have no effect on the difficulty firms face in hiring workers, it will decrease the measured unemployment rate, and the help-wanted index should be unaffected.

e) If agriculture grows relative to manufacturing, this will primarily affect the quantity of job vacancies listed in metropolitan areas. One would expect no long-term effect on the difficulty firms face in hiring workers, the measured unemployment rate should be unaffected, and the help-wanted index would decrease.

4 Chapter 3, Working With the Data #3

As Figure 1 shows, durables are much more volatile than GDP, while the other categories of consumption are slightly less volatile than GDP. This is because durables (and to a lesser extent semi-durables) are analogous to investment - they represent spending in the present to produce benefits that are (mostly) in the future.

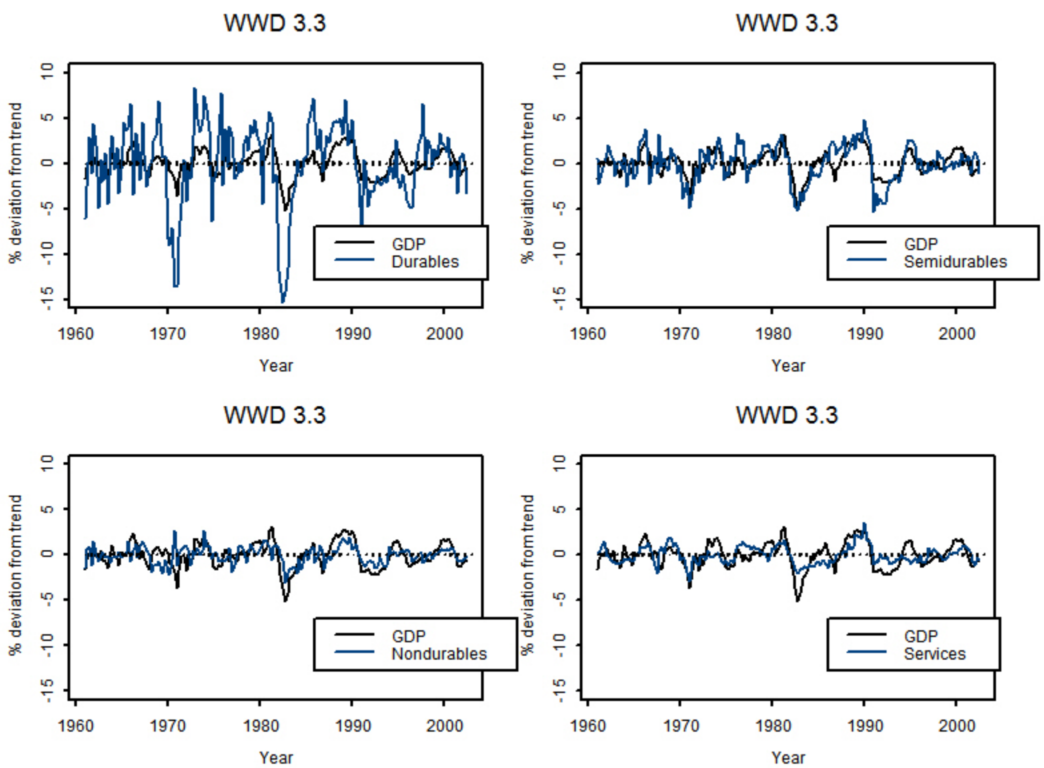

Figure 1: Consumption and GDP.