

**Economics 102**  
**Spring 2013 – Elizabeth Kelly**  
**Answers to Homework #3**  
**Due 3/4/2013**

**1. Calculation of GDP.** This problem will give you a chance to calculate GDP using several different methods. You should get the same value for GDP with each method.

Paradise Island produces coconuts and coconut pies, but nothing else. Some of the coconuts are consumed domestically, some are exported, and some are used to make pies. Some pies are consumed domestically and some are exported. All ingredients for making pies are imported except for coconuts. Labor is the only factor of production in Paradise Island. The government of Paradise Island purchases pies as part of a program for feeding the Island’s poorest residents. The government funds this program entirely through a tax on households, [where all of the taxes collected go to pay for the](#) pie-purchasing program. Because the country is small, the world price prevails in local markets.

Consider the following data:

	<b>2011 3<sup>rd</sup> Quarter</b>
<b>Data from coconut factories</b>	
Total labor hours worked:	200,000 hours
Coconut factory wage:	\$6/hour
Total Coconuts Sold:	240,000 coconuts
Price of Coconuts:	\$5/coconut
<b>Data from Pie Factories</b>	
Total labor hours worked:	75,000 hours
Pie factory wage:	\$12/hour
Total pounds of non-coconut ingredient inputs:	80,000 lbs.
Price of non-coconut ingredients:	\$2.50/lb.
Total coconut inputs:	60,000 coconuts
Total coconut pie sales:	140,000 pies
Price of pies:	\$10/pie
<b>Data from Households</b>	
Coconuts consumed:	160,000 coconuts
Pies consumed:	120,000 pies
<b>Government Data:</b>	
Pies purchased by government:	10,000 pies
<b>Trade Data</b>	

Pies exported:	10,000 pies
Coconuts exported:	20,000 coconuts
Ingredients imported:	80,000 lbs.

A. First, calculate GDP using the *factor income approach*.

$$(200,000 \text{ hours})(\$6/\text{hour}) + (75,000 \text{ hours})(\$12/\text{hour}) = \$2,100,000$$

B. Now we will use the *value added approach* to calculating GDP.

i. What is the total value added by the coconut factories?

There are no intermediate goods, so the value added is just the total sales:

$$\text{Value added} = (240,000 \text{ coconuts})(\$5/\text{coconut}) = \$1,200,000$$

ii. What is the total value added by the pie factories?

Value added = pie sales – value of intermediate goods

(Note that labor is not an intermediate good. It is a factor of production.)

$$\begin{aligned} \text{Value added} &= (140,000 \text{ pies})(\$10/\text{pie}) - (80,000 \text{ lbs ingredients})(\$2.50/\text{lb}) \\ &\quad - (60,000 \text{ coconuts})(\$5/\text{coconut}) = \$900,000 \end{aligned}$$

iii. What is the GDP?

$$\text{GDP} = \text{sum of value added} = \$1,200,000 + \$900,000 = \$2,100,000$$

C. Now we will use the *expenditure approach* to calculate GDP. [Note: This is the approach that uses equation (7-1) in your textbook. Investment has been left out of this problem for simplicity.]

i. Find the total consumer spending.

$$(160,000 \text{ coconuts})(\$5/\text{coconut}) + (120,000 \text{ pies})(\$10/\text{pie}) = \$2,000,000$$

ii. Find the total government spending.

$$(10,000 \text{ pies})(\$10) = \$100,000$$

iii. Find the total spending on export goods.

$$(10,000 \text{ pies})(\$10/\text{pie}) + (20,000 \text{ coconuts})(\$5/\text{coconut}) = \$200,000$$

iv. Find the total spending on import goods.

$$(80,000 \text{ lbs. ingredients})(\$2.50/\text{lb}) = \$200,000$$

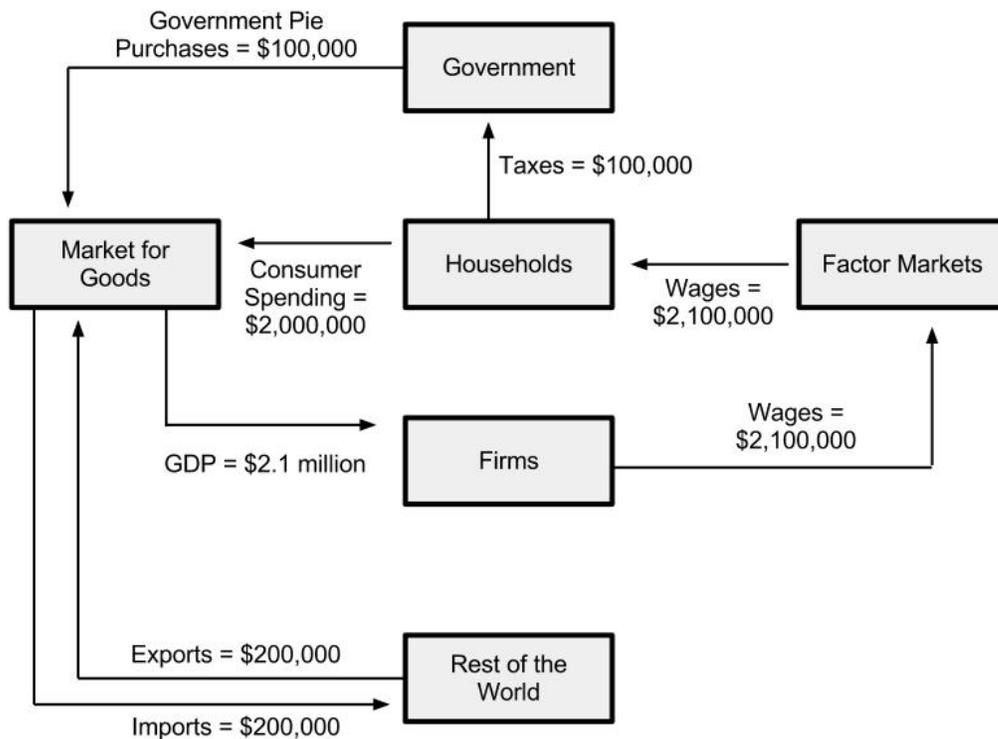
v. Find the GDP.

$$\begin{aligned} \text{GDP} &= C + I + G + (X - M) = \$2,000,000 + \$0 + \$100,000 \\ &\quad + (\$200,000 - \$200,000) = \$2,100,000 \end{aligned}$$

D. Draw a circular flow diagram for this economy **showing the monetary flows in this economy**.

Be sure that inflows and outflows are equal for every **market or sector** of the diagram. (Hint: you can use the diagram in problem 1 on page 209 of your textbook as an example.)

**Solution:**



## 2. Unemployment:

A. Suppose that in Macrostan, labor supply is given by  $W=2+(1/2)L_S$  and labor demanded by firms is  $W=20-(3/2)L_D$ , where  $W$  is the wage and  $L$  is the number of labor units. What minimum wage leads to structural unemployment of 12 labor units?

Note: Without intervention, wage would be \$6.50

$L_S - L_D = 12$  because 12 more units of labor are willing to work than are demanded by firms.

Solving the labor supply curve for  $L_S$  gives  $L_S = 2W - 4$

Solving the labor demand curve for  $L_D$  gives  $L_D = 40/3 - (2/3)W$

Plugging back into  $L_S - L_D = 12$  gives  $(2W - 4) - (40/3 - 2W/3) = 12$

Solving for  $W$  gives  $W = \$11$

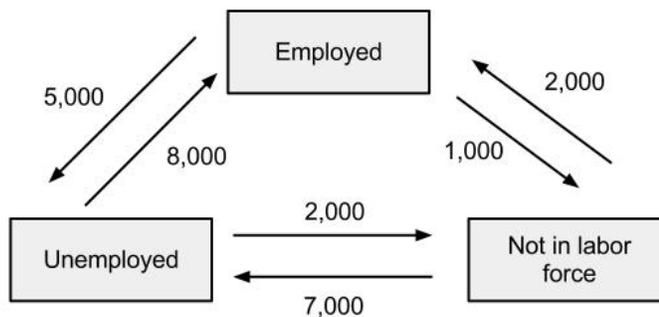
**B.** In January 2011, the government of Keynesland took a census count of its population. At this time, it documented 100,000 working-age adults, of whom 50,000 are employed and 40,000 do not participate in the work force.

**i.** What is Keynesland's unemployment rate?

There are 60,000 people in the labor force. 10,000 of these are unemployed.

Thus unemployment rate =  $10,000/60,000=16.7\%$

**ii.** Suppose the January 2012 census discovers the following flows between January 2011 and January 2012.



Using this information, what is the January 2012 unemployment rate?

There were 10,000 unemployed in January 2011, as found in (i)

Number unemployed =  $10,000 + (7,000 - 2,000) + (5,000 - 8,000) = 12,000$

Number employed =  $50,000 + (8,000 - 5,000) + (2,000 - 1,000) = 54,000$

So the unemployment rate is  $12,000 / (12,000 + 54,000) = 17.6\%$

**3. CPI.** Table 2 lists the average prices faced by consumers (from 1980-2000) across five categories of household expenditure: housing, clothing, fuel, food, and entertainment.

Table 2: Average Prices

Year	Housing	Clothing	Fuel	Food	Entertainment
1990	\$100,000	\$25	\$2.50	\$4.00	\$5.00
2000	\$150,000	\$50	\$3.00	\$5.00	\$10.00
2010	\$125,000	\$50	\$4.00	\$8.00	\$20.00

When calculating market basket expenditure, the Bureau of Labor Statistics wants you to use the following weights (fixed quantities) for each category of expenditure. These weights represent the portion of consumer spending on each of the categories. (For example, fuel price is per/gallon, but consumers don't just buy 1 gallon. They do, however, typically only buy 1 house, so the weights on prices must be different.) Assume that the weights do not change over time. Given market basket expenditure in each year, you can compute the Consumer Price Index (CPI).

Category	Weight
Housing	0.02
Clothing	0.10
Fuel	0.20
Food	0.50
Entertainment	0.18

Even though Housing is very expensive, it only has a 2% weight on the CPI in this example. This means the market basket would be  $\$100,000 \times 0.02 + \dots$  etc. for the year 1990.

(it is okay to use a calculator for the following questions)

- a) Calculate the market basket expenditures for each year: 1990, 2000, 2010.  
 To calculate market basket expenditure, multiply the average price by the weight for each category and then sum these products.  
 Market basket of 1990 =  $100,000 \times .02 + 25 \times .1 + 2.5 \times .2 + 4 \times .5 + 5 \times .18 = 2005.90$   
 Market basket of 2000 = 3009.90  
 Market basket of 2010 = 2513.40
- b) Calculate the CPI on a one hundred point scale for each year using 1990 as the base year.  
 To calculate the CPI, we take the market basket of our year and divide by the market basket of the base year and multiply by our scale factor (100).  
 $CPI_{1990}$  of 1990 = 100 (this one is easy because the CPI of the base year is always 100).  
 $CPI_{1990}$  of 2000 = 150.05  
 $CPI_{1990}$  of 2010 = 125.30
- c) Calculate the CPI on a one hundred point scale for each year using 2010 as the base year.  
 $CPI_{2010}$  of 1990 = 79.8  
 $CPI_{2010}$  of 2000 = 119.75  
 $CPI_{2010}$  of 2010 = 100
- d) Compute the CPI growth rate from 1990-2000 and 2000-2010. What do these growth rates mean?  
 CPI growth rate for 1990-2000 is calculated by taking:  

$$\frac{[CPI(2000) - CPI(1990)]}{CPI(1990)} \times 100$$
  
 $CPI$  growth rate from 1990-2000 = 50.05%  
 $CPI$  growth rate from 2000-2010 = -16.5%

This means the consumer price index rose by 50% between the years 1990 and 2000. This tells us that a consumer faced prices that were 50% higher in the year 2000 as the year 1990 (ie. on average, prices rose 50% between the years 1990 and 2000).

The CPI fell 16.5% between the years 2000-2010. This is mainly due to the falling housing prices. On average prices fell 16.5% between the years 2000 and 2010. However, if you look closely, only housing prices fell. The rest of the prices rose but since housing prices fell by such a large amount the CPI actually declined.

**4. Data Acquisition of GDP.** Go to the Bureau of Economic Analysis online to find annual GDP figures for the United States (<http://www.bea.gov/index.htm>). To find GDP values, click on the “National” tab. Once there, you’re looking for a link labeled: Current-dollar and “real” GDP (you can also type “current dollar and real GDP” into the search box on the home page and it should be the first link). This will download an excel file with annual US GDP for years 1929-2012 as well as quarterly GDP for years 1947-2012.

- a) Find and report the annual nominal GDP value of the US for the year 2008, 2009, and 2010.

Nominal GDP 2008: 14,295 billion dollars (14,295,000,000,000)

Nominal GDP 2009: 13,973 billion dollars

Nominal GDP 2010: 14,498 billion dollars

- b) Find and report the annual real GDP value (in 2005 dollars) of the US for the year 2008, 2009, and 2010. Why do you think Real GDP fell between the years 2008-2009?

Real GDP 2008: 13,161 billion dollars

Real GDP 2009: 12,757 billion dollars

Real GDP 2010: 13,063 billion dollars

Real GDP fell between the years 2008/2009 because the United States was in a recession. Housing prices fell and subsequently, the housing market slowed down. Thus, people were no longer buying new houses which reduced GDP due to that reduction in expenditure. Unemployment rose between the years 2008 and 2009 which means these unemployed people were no longer producing products during that time period that would contribute towards US GDP.

- c) Find the real GDP value (in 2005 dollars) for the year you were born. Then find the percent increase in GDP from that year to 2012. This tells you how much the US GDP has grown since you were born. (Has the US real GDP doubled in value since you were born? Nominal GDP has nearly tripled since most of your TA’s were born!)

This will vary with your age.

I was born in 1988. Real GDP 1988 = 7,607.4 billion dollars. Real GDP 2012 = 13,588.8 billion dollars.

% increase in GDP = 78.6%