Economics 102
Spring 2012
Homework #3
Due 3/14/12

Directions: The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Please remember the section number for the section **you are registered,** because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

1. This problem concerns the economic activities of five friends—Sylvester, Bruce, Jean-Claude, Kurt, and Arnold—who live in Hollywood. Answer the following questions:
   a) Jean-Claude decides to offer all the other guys karate lessons at his karate studio, Fast Chop. Everyone but Arnold signs up and pays a one-time enrollment fee of $250. To convince Arnold to join, Jean-Claude offers him a 20% discount, so Arnold signs up as well. What is the change in U.S. GDP due to the karate lessons?
   The change in GDP is 3*$250 + (1−0.20)*$250 = $950.
   b) In 1997, Bruce decides to sell his 1992 Rolls-Royce to Kurt for $300,000. Sylvester takes care of all the paperwork for this deal, for which the other two each pay him $25 each. What is the change in U.S. GDP in 1997 due to the car deal?
   Only Sylvester's work counts toward GDP in 1997, so the change is 2*$25 = $50.
   c) In 2000, the five guys inherit $10 million from their friend, Dolph, and decide to use it to set up a business to produce and sell swords. In order to save money, they decide to build the factory themselves, which takes 3 months to complete. They buy the materials and the machinery for the production of swords from China and pay $1.5 million for them. Kurt offers to take care of advertisement, for which he is compensated with $10,000. The entire first batch of swords is immediately sold to Japan for $3 million. What is the change in U.S. GDP due to the sword-making business?
   Use the expenditure approach. The inheritance does not count as it does not represent expenditure. Imports from China are $1.5 million, exports to Japan are $3 million, and private investments in the form of Kurt's advertisement services are $10,000. So GDP = I + X − M = 10,000 + 3,000,000 − 1,500,000 = $1,510,000.
   d) In 2001 the guys continue their production of swords. During that year, they produce 10,000 swords, but are able to sell only a quarter of them for a total value of sales of $250,000. What is the change in U.S. GDP for 2001 due to this activity? Which expenditure components of GDP (C, I, G, X, or M) change?
   The total change in GDP is $1,000,000. Since a quarter of the swords, or 2,500 swords, were sold for a total of $250,000, we can see that the price of a sword is $100. Then, we have that C increases by $250,000 and there is an increase in inventories (the unsold swords), so I also increases by $750,000. If you continue to assume that the swords get sold to Japan, then it would be correct to say that X increases by $250,000 rather than C.
   e) In 2002 the guys get bored with their sword-making business, so they look for new jobs. Arnold takes a government job, which pays $45,000 a year. Sylvester and Kurt get hired to star in a movie and each of them is paid $150,000 for the job. Jean-Claude decides to

try a more exciting life and joins a band of drug smugglers, who pay him a weekly salary of $1000. Bruce is the only one left to take care of the business, so he has to scale down, but still collects an annual profit of $250,000. How do the economic activities of the five friends affect U.S. GDP for 2002?

Use the income approach. We can discard Jean-Claude's income, since it comes from illegal activities. We have to add up the wages of Sylvester, Kurt, and Arnold, as well as the profits of Bruce (there are no interest payments or rents to be considered). So, the change in GDP is 45,000 + 2*150,000 + 250,000 = $595,000.

2. The following table contains information about the small economy of Nedelialand, which produces only four kinds of goods: cheesecakes, muffins, chocolate fudge, and cookies. Use the information to answer the questions below.

Year	Cheesecakes		Muffins		Chocolate Fudge		Cookies	
	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity
2007	$5.00	150	$0.80	320	$5.50	20	$0.25	400
2008	$5.00	200	$1.00	400	$6.00	30	$0.30	600
2009	$6.25	100	$1.00	250	$6.00	16	$0.50	300

a) Calculate the nominal GDP of Nedelialand for 2007, 2008, and 2009.

$NGDP_{2007} = (5.00)(150) + (0.80)(320) + (5.50)(20) + (0.25)(400) = \$1,216$
$NGDP_{2008} = (5.00)(200) + (1.00)(400) + (6.00)(30) + (0.30)(600) = \$1,760$
$NGDP_{2009} = (6.25)(100) + (1.00)(250) + (6.00)(16) + (0.50)(300) = \$1,121$

b) If we use 2008 as a base year to calculate real GDP, do you think real GDP in 2007 would be higher or lower than nominal GDP in 2007? Why? (No calculations here, just intuition).

Since prices in 2008 for all goods are equal to or higher than prices in 2007 (that is, there is inflation from 2007 to 2008), we expect that real GDP in 2007 will be higher than nominal GDP in 2007, when calculations are performed using 2008 as the base year.

c) Calculate real GDP for 2007, 2008, and 2009 using 2008 as the base year.

$RGDP_{2007} = (5.00)(150) + (1.00)(320) + (6.00)(20) + (0.30)(400) = \$1,310$
$RGDP_{2008} = (5.00)(200) + (1.00)(400) + (6.00)(30) + (0.30)(600) = \$1,760$
$RGDP_{2009} = (5.00)(100) + (1.00)(250) + (6.00)(16) + (0.30)(300) = \$936$

d) Calculate the GDP deflator for the three years, using 2008 as the base year.

$Deflator_{2007} = (NGDP_{2007}/RGDP_{2007}) \times 100 = 92.8$
$Deflator_{2008} = (NGDP_{2008}/RGDP_{2008}) \times 100 = 100$
$Deflator_{2009} = (NGDP_{2009}/RGDP_{2009}) \times 100 = 119.7$

e) By what percentage did Nedelialand's real GDP grow from 2007 to 2008? How about from 2008 to 2009? Can you think of economic reasons to justify these numbers?

$\%\Delta_{2008} = [(RGDP_{2008} - RGDP_{2007})/RGDP_{2007}] \times 100 = 34.4\%$
$\%\Delta_{2009} = [(RGDP_{2009} - RGDP_{2008})/RGDP_{2008}] \times 100 = -46.8\%$

Perhaps the economy of Nedelialand was hit hard by the recession and therefore experienced large negative growth in GDP.

f) What was the inflation rate from 2007 to 2008? How about from 2008 to 2009? (using 2008 as the base year)

$Inflation(08) = [(Deflator08 - Deflator07)/Deflator07]*100 = 7.7\%$

Inflation(09) = [(Deflator09 − Deflator08)/Deflator08]*100 = 19.7%

3. The population of Raleigh, NC is 400,000. Of those, 5% are under 16 years of age and 10% are already retired. **Of the remaining people**, 10% fall into the category "not in the civilian labor force". **Of the remaining people**, there are 26,000 part-time workers, 20,000 who are underemployed, and 230,000 full-time employees.

a) Determine the size of the civilian labor force of Raleigh.
Labor force = Employed + Unemployed
Those who are too young or too old to work represent 15% of the total population, so the remainder is 85%, or 340,000 people.
Of those 340,000, a total of 10% are not in the labor force, so the remaining 90%, or 306,000 people, are either employed (in some way) or unemployed. So, the labor force is 306,000 people.

b) What is the unemployment rate in Raleigh?
Unemployment Rate = (Unemployed/Labor Force)*100
The employed are 26,000 + 20,000 + 230,000 = 276,000. Therefore the unemployed are the total amount of the labor force less the employed, or 306,000 – 276,000 = 30,000.
Plugging into the formula above, we get UR = (30,000/306,000)*100 = 9.8%.

c) What figure would be a more realistic representation of the proportion of people in Raleigh who would like to work, but don't have a job?
For a more realistic figure, we should include the discouraged workers in the labor force and count them as unemployed as well.

d) Now suppose you are told that of those who are unemployed, 20% are being retrained because their skills no longer match the advancements in technology introduced at their jobs. Another 15% of the unemployed are students who have just graduated and are looking for a job for the first time since they got their degree. Also, another 65% of the unemployed are workers who were laid off when the recession hit and have been unsuccessfully looking for a job ever since.

    i. What is the frictional rate of unemployment in Raleigh?
Frictional unemployment = 15% of 30,000 = 4,500
Frictional rate of unemployment = (Frictional unemployment/Labor force)*100 = (4,500/306,000)*100 = 1.47%

    ii. What is the structural rate of unemployment in Raleigh?
Structural unemployment = 20% of 30,000 = 6,000
Structural rate of unemployment = (6,000/306,000)*100 = 1.96%

    iii. What is the cyclical rate of unemployment in Raleigh?
Cyclical unemployment = 65% of 30,000 = 19,500
Cyclical rate of unemployment = (19,500/306,000)*100 = 6.37%

    iv. What is the natural rate of unemployment in Raleigh? How can you check your work?
Natural rate of unemployment = Frictional + Structural = 1.47% + 1.96% = 3.43%
You should get that the natural rate and the cyclical rate of unemployment add up to the unemployment rate of 9.8%

4. In the small island country of Montecristo, people consume only services. Thus, their representative consumer basket for one year consists of 5 haircuts, 20 bus rides, 4 visits to the dentist, 10 visits to the movies, and 1 consultation with a lawyer. The prices of these services for the years 2000, 2001, and 2002 per usage (visit) in Euros are as follows:

Service/Year	2000	2001	2002
Haircut	€8	€20	€20
Bus Ride	€2	€3	€5
Dentist	€20	€20	€25
Movies	€4	€8	€10
Lawyer	€50	€80	€100

a) Fill out the following table, noting that the CPI value for the base year should be 100 (this is a good way to check your calculations).

	Base year: 2000	Base year: 2001	Base year: 2002
CPI in 2000	100	(250/400)*100 = 62.5	(250/500)*100 = 50
CPI in 2001	(400/250)*100 = 160	100	(400/500)*100 = 80
CPI in 2002	(500/280)*100 = 200	(500/400)*100 = 125	100

CPI = (Expenditures in current year/Expenditures in base year)*100
Expenditures in 2000 = 5*8 + 20*2 + 4*20 + 10*4 + 1*50 = €250
Expenditures in 2001 = 5*20 + 20*3 + 4*20 + 10*8 + 1*80 = €400
Expenditures in 2002 = 5*20 + 20*5 + 4*25 + 10*10 + 1*100 = €500

b) Using your answers from part a), calculate the rate of inflation from 2000 to 2001 and from 2001 to 2002 and fill out the table below. Provide some intuition for your answers.

	Base year: 2000	Base year: 2001	Base year: 2002
Inflation$_{(2001)}$	[(160-100)/100]*100 = 60%	[(100-62.5)/62.5]*100 = 60%	[(80-50)/50]*100 = 60%
Inflation$_{(2002)}$	[(200-160)/160]*100 = 25.0%	[(125-100)/100]*100 = 25.0%	[(100-80)/80]*100 = 25.0%

The inflation rates are the same regardless of the base year. This is expected, since the base year affects the value of the CPI, but it does not affect the percentage change in CPIs.

c) Suppose Edmond lives in Montecristo and his annual nominal income in 2001 is €5,000. What must his annual nominal income in 2002 be so that Edmond doesn't experience a drop in real income?
Approach 1: You can realize that in order to keep his real income constant, Edmond's nominal income has to increase in proportion to the inflation rate. That is, his nominal income in 2002 has to be 25% higher than his nominal income in 2001. This gives:
NIncome(2002) = NIncome(2001) + 0.25*NIncome(2001) = 5000*1.25 = 6250
Approach 2: You can use the formula: NIncome02/CPI02 = NIncome01/CPI01
The unknown here is NIncome02 and cross-multiplying gives NIncome02 = (NIncome01*CPI02)/CPI01 = (5000*200)/160 = €6250

d) Suppose Mercedes is Edmond's wife and their combined annual nominal income in 2001 is €8,000. What should Mercedes' annual nominal income in 2002 be so that the two together don't experience a drop in their real income, if Edmond's nominal income in 2002 is €6,250?

Mercedes' nominal income in 2001 is €3,000. From part c), we can see that Edmond's nominal income in 2002 is enough to keep his real income from 2001 to 2002 constant. So, we should only look at Mercedes' income alone. Using the second approach (you can use either one), calculate NIncome02 = (NIncome01*CPI02)/CPI01 = (3000*200)/160 = 3750. So, if Mercedes' nominal income in 2002 is €3750 and Edmond's nominal income in 2002 is €6250, the two wouldn't experience a drop in their real income from 2001 to 2002.

5. Suppose economy X produces according to the following production function:
$$Y = K^{\frac{1}{2}}L^{\frac{1}{2}}$$
Here, Y is real GDP, K is capital, and L is labor. Suppose capital K is fixed at 25 units at each period. Fill out the following table:

Period	Labor	Real GDP	Growth in Real GDP
0	4	10	---
1	9	15	50%
2	25	25	66.67%
3	49	35	40%
4	64	40	14.3%

Notice that $25^{\frac{1}{2}} = 5$, so Real GDP = $5*L^{\frac{1}{2}}$ for each L.

Growth in real GDP for period t =
= [(Real GDP in period t – Real GDP in period t-1)/Real GDP in period t-1]*100