Name: _____**Solutions**_____

Department of Economics
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Professor Dowell
Spring 2013

Problem Set #3

Due in hard copy at <u>beginning</u> of lecture on Wednesday, March 6, 2013

Important: Place all answers in the indicated spaces. <u>Only your work and answers in the indicated spaces will be graded.</u> All pages must be in order and stapled together.

1. Fill in the missing values in the table of data collected in the household survey for the year 2012.

Working Age Population	243,236,958
Employed	143,305,000
Unemployed	12,123,416
Unemployment Rate	7.8%
Labor Force	155,428,416
Labor Force Participation Rate	63.6%

Using the given information and the formulas from class, we solve for the unknowns.

First, solve for the number unemployed. This will also allow us to easily solve for the labor force by simple addition of the numbers employed and those unemployed.

$$U = \frac{Unemployed}{Emplyed + Unemployed} \Rightarrow 0.078 = \frac{Unemployed}{143{,}305{,}000 + Unemployed}$$

$$\Rightarrow 0.078(143{,}305{,}000 + Unemployed) = Unemployed$$

$$\Rightarrow 11{,}177{,}790 + 0.078(Unemployed) = Unemployed \Rightarrow 11{,}177{,}790 = 0.922(Unemployed)$$

$$\Rightarrow Unemployed = 12{,}123{,}416$$

Next, solve for the working age population.

$$Labor\ Force = Working\ Age\ Population\ (LFP) \Rightarrow 155{,}428{,}416 = Working\ Age\ Population\ (0.639)$$

$$\Rightarrow WorkingAgePopulation = \frac{155{,}428{,}416}{0.639} = 243{,}236{,}957.75 \approx 243{,}236{,}968$$

2. You are given the following data:

Good	Quantity in 2005	Price in 2005	Quantity in 2006	Price in 2006
Ice Cream Cones	1,000	$2.50	800	$3.50
Hot Dogs	500	$1.25	400	$2.25
Surf Boards	10	$100.00	14	$100.00

Suppose the typical consumer's consumption basket is 75 ice cream cones, 50 hot dogs and one surf board.

Base Year Cost = 75 x $2.50 + 50 x $1.25 + 1 x $100.00 = $350.00 is the cost of the basket in 2005 using 2005 prices.

Cost in 2006 = 75 x $3.50 + 50 x $2.25 + 1 x $100.00 = $475.00 using 2006 prices with 2005 quantities

$$CPI_{2006} = \frac{475}{350} x100 = 135.7$$

a. Using 2005 as the bas year, calculate the CPI for 2006.

The value of the CPI in 2006 is **135.7**

b. What is the inflation rate at the consumer level from 2005 to 2006?

$$\pi = \frac{135.7 - 100}{100} x100 = 35.7\%$$

The inflation rate is **35.7%**

3. The following table shows the top ten films of all time through 2007, measured by box office receipts in the U.S., as well as several other films well down the list:

Rank	Film	Total Box Office Receipts	Year Released	CPI	Total Box Office Receipts (2012 $)
1	Avatar	$760,505,847	2009	215	**$813,564,394**
2	Titanic	658,672,302	1997	161	**9,409,60,431**
3	The Avengers	623,279,547	2012	230	**623,279,547**
4	The Dark Knight	533,316,061	2008	215	**570,524,158**
5	Star Wars: Episode I – The Phantom Menace	474,544,677	1999	167	**653,564,525**
6	Star Wars	460,935,665	1977	61	**1,737,954,147**
7	The Dark Knight Rises	448,130,642	2012	230	**448,130,642**
8	Shrek 2	436,471,036	2004	189	**531,155,229**
9	E.T. the Extra-Terrestrial	434,949,459	1982	97	**1,031,323,459**
10	Pirates of the Caribbean: Dead Man's Chest	423,032,628	2006	202	**481,670,814**
20	Spider-Man 2	373,377,893	2004	189	**454,375,214**
65	Jaws	260,000,000	1975	54	**1,107,407,407**
129	Gone with the Wind	198,655,278	1939	14	**3,263,622,424**
146	Snow White and the Seven Dwarfs	184,208,842	1937	14	**3,026,288,119**
204	The Sound of Music	163,214,286	1965	32	**1,173,102,681**
232	One Hundred and One Dalmatians	153,000,000	1961	30	**1,173,000,000**

The CPI in 2012 was 230. Use this information and the data in the table to calculate the box office receipts for each film in 2012 dollars. Assume each film generated all of its box office receipts during the year it was released. Use your results to prepare a new list of the top ten films based on their earnings in 2012 dollars. (Several of the films were re-released several times, so their receipts were actually earned during several different years, but we will ignore that complication.) Hint: The base year is 1982-1984. This simply means the BLS sets the average index level (representing the average price level)-for the 36-month period covering the years 1982, 1983, and 1984-equal to 100 then measures changes in relation to that figure. In essence, you must "deflate" all values to 1982-1984 dollars and then "inflate" to 2007 dollars.

As discussed in class, we first need to deflate each value to the base year (1982-84) and then inflate the value to 2012 dollars. To deflate, we divide by the CPI and multiply by 100. For example, to deflate Avatar to 1982-84 dollars as follows:

$$\$_{1982\text{–}84} = \frac{760{,}505{,}847}{215} x100 = 353{,}723{,}649$$

To inflate this to 2012 dollars, we multiply by the price index (230) and divide by 100 as follows:

$$\$_{2012} = \frac{353{,}723{,}649.8x230}{100} = 813{,}564{,}394$$

We can combine both steps into one process as follows:

$$\$_{2012} = \frac{760{,}505{,}847x230}{215} = 813{,}564{,}394$$

Note that given the magnitude of the numbers I am rounding to zero decimal places. Results for all movies are indicated in the table above and the ranking of the top 10 is given in the table below:

Rank	Film	2012 $ Earnings
1	Gone with the Wind	$3,263,622,424
2	Snow White and the Seven Dwarfs	3,026,288,119
3	Star Wars	1,737,954,147
4	The Sound of Music	1,173,102,681
5	One Hundred and One Dalmatians	1,173,000,000
6	Jaws	1,107,407,407
7	E.T. the Extra-Terrestrial	1,031,323,459
8	Titanic	940,960,431
9	Avatar	813,564,394
10	Star Wars: Episode I – The Phantom Menace	653,564,525

Notice how the rankings change when we convert the revenue from all the movies into comparable terms.

4. A job paid $53,000 in 2002. The CPI in 1960 was 29.6, compared to 179.9 in 2002. In 1960, what salary would be comparable to 2002's $53,000 in real terms?

We use the formula, $Real\ Value = \frac{Nominal\ Value}{Price\ Index}\ x\ 100$. The first thing we need to do is get 2002's salary in real terms. Then we will solve for the nominal 1960 salary that is equal to the 2002 real salary. The first step is done with the first term below which we set equal to the second term. Solving for *W* we find the nominal salary we are looking for.

$$\frac{\$53{,}000}{179.9}\times 100 = \frac{W}{29.6}\times 100 \Rightarrow W = \frac{\$53{,}000\times 29.6}{179.9} = \$8{,}720.40$$

W = $8,720.40

5. Many "cell-phones" today are much more than cell phones. They are actually mini-computers on which you can check email, surf the web and do all kinds of other things. Suppose that in calculating the CPI the BLS treated them as old-fashioned cell phones, say like those that existed in the 1990s. How would this cause bias in the CPI? Explain.

Clearly, today's smart phones are not the same product. There is far more technology embodied in the phones of today. If we treated them as old fashioned phones, we would fail to measure the incredible drop in the price of technology and as a result would overstate inflation.

6. Use the Fisher relation to fill in the blanks in the following table:

Inflation Rate	Real Interest Rate	Nominal Interest Rate
5%	2%	7%
7%	0%	7%
2%	**4%**	6%
9%	**-3%**	6%
2%	2%	**4%**
10%	2%	**12%**

7. If an investment costs $100 today and pays $107 in on year, what is the maximum interest rate at which one would make the investment?

7%

Assume you would borrow the money. At 7% you would be indifferent. At anything under 7% the investment would be profitable and you would carry out the project. At anything over 7% you would suffer a loss and hence would not carry out the project.

8. a. Suppose you buy a one-year discount bond with a face value of $10,000 for $9,900 today. What interest rate will you receive by holding the bond until it matures in one year?

1.01%

$$i = \frac{10{,}000 - 9{,}900}{9{,}900} x100 = 1.01\%$$

b. Suppose you have the opportunity to buy a one-year discount bond with a face value of $5,000. Suppose also that you decide you need to earn at least a 3% return on the bond. What is the most you would be willing to pay for the bond?

$4,854.37

$$0.03 = \frac{5{,}000 - PV}{PV} \Rightarrow 0.03PV + PV = 5{,}000 \Rightarrow PV = \frac{5{,}000}{1.03} = 4{,}854.37$$

Note that for simplicity of calculation I use the interest rate in decimal form above.

c. Suppose you buy a $2,000 discount bond maturing in one year for $1,980.20.

i. What interest rate will you earn on your bond if you hold it too maturity?

1%

$$i = \frac{2{,}000 - 1{,}980.20}{1{,}980.20} x100 \approx 1\%$$

ii. Now, suppose that latter in the day, due to panic in the financial markets, interest rates on all one year bonds that are identical to your rise by two percentage points. In the panic you decide to sell your bond. Assuming there are no transaction costs such as broker fees or taxes, how many dollars do you lose when you sell your bond?

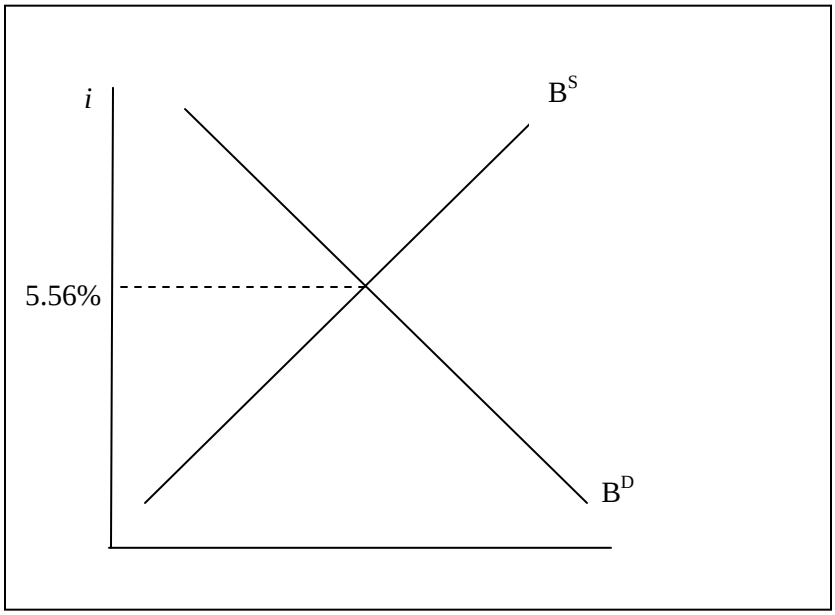
$38.45

$$0.03 = \frac{2{,}000 - PV}{PV} \Rightarrow 0.03PV + PV = 2{,}000 \Rightarrow PV = \frac{2{,}000}{1.03} = 1{,}941.75$$
$$1{,}980.20 - 1941.75 = \$38.45$$

9. Suppose you are borrowing money to buy a car. Which of the following situations would you prefer: The interest rate on your car loan is 20 percent and the inflation rate is 19 percent or the interest rate on your car loan is 5 percent and the inflation rate is 2 percent? Explain briefly.

You would rather borrow at 20% because with inflation at 19%, your real interest rate is only 1%. If you borrow at 5% when the inflation rate is 2%, you will pay a real interest rate of 3%.

10.. a. Let the supply of loanable funds be represented by $S^F = 20i$ and the demand can be represented by $D^F = 200\text{-}18i$. Graph the supply and demand for loanable funds below. Also solve for the equilibrium interest rate and label it on your diagram. Also correctly label the axes in your diagram.



Solve algebraically we get

$$S^B = D^B \Rightarrow 20i = 200 - 18i \Rightarrow 36i = 200 \Rightarrow i = 5.56\%$$

b. Suppose there is an improvement in manufacturing technology within the economy, but that nothing else changes.

i. After this change, which of the following equations could represent the demand for loanable funds? (Circle the correct one.)

$D^F = 100 - 18i$ $D^F = 200 - 18i$ $D^F = 300 - 18i$

ii. After this change, which of the following equations could represent the supply of loanable funds? (Circle the correct one.)

$S^F = -100 + 20i$ $S^F = 20i$ $S^F = 100 + 20i$

iii. Using the equations selected in parts I and ii above, find the new equilibrium interest rate.

$$S^B = D^B \Rightarrow 20i = 300 - 18i \Rightarrow 36i = 300 \Rightarrow i = 8.33\%$$

i=8.33%