

Economics 1021, Section 1
Solutions to Problem Set #2

Prof. Steve Fazzari
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1.a)

<u>Year</u>	<u>Units of Stuff Produced</u>	<u>Price of Stuff</u>	<u>Nominal GDP</u>	<u>GDP Deflator</u>	<u>Real GDP</u>
2003	500	\$20	\$10,000	95.2	\$10,504
2004	520	\$21	\$10,920	100.0	\$10,920
2005	560	\$24	\$13,440	114.3	\$11,759

Nominal GDP = (Units Produced in a Year) x (Price in a Year)

Price Deflator = Ratio of Price in Each Year to Price in the Base Year, multiplied by 100
(Note: The Price Deflator for the base year is given to be 100.0)

Real GDP = (Nominal GDP for Year t) x (Deflator in Base Year) / (Deflator for Year t)

The numbers you calculated may differ slightly due to rounding.

b) Growth Rate of Nominal GDP between 2004 and 2005:

$$(13,440 / 10,920) - 1 = 0.2308 \text{ or } 23.08\%$$

c) Inflation Rate between 2003 and 2004:

$$(100.0 / 95.2) - 1 = 0.0504 \text{ or } 5.04\%$$

d) Annualized Growth Rate of Real GDP between 2003 and 2005:

$$(11,759 / 10,504)^{1/2} - 1 = 0.0581 \text{ or } 5.81\%$$

Note that the 1/2 power is used because the growth took place over two years, and you want to "annualize" the growth. That is, you want to compute how fast real GDP would have to grow each year to reproduce its actual growth over the two-year period.

2a) Here is a table with the 2012 data obtained from the FRED database (<http://research.stlouisfed.org/fred2/>). From the FRED home page, follow the links to "Gross Domestic Product (GDP) and Components" and then "GDP/GNP." The quarterly nominal GDP figures are designated by the series ID "GDP." You can take real GDP directly from the variable "GDPC1" (one decimal point of precision) or "GDPC96" (three decimal points of precision). To get the GDP price index, go back to the Gross Domestic Product and Components page and click the link "Price Indexes & Deflators." The price index used to deflate all of GDP is designated as "GDPDEF." (Note that this is also where you could find the personal consumption deflators we talked about in class.)

Time Period	Nominal GDP	GDP Price Index	Real GDP
2012:1	\$15,478.3	114.599	\$13,506.4
2012:2	15,585.6	115.035	13,548.5
2012:3	15,811.0	115.810	13,652.5

The data in the table come directly from the FRED site. If you divide the nominal GDP figures by the price index and multiply by 100, you will get slightly different figures for real GDP due to rounding error. The figures are in billions of dollars. Note that nominal GDP is approaching \$16 trillion, a useful fact to keep in mind when assessing the relevance of economic figures relative to the size of the economy. You might here about a government spending program of \$10 billion discussed as if it were a lot of money. Indeed, \$10 billion would be a huge amount of money for an individual, but it's only 0.06% of GDP!

b) "Annual rates" means that the numbers reflect the level of activity that would have taken place if the economy operated for a full year at the same level it did for the period you are actually measuring. The data are for calendar quarters, so they are multiplied by 4 to obtain annual rates. For example, the actual value of final goods and services produced in the first quarter of 2012 was \$15,478.3 billion / 4 = \$3,869.6 billion.

Seasonal adjustment means that the data are modified with statistical techniques to account for typical seasonal variations. For example, first quarter actual data are adjusted upward to reflect the fact that the post-holiday lull in sales and winter weather make actual GDP systematically low in the first quarter. For similar reasons, fourth quarter data are adjusted downward to account for seasonality. The idea is to obtain statistics that reflect underlying trends in the economy, not just normal seasonal fluctuations. But if seasonal factors are unusual (an especially bad winter weather, for example) the seasonal variations may not be entirely eliminated by the adjustment procedure.

c) With the data above, you can calculate just the annualized real growth rates for the second through the third quarters. (To calculate real growth for the first quarter, you would need the figures for the fourth quarter of 2011, which you certainly find easily, but it was not required.)

For 2012:2 annualized real growth was:

$$(13,548.5 / 13,506.4)^4 - 1 = 0.0125 \text{ or } 1.25\%$$

Using the same formula, third quarter annualized real growth was 3.11%.

c) You must be careful here. The question asks for the annualized value of the inflation rate over two quarters. The actual growth rate in the price index between the first and third quarters was $(115.810 / 114.599) - 1 = 0.0106$ or 1.06%. Since this inflation took place over two quarters, to annualize it you would add 1 to growth rate and raise the sum to the second power: Annualized Growth Rate = $(1.0106)^2 - 1 = 0.0213$ or 2.13%. This question goes somewhat beyond what I expect students to do on the exam, but I want you

to try to understand the general principle of annualization, which can go take a growth rate from any period (month, quarter, half year, 7 months, etc.) and express it as if the variable had grown at the same rate over a full year.

3. a) To say that a GDP figure is "in 2005 dollars" indicates that it is a "real" figure, that is, corrected for inflation by dividing by a price index with a 2005 base year. Therefore, this is the value of final production in the period you are analyzing with goods and services valued at constant 2005 prices.

b) To compute the average annual growth rate of real GDP between 1960 and 2011, use this formula:

$$(13,299.1 / 2,828.5)^{1/51} - 1 = 0.0308 \text{ or } 3.08\%$$

Note that the formula drops the "billions" (10^9) terms because they simply cancel in the numerator and the denominator. (It's fine if you kept the billions in your numbers.) The $1/51$ exponent reflects the fact that the growth compounded for 51 years. You want to find the average annual growth rate that would have generated the actual 1960 to 2011 expansion if had continued at a constant growth rate for this entire period (which of course it did not). Also note that if you simply divided the actual growth of 370.02 percent over this period by 50 you would get a badly distorted answer ($370 / 51 = 7.26$). You have to take into account "compounding" and compute the annual growth rate with the exponential formula above. The distortion from ignoring compounding over a long period of time like this is very severe.

4. Undoubtedly, the Great Depression in the early 1930s is the single worst economic event in U.S. history, no matter what measure you use to judge its severity. Until recently, it was somewhat harder to pick the second worst recession. The most likely candidates are the recessions of 1974-75 and 1981-82. In both cases unemployment rose substantially (reaching 10.8 percent in late 1982) and output fell quite a bit. Both unemployment and the output drop in the 1974-75 and 1981-82 recessions were worse than in the 1990-91 and the 2001 recessions. But, if one measures the severity of a downturn by the amount of time it takes for output to return to its previous growth trend, the experience of 1989 to 1992, including the 1990-91 "official" recession looks quite bad. The 2001-2005 period also looks bad in this sense. Most likely, the early 1980s period would have ranked as the second worst period because it was both rather long and had quite a severe drop in output and rise in unemployment.

But the recent downturn that started in late 2007 is now the worst since the Great Depression, in the estimation of most economists. The unemployment rate did not get quite as high as it did in 1982 (10.0% in 2009 versus 10.8% at the trough of the 1982 downturn), but the drop in total jobs was more severe and it is now clear that the recovery of the labor market will take much longer following the trough than was the case in 1982.

The point is that the severity of a downturn depends on how you measured it. If you provide a sensible analysis, you will get full credit for this question regardless of how you chose the second worst period.

5.a) The peak of the cycle is the quarter in which GDP hits its highest level (not its highest growth rate). This occurs during the last quarter of positive growth before a recession. In the data given in the question, the peak is in 2015:1. Correspondingly, the trough occurs when GDP hits its lowest level during a recession, 2015:4 in these data.

b) The unemployment rate moves counter-cyclically. It rises when GDP declines and falls when GDP rises. The increase in unemployment during the end of the recession in 2015:3 and 2015:4 provides a good example of this phenomenon. But the unemployment rate is a "lagging indicator." Its movements follow the cycle in real output. In the data given, the unemployment rate does not begin to rise until the economy is well into the recession and it peaks in 2016:2 or 2016:3, several quarters *after* the end of the recession.

c) It is unusual for the inflation rate to rise in a recession, but this is what happens here. This "stagflation" is similar to what happened in the U.S. during the 1974-75 recession when dramatic oil price increases pushed up prices even as the economy contracted.

d) The party that controls the presidency faces problems from all three data series. While the recession appears to have ended, real output growth remains quite sluggish in 2016. These slow growth rates correspond to the initial sluggish growth of the U.S. economy after the 1990-91, 2001, and 2008-09 recessions. Also, not surprisingly, the unemployment rate remains high in the year after the recession. Because it is a lagging indicator, the unemployment rate is nearly at its peak at the time of the election, even though the recession has ended. Finally, the inflation rate is very high in 2016 by recent historical standards.

6. a) A housewife or househusband is probably not actively engaged in searching for a job, so they would not be counted as part of the labor force and would not be counted as unemployed.

b) Because an inmate is not actively looking for a job, he or she is not counted as unemployed. (Note that inmates might do some work in prison, but this is not considered part of the "market," and prisoners are not counted as part of the labor force.)

c) This college student is not unemployed because he or she is not looking for a job.

d) A recent graduate who is looking for a job but has not found one will be counted as unemployed.

e) A person who was fired and is looking for a job would be counted as unemployed.

f) If jobless people stop actively seeking work they will not be counted as unemployed--even if they once held a job and would like to have one again.

7. The unemployment rate is $\text{Unemployed} / (\text{Working} + \text{Unemployed})$, or you can define the unemployment rate as $\text{Unemployed} / \text{Labor Force}$ and the Labor Force as $\text{Working} + \text{Unemployed}$. How could the unemployment rate fall even if there is no change in the number of people working? If some unemployed people stop actively looking for work

(that is, they become discouraged workers) the numerator of the unemployment rate will fall proportionately more than the denominator. This change causes the unemployment rate to decline even though the number of people working does not change.

A roughly opposite condition can occur in the early stages of recovery. Suppose that lots of people have dropped out of the labor force during a recession, that is, they stop looking for work, because they are discouraged and jobs seem very difficult to find. When the economy begins to recover and grow, the news about jobs gets better. Some of these discouraged workers will likely begin searching for jobs again. If more people search for jobs, but don't find them immediately, the unemployment rate can rise.

These examples show why the unemployment rate can be a misleading indicator of the state of the economy and the labor market. Many economists put more emphasis on the number of new jobs created every month, even though this statistic gets less public attention than the unemployment rate.

8. There are several reasons why this statement is false. When the unemployment rate is above a level associated with full employment, some output is lost and can never be recovered. There are also significant psychological costs to unemployed workers even if their incomes are maintained. Furthermore, not all unemployed workers are covered by unemployment insurance, and the insurance often falls *far short* of what would be required to fully replace lost wages. Finally, the government transfer payments that constitute part of the unemployment payments are financed by taxes, which may be better used elsewhere.

9. An unemployment rate of 4.5 percent does not necessarily indicate bad macro performance. Most economists believe that the economy is close to "full employment" even when the unemployment rate is in the neighborhood of 4 to 5 percent. This is because there will always be some frictional and structural unemployment as the labor market adjusts to new conditions and people change their job preferences. For these reasons, it is not likely that the government would propose any policies specifically to reduce unemployment below this level.

10. You will gain and your friend will lose. Because you set the interest rate on your loan at a level that you expected to yield a zero real rate of interest, you must have set the nominal interest rate equal to your expected inflation rate. If inflation turns out to be lower than what you expected, the actual real interest rate will be positive over the term of the loan. When your friend repays the loan, the total amount repaid will buy more goods and services than what you could have bought with the amount of money you lent at the time you made the loan.

11. The real interest rate was the nominal rate (7.56 percent) less the inflation rate (8.7 percent) or *negative* 1.14 percent. Because the real interest rate is negative, we can deduce that the individuals who bought these bonds did not expect inflation to be so high. They probably would not have chosen to lend money to the government at an interest rate that did not even compensate them for the loss in purchasing power due to inflation.

