

**Finance 30220**  
**Solutions to Problem Set #2**

1) Suppose that you have the following series for real GDP.

Year	Real GDP
2002	\$3,250
2003	\$3,450
2004	\$3,500
2005	\$3,700

- Calculate the trend rate of growth assuming a constant annual growth rate.
- Rewrite the series in terms of deviation from trend.

First, let's calculate an average annual growth rate. We can do this two different ways:

$$\left[ \left( \frac{3,700}{3,250} \right)^{\frac{1}{3}} - 1 \right] * 100 = 4.4\%$$

Or,

$$\frac{[\ln(3,700) - \ln 3250] * 100}{3} = 4.32\%$$

Now, we need to extrapolate the future values...

$$3,250(1.044) = 3,393$$

$$3,250(1.044)^2 = 3,542$$

$$3,250(1.044)^3 = 3,698$$

Or,

$$3,250e^{.0432} = 3,393$$

$$3,250e^{2(.0432)} = 3,542$$

$$3,250e^{3(.0432)} = 3,698$$

Now, calculate deviations from trend:

$$\left( \frac{3,450 - 3,393}{3,393} \right) * 100 = 1.68\%$$

$$\left( \frac{3,500 - 3,542}{3,542} \right) * 100 = -1.12\%$$

$$\left( \frac{3,700 - 3,698}{3,698} \right) * 100 = .05\%$$

2) See excel spreadsheet for solutions

3) Suppose you have the following data on an economy (assume that indirect taxes and depreciation are equal to zero):

- Gross Domestic Product: \$5,000
- Government Purchases: \$2,000
- Tax Revenues: \$500
- Net Exports = -\$1,000
- Net Factor Payments = \$200
- Consumption Expenditures = \$3,000

Find National Income, Current Account, Private Savings, Net Investment, and Gross Investment.

First, we can convert GDP (gross domestic product) to GNP (gross national product) by adding net factor payments:

$$\text{GNP} = \$5,000 + \$200 = \$5,200$$

Ordinarily, to get National Income, we would subtract out depreciation and indirect taxes. Here, both of these are zero, so

$$\text{National Income} = \$5,200$$

The current account is given by net exports plus net factor payments:

$$\text{Current Account} = -\$1,000 + \$200 = -\$800.$$

Private savings equals national income minus taxes minus consumption:

$$\text{Private Savings} = \$5,200 - \$500 - \$3,000 = \$1,700$$

To get net investment, we can use the relationship:

$$S = I + (G-T) + CA$$

We can calculate the deficit:  $(G-T) = (\$2,000 - \$500) = \$1,500$ . Therefore,

$$\$1,700 = I + \$1,500 - \$800.$$

Solving for investment:

$$I = \$1,000$$

Lastly, to get gross investment, use the relation:  $GDP = C + I + G + NX$

$$\$5,000 = \$3,000 + I + \$2,000 - \$1,000$$

Solving for I, we get

$$\text{Gross Investment} = \$1,000$$

**Note that gross investment and net investment are equal. That's because we assumed depreciation to be zero!!**

For Questions (4) – (5), refer to the following chart.

Suppose that apples and oranges are the only two goods available in the economy, and that they are sold in the quantities and prices indicated in the following table.

	Apples		Oranges	
Year	Quantity	Price	Quantity	Price
2003	4	\$5	8	\$9
2004	6	\$8	12	\$12
2005	5	\$12	14	\$10

4) Suppose the average American spends equal amounts on apples and oranges:

- Calculate Nominal GDP in 2003, 2004, and 2005.

GDP is calculated by multiplying price times quantity in each year and adding them up.

$$2003: 4(\$5) + 8(\$9) = \$92$$

$$2004: 6(\$8) + 12(\$12) = \$192$$

$$2005: 5(\$12) + 14(\$10) = \$200$$

- Using 2004 as the base year, calculate the CPI in 2003, 2004, and 2005.

First, let's calculate the value of the price index for each year assuming equal weights on each price (the average American consumes equal amounts of each good).

$$2003: .5(\$5) + .5(\$9) = \$7$$

$$2004: .5(\$8) + .5(\$12) = \$10$$

$$2005: .5(\$12) + .5(\$10) = \$11$$

Now, let's divide each by the base year price (2004) to get the price index relative to the base year.

$$2003: \$7/\$10 = .7 \text{ (or } 70)$$

$$2004: \$10/\$10 = 1 \text{ (or, } 100)$$

$$2005: \$11/\$10 = 1.1 \text{ (or, } 110)$$

- Calculate real GDP in 2003, 2004 and 2005 using the CPI.

First, we need to calculate GDP in terms of year 2004 prices:

$$2003: \$92 (100/70) = \$131$$

$$2004: \$192 (100/100) = \$192$$

$$2005: \$200 (100/110) = \$181$$

Now, the growth rates are calculated by taking differences in logs:

$$2003-2004: (\text{LN}(192) - \text{LN}(131)) * 100 = 38\%$$

$$2004-2005: (\text{LN}(181) - \text{LN}(192)) * 100 = -6\%$$

- Calculate the inflation rates using the CPI

Inflation rates are calculated by taking the differences in logs of the price index:

$$2003-2004: (\text{LN}(100) - \text{LN}(70)) * 100 = 36\%$$

$$2004-2005: (\text{LN}(110) - \text{LN}(100)) * 100 = 9.5\%$$

5) Calculate real GDP in each year using 2003 prices.

For each year, we take quantity in each year times the price in 2003:

$$2003: 4(\$5) + 8(\$9) = \$92$$

$$2004: 6(\$5) + 12(\$9) = \$138$$

$$2005: 5(\$5) + 14(\$9) = \$151$$

- Calculate the rates of real economic growth for 2003-2004 and 2004-2005?

As in the previous question, the rate of growth is the difference in logs

$$2003-2004: (\text{LN}(138) - \text{LN}(92)) * 100 = 41\%$$

$$2004-2005: (\text{LN}(151) - \text{LN}(138)) * 100 = 9\%$$

- Calculate the implicit GDP deflators for 2003, 2004, and 2005

The implicit GDP deflator is given by nominal GDP divided by real GDP (we calculated nominal GDP earlier)

$$2003: (92/92) = 1 \text{ (or, 100)}$$

$$2004: (192/138) = 1.39 \text{ (or, 139)}$$

$$2005: (200/151) = 1.32 \text{ (or, 132)}$$

- Calculate the inflation rates of the GDP deflator.

Inflation is given by the difference in logs of the price level:

$$2003-2004: (\text{LN}(139) - \text{LN}(100)) * 100 = 33\%$$

$$2004-2005: (\text{LN}(132) - \text{LN}(139)) * 100 = -5\%$$