

14.02 Principles of Macroeconomics

Problem Set #2, Answers

Posted: Thursday, February 21, 2002

Due Date: Thursday, February 28, 2002

Please remember to write your TA's name and section time on the front page of your problem set.

Part I: True, False Questions. Decide whether each statement is true or false and justify your answer with a short argument. (5 points each, 35 points total)

1. The real output per capita is one of the best measures of the standard of living.

True. It is very correlated with other measures as health provision, educational achievements, democracy, social security, low poverty and so on.

2. An increase in the personal savings rate reduces aggregate demand, so it is unambiguously bad for short and long-term growth.

False. It might not be for long-term growth, because higher savings increases the amount of investment, and so the capital level. This will imply a higher income tomorrow.

3. The regression line obtained using OLS is chosen to minimize the size of the estimated coefficient.

False. Minimizes the sum of squares residuals.

4. A t-statistic close to zero indicates that we cannot be 95% sure that the true coefficient is different from zero.

True. If the absolute value of t-statistic is greater than 2, it implies that the true coefficient is different from zero with at least 95% confidence.

5. Cross-sectional data show that relatively high growth countries have had a relatively highly educated labor force.

True. Just check last graphs in the class about growth.

6. A regression of Y on X with a high R^2 indicates that X is caused by Y.

False. The regression will show a measure of "correlation" (an statistical measure of how two variables move together) that it is not a proof of causality. It might be that X and

Y moved together because Z was moving and affecting both X and Y. In that case, Z is the cause of both X and Y.

7. Other factors equal, a 1% increase in a nation's investment in physical capital, produces a 1% increase in potential output.

False. The more the capital is there, for a given amount of labor, the smaller will be the increase in output of adding one more unit of capital (decreasing returns).

Part II. National Accounts. (5 points each, 40 points total)

There are an orange farm and an orange juice company in a country called Orangeland. Orangelanders live only on orange juice. In 1992, the orange farm produced 10 oranges, and sold them to the orange juice company at \$1 each. The orange juice company produced 3 bottles of orange juice, and sold them at a unit price of \$10 plus 10% indirect tax collected by government (so the price paid was actually \$11). The orange farm paid total wages of \$6. The orange juice company paid total wages of \$10. The orange juice company also had to pay \$4 to replace the orange juice extractor that was not working properly (depreciation). Both companies retained 50% of their profits and paid the rest of it as dividends to the households. After receiving their wage income and their dividends, the households paid a 10% direct tax on their income to the government. The government bought one orange juice bottle. (Notice that the firms are not paying any direct taxes on their retained profits)

1. Compute the GNP of Orangeland using the value added approach or the final goods approach.

Value added:

$$\text{Farm: } \$10 * \$1 = \$10$$

$$\text{OJ company: } 3 * \$11 - \$10 = 23\$$$

$$\text{GDP} = 10 + 23 = \$33$$

Final goods:

$$3 \text{ OJ bottles: } 3 * \$11 = \$33 = \text{GDP}$$

2. What is NNP? What is National Income?

$$\text{NNP} = \text{GDP} - \text{Depreciation} = \$33 - \$4 = \$29$$

$$\text{NY} = \text{NNP} - \text{Indirect Taxes} = \$29 - \$3 = \$26$$

3. What is the total income of the government?

$$\text{Profits of the farm: } 10 - 6 = \$4$$

$$\text{Profits of the OJ firm: } 30 - 10 - 10 - 4 = \$6$$

$$\text{Total profits} = \$10$$

$$\text{Dividends Paid to the households (50\%)} = \$5$$

$$\text{Income of the households} = \text{dividends} + \text{wages} = 5 + 6 + 10 = 21$$

$$\text{Income tax paid} = (10\% * 21) = \$2.1$$

$$\text{Indirect tax paid} = (10\% * 30) = \$3$$

$$\text{Total income} = (2.1+3) = \$5.1$$

4. What is its budget deficit (or surplus)?

$$\text{Expenditures of the government} = 1 * \$11 = \$11$$

$$\text{Fiscal Deficit} = \$11 - 5.1 = \$5.9$$

5. What is the disposable income (income available for consumption) of the households?

$$\text{Wages} + \text{dividends} - \text{taxes} = \$21 - \$2.1 = \$18.9$$

In 1993, the price of all the goods (the oranges and the orange juice bottles) went up by 10%.

6. Would you say that the economy experience an economic expansion between 1992 and 1993? Explain

No. The economy keeps producing only three bottles of orange juice.

7. What was the GNP in 1993? What is the inflation rate?

$$\text{GNP}_{93} = \$33 * 1.10 = \$36.3$$

$$\text{Inflation} = \%10$$

8. What was the real GNP in 1993 measured at 1992 prices?

$$\text{Real GNP}_{93} = \$33$$

Part III : Econometrics and Aggregation (5 points each, 25 points total):

An economist used data on savings (S) and disposable income (Y) over many years of a given individual (Mister X). He applied an appropriate econometric procedure to estimate the following savings equation :

$$S_t = \alpha + \beta Y_t + \text{residual}$$

1. Interpret β . What values should you expect for β ?

It is the marginal propensity to save. We should expect it to be between 0 and 1.

2. The regression yielded the following estimates: $\alpha = -5$, $\beta = 0.3$. Suppose that for one of the observations in the sample, $Y_t = 100$ and $S_t = 10$. What is the fitted value for that observation? What is the residual?

$$\text{Fitted value} = -5 + 0.3 * 100 = 25$$

$$\text{Residual} = 10 - 25 = -15$$

3. The t-statistic for β was 1.023. What can you say about the effect of disposable income on consumption? *It is not statistically different from zero*

4. Derive the consumption function of Mister X (forget about the residual) using the estimated values for the parameters.

$$C = Y - S = Y - (-5 + 0.3Y) = 5 + 0.7Y$$

5. Suppose that there are 100 individuals in the economy. All individuals have the same consumption function as Mister X but have different disposable incomes. What is the aggregate consumption function?. Aggregate disposable income is 8000. What will be your "estimate" of aggregate consumption? If there is no government expending, no imports, and no exports, how big is investment in this economy?

$$\text{Aggregate } C = 500 + 0.7 * (\text{Aggregate } Y)$$

$$\text{Estimated Aggregate consumption} = 500 + 0.7 * 8000 = 6100$$

$$\text{Investment : } I = S = Y - C = 8000 - 6100 = \$1900$$