

14.02 Principles of Macroeconomics

Problem Set #1, Questions

Posted: Wednesday, September 10, 2003

Due Date: Wednesday, September 17, 2003

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

Assume a closed economy throughout the problem set.

Part I: True/False Questions: Decide whether each statement is true or false and justify your answer with a short argument.

1. The Keynesian multiplier is always greater than 1.

True. It is $1/[1-(1-t)c_1]$, where c_1 is the marginal propensity to consume (MPC), and t is the tax rate. Since we always assume that $0 < c_1 < 1$ and $0 < t < 1$, $\Rightarrow \{1/[1-(1-t)c_1]\} > 1$.

2. US nominal GDP in 1998 was 16 times higher than US nominal GDP in 1960. US Real GDP increased by a factor of 3.3 from 1960 to 1998.

True. See Blanchard, figure 2.1

3. Assume the government maintains a budget balance through fixed taxes and transfers. If the government increases government transfers and decreases government spending by the same amount, then, the GDP and budget balance will remain unchanged.

False. A reduction of one unit in the government spending decreases the autonomous spending by one unit. An increase in government transfers decreases net taxes by one unit, which increases autonomous spending by the marginal propensity to consume ($MPC < 1$). Therefore, the net effect on the total autonomous spending is negative ($MPC - 1 < 0$). Thus, the GDP in equilibrium decreases by the reduction in the autonomous spending times the multiplier. That is, $(MPC - 1)/(1 - MPC) = -1$, which is balanced-budget multiplier. The budget will be maintained.

4. If the goods market is in equilibrium, then total saving is equal to total investment.

True. If the goods market is in equilibrium, then:

$$Y = C + G + I \Leftrightarrow Y - C - G = I \Leftrightarrow (Y - T) - C - (G - T) = I \Leftrightarrow (Y^d - C) + (T - G) = I \Leftrightarrow S_p + S_g = I \Leftrightarrow S = I$$

Where: S_p , S_g , and S are private saving, government saving, and total saving, respectively.

Part II. National Accounts

In Orangeland, a closed economy, Orangelanders live only on orange juice. There is a farm that produces oranges and a factory that produces OJ. In 2002, 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 all 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. Both companies retained 50% of their net profits (after depreciation) 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 total income to the government. The government bought one orange juice bottle (for \$11). The government made no social transfers. (Notice that the firms are not paying any direct taxes on their retained profits)

1. Compute the GDP of Orangeland using (a) income approach, (b) the value added approach, and (c) the final goods approach.

(a) Households' income:

$$\text{Wages: } \$6 + \$10 = \$16$$

$$\text{Dividends: } 50\% (\$4 + \$10) = \$7 \text{ (see calculation of profits below)}$$

$$\text{Retained profits: } 50\% (\$4 + \$10) = \$7 \text{ (see calculation of profits below)}$$

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

$$\text{Total households income: } \$16 + \$7 + \$7 + \$3 = \$33$$

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

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

(b) Value added:

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

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

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

(c) Final goods:

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

2. What is the total income of the government from taxes?

$$\text{Income of the households} = \text{dividends} + \text{wages} = 7 + 6 + 10 = 23$$

$$\text{Income tax paid} = 10\% * 23 = \$2.3$$

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

$$\text{Transfers} = 0$$

$$\text{Total taxes} = (2.3 + 3 - 0) = \$5.3$$

3. What's the government spending? What's the government budget deficit (or surplus)?

$$\text{Government spending} = 1 * \$11 = \$11$$

$$\text{Total taxes} = (2.3 + 3) = \$5.3 \text{ (see part 3 above)}$$

$$\text{Fiscal Deficit} = \$11 - 5.3 = \$5.7$$

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

$$\text{Wages} + \text{dividends} - \text{income taxes} = \$23 - \$2.3 = \$20.7$$

The above information holds also for 2003, except that in 2003, the prices of all the goods (the oranges and the orange juice bottles) go up by 10%.

5. Would you say that the economy experience an economic expansion between 2002 and 2003? Explain

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

6. What was the nominal GDP in 2003?

$$\text{Nominal GDP}_{2003} = \$33 * 1.10 = \$36.3$$

7. What was the real GDP in 2003 measured at 2002 prices?

$$\text{Real GDP}_{2003} = \$33 \text{ (no change)}$$

8. What is the GDP deflator (Basis year = 2002)? What is the inflation rate between 2003 and 2002?

$$P_{2003} = \$36.3 / \$33 = 1.1$$

$$dP_{2003} / P_{92} = 10\%$$

Part III: First Macro Model

Assume a closed economy with:

$$C = 100 + 0.6Y^d, \quad I = 200 - i, \quad G = 500$$

1. (a) State the equilibrium condition for GDP and give a brief explanation of what it means. Solve for equilibrium GDP as a function of the unknown variables, i and T ; (b) Plot two demand curves: (1) in the aggregate demand- Y space; and (2) in the i - Y space.

(a) The equilibrium condition is: $Y=C+G+I$; aggregate supply equals aggregate demand. This is the sum of spending by consumers, gross investment by firms, and government spending (this is also the definition of GDP). If the economy is open to trade, we have to add the amount foreigners spend on domestic goods and services (EX) and subtract off the spending on foreign goods and services (IM).

Substituting the given values and solving for Y yields:

$$\text{Aggregate demand: } Z=C+G+I = 100+0.6(Y-T)+500+200-i = 800-0.6T-i+0.6Y$$

$$\text{Aggregate supply: } Y$$

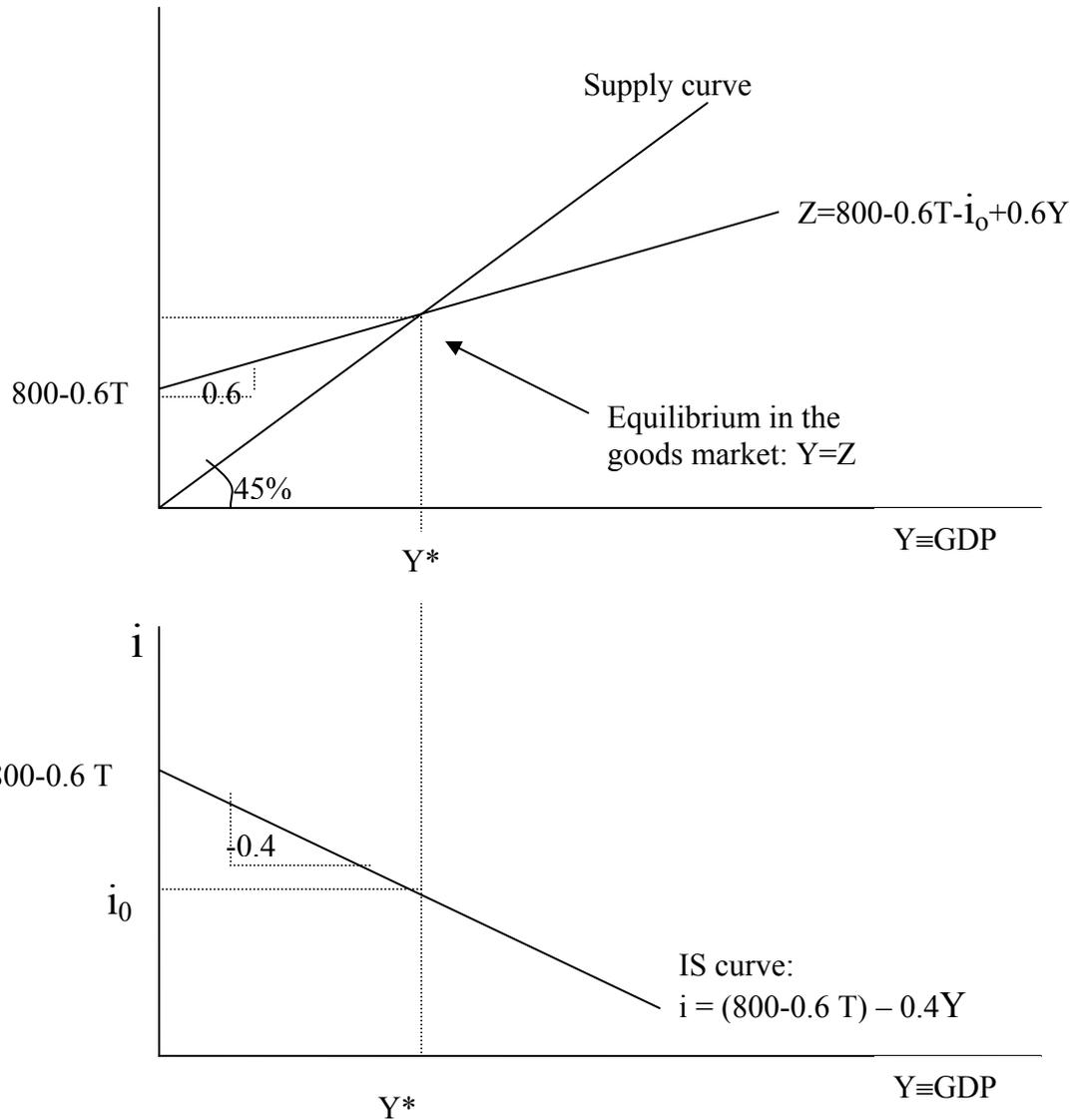
$$\text{In equilibrium: } Y = Z$$

$$\implies Y = 800-0.6T-i+0.6Y$$

$$\implies Y^* = 2.5 * (800-0.6T-i)$$

$$\text{or } Y^* = (2,000-1.5 T) - 2.5 i \quad \leftarrow \text{ This is the IS curve.}$$

See graph below.

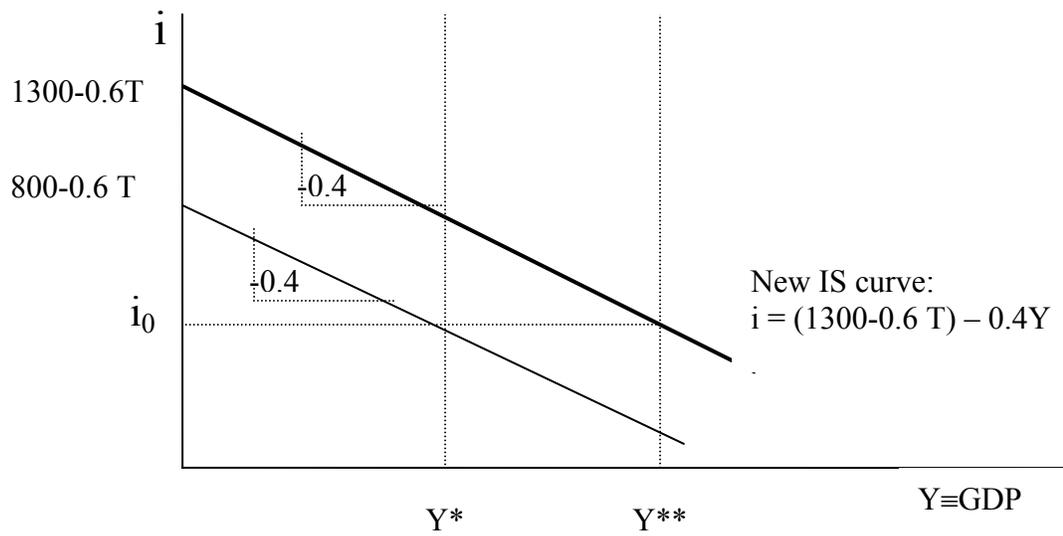
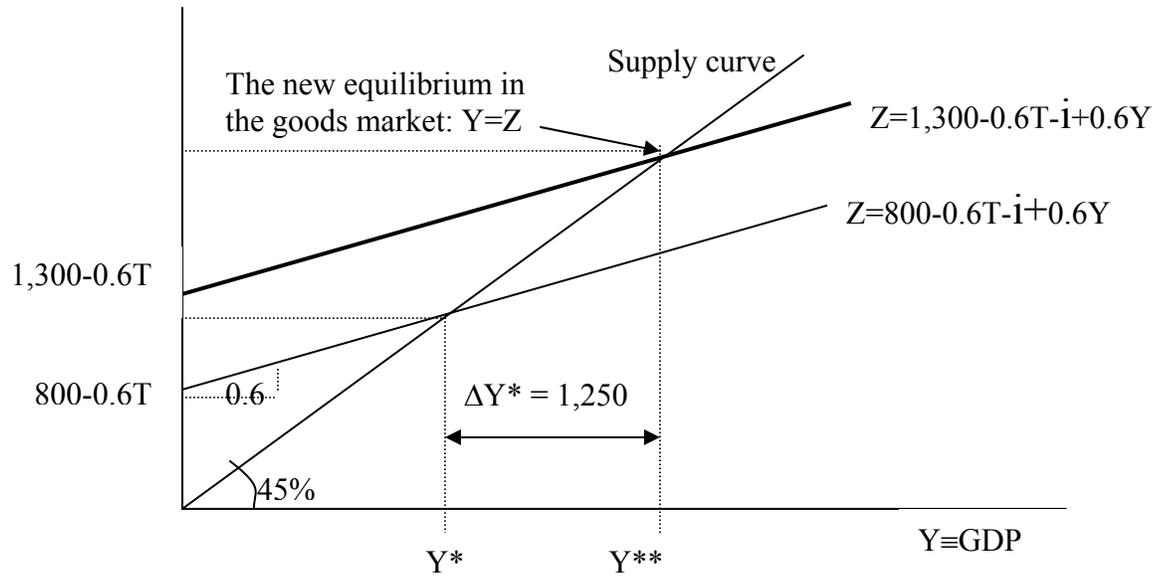


2. (a) What's the value for the multiplier, autonomous spending, and equilibrium GDP if $T=0$ and $i_0=10$ (so, now $I=190$)? (b) What's the value for the multiplier, autonomous spending, and equilibrium GDP if the government budget is balanced and $i_0=10$?

Launch Internet Explorer Browser.Ink (a) The multiplier is 2.5 and independent of the values of T and i . If $T=0$ and $i=10$, then the autonomous value is $(800 - 0.6 * 0 - 10) = 790$. The GDP in equilibrium is $2.5 * 790 = 1,975$. (b) If there is a budget balance, $T=500$. Then the autonomous value is $(800 - 0.6 * 500 - 10) = 490$. The multiplier remains the same. The GDP in equilibrium is: $Y^* = 2.5 * 490 = 1,225$.

3. **(a)** By how much will the GDP increase if the government decides to increase defense spending by \$500 million? **(b)** By how much will output increase if the government increases defense spending by \$500 million, but keeps a balanced budget? What is the balanced budget multiplier?

(a) To answer this question we don't need to know T . It is enough that we know the multiplier, which exactly tells us by how much the GDP reacts to a *change* in the autonomous value: $2.5 * \$500 = +\$1,250$ increase in GDP. **(b)** If we increase both G and T by 500, then GDP will increase by the balanced budget multiplier, which is $1 * 500 = 500$ (see T/F#4 above). To put another way, the total change in the autonomous value will be only $(1 - 60\%) \$400 = +\160 , and therefore, the change in GDP will be $160 * 2.5 = +\$500$.



4. The government decides to increase total savings in the economy. In order to do that, it implements a new social security law that increases the marginal propensity to save by 0.1. By how much will GDP and total savings change (assume $G=T=500$, $i_0=10$)? Explain.

In the new equilibrium, the $GDP = 2(800 - 0.5T - i) = 2(800 - 0.5 * 500 - 10) = 1,080$ from 1,225 before. Total Saving, in fact, does not change, and stays at 190 (check). Note, if investment was positively correlated with GDP, then investments and savings will decrease (the Savings Paradox).

