

14.02 Principles of Macroeconomics

Problem Set # 1, Answers

Part I

1. **True:** The labor supply curve will shift up-left and a new equilibrium with a higher real wage will exist. This is, in part, due to the pro-cyclical mark-up assumption.
2. **True:** If we keep all other variables constant, a contraction in fiscal policy decreases GNP in equilibrium, which decreases investment. A more sophisticated answer to this question could consider the effect of fiscal policy on other variables that we would otherwise consider exogenous. For example, we could include the effect that changes in fiscal policy have on the behavior of the Fed. In this case, if the Fed cuts interest rates (to make sure the cut in spending doesn't lead to recession), then this will have a positive effect on investment, and might dominate the first effect.
3. **True:** It is important to note that, without any further assumptions or considerations, the whole of the profits of the firm are income that eventually turns out in the hands of the households. (a) Final value (200) = the value of sales to consumers (200); (b) The added value (140) = the value of the final goods (200) minus the value of the intermediate goods (60); and (c) The household income (140) = wages (50) + profits (90=200-50-60).
4. **True:** A policy variable like military spending is a given variable, and therefore by definition, doesn't have a behavior equation in the model. Again, a more sophisticated answer could consider the effect of the situation in the economy on military economy. This last consideration requires that we "model" the behavior of military spending to change the character of this variable from exogenous to endogenous.
5. **False:** In this case, the balanced budget multiplier is one. Note that the negative effect of T on the aggregate demand is mitigated by the MPC while the change of G has 1:1 positive effect on the aggregate demand.
6. **True:** It is very correlated with other measures as health provision, educational achievements, democracy, social security, low poverty and so on. So if we look at the evolution of a country through time, real GDP

per capita is a very good measure of the standard of living. A more sophisticated answer could mention that if we wanted to compare standards of living across different countries we would need to have comparable measures of the price level so that a comparison of real GDPs means the same in all countries. For example if we wanted to compare the 2000 GDP of countries A and B at 1990 prices we would need to have a measure of the relative purchasing power of money in countries A and B in year 1990.

7. **True:** Trading centers like Hong Kong exist, where imports and exports are larger than domestic production. In fact the national accounting identity can be rewritten as:

$$X - Y \equiv \text{Im} - C - I - G$$

so we can see that it is possible that exports are larger than income only if the country has very large imports.

Part II

1. The difference between gross (GNP) and net (NNP) national product is **depreciation, or capital consumption allowance (CCA)**
2. NNP minus “National income” equals **indirect taxes**.
3. Personal income minus **direct taxes** equals disposable income.
4. Consumers allocate their disposable income between consumer spending and **savings**.
5. Give one example of a type of government spending not counted as “G” in the standard GDP identity: **interest payments, transfers, grants-in-aid** (all acceptable—only one required).

Part III

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

Value added:

Farm: $\$10 * \$1 = \$10$

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

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?

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

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

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

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

Part IV

1. The equilibrium condition is $Y=C+I+G$ or $Y=C+I+G+X-M$. It is an accounting identity: income is equal to total spending on domestic production (every purchase is a sale). This is the sum of spending by consumers, investment by firms, and government spending. If the economy is open to trade, we have to subtract off the spending on foreign goods and services and add the amount foreigners spend on domestic goods and services. Substituting the values given and solving for Y yields $Y=(10/3)(160-0.6T-i)$.
2. If the budget is balanced, $G=T$ so $T=100$. This gives us $Y=(10/3)(100-i)$. The graph of this curve is a downward sloping line, with Y on the horizontal axis. The slope is -0.3 and tells us that for every percentage point that interest rates increase, equilibrium income decreases by $3 \frac{1}{3}$. (Note that investment falls by one unit for each point increase in interest rates and the multiplier is $3 \frac{1}{3}$.)
3. If $i=10$, then autonomous spending, $100-i$, is 90, the multiplier is $10/3$, and equilibrium income is 90 times $10/3$ or 300. The multiplier tells us the change in equilibrium income for a one-unit change in autonomous spending.
4. When G increases to 110, autonomous spending increases by 10 to 100, the multiplier doesn't change, and thus equilibrium income increases by 10 times $10/3$, or $33 \frac{1}{3}$. Income changed by more than the amount of the change in government spending because of the feedback effects in the

economy: increased government spending led to increased income. Increased income caused consumers to spend more and firms to invest more. This increase in consumption and investment, further increasing income, etc. If T also increases to 110, then autonomous spending increases by $10 - .6(10) = 4$, the multiplier is unchanged, and thus equilibrium output increases by 4 times $10/3$ or about 13.3. You might have expected that equilibrium output would be unchanged since this is just a transfer of ten dollars from consumers to the government, but while consumers spend 60 cents of every dollar they receive, the government spends all of the money it receives in our model (100 cents on the dollar) so there is an increase in equilibrium income.

5. Now $C = 50 + 0.6(Y - 1/3Y) = 50 + 0.4Y$, so $C + I + G = 160 + .5Y - i$, and thus $Y = 2(160 - i)$. With $i = 10$, autonomous spending is 150, the multiplier is 2 and equilibrium income is 300, as before. (Also note that $Y_t = 100$, the same starting point as before.) The multiplier is lower: before when a consumer received an extra dollar of income, she spent 60 cents of it. Now, when she receives an extra dollar of income she gives a third of it to the government, so her disposable income only rises by $66\frac{2}{3}$ cents. She then spends 60% of that, which is 40 cents. For an extra dollar of income, consumption spending is only increased by 40 cents instead of 60 cents and this means a smaller feedback effect. The government budget is balanced. If the government increases spending by 10, equilibrium income rises by 20. This means $20/3$ or $6\frac{2}{3}$ more is being collected in taxes, so the government is now running a deficit.

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