

ECONOMICS 1 (Lecture1)

Solutions to PROBLEM SET #4

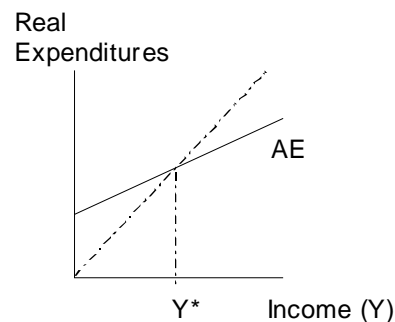
1. Aggregate Demand and Consumption (Chap. 24): What does Marginal Propensity to Consume (MPC) represent? Give ballpark figures for the MPC of: an Econ 1 student, kids on Telegraph, your GSI, a professor, Michael Jordan, Dennis Rodman?

The Marginal Propensity to Consume (MPC) represents the increase in consumption resulting from a one dollar (marginal) increase in disposable income. To guess people's MPC, you must remember that they can do only two things with their additional income: spend and/or save ($MPC + MPS = 1$). In general (although this may not be always true), we assume that the richer people are, the more they save, since they may have at least taken care of all their basic needs. So you would expect kids on Telegraph and GSIs (the poorer citizens) to have MPCs virtually equal to one, using any additional income for food and shelter. Students, who tend to have a little more income than vagrants and GSIs, might spend, say, 95% of any additional income they make ($MPC=0.95$) A richly paid professor might save more, say 22% ($MPC=0.78$) As for basketball players and the ridiculous amounts of money they make: who knows? Anything's possible. I don't want to know.

2. Aggregate Demand and Other Forms of Spending (Chap. 25): Can you represent Aggregate Demand and Aggregate Expenditures on the same graph? Why, or why not? Why is one sloping up and the other one sloping down? Explain briefly.

The answer is no: they need separate graphs.

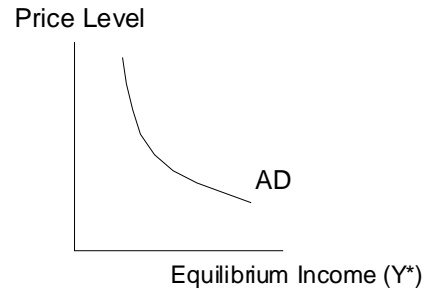
Aggregate Expenditures is given by $AE = C + I + G + \text{net exports}$. It shows how those expenditures vary with Income. It is clear, for example, that Consumption goes up with Income. Since there is no mention of prices, we assume it is *given*, meaning that it does not change, whatever it is. If price were to change, we would have to draw a new, different AE graph.



If the price level went up for example, then we would expect the whole AE curve to go down. Why? Because

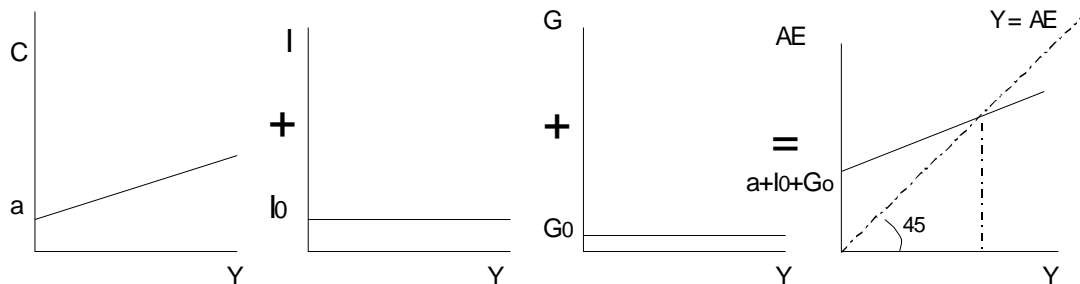
- even if your salary and all prices went up with inflation, your bank account does not, and that may lead you to consume less (wealth effect);
- net exports would go down since imports would become relatively cheaper; and
- higher prices increase demand for Money, raising interest rates, which depresses Investment (more on this in problem set 5).

So, how to show this influence of Price on Aggregate Expenditures? One way is to make a new plot which shows only equilibrium Income (Y^*) against various prices. What you get is the Aggregate Demand (AD) curve.



3. The Spending Multiplier (Chap. 26; see also appendix to Chap. 28): To understand how the multiplier works, imagine a simple economy where the only determinants of aggregate expenditure are consumption, investment, and government spending $\rightarrow [AE = C + I + G]$. There are no imports, exports or taxes, and we will not worry about inflation just yet. Consumption is defined as simply as $\rightarrow [C = a + bY_d]$: in this case, income is fully disposable ($Y = Y_d$). Investment, government expenses, as well as a portion of consumption (I_0 , G_0 , and a) are autonomous, meaning they are given outside the model and stay constant, until we decide to change them. (**Note: this exercise is the sort of thing you might be expected to do in an exam *without* a calculator**) (Hint for preparing the final: do *not* memorize multipliers, but understand where they come from)

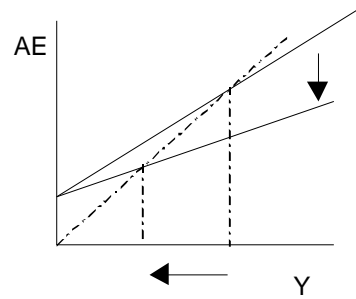
- a) Illustrate on a graph the equilibrium situation where $Y = AE$. What do we mean by equilibrium in this case? How would you expect the economy to get back to equilibrium if it were not?



An equilibrium occurs when there is no unplanned variation in inventories ($Y=AE$). If aggregate expenditures (AE) were bigger than National Income (Y), firms would experience an unplanned decrease in inventories (Nike would start running out of shoes in its warehouse): they would thus want to produce more. (Y goes up) The opposite happens if AE is smaller than Y.

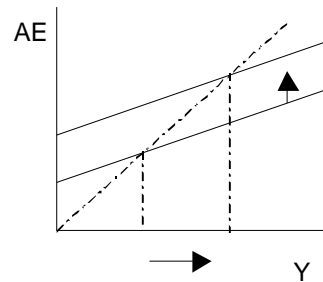
- b) What is 'b'? Show graphically what happens if it gets a bit smaller. Discuss (very) briefly.

'b' is the Marginal Propensity to Consume (MPC). If it were to become smaller, the multiplier would be reduced and so would equilibrium Y.



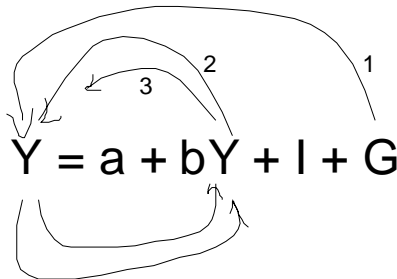
- c) On another graph, show what happens if G_0 gets bigger. Is the increase in Income (Y) necessarily equal to the increase in G_0 ? Why?

No. You would expect the final increase in Income (Y) to be larger than the initial increase in Government Spending (G), since that spending will be re-injected in the economy. Those from whom the government has bought stuff will turn around and buy more themselves, and so on.



- d) Solve the equilibrium condition for Y. What is the multiplier in this case? Give an intuitive explanation of the multiplier effect.

Look at what happens if the government spends \$100 more (arrow 1). It might decide to buy books. The bookstore owner would turn around and spend (if her MPC was 0.8 for example) \$80 worth of café lattes (arrow 2). The coffeehouse owner (we are assuming everyone has the same MPC) would then buy \$64 worth of CDs (arrow 3), and so on, until the additional amount of consumption is close to zero. What is the final impact? We can add it up: $100 + 80 + 64 + 51.20 + \dots$



An easier way is to simply solve for Y:

$$Y = C + I + G = a + bY + I + G$$

$$Y - bY = a + I + G$$

$$Y = (1/(1-b)) * (a + I + G) = (\text{multiplier}) * (\text{autonomous expenses})$$

If G goes up by \$100, final impact on Y is $(1/(1-b)) * 100$. If $b=0.8$, then the multiplier is equal to 5 and the final impact on income is +500.

- e) Let's repeat what we did in parts b) and c), but with numbers this time. Let's say $a = 30$, $b = 0.75$, $I_0 = 60$, and $G_0 = 130$. What is the equilibrium income? What happens if b goes up to 0.80? Or if instead, G_0 goes up to 150?

$$Y = (1/(1-b)) * (a + I + G) = (\text{multiplier}) * (\text{autonomous expenses})$$

$$= (1/(1-0.75)) * (30 + 60 + 130) = 4 * 220 = 880$$

If b goes up to 0.8 (people spend more of their income, and multiplier becomes bigger), then:

$$Y = (1/(1-b)) * (a + I + G) = (\text{multiplier}) * (\text{autonomous expenses})$$

$$Y = (1/(1-0.8)) * (30 + 60 + 130) = 5 * 220 = 1100$$

If instead G_0 goes up to 150, the multiplier is still 4, but:

$$Y = (1/(1-0.75)) * (30 + 60 + 150) = 4 * 240 = 960$$

- f) Note that the process of calculating a multiplier always involves the following: writing out the equilibrium condition ($AE = Y$) with all the elements of AE properly specified, and then solving for Y . Do solve for Y if we make the following changes: $Y_d = Y - tY - T$, exports are $X = X_0$, and imports are $M = M_0 + mY$. What are t , T , M_0 and m ? Is it reasonable to consider exports autonomous?

In this case:

$$Y = C + I + G + (X - M)$$

$$= a + b(Y - tY - T) + I_0 + G_0 + X_0 - M_0 - mY$$

$$Y - bY + btY + mY = a - bT + I_0 + G_0 + X_0 - M_0$$

$$Y(1 - b + bt + m) = a - bT + I_0 + G_0 + X_0 - M_0$$

$$Y = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0)$$

$$= (\text{multiplier}) * (\text{autonomous expenses})$$

The tax rate is t (meaning $(t*100)\%$ of income is paid in taxes), while T is the lump-sum tax (a lump-sum *transfer payment* if negative), M_0 is the autonomous level of imports, and m is something like a marginal propensity to consume. It is reasonable (although not perfect) to think of exports as autonomous, since they are a function of another country's GDP.

- g) What would be the relevant multiplier for an increase in government spending financed by bonds?

When we calculate the multiplier for an increase in government spending, what we are actually doing is asking ourselves what happens to Y (what is the change DY ?) if G_0 becomes $(G_0 + DG)$. In this case, we start with:

$$Y = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0), \text{ which becomes}$$

$$Y + DY = (1/(1-b+bt+m)) * (a - bT + I_0 + (G_0 + DG) + X_0 - M_0)$$

$$\mathbf{Y + DY = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0)} + (1/(1-b+bt+m)) * (DG)$$

The right hand side expression in bold is equal to Y , so we can subtract the same quantity from both sides, and we are left with:

$$DY = (1/(1-b+bt+m)) * (DG)$$

$$\text{change in } Y = (\text{multiplier}) * (\text{change in autonomous spending})$$

So if we want to know what is the impact of an increase in government spending financed by bonds (outside of this model), we simply multiply that increase (DG) by the multiplier $(1/(1-b+bt+m))$. Nothing else changes here since the bond market (borrowing by government) is not included in our model. (that doesn't mean there are no impacts! see problem set 5)

- h) What would be the relevant multiplier for an increase in government spending financed by a tax (T) increase?

In this case, the increase in spending (DG) is financed by an equivalent increase in taxes (T also goes up by DG):

$$Y = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0) \text{ becomes}$$

$$Y + DY = (1/(1-b+bt+m)) * (a - b(T+DG) + I_0 + (G_0 + DG) + X_0 - M_0)$$

$$Y + DY = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0) + (1/(1-b+bt+m)) * (-bDG + DG)$$

$$Y + DY = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0) + (1/(1-b+bt+m)) * ((1-b) * DG)$$

$$DY = ((1-b)/(1-b+bt+m)) * (DG)$$

$$DY = (\text{balanced budget multiplier}) * (DG)$$

Note how the multiplier is smaller (numerator is 1-b instead of 1)

- i) Moving further along, let's put some numbers (with the initial ones in part f) in there: $X_0 = 60$, $M_0 = 40$, $T = 70$, $m = 0.10$, and $t = 0.20$. What is the new equilibrium income?

$$Y = (1/(1-b+bt+m)) * (a - bT + I_0 + G_0 + X_0 - M_0)$$

$$Y = (1/(1 - 0.75 + (0.75 * 0.20) + 0.10)) * (30 - (0.75 * 70) + 60 + 30 + 60 - 40)$$

$$Y = (2) * (187.50) = 375.00$$

- j) What is the value of the multiplier you found in part g)? What happens to equilibrium income if government expenses *decrease* by 10?

The multiplier is 2, so a decrease in government spending ($DG = -10$) causes a decrease in income of 20 ($DY = -20$).

- k) What is the value of the multiplier you found in part h)? What happens to equilibrium income if government expenses *increase* by 10? Why would you expect income to go up in this case, when government gives with one hand and takes the same with the other?

The multiplier is $2 * (1-b) = 2 * (1-0.75) = 0.5$, so if government increases both spending and taxes by 10, the increase in income is 5 ($DY = +5$). The government takes away 10 from consumers and spends itself that amount. The reason income does go up (although not by much) is that government spends that amount in its entirety, whereas consumers would have spent only 80% of it (because their MPC is equal to $b = 0.8$).

- l) Discuss (intuitively) the relative size of all the three types of multipliers you have calculated so far.

The multiplier in part (d) was the largest. The one in part (g) was smaller because we introduced *leakages*: some of the money was either paid as taxes or sent abroad (to pay for imports) instead of being spent in the domestic economy. The one in part (h) was smaller still because the increase in government spending was counterbalanced by an equivalent increase in taxes.

4. The Supply Side of the Macro Economy (Chap. 27): How are the multipliers calculated in question 3 affected in general if we take into account inflation (and deflation)? Do you need to know the slope of the Aggregate Supply curve? Give a brief intuitive explanation.

As long as the Aggregate Supply (AS) curve slopes up, we expect the value of the actual multipliers to be smaller than the ones we calculated in Question 3 (see your textbook: pp.642-4). Why? Because the 'over-simplified multiplier formula' we used assumes that firms will satisfy (supply more stuff) this desire for increased aggregate

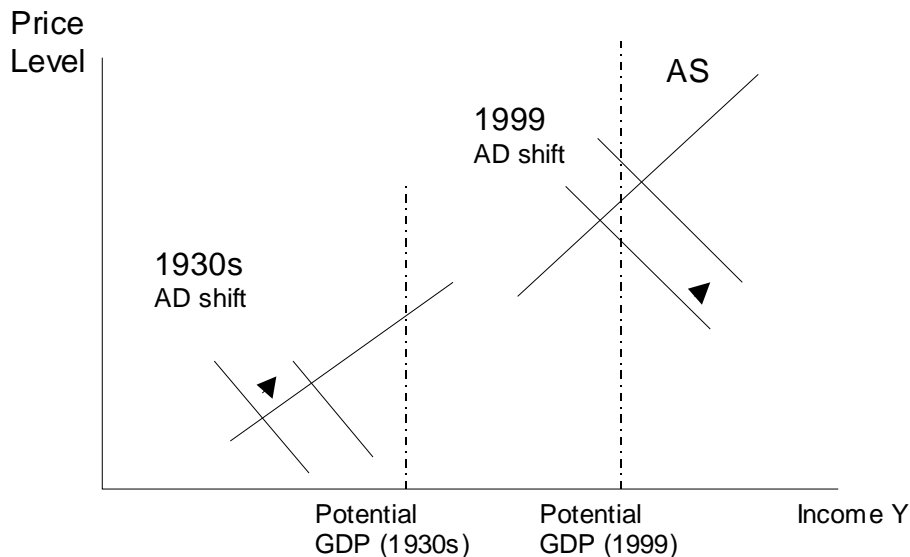
expenditures *at the same price*. But the upward-sloping AS curve tells us something else: firms need higher prices (higher profits) to produce more. So prices must go up to induce increased supply, which reduces (but does not eliminate) the increased demand. The impact (and therefore the multiplier) of increases in autonomous spending is smaller if we take prices into account. The steeper is AS, the more producers need higher prices to produce more, and the more any increase in autonomous spending will be dissipated in inflation.

5. **Fiscal Policy** (Chap. 28): We have dealt with most of the issues here in question 3. You may want to ask yourself whether you think that an increase in government spending would be as appropriate today as it was in the 1930s

In the 1930s, the U.S. economy was in a severe depression (huge recessionary gap). The economy was far from potential GDP, which implies AD way to the left, and very high unemployment levels. Today, unemployment levels are close to their historical lows, meaning that AS and AD must cross very close to the full-employment level of income Y (recall that we use income as a way to measure GDP).

What would an increase in government spending do in our model? It would lift up the AE curve for any given price: that means that the AD curve would shift right. That was a good idea in the 1930s, since the economy was clearly well under full employment: a shift right in AD *did* reduce the recessionary gap. Today however, a shift right would probably take the economy over its full-employment level ('overheating'), and create an inflationary gap. This is why you often hear the Chairman of the Federal Reserve, Alan Greenspan, warn against deficits and the inflationary threats they create---think about it.

Graphically:



Note that the potential GDP is now much higher than it was in the 1930s. This is what we call economic growth, which we will encounter in problem set 5.

/as