EC 313 Intermediate Macroeconomics

Lecture 2

Thursday 10/3/2013

The Goods Market (ch. 3)

- Will look at the composition of GDP
  - Divide economy into four sectors, households, business, government, and foreign sector
- Then, will look at the demand for goods and services by sector (C, I, G, NX).
- Equilibrium: Production of goods=demand for goods. How does this come about?
- Fiscal policy

The Composition of GDP

- Since the demand for goods and services varies across groups, e.g. the government versus households, and since the decisions are based upon different things, we divide the economy into four sectors:
  - Households
  - Business
  - Government
  - Foreign sector
- Households demand for goods and services is called **consumption**. We'll use the symbol C for this.

- The demand for goods and services by businesses and the demand for new houses by households is called **investment**. We'll use the symbol I for this.
- The demand for goods and services by the government is called **Government Spending**. We'll use the symbol G for this (does not include cash transfers such as Medicare or Social Security
- The net demand for goods and services in the foreign sector is called **Net Exports**. We'll use the symbols X for exports and IM for imports. Net exports is defined as (X-IM). It represents the net demand for US goods

- The difference between production and sales is called **inventory adjustment**.
- From the text:

Table 3-1 The Composition of U.S. GDP, 2010

		Billions of Dollars	Percent of GDP
	GDP (*Y*)	14,660	100
1	Consumption (*C*)	10,348	70.5
2	Investment (*I*)	1,756	12.0
	Nonresidential	1,415	9.7
	Residential	341	2.3
3	Government spending (*G*)	3,001	20.4
4	Net exports	−516	−3.5
	Exports (*X*)	1,838	12.5
	Imports (*IM*)	−2,354	−16.0
5	Inventory investment	71	0.5

Source: Survey of Current Business, May 2010, Table 1-1-5

The Demand for Goods

- The total demand for goods and services across sectors is

$$Z \equiv C + I + G + X - IM$$

- This is an identity, it defines Z, aggregate demand.
- We will assume
  - All firms produce the same good (Y)
  - All firms supply as many goods as demanded at the current price level, P (i.e. P is fixed)
  - The economy is closed (IM=X=0)

- Under these assumptions, $Z \equiv C + I + G$
- Next, let's look at the determinants of each component of expenditures.
- Consumption:

  We will assume that $C=C(Y_D)$

  where Y_D is disposable income (Y-T), where Y is income and T = (taxes-transfers)
- The relationship is positive, i.e. when Y_D goes up, C goes up
- This is called a behavioral equation

- Specific, linear example:

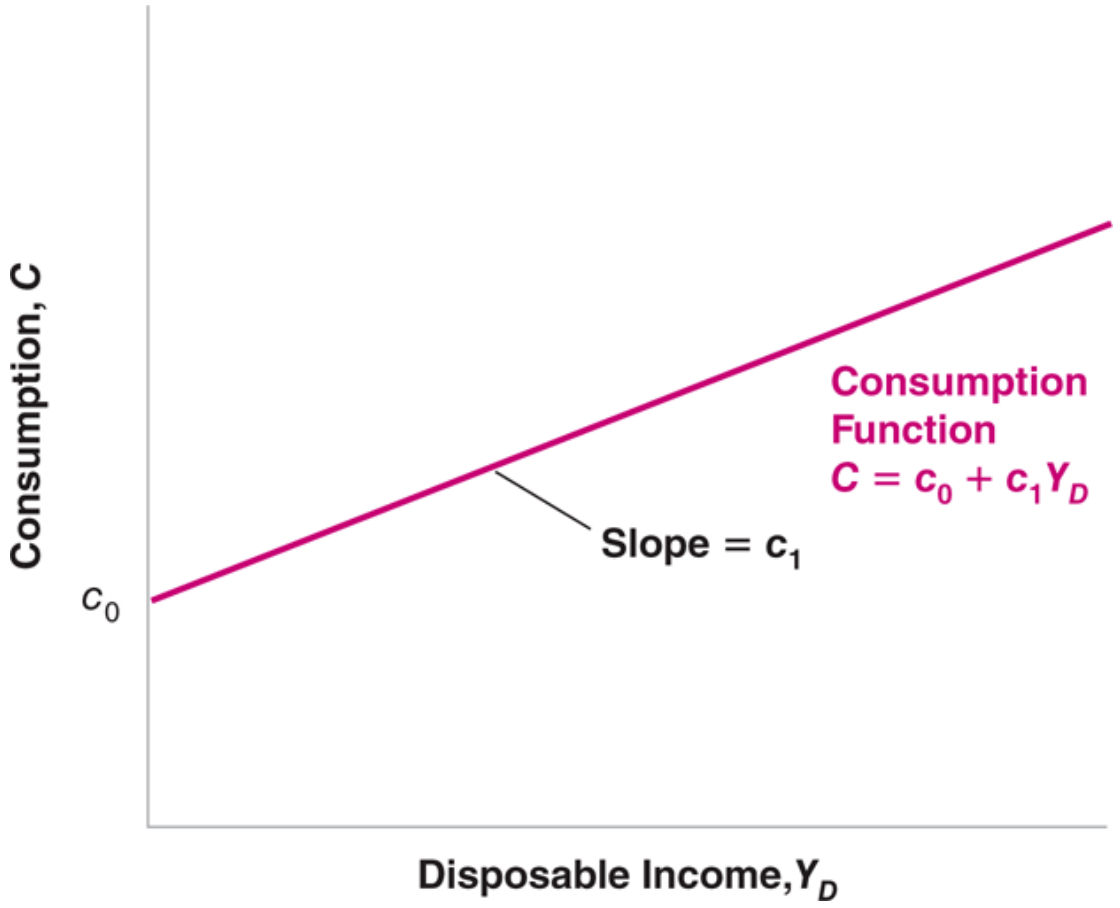
$$C = c_0 + c_1 Y_D$$

- The parameter c_1 is called the marginal propensity to consume (mpc). It tells us how much consumption rises when disposable income increases by one unit.
- For example, if $c_1 = .9$, then a \$1 increased in disposable income increases consumption by 90 cents.
- We assume that $0 < c_1 < 1$.

- The parameter c_0 has two interpretations.
  - First, it is the amount of consumption when $Y_D = 0$. That is, $C = c_0 + c_1(0) = c_0$, so $C = c_0$
    How can a person consume when there is no income? By dis-saving (e.g. selling stocks and bonds, a car, drawing down savings account, etc.)
  - Second, a less literal but more frequently used interpretation is that c_0 is a catch-all term for all other factors that might affect consumption, e.g. interest rates, past disposable income, expected future disposable income, wealth, etc.

To the chalkboard to explain …

Figure 3-1 Consumption and disposable income



- Last thing to do is to insert the definition of disposable income, i.e. $Y_D \equiv Y - T$
  Reminder: T = taxes - transfers
- Substitute this into the consumption function:

$$C = c_0 + c_1(Y-T)$$

- Thus, C increases by c_1 when Y increases, and decreases by c_1 when T increases.

- Move on to investment. We will assume that

$$I = I_0$$

(Note: The book uses a "bar" rather than a subscript, I can't reproduce the bar in presentation.)

- That is, we will assume that investment spending is exogenous for now. Later it will depend upon the interest rate (ch 5).

- Government spending:
  - Together, T and G define fiscal policy. We will assume the government sets both variables.

Equilibrium:

- Recall that the demand for goods and services is given by $Z \equiv C + I + G$
- If we sub in for C and I, we get:

$$Z \equiv c_0 + c_1(Y-T) + I_0 + G$$

- Y is production (or income), Z is expenditures or spending, so equilibrium must be where Y=Z, i.e. where **income = expenditures**. Thus, equilibrium is the Y that solves:

$$Y = c_0 + c_1(Y-T) + I_0 + G$$

- We will look at this three ways:
  - Algebraically
    Graphically
  - Intuitively
- Algebra:

  To the board….
- Result:

$$Y = [1/(1 - c_1)][c_0 + I_0 + G - c_1T]$$

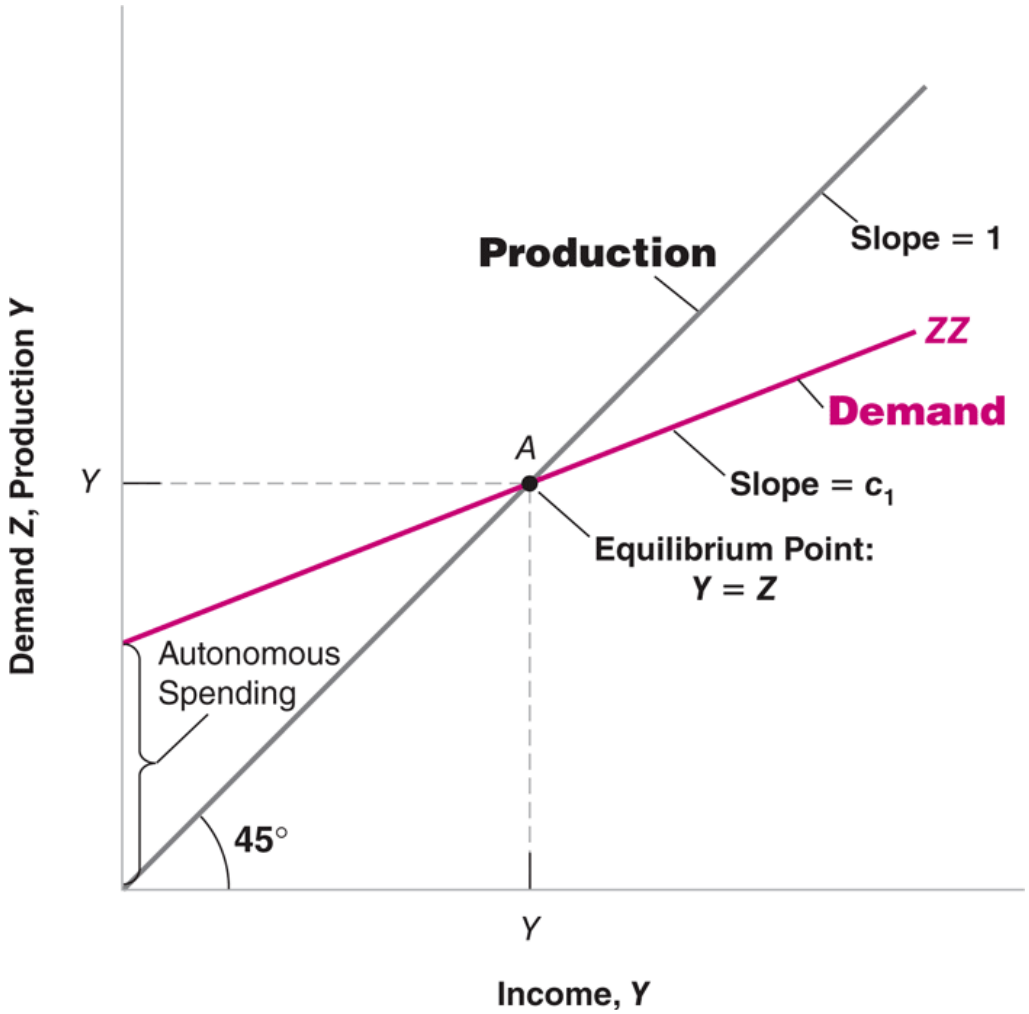
- The term $[c_0 + I_0 + G – c_1T]$ is called called **autonomous spending** (the part that does not depend upon Y)
- The term $1/(1 - c_1)$ is called the **expenditure multiplier**. Since $0 < c_1 < 1$, the multiplier is greater than one.
- For example, if $c_1 = .8$, then the multiplier is 5.
- What does this mean? It tells us that a $1 increase in autonomous spending (e.g. G increases by $1 or T decreases by $1), they output goes up by $5.

- Show how this works graphically, then explain the multiplier intuitively.
- To do this graphically, we need to plot the expenditure function, $Z \equiv c_0 + c_1(Y-T) + I_0 + G$
- It's helpful to write this as

$$Z \equiv (c_0 + I_0 + G - c_1T) + c_1Y$$

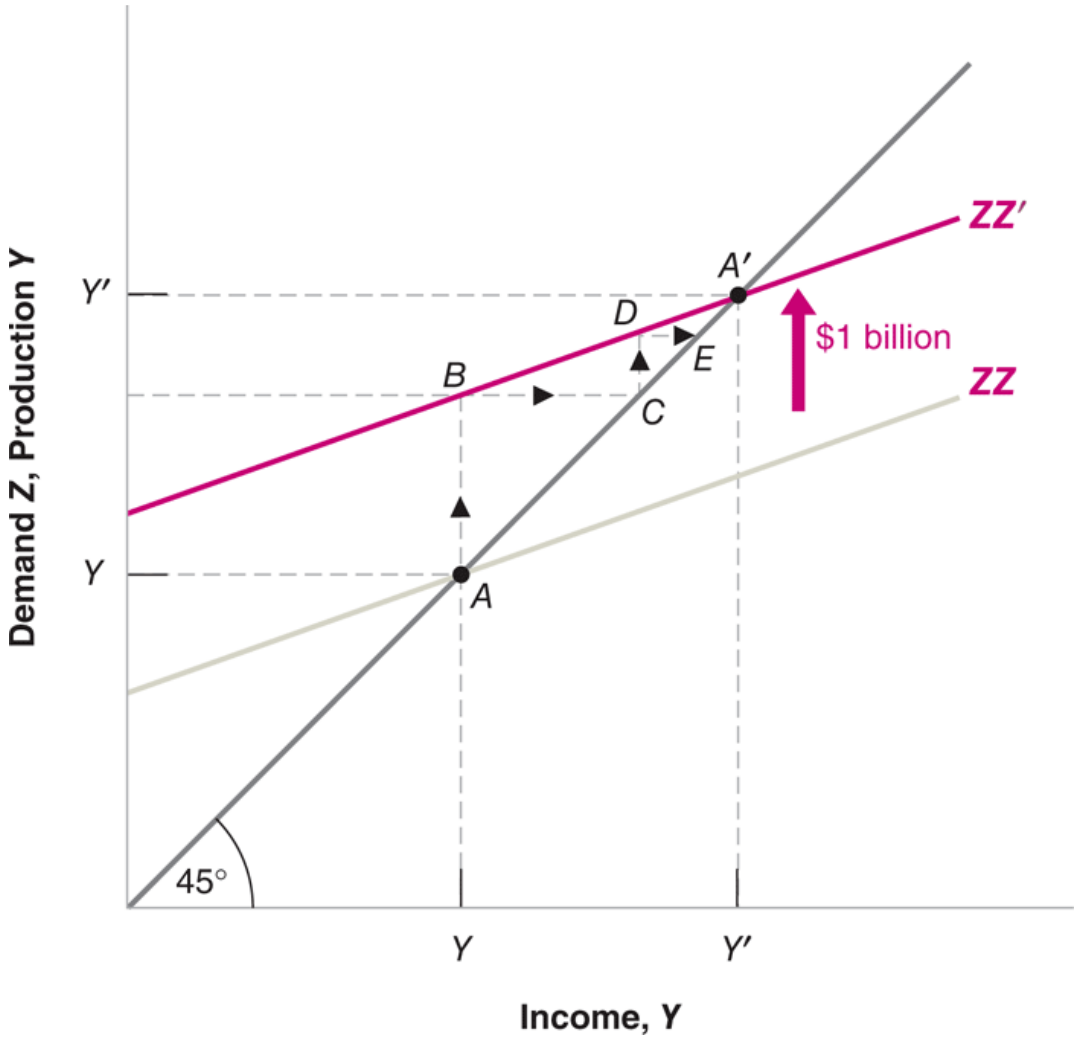
- Intercept = $(c_0 + I_0 + G - c_1T)$
- Slope = c_1
- Graph on next page

Figure 3-2 Equilibrium in the goods market



- Why is the intersection of the expenditure function and the 45 degree line the equilibrium?
- The 45 degree line is, by definition, the set of points where Y=Z, so the intersection is the one point on the Z-line where Y=Z (income = expenditures)
- **Role of inventories** in adjustment to the equilibrium
- Now, start at point A on the graph and let c_0 increase by $1 billion
- The next graph shows what happens

Figure 3-3 The effects of an increase in autonomous spending on output



- Go to the board to show that
  $\Delta Y=[1/(1-c_1)]\ \Delta$(autonomous spending)
- In this case
  Δ(autonomous spending) = \$1 billion
- Thus, if them mpc (c_1) is .8
  ΔY = [1/(1-.8)](\$1 billion) = [5](\$1 billion]
  = \$5 billion
- Why is the change in output more than the change in autonomous consumption?

- Go to the board to explain the multiplier intuitively with the circular flow diagram

To the board…

- Process takes time to unfold in the real world, probably in the 6-18 months range, perhaps longer for, say, infrastructure spending by the government

An alternative way to look at equilibrium

- Recall that equilibrium is where Y = Z, or where Y = C + I + G
- But note that we can write Y, income, as Y = C + S +T (income goes to taxes or consumption, whatever is left over is saving).
- Then, at equilibrium

$$C + S + T = C + I + G$$

- Cancel the C terms to get

$$S + T = I + G$$

- Rearrange terms to get

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

- This says that **investment = saving**, i.e. S = private saving and (T-G) is public saving (which can be negative)
- Now, note that S = Y – C – T. Sub in to get

$$S = Y - (c_0 + c_1(Y-T)) - T$$

- Or, combining terms

$$S = -c_0 + (1-c_1)(Y-T)$$

- This is the **saving function**, and $(1-c_1)$ is the **marginal propensity to save**.

- Now use this to find the equilibrium (recalling that $I = I_0$)

$$I_0 = S + (T-G)$$

- Sub for S

$$I_0 = -c_0 + (1-c_1)(Y-T) + (T-G)$$

- Solve for Y

$$Y = [1/(1 - c_1)][c_0 + I_0 + G - c_1T]$$

- This is the same equilibrium. It has to be, it was derived from Y=Z.

Show graphically on the board…

How easy is this in the real world?

- Changing G or T – getting this through Congress – is not easy
- We held all else equal, e.g. investment and net exports, but when these change and it's not fully predictable, hitting a policy target is much harder
- Expectations of the future also matter, we have abstracted from this (for now)
- There may be side effects, e.g. deficits or inflation

Practice Problems

- **Example 1**

  C = 200 + .8(Y-T)

  I = 160

  G = 300

  T = 200

  – Find equilibrium income, disposable income, and consumption. How large is the deficit?
  – Let autonomous consumption increase to 300. Use the multiplier to find the new equilibrium for output
  – If full employment is when output = 4000, how much should G change to reach full employment?

- **Example 2 (Balanced Budget Multiplier)**

  C = 300 + .75(Y-T)

  I = 200

  G = 400

  T = 400

  – Find equilibrium income
  – Notice that the budget is in balance, i.e. G=T. Let both G and T increase by 50 so that the budget stays in balance. What happens to output?
  – If the government spends a dollar more, and takes a dollar back in taxes at the same time, how can output go up? Why does this increase demand?

- **Example 3 (paradox of thrift)**

  $C = 800 + .75(Y-T)$

  $I = 600$

  $G = 500$

  $T = 400$

  - Find equilibrium income. Find saving.
  - Let autonomous consumption, c_0, decrease from 800 to 700. That is, let people be "virtuous" and try to save more and consume less.
  - Find the new values for output and saving.
  - Why doesn't saving change (this is the paradox, that people try to save more, but this reduces output and they end up with the same savings as before)