Lecture 11

Economic Fluctuations: the Goods Market

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Economic Growth and Economic Fluctuations

Short Run versus Long Run

- **In the previous lectures, we studied output, employment, money, inflation and interest rates in the long run. In studying these concerns, we followed the Classical Dichotomy in assuming that:**
  - different forces influence real and nominal variables
  - money affects nominal variables, not real variables
- **In the long run, the level of output is determined by:**
  - the stock of physical capital
  - the stock of human capital,
  - the size of the labor force
  - and technology
- **In the long run, unemployment is:**
  - frictional – because it takes time to match workers to jobs
  - and/or structural – because the wage rate is set at a level above the one that clears the labor market
- **In the long run, money the quantity of money available determines the price level, while the rate of money growth determines the inflation rate**
- **We'll now turn our attention to the short run, where:**
  - output does not entirely depend on the available factors of production
  - there's a trade-off between unemployment and inflation

Aggregate Output and Income

- **Aggregate output – is the total quantity of goods and services produced by an economy in given period.**
- **Aggregate output refers to <u>real</u> output, NOT <u>nominal</u> output:**
  - This lecture assumes that **prices are "sticky"** in the short run.
  - Unless the inflation rate is extremely high, firms do not immediately adjust their prices in response to changes in the money supply.
- **Aggregate income – is the total income received by all factors of production in a given period**
- **We'll use** Y **to denote both aggregate output and aggregate income to remind us of the exact equality between the two.**
- **To begin this lecture, we'll examine an economy in which:**
  - **there is no international trade** (so net exports equal zero) **and**
  - **government purchases equal zero**
- **So – when the goods market is in equilibrium – output is divided among consumption and investment:**

$$Y = C + I$$

- **Later on, we'll add taxation and government purchases to the model**

The Allocation of Aggregate Income

- **In the absence of government, the income of the households in the economy,** Y**, is divided among:**
  - **consumption** of goods and services, denoted: C
  - **saving,** denoted: S
- **Saving is the income that not consumed in a given period, i.e.:** $S \equiv Y - C$
- In reality, aggregate consumption is determined by households' income, households' wealth, interest rates and expectations about the future
- **For simplicity however, we'll only focus on income in this lecture**

The Keynesian Consumption Function

- **For simplicity, we'll assume that aggregate consumption is a linear function of income:**

$$C = a + b \cdot Y \qquad \text{where: } 0 \leq a \text{ and } 0 < b < 1$$

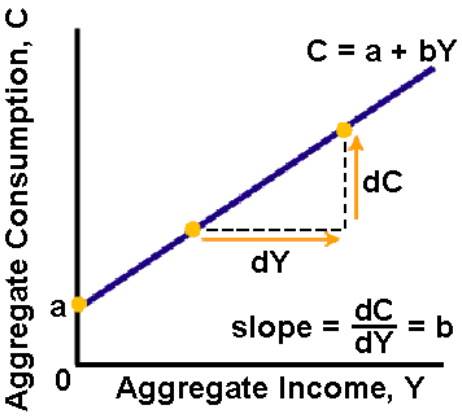
- The microeconomic foundations of such a consumption function are weak at best. However, it does capture two important elements of reality:
  - households only save after surpassing a certain level of income, a
  - when households' income increases (ex. after receiving a tax cut) some of that additional income will be saved and some of it will be consumed

The Keynesian Consumption Function

- **The slope of the consumption function, b, is the marginal propensity to consume (MPC) – the fraction of an additional increment in income that is consumed.**
- **For example, if the consumption function were given by:**

$$C = 100 + 0.75 \cdot Y$$

then for every $100 increase in income, consumption rises $75 and saving rises $25



- **Since income can only go to either consumption or saving, the fraction of an additional increment in income that is not consumed is the fraction saved – which we'll call the marginal propensity to save (MPS).**

$$MPC + MPS = 1 \quad \rightarrow \quad MPS = 1 - MPC \quad \rightarrow \quad MPS = 1 - b$$

- **Once we know how much consumption will result from a given level of income, we also know how much will be saved since:** $S \equiv Y - C$

Investment

- **Recall from Lecture 4 that investment consists of:**
  - goods that firms and households purchase for future use
    - **new plants and equipment**
    - **new housing**
  - and **inventory investment** – investment to meet future demand
    - **this is positive when firms add to their inventories**
    - **this is negative when firms run down their inventories**
- **inventory investment is partly determined by how much households decide to buy, which is not under the complete control of firms**

$$\text{change in inventory} = \text{production} - \text{sales}$$

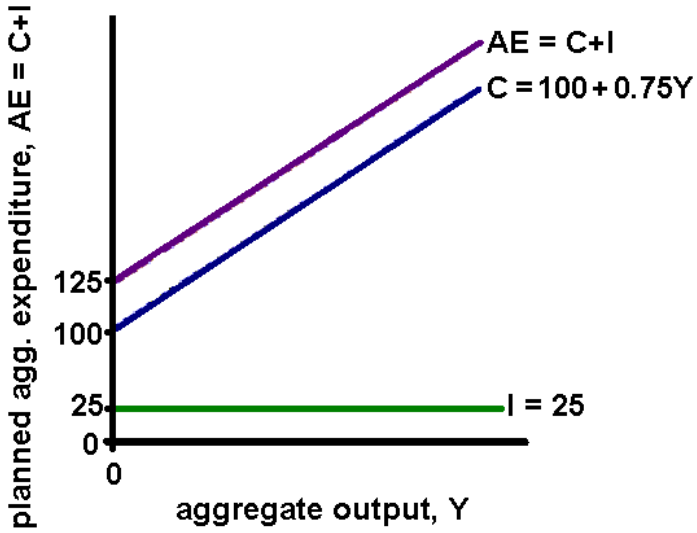
- **planned investment – is the planned component of additions to the capital stock and inventory**
- **actual investment** – includes unplanned changes in inventories
  - sometimes demand falls short of the amount that firms predicted. In such a case, firms add more to their inventories than they had planned
  - other times demand exceeds the amount that firms predicted. In such a case, firms run down their inventories more than they had planned

Planned Aggregate Expenditure

- **For now, assume that planned investment is fixed. It does not respond to changes in income, interest rates, etc.** In the example which follows, we'll assume that planned investment is given by: I = 25
- **Also, continue to assume that consumption is given by:** C = 100 + 0.75·Y
- **Planned aggregate expenditure, AE, is the sum of consumption and planned investment** (at each level of aggregate income)**:**

  AE = C + I

  AE = 125 + 0.75·Y



Equilibrium Aggregate Output

- **Equilibrium in the goods market occurs when planned aggregate expenditure equals aggregate output, i.e.:**

  Y = AE

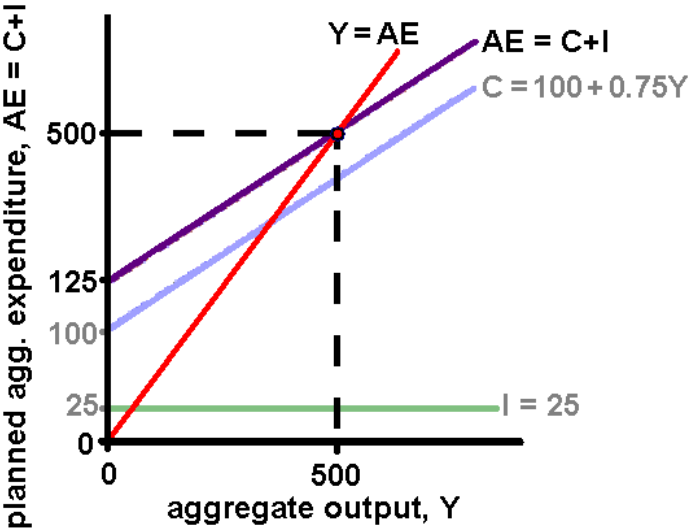
- **In our example, this occurs when** Y = AE = 500 **because:**

  Y = 125 + 0.75·Y

  (1 – 0.75)·Y = 125

  0.25·Y = 125

  $$Y = \frac{125}{0.25} = 500$$



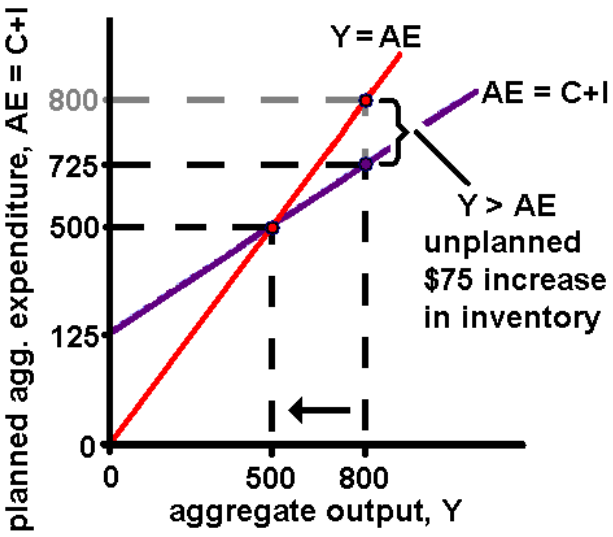
- **The red line in the graph above represents equilibrium in the goods market.**
- **At each point along the red line planned aggregate expenditure equals aggregate output.**

unplanned inventory investment

- **Now remember that there is no unplanned consumption**
- **And remember that firms plan to invest a fixed amount in a given year**
- **What happens if aggregate output exceeds planned aggregate expenditure? That is: What happens if firms produce more than consumers plan to purchase – given their** (aggregate) **income?**

$$Y > AE \rightarrow Y > C + I$$

- **In such a case, firms' inventory would increase by more than they had planned, i.e.** they face unplanned inventory investment
- **To restore equilibrium, firms need to reduce their production level – reducing real GDP – from $800 to $500**
- **When firms reduce their production level, they lay off workers.**

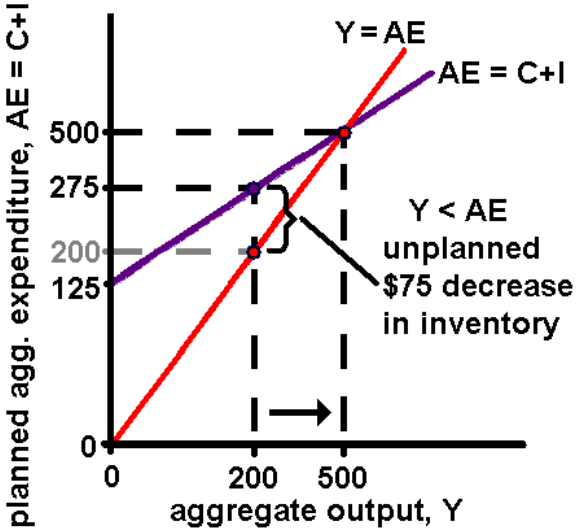


unplanned inventory dis-investment

- **What happens if aggregate output falls short of planned aggregate expenditure? That is: What happens if firms produce less than consumers plan to purchase – given their** (aggregate) **income?**

$$Y < AE \rightarrow Y < C + I$$

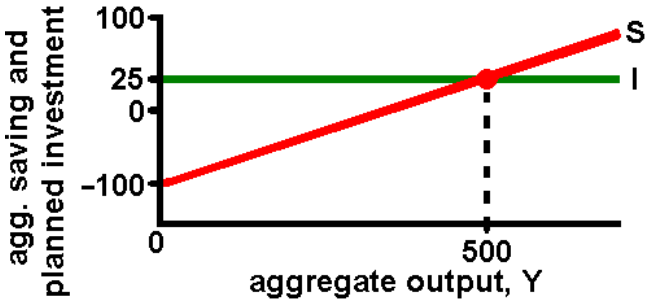
- **In such a case, firms' inventory would decrease by more than they had planned, i.e.** they face unplanned inventory dis-investment
- **To restore equilibrium, firms need to raise their production level – raising real GDP – from $200 to $500**
- **When firms raise their production level, they hire more workers.**



Saving and Investment

- **Aggregate output will only be equal to planned aggregate expenditure when saving equals planned investment, i.e.:** $S = I$
- **To see this recall that:**

$$S \equiv Y - C$$
$$S = Y - 100 - 0.75 \cdot Y$$
$$S = 0.25 \cdot Y - 100$$



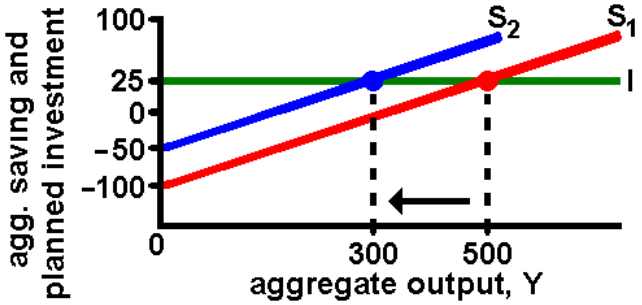
- **then equate saving to planned investment to find that:**

$$I = S$$
$$25 = 0.25 \cdot Y - 100$$
$$125 = 0.25 \cdot Y$$
$$Y = 500$$

- **which is the same equilibrium level of aggregate output as before.**

The Paradox of Thrift

- **When households are concerned about the future, they save more.**
- **As we saw in the lectures on economic growth, increased saving leads to a higher level of output per worker in the long run.**
- **But what happens in the short run? Would equilibrium output rise?**
- **To examine this question, suppose the consumption function changes from** $C = 100 + 0.75 \cdot Y$ **to** $C = 50 + 0.75 \cdot Y$**. Would saving rise because the autonomous component of consumption falls from \$100 to \$50? No.**



- **If planned investment remains unchanged, then equilibrium output would fall and** – in their attempt to save for future hard times – **households have inadvertently created the hard times they feared.**
- **They end up consuming less, but they have not saved any more.**

How Realistic is the Paradox of Thrift?

- **At first glance, the Paradox of Thrift looks very unrealistic.**
  - Could the fear of future hard times really cause a major economic recession?
  - If saving is good for long-run economic growth, then how could it damage the economy in the short run?
- **In reality, it's not that the fear of hard times that makes people save more. It's the fact that they have no choice.**
- **Remember: Repaying a loan is a form of saving.** In other words, a borrower "dis-saved" when he/she took out the loan, so he/she must now save by repaying the loan.
- If a homeowner is struggling to repay his/her home mortgage, then he/she will reduce his/her consumption of "luxury" items in order to save and repay the mortgage.
- So the homeowner cuts back on present consumption to pay for the home that he/she purchased in the past.
- **It's the weight of past debt that causes the recession today!**

Adding a Government Sector to the Model

- **If recessions are caused by an increase in saving, then there is a very simple way to alleviate the short-run problems caused by thrift: tell people to start consuming more.**
- **But is such a solution realistic?**
- **Maybe not, but we haven't introduced a government sector yet.**
- **So now let's divide** (equilibrium) **output among consumption, investment and government purchases:**

$$Y = C + I + G$$

- **Of course, government purchases,** G**, must be financed by tax revenues,** T**, so we now have to allow consumption to be a function of disposable income – income net of taxes:** $Y_d \equiv Y - T$

$$C = a + b \cdot (Y - T) \quad \text{where: } 0 \leq a \text{ and } 0 < b < 1$$

- For simplicity, we'll assume that tax revenues and government purchases are **autonomous variables** (i.e. they do not depend on the state of the economy), so that changes in taxes or spending result from deliberate changes in government policy.

Adding a Government Sector to the Model

- **If the government's budget is balanced, then:** $G = T$
- **With the exception of four fleeting years** (1998, 1999, 2000 and 2001)**, the US government has consistently run a budget deficit,** $G > T$**, since 1970.**
- **When the government runs a budget deficit:**
  - it finances the deficit by selling Treasury bills, notes and bonds
  - and some saving goes to the government sector

♦♦♦

- **As before, disposable income can be either saved or spent:**

$$Y - T \equiv C + S \quad \textbf{which implies that:} \quad Y \equiv C + S + T$$

- **Similarly, planned aggregate expenditure can either be consumed by households, invested or consumed by the government:**

$$AE \equiv C + I + G$$

- **Equilibrium in the goods market still occurs when aggregate output equals planned aggregate expenditure,** $Y = AE$
- **but now aggregate output will only be equal to planned aggregate expenditure when:** $S + T = I + G$
  - Equilibrium does not require the government's budget to be balanced
  - But if $G > T$, then $S > I$, so that some saving goes to the government

A Solution to the Short-Run Problem of Thrift

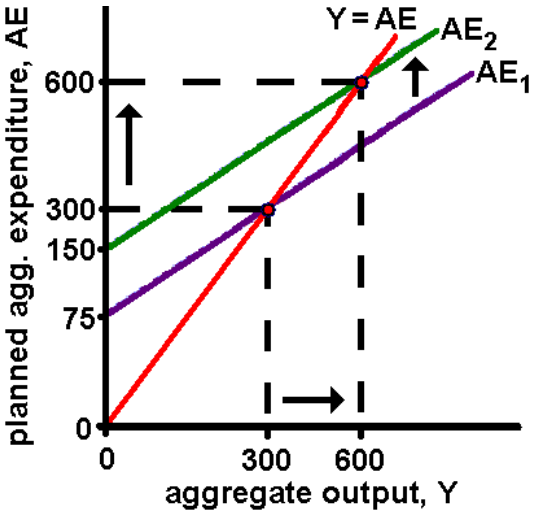
- **Now let's say you're the President of the United States.**
  - During the first three years of your administration, the government has not made any purchases, nor has it levied any taxes, i.e. $G = 0$ and $T = 0$
  - Investment has been humming along as planned at $I = 25$ each year.
- **This year, Americans decide that they have borrowed too much and they've decided to increase their saving, by altering their** (aggregate) **consumption function from** $C = 100 + 0.75 \cdot Y$ **to** $C = 50 + 0.75 \cdot Y$**.**
- **As we saw earlier, this causes equilibrium output to fall from \$500 to \$300 as firms reduce the amount they produce by firing workers.**

But you face a re-election campaign this year!

- **The American people will vote you out unless you do something fast!**
- **Fortunately, you read Prof. Doviak's *Lecture Notes* and you quickly realize that you can increase aggregate output in the short run by increasing government purchases.**
- **Now you don't want to raise taxes in an election year, so you leave** $T = 0$ **and you sell bonds to fund government purchases at a level of** $G = 75$

Why You Win the Election

- **Had you left government purchases at** G = 0**, equilibrium output would have been $300**
- **but because you increased government purchases to** G = 75**, planned aggregate expenditure rises and equilibrium output rises to $600**
- **to produce that higher level of output, firms have to raise employment**
- **since employment increases, workers think you are a genius and re-elect you in a landslide**

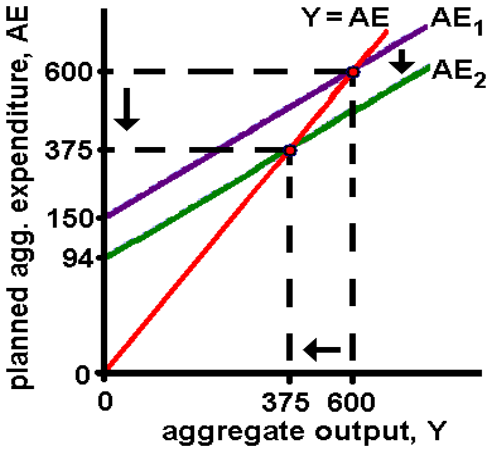


- **Notice that output rose $300 while government purchases only rose $75**
  - output rose four times more than the increase in government purchases
  - the **government spending multiplier** – the ratio of the change in equilibrium output to the change in government purchases – **is four**

After the Election

- **Now notice that because there was a budget deficit of $75, those $75 become part of the government debt.**
- **Unless you balance the budget in the next year, the budget deficit will again be $75 and the government debt will rise to $150** (for simplicity, we'll assume that interest rates are zero)
- **After the election, members of Congress start to worry about the debt and they beg you to balance the budget.**
- **Since you no longer have to face another election, you agree.**
- **There are two ways to balance the budget:**
  - You can cut government purchases back down to zero OR
  - You can raise taxes by $75
- **Because you read Prof. Doviak's *Lecture Notes*, you know that:**
  - the **tax multiplier** – the ratio of the change in equilibrium output to the change in taxes– **is smaller than the government spending multiplier**
  - so a tax increase will have a smaller effect on aggregate output than reducing government spending by the same amount
- **So you decide to raise taxes by $75**

The Effects of the Tax Increase



- **since you leave government purchases unchanged at** $G = 75$ **and**
- **increase taxes from** $T = 0$ **to** $T = 75$
- **equilibrium output now falls from $600 to $375**
- **because the increase in taxes reduces consumption and therefore lowers planned aggregate expenditure**
- **since firms now produce less output, firms have to reduce employment**
- **Notice that output fell $225 while taxes only rose $75**
  - output fell three times more than the increase in taxes
  - the **tax multiplier** – the ratio of the change in equilibrium output to the change in taxes – **is negative three**
  - the tax multiplier is smaller than the government spending multiplier
- **Notice also that the tax increase balances the budget, but it does not eliminate the government debt. To eliminate the debt, another painful tax increase and/or government spending decrease must be passed.**

The Multipliers

- **In the pages above, I told you what the multipliers are, but I did not explain how I obtained them. In equilibrium:**

$$Y = C + I + G$$

- **Plugging the consumption function,** $C = a + b\cdot(Y-T)$**, into the equation for equilibrium output, we have:**

$$Y = a + b\cdot(Y-T) + I + G$$

- **Rearranging terms slightly:**

$$Y\cdot(1-b) = a + b\cdot T + I + G$$

- **we can solve for the equilibrium level of output:**

$$Y = \frac{a - b\cdot T + I + G}{1 - b}$$

- **Notice that the terms on the right-hand side of this last equation are all autonomous variables.**
- **Now that we have a obtained an equation which defines the equilibrium level of output entirely in terms of autonomous variables, we can use our calculus tricks to find the multipliers.**

The Multipliers

- **The government spending multiplier is the derivative of the last equation with respect to government spending:**

$$\frac{dY}{dG} = \frac{1}{1-b}$$

- **The tax multiplier is the derivative of the last equation with respect to taxes:**

$$\frac{dY}{dT} = \frac{-b}{1-b}$$

- **Now recall that b is the marginal propensity to consume and $1-b$ is the marginal propensity to save. Therefore:**

$$\frac{dY}{dG} = \frac{1}{MPS} \quad \textbf{and} \quad \frac{dY}{dT} = \frac{-MPC}{MPS}$$

- **We assumed that the consumption function is given by $C = 50 + 0.75 \cdot Y$, so we've assumed that $b = 0.75$. Therefore:**

$$\frac{dY}{dG} = \frac{1}{1-0.75} = 4 \quad \textbf{and} \quad \frac{dY}{dT} = \frac{-0.75}{1-0.75} = -3$$

Automatic Stabilizers

- **As you should have observed in the discussion of your attempts to ensure victory in the "presidential election," fiscal policy can be used to soften recessions.**
- **In reality, Congress and the President and state lawmakers don't need to suddenly change the course of fiscal policy when they perceive an imminent recession.**
- **Federal and state budgets contain automatic stabilizers – revenue and expenditure items in a budget that automatically adjust to the state of the economy in such a way as to stabilize GDP.**
  - For example, personal and corporate income tax revenues fall when economy goes into recession
  - Governments may also spend more on job placement assistance during recessions
  - Unemployment benefits are **NOT** an automatic stabilizer however, since they merely transfer income from one group of people to another
- **Similarly, when the economy is experiencing a vigorous expansion, there is fiscal drag – average tax rates increase because some taxpayers move into higher income brackets during the expansion**