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**Lecture 07: AD-AS**

1. The Axes
   1. We begin with something that looks a bit familiar. We have something like “price” on the y-axis and something like “quantity” on the x-axis.
   2. This is the beginning of our aggregate (total) model.
      1. Thus y-axis is the *price level*: all prices. Note this isn’t the same thing as inflation. Inflation is a rate; inflation describes how the price level is changing. It’s like the difference between velocity and distance traveled.
      2. Similarly, the x-axis is *real GDP*: all quantities. It is the total output of the entire economy.
2. The Shape of Things: Aggregate Demand
   1. There is also a downward sloping line which should remind us of demand. Indeed, it is demand but now we look at demand across the whole economy, not just a single sector. We look at *aggregate demand*.

Price level

YR

AD

* 1. Like the demand curves of yore, aggregate demand assumes *certeris paribus*. As the price level increases, all other things being equal, real output will fall.
  2. That the aggregate demand slopes down might make sense just like a normal demand curve. As prices across the board rise, people should buy less stuff. That intuition is wrong; it’s not why the aggregate demand curve slopes down.
     1. Why is it wrong? Recall what real GDP is. Income equals expenditures. If prices rise, people might have to spend more to afford something but they also get more income. Money is neutral in the long-run.
  3. So why does AD slope down?
     1. Some books use three reasons, but we really only need one:
     2. *Interest*-*Rate Effect*. As the price level rises, people will want more money; they will borrow more. But the amount of money in the system is the same (remember, *ceteris paribus*). So if more people are borrowing but there is the same amount available to borrow, the interest rate—or the price of borrowing money—will rise. Higher interest rates will cut investment and consumption and thus real GDP falls. We can see this with our old friend:

If pL, the price level, increases and the left half of the equation remains the same, real GDP must fall.

1. A Sticky Situation
   1. It’s now that things get sticky…literally! Well, kind of literally.
   2. Economists typically assume immediate adjustments. If the government prints a bunch of money, wages will automatically compensate. Prices will instantly increase. Really?
   3. In reality, prices and wages are “sticky.” They don’t immediately adjust to changes in the money supply or money velocity.
      1. Contracts inhibit price and wage movement. Billy the farmer has a contract with Andrea the restaurateur where Andrea will buy 1,000 pounds of lettuce per month at $0.50 a pound. This contract lasts a year, which allows both Billy to plan his crop and Andrea to plan her menu. That price is locked in.
      2. Menu costs inhibit price movement. At Andrea’s restaurant, a Big Salad cost $5. If the price of tomatoes increases, it would be costly to change the menu to reflect the new cost. She probably won’t bother, especially if she thinks this is a temporary change in cost.
      3. Consumer expectations inhibit price movement. Customers expect many prices to be consistent even if costs are not. They hate it if, say, their daily intake of Starbucks costs a few nickels more today than it did yesterday. They hate it more than they like it when prices unexpected fall because, in general, consumers like consistency. It helps them plan their budget, enabling comfortable routine and consumption smoothing. So firms often opt to absorb higher costs and reap the benefits of lower costs—which in theory will even out profit-wise—rather than constantly change prices.
2. The Shape of Things: Short-Run Aggregate Supply
   1. In the *long-run*, both input and output prices are flexible.
      1. This is a completely vertical line. More on that later.
   2. In the *immediate short-run* both input and output prices are sticky.
      1. This is a completely flat line because the price level can’t change. This is pretty boring, though, and limiting our analysis to just the very near future doesn’t happen much. We will ignore any further details on this subject.
   3. In the *short-run*, input prices are sticky but output prices are flexible.
      1. This is the first curve that actually looks like a curve. It’s upward sloping and convex.

YR

Price level

SRAS

* + 1. SRAS slopes up because changes in the price level will change what something is sold for (output prices) but not what it costs to produce (input prices). This causes profits to increase and additional productivity to follow. (In this way, it is very similar to our micro-supply curve…greater profits to the supplier induce greater output.)
    2. SRAS is convex because at GDP levels below full employment (left of LRAS), the economy’s not at full capacity. As idle people and equipment are put to work (increase in GDP), there is little upward pressure on price. But above full employment (right of LRAS), further expansion creates disproportionally more inflation.

1. The Shape of Things: Long-Run Aggregate Supply
   1. The Long-Run Aggregate Supply Curve captures the fundamentals of an economy. As such, it is a vertical line: the real GDP is $50 billion or $9 trillion. No matter what inflation is.

YR

LRAS

Price level

* + 1. Recall real growth rates are *adjusted* for inflation. If prices double, GDP should double. But GDP adjusted for inflation should be the same.
    2. One of the most fundamental assumptions of the LRAS is that wages and prices are completely flexible—that’s what the “long-run” means.
    3. Thus higher prices don’t induce higher output. Why should it? If the price level increases, input prices (including materials and labor) also increased.
    4. This also means we’re at full-employment at the LRAS. If equilibrium output didn’t match full-employment, wages would adjust so the only unemployment was the natural rate.

1. Shifting LRAS
   1. When LRAS curve shifts, something fundamental just happened in the economy. We call these *real shocks* (because they have a real effect: an effect that’s adjusted for inflation).
      1. A positive shock increases real GDP. Examples include technology, increases in the capital stock, higher levels of education, and increases in the population.
      2. A negative shock decreases real GDP. Examples include disasters and wars (which reduce both the capital stock and the population), and a fall in education levels.
2. Shifting SRAS
   1. *Input prices*. While input prices are sticky, they are not set in stone. If wages fall (say, because of an increase in immigration) or the dollar appreciates (thus importing inputs are cheaper), the SRAS shifts right/down.
      1. Cheaper dollars thus have two effects; one for input prices and one for greater exports/fewer imports.
      2. Here we can relax my rule from Unit 1: it’s now okay to shift more than one curve. In this case, AD would shift right/up *and* AS would shift up/left.
   2. *Productivity*. If an economy can produce more output with the same number of inputs, that’s effectively the same as reducing input prices. In both cases, buy spending the same amount of money on inputs, the economy will be able to create more output. Increases in productivity shift AS right/down. LRAS should shift in the same direction (assuming this is a permanent increase in productivity) at the same time.
   3. *Legal-Institutional Environment*. Changes in regulations, taxes, and subsidies (reverse taxes) shift the AS curve in the same way changes in input prices shift AS. Complying with regulations are costly, as are taxes. Subsidies, on the other hand, reduce cost-per-unit of production.
   4. When LRAS shifts, SRAS shifts with it, as long the real shock affects the short-run, too (which it usually does).
3. Shifting AD
   1. Like our microeconomics demand curve, our aggregate demand curve can shift. These changes are all unexpected changes.
   2. Consumer spending
      1. *Wealth*. If consumers’ assets suddenly become more valuable, AD shifts right/up.
      2. *Borrowing*. A sudden increase in borrowing also shifts AD right/up. It shifts lefts/down if people suddenly begin to save more.
      3. *Consumer Expectations*. Similarly, changes in expectations can change spending habits. If people think the economy will pick up, spending will increase.
      4. *Personal Taxes*. Lower taxes means more disposable income which means more spending and a rightward/upward shift in AD.
   3. Investment spending
      1. *Real interest rates*. The interest rate is the cost of borrowing. Unexpected higher interest rates not only encourage savings, they discourage investment spending. Decrease the real interest rate and AD will shift right/up.
      2. *Expected returns.* If interest rates are the cost of investment, this is the benefit. Whether the returns are higher because of lower taxes, better technology, better business conditions, or something else, higher expected returns shifts AD right/up.
   4. *Government spending*. Not much nuance to this one. As government spends more, AD shifts right/up. Again, remember ceteris paribus: we assume taxes and interest rates are not changing because of this government spending.
   5. Net Export spending
      1. *National income abroad*. If other countries are suddenly wealthier, AD shifts right/up because they will buy more U.S. goods.
      2. *Exchange rates*. Suppose the dollar suddenly becomes less valuable (for some reason other than the price level). For our purposes that’s effectively the same thing as incomes abroad increasing. In both cases, foreigners will buy more U.S. goods. AD will shift right/up.
4. On Income
   1. One of the strongest relationships in macroeconomics is the relationship between disposable income (DI) and consumption (C). The more you make, the more you spend. There is a positive correlation between the two.
      1. *Disposable income* is income after taxes.
   2. *Savings* (S), or anything that’s not spending, is also positively correlated with disposable income. It becomes investment.
      1. Or, S = DI – C
   3. *Marginal propensity to consume* (MPC) describes what portion of an additional amount of income goes to consumption. It ranges from zero to one (but sometimes more).
      1. Typically people with a low income have a high MPC. MPC decreases as income rises. The same is true for whole economies. But for simplicity, we will be assuming MPC is constant.
   4. *Marginal propensity to save* (MPS) describes what portion of an additional amount of income goes to saving. Ranging from zero to one.
      1. Since you can either save or spend your income,
5. The Keynesian (or Fiscal) Multiplier
   1. Suppose I give you $1. What could you do with it?
      1. Some of it you will save, some of it you will spend.
      2. The portion you spend will be added to someone else’s income.
      3. This additional income will be partly spent as well, adding to someone else’s income.
      4. And so on…
   2. All these individual transactions, added together, increase GDP and it increases it by more than the initial $1 I gave you. We call this the Keynesian Multiplier, after John Maynard Keynes, the father of macroeconomics.
      1. How much more depends on the MPC.
      2. If MPC = 0.9, GDP increases by $1+$0.90+$0.81+$0.73+…
      3. If MPC = 0.8, GDP increases by $1+$0.80+$0.64+$0.51+…
      4. This infinite series converges such that to total multiplier equals
      5. So a 0.9 MPC is a multiplier of 10; at 0.8, the multiplier is 5.
   3. Economists estimate the actual multiplier is much lower that what we predict here. This equation gives us an upper bound. The actual value (somewhere between zero and 2.5) is lower because…
      1. New income is dissipated in the form of taxes and imports.
      2. Inflation from extra spending reduces the real GDP gains.
      3. Savings becomes investment, which is also spent but on different things. This process takes longer than spending, but it does decay the spending gains thanks to opportunity cost.
      4. The equation derives from an infinite series, but it can take a long time for money to change hands that often! In practice, it might only change hands a few times before the year runs out. On the other hand such spending *will* increase real GDP; it’s just a matter of time.
6. Shifting together
   1. We now have three lines which means we’ll have to break one of ours rules: we’ll have to shift multiple curves! (Pause for gasp of dismay.)

YR

AD

LRAS

Price level

SRAS

* 1. Time becomes an important factor in this analysis. Whatever happens, we must make all three curves eventually intersect at one point. The economy trends towards equilibrium
     1. The question you must consistently ask yourself is: in the long-run, what should happen? Should real GDP change or only the price level?

1. Fall into the Gap
   1. If you shift just one curve, the economy shows an imbalance. Rather than three lines intersecting on the same point, three lines will intersect at two different points. Three different scenarios can’t be happening at the same time: the price level can only be one result; real GDP can only be one value. The imbalance must correct itself.
   2. The correction occurs when another curve shifts so all lines meet at the same point.
   3. Two gaps are of particular note. They occur when *either* the AD curve shifts or when the SRAS curves shifts.
      1. A *recessionary gap* occurs when AD and SRAS intersect at a real GDP below LRAS. It suggests the economy has excess capacity and the current employment level is below full employment. As the name suggests, it represents a recession.
      2. An *inflationary gap* occurs when AD and SRAS intersect at a real GDP above LRAS. It suggests the economy is running “too hot” and that the current employment level is above full employment. This scarcity of workers puts upward pressure on wages across the board, encouraging—as the name suggests—inflation.
   4. For example, consider demand-pull inflation:
      1. AD shifts out for some exogenous reason.
      2. This shift puts upward pressure on prices and wages. In the short-run, output increases. This creates an inflationary gap.
      3. But operating beyond full employment can only happen for so long. Inputs are in high demand; input prices and wages will rise.
      4. This cutting into profits causes SRAS to shift up to LRAS. The gap closes.
      5. In the long-run, output won’t change but we’ll get a lot of inflation.

YR

AD

LRAS

Price level

SRAS

AD’

Inflationary Gap

YR

AD

LRAS

Price level

SRAS

AD’

SRAS’

Gap Closes

* 1. Some economists argue this is what business cycles are all about. Real GDP doesn’t change because of shifts in AD but because of fundamental shocks to the economy. The belief that the business cycle is governed by real shocks—events that move LRAS—is called Real Business Cycle theory (RBC).
  2. Other economists disagree. They believe AD ultimately governs the business cycle. By tweaking the economy, they argue, we can achieve short-run stability with long-run growth. We will use this model to better understand their approach in the next lecture.
     1. In both cases, these gaps close by themselves, though they do so painfully. We will explore in the next lectures how to close the gaps in less painful ways.