Lecture 12: Aggregate Demand
(chapter 11)

topics: IS-LM
AD
Long run versus short run
Great Depression

1) IS-LM
Recall two markets:
IS: Equilibrium in goods market: planned expenditure equals actual expenditure.
   Rise in interest rate lowers investment, this lowers planned expenditure, which
   lowers equilibrium output.
LM: demand for real money balances equals supply.
   A rise in income raises real money demand, which causes the equilibrium interest
   rate to rise in the money market (too keep real money demand consistent with real
   money supply at the given price level).
Need to consider both curves at the same time, because we require equilibrium both in
the goods and money markets.

a) Monetary policy: increase money supply

Money market: said increase MS shifts LM right: Theory of liquidity preference says
for a given level of income, rise in money supply means money market will lower
interest rate so money demand rise to equal money supply.

Now look at goods market, IS: new equilibrium at point 2. Moving along IS.
Idea: IS says that as interest rate falls, this will stimulate investment and hence
income. This is movement along IS curve.

Monetary transmission mechanism: means by which rise in money supply raises
income - works through interests rate’s effect on investment expenditure.

Note what is happening in the money market: the fact that income is increasing leads
to arise in money demand, so the equilibrium interest rate does not need to fall so
much to make money demand equal the existing money supply.
b) Fiscal Policy: Increase government expenditure:

Increase G by G. Keynesian cross says at any given r, increase G will increase income by multiplier \( G \times \frac{1}{1-MPC} \). IS shifts to right by this amount.

But need to be on LM: Move along LM, so equilibrium is at 2, with higher r and Y less than full multiplier effect.

What LM doing: LM says the increase in income being generated by the fiscal policy will raise money demand. But need to keep money demand consistent with constant money supply, so need interest rate to rise. Rise in \( r \) will discourage investment expenditure. Partial crowding out of investment by government expenditure. Not total crowding out, as in classical economy. And will detract from rise in total expenditure, and hence on income.

So increase is less than full multiplier effect shown in Keynesian Cross - which took investment level as fixed, did not consider feedback effect of Y on r and then r on I.

Similar effect for tax cut, but IS shift to right by tax multiplier: \( T \times \frac{MPC}{1-MPC} \). Partial crowding out of investment by consumption.

c) Exogenous shocks: IS and LM curves not only shifted by policies, but also by shocks:

**Shift IS left:**
1) Exogenous fall in investment demand. Consider if people become pessimistic about economy. Think will not sell much next couple years, so not invest in new factories. Fall in investment expenditure will lower income -can lead to self-fulfilling expectations.
2) Exogenous fall in consumption demand; fall in consumer confidence; they may fear they may lose their job, so cut back on purchases. Shifts IS left. Lowers expenditure and income, so it may become more likely they will indeed lose job.

**Shift LM left: exogenous rise in money demand.** Rise in money demand for a given level of Y or r. Requires that for a given money supply equilibrium will need higher r. shifts LM left, raise r and fall Y.
2a) Deriving Aggregate Demand

Have been assuming a fixed price level here. Let's see what happens when price level begins to adjust. Effect of change in price level

A higher price level, P, means the level of real money supply has fallen, for a given nominal level of money supply. So rise P from P1 to P2 shifts LM left.

Move up along IS. Rise in R fall in Y from Y1 to Y2.
If plot pairs of P and Y, find downward sloping AD curve: lower output associated with higher price.
Logic: a higher price implies that the REAL money supply is lower, lower than real money demand at the given interest rate and income level. As people go to the bank to try to borrow more money to satisfy their money demand, they bid up the interest rate. But this has an effect on the goods market: as the interest rate rises, it also becomes more expensive to take out loans for investment projects. So the investment component of planned expenditure falls, and equilibrium output falls.

b) Shifting the AD curve:

This is movement along AD curve: shift in LM due to rise in P. What shifts it: shift in IS or LM for reasons other than rise in P. If due to rise in P can show it in graph because P is on vertical axis.
If there is a rise in government purchases, this will shift IS right, and raise Y for any given P, so it also shifts the AD curve right.
Also, if there is an increase in the money supply, the resulting rightward shift in LM will also shift the AD curve right.

Conclude: A change in Y in IS-LM resulting from change in P represents a movement along AD curve. A change in IS-LM for a fixed price level is a shift in AD curve.
c) Do math for deriving the AD curve: (skip this in Econ 105)

**Goods Market:**

\[ C = a + b(Y - T), \]
\[ I = c - dr, \]
\[ T = T_{bar}, G = G_{bar} \]

\[ Y = C + I + G \]
\[ Y = a + b(Y - T_{bar}) + c - dr + G_{bar} \]
\[ Y - bY = a - bT_{bar} + c - dr + G_{bar} \]

**IS:**

\[ Y = \left(\frac{a + c}{1 - b}\right) + \left(\frac{1}{1 - b}\right)G_{bar} + \left(-\frac{b}{1 - b}\right)T_{bar} + \left(-\frac{d}{1 - b}\right) r \]

Like Keynesian cross did before, but now allow I be function of r. so see how r relate to Y. See for a given r, G affect Y by spending multiplier, and T by tax multiplier – but all for a given r.

Y and r are endogenous variables. Gbar and Tbar are exogenous (determined outside the model). If want to solve for Y, need a formula or equation with Y on left, and only exogenous variables on right. Need to substitute r out of equation. Use LM:

**Money Market:**

\[ \frac{M}{P} = eY - f r \]
\[ \frac{M}{P} = \frac{M_{bar}}{P_{bar}} \]

\[ \frac{M_{bar}}{P_{bar}} = eY - f r \]

**LM:**

\[ r = \frac{e}{f} Y - \left(\frac{1}{f}\right)\frac{M_{bar}}{P_{bar}} \]

This is a line, slope = e/f, slope up

Now combine the two: plug r from LM into r in IS:

\[ Y = \left(\frac{(a+c)}{(1-b)}\right) + \left(\frac{1}{1-b}\right)G_{bar} + \left(-\frac{b}{1-b}\right)T_{bar} + \left(-\frac{d}{1-b}\right) \left(\frac{e}{f}\right) Y - \left(\frac{1}{f}\right)\frac{M_{bar}}{P_{bar}} \]

For convenience, define the following:

\[ z = \frac{f}{f + de/(1-b)} \] between 0 and 1.

Then we can rearrange the equation above to say:

\[ Y = \left[z\left(\frac{a+c}{(1-b)}\right)\right] + \left[z/(1-b)\right]G_{bar} + \left[-zb/(1-b)\right]T_{bar} + \left[\frac{d}{(1-b)f + de/(1-b)}\right]\left(\frac{1}{f}\right)Y - \left(\frac{1}{f}\right)\frac{M_{bar}}{P_{bar}} \]

Now have a formula for how to compute what equilibrium Y must be if we are given levels of exogenous variables.

But this equation takes price level as an exogenous variable (Pbar). This was our extreme assumption that price is fixed completely at short run.

If willing to allow price to be influenced by economic events, then must regard it also as an endogenous variable. Then the equation above becomes a relationship between Y and P, in other words, an AD curve.
**d) Policy effectiveness:**

Economists debate whether monetary or fiscal policy more effective means of raising output:

**Fiscal policy is effective when:**

1) if LM flatter: \( f \) large or \( e \) small, so \( z \) near 1) increase money demand not raise \( r \) much, so I not crowded out as much.

2) if IS steeper: \( d \) is small so \( z \) is near 1) investment not respond much to rising \( r \). Means \( z \) is small, so multiplier not much dampened.

**Monetary policy is effective when:**

1) if IS flatter: fall in \( r \) stimulates I much. \( (d \) large)

2) if LM steeper: (small \( f \) takes big drop in \( r \) to raise money demand to clear money market.

(See in math; Hard to graph because small \( f \) affects size of LM shift.)
3) Long run and Short run.

a) Money shocks

In the long run, we think that prices have the time they need to adjust to clear markets. We have told the story of the short run versus the long run using the SRAS and the LRAS curves. We can now see better the transition from the short run to the long run by considering the IS and LM curves. Note what happens to the LM curve as the price level, \( P \), adjusts to clear the money market instead of the interest rate doing this job.

Consider the effects of a cut in money supply.

In the short run with the price level fixed, a cut in the nominal money supply implies a cut in the real money supply. This shifts the LM and AD curves left, as we have seen before. This raises the interest rate and cuts investment and equilibrium output.

But in the long run, the price level adjusts in proportion to the cut in nominal money supply. So the real money supply (the ration of nominal money to price level) returns to its original level. The LM curve returns to its original position, so the interest rate and output return to their original equilibrium levels.

So in the long run, a cut in money supply only leads to a proportional fall in price level, with no changes in real variables, which is consistent with the classical dichotomy.
b) Goods-market shocks

Consider next the effects of a cut in government purchases.

In the short run a cut in government purchases lowers planned expenditure and shifts the IS and AD curves left. The equilibrium level of interest rate and output falls. Recall the interest rate falls because lower income implies a lower real money demand, and given that prices are fixed, the interest rate adjusts to equate money demand to the existing money supply.

But in the long run, the price level adjusts to clear the money market instead of the interest rate. The price level will fall. This in turn implies a rise in the real money supply (even though nothing is happening to the level of money supply in nominal terms). This causes the LM curve to shift right, and acts like expansionary monetary policy, although it happens automatically as the price level adjusts. This will continue to the point that output is restored to the original level at ybar. This is a movement along the AD curve.

3) Case Study for class discussion: Great Depression