ECON 3510 - Intermediate Macroeconomic Theory
Fall 2015
Mankiw, *Macroeconomics, 8th ed.*, Chapter 12

Chapter 12: Aggregate Demand 2: Applying the IS-LM Model

Key points:

- Policy in the $IS - LM$ model:

    - Monetary
    - Fiscal
    - Interaction of Monetary and Fiscal

- $IS - LM$ to AD

- Explaining the Great Depression and the Great Recession in terms of the $IS - LM$ model

$IS - LM$ Model:

- Exogenous variables: G, T, M, P

- Endogenous variables: r, Y

- Eq'm: Both markets clear

    - Goods market: supply = demand
        * $IS : Y = C(Y - T) + I(r) + G$
    - Money market: supply = demand
        * $LM : \frac{M}{P} = L(r, Y)$
    - Eq'm will give a price, r, and a quantity, Y such that both these markets clear

- DRAW eq'm in IS-LM model

Fiscal Policy:

- Change Gov't Spending:

    - $\Delta G \Rightarrow$ (using aggregate expenditure model) $\Delta Y = \frac{\Delta G}{(1 - MPC)}$
    - Shifts IS curve to the right by this amout
    - DRAW IS-LM model and show a shift in the IS curve up and to the right. Show the amount of this shift $= \frac{\Delta G}{(1 - MPC)}$
    - What's happening here?
        * $\uparrow G \Rightarrow \uparrow Y$ (as in agg expend model)
        * $\uparrow Y \Rightarrow \uparrow r$ b/c demand for money $\uparrow$ (as in model of market for real money balances)
        * $\uparrow r \Rightarrow \downarrow I$ so fall in invest b/c of higher interest rate (i.e., some crowding out takes place)
        * $\Rightarrow \Delta Y < \frac{\Delta G}{(1 - MPC)}$ b/c increase in interest rate lowers investment spending, offsetting some of the gains from increasing gov't expenditures (so GE results is that effect is less than in partial eq'm where you get the full multiplier effect)

- Change in taxes:

    - DRAW IS-LM model with shift out in IS curve. Show the amount of this shift $= \frac{-\Delta T \times MPC}{(1 - MPC)}$
    - Tax cut shifts the IS curve out
    - Same offsetting effect as with gov't spending b/c of higher interest rate
    - $\Rightarrow \Delta Y < \frac{-\Delta T \times MPC}{(1 - MPC)}$

Monetary Policy:

- Recall how we derived the LM curve:

    - $\Delta M \Rightarrow$ a diff eq'm interest rate in the market for real money balances
    - $\uparrow M \Rightarrow \downarrow r$
    - Why?
        * P fixed, so $\uparrow M \rightarrow \uparrow (\frac{M}{P})$
        * $\uparrow (\frac{M}{P}) \Rightarrow$ supply higher
        * More supply $\rightarrow$ need price to fall so demand matches supply $\Rightarrow r \downarrow$
    - DRAW IS-LM model and show shift down and to right of LM curve with new eq'm
    - What's happening here?
        * $\uparrow M \Rightarrow \uparrow (\frac{M}{P}) \Rightarrow \downarrow r$ (from the market for real money balances)
        * $\downarrow r \Rightarrow I(r) \uparrow$ (from the market for loanable funds)
        * $\uparrow I \Rightarrow \uparrow Y$ (from the agg expenditure model)

Interaction Between Monetary and Fiscal Policy:

- Janet has some idea what Barack is planning and Barack knows what Janet does

- Need to know how these policy makers respond to each other

- Lots of potential responses, but we'll consider just 3.

- In all of these we consider, the Fiscal Authority moves before the Monetary Authority.

- The three cases are - Barack raises taxes and:

    1. the Fed holds M constant
    2. the Fed holds r constant
    3. the Fed holds income (Y) constant

- Case 1: $\uparrow T$, M held constant

    - DRAW IS-LM model and show the shift down and to left of IS curve as result of tax increase
    - Tax increase shifts IS curve down and left
    - Fed does nothing (i.e., holds M constant)
    - $\Rightarrow$ income and interest rates fall
    - $\Rightarrow$ tax hike causes a recession

- Case 2: $\uparrow T$, Fed acts so r held constant

- DRAW IS-LM model and show the shift down and to left of IS curve as result of tax increase and shift up and left of LM curve as result of contractionary monetary policy
- Tax increase shifts IS curve down and left
- This would cause r to fall
- But, to hold r constant, Fed contracts the money supply ($\downarrow M$), shifting LM up and to the left
- $\Rightarrow$ interest rate remains same
- $\Rightarrow$ income falls more than in Case 1, where no response
- $\Rightarrow$ deeper recession!
- Why?
    * W/out Fed response, $T \uparrow \Rightarrow r \downarrow \Rightarrow I \uparrow$
    * Increase in investment due to lower interest rates offsets some of the lower consumption resulting from higher taxes
    * But if keep r at same rate, then don't get this benefit of increased investment.

- Case 3: $\uparrow T$, Fed acts so Y held constant
    - DRAW IS-LM model and show the shift down and to left of IS curve as result of tax increase and shift down and right of LM curve as result of expansionary monetary policy
    - $T \uparrow$ shifts IS curve down and left
    - This causes interest rates and income to fall
    - But Fed offsets lower consumption, by $\uparrow M \Rightarrow \downarrow r \Rightarrow \uparrow I$
    - Expands M enough to offset tax cut
        * No recession
        * Largest fall in interest rates

Shocks to the $IS - LM$ Model:

- We want to know how economic shocks affect the equilibrium of the $IS - LM$ model
    - This will help us understand what causes short term fluctuations
- Shocks to the IS curve
    - Exogenous changes in demand for goods and services
        * Changes in beliefs (e.g., "animal spirits" $\rightarrow$ waves of optimism or pessimism)
        * Loss of wealth changing demand for goods and services (e.g., stock market crash, home price collapse)
        * If demand for goods/services increases, IS curve shifts out
        * If demand goods/services decreases, IS curve shifts in
- Shocks to the LM curve
    - Exogenous shifts in the demand for money
        * e.g., increase in the perceived risk of loans (lend less, hold more money), limits on credit cards
        * If demand for money increases, LM curve shifts in
        * If demand for money decreases, LM curve shifts out

$IS - LM$ to Aggregate Demand:

- AD relates P and Y

- $IS - LM$ relates r and Y at a given P

- First - show why AD is downward sloping

- Second- show what causes the AD curve to shift

1. The slope of AD:

    - Take the $IS - LM$ model and change P, $\uparrow P$ from P_1 to P_2
    - DRAW IS-LM model and show how LM curve shifts up and to the left when increase P
    - $\uparrow P \Rightarrow \frac{\bar{M}}{P} \downarrow$
        - $\Rightarrow$ lower supply of real money balances
        - Shift LM curve up and left (now eq'm in money market has a higher r for all Y)
        - $\Rightarrow$ In $IS - LM$ eq'm, Y^* falls and r^* increases
    - In terms of AD
        - DRAW AD and note the two points, P1 and P2, along the AD curve
        - AD curve shows the set of eq'm points from the $IS - LM$ model as we vary P

2. What causes AD to shift?

    - AD is a summary of results from $IS - LM$
    - $\Rightarrow$ AD shifts for anything that shifts the IS or LM curves (except for a change in P - that is just a movement along AD)
        - ΔM
        - ΔG
        - ΔT
        - Shocks to IS (e.g., animal spirits)
        - Shocks to LM (e.g. changes in risk premia)
        - Note that all of the above are exogenous variables in the $IS - LM$ model
    - Monetary Policy - Expansionary
        - DRAW IS-LM model and AD next to it. Show how increase M shifts LM out and increases Y. Moving over to AD, this is a shift out in the AD curve -higher Y at same price level
    - Fiscal Policy - Expansionary
        - DRAW IS-LM model and AD next to it. Show how increase G shifts IS out and increases Y. Moving over to AD, this is a shift out in the AD curve -higher Y at same price level
        - $\Delta P \Rightarrow$ movement along AD
        - Δ in $IS - LM$ for a given price $\Rightarrow$ shift in AD

$\underline{IS - LM \text{ in the Short and Long Run:}}$

- $IS - LM$ is a short run model

- Since we saw what a change in P does to $IS - LM$ (shifting the LM curve) we can use $IS - LM$ in long run too

- Recall: long run is defined as when P can adjust

- DRAW IS-LM model with two LM curves for P1 and P2. Draw a vertical $\bar{Y}$ curve that intersects the IS and LM2 curves. This denotes the long run level of output. Next to this, draw a AS-AD model. Have to SRAS curves (corresponding to P1 and P2). Have the LRAS curve intersect the AD and SRAS2 curves. Showing how move along the AD curve.
  - Short run eq'm is point A
  - In the long run, prices adjust, so return to the "natural level of output", $\bar{Y}$
  - High demand for goods and services causes prices to rise (and vice versa)

The Classical View vs. the Keynesian View:

- Economy has 3 endogenous variables: Y, P, r
- $IS - LM$ has 2 equations:
  - $IS: Y = C(Y - T) + I(r) + G$ (Goods mkt eq'm)
  - $LM: \frac{M}{P} = L(r, Y)$ (Money mkt eq'm)
- Need one more equation to solve for the 3 endogenous variables
- The Keynesian assumption is: $P = P_1$
  - $\Rightarrow Y$ and r must adjust to satisfy $IS - LM$
- The classical view assumes: $Y = \bar{Y}$
  - $\Rightarrow$ prices, P and r must adjust to satisfy $IS - LM$
- Which view is more appropriate depends upon the time horizon and what you think the "frictions" are that might prevent prices from moving

What caused the Great Depression:

- SHOW some graphs of GDP, unemp, inflation, interest rates, around Great Depression
- No one knows for sure
- Bernanke (Fed chair during Great Recession) is an expert
- 2 main hypotheses: the Spending Hypothesis and the Money Hypothesis

1. Spending hypothesis:
   - Stock market crash led to less spending
   - SHOW stock market in Oct 1929
   - At same time, housing values fell, many banks failed (making it hard to borrow money), gov't worried about balanced budget
   - SHOW home prices though history, bank failures
   - Model representation: IS curve shifts in
   - DRAW IS-LM model with IS curve shifting in. Note lower eq'm output
   - Consistent w/ i (nominal interest rates) falling, drop in output, drop in employment
   - Inconsistent w/ fact that r (real interest rate) rose
     - Even thought i fell, prices fell faster so that $r = i - \pi$ rose

2. <u>Money hypothesis:</u>

- <u>Version 1:</u>
  - Money supply fell $\Rightarrow$ shift in LM
  - DRAW IS-LM model and show shift to left in the LM curve. Note drop in Y
  - Consistent with fall in money stock, fall in output, employment, r rising
  - Inconsistent with rise in $\frac{M}{P}$ (which is why we shifted LM left to begin with)
  - $\rightarrow$ prices fell so that even though $M \downarrow$, $\frac{M}{P} \uparrow$, so really no contractionary shift in LM

- <u>Version 2:</u>
  - Deflation $\Rightarrow$ shift in IS curve
  - rewrite IS: $Y = C(Y - T) + \underbrace{I(i - \pi^e)}_{r} + G$
  - $\rightarrow$ Deflation means $\pi^e < 0$
  - rewrite LM: $\frac{M}{P} = L(i, Y)$
  - $\rightarrow$ Nominal interest rate means that it's not just the opportunity cost of holding money that affects demand for money, but also the inflation tax
  - DRAW IS-LM model with i as vertical axis. Show shift down in the IS curve as a result of $\pi^e < 0$. Note drop in Y
  - Idea here: prices expected to be lower
  - $\rightarrow \Rightarrow r$ higher
  - $\rightarrow \Rightarrow$ less demand for investment and consumption
  - Also, debt-deflation theory
  - $\rightarrow$ deflation transfers wealth from debtors to creditors
  - $\rightarrow \rightarrow$ creditors spend less than debtors (that's why they have money to lend)
  - $\rightarrow \rightarrow \Rightarrow$ Output falls because less consumption
  - Consistent with: fall in prices, fall in output, fall in emp, increase in r, fall in i
  - Suggests that Fed played a large role in making the depression "Great" by not expanding M to avoid deflation/deflationary expectations

<u>The Great Recession:</u>

- SHOW some graphs of GDP, unemp, inflation, interest rates, around 2008 - also home prices (maybe compare all this to Great Depression)

- The 2007-2009 recession was especially large

- With exception of 1981-82 recession, worst labor market experience since GD

- As with the Great Depression:

  - Housing bubble burst
  - Stock market crash

- $\Rightarrow$ shift IS curve in

- Uncertainty about lending money $\Rightarrow$ shift in LM b/c people/institutions hoard cash

  - Increased demand for money causes the LM curve to shift in (left)
  - Makes things even worse

- SHOW reserves of Fed graph

- Also, increases in bank failures, as before (basically 0 since 1980's S&L crisis)

- DRAW graph with IS curve and LM curve both shifting in

- Why not a depression?

    - Policy response:
        * No worry about balancing budget - huge fiscal stimulus (shifts IS back out)
        * No contracting money supply - still working hard to increase it (shift LM back out)

- But, as with most financial crises, the recovery period has been long

- "Trough" of recession was June 2009, but over 5 years later we still see the effects

- Show - slow recovery in labor market graph, table of most volatile days in stock market (22 of 40 most volatile days since 1950 occurred between 2008 and 2011)