Introduction to The IS-LM Model

- This name originates from its basic equilibrium conditions:
  - investment, $I$, must equal saving, $S$;
  - money demanded, $L$, must equal money supplied, $M$.
- The model is developed and used by Keynesians.

The *FE* Line: Equilibrium in the Labour Market

- The equilibrium in labour market is represented by full employment line, *FE*.
- When the labour market is in equilibrium, output equals its full employment level, regardless of the interest rate (*FE* line is vertical).
Factors that Shift the $FE$ line

- The full-employment level of output, $\bar{Y}$, is determined by the current level of labour, capital, and productivity.
- For classical economists the full-employment level of output is affected by government spending.

The IS Curve: Equilibrium in the Goods Market

- The IS curve shows for any level of output (income), $Y$, the interest rate, $r$, for which the goods market is in equilibrium.
- The IS curve slopes downward.
- At all points of the curve $I=S$. 
Factors That Shift the IS Curve

- For constant output, any change in the economy that reduces desired national saving relative to desired investment will increase the real interest rate that clears the goods market and, thus, shift the IS curve.

Factors That Shift the IS Curve (continued)

- The IS curve in terms of goods equilibrium condition ($AD=AS$): For a given level of output, any change that increases the aggregate demand for goods shifts the IS curve up.
The Price of a Nonmonetary Asset and the Interest Rate

- Given the promised schedule of repayments of a bond or other nonmonetary asset, the higher the price of the asset, the lower is the nominal interest rate of the asset.

The Price of a Nonmonetary Asset (continued)

- For a given rate of inflation the price of a nonmonetary asset and its real interest rate are also inversely related.
The Equality of Money Demanded and Supplied

- The real money supply curve (MS) is a vertical line, it does not depend on the real interest rate.
- The money demand curve (MD) slopes downward. With higher \( r \) attractiveness of money as an asset decreases.

The Equality of \( MD \) and \( MS \) (continued)

- Asset market equilibrium occurs at the intersection of the \( MS \) and the \( MD \) curves.
- When the \( MD \) increases people sell nonmonetary assets, their price falls and the interest rate increases.

The LM Curve: Asset Market Equilibrium

- The \textit{LM curve} is graphical representation by the relationship between output and the real interest rate that clears the asset market.
- The \textit{LM curve} always slopes upward.
- At all points of the curve \( MD = MS \).
Factors That Shift the LM Curve

- For constant output, any change that reduces real money supply relative to real money demand will increase the real interest rate that clears the asset market and cause the $LM$ curve to shift up.

Changes in the Real Money Supply

- An increase in the real money supply ($M/P$) will reduce $r$ and shift the $LM$ curve down.
- With an excess supply of money holders of wealth try to purchase nonmonetary assets and their price goes up, then $r$ goes down.
Changes in the Real Money Demand

- A change in any variable that affects real money demand, other than output or real interest rate, will also shift the LM curve.
General Equilibrium in the Complete IS-LM Model

- The general equilibrium of the economy:
  - the FE line along with the labour market is in equilibrium;
  - the IS curve, along with the goods market is in equilibrium;
  - the LM curve, along with the asset market is in equilibrium.

General Equilibrium (continued)

- The general equilibrium of the economy always occurs at the intersection of the IS curve and the FE line.
- Adjustments of the price cause the LM curve to shift until it passes through the general equilibrium point.
A Temporary Adverse Supply Shock

- The productivity parameter $A$ in the production function drops temporarily.
- It reduces the $MPN$ and shifts the labour demand down. The labour supply is unaffected.
- The $FE$ line shifts left.

A Temporary Adverse Supply Shock (continued)

- A temporary adverse supply shock is a movement along the $IS$ curve, not a shift of the $IS$ curve.
- A temporary adverse supply shock has no direct effect on the demand for or supply of money.
A Temporary Adverse Supply Shock (continued)

• The $LM$ curve shifts until it passes through the intersection of the $FE$ line and the $IS$ curve.
• For that the $M/P$ should fall, that is $P$ should rise. A temporary supply shock should cause a temporary increase in the rate of inflation.

The Effects of a Monetary Expansion

• Suppose that the central bank decides to raise $M$.
• $P$ is constant, so $M/P$ increases.
• The $LM$ curve will shift down, the interest rate drops.
• Only the asset market and the goods market are in equilibrium.
The Effects of a Monetary Expansion (continued)

- After the interest rate drops the aggregate demand for goods rises.
- Assume that firms respond by increasing production leading to a higher output in the short-run equilibrium.

The Adjustment of the Price Level

- In meeting the higher level of aggregate demand, firms are producing more output than they want to.
- At some point firms begin to raise their prices and the price level rises.

The Adjustment of the Price Level (continued)

- As the price level rises the real money supply $M/P$ becomes lower and the $LM$ curve shifts up.
- The $LM$ curve keeps shifting until it is in its initial position, where the aggregate quantity of goods demanded equals full-employment output.
The Adjustment of the Price Level (continued)

• Thus, the change in the nominal money supply causes the price level to change proportionally.
• The return of the economy to general equilibrium requires adjustment of nominal wages as well as the price of goods.

In practice the money supply increases constantly and the price level increases accordingly.

Thus, by increase in money supply we will mean an increase relative to the expected, or trend, rate of money growth.

The Debate Between the Classicals and Keynesians

• Two questions central to the debate:
  – How rapidly does the economy reach general equilibrium?
  – What are the effects of monetary policy on the economy?
Price Adjustment and the Self-Correcting Economy

- After an initial $LM$ curve shift, the price level adjusts and shifts the $LM$ curve back to the general equilibrium.
- The classical assumption is that prices are flexible and the adjustment process is rapid.

Price Adjustment (continued)

- According to the Keynesian view, sluggish adjustment of prices might prevent general equilibrium from being attained for a much longer period of time.
- The economy is not in general equilibrium and the labour market is not in equilibrium.

Stabilization Policy

- Unexpected shifts in the $IS$, $LM$ and the $FE$ curves are the sources of business cycles.
- Stabilization policy is the use of fiscal and monetary policy to shift the position of the $IS$ and $LM$ curves so as to offset the effects of such shocks.
Monetary Neutrality
- There is monetary neutrality if a change in the nominal money supply changes the price level proportionally but has no effect on real variables.
- Keynesians believe in monetary neutrality in the long run but not in the short run.

The AD-AS Model
- The AD-AS and the IS-LM models are equivalent.
- The IS-LM model relates the real interest rate to output.
- The AD-AS model relates the price level to output.

The Aggregate Demand Curve
- The aggregate demand curve shows the relation between the aggregate quantity of goods demanded ($C + I + G$) and the price level, $P$.
- The AD curve slopes downward.
Factors That Shift the AD Curve

- For a constant price level:
  - any factor that changes the aggregate demand for output will cause the AD curve to shift;
  - any factor that causes the intersection of the IS and the LM curves to shift will cause the AD to shift.

The Aggregate Supply Curve

- The aggregate supply curve shows the relation between the price level and the aggregate amount of output that firms supply.
- The prices remain fixed in the short run and the short-run aggregate supply curve (SRAS) is a horizontal line.
The Aggregate Supply Curve (continued)
- The prices adjust to clear all the markets in the long run, employment equals $N$ and the output supplied is the full-employment output $Y$.
- The long-run aggregate supply curve ($LRAS$) is a vertical line.

Factors That Shift the AS Curve
- Any factor that changes the full-employment level of output, $\bar{Y}$, shifts the $LRAS$.
- The $SRAS$ curve shifts whenever firms change their prices in the short-run (e.g. due to costs changes).

Equilibrium in the $AD$-AS Model
- Long-run equilibrium is the same as general equilibrium because in long-run equilibrium, all markets clear.
- In general equilibrium, or long-run equilibrium, $AD$, $SRAS$, and $LRAS$ curves intersect at a common point.
Monetary Neutrality in the AD-AS Model

- An increase in $M$ shifts the $AD$ curve up and to the right.
- In the short run the price level remains fixed and $SRAS$ does not change.
Monetary Neutrality in the AD-AS Model (continued)

- In the long run the price level rises, the SRAS shifts up to the point where the AD and the LRAS curves intersect.
- We conclude that money is neutral in the long-run.

End of Chapter