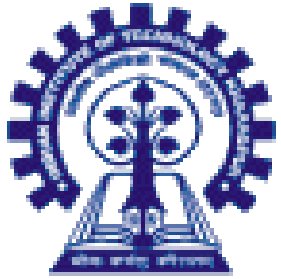
IS-LM Model

The Variable Price Model

Macroeconomics II



Introduction

- IS Curve: Goods market Equilibrium
- LM Curve: Money Market Equilibrium
- IS-LM Model: Simultaneous determination of rate of interest and the real GDP.
- Alternate derivation of AD curve is the core of IS-LM analysis.
- Keynesian fixed price model: Firms are assumed to supply any quantity of their goods at fixed price.
- However, it does not explain how aggregate price is determined.
- It is a static model. Expectation of future prices tends to have an impact on both AD and AS.
- Prices do not remain fixed in the real world.
    - Fixed price is not tenable even in the short run
    - Scarcity of resources make prices to change.
    - Variable price due to inflation/ deflation and business cycles.
    - Under variable price model: the distinction between nominal and real interest rate becomes significant (Real r = Nominal r – expected inflation rate)
    - Distinction between nominal exchange rate and real exchange rate also becomes significant.

Derivation AD Curve

AD equation under IS-LM is derived as

$$Y = \frac{Ao + \frac{d}{f}\left(\frac{Mo}{P}\right)}{\frac{1}{k} + \frac{de}{f}} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

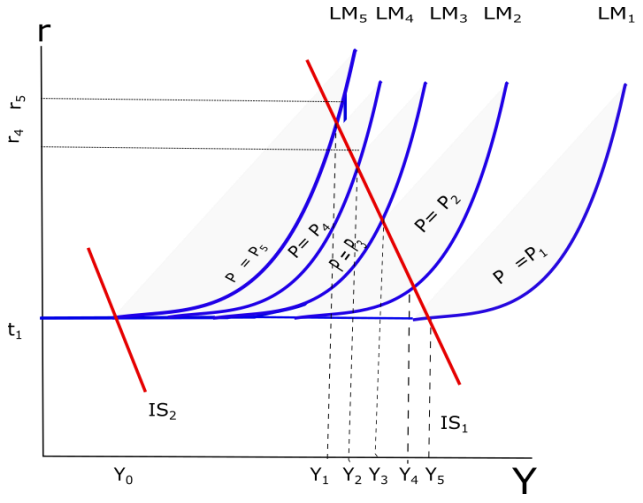
Here if P is assumed to be variable, the equation 1 does not determine equilibrium Y.

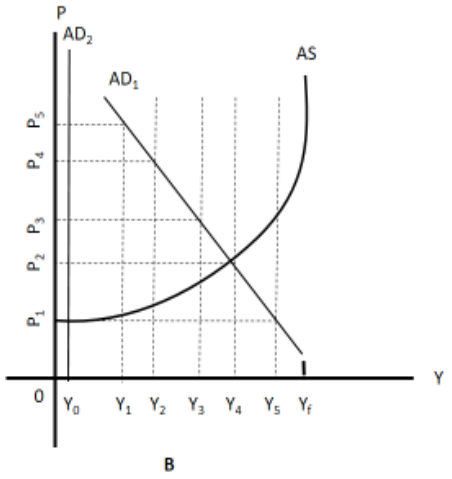
- It provides AD equation which gives the menu of real income and general price level at each combination of which the goods and money market are simultaneously in equilibrium.
- The IS-LM model is now incomplete as now it has one more endogenous variable (P) and that makes them exceed the number of independent variables.
- P and Y are inversely related.
- Hence AD curve is negatively sloped.

Cont…

- If AD curve is perfectly inelastic (e =0): Keynesian
  - Here neither IS nor LM curve shifts with changes in the price level.
  - If total nominal spending increases or decreases proportionaletly with any rise or fall in the price level, the total real spending is unchanges.
- If AD curve is less than perfectly elastic (downward sloping) (elasticity varies at each point)
  - Changes in price level lead to shifts in IS & LM curves: More demanded at lower prices and vice versa.
- If AD curve is a rectangular hyperbola (e=1): Classical (MV = PY)

Derivation of the AD Curve





Equilibrium in the Keynesian Model:

Here we assume $p5 - p4 = p4 - p3 = p3 - p2 = p2 - p1$

With the fall in price level, apart from the liquidity trap range, at each interest rate, the Y value indicated by successive LMs are higher than the preceding ones.

Process of deriving Downward sloping AD Curve

- The decrease in price causes a shift in the LM curve.
- The adjustment of Y and r is not instantaneous.
- **Example: under Part A of the previous diagram**
  - Suppose price falls from P5 to P4.
  - LM4 becomes the new LM curve.
  - At the existing combination of Y1 and r5, people like to hold more money than what they wish to hold.
  - This is because, r5 lies towards the left of the LM4.
  - The excess real balances spill over into purchase of bonds.
  - This would bid up the bond prices and lower the interest rate.
  - With lower r, investment will rise leading to increase in total demand for goods.
  - Once the adjustment is complete, the increase in real money supply due to decrease in price ceases to be an excess supply.
  - A fall in r to r4 and rise in Y to Y2 tend to increase Md by just the amount equal to the increase in Ms.
  - Any other combinations of y and r on LM4 provides equilibrium in money market but not in goods market. To have simultaneous equilibrium in both money and goods market, the combination should be Y2 and r4.

Elasticity of the IS Curve and AD

- How much of an increase in the amount of goods demanded will occur with the rightward shift in the LM curve?
  - Less elastic the IS curve is, the smaller will be increase in AD resulting from the decrease in price level.
  - If IS curve is perfectly inelastic ($e_{IS} = 0$), $then\ e_{AD} = 0$
  - Decline in r due to the fall in P will call forth no increase in investment
  - In a special case, even if IS curve is not perfectly inelastic, $still\ e_{AD} = 0$ if IS curve is in the Keynesian range.
  - Decline in P does not lead to shift in LM
  - There is no fall in r below the liquidity trap.

Equilibrium Price and Output

- Once in AD curve is derived, its intersection with AS curve will determine the equilibrium price and output.
- There are two such points shown earlier (p1 and Y0; p2 and Y4).
- Here AS curve is assumed to have an upward sloping range (Fixed Money Wage and Diminishing MPP of Labour) until full employment is reached.
- Equilibrium below full employment is the rule.
- However, full employment equilibrium can be attained if there is a sufficiently large rightward shift in IS curve to cause AD curve to shift to the level where it intersects AS curve at the full employment level.

Wage Price Flexibility and Full employment Equilibrium

- According to Classical economists, wage-price flexibility brings about full employment equilibrium.
- However, money wage rigidity may deter it.
- Keynes further argues that full employment equilibrium may not be attained even if money wage is flexible downward.

Wage – Price Flexibility and Full Employment Equilibrium

- Classical economists concluded that the equilibrium level of output would be only at the full employment level.
- The AD curve is throughout unitary elastic.
- From the quantity theory of money assumption that the velocity of money is stable.
- Given V, MV or total spending is known as soon as M=(M_S) is known.
- Because MV = PY and AD = MV, any indicated MV or AD will buy various quantities of Y depending on P.

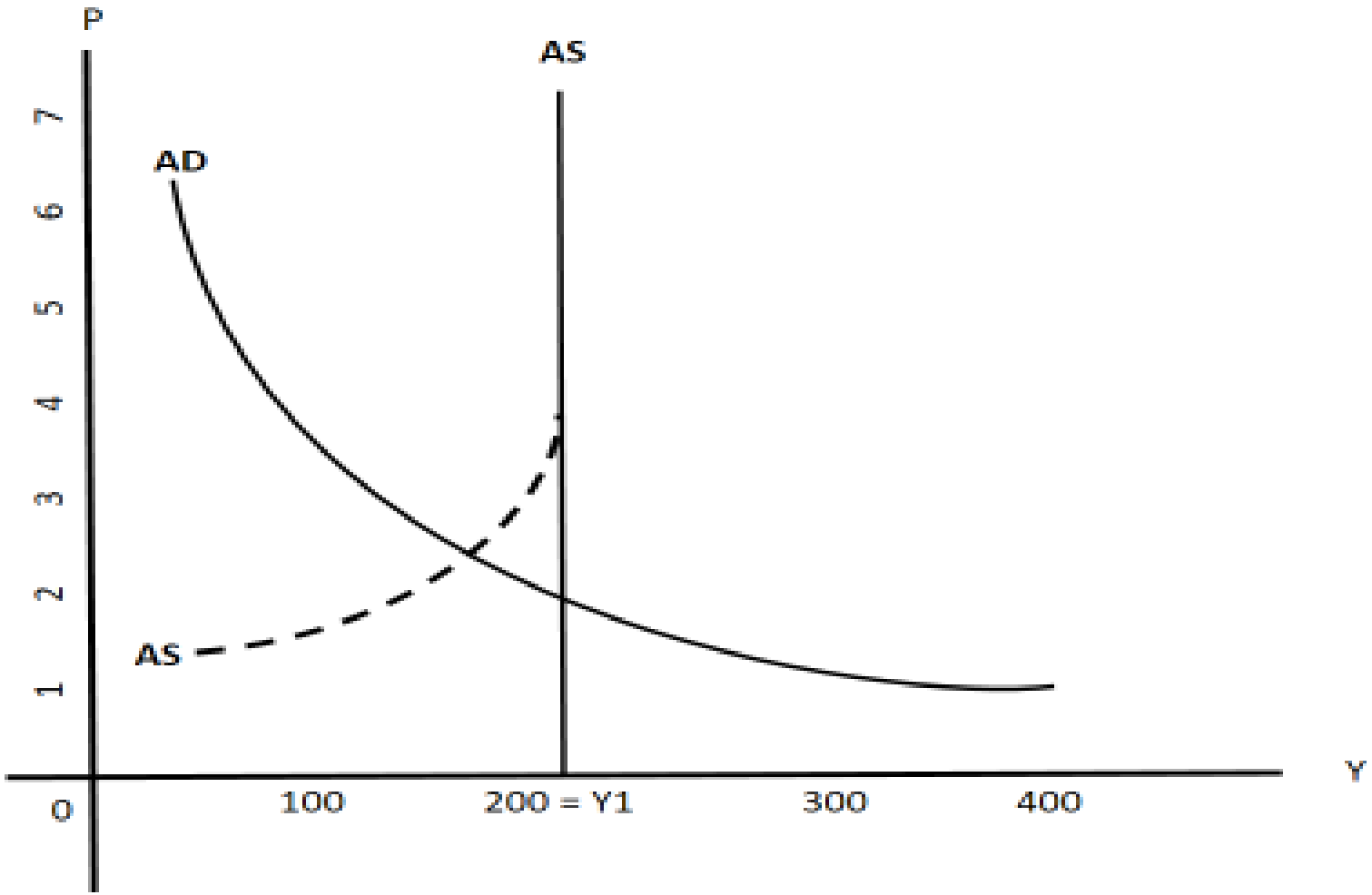


Figure – Full Employment Equilibrium in the Basic Classical Model

- The various possible combination of Y and P consistent with a given AD are identified in the classical model by a curve with unitary elasticity that graphically appears as a rectangular hyperbola.
- The classical theory assumes a flexible money wage rate.
- The figure follows from combining the AD curve of the basic classical model with the Keynesian assumption of a downwardly inflexible money wage rate.

Rejection of the Quantity Theory of Money and Under-employment Equilibrium under Flexible Money Wage Rate

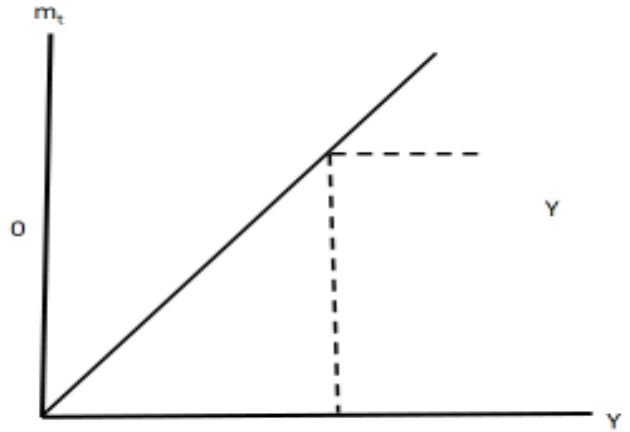
- The shape of the LM curve derived from the QTM is different from that derived from the Keynesian Theory.
- According to Keynes

$$\frac{L}{p} = \mathrm{Md} = \mathrm{k(Y)} + \mathrm{h(r)}$$

- Under QTM

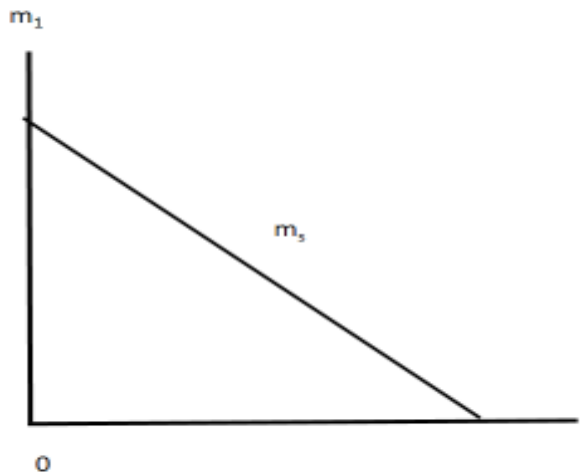
$$\frac{L}{p} = \mathrm{Md} = \mathrm{k(Y)}$$

  - Demand for money is interest inelastic.
  - For a given price level, LM curve based on QTM is a vertical straight line or perfectly inelastic.

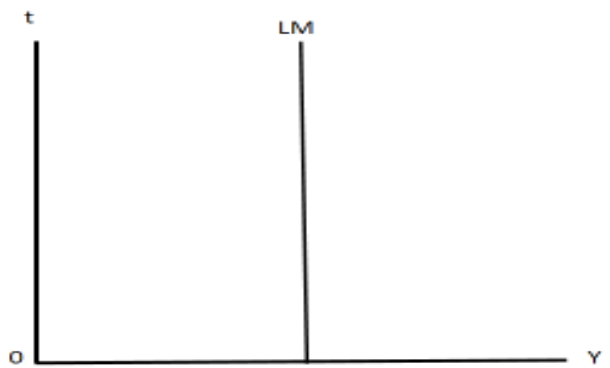


C

Transaction Demand
$m_t = k(Y)$



B
Supply of Money
$m_s = m_t + m_{sp} ; m_{sp} = 0$



D
Money Market Equilibrium
$M_s = k(Y) + h(r) ; h(r) = 0$

A
Speculative Demand
$m_{sp} = 0$

Figure: Money Market Equilibrium with Speculative Demand equal to Zero

Full Employment Equilibrium in the Classical Model Within the IS-LM Framework

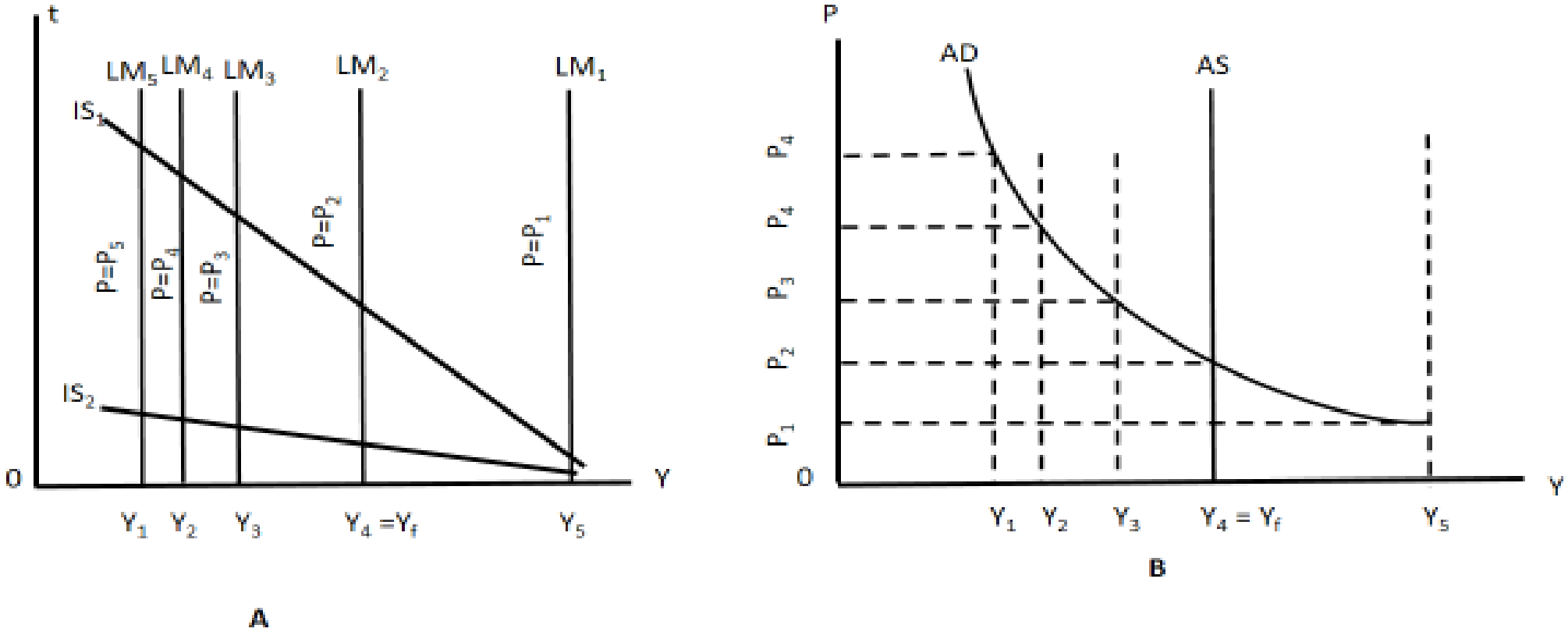


Figure:

Wage – Price Flexibility and the Interest Rate Effect

- In the Quantity theory of money, an increase in the real money supply that results from a reduction in the price level leads directly to an increase in the quantity of goods demanded.
- Successive increases in the real money supply lead directly to successive increases in the quantity of goods demanded.

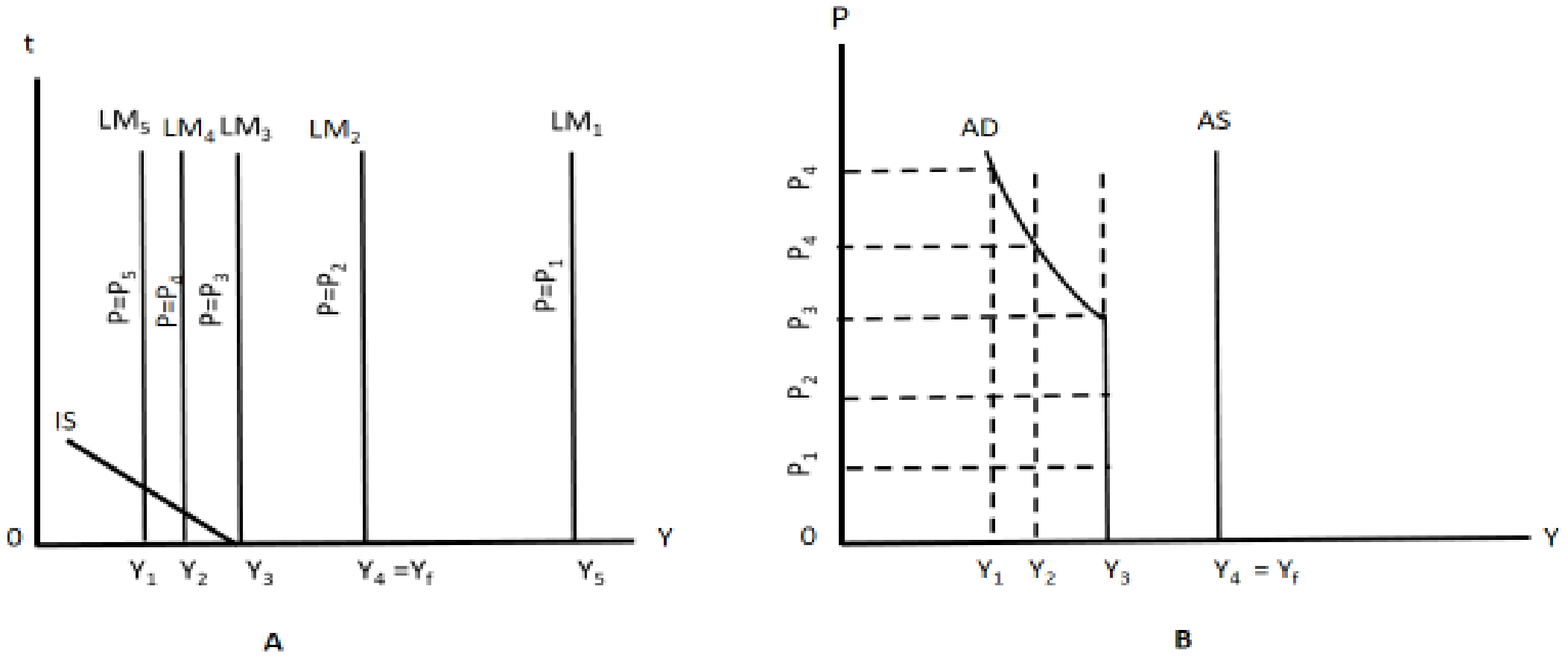


Figure –Unemployment Due to Inconsistency Between Saving and Investment

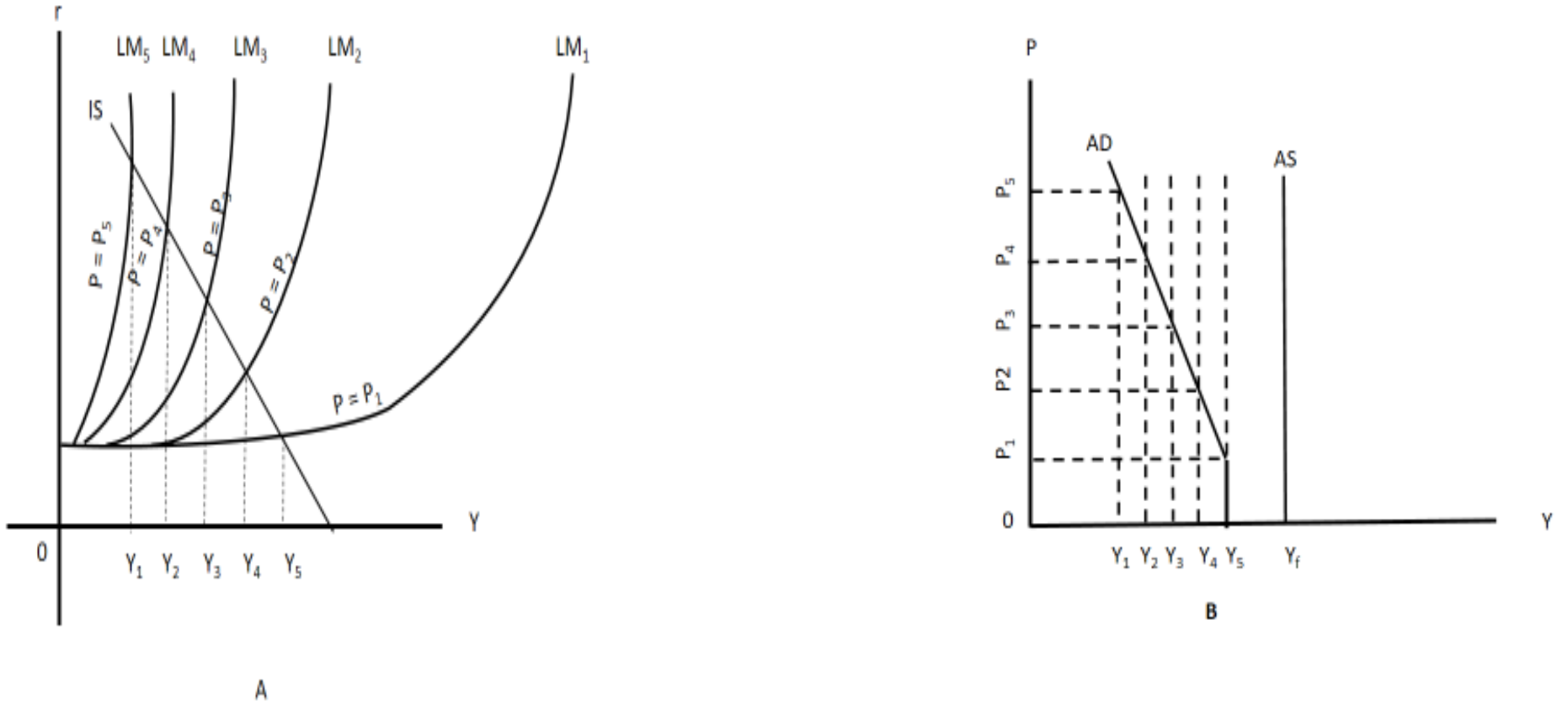


Figure –Unemployment Due to a Liquidity Trap

Wage – Price Flexibility and the Pigou Effect

- If the limit to the reduction in the interest rate set by the liquidity trap is reached before the quantity of goods demanded can be raised to the full employment level or if even a reduction in the interest rate to zero is unable to raise the quantity of goods demanded to the full employment level, wage and price flexibility working through the Keynes effect is repudiated as the means of achieving full employment level of output.

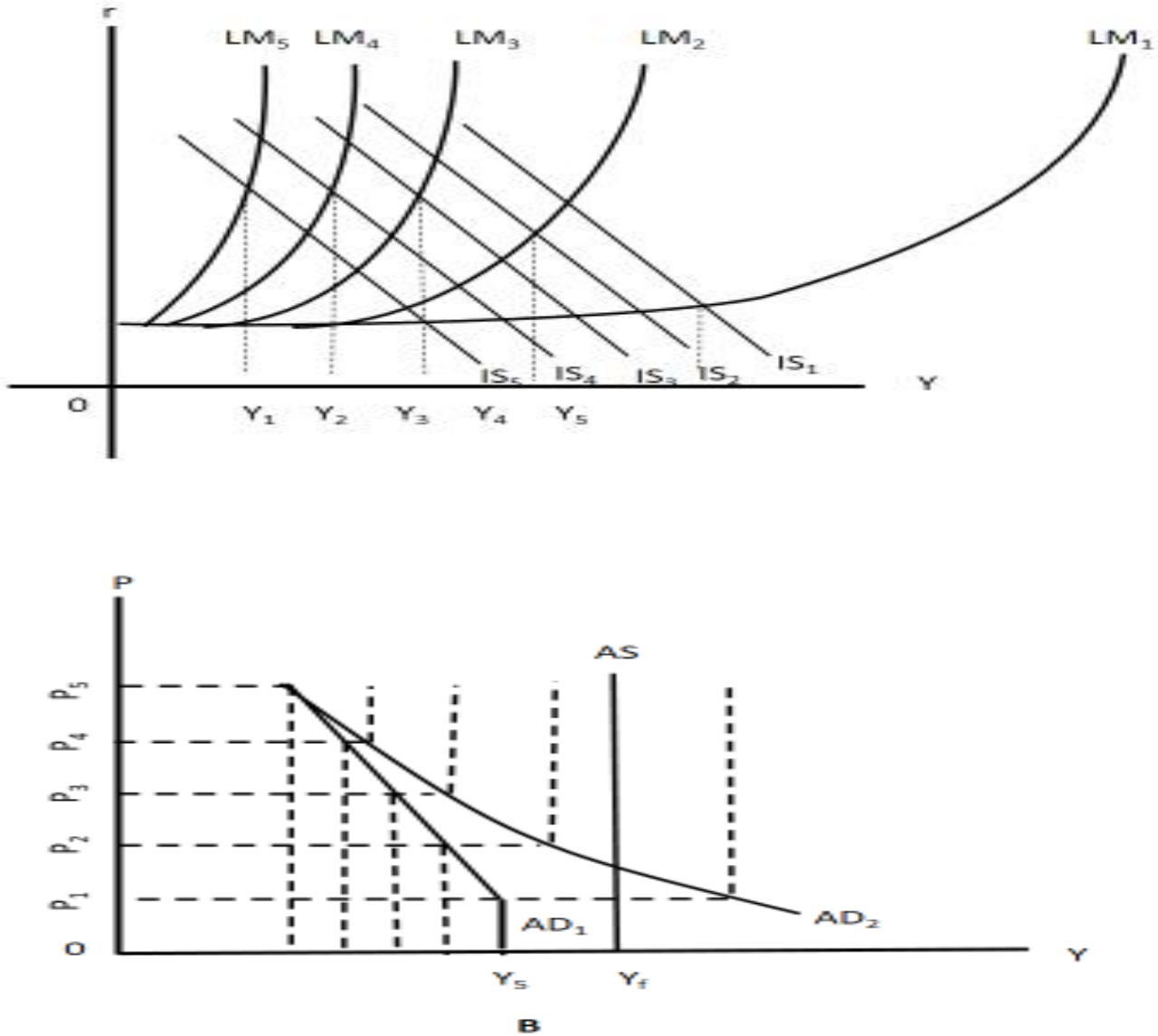


Figure – Full Employment via the Pigou Effect

- A decline in wages and prices experts its influence only through the interest rate.
- An attempt to counter the Keynesian argument and rehabilitate the classical theory's conclusion of automatic full employment through wage price flexibility is found in the Pigou effect or real balance effect.

Wage – Price Flexibility and Other Effects

➢The Keynes (interest rate) effect and the Pigou (real balance) effect have received the most attention in discussion of wage-price flexibility as a cure for unemployment.

The other effects are ----

- **Income-Redistribution Effects :** Wage and Price deflation involves some redistribution of real income in favour of fixed-income groups.

For any level of real income, the share of the total that goes to wage and profit recipients will decrease, and the share going to recipients of interest, rents and pensions will increase.

- Some fixed income flows such as interest payments may go predominantly to upper middle groups others such as pensions may go predominantly to lower income groups.
- The redistribution favours lower income groups, some rise in the consumption function is to be expected and therefore some shift to the right in the IS and AD functions.
- The extent of the effect depends on their MPC.

- **Tax and Transfer-Payment Effects:** Wage-price declines due to tax effect may be expected to favourably affect consumption.

With the progressive income tax, deflation automatically shifts the taxpayers into lower brackets and reduces the fraction of their real income that is paid in income taxes thus, increases both disposable income and consumption.

- **Foreign Trade Effects :** A decline in Nation's prices relative to the level of prices in other nations encourages exports and discourages imports, increasing the net export component of of the aggregate spending.

In an open economy aggregate spending is the sum of **C+I+G+(X-M)**

A rise in the (X-M) will shift the IS function to the right, just as a rise in C,I or G would.

In an open economy some shift in the IS function and stimulus to demand may be expected from a decline in its price level relative to the price level in other countries.

Thus, Classical theory argued that an economy with flexible wages and prices would be self equilibrating at the full employment income level.

Monetary – Fiscal Policies and the Full Employment Equilibrium

Here, the AS curve is upward to the right. Shifts in the AD curve produced by shifts in the LM and IS curves, affect not only the output level but also the price level.

The positions of the IS and LM curves are affected by the changes in the price level, to trace the process by which monetary and fiscal policies raise the level of output, allowance must be made for the changes in the price level that may occur as a result of these policies.

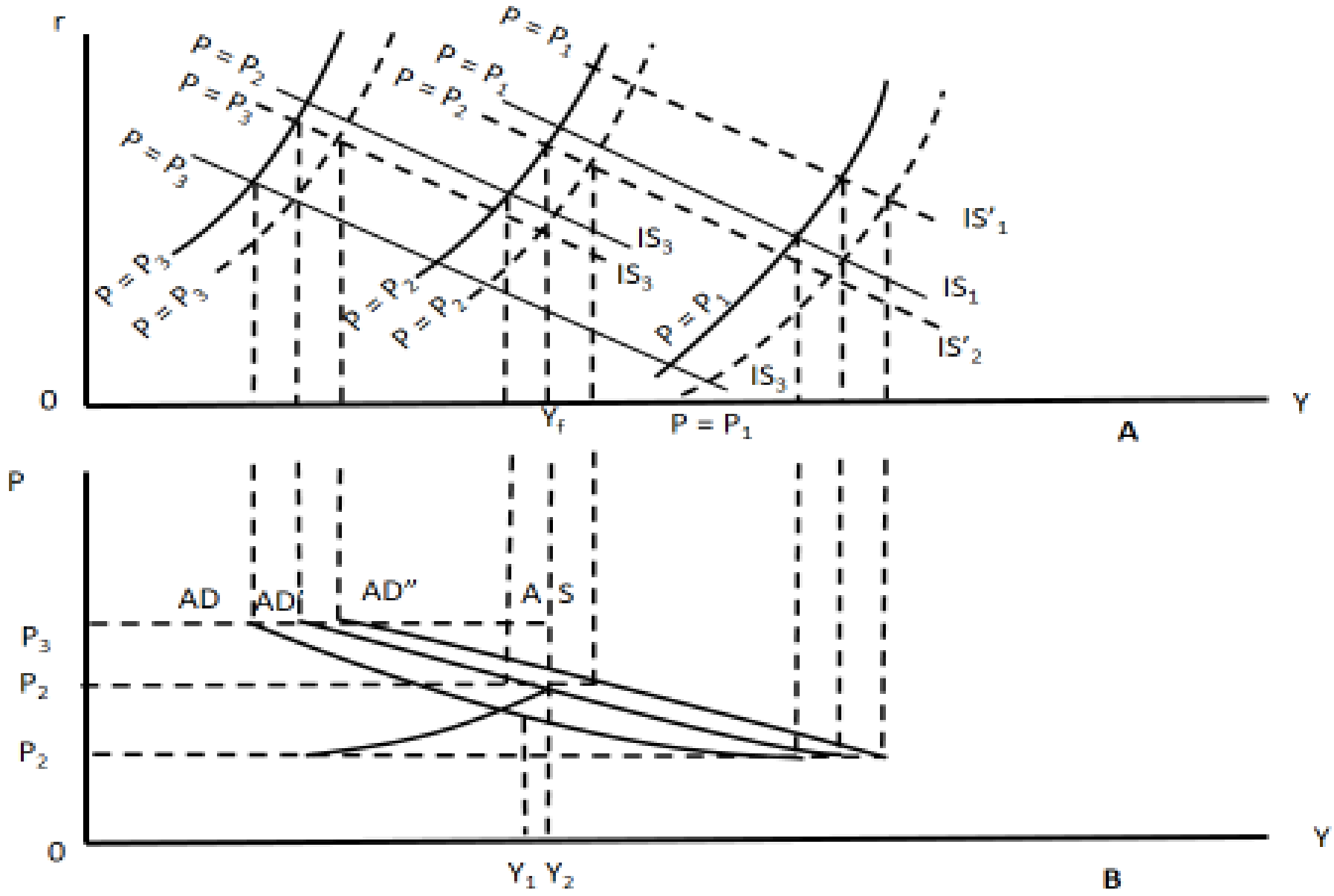


Figure – Monetary-Fiscal Policies and the Full Employment Equilibrium