Chapter 9 : Keynesian Business Cycle Theory: Sticky Wage Model

EE312

Macroeconomics, Stephen Wiliamson, Chapter 14

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Keynesian economics

- John Maynard Keynes' 'General Theory of Employment, Interest, and Money' (1936).
- John Hicks' IS-LM model (1937).
- Paul Samuelson's 'Economics' (1948).
- The crisis of Keynesian economics (1970s).
- New Keynesian economics (Gregory Mankiw and David Romer).

Sticky price, sticky wages

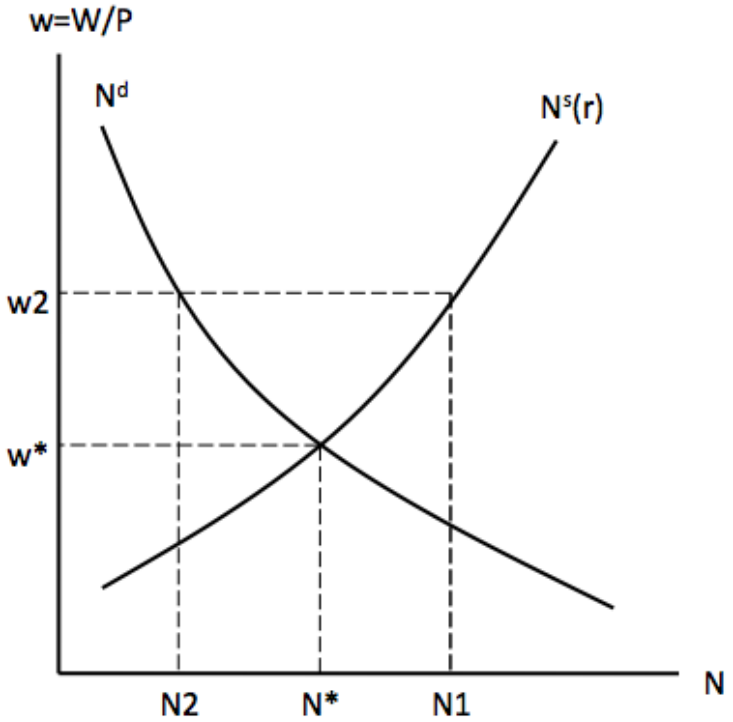
- Prices and wages are not completely flexible.
  - Some markets do not clear.
  - Involuntary (Keynesian) unemployment.
- Non-neutrality of money: changes in the money supply affect real variables.

The labor market

- In the short run, the nominal wage (W) is not flexible — wage rigidity.
  - Existence of labor contracts.
  - Cost of renegotiation when the situation changes.
  - Indexation of labor contracts is not popular.
- In theory, rigid nominal wages are treated as the fixed nominal wage rate.
- The labor market does not clear — Keynesian unemployment.
- Discretionary fiscal and monetary policy to stabilize the economy.

Fixed nominal wage rate

- At w* = $\frac{W^*}{P^*}$, employment = N^*.
- If W is fixed at W2 > W*, then w2 = $\frac{W2}{P^*}$; employment = N2.
- Keynesian unemployment = N1N2.

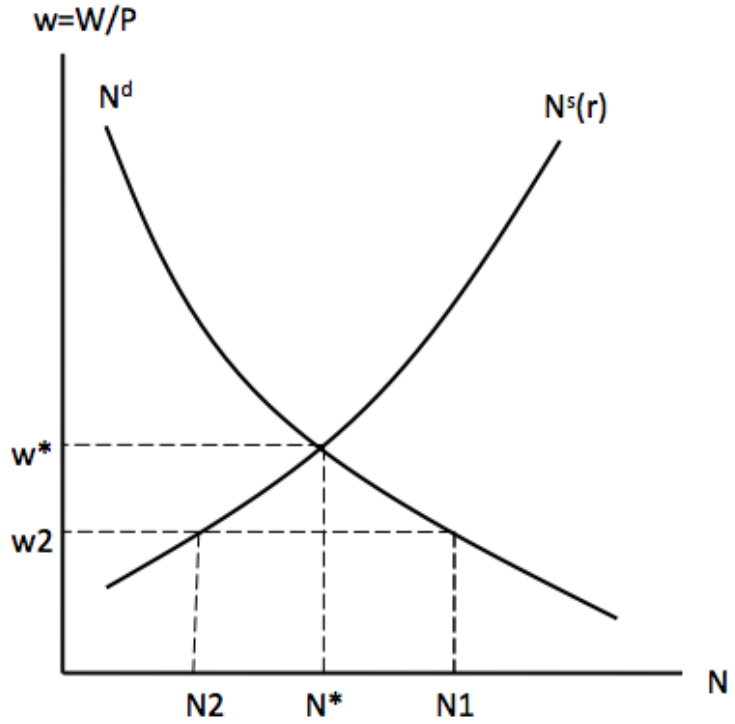


Problems with sticky wage model

- Unemployment is typically low for most of modern history (except the 1930s).
- Actual unemployment mostly consists of job search activity.
- Possibility of no unemployment in the model.
- The nominal wage is fixed below the market-clearing level.
- But some unemployment always exists.

Zero unemployment?

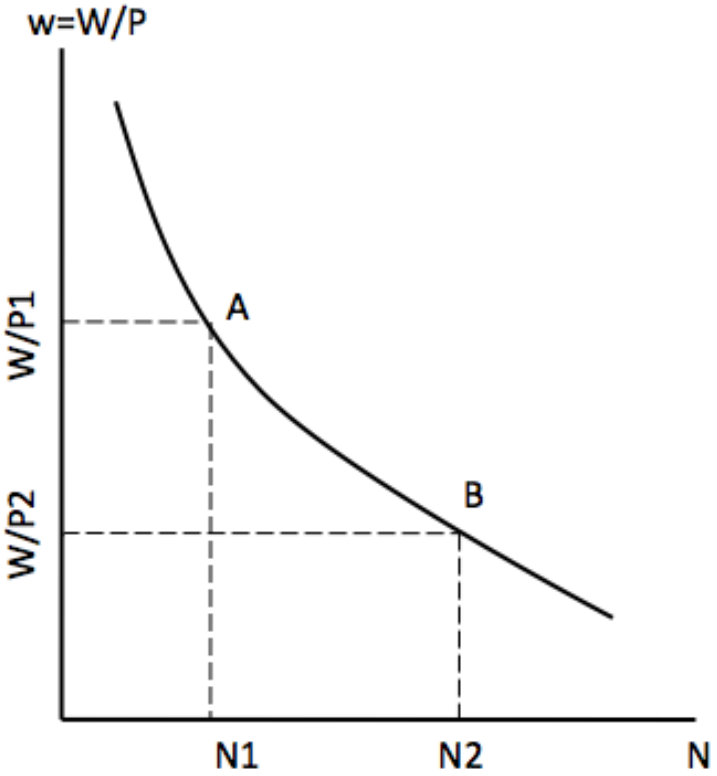
- Equilibrium w* = $\frac{W^*}{P^*}$.
- If W is fixed at W2 < W*,
- employment = N2 and unemployment is zero!

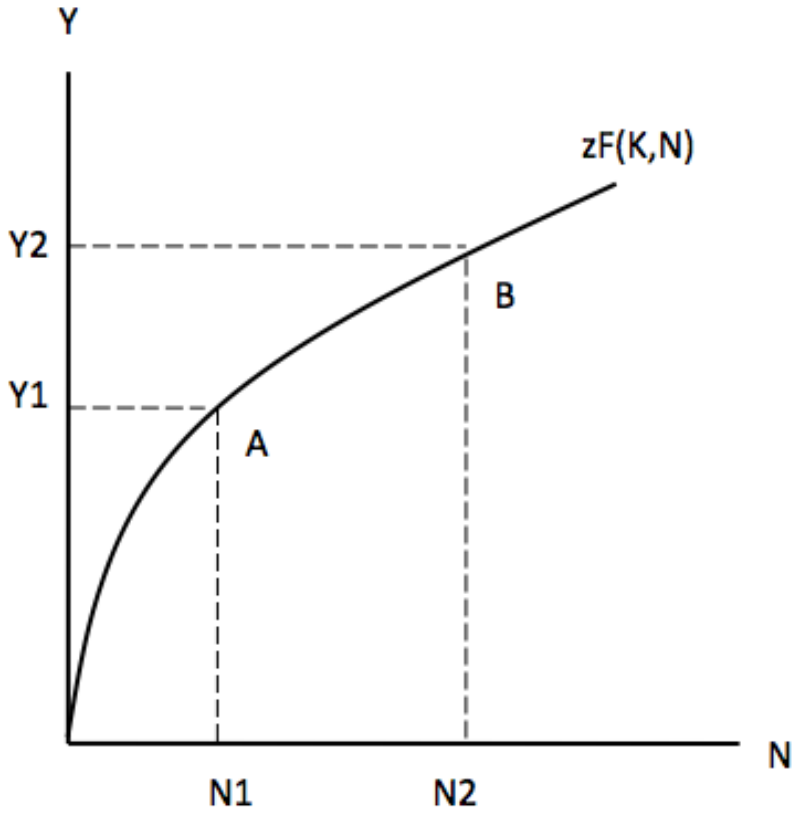


Aggregate supply (AS)

- The labor market determines the level of employment (N).
  - The price level (P) determines the real wage, given the fixed nominal wage (W).
- Production function: labor input (given capital stock) determines output (Y).
- **The AS curve**: the levels of aggregate output which the economy produces at different aggregate price levels.

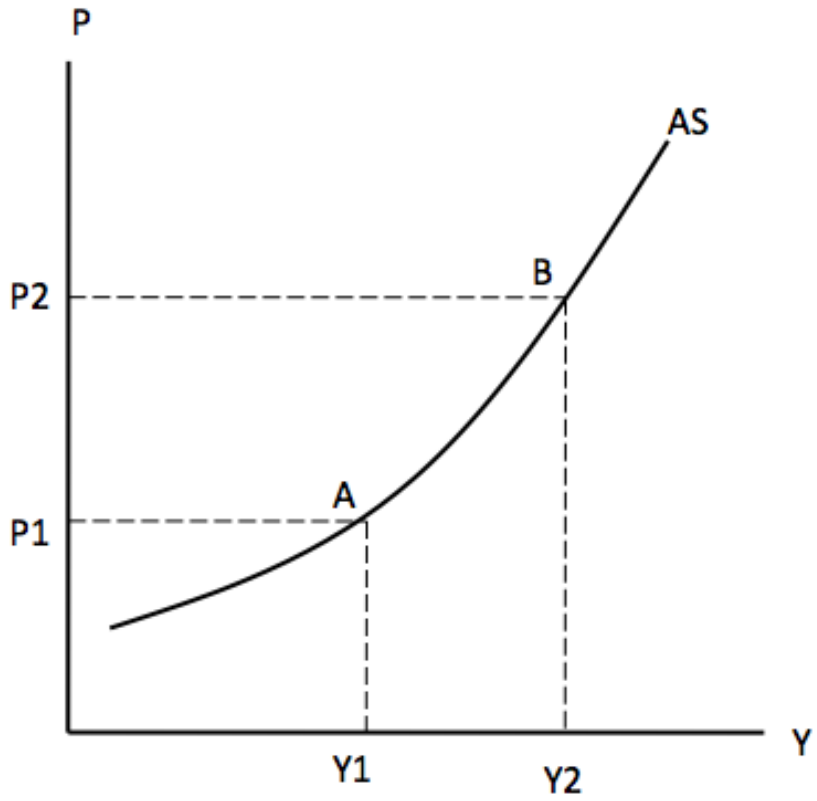
Employment and production





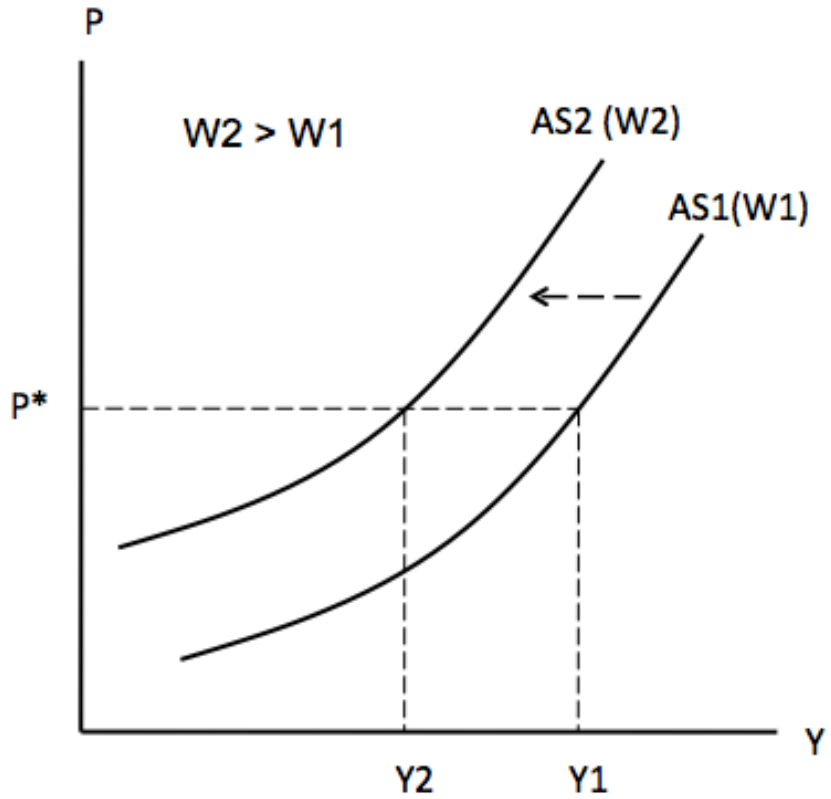
The aggregate supply curve

- Given technology and capital stock, the P-Y relationship is positive.
- Output is not related to the real interest rate.



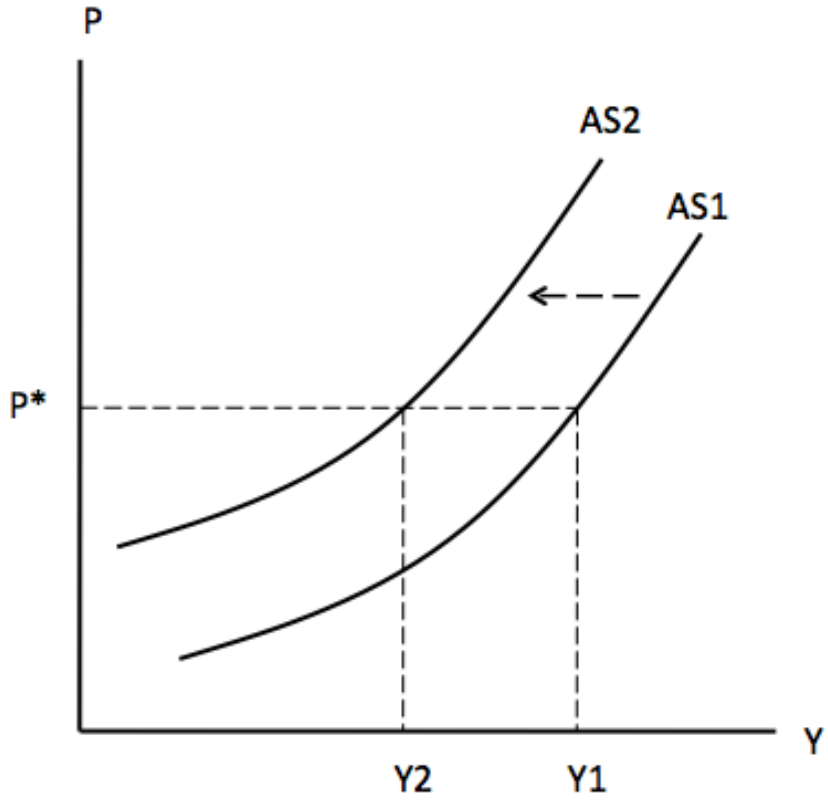
A higher W shifts AS left.

- An increase in W raises the real wage and reduces labor demand and employment.
- Output falls, given P*; AS shifts left.



A lower z shifts AS left.

- A lower z rotates the production function downward.
- Output falls, given P*, W and N.



Aggregate demand (AD)

- **Aggregate demand**: the levels of aggregate expenditure at different aggregate price levels.
  - **The goods market**: the levels of aggregate expenditure in relation to the real interest rate – **the IS curve**.
  - **The money market**: the relation between money and the real interest rate — **the LM curve**.
  - The changes in the price level affects the real money demand, the real interest rate and the level of aggregate expenditure.

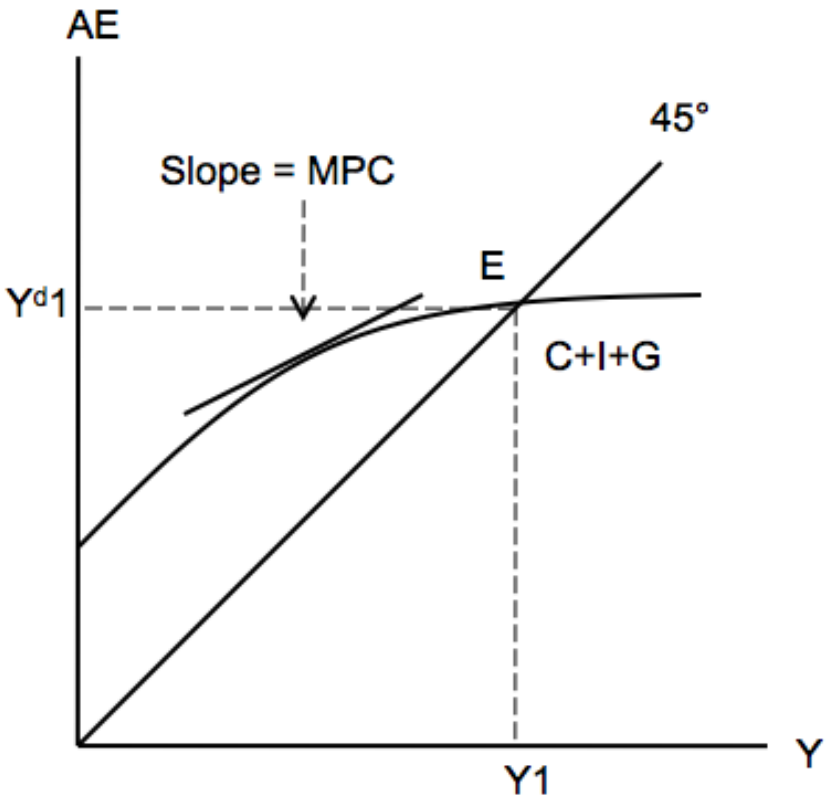
The goods market

- Current aggregate expenditure (AE):
  - The consumer's demand for consumption goods (C^d) ,
  - The firm's demand for investment goods (I^d),
  - Government purchases of current goods (G),
  - C^d and I^d are negatively related to the real interest rate.

$$AE = C^d(r, Y) + I(r) + G$$

The 45° line diagram

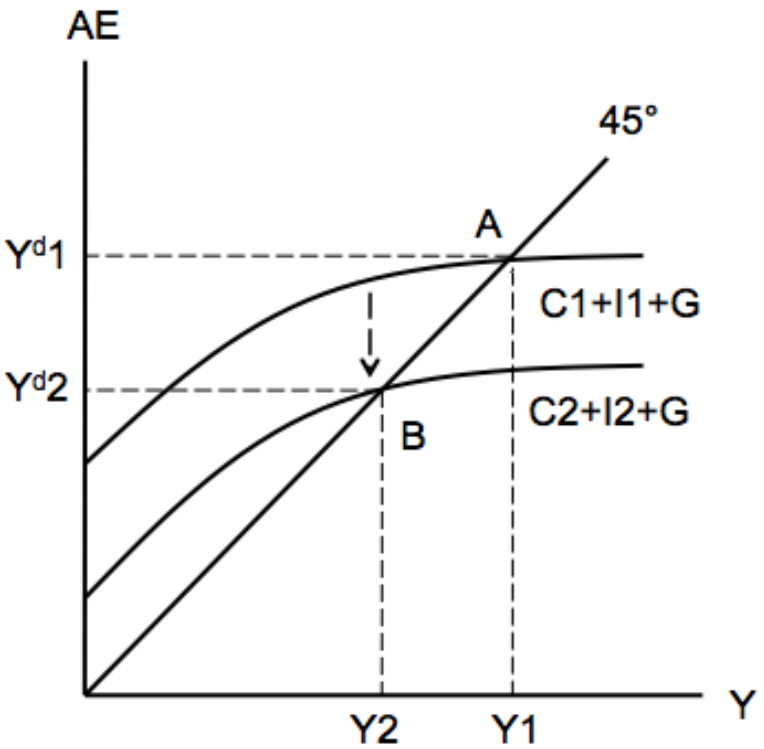
- C^d is positively related to Y.
- I^d and G are not related to Y.
- The slope = MPC.
- Equilibrium AE = Y^d = Y1.

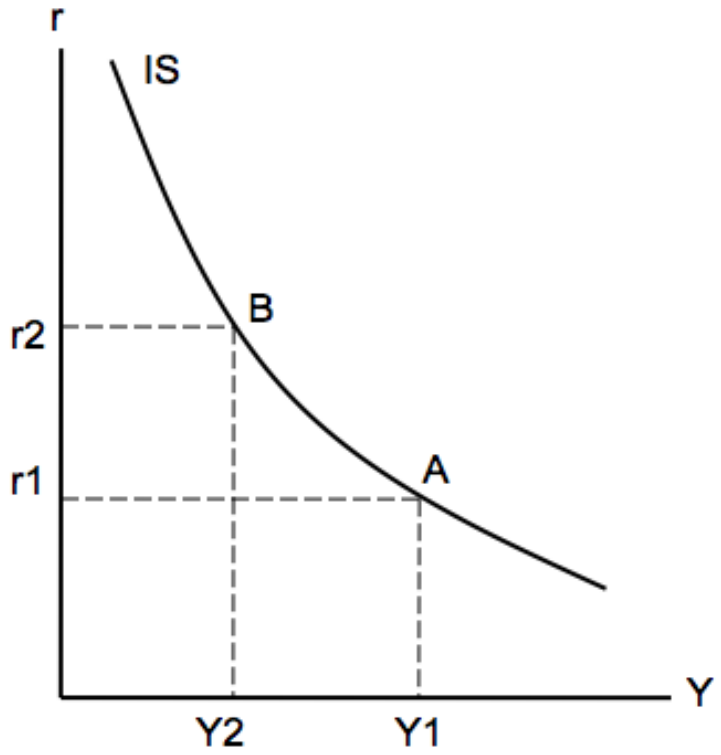


AD and the real interest rate

- An increase in the real interest rate causes a reduction in the demand for current output.
  - Shifts towards future consumption: falling demand for current consumption goods.
  - Lower optimal investment: higher opportunity cost of capital.
- **The IS curve** is sloped downwards.
  - Combinations of r and Y which maintain equilibrium in the goods market.

The IS curve





The IS curve shifts right.

- An increase in government spending (G).
- A decrease in the PV of taxes (T):
- An anticipated increase in future income.
  - An increase in current and future consumption.
- A decrease in the current capital stock (K).
- A rise in future total factor productivity (z').
  - Future MP'_K and the demand for investment goods increase.

The money market

- **Nominal money demand** is positively related to real income and negatively related to the real interest rate.
- **Nominal money supply** is exogenously determined by the central bank.

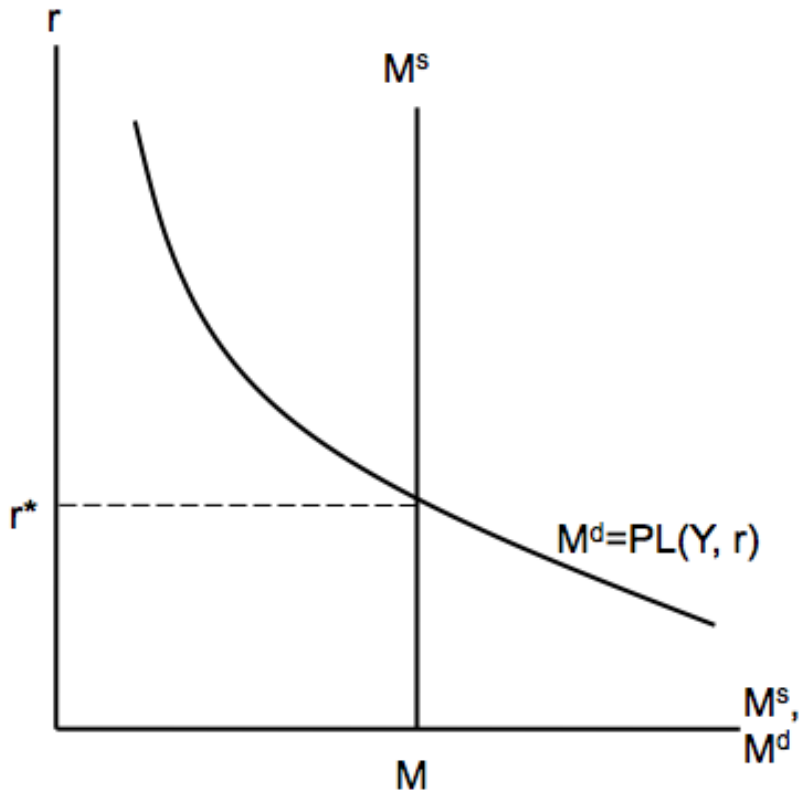
$$M^d = PL(Y, r) \quad ; \quad \frac{\partial M^d}{\partial Y} > 0, \ \frac{\partial M^d}{\partial r} < 0$$

$$M^s = M$$

$$M^s = PL(Y, r)$$

The money market

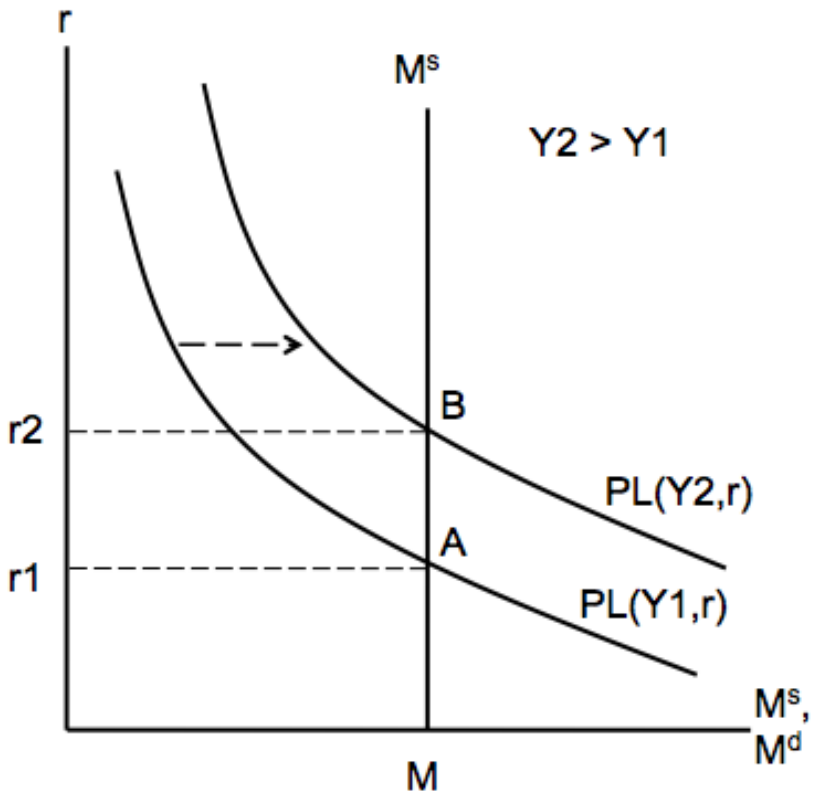
- The nominal money supply (M^s) is exogenous, determined by the central bank.
- $M^s = M^d$ determines the equilibrium interest rate.

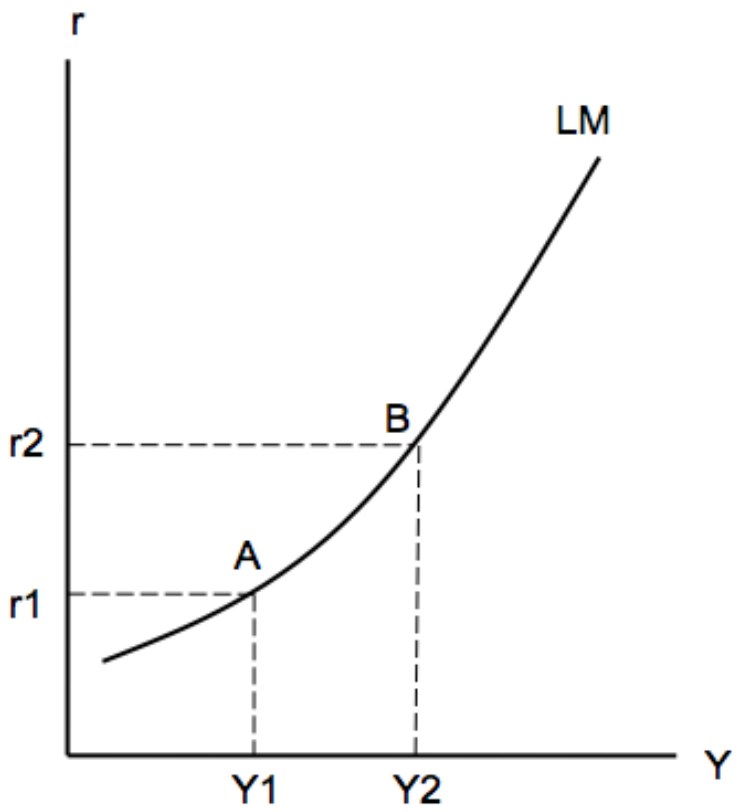


Money market and income

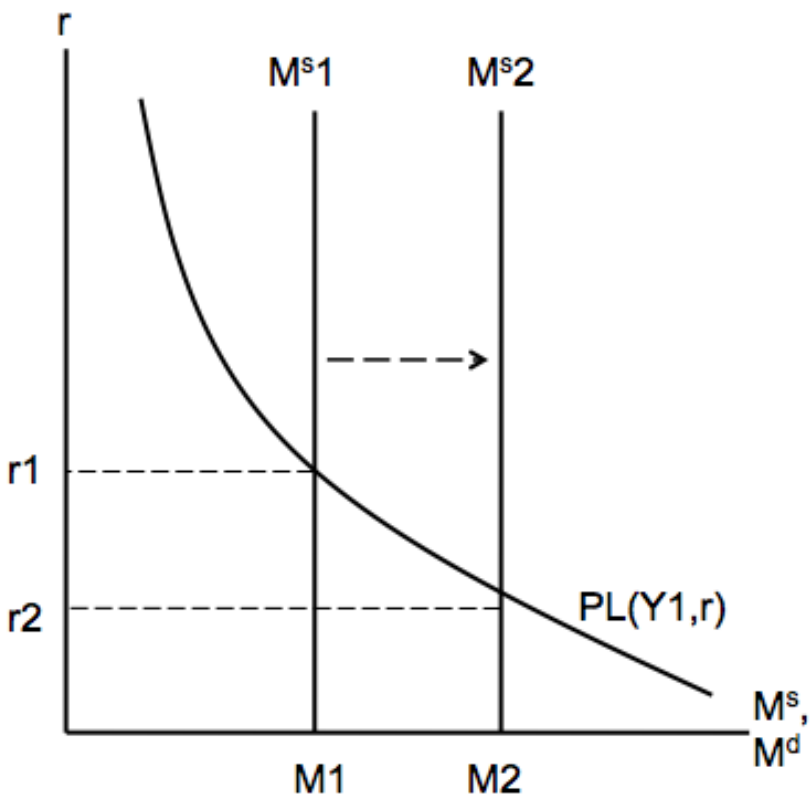
- An increase in real income causes an increase in money demand, given the price level.
  - The money demand curve shifts right.
  - The real interest rate increases.
  - Positive relationship between r and y.
- **The LM curve** is sloped upwards.
  - Combinations of r and Y which maintain equilibrium in the money market.

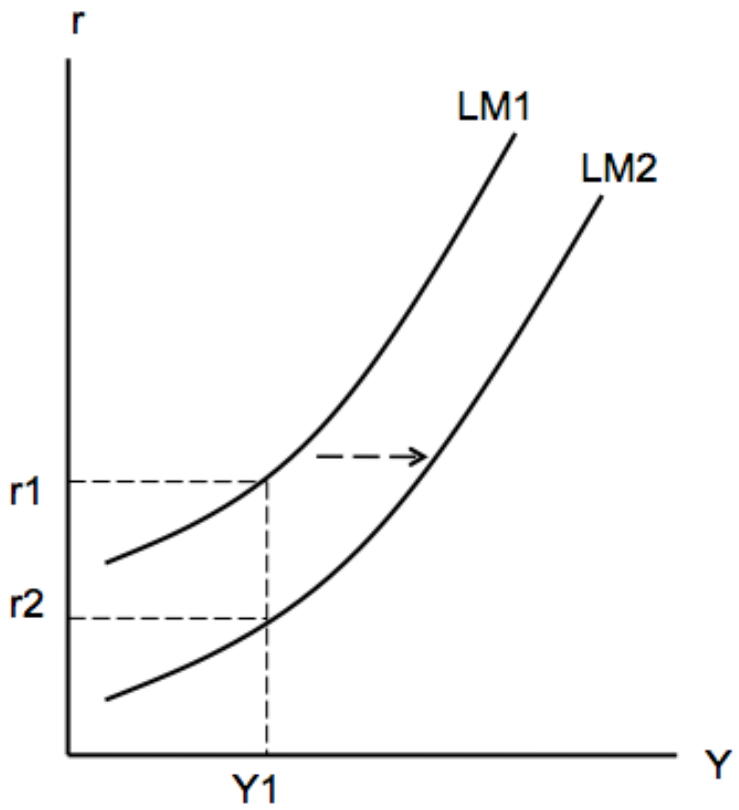
The LM curve



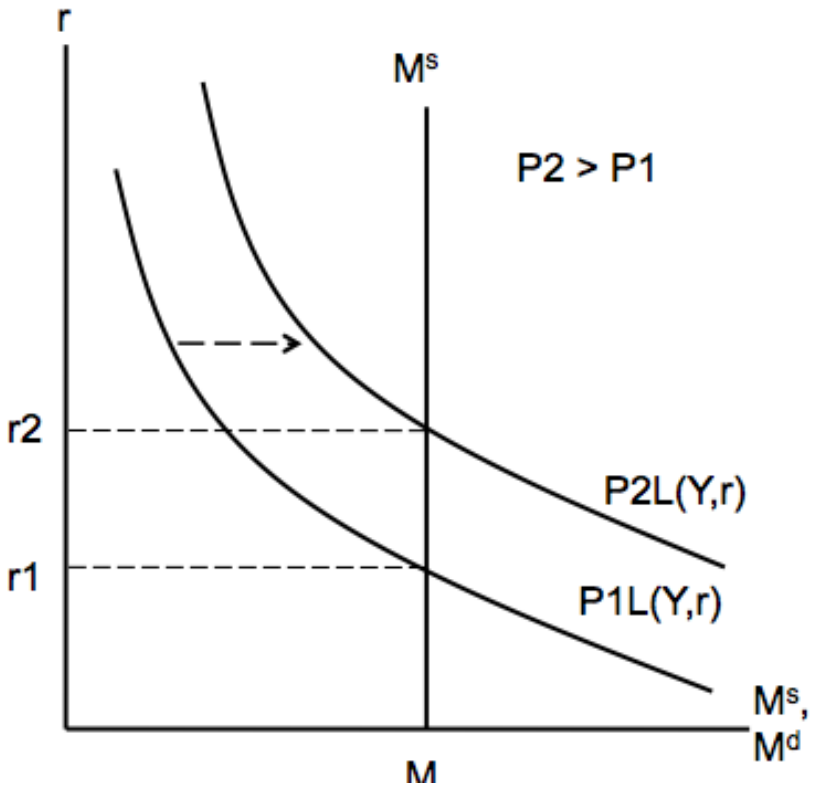


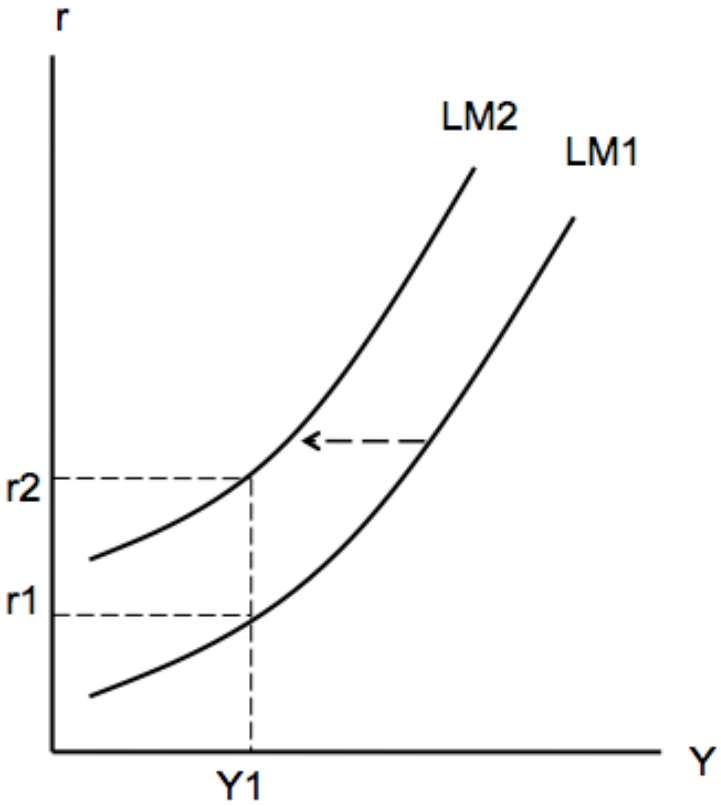
A higher Ms shifts LM right.



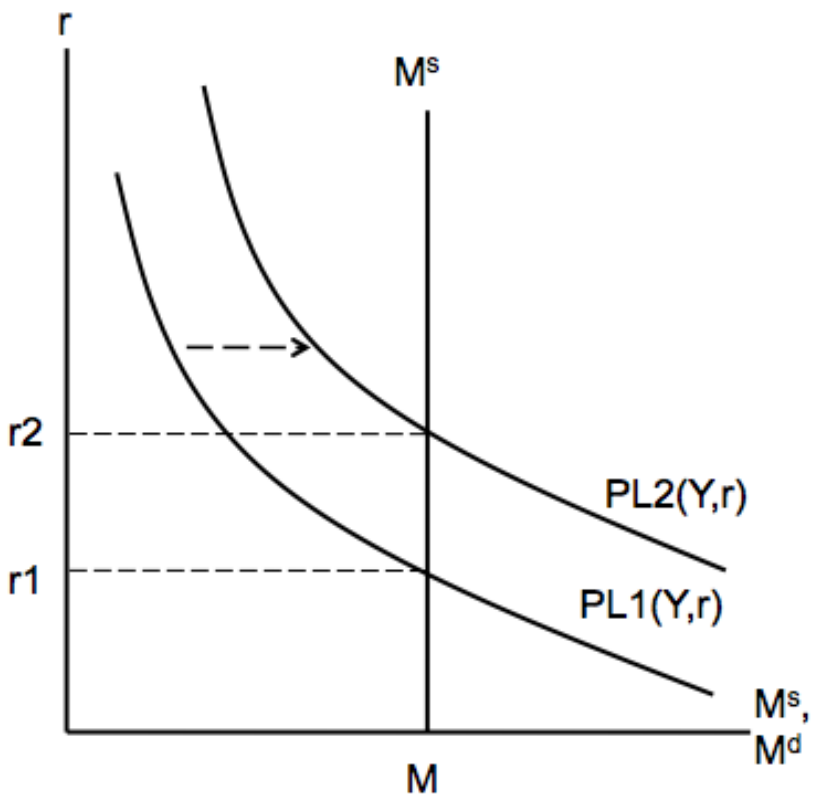


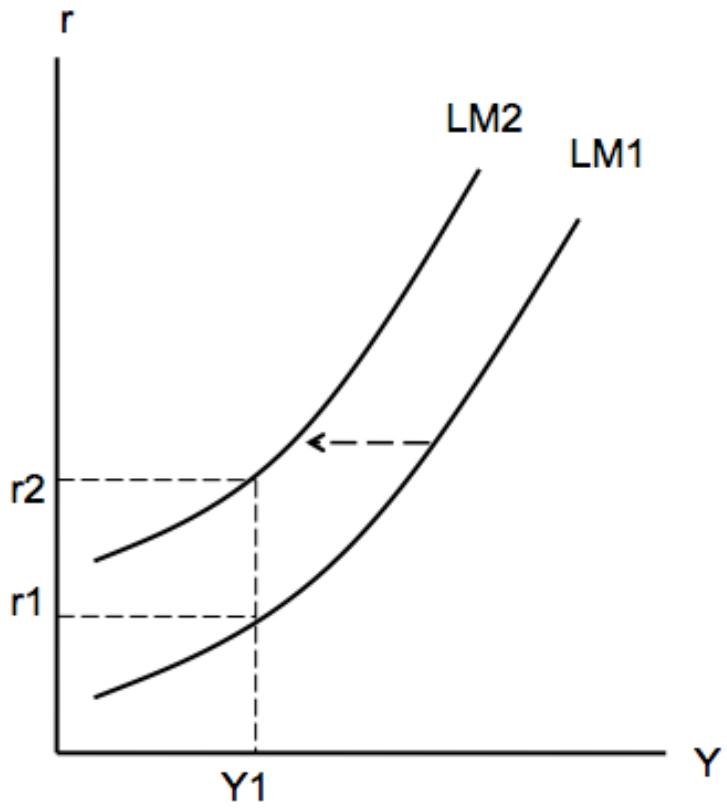
A higher P shifts LM left.





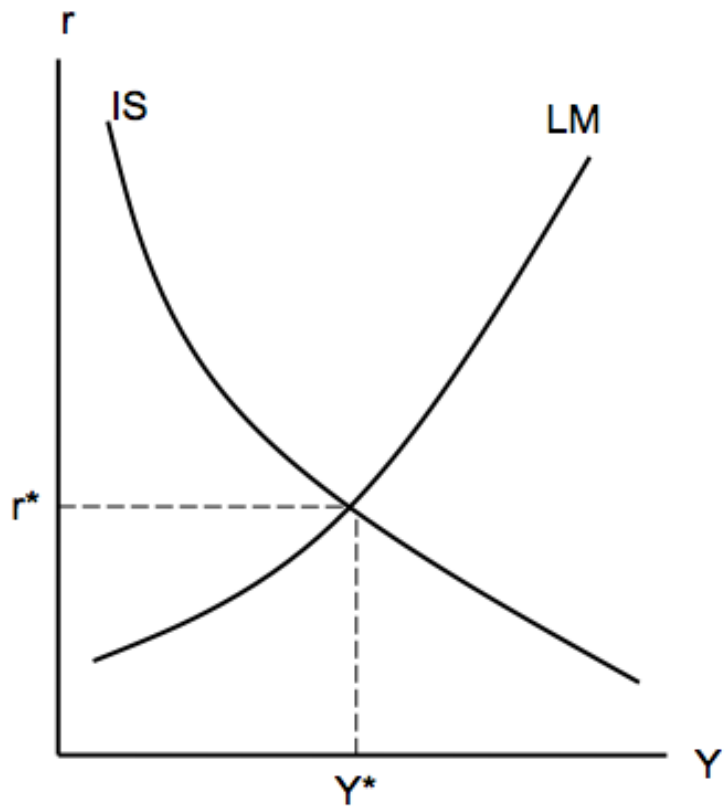
A higher Md shifts LM left.





Simultaneous equilibrium

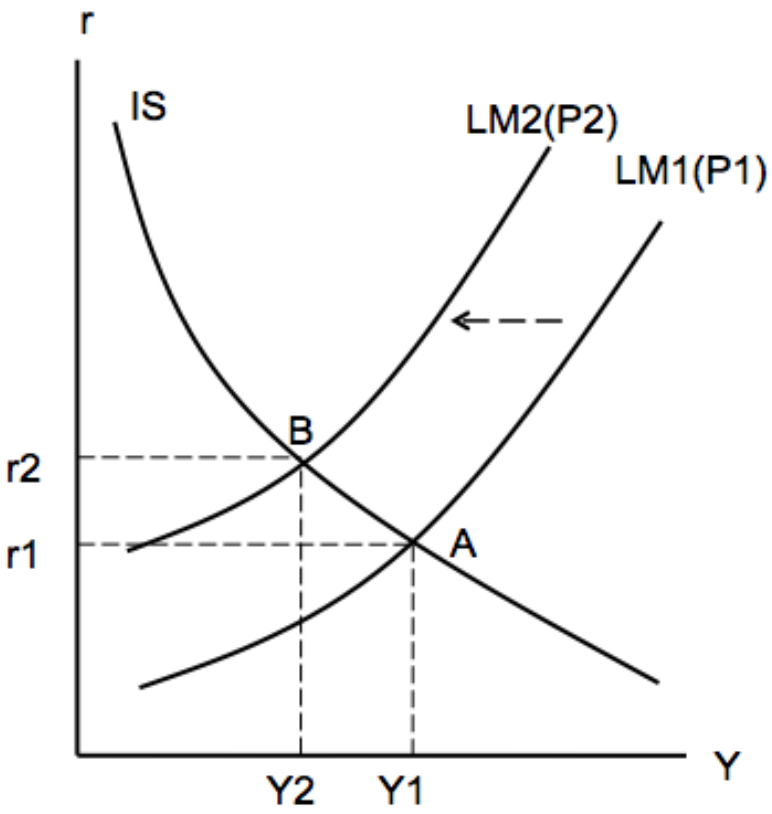
- The r* and Y* give simultaneous equilibrium in the goods and money markets, given P.

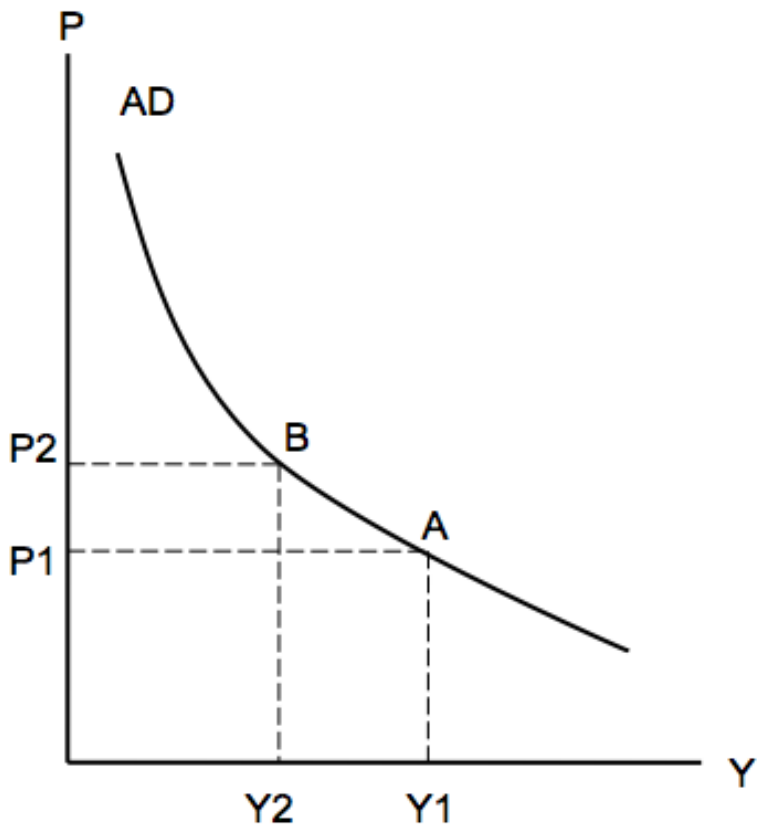


The aggregate demand curve

- A rise in the price level increases the nominal money demand.
  - The Md shifts right.
  - The LM curve shifts left.
  - Real income decreases.
- The AD curve: the levels of aggregate spending at different price levels.
  - The AD curve is sloped downwards.

The AD curve

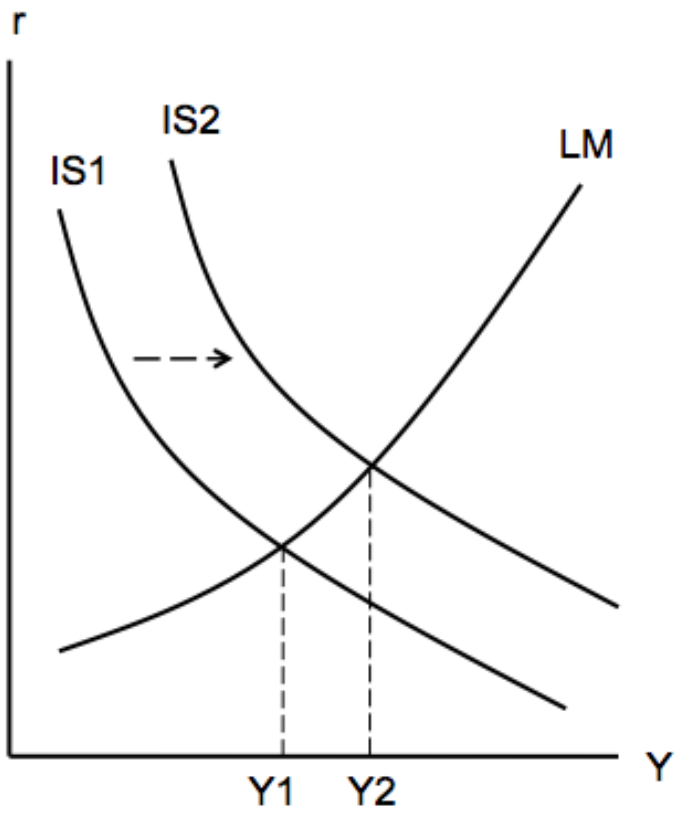


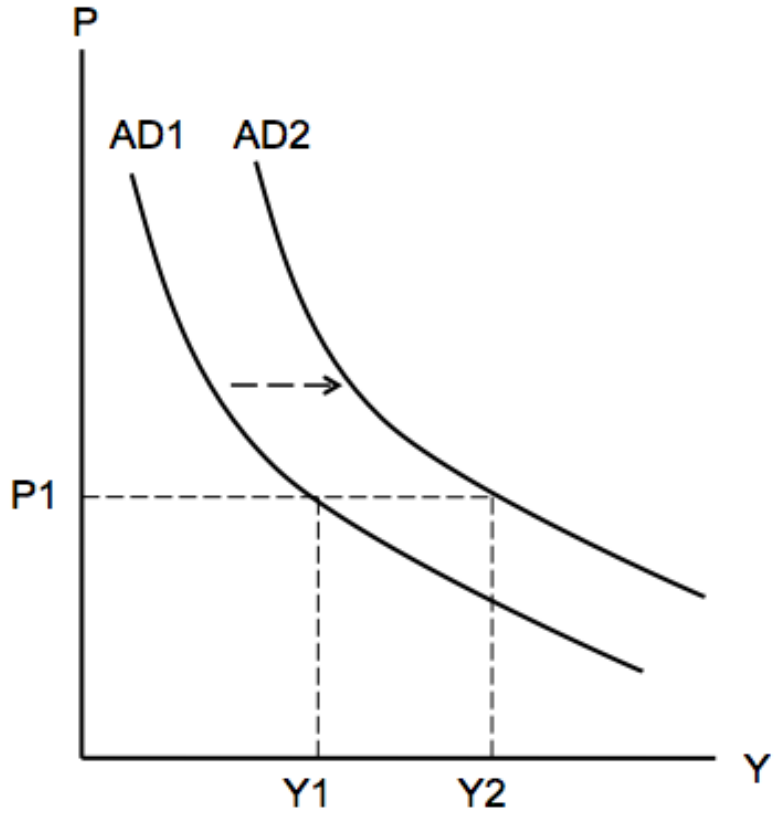


The AD Shifts

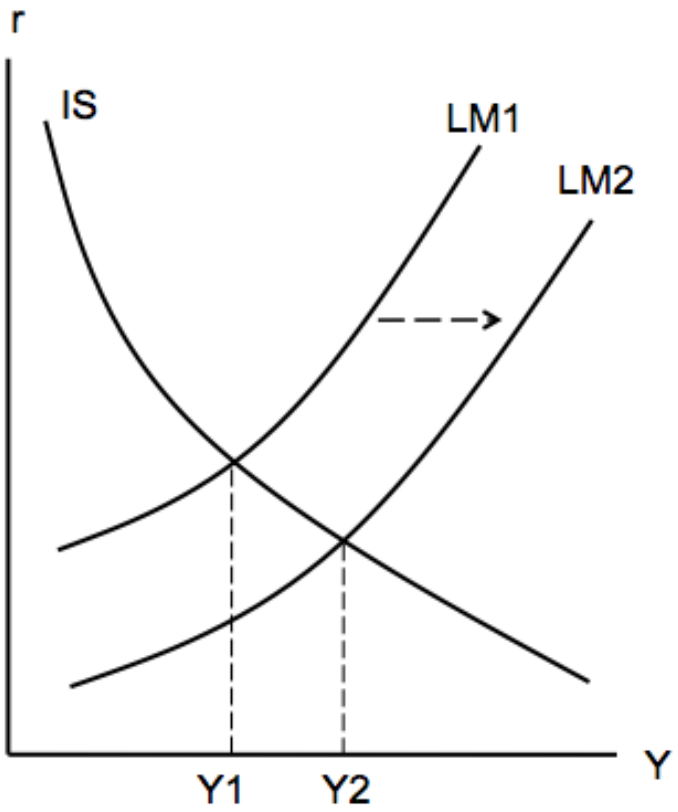
- If the IS curve shifts right, the AD shifts right.
  - Government spending increases (G).
  - The PV of taxes decreases (T).
  - The current capital stock decreases (K).
  - Future total factor productivity increases (z').
- If the LM curve shifts right, the AD shifts right.
  - The nominal money supply increases (M^s).
  - A decrease in the nominal money demand (M^d).

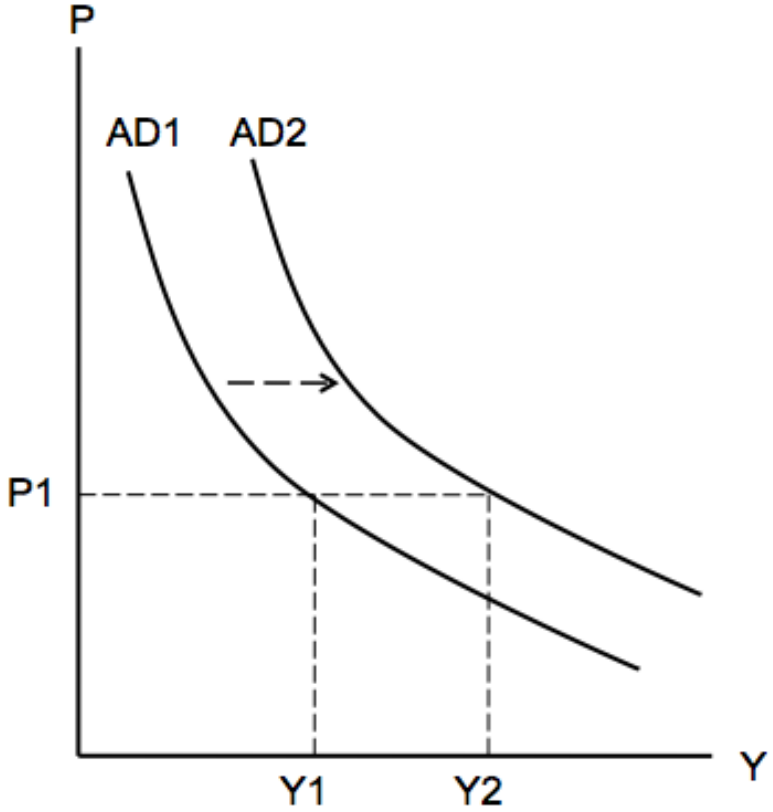
The IS curve (and AD) shifts right.



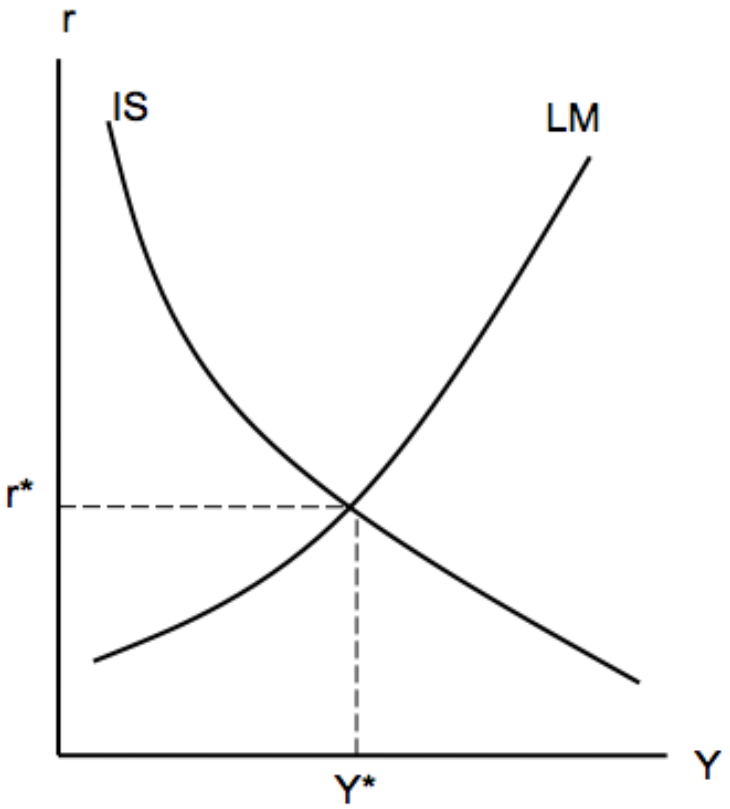


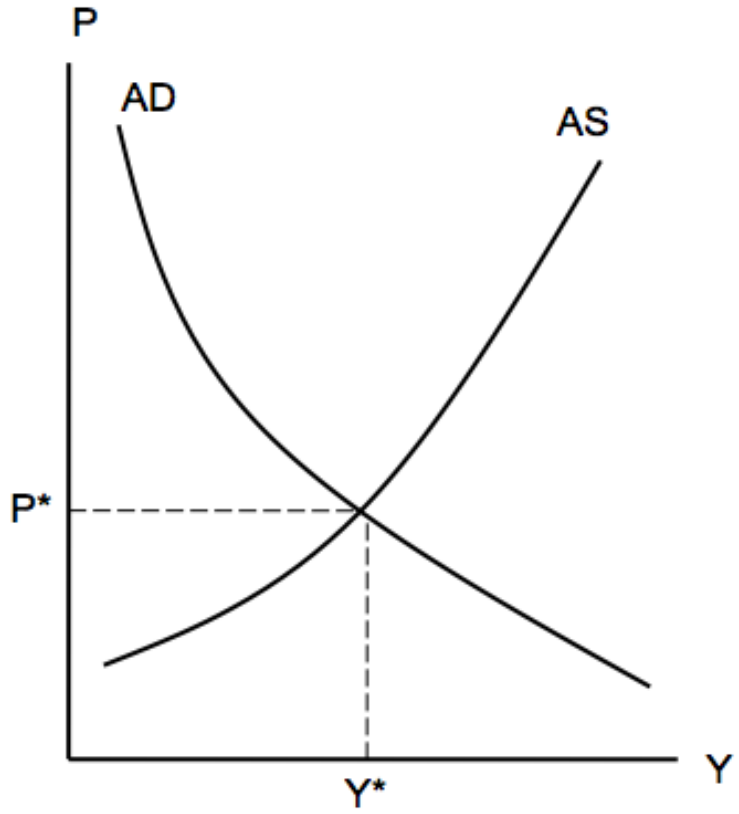
The LM curve (and AD) shifts right.

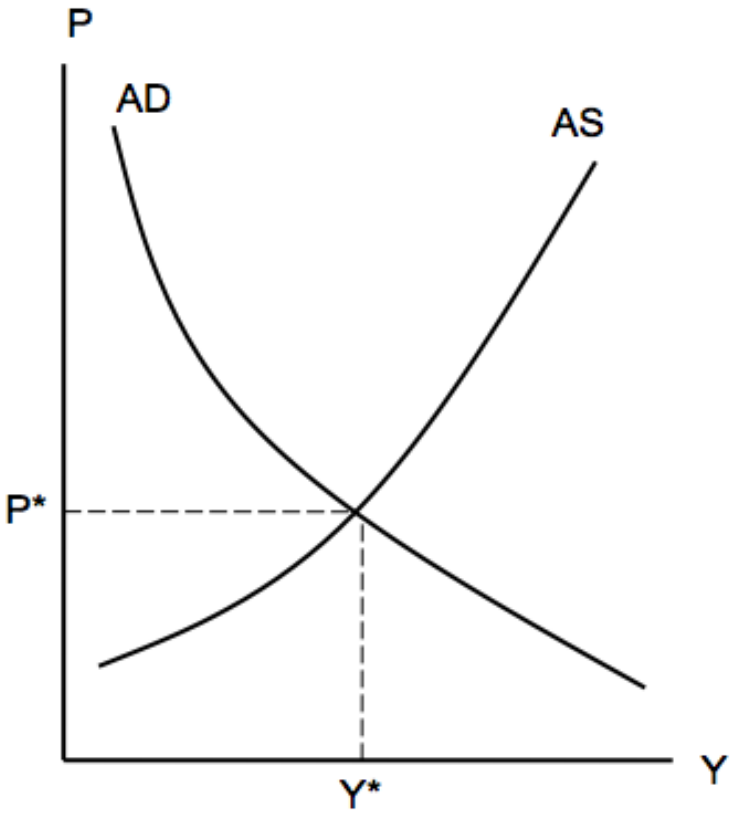


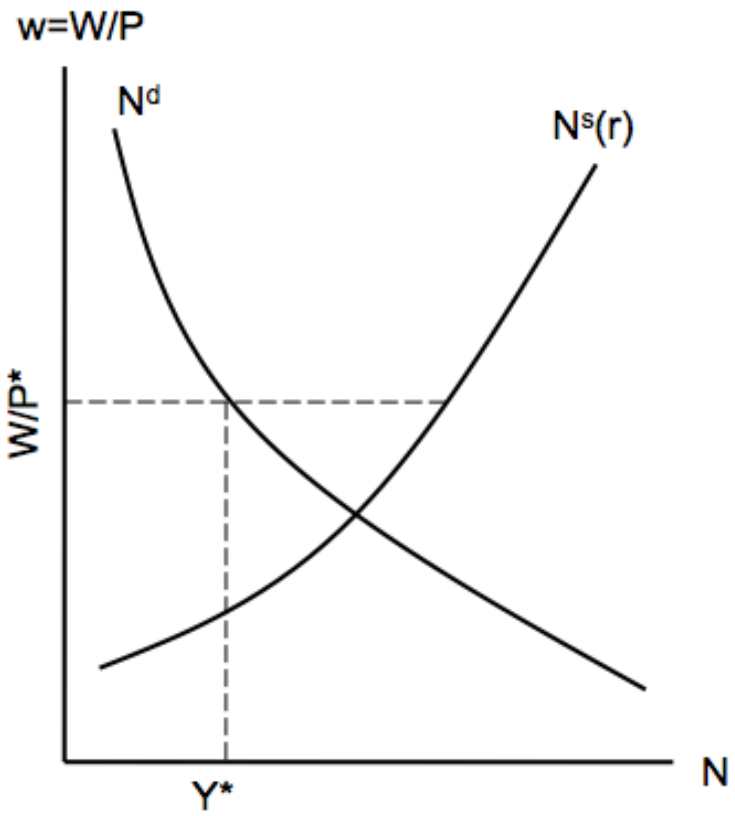


The Keynesian sticky wage model






P
AD
AS
P*
Y*
Y


w=W/P
Nd
Ns(r)
W/P*
Y*
N

Non-neutrality of money

- A change in the nominal money supply affects real variables.
  - The real interest rate, the real wage, employment, output and real income.
- **The money market**:
  - An increase in M^s reduces the interest rate; M^d shifts to the right.
  - The lower interest rate induces M^d to rise to maintain equilibrium.
  - The LM curve shifts to the right.

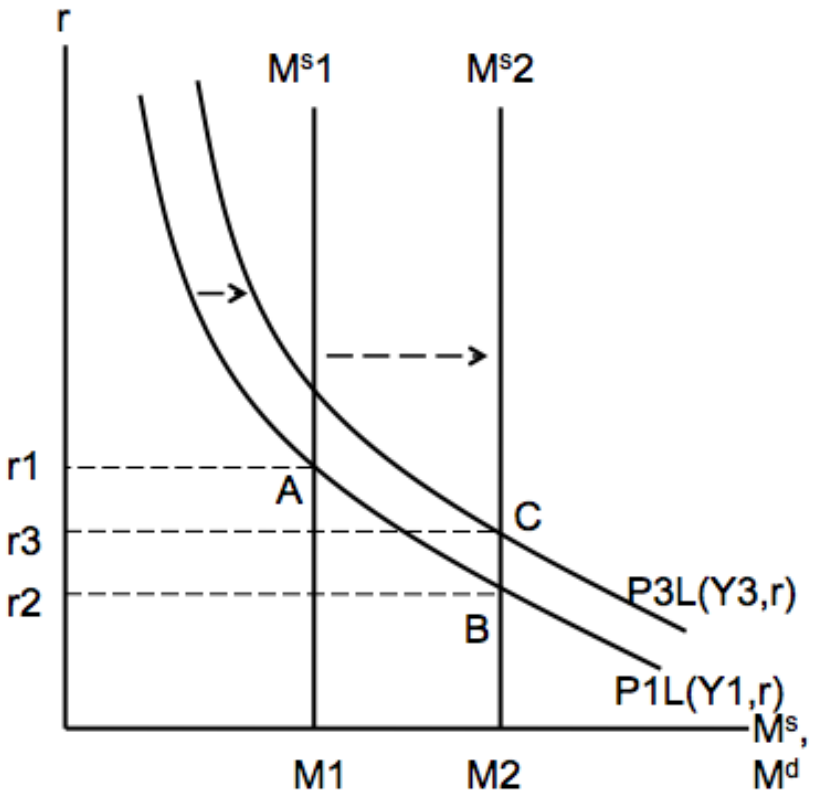
- **The goods market:**
  - The falling interest rate induces more demand for consumption goods and investment goods.
  - Aggregate expenditure increases.
  - The AD curve shifts right, inducing excess aggregate demand (Y2-Y1).
  - The price level increases (P1 towards P2).
- **The money market:**
  - The rising price induces more nominal money demand; Md shifts to the right.
  - The LM curve shifts left, reducing excess AD to Y3.

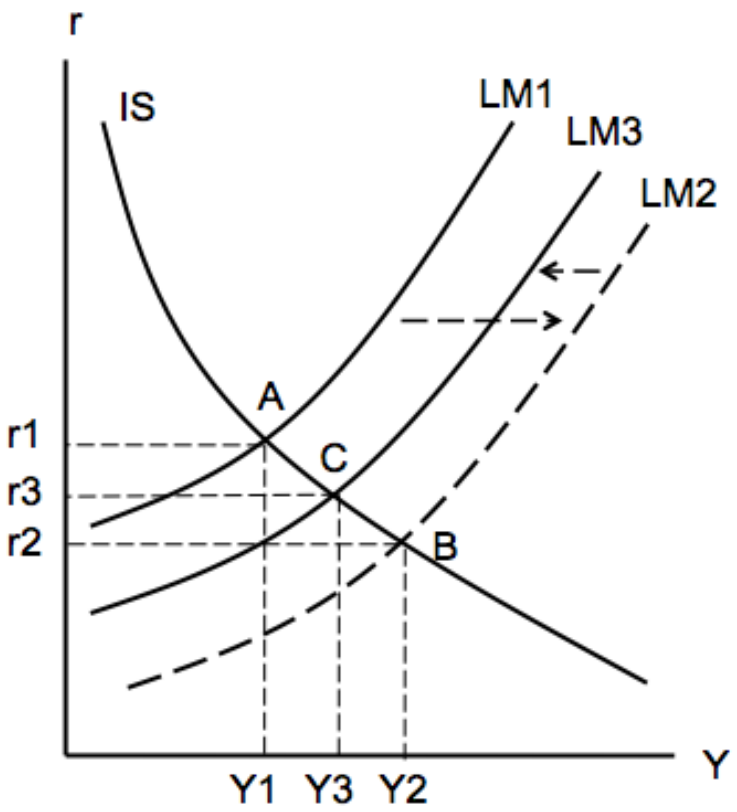
- **The labor market:**
  - The higher price level (P3) causes the real wage to fall, inducing more demand for labor.
  - The lower real interest rate induces more leisure and less labor supply; Ns shifts to the left.
  - Employment increases (N1 to N3).
  - Keynesian unemployment decreases (from N2-N1 to N4-N3).
  - Average labor productivity falls.
  - Output and real income rise (from Y1 to Y3).

Conclusion

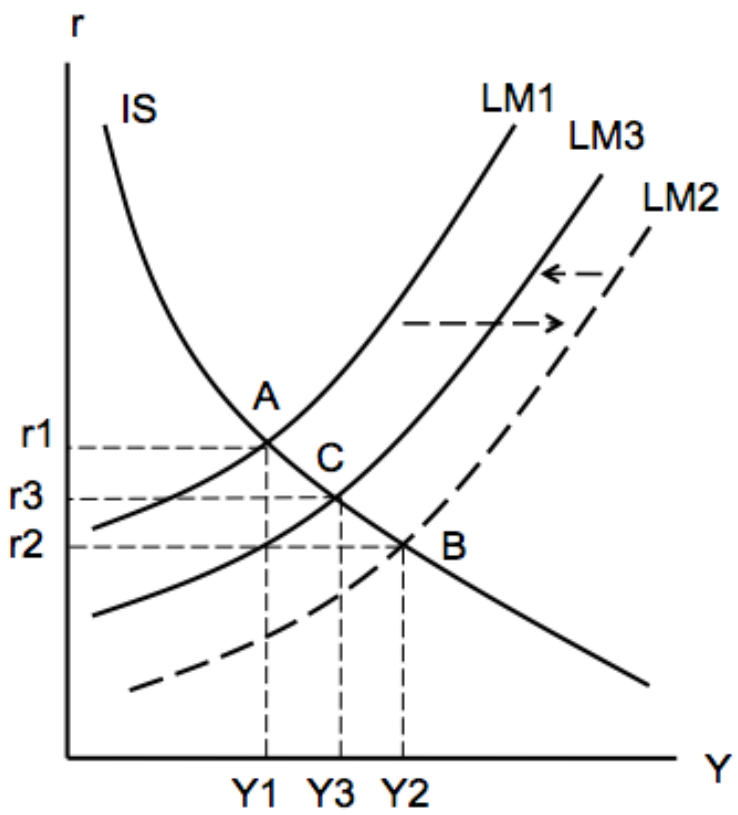
- The increase in the money supply has both nominal (price) and real effects.
  - The price level increases in less proportion to the money supply (contra the classical model).
  - Output and real income increase.
- The Keynesian transmission mechanism for monetary policy:
  - The money supply (as controlled by the central bank) affects output and employment through the interest rate and aggregate spending.

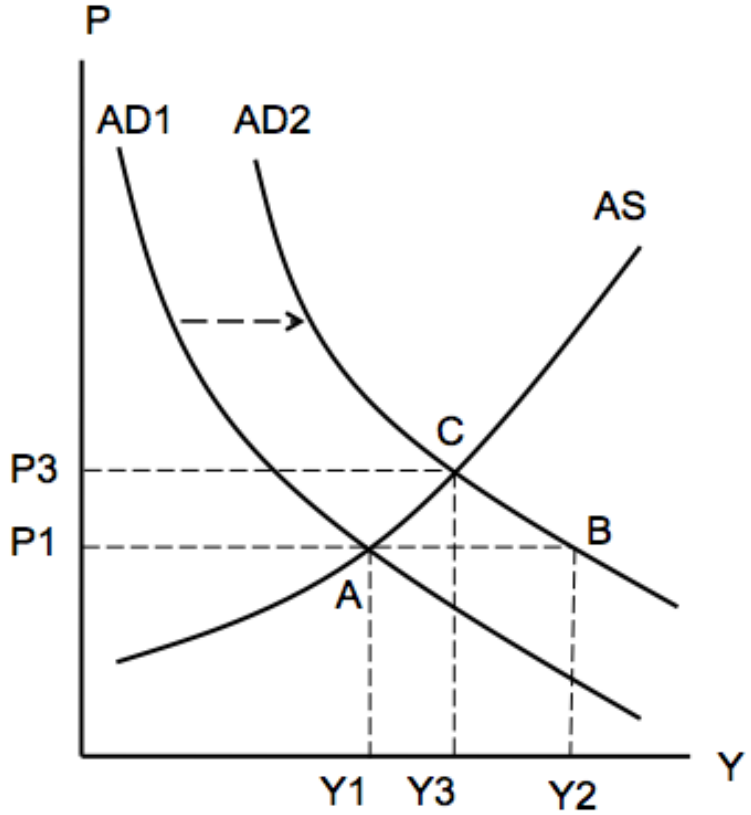
The money market and LM



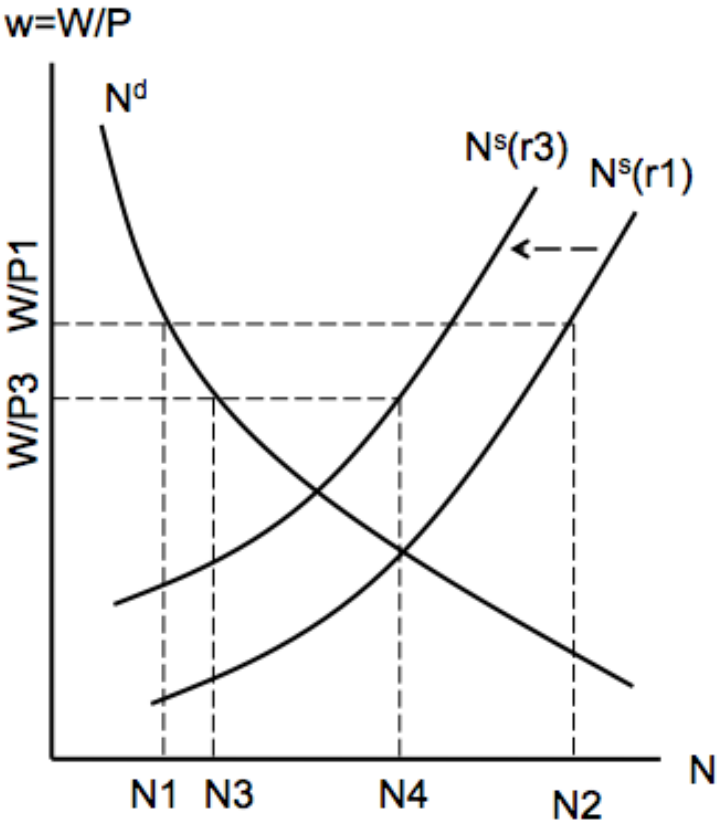


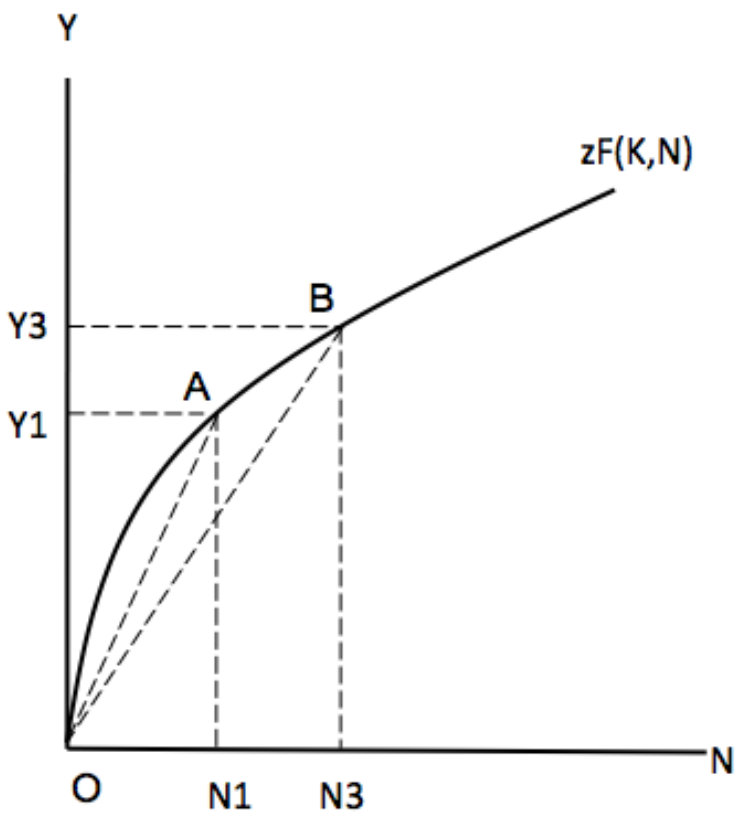
LM and aggregate demand





Employment and output





The US's data and sticky wage

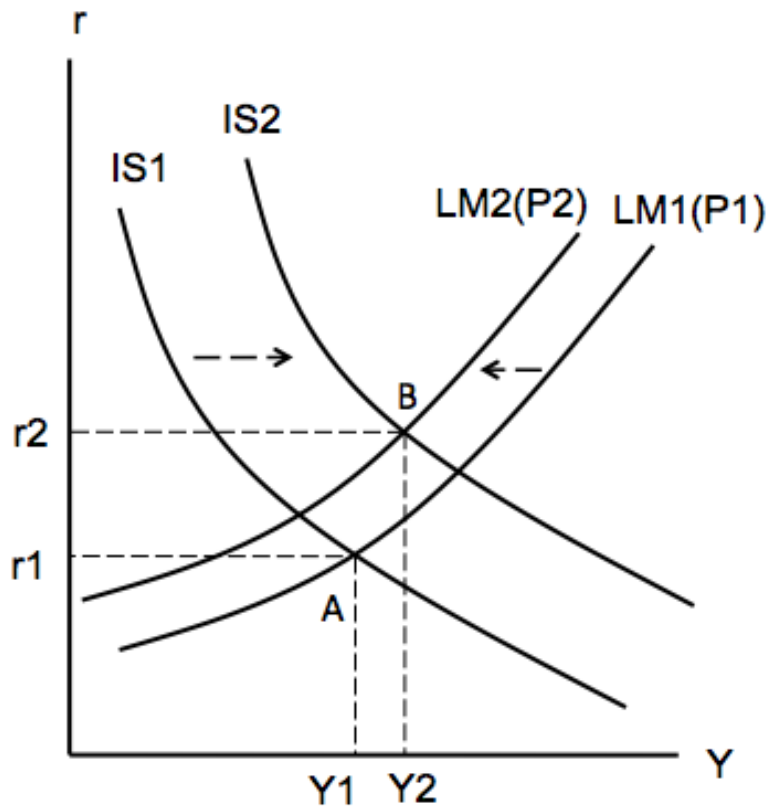
Variable	Data	Model
Consumption	Procyclical	Procyclical
Investment	Procyclical	Procyclical
Price Level	Countercyclical	Procyclical
Money Supply	Procyclical	Procyclical
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Countercyclical
Average Labor Productivity	Procyclical	Countercyclical

AD shocks as cause of cycles

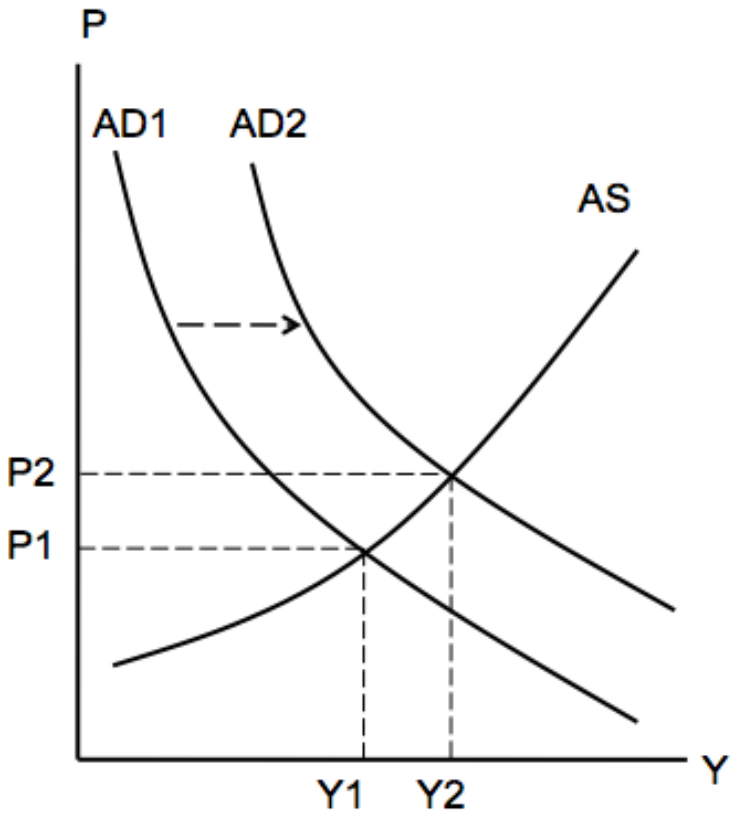
- Keynesians believe that private investment is unstable, subject to expectations and animal spirit.
  - Investment shocks shift the IS and AD curves.
  - Changes in the interest rate further affects consumption and investment.
  - Changes in the price level affect the real wage and the labor demand (and money demand).
  - Employment, output and real income fluctuate.

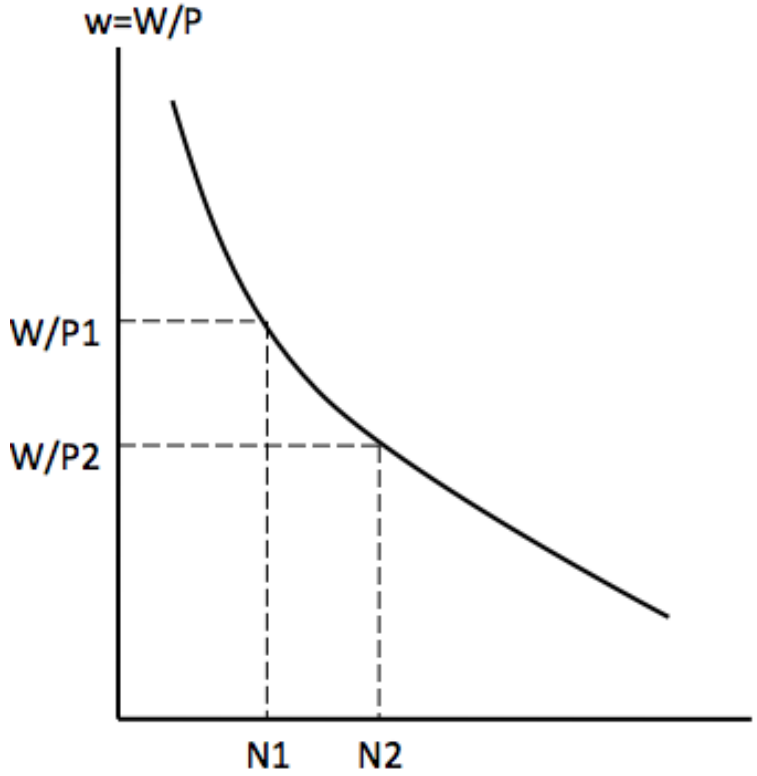
Investment fluctuations

- Unstable investment (and AE) shifts the IS curve and the AD curve.
- The changing price shifts the LM curve.



Output-employment fluctuations





AD shocks vs business cycles

Variable	Data	Model
Consumption	Procyclical	Procyclical
Investment	Procyclical	Procyclical
Price Level	Countercyclical	Procyclical
Money Supply	Procyclical	Procyclical
Employment	Procyclical	Procyclical
Real Wage	Procyclical	Countercyclical
Average Labor Productivity	Procyclical	Countercyclical

Keynesian short run and long run

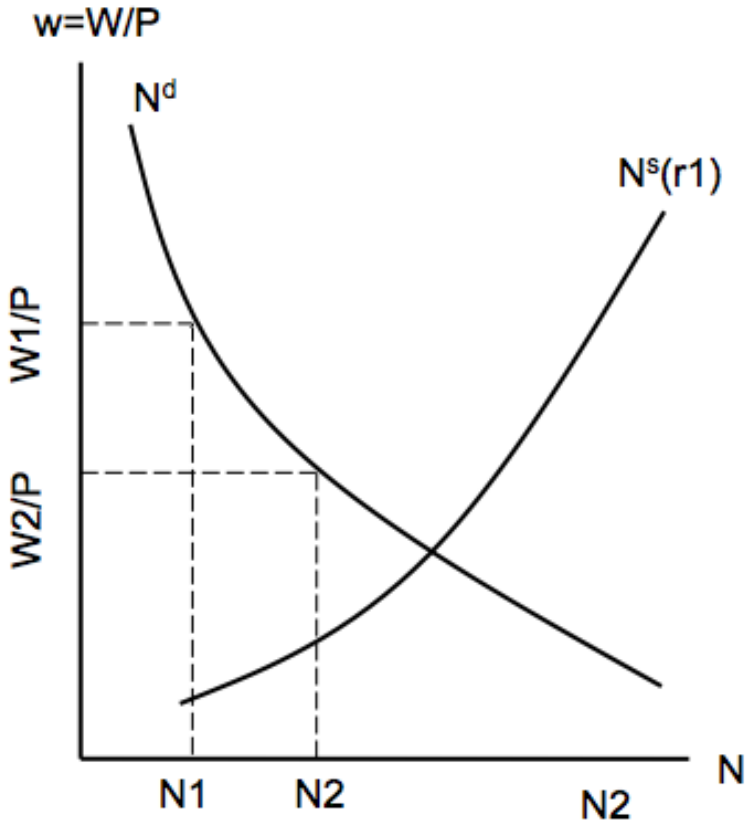
- Business cycles originate from volatile private investment spending.
  - In the short run, the nominal wage is sticky (above equilibrium).
  - Keynesian unemployment exists.
  - The economy tends to adjust towards long run equilibrium.
- But the market is inefficient and takes too long time to adjust to the new equilibrium.

Long-run market adjustment

- In the long run, nominal wages gradually fall.
  - Labor demand increases and employment rises.
  - Production and real income increase; the price level decreases (AS shifts right).
  - Nominal money demand decreases and the real interest rate falls (LM shifts right).
  - Labor supply decreases to achieve full employment equilibrium.

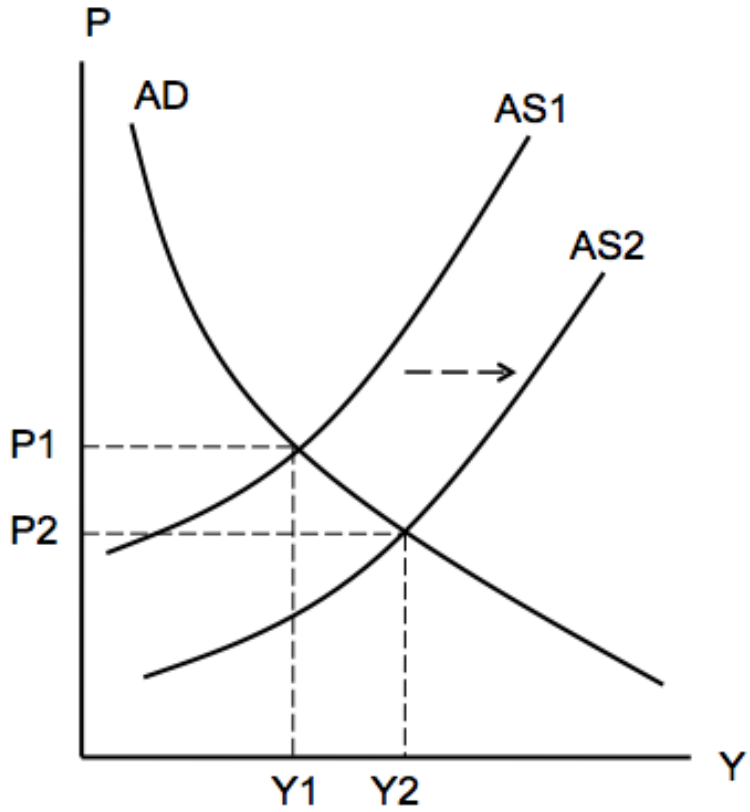
Labor market adjustment

- The nominal wage falls ($\frac{W1}{P}$ to $\frac{W2}{P}$).
- Labor demand and employment increase (N1 to N2).



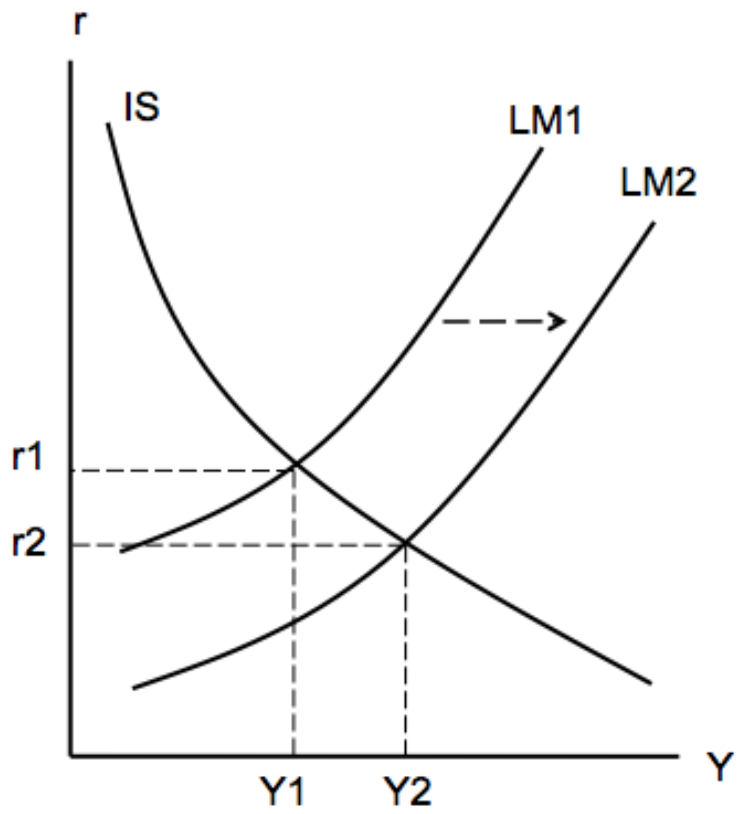
Goods market adjustment

- Production increases, shifting the AS to the right.
- Real income increases (Y1 to Y2); the price level falls (P1 to P2).



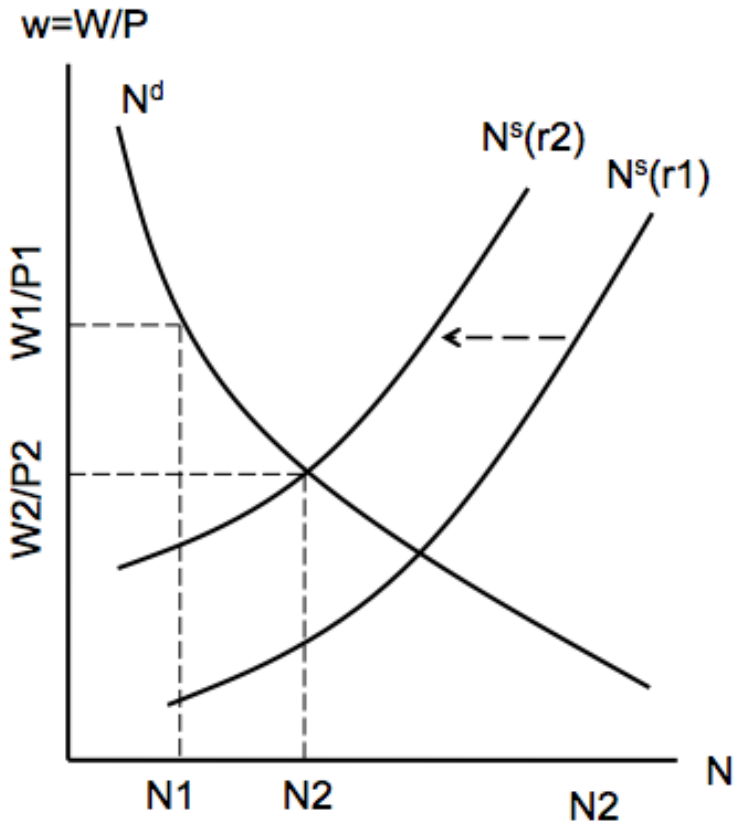
Money market adjustment

- A lower P reduces nominal money demand; Md shifts left.
- LM shifts right; the interest rate falls (r1 to r2).



Full employment equilibrium

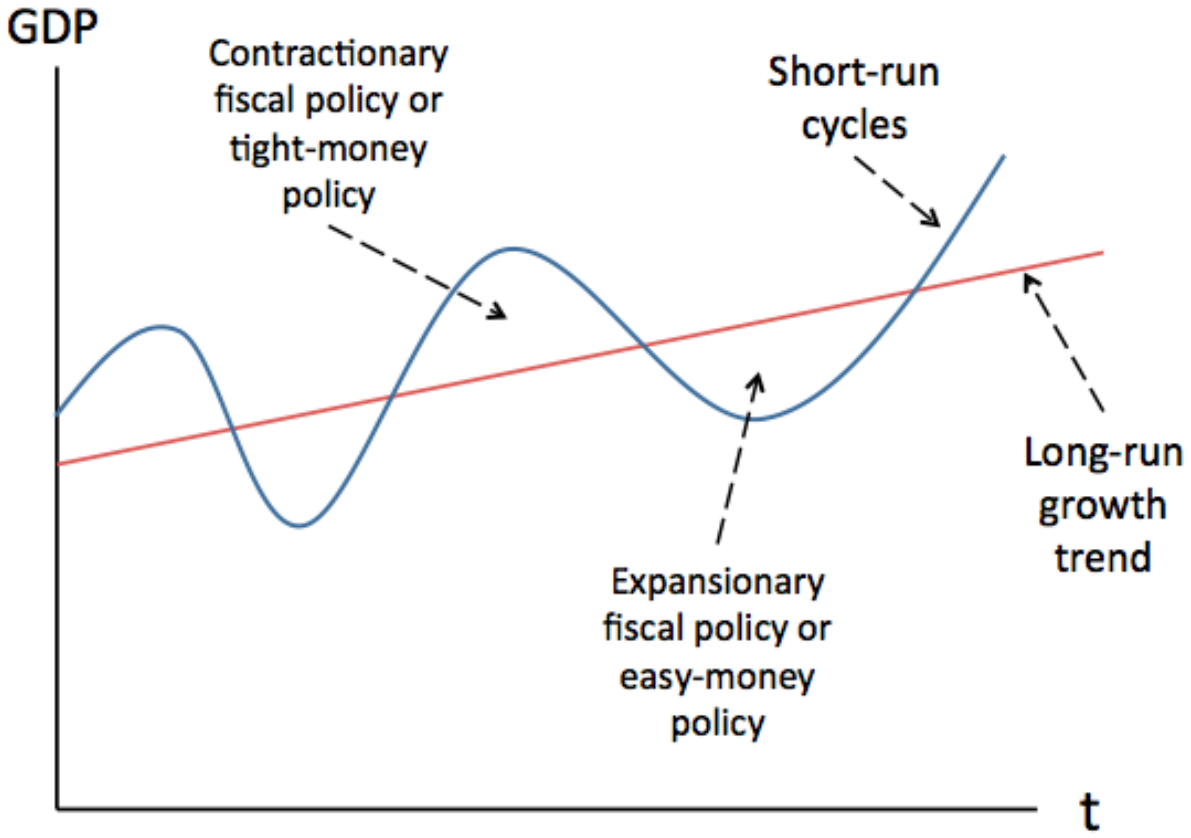
- A lower real interest rate reduces labor supply.
- Long-run full employment equilibrium is achieved (N2).



Keynesian stabilization policy

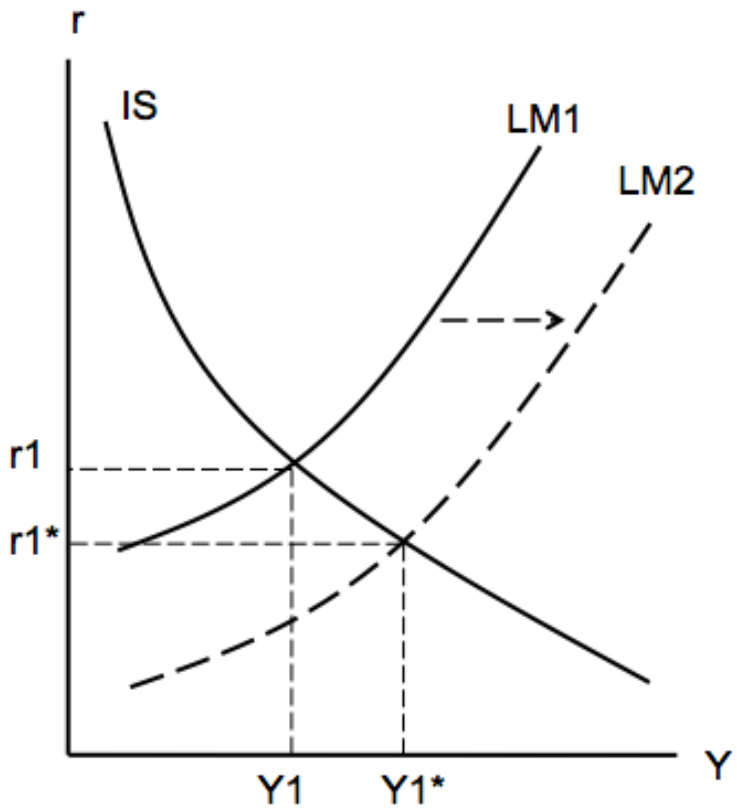
- Government can stabilize the economy through fiscal (G and T) and monetary policies (Ms).
- Increase AD when real output is below trend.
  - Expansionary fiscal policy or easy-money policy.
- Decrease AD when real output is above trend.
  - Contractionary fiscal policy or tight-money policy.

Counter-cyclical policies



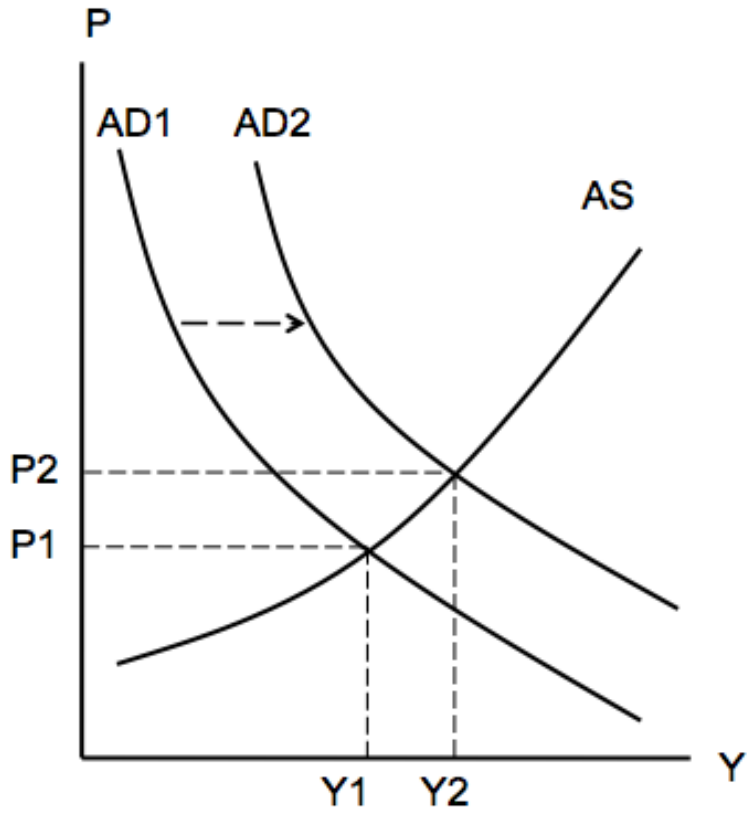
Easy-money policy

- The central bank increases the money supply; LM shifts to the right.
- The interest rate drops; current consumption and investment increase.



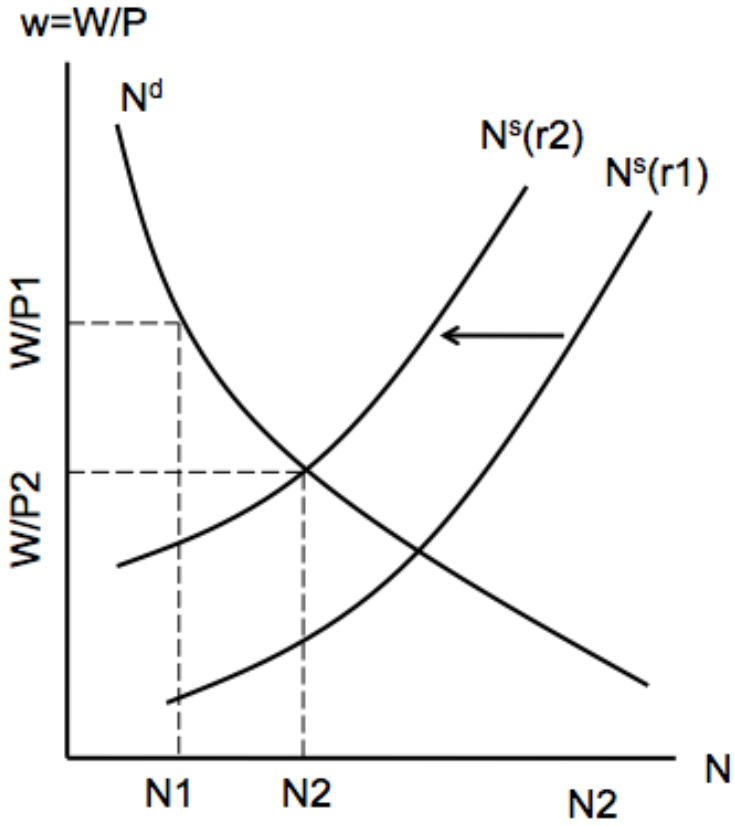
AE increases.

- Rising aggregate expenditure shifts AD to the right.
- The price level increases.



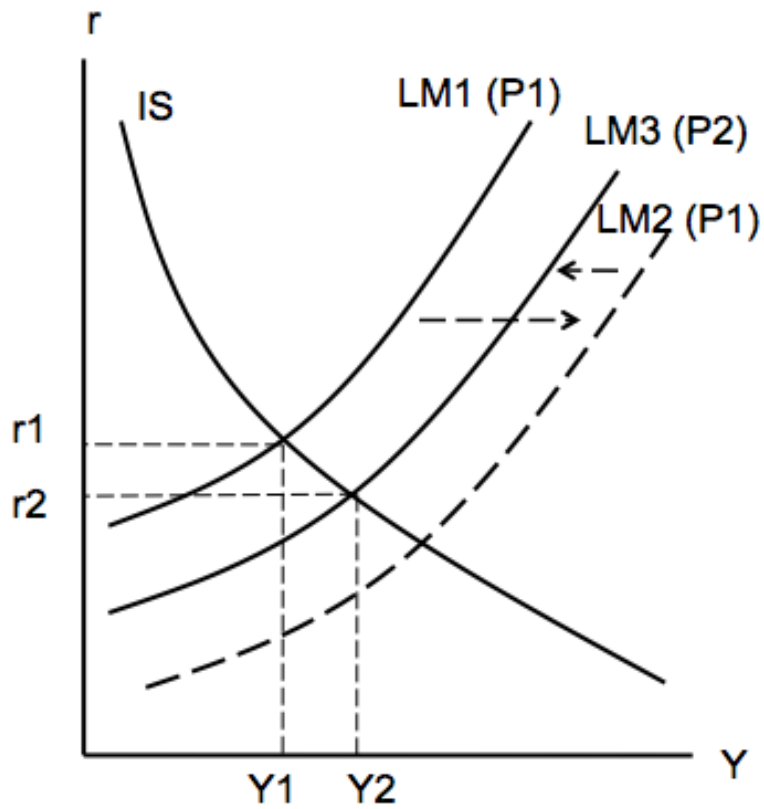
Labor demand increases.

- Rising aggregate expenditure shifts AD to the right.
- The price level increases.



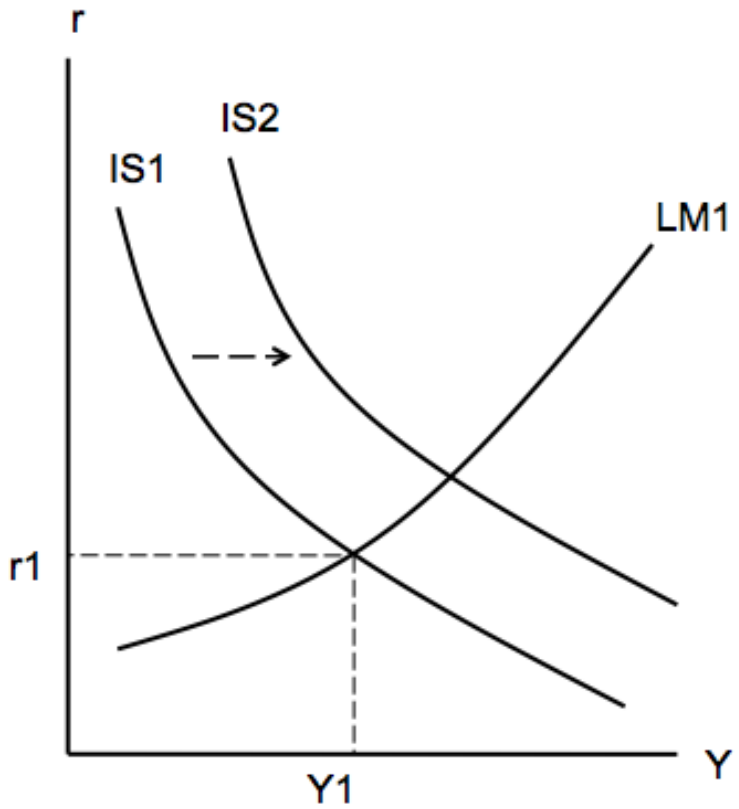
Real money demand drops.

- Higher P induces more nominal money demand; LM shifts left.



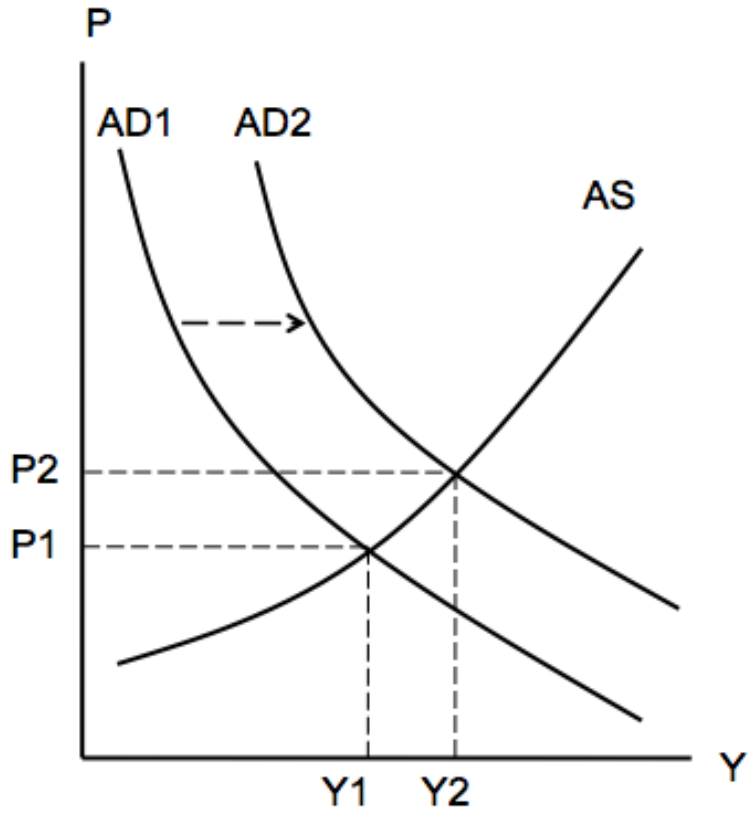
Expansionary fiscal policy

- Government increases spending or decreases taxes (which increases consumption).
- IS shifts right.
- The real interest rate is rising.



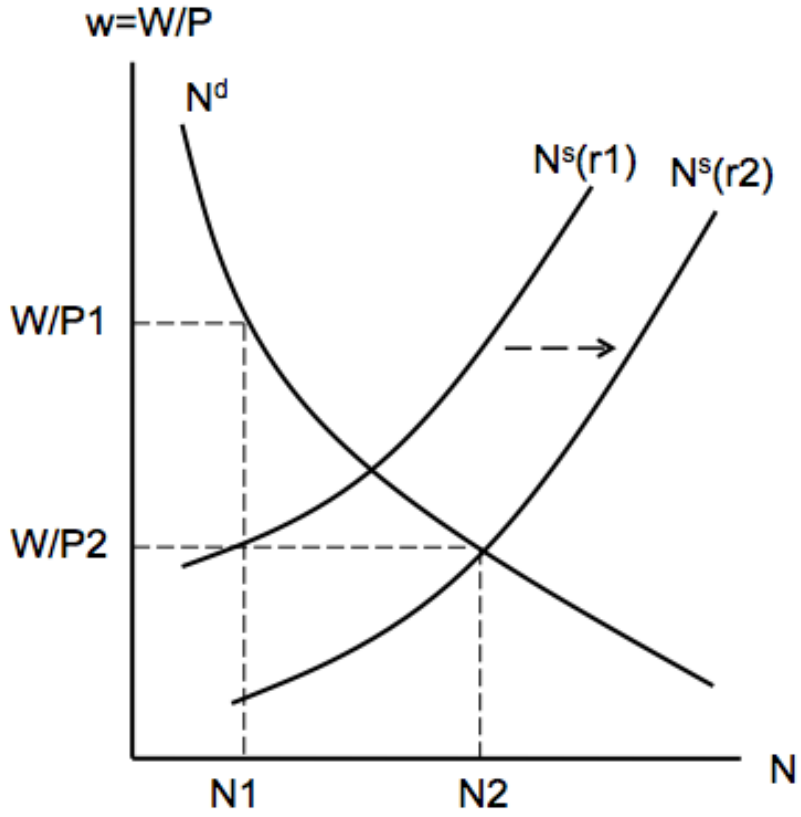
AE increases.

- Rising aggregate expenditure shifts AD to the right.
- The price level increases (P1 to P2).



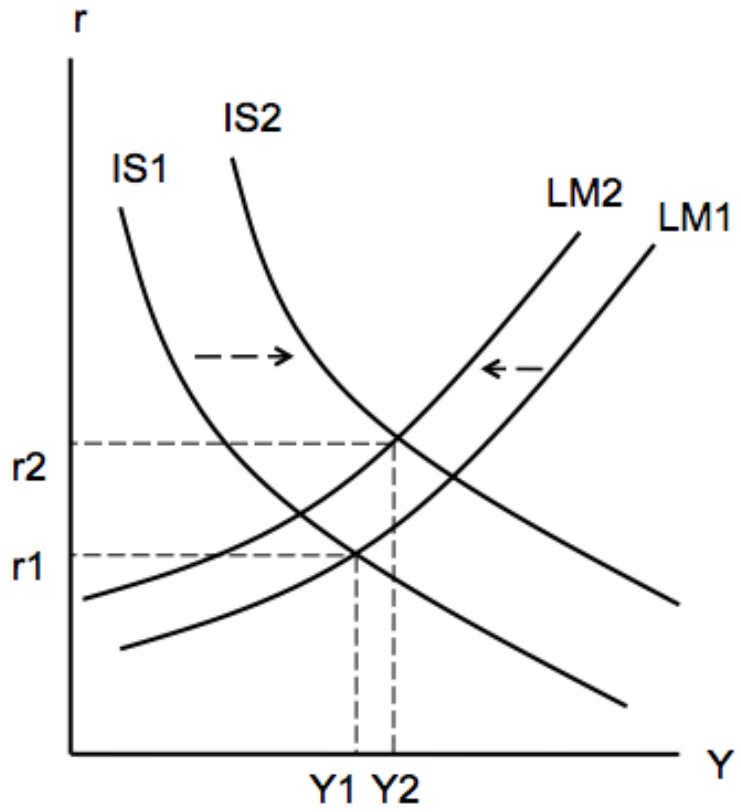
Labor demand and supply

- The higher P induces more labor demand.
- The higher interest rate induces more labor supply.
- Full employment at N2.



Real Money demand drops.

- The higher price reduces more nominal money demand.
- LM shifts left; the interest rate rises further to equilibrium (r2).



Policy effects

- Monetary policy results in a **lower real interest rate** and increases private consumption and investment.
- Fiscal policy results in **a higher real interest rate**.
  - Private investment and consumption decrease — **the crowding-out effect**.
  - But higher real income also induces higher consumption — unclear final result.

Keynesian sticky price, sticky wages

- Firms prefer varying production rather than prices (menu cost).
- Labor contracts; workers' resistance to wage cuts.
  - The goods and labor markets are not perfectly competitive and do not clear.
- Money is not neutral in the short run.
- Role for Keynesian stabilization policy.

Problems with the model

- Predictions by the sticky wage model do not fit the actual data.
- Sticky wage models lack micro-foundations.
  - Why do firms and workers choose to fix money wages?
  - Menu cost is actually very low compared to cost of changing production levels.

Optimal policy action?

- Keynesian stabilization policy requires ‘government wisdom’.
  - Information on the behavior of the economy,
  - Correct timing of action.
- **Government failure**?
  - Lack of information on the magnitudes and directions of macro variables.
  - Wrong timing further destabilizes the economy.
  - Unstable money demand.

Policy lags

- Lag in collecting information about the economy.
- Lag in formulating appropriate policy.
  - Executive and legislative processes in fiscal policy.
  - Monetary Policy Committee's meetings.
- Lag in timing of policy effects.
  - Uncertain length of lag results in wrong timing.

Alternative view on cycles

- Most people believe a recession is bad and must be avoided at all cost.
- **Austrian economics: Joseph Schumpeter.**
  - Recessions are a natural feature of the economy.
  - Necessary adjustment for change — creative destruction.
  - Capital is released from inefficient firms and sectors with low productivity to new ones.

Friedrich von Hayek

- Fundamental factors for long-term growth is productivity.
- Booms nurture unprofitable investments.
  - Too much investment; too little saving.
  - These are corrected by a recession, releasing resources from low yields for profitable investments.
  - Monetary policy to prevent a recession allows the misallocation to persist.

- Benefits of business cycles:
  - Cycles are short-run phenomenon.
  - Output loss during recessions is compensated by output gain during booms with the same long-run growth trend.
  - Demand management policy makes no long-term gain.
  - Booms allow business restructuring and more risky investment to boost future productivity.
  - Recessions weed out unprofitable investment and allow resource reallocation.

Recent lessons

- 1998: The US's Fed bailed out Long-Term Capital Management from collapse.
- 2001: The Fed cut its policy rate sharply to prevent a stock market bubble burst.
- 2002-2005: very low interest rates; housing bubbles developed.
- 2006: The sub-prime loan crisis exploded.
- 2008: the global financial crisis.