

Intermediate Macroeconomics

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Lecture 9 Aggregate Demand I: the IS-LM Model

- Why we need this IS-LM model?
- The goods market and the IS curve
 - The Keynesian cross
 - The interest rate, investment and the IS curve
 - How fiscal policy shift the IS curve
- The money market and the LM curve
 - The theory of liquidity preference
 - Income, money demand and the LM curve
 - How monetary policy shift the LM curve
- Conclusion: the short run equilibrium

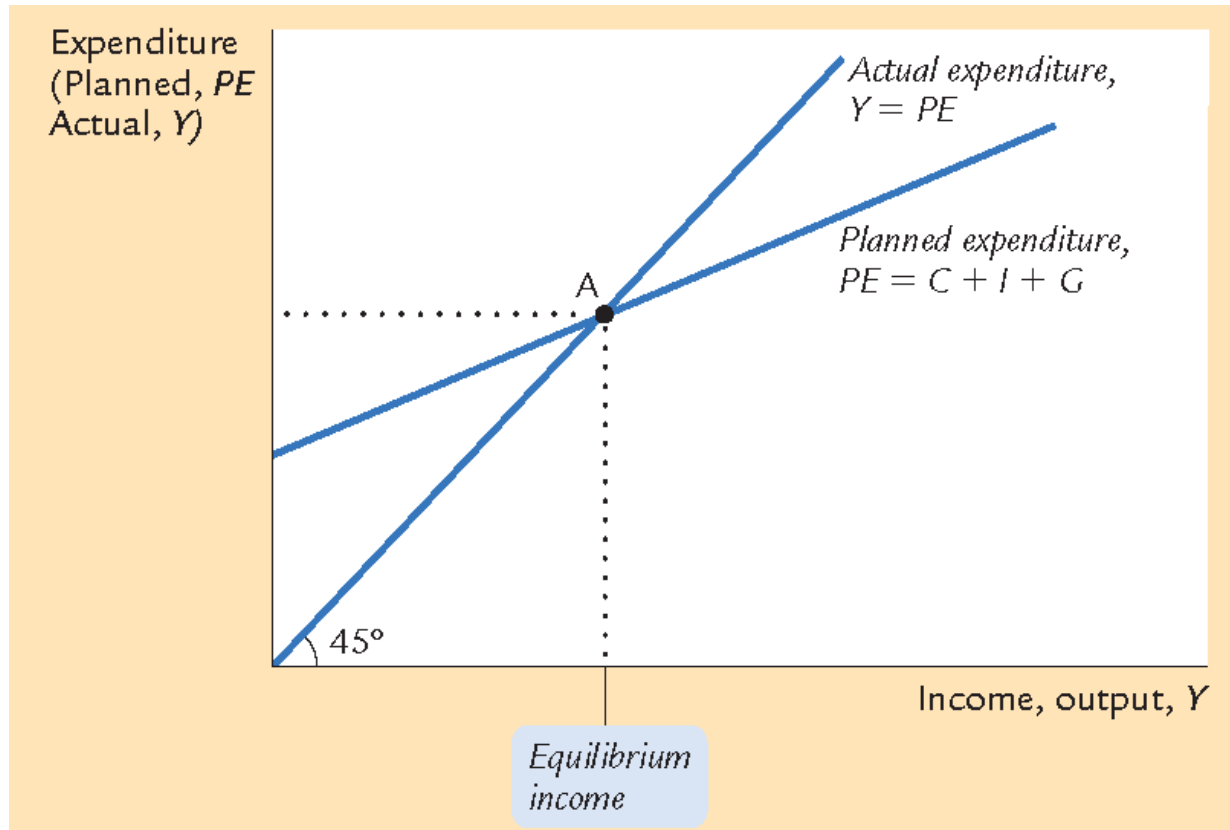
Why we need the IS-LM Model

- In classical theory, national income (output) is determined by the amount of labor and capital input:
 - but why did we have the **great depression**?
 - last chapter uses a simple AD and AS model to show that demand can affect national income in the short run.
- But the way we model AD in last chapter is way too simple and restrictive
 - in the **quantity theory of money**, AD is only affected by money supply and velocity of model
 - it restrict us from analyzing other factors that might affect AD, particularly fiscal policy
- To emphasize the importance of AD in determining short run economic fluctuation, we need a more sophisticated model
 - the IS-LM model was first developed by Maynard Keynes (*the very first Keynesian*)
 - it is still widely used in policy decision and business analysis nowadays

The Keynesian Cross

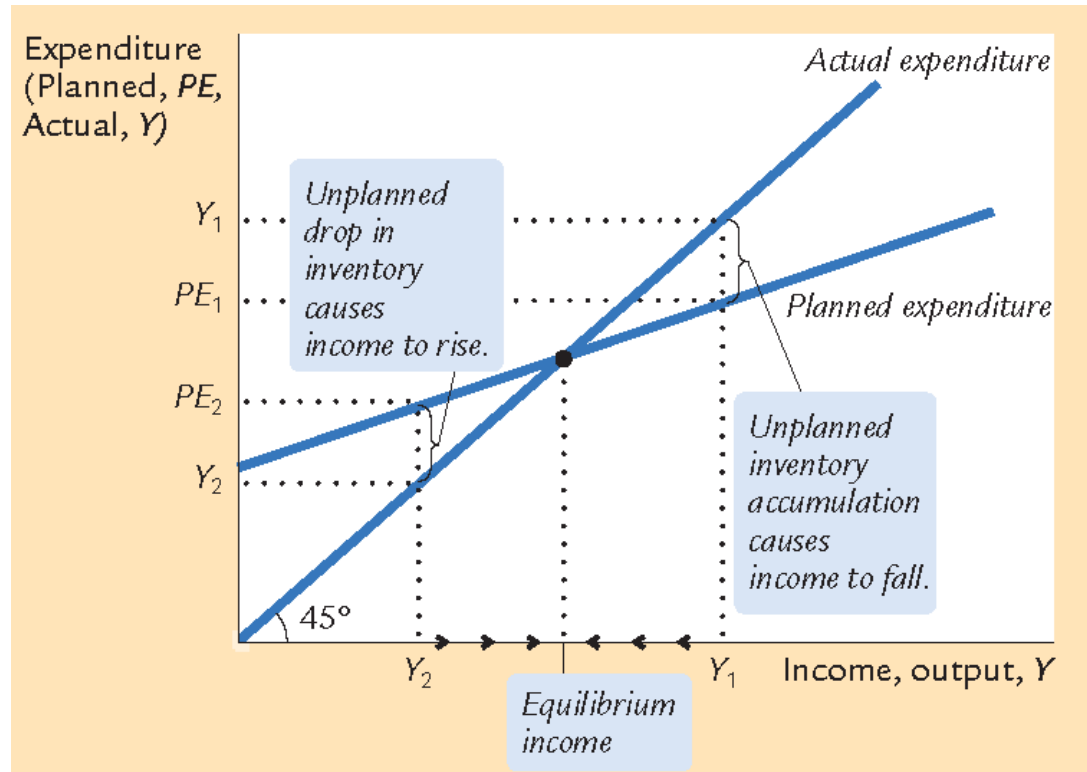
- The IS curve plots the relationship between the **interest rate** and the level of **income** that arises in the **market for goods and services**
 - I stands for *investment*, S stands for *saving*
- We start with a simpler version of the IS curve: **Keynesian cross** (凯恩斯交叉)
 - an economy's total income was, in the short run, determined largely by the **desire to spend** by households, firms, and the government
 - the problem during recessions and depressions was **inadequate spending**
- **Planned expenditure** vs **actual expenditure**
 - planned expenditure: $E = C(Y - T) + \bar{I} + \bar{G}$
 - actual expenditure: $E = Y$
 - equilibrium: planned expenditure = actual expenditure
$$Y = C(Y - T) + \bar{I} + \bar{G}$$
 - why planned expenditure does not necessarily equal actual expenditure?
 - because of the existence of **inventory** (excluded from \bar{I})

The Keynesian Cross: Equilibrium



Why the slope of planned expenditure is smaller than the actual expenditure?
- Because the marginal propensity to consume is less than one

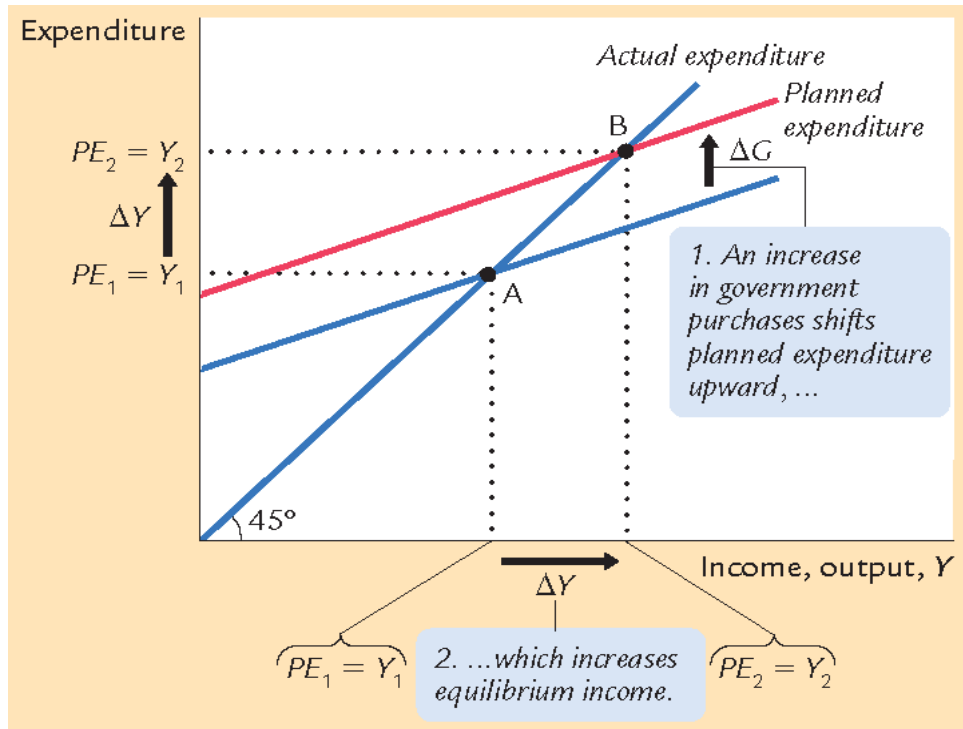
The Keynesian Cross: Approaching the Equilibrium



Why we need to emphasize **unplanned** change in inventory?

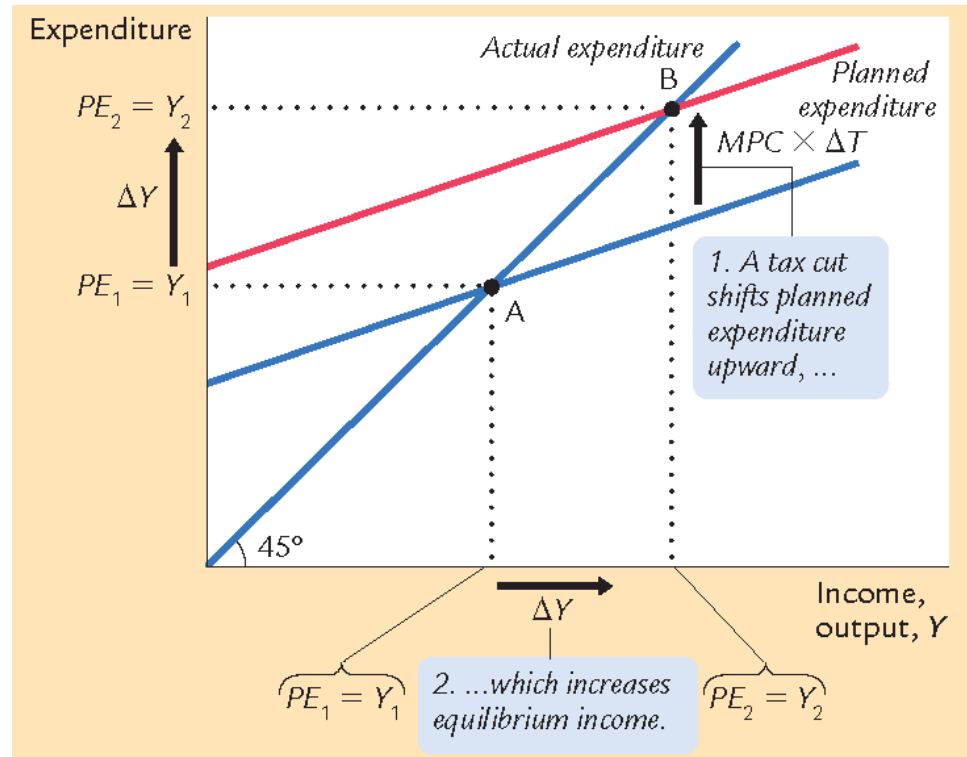
- Because only when the change in inventory is unplanned that the firms will change their future hiring the production plan, which in turn affects aggregate income.

Fiscal Policy: Government Purchases



Note: $\Delta Y > \Delta G$ (government spending multiplier, 政府支出乘数)

Fiscal Policy: Tax Cut



Fiscal Policy: Multipliers

- Government Spending Multiplier:

$$\begin{aligned}\Delta Y &= \Delta G + (MPC \cdot \Delta G) + MPC(MPC \cdot \Delta G) \\ &\quad + MPC(MPC(MPC \cdot \Delta G)) + \dots \\ &= \frac{1}{1 - MPC} \Delta G\end{aligned}$$

→ $\frac{\Delta Y}{\Delta G} = \frac{1}{1 - MPC}$

Alternatively we can use total differentiation to obtain this multiplier.

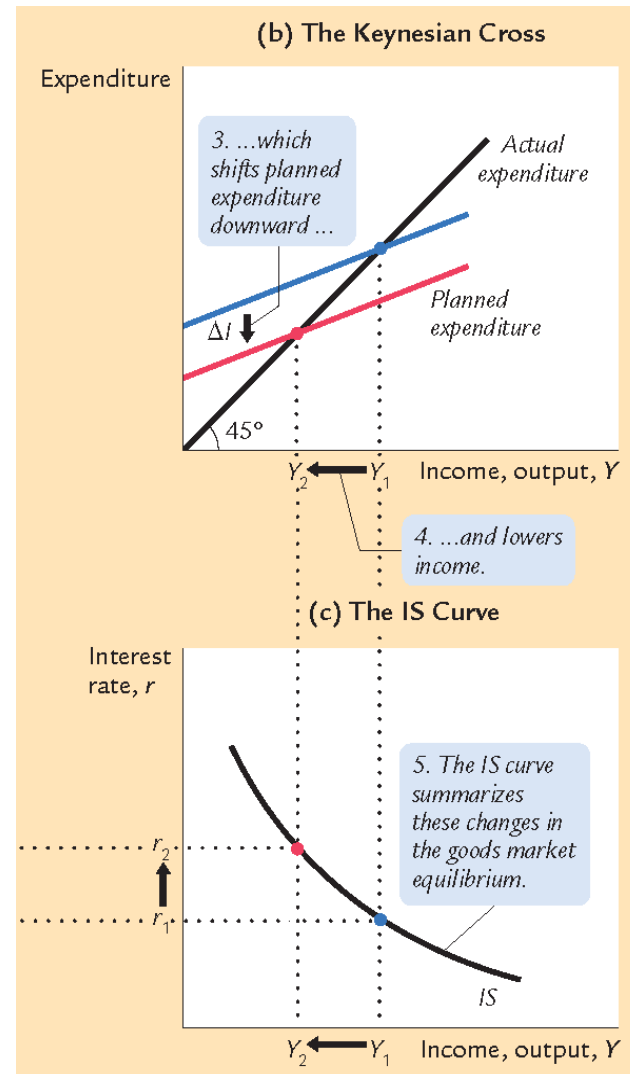
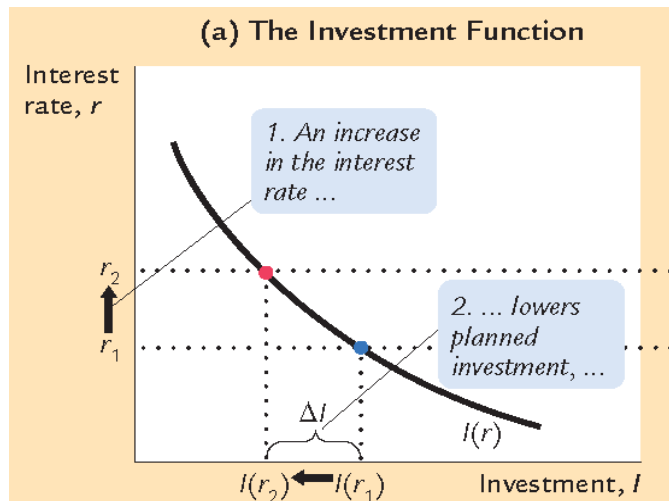
- Tax Multiplier:

$$\begin{aligned}\Delta Y &= -MPC \cdot \Delta T - (MPC \cdot MPC \cdot \Delta T) - (MPC \cdot MPC \cdot MPC \cdot \Delta T) - \dots \\ &= \frac{-MPC}{1 - MPC} \Delta T\end{aligned}$$

→ $\frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - MPC}$

The IS Curve

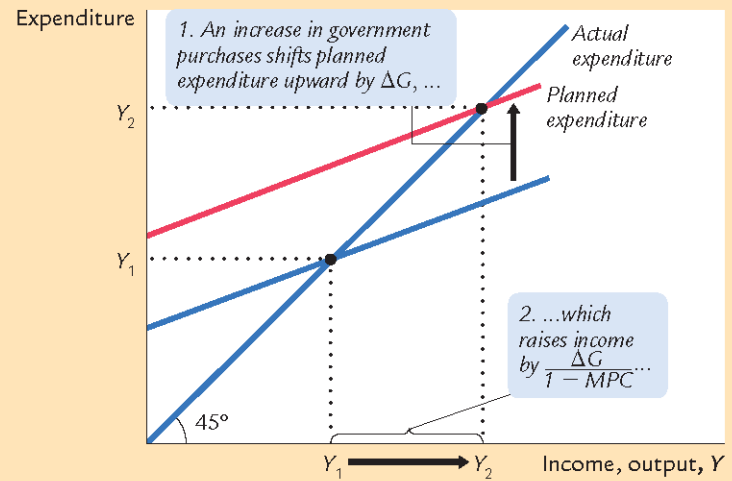
- The Keynesian cross shows how fiscal policy affects total income
- But it does not tell how monetary policy might affect total income
- This is because it takes investment as exogenously fixed



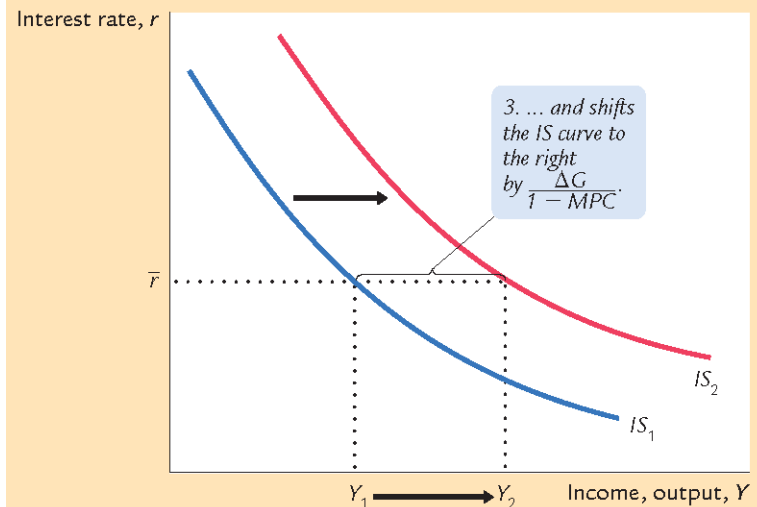
Fiscal Policy and the IS Curve

- We can use the IS-LM curve to analyze the effect of fiscal policy on total income.
- For now, we start by relying on the Keynesian Cross to show how fiscal policy shifts the IS curve

(a) The Keynesian Cross



(b) The IS Curve



Theory of Liquidity Preference

● Theory of Liquidity Preference (流动性偏好理论)

- fixed supply of real money balance

$$\left(\frac{M}{P}\right)^s = \frac{\bar{M}}{\bar{P}}$$

- money supply is exogenous (policy variable)
- price level is fixed at the short run

- interest rate is one determinant of real money demand

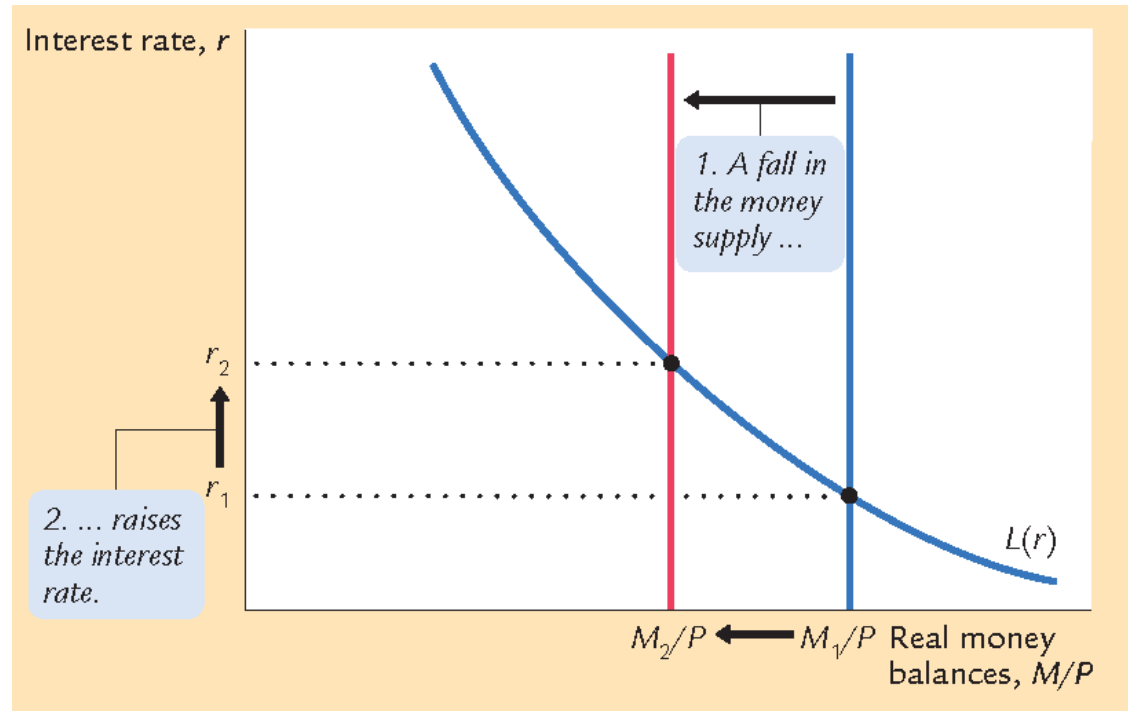
$$\left(\frac{M}{P}\right)^d = L(r), L'(r) < 0$$

- interest rate is the opportunity cost of holding money
- with higher interest rate, people tend to hold less of their wealth in the form of money

- the supply and demand of real money balance determines the prevailing interest rate in the economy

Money Supply and Interest Rate

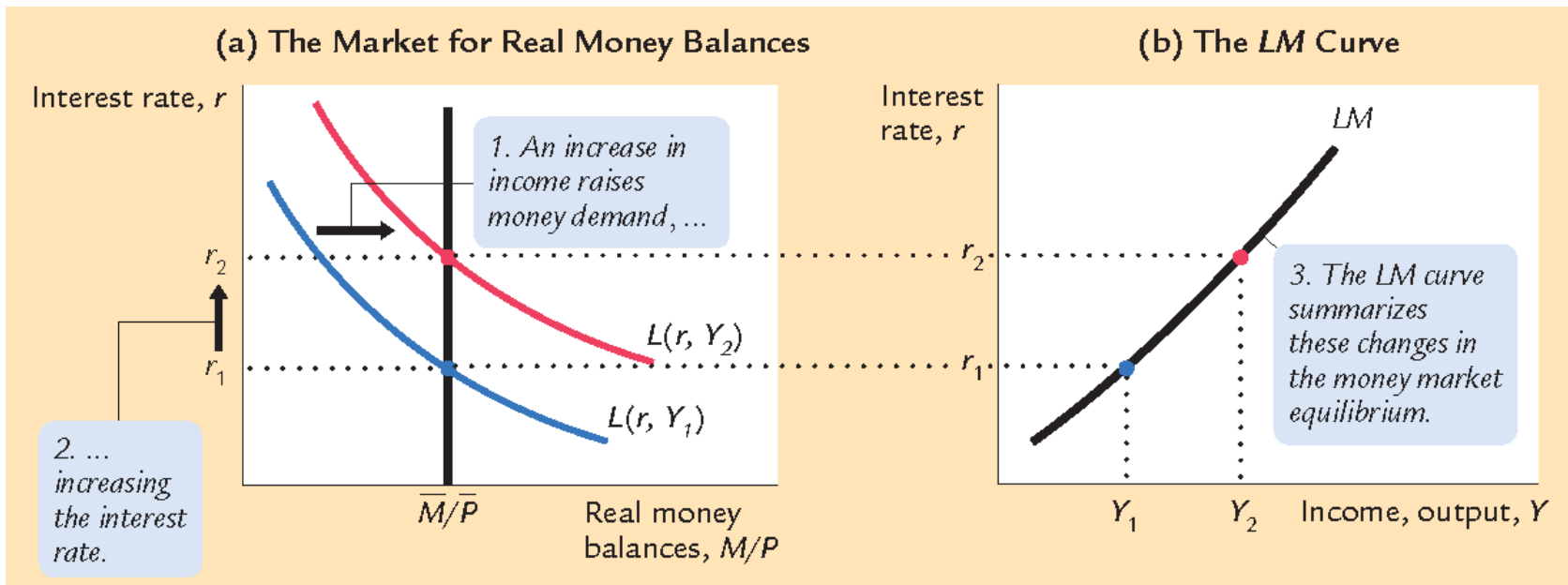
- According to the Liquidity Preference Theory, reducing the money supply raises the interest rate.
- But reducing the money supply lowers the price and, according to the Fisher equation, in turn lowers the nominal interest rate.
- Hence the effect of changing money supply depends on the time horizon.



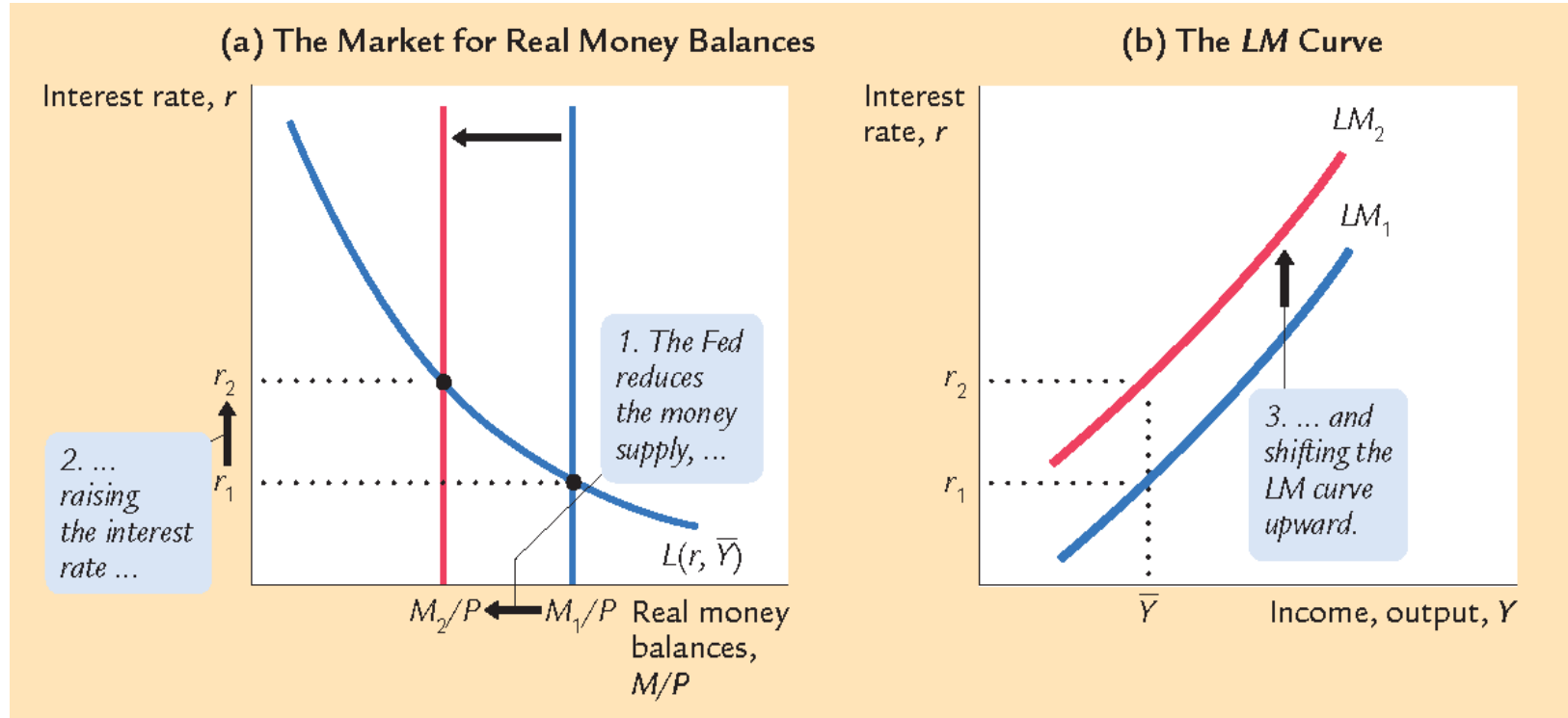
The LM Curve

- When income is high, expenditure is high, and therefore people need more real balance holding for transaction:

$$\left(\frac{M}{P}\right)^d = L(Y, r), \frac{\partial L}{\partial r} < 0, \frac{\partial L}{\partial Y} > 0.$$



Money Supply and the LM Curve



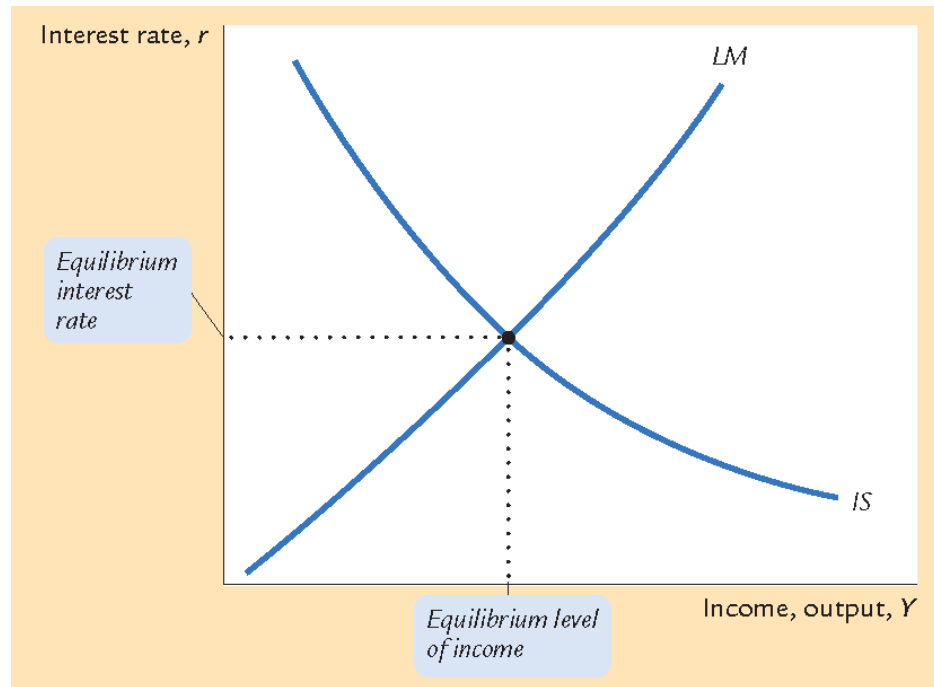
Reducing money supply lowers the short run nominal interest rate and in turn shifts the LM curve upwards.

The IS-LM Model

The IS-LM model:

IS: $Y = C(Y - \bar{T}) + I(r) + \bar{G}$

LM: $\left(\frac{M}{P}\right)^d = L(Y, r)$



A Theory of Short Run Fluctuations

