

The Multiplier Model

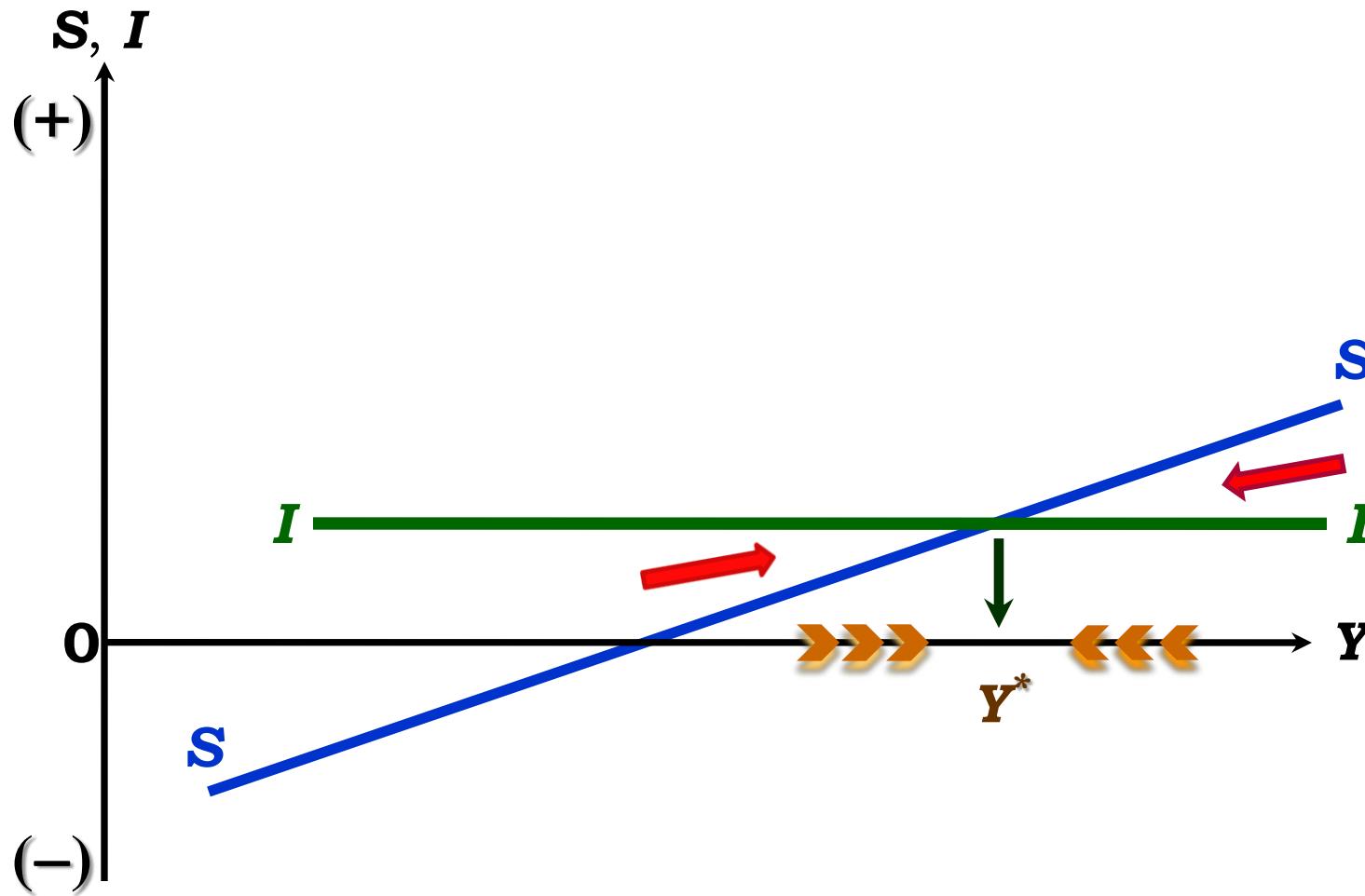
The multiplier is the amount by which equilibrium output changes when *autonomous* aggregate demand increases by 1 additional unit.

Why focus on the multiplier?

If an economy for some reasons (political uncertainty, stock market crash, etc.) experiences a loss in confidence that reduces investment spending — an adverse shock that reduces income — people whose incomes have gone down will spend less, thereby driving equilibrium income down even further.

The multiplier is therefore, potentially an explanation of why output fluctuates in an economy.

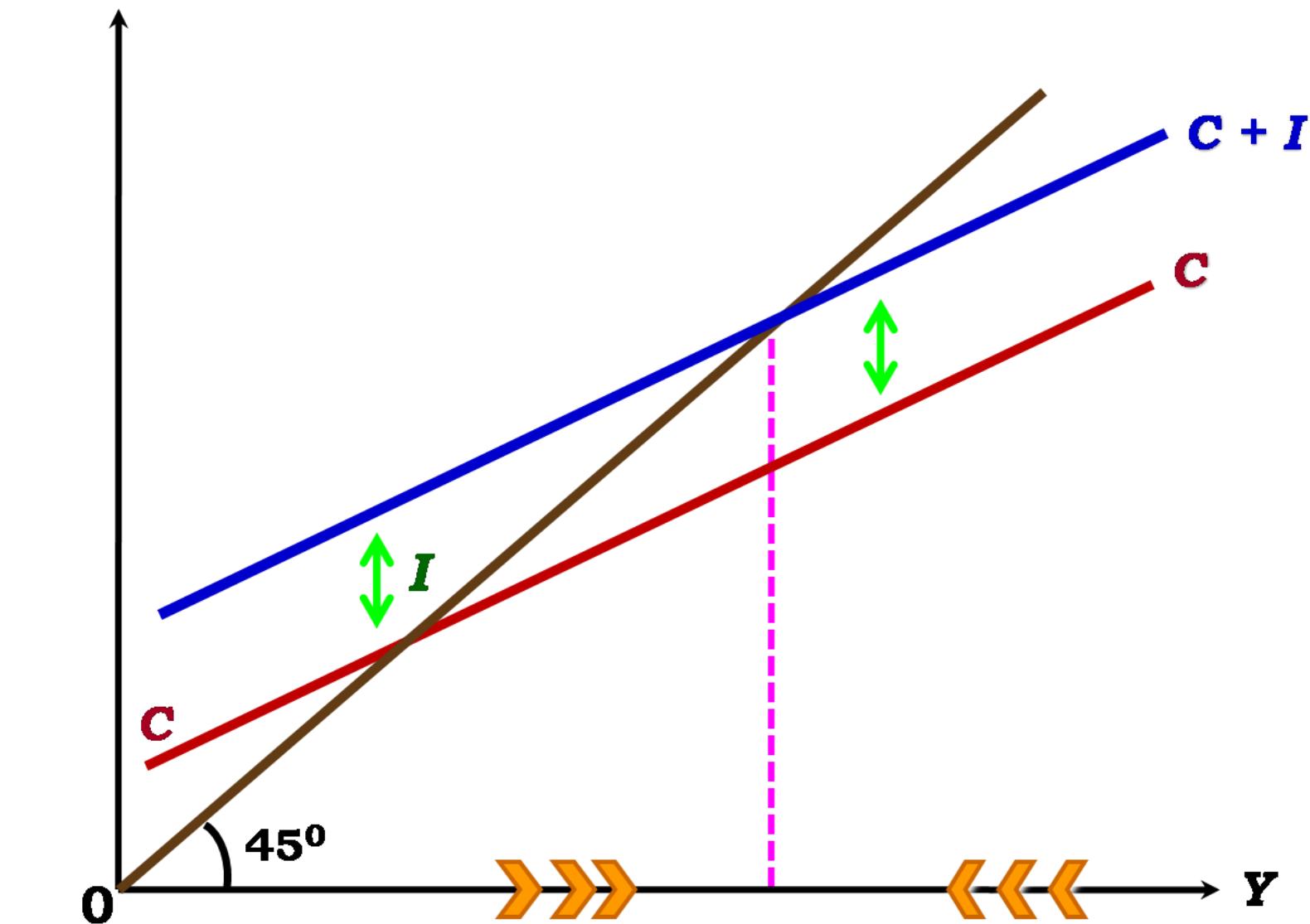
Saving & Investment Functions



The Equilibrium Output Is Determined by Intersection of S & I

Total Expenditure / Aggregate Demand

AD / Agg. Exp.



The Investment & G - Multipliers

$$\frac{\Delta Y}{\Delta G} = \frac{\Delta Y}{\Delta \tilde{I}} = \frac{1}{(1 - MPC)} \gg 1$$

$$\frac{\Delta Y}{\Delta G} = \frac{\Delta Y}{\Delta \tilde{I}} = \frac{1}{MPS} \gg 1$$

Larger the MPC, greater the multiplier effect

Larger the MPS, smaller the multiplier effect

The Balanced Budget Multiplier

Additional govt. expenditure is financed by additional taxation

$$Y = C(Y-T) + \tilde{I} + G$$

Assume that investment is autonomous and fixed

$$dY = \dot{C} dY - \dot{C} dT + d\tilde{I} + dG \quad d\tilde{I} = 0$$

$$dT = dG$$

$$(1 - \dot{C}) dY = (1 - \dot{C}) dG$$

$$\left. \frac{dY}{dG} \right|_{dG=dT} = \frac{(1 - C')}{(1 - C')} = 1$$

THE TAX MULTIPLIER

Disposable Income = Income *minus* Taxes

Increase in Tax *reduces* the Disposable Income.

But Consumption is a rising function of Disposable Income.

With rise in tax, DI will be falling and so would be Consumption demand.

Consumption demand comprises the single largest portion of aggregate demand in the economy.

Hence, AD would fall.

Summary: The Autonomous Multipliers

Closed economy multiplier is greater than the open economy multiplier.

Investment and G-multipliers are *positive* but the tax multiplier is *negative*.

A Model of Short Run Aggregate Supply

The Sticky Wage Model

Economists stress the sluggish adjustment of nominal wages. In many industries, nominal wages are set by long-term contracts, so wages cannot adjust quickly when economic conditions change. Wages may also depend on social norms and notions of fairness that evolve slowly.

Nominal wages are *sticky* in the *short-run*.

What a sticky nominal wage implies for aggregate supply?

What happens to the amount of output when the price level rises?

Why Sticky Wages in Short-Run?

In recessions when labor demand falls the real wage is relatively fixed so employment falls. That is, in labor market, in the short-run, employment adjusts but *not* the wage rate.

Long term union contracts that fix wages for at least 2-3 years.

Implicit contracts or mutual understandings between employers and employees that during bad times wages will not fall.

Keeping wages fixed may reduce uncertainty. If a firm cuts wages to encourage the labors to quit during a downturn, still workers may not quit.

Efficiency Wage Hypothesis: Higher wage may improve workers' productivity. Cutting down wage may mean loss of best of the workers if competing firms do not cut wage.

The Sticky Wage Model

- ✓ When the nominal wage is stuck, a rise in the price level lowers the real wage, making labor relatively cheaper.
- ✓ The lower real wage induces firms to hire more labor.
- ✓ The additional labor hired produces more output.

This positive relationship between the price level and the amount of output implies that the aggregate supply curve slopes *upward* during the time when the nominal wage cannot adjust.

The Economic Intuition

Workers and firms bargain over and agree on the nominal wage before they know what the price level will be when their agreement takes effect.

The bargaining parties have in mind a target real wage to maximize their self interests. The target real wage may be the real wage that equilibrates the labor market. However, more likely, the target real wage is higher than the equilibrium real wage; militant trade union power and efficiency-wage considerations tend to keep the real wage above the equilibrium level.

Workers and firms set the nominal wage (W) based on the target real wage (w) and their expectation of the future price level (P^e).

$$W = w \times P^e$$

Nominal Wage Target Real Wage Expected Price Level

Then the real wage turns out to be:

$$\frac{W}{P} = w \times \frac{P^e}{P}$$

Real Wage Target Real Wage Expected Price Level
Actual Price Level

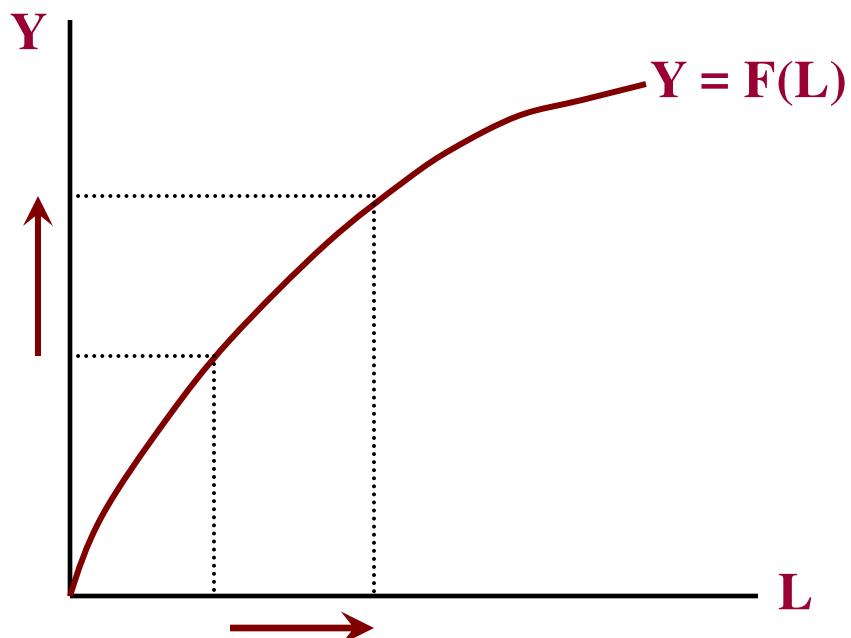
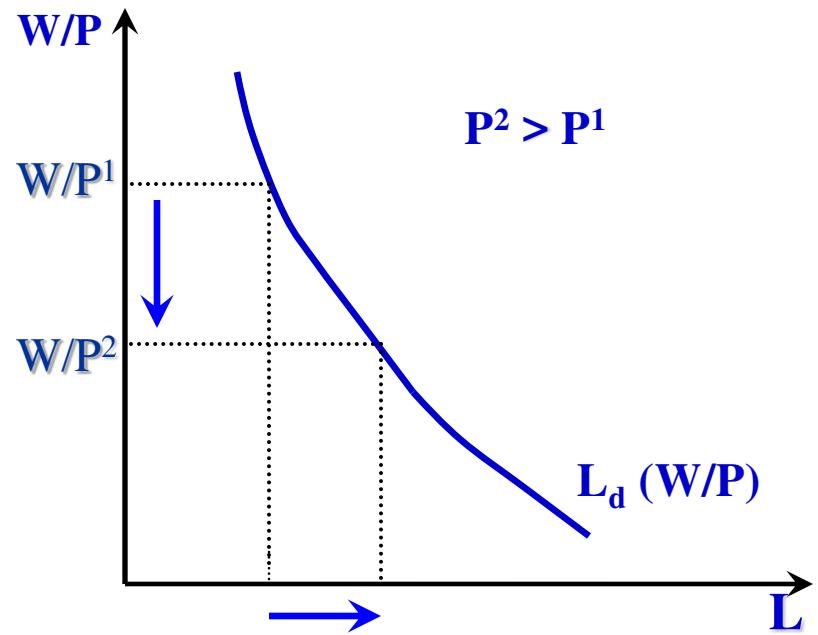
Real wage deviates from its target if the actual price differs from the expected price level. When the actual price level is greater than expected, the real wage is less than its target; when the actual price level is less than expected, the real wage is higher than its target.

The labor demand function:

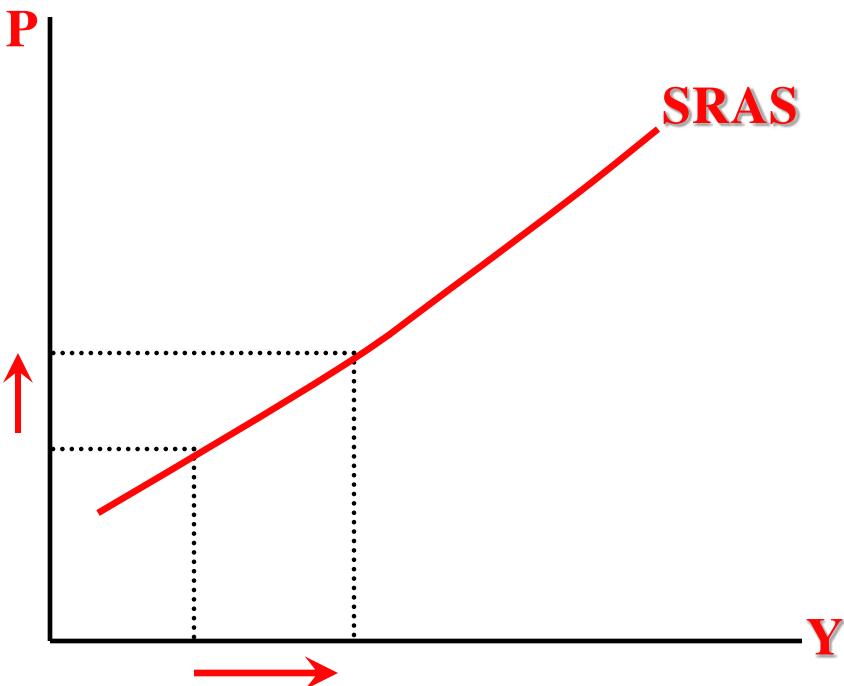
$$L = L_d\left(\frac{W}{P}\right), \text{ with } L'_d < 0$$

There exists a *positive* relationship between employment and output.

$$Y = F(L), \text{ with } F'_L > 0, \quad F''_{LL} < 0$$



Derivation of the SRAS Curve



Summary

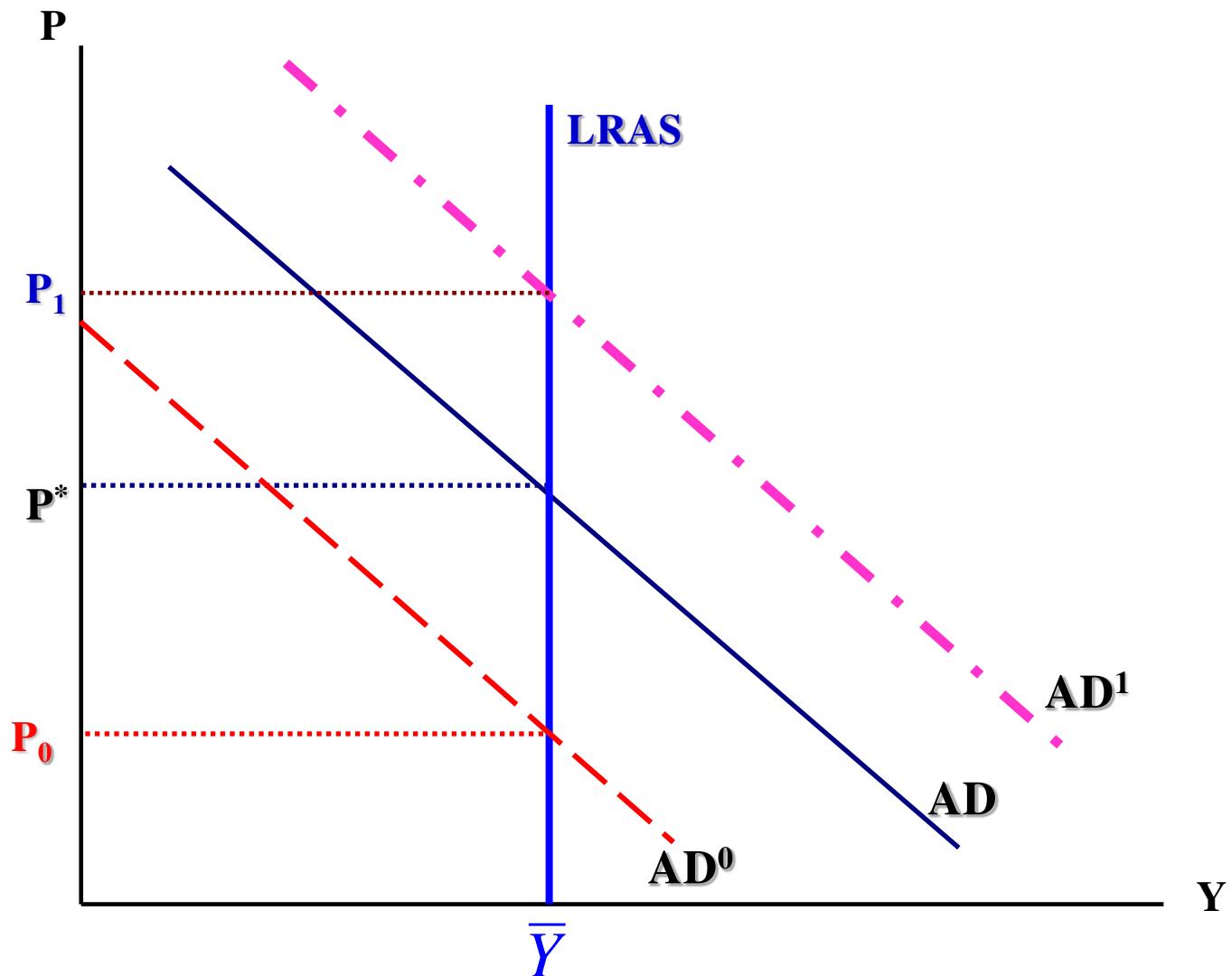
Because nominal wage is *sticky*, an unexpected change in the price level moves the real wage away from then target real wage, and this change in the real wage fluctuates the amount of labor hired and output produced.

$$\text{SRAS: } Y = \bar{Y} + \alpha(P - P^e); \alpha > 0$$

This is also called the Lucas supply curve, named after Robert Lucas.

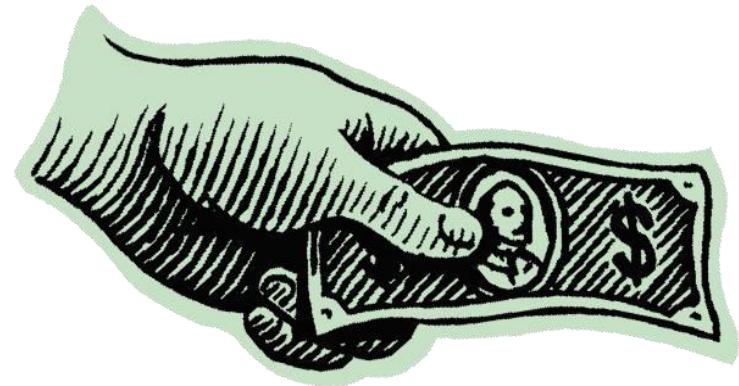
Output deviates from its natural level when the price level deviates from the expected price level.

Long Run Aggregate Supply Curve





MONEY AND BANKING



Money Supply in India

Narrow money: A] currency with the public

$$(M_1) = A + B$$

notes in circulation

circulation of rupee coins

circulation of small coins

cash in hand with banks

B] demand deposits of banks

‘other’ deposits with RBI

“Other” deposits with RBI (ex-Governors of RBI are permitted to use RBI as any other commercial bank). Also include the demand deposits with the RBI held by the central and the state governments, foreign central banks and foreign governments, international financial institutions (e.g. IMF).

MONETARY AGGREGATES IN INDIA

- ✖ $M_2 = M_1 + \text{Post Office savings deposits}$
 - ✖ $M_3 = M_1 + \text{Time deposits of the public with banks} - \text{Broad Money}$
 - ✖ $M_4 = M_3 + \text{Total post office deposits*}$
- * *People maintain fixed deposits of various maturities with post offices, apart from savings deposits.*

RESERVE MONEY / HIGH POWERED MONEY (MONETARY BASE)

RM also called the government money is produced by the Central Bank (RBI, in India) and held by the people and the banks. It is composed of:

- ✓ Currency with the public in circulation.
- ✓ Cash reserves of commercial banks: (i) cash reserves with the banks themselves and (ii) Bankers' deposits with RBI (which commercial banks maintain with RBI as reserve and consider as their 'vault' cash).
- ✓ ‘Other’ deposits with RBI.

*A commercial bank's required amount of reserves is equal to the required reserve ratio times the total deposits in the bank. The difference between a bank's **actual reserves** and its **required reserves** is its **excess reserves**.*

$$\text{Excess Reserves} = [\text{Actual Reserves} - \text{Required Reserves}]$$

Commercial banks give loans up to the point where they can no longer do so because of the reserve requirement restriction, it means that *banks give loans up to the point where their excess reserves are zero.*

Changes in reserve requirements affect the amount of reserves that commercial banks must keep as deposits with the RBI and consequently the amount available for lending or investing.

By *raising the reserve ratio* to be maintained by every bank, the RBI can *reduce the volume of credit* and by *lowering the reserve ratio*, it can *expand the volume of credit*.

Excess cash reserves will induce commercial banks to expand credit and reduction of cash reserves will result in contraction of credit.

MONEY MULTIPLIER

Supply of money is an *increasing* function of *reserve money*.

$$M^S = m \text{ RM} \quad \text{where } m > 1$$

$$m = \frac{M^S}{RM}$$

The money multiplier is the ratio of stock of money to the stock of high powered money.

Money Supply is: $M = \text{Currency} + \text{Deposits}$
 $(CU) \quad (D)$

High-Powered money consists of *Currency* plus *Reserves*:

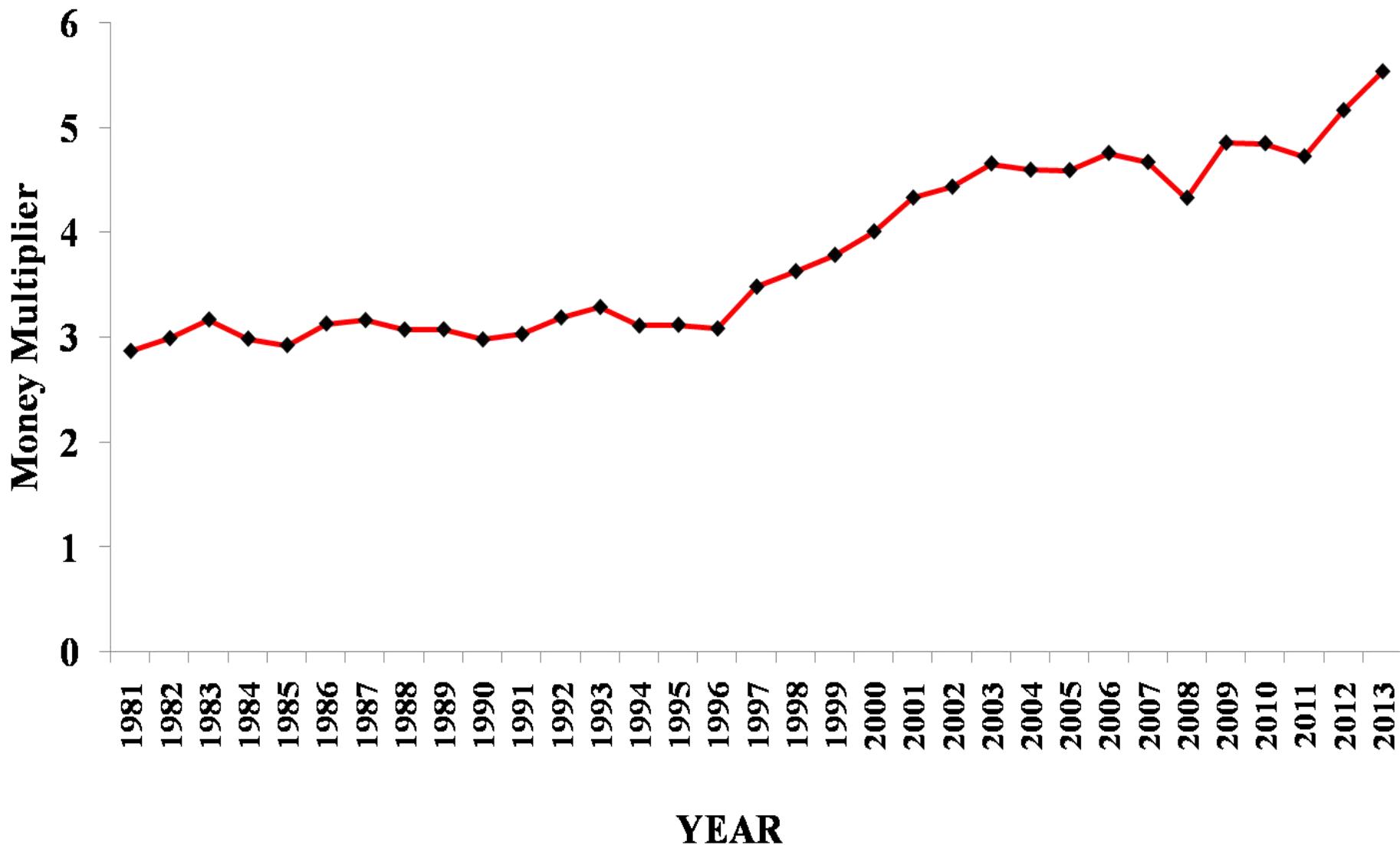
Therefore, $H = CU + R$

Money Supply can be re-written as: $M = \left(\frac{CU}{D} + 1\right)D = (curr + 1)D$

H can be re-written as: $H = (curr + res)D$

$$H = \left(\frac{CU}{D} + \frac{R}{D}\right)D$$

Therefore, $M = \left(\frac{curr + 1}{curr + res}\right)H = mH$



Money Multiplier in India

The Important Tool of Controlling Money Supply

Open Market Operations (OMO): the purchase and sale of government securities/bonds. An OMO by the RBI affects bank reserves.

Consider an open-market purchase by the RBI of a government security worth of Rs. 1,000. *Government securities constitute the major part of RBI assets.*

The RBI writes a cheque on itself, drawn on the Mumbai RBI. What happens to that cheque?

Suppose, Mr. B sold the security to the RBI. That individual B will take the cheque and deposit it at a local commercial bank, SBI Powai branch.

SBI will then present the cheque to the RBI for payment. And RBI will credit the SBI account by Rs. 1,000. The open-market purchase thus results in an increase of an equal amount in bank reserve deposits with the RBI.

THE MECHANISM OF MONETARY EXPANSION

The RBI requires that commercial banks retain a certain percentage of their liabilities as reserves, mainly as deposits in the Central Bank (FED/RBI).

Fed buys treasury bonds worth of \$100 and consequently issues a chq drawn on itself to the seller. The seller then deposits that chq in his account in Bank A, creating \$100 in liabilities for the bank and also \$100 in assets for the bank, the claim on the Fed. If there is a 20% reserve requirement, Bank A can loan out \$80 and must retain \$20 as reserves.

The borrower spends this amount, transferring \$80 to the seller's bank (Bank B), which in turn loans out \$64. This amount is then transferred to Bank C and the process continues. As a result, the total increase in the money supply from the \$100 reserve increase is given by

$$\Delta M = \$100 + \$80 + \$64 + \dots$$

$$\Delta M = \$100 [1 + 0.8 + (0.8)^2 + \dots] = \frac{100}{1 - 0.8} = 500.$$

Balance-Sheet Effects of a \$100 Increase in Reserves

Bank A

Assets	Liabilities
\$100	\$100
(\$20 reserves	
\$80 loans)	

Bank B

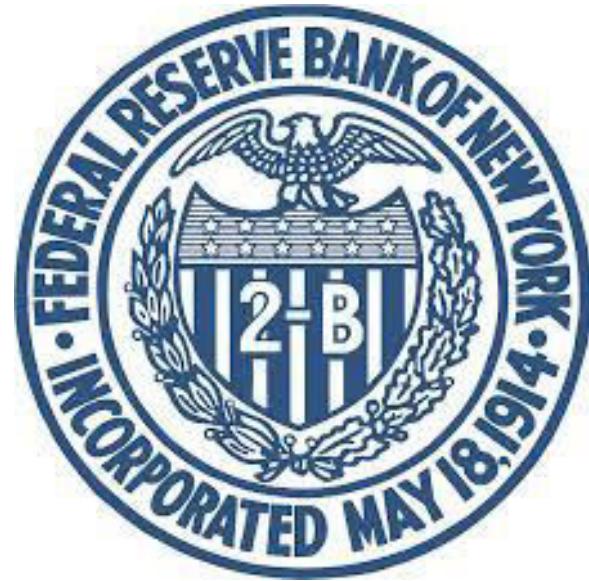
Assets	Liabilities
\$80	\$80
(\$16 reserves	
\$64 loans)	

Bank C

Assets	Liabilities
\$64	\$64
(\$12.8 reserves	
\$51.2 loans)	

MONEY & BANKING

Lecture 2



*A commercial bank's required amount of reserves is equal to the required reserve ratio times the total deposits in the bank. The difference between a bank's **actual reserves** and its **required reserves** is its **excess reserves**.*

$$\text{Excess Reserves} = [\text{Actual Reserves} - \text{Required Reserves}]$$

Commercial banks give loans up to the point where they can no longer do so because of the reserve requirement restriction, it means that *banks give loans up to the point where their excess reserves are zero.*

In addition to required reserves, banks hold excess reserves in order to meet unexpected withdrawals. Because reserves earn no interest, banks try to minimize excess reserves — *interest sensitivity of excess reserves.*

BANK RATE (DISCOUNT RATE)

Bank Rate is the rate at which the central bank of a country provides medium and long-term finance to the commercial banks. Also known as the *discount rate*. It is the interest rate charged by the RBI on its medium and long-term loans to commercial banks.

An instrument of credit control. When the bank rate is raised, the cost of medium and long-term borrowing by the commercial banks goes up. Increase in the lending rates of commercial banks. This compel the borrowers of commercial banks to borrow less. The bank rate is usually raised when there is an inflationary situation in the country.

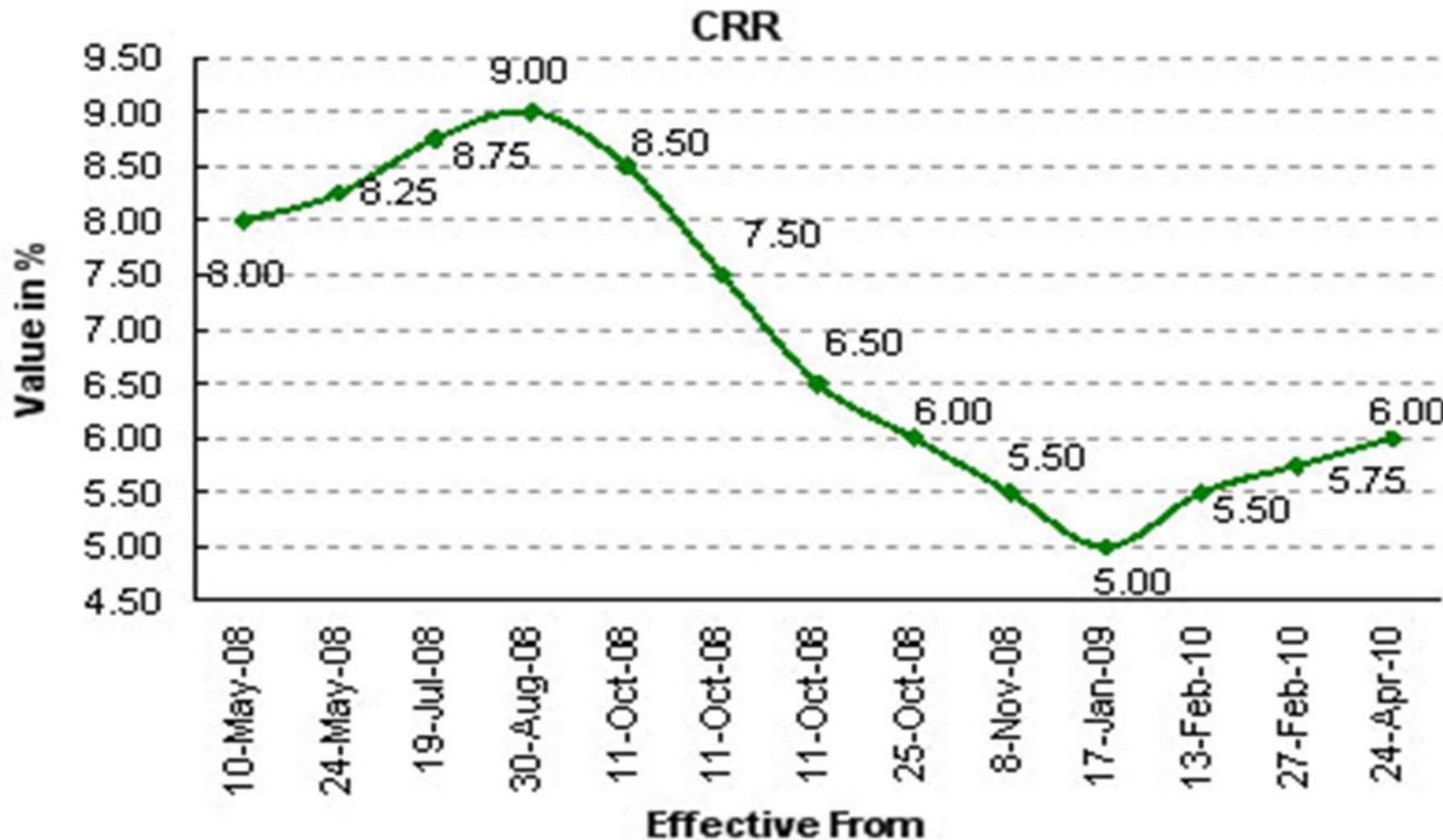
A fall in the bank rate similarly leads to a lowering of the lending rates of commercial banks which, in turn, leads to an expansion of bank credit.

CRR (***Cash Reserve Ratio***) refers to a portion of deposits (as cash) which banks have to keep with the RBI. This serves two purposes: it ensures that a portion of bank deposits is totally risk free; and secondly, *it enables the RBI to control liquidity in the economy, and thereby inflation.*

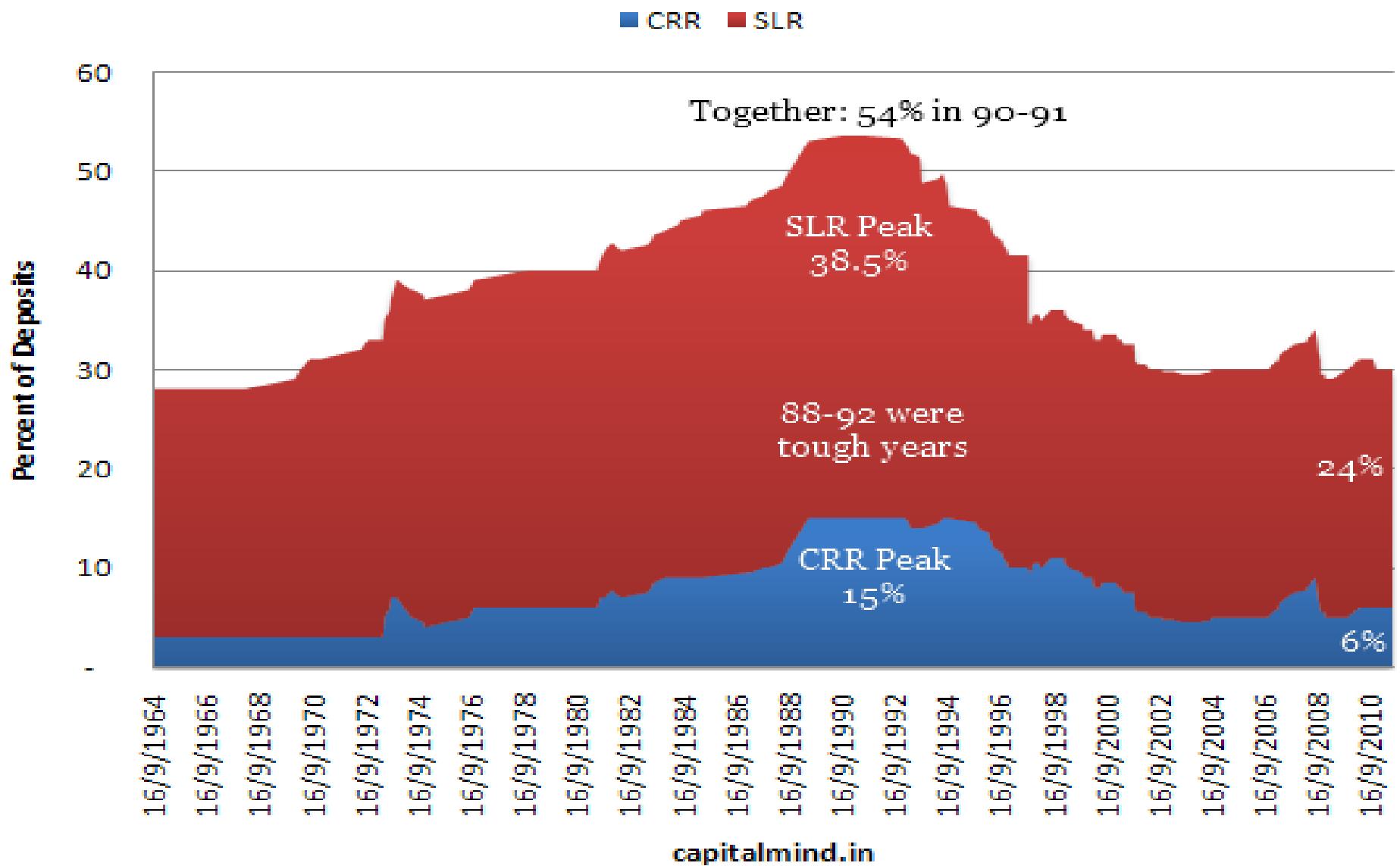
Note that cut (increase) in CRR means more (less) money in terms of loan chasing the same number of borrowers, hence interest rate comes down (goes up).

Banks are also required to invest in government securities as a part of their SLR (***Statutory Liquidity Ratio***) requirements. The government securities (also known as gilt-edged securities or gilts) are bonds (e.g., IDBI, UTI bonds) issued by the Central government to meet its revenue requirements.

CRR MOVEMENTS IN INDIA



CRR and SLR in India: A Historical Chart



RBI'S INTEREST PAYMENT ON CRR

Chiefs of large commercial banks had decided to make a case to the RBI for interest payment on the CRR. Unlike in the past, the Central Bank does not pay any interest on the CRR, the slice of deposits that banks have to park with the RBI.

Source: **Economic Times, Nov. 3, 2007.**

RBI dy guv snubs SBI chief on CRR

Kancheepuram (TN): A top Reserve Bank of India (RBI) official on Monday snubbed State Bank of India (SBI) chairman Pratip K Chaudhuri for his remarks suggesting abolition of cash reserve ratio (CRR), bluntly telling him that he has to find "some other place" if he could not work as per the central bank's regulatory environment.

"If the SBI chairman is not able to do business as per our regulatory environment, he has to find some other place," RBI deputy governor K C Chakrabarty said in a sharp reaction to Chaudhuri's recent comments that CRR does not help anybody and it was unfairly put on banks. Chakrabarty was responding to a question by a student of Great Lakes Institute of Management near here during its

If SBI chairman is not able to do business as per our regulatory environment, he has to find some other place



K C Chakrabarty |
RBI DY GOVERNOR

third annual financial conference "Systemic Risk".

To another query as to "which banking tree needed to be protected", Chakrabarty, drawing an analogy to forest fire, said: "Obviously it is the SBI. SBI is too big a tree. If you fail to protect (the) SBI tree, it (the fire) may spread to other banks and it will turn out to be

Times View: Remarks are in bad taste

The RBI deputy governor's reported remarks on the SBI chairman are in bad taste. The issue here is not whether the SBI chief has a point when he says that cash-reserve requirements on banks are an unfair imposition considering there is no such demand from insurance firms, non-banking financial companies and mutual funds. The RBI deputy governor would have been well within his rights in disagreeing. Where he has gone overboard is in suggesting that the SBI chairman can work somewhere else if he does not like the RBI's regulatory framework. A regulator, especially one like the RBI that prides itself on its independence, should have the tolerance to hear its decisions being questioned by stakeholders. Flying off the handle at any dissent is unwarranted.

a systemic failure."

CRR is the amount of deposits banks keep with RBI in cash. Chaudhuri had questioned why the CRR requirement was not applied to insurance companies, non-banking financial companies and mutual funds, who are also mobilizing public deposits. "CRR

doesn't help anybody and it is unfairly put on the banks," the chief of the country's largest public sector SBI had said last week.

Keeping required funds with the RBI without any interest was costing the banking system about Rs 21,000 crore, Chaudhuri had said. AGENCIES

Source: TOI, Mumbai Edition, 28th August, 2012

REPO & REVERSE REPO

A **repo** is a **repurchase agreement**. Under a repo transaction, the bank sells government securities to the RBI bank with an agreement to repurchase (buyback) the same securities at a predetermined date. The **reverse repo is the mirror image of repo transaction.**

SBI

Selling government securities to RBI with an agreement of repurchasing (buying back) them within 14 days. Therefore, RBI buying the securities temporarily for a short-term.

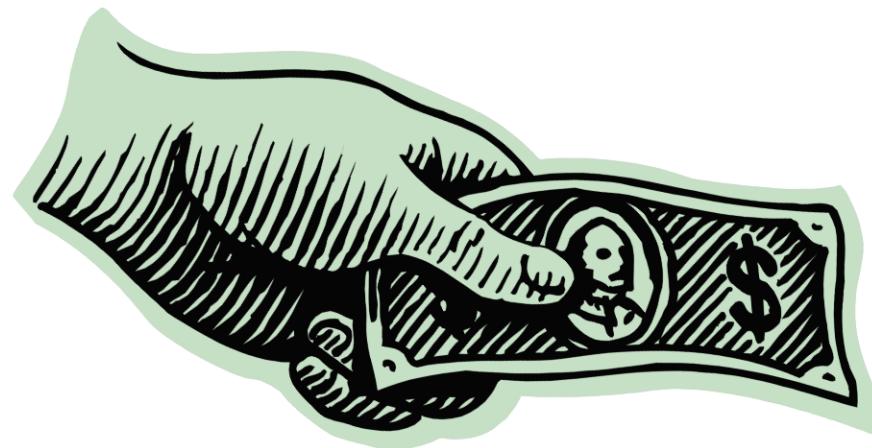
Repo: Injects Liquidity

SBI

Buying government securities from the RBI with an agreement of selling them back within 14 days. Therefore, RBI is selling the securities temporarily for a short-term.

Reverse Repo: Absorbs Liquidity

Demand For Money



THE DEMAND FOR MONEY

✖ The main concern is:

- + How much of your financial assets you want to hold in the form of money, which does not earn interest, versus how much you want to hold in interest-bearing securities.**

- + The demand for money is a demand for real balances.**

KEYNESIAN THEORY OF DEMAND FOR MONEY

THE TRANSACTIONS MOTIVE

- ✖ There exists a *trade-off* between the liquidity of money and the interest income offered by other kinds of assets.
- ✖ The *transactions motive* is the main reason that people hold money – to buy things.

TRANSACTIONS DEMAND FOR MONEY

Baumol (1952) & Tobin (1956)

Mr. A gets paid Rs. 1,800 per month. Mr. A spends his income evenly over the month (Rs. 60 per day).

Case I A holds Rs. 1,800 in cash and spend Rs. 60 per day.

Case II A keeps with him Rs. 60 for the first day and keeps the rest Rs. 1740 in bank as savings.

In this case then A will have to go to bank each and every day to withdraw Rs. 60 for that particular day.

Benefit: Mr. A earns interest on money retained with the bank each day by keeping less money with himself.

Cost: Time cost, transaction cost and inconvenience of the trips to the bank each and every day.

The more the number of trips to the bank, means the less individual A hold money with him and larger the amount of interest earnings.

$$\text{Real Money Balance} \left(\frac{M^d}{P} \right) = L(Y, r)$$

where $L_Y > 0$ and $L_r < 0$

The higher the interest rate, more money to be parked with the banks and less money to be hold in hands for transactions purposes.

$$\text{Real Money Balance} \left(\frac{M^d}{P} \right) = L = k Y - \kappa r \quad k, \kappa > 0$$

'Y' being the money income and 'r' being the interest rate.

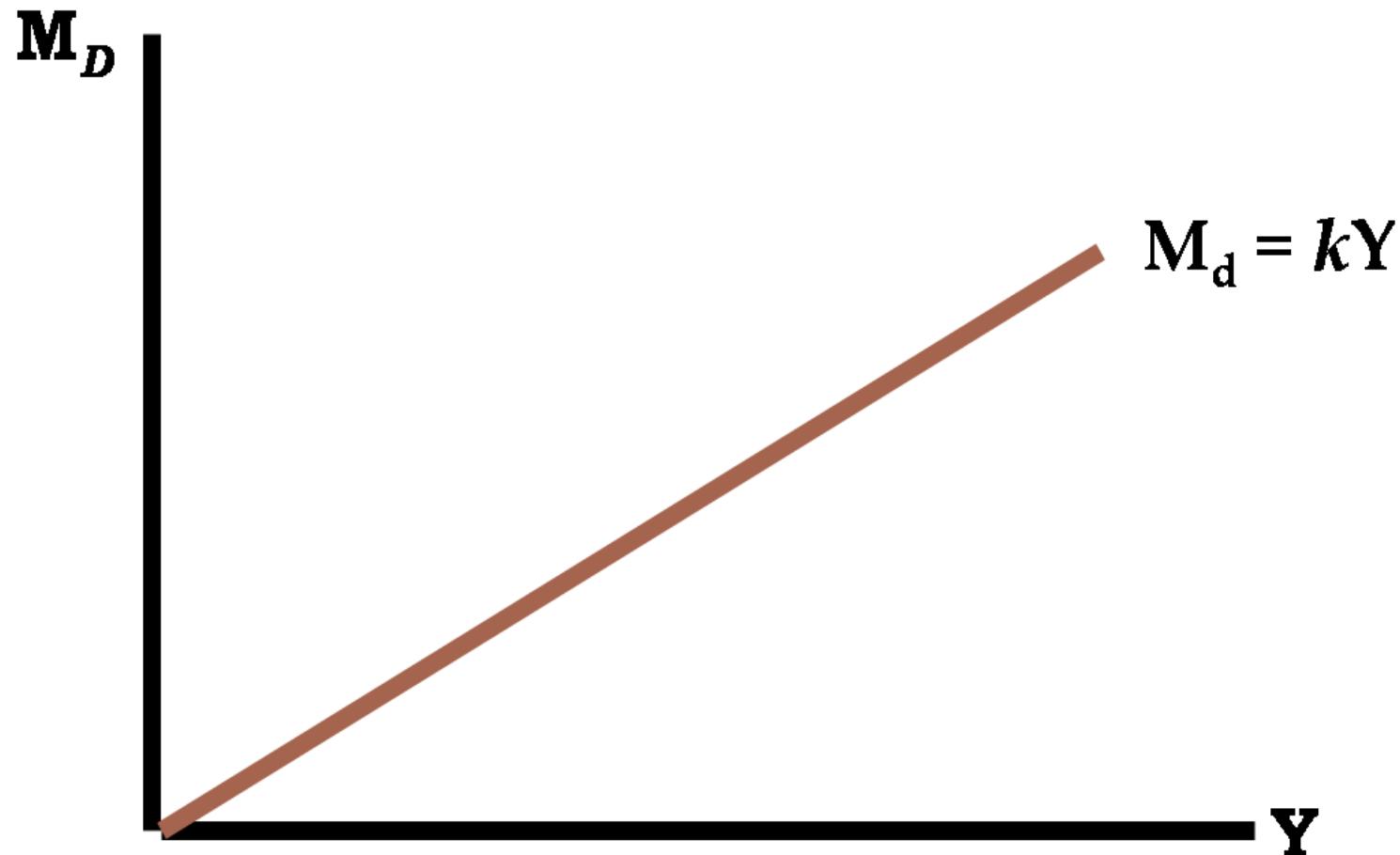
BOND PRICE AND INTEREST RATE

A bond of Rs. 1000 is issued for five years with a 5% interest rate, paid yearly. Then interest rate rises to 6%.

- ✖ If you want to sell this bond, who would buy it when it is paying 1% below market rates (5% vs. 6%)? You have to sweeten the deal so the buyer gets a market rate for the bond.

- ✖ You can't change the interest rate on the bond. That's fixed at 5%. You can, however, change the price you will take for the bond.

Money Demand and Income



WALRAS' LAW

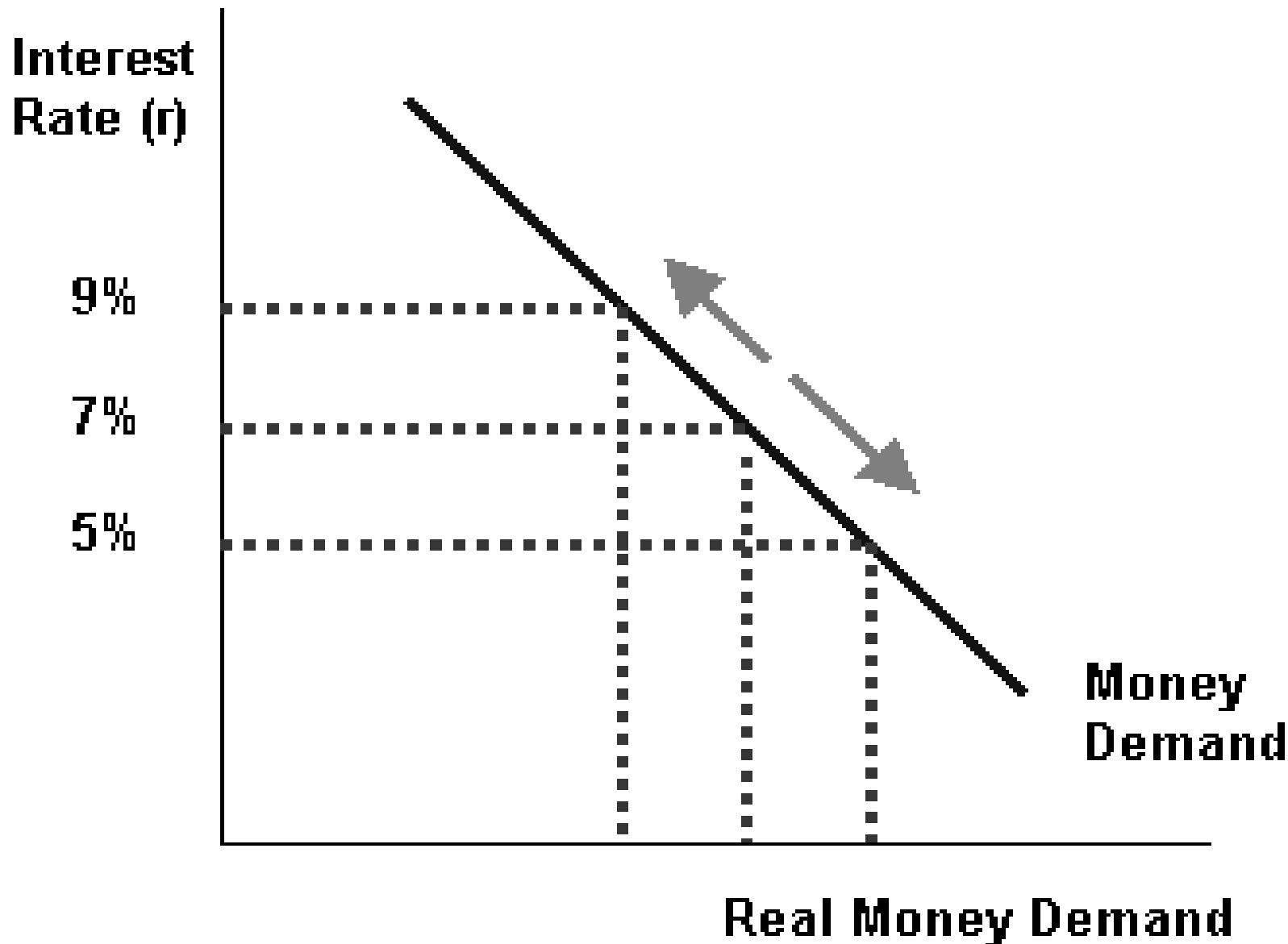
In an economy of n markets, when $(n-1)$ markets clear, the n^{th} market will also be in equilibrium.

Total supply of money and bonds [$M+B$] must be equal to the total demand for money and bonds ($M^D + B^D$), since people who are trying to sell bonds are trying to obtain money.

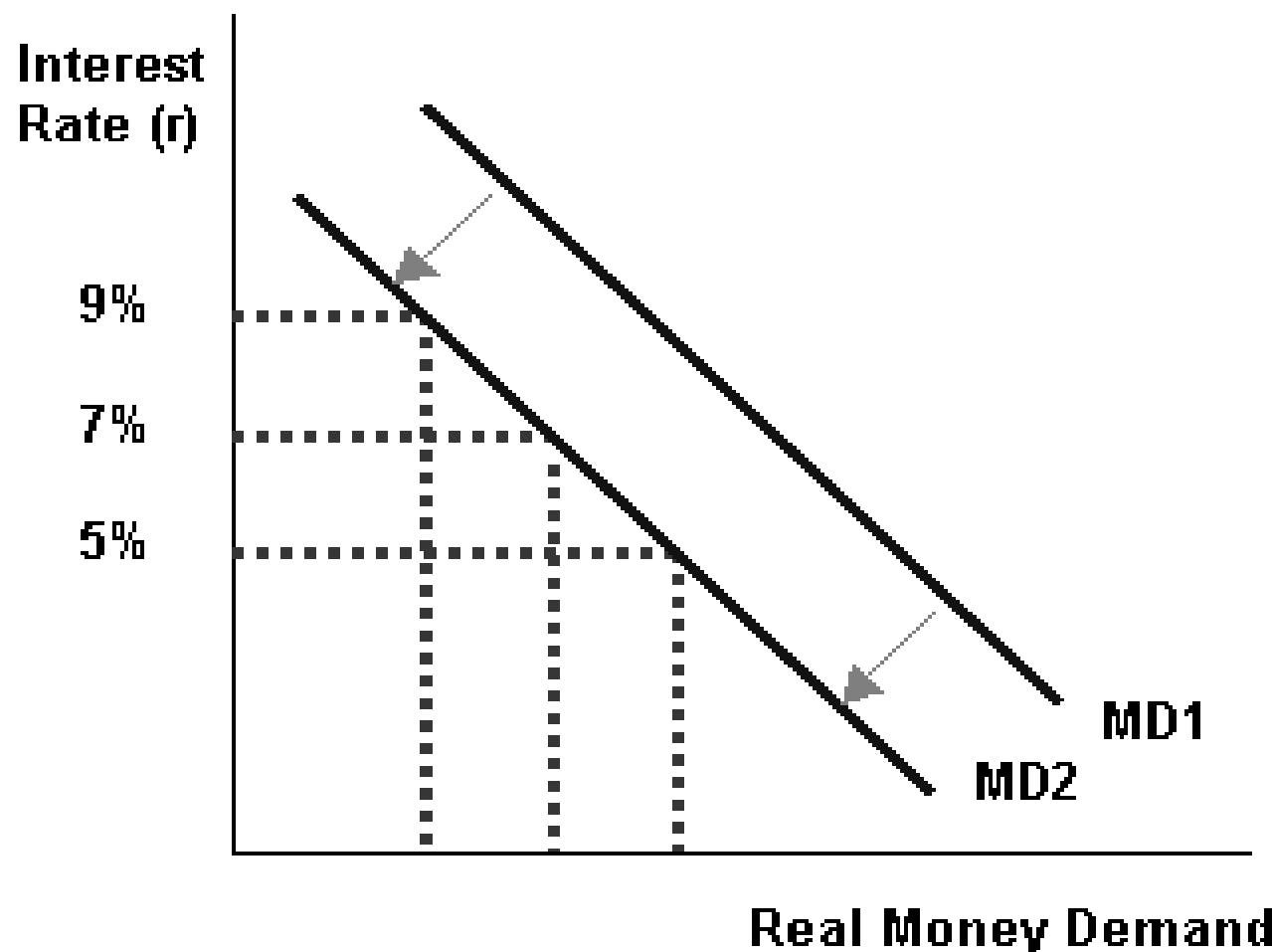
$$M + B = M^D + B^D$$

or $(M^D - M) + (B^D - B) = 0$

If there is an excess demand for money, there must be an excess supply of bonds.



Financial Innovation and Demand for Money



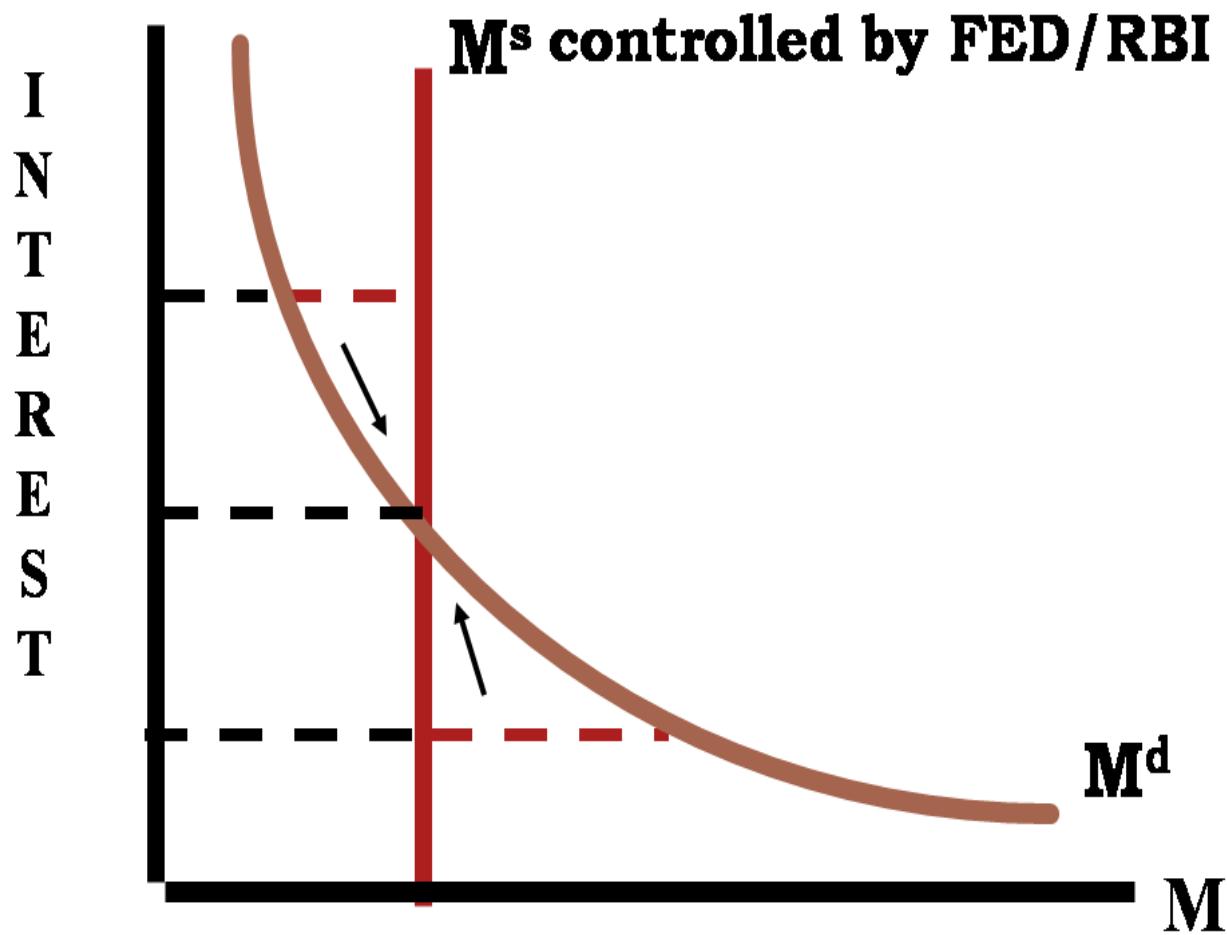
THE PRECAUTIONARY MOTIVE

- ✖ Cash balances held in case of unforeseen outlays, essentially of a transaction nature (e.g. *unforeseen medical bill*).
- ✖ People hold money because they can't anticipate every need, there is uncertainty, so they hold more.

SPECULATIVE DEMAND FOR MONEY

- ✖ Speculation = buying an asset in the hopes that its price will rise, e.g., a bond.
- ✖ Bond price vary inversely with interest rate, i.e., *if interest rate rises, bond price falls.*
- ✖ So, lower the interest rate, the more you might expect them to rise and bond prices to fall, so you would hold fewer bonds and more money.

EQUILIBRIUM INTEREST RATE



Expand supply of money to decrease interest rate

Interest rate

M^s

M^s

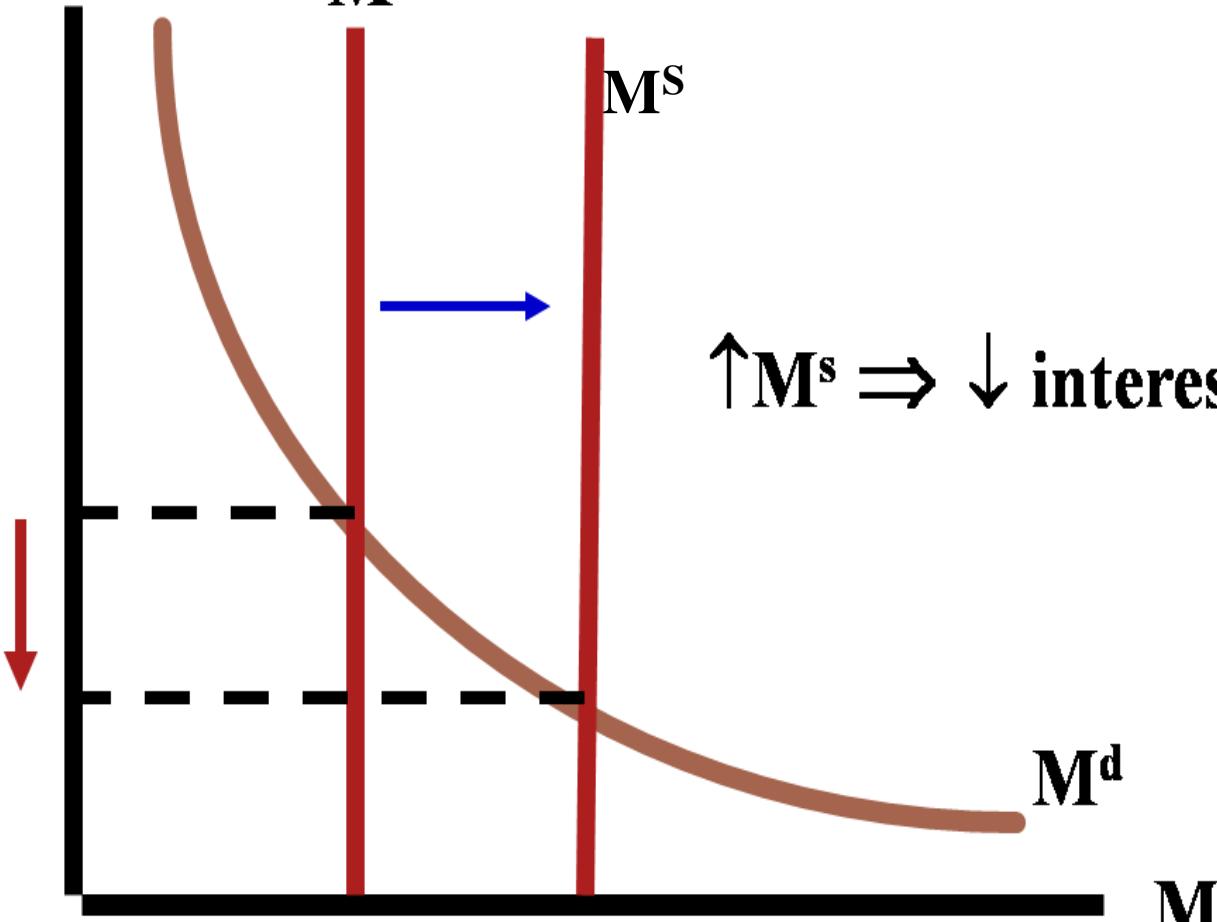


$\uparrow M^s \Rightarrow \downarrow \text{interest rate}$

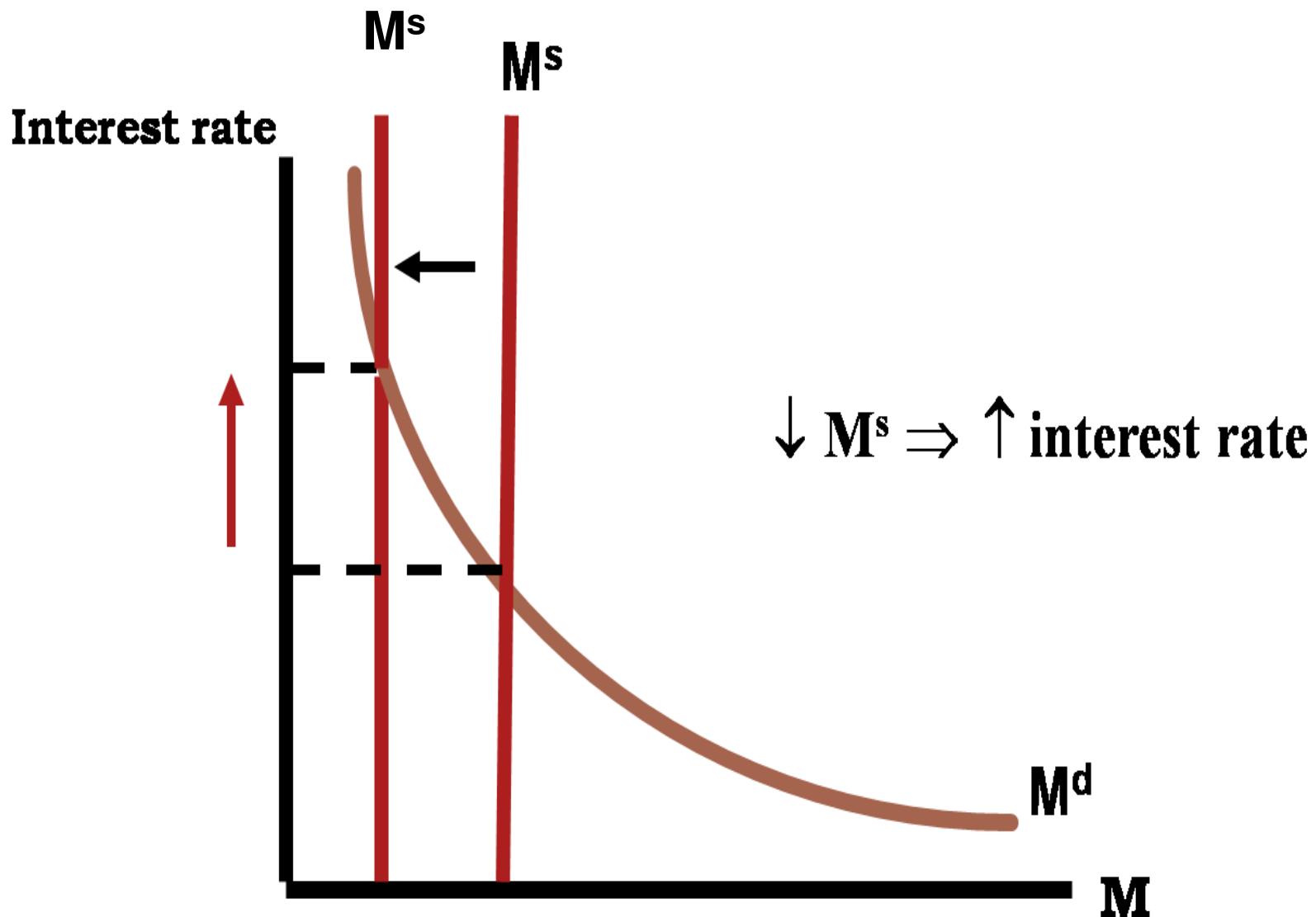


M^d

M



Contract supply of money to increase interest rate



- ✖ *Tight monetary policy* refers to the Fed/RBI policies that **contract the money supply** in an effort to **restrain** the economy.
- ✖ *Easy monetary policy* refers to the Fed/RBI policies that **expand the money supply** in an effort to **stimulate** the economy.

THE CLASSICAL VIEW

THE QUANTITY THEORY OF MONEY

$$M^S \times V = P \times Y$$

Money Supply \times Velocity[†] = Price \times Output

Classicalists assumed V and Y to be fixed.

Therefore, *price level is proportional to the money stock.*

[†] It measures the rate at which money circulates in the economy.

Thus, the *classical* QTM states that the Central Bank, which controls the money supply, has ultimate control over inflation.

If the Central Bank keeps the money supply stable, then price level will be stable.

If the Central Bank increases the money supply rapidly, the price level will rise rapidly.