

2-1

Look for the answers to these questions:

- How is unemployment measured?
- What is the “natural rate of unemployment”?
- Why are there always some people unemployed?
- How is unemployment affected by unions and minimum wage laws?
- What is the theory of efficiency wages, and how does it help explain unemployment?

1

2-2

Measuring Unemployment

- ❑ Unemployment Rate is the statistic that measures the percentage of people who want to work but do not have jobs – reflecting performance of the economy.
- ❑ To find unemployment rate, we need to know
 - number of people who want to work
 - what portion of them does not have work``

2-3

Measuring Unemployment

- ❑ **Labor force** is defined as the sum of the employed and unemployed
- ❑ **unemployment rate** is defined as the percentage of the labor force that is unemployed.
- ❑ **Labor force participation rate** is the percentage of the adult population who are in the labor force.

$$\text{Unemployment Rate} = \frac{\text{Number of Unemployed}}{\text{Labor Force}} \times 100$$

$$\text{Labor-Force Participation Rate} = \frac{\text{Labor Force}}{\text{Adult Population}} \times 100$$

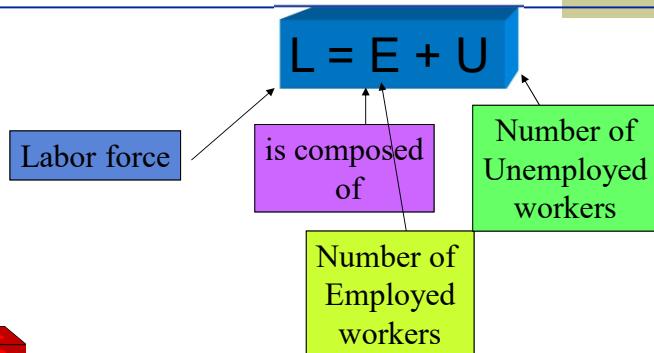
2-4

Natural Rate of Unemployment

- ❑ The average rate of unemployment around which the economy fluctuates is called the **natural rate of unemployment**.
- ❑ The natural rate is the rate of unemployment towards which the economy gravitates in the long run.

2-5

Job Loss, Job Finding and the Natural Rate of Unemployment

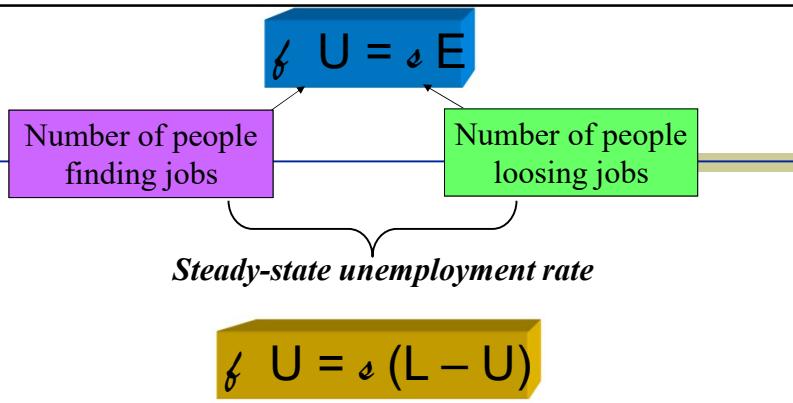


2-6

Job Loss, Job Finding and the Natural Rate of Unemployment

- ❑ Labor market in steady state (i.e Unemployment Rate neither falls nor rises)
- ❑ No. of people finding job = number of people losing jobs
 - ❖ The number of people finding jobs = fU (f denotes the rate of job finding)
 - ❖ The number of people losing jobs = sE (s job separation rate)
- ❑ Thus in steady state,
 $fU = sE$

2-7



Dividing both sides by L and to obtain:

$$U/L = s / (s +$$

Solving for U/L for find :

$$U/L = s / (s +$$

2-8

Natural Rate of Unemployment - Example

$$U/L = s / (s +$$

□ Suppose 1% of employed lose their jobs every month (s = 0.01)

□ Assuming 20% of unemployed find job each month (i.e., f = 0.2)

The steady state rate of unemployment will be:

$$\begin{aligned} \diamond U/L &= s/(s+f) = 0.01/(0.01+0.2) = 0.01/0.21 \\ &= 0.0476 \end{aligned}$$

❖ The rate of unemployment $\approx 5\%$

2-9

Job Search and Frictional Unemployment

- ❑ The unemployment caused by the time it takes workers to search for a job is called ***frictional unemployment***.
- ❑ Economists call a change in the composition of demand among industries or regions a ***sectoral shift***.
- ❑ Since sectoral shifts are always occurring, and because it takes time for workers to change sectors, there is always frictional unemployment.
- ❑ In trying to reduce frictional unemployment, some policies inadvertently ↑ the amount of frictional unemployment.
- ❑ One such program is called ***unemployment insurance***.
- ❑ In this program, workers can collect a fraction of their wages for a certain period after losing their job.

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Real-Wage Rigidity and Structural Unemployment

- ❑ ***Wage rigidity*** is the failure of wages to adjust until labor supply equals labor demand.
- ❑ In eqbm model of labour market, real wage adjusts to equilibrate supply & demand. Yet wages are not flexible.
- ❑ Sometimes, real wage is stuck about the market clearing level.
- ❑ The unemployment resulting from wage rigidity and job rationing is called ***structural unemployment***.
- ❑ Workers are unemployed not because they can't find a job that best suits their skills, but rather, at the going wage, the supply of labor exceeds the demand.
- ❑ These workers are simply waiting for jobs to become available.

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POLICY IMPLICATION

- Any policy aimed at lowering the natural rate of unemployment must either
 - ❖ reduce the *rate of job separation* or
 - ❖ increase the *rate of job finding*.
- Similarly, any policy that affects the rate of job separation or job finding also changes natural rate of unemployment.

WHY is there unemployment in the first place?

TWO REASONS: Job Search and Wage Rigidity

2-12 <http://www.ndtv.com/india-news/quotable-quotes-of-the-obama-visit-438595> accessed on May 6 2016



Quotable quotes of the Obama visit

[India](#) | [NDTV Correspondent](#) | Updated: Nov. 08, 2010 19:53 IST

New Delhi: US President Barack Obama is on a four-day presidential visit to India. During the trip, Obama got over 50,000 jobs for Americans, wooed India Inc, interacted with India's Gen Next and addressed the Indian Parliament. We take a look at some of the quotable quotes from this visit:

- When American people ask me why you are visiting India, I want to say that look India just created 50,000 jobs and so we should not be talking about protectionism – Obama

2-13

Causes of Real-Wage Rigidity

- Minimum Wage Laws*
- Monopoly power of Unions*
- Efficiency Wages*

2-14

Union membership as a %age of Employment

| Country | % Union Workers |
|-------------|-----------------|
| Sweden | 84 |
| Denmark | 75 |
| Italy | 47 |
| UK | 41 |
| Australia | 34 |
| Canada | 33 |
| Germany | 33 |
| Netherlands | 28 |
| Switzerland | 28 |
| Japan | 26 |
| US | 16 |
| France | 11 |

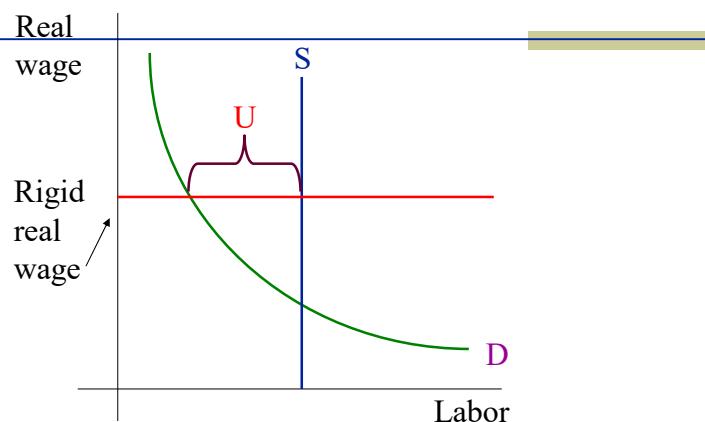
2-15

Efficiency Wage

- ❑ Efficiency-wage theories - wage rigidity.
- ❑ Efficiency-wage theories hold that high wages make workers more productive.
- ❑ So, though a wage reduction would lower a firm's wage bill, it would also lower worker productivity and the firm's profits.
- ❑ Four different theories:
 - ❖ Theory 1 – mostly in developing countries
 - Wage influence nutrition
 - Better paid workers can afford more nutritious diet
 - healthier workers more productive
- ⇒ Firm can pay > equilibrium m wage to maintain healthy work

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Real-Wage Rigidity and Structural Unemployment



- ❑ If the real wage is stuck above the equilibrium level, then the supply of labor exceeds the demand.
- ❑ Result: **unemployment U.**

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Efficiency Wages

❑ Theory 2: High wages reduce labor turnover.

- Higher pay ↑ workers' incentive to stay with the firm
- this ↓ hiring and training costs.

❑ Theory 3: Average quality of a firm's workforce depends on the wage it pays to its employees.

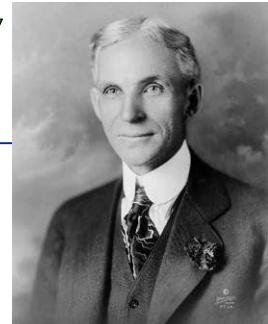
- If a firm ↓ its wage, best employees may take jobs elsewhere – leaving firm with inferior employees.
- **Adverse Selection problem .**

❑ Theory 4: A high wage improves worker effort.

- Firm cannot monitor its employee – **moral hazard problem**
- Higher the wage, greater the cost to worker of getting fired.

2-18

Henry Ford's \$5 workday



- ❑ In 1914 Ford Motor company started paying \$5 per day against prevailing \$2 or \$3 wage.

❑ **Outcome – Long queue outside Ford plant to get job.**

- According to Ford “The payment of 5\$ a day for an 8 hrs day was one of the finest cost cutting moves we ever made.”

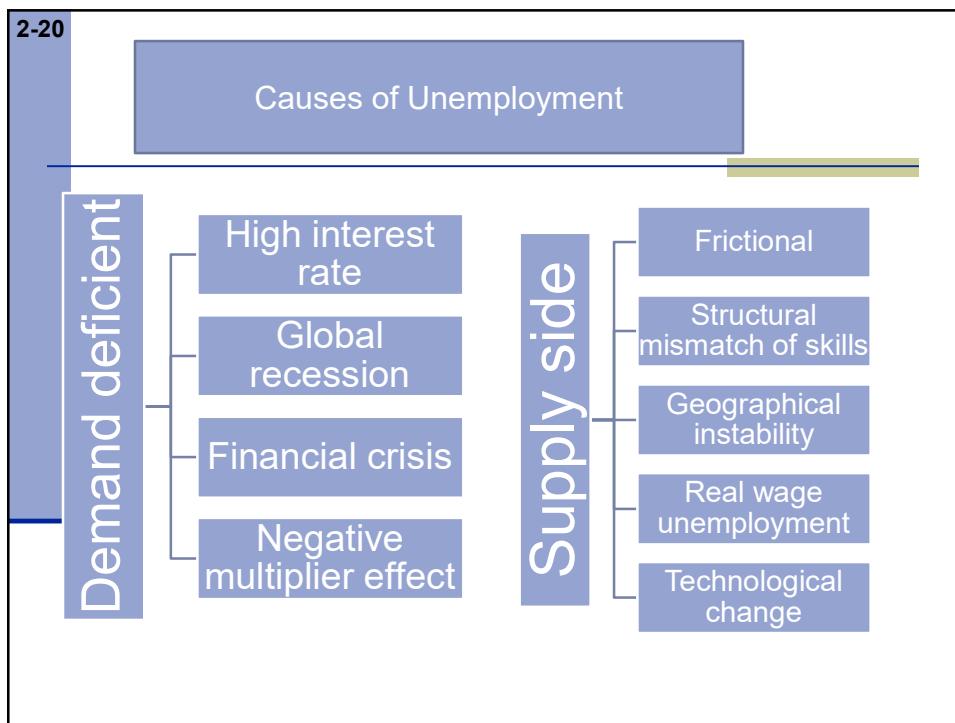
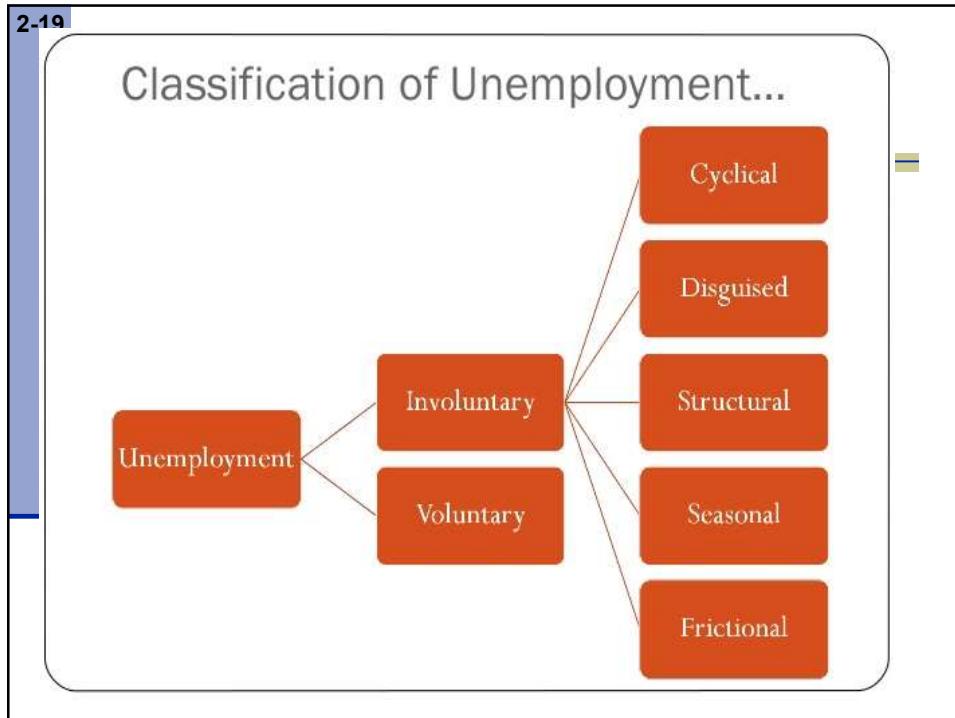
- ❑ From traditional economic theory – Ford's explanation seems peculiar.

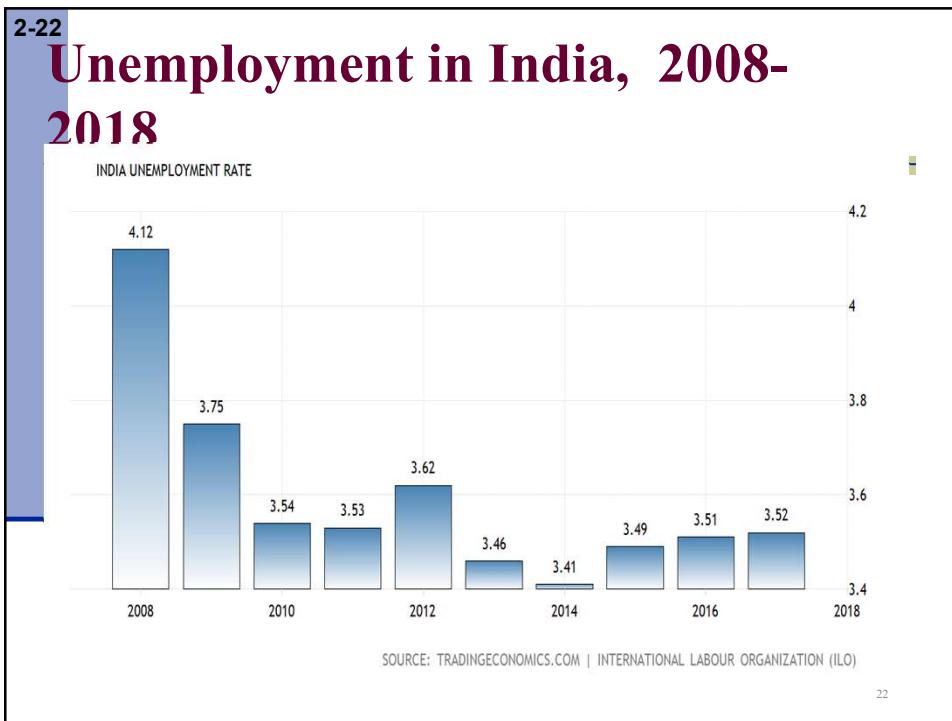
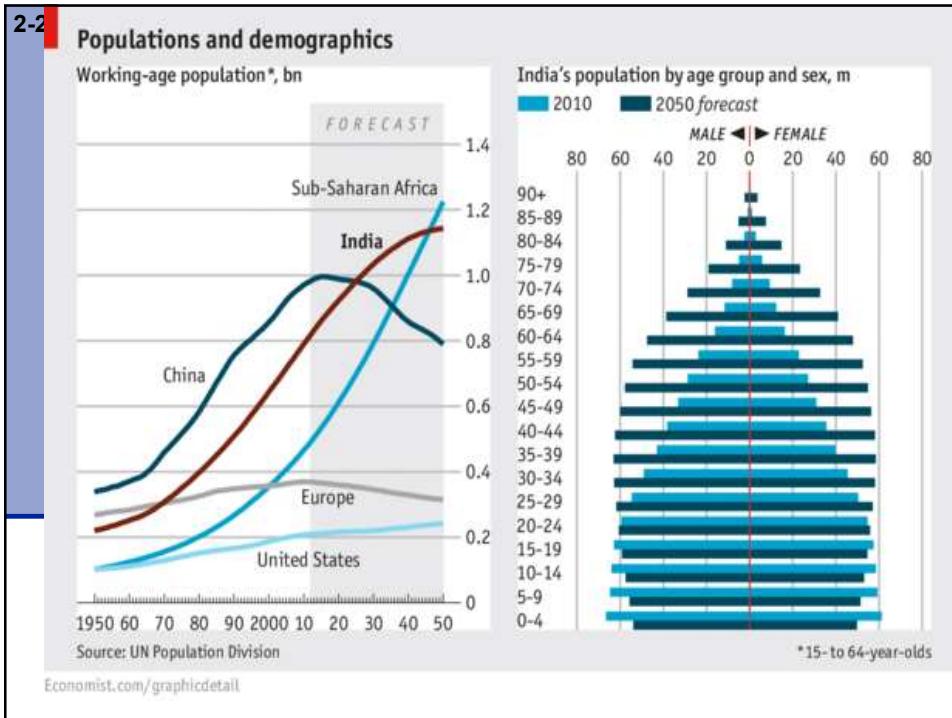
- ❑ He was suggesting that high wages imply low costs.
⇒ Perhaps he discovered Efficiency-Wage Theory.

❖ **Outcome: Increase in firm's productivity.**

↓ Absenteeism (fell by 75%)

↓ Shop floor costs





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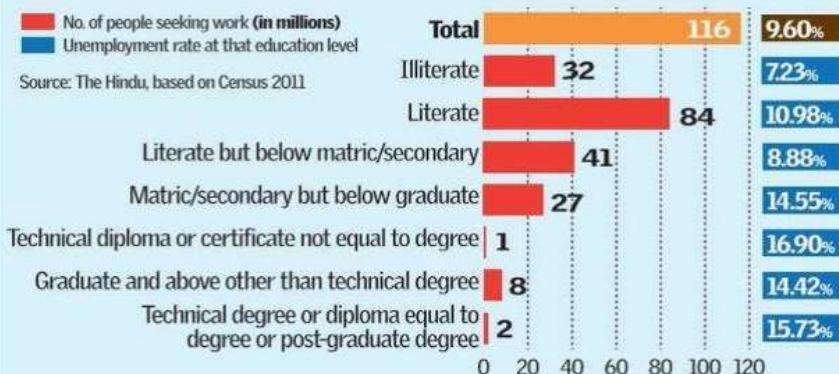
THE HINDU

WHO ARE INDIA'S UNEMPLOYED?

Data emerging from Census 2011 suggest unemployment rate is high among the better qualified

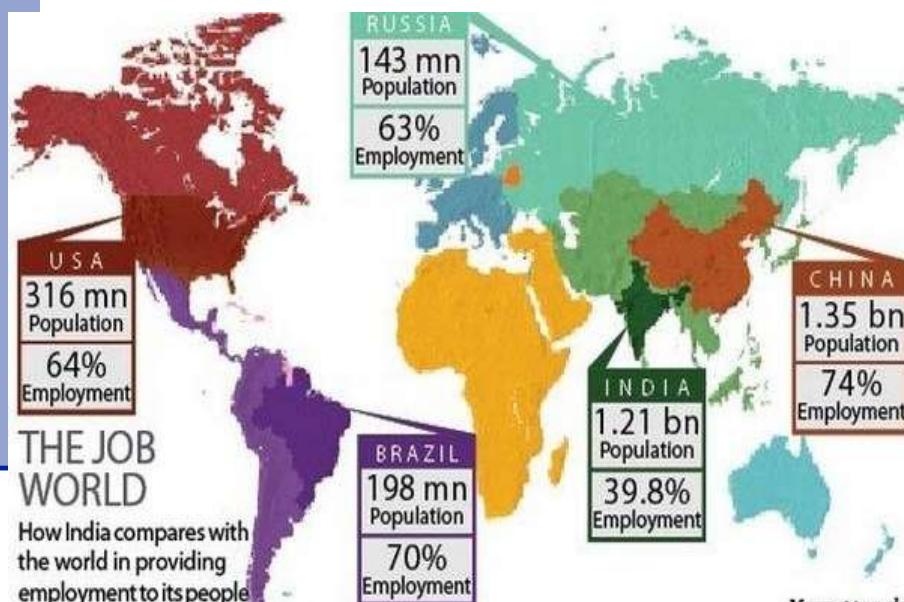
No. of people seeking work (in millions)
Unemployment rate at that education level

Source: The Hindu, based on Census 2011

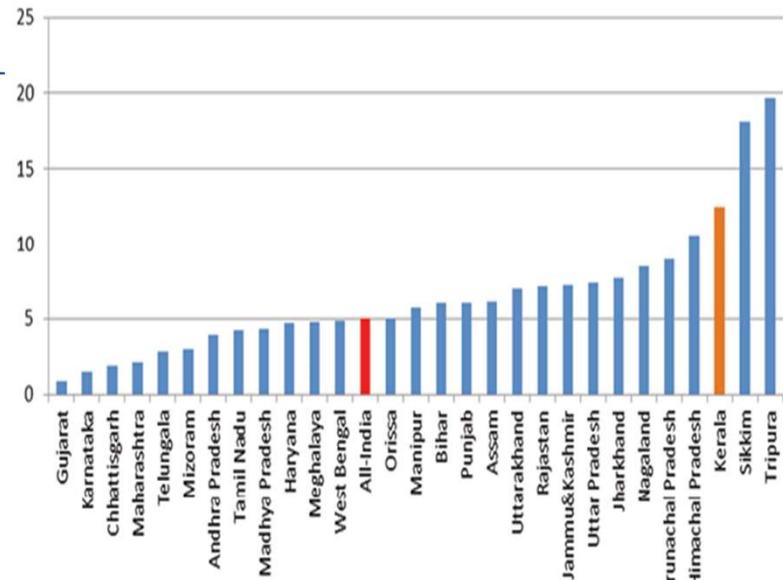


0 20 40 60 80 100 120

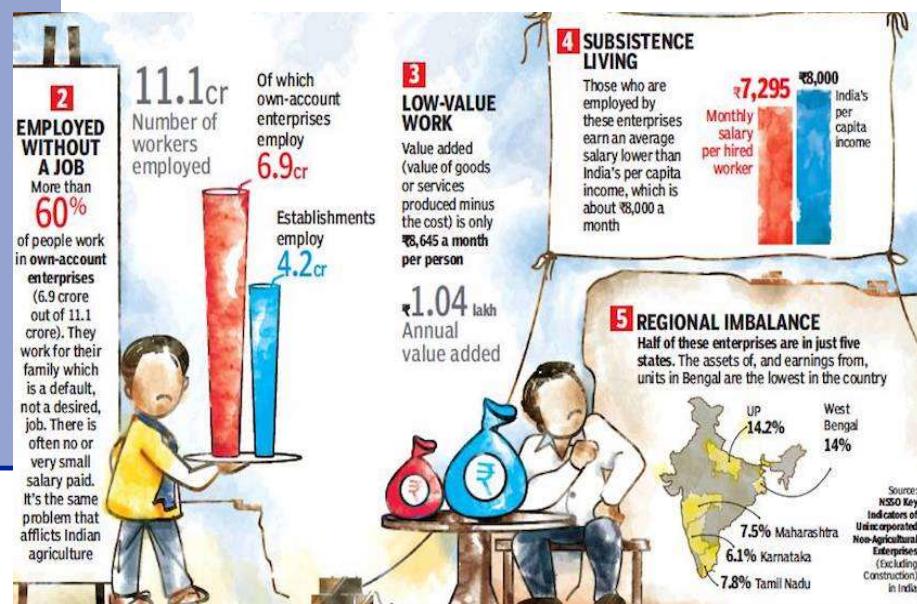
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“UNEMPLOYABILITY” = A BIGGER PROBLEM THAN UNEMPLOYMENT

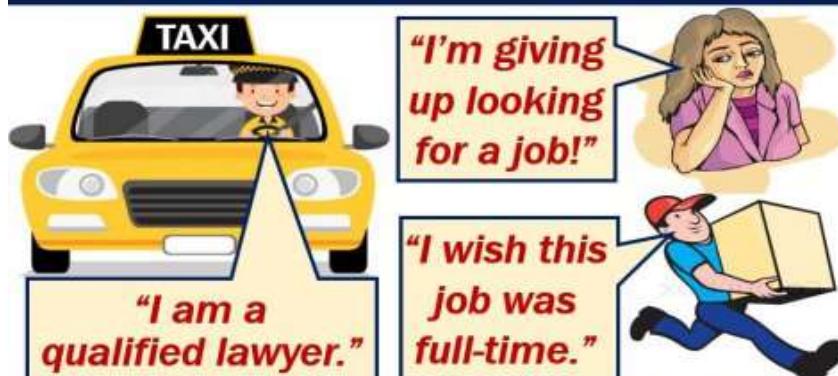
INTRIGUING FACTS:

MORE THAN
50 LAKH
 STUDENTS
 GRADUATE PER YEAR
 VERY FEW ARE FIT TO BE EMPLOYED.

MORE THAN
50 %
 OF INDIAN GRADUATES LACK
 BASIC EMPLOYABILITY SKILLS

2-28

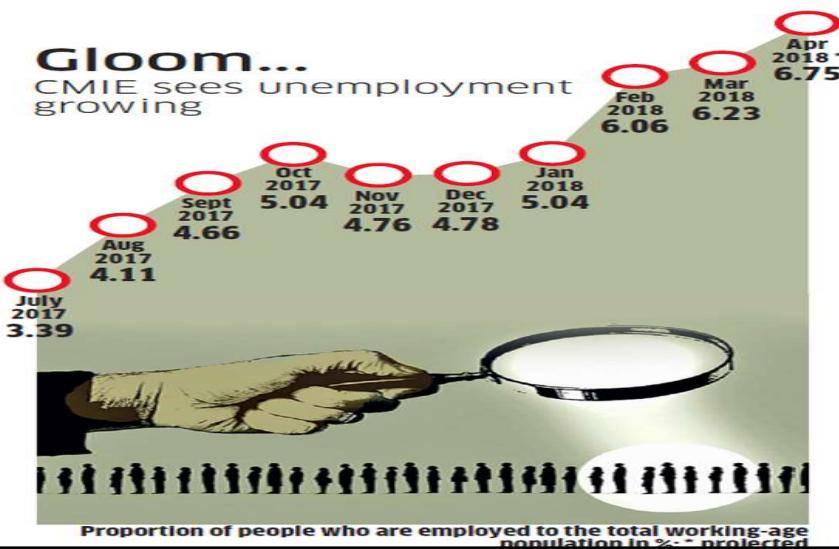
What is Hidden Unemployment?



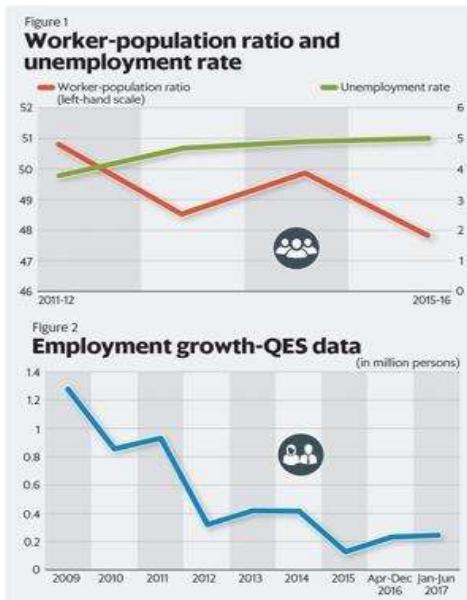
Unemployed people not registered in official statistic.
 Underemployed people. Skilled people in low-skilled jobs.

2-29

The sharp debate on jobs data shows govt may arrive at a process for understanding India's labour market. Read more at:
[/economictimes.indiatimes.com/articleshow/64045032.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst](http://economictimes.indiatimes.com/articleshow/64045032.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst)



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You have the **RIGHT TO WORK!**



Under EGA, you have the right to
100 days employment
in a year, for each family
within 5 km of your residence
within 15 days from application
on local development project

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THE SKILL GAP IN INDIA (2022)



Source: IMaCS, Aon Hewitt & NSDC



National Institute of Technical Teachers Training and Research, Chandigarh
 (Ministry of Human Resource Development, Government of India)

नाश्तीय गतिविधि शिक्षक प्रशिक्षण एवं अनुग्रहान शोध्यान चैक्यांग

2-33

Alternative Measures of Labour Underutilization

| | Definition | % in Mar 2001 |
|----|--|------------------|
| U1 | Persons employed 15 weeks or more / total labour force (includes only very long term unemployed) | 1.2 |
| U2 | Job losers & persons completed temporary jobs, as a % of labor force (excludes job leavers) | 2.4 |
| U3 | Total unemployed as a % of labour force (official unemployment rate) | 4.6 |
| U4 | (Total unemployed + discouraged) / (labour force + discouraged) | 4.8 |
| U5 | (Total unemployed + marginally attached) / (labour force + marginally attached) | 5.3 |
| U6 | (Total unemployed + marginally attached + employed part time) / (labour force + marginally attached) | 7.6 |

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Okun's Law Unemployment & GDP relation

Note: Employed workers help to produce goods and services, and unemployed workers do not.

⇒ ↑ In unemployment rate should be associated with ↓ in real GDP.

❑ The negative relationship between unemployment and GDP is called **Okun's Law**, after Arthur Okun, the economist who first studied it.

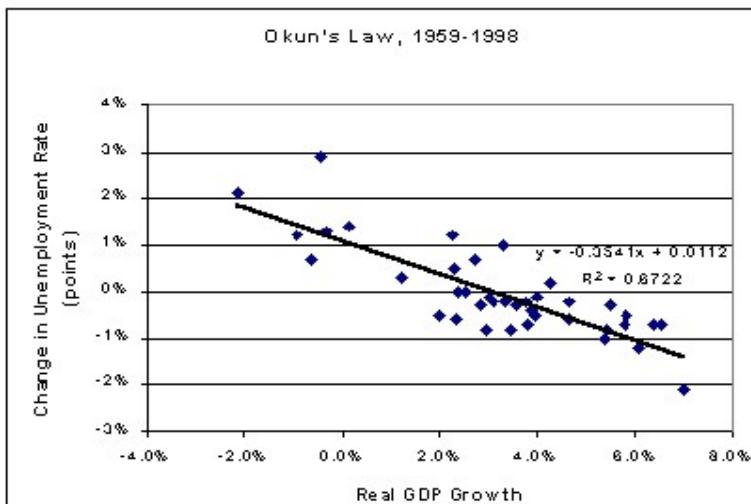
❑ It is defined as:

Percentage Change in Real GDP =

Relation between Real GDP & Unemployment – 2 × the
Change in the Unemployment Rate

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Okun's Law



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Okun's Law

Ex.: If the past relation between Real GDP & Unemployment Rate is 3% (found out for US economy during 1959-1998), then

Percentage Change in Real GDP =

$$3\% - 2 \times \text{the Change in the Unemployment Rate}$$

- If the unemployment rate remains the same, real GDP grows by about 3%
- For every percentage point the unemployment rate rises, real GDP growth typically falls by 2%.
- If the unemployment rate rises from 6% to 8%, then real GDP growth would be:

$$\text{%age Change in Real GDP} = 3\% - 2 \times (8\% - 6\%) = -1\%$$

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GDP as welfare measure?

Two Issues:

- ❑ Does GDP correctly measure production?
- ❑ Is production a good proxy for welfare?

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I. Problems in GDP Measurement -

■ Underground economic activity

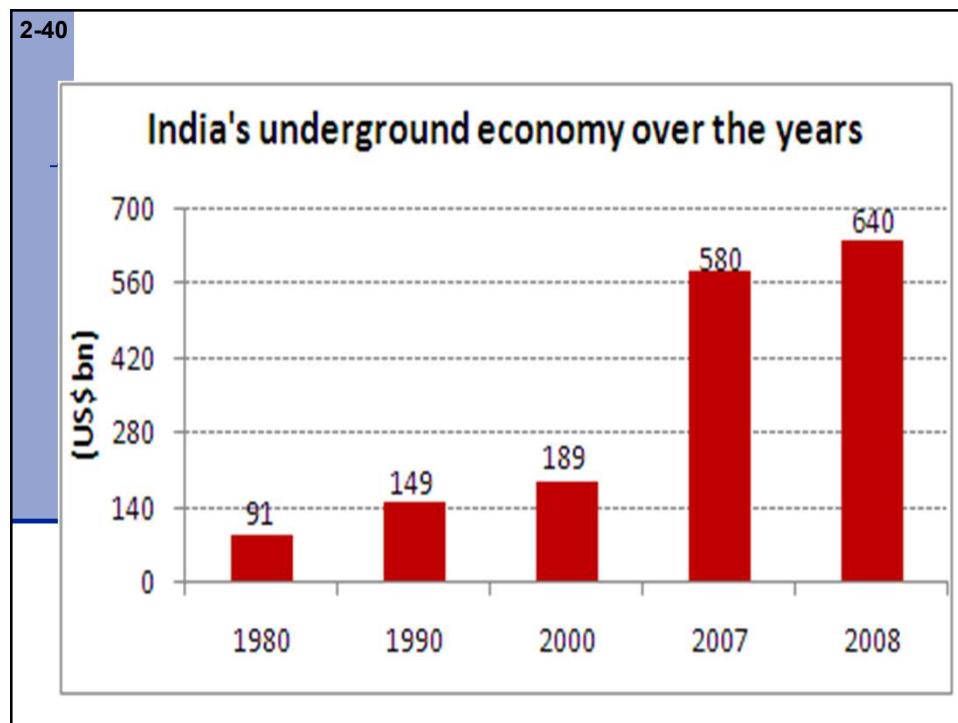
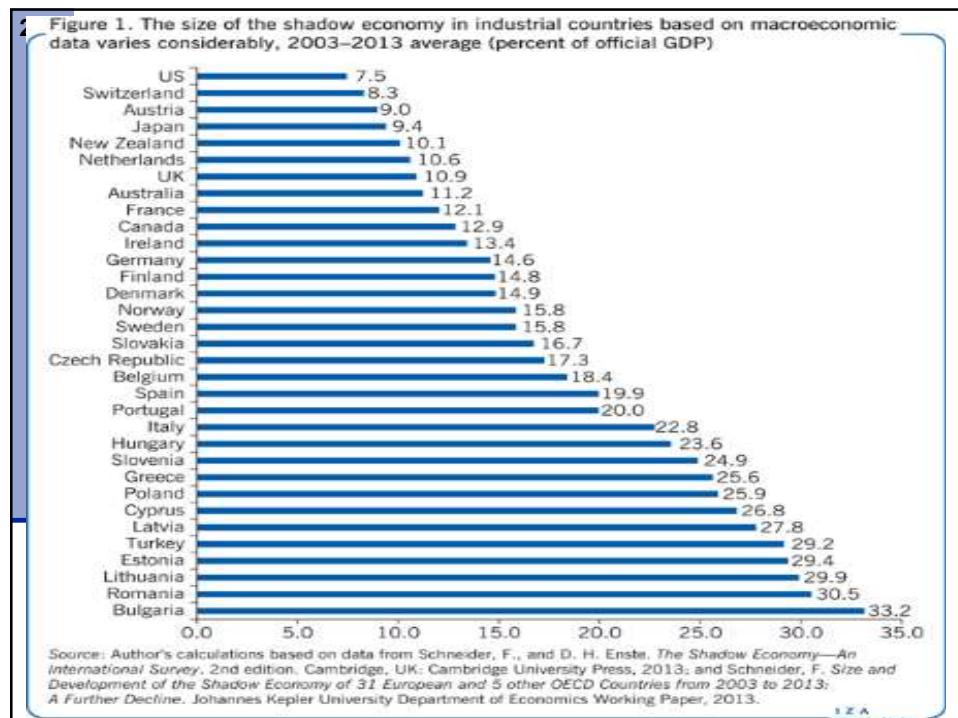
- ❑ Illegal activities (Middleman or facilitator???)

(Gas, Passport, License, NOC, Affidavit etc.)

- ❑ Tax avoidance (10% of earning population paying tax)

- ❑ Assets Hoarding (e.g., Gold)

Note: Problem primarily in developing countries like India



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Black money estimates in India

| | Year/ period | Amount (\$ bn) | % of GDP |
|---|-----------------|-------------------|-------------|
| Domestic tax evaded Income | | | |
| Wanchoo Committee | 1961 | 8 | 4.5 |
| Mr.O.P.Chopra (noted economist) | 1977 | 81 | 8.7 |
| National Institute of Public Finance & Policy | 1984 | 316-368 | 19-21 |
| World Bank | 2007 | 9019 | 21 |
| Offshore black money | | | |
| IMF & later revisions (flight of capital) | 1971-97 | 4400 | 31 |
| Swiss National Bank (only Swiss accounts) | 2012 | 90 | 0.1 |
| Global Financial Integrity | | | |
| Estimate Flight of capital | 1947-2010 | 11.6 | 17.9 |
| Estimate of Illicit assets | 2010 | 24350 | 37.6 |

Source: Jeffries May 2014 report on VDIS

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Underground Economy: Beneficial Or Subversive

The OECD countries underground economies ranged from 8 percent to 30 percent of their GDP.

| Countries | Percentage |
|-----------|---|
| India | 22 % to 50 % |
| Taiwan | 25 % to 45 % |
| Pakistan | 20 % to 50 % |
| Brazil | 7% in early 1980s and shot up to more than 100% by the early 1990s. |

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Problems with GDP – negative externalities



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Is production a good proxy for welfare?

- Growth vs. Development?
- Growth or HDI?
- Growth vs. Inequality
 - (GDP ↑ in most countries, median income ↓)
- GDI – Middle-east????
- H-Index ??????

2-45

NATIONAL

Estimates panel wants GDP norms changed



C.A. Sharad Raghavan

Sobhana K. Nair



NEW DELHI, OCTOBER 12, 2018 21:45 IST

- Committee noted that the GDP calculation doesn't measure the depletion of natural resources, a point several economists including former CEA Arvind Subramanian have pointed out.
- The report said the current measure of GDP did not incorporate the economic contributions of women in running households and maintaining accounts, nor did
- it have any measure of whether an increase in GDP resulted in an increase in happiness.
- "Whereas any rise in GDP growth requires utilisation of natural resources, their utilisation and depletion is not taken into account while measuring GDP."

<https://www.thehindu.com/news/national/estimates-panel-wants-gdp-norms-changed/article25208100.ece?homepage=true>

Savings and Investment

In this chapter,
look for the answers to these questions:

- What are the main types of financial institutions in the Indian economy, and what is their function?
- What are the three kinds of saving?
- What's the difference between saving and investment?
- How does the financial system coordinate saving and investment?
- How do govt policies affect saving, investment, and the interest rate?

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Financial Institutions

- The **financial system**: the group of institutions that helps match the saving of one person with the investment of another.
- **Financial markets**: institutions through which savers can directly provide funds to borrowers.
Examples:
 - The Bond Market.
A **bond** is a certificate of indebtedness.
 - The Stock Market.
A **stock** is a claim to partial ownership in a firm.

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Financial Institutions

- **Financial intermediaries:** institutions through which savers can indirectly provide funds to borrowers. Examples:
 - Banks
 - **Mutual funds** – institutions that sell shares to the public and use the proceeds to buy portfolios of stocks and bonds

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Different Kinds of Saving

Private saving

- = The portion of households' income that is not used for consumption or paying taxes
- = **$Y - T - C$**

Public saving

- = Tax revenue less government spending
- = **$T - G$**

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National Saving

National saving

$$= \text{private saving} + \text{public saving}$$

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

$$= \mathbf{Y} - \mathbf{C} - \mathbf{G}$$

= the portion of national income that is not used for consumption or government purchases

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Saving and Investment

Recall the national income accounting identity:

$$\mathbf{Y} = \mathbf{C} + \mathbf{I} + \mathbf{G} + \mathbf{NX}$$

For the rest of this chapter, focus on the closed economy case:

$$\mathbf{Y} = \mathbf{C} + \mathbf{I} + \mathbf{G}$$

Solve for \mathbf{I} :

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

national saving

Saving = investment in a closed economy

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Budget Deficits and Surpluses

Budget surplus

- = an excess of tax revenue over govt spending
- = $T - G$
- = public saving

Budget deficit

- = a shortfall of tax revenue from govt spending
- = $G - T$
- = – (public saving)

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ACTIVE LEARNING 1

A. Calculations

- Suppose GDP equals Rs 10 trillion, consumption equals Rs 6.5 trillion, the government spends rs 2 trillion and has a budget deficit of Rs 300 billion.
- Find public saving, taxes, private saving, national saving, and investment.

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ACTIVE LEARNING 1**Answers, part A****Given:**

$$Y = 10.0, \quad C = 6.5, \quad G = 2.0, \quad G - T = 0.3$$

$$\text{Public saving} = T - G = -0.3$$

$$\text{Taxes: } T = G - 0.3 = 1.7$$

$$\text{Private saving} = Y - T - C = 10 - 1.7 - 6.5 = 1.8$$

$$\text{National saving} = Y - C - G = 10 - 6.5 = 2 = 1.5$$

$$\text{Investment} = \text{national saving} = 1.5$$

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ACTIVE LEARNING 1**B. How a tax cut affects saving**

- Use the numbers from the preceding exercise, but suppose now that the government cuts taxes by Rs 200 billion.
- In each of the following two scenarios, determine what happens to public saving, private saving, national saving, and investment.
 1. Consumers save the full proceeds of the tax cut.
 2. Consumers save 1/4 of the tax cut and spend the other 3/4.

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ACTIVE LEARNING 1

Answers, part B

In both scenarios, public saving falls by Rs 200 billion, and the budget deficit rises from Rs 300 billion to Rs 500 billion.

- 1.** If consumers save the full Rs 200 billion, national saving is unchanged, so investment is unchanged.
- 2.** If consumers save Rs 50 billion and spend Rs 150 billion, then national saving and investment each fall by Rs 150 billion.

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ACTIVE LEARNING 1

C. Discussion questions

The two scenarios from this exercise were:

- 1.** Consumers save the full proceeds of the tax cut.
- 2.** Consumers save 1/4 of the tax cut and spend the other 3/4.

■ Which of these two scenarios do you think is more realistic?

■ Why is this question important?

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The Meaning of Saving and Investment

- **Private saving** is the income remaining after households pay their taxes and pay for consumption.
- Examples of what households do with saving:
 - Buy corporate bonds or equities
 - Purchase a certificate of deposit at the bank
 - Buy shares of a mutual fund
 - Let accumulate in saving or checking accounts

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The Meaning of Saving and Investment

- **Investment** is the purchase of new capital.
- Examples of investment:
 - General Motors spends \$250 million to build a new factory in Flint, Michigan.
 - You buy \$5000 worth of computer equipment for your business.
 - Your parents spend \$300,000 to have a new house built.

Remember: In economics, investment is NOT the purchase of stocks and bonds!

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The Market for Loanable Funds

- A supply-demand model of the financial system
- Helps us understand
 - how the financial system coordinates saving & investment
 - how govt policies and other factors affect saving, investment, the interest rate

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The Market for Loanable Funds

Assume: only one financial market

- All savers deposit their saving in this market.
- All borrowers take out loans from this market.
- There is one interest rate, which is both the return to saving and the cost of borrowing.

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The Market for Loanable Funds

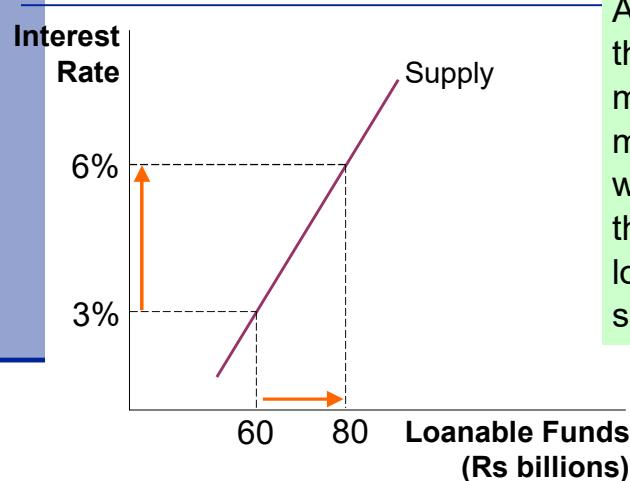
The supply of loanable funds comes from saving:

- Households with extra income can loan it out and earn interest.
- Public saving, if positive, adds to national saving and the supply of loanable funds. If negative, it reduces national saving and the supply of loanable funds.

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The Slope of the Supply Curve



An increase in the interest rate makes saving more attractive, which increases the quantity of loanable funds supplied.

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2-65

The Market for Loanable Funds

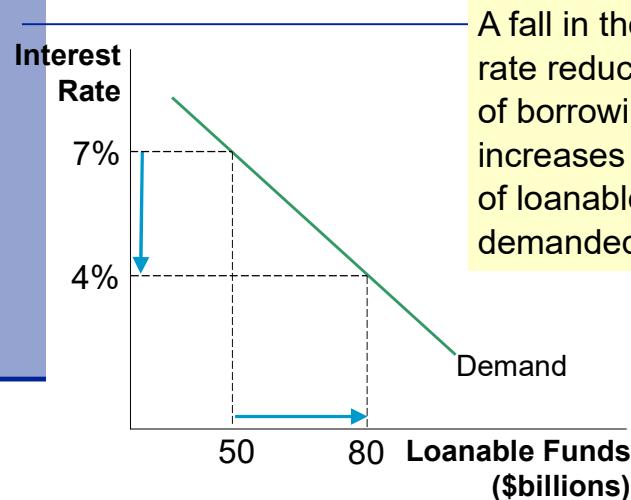
The demand for loanable funds comes from investment:

- Firms borrow the funds they need to pay for new equipment, factories, etc.
- Households borrow the funds they need to purchase new houses.

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The Slope of the Demand Curve

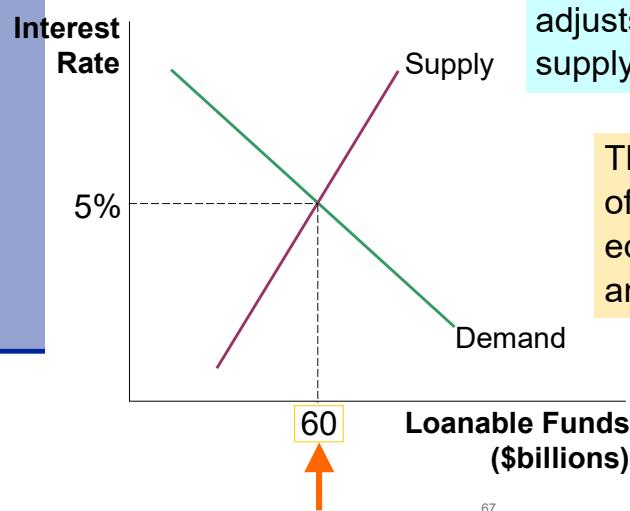


A fall in the interest rate reduces the cost of borrowing, which increases the quantity of loanable funds demanded.

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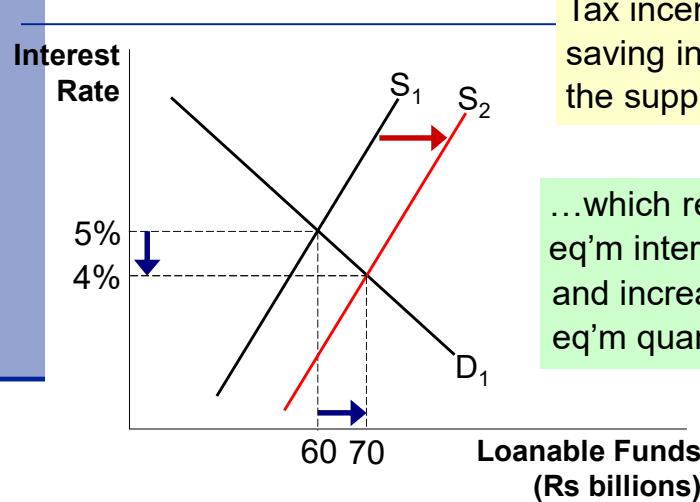
Equilibrium



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2-68

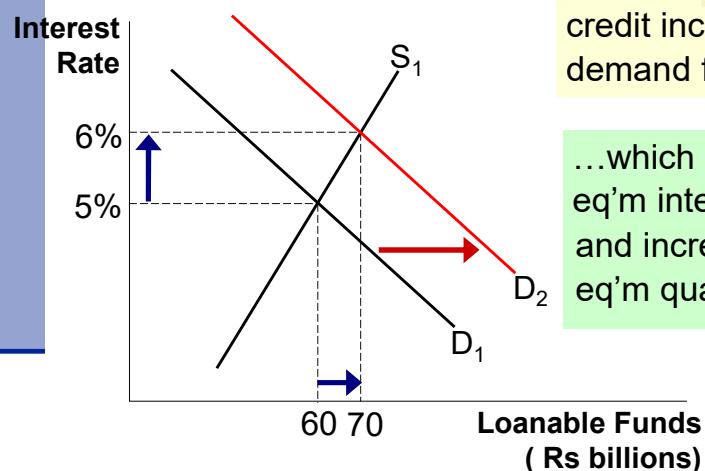
Policy 1: Saving Incentives



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2-69

Policy 2: Investment Incentives



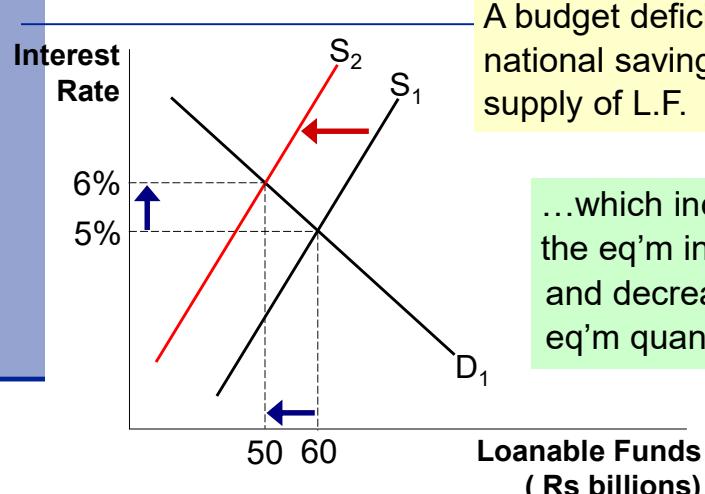
An investment tax credit increases the demand for L.F.

...which raises the eq'm interest rate and increases the eq'm quantity of L.F.

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Policy 3: Govt Budget Deficits



A budget deficit reduces national saving and the supply of L.F.

...which increases the eq'm interest rate and decreases the eq'm quantity of L.F.

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ACTIVE LEARNING 2

Exercise

Use the loanable funds model to analyze the effects of a government budget deficit:

- Draw the diagram showing the initial equilibrium.
- Determine which curve shifts when the government runs a budget deficit.
- Draw the new curve on your diagram.
- What happens to the equilibrium values of the interest rate and investment?

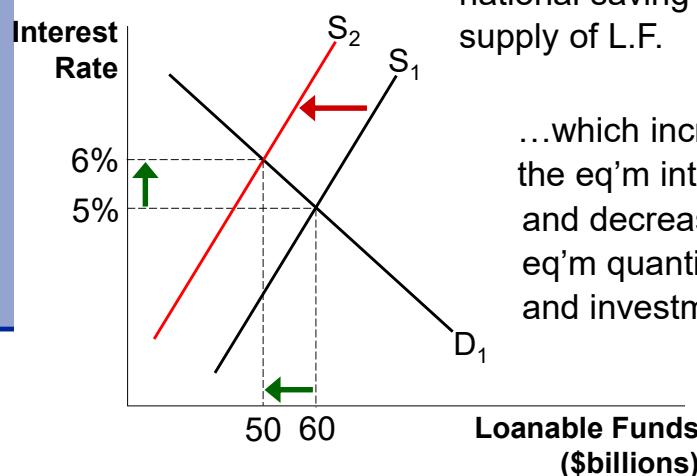
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ACTIVE LEARNING 2

Answers

A budget deficit reduces national saving and the supply of L.F.

...which increases the eq'm interest rate and decreases the eq'm quantity of L.F. and investment.



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Budget Deficits, Crowding Out, and Long-Run Growth

- Our analysis: Increase in budget deficit causes fall in investment.
The govt borrows to finance its deficit, leaving less funds available for investment.
- This is called **crowding out**.
- Recall from the preceding chapter: Investment is important for long-run economic growth.
Hence, budget deficits reduce the economy's growth rate and future standard of living.

73

INDIAN GOVERNMENT DEBT TO GDP



2-75

Types of Indian government securities

- **Fixed Rate Bonds** – the interest rate payable does not alter over time.
- **Floating Rate Bonds** (FRB) – the interest rate is expressed as a margin over the national base rate.
- **Zero Coupon Bonds** – pay no interest but are sold at a discount and redeemed at full face value.
- **Capital Indexed Bonds** – the face value of the bond increases in line with inflation.
- **Inflation Indexed Bonds** (IIBs) – both the loan amount and the interest are index linked. Since 2013 these bonds have been issued exclusively to the general public.
- **Bonds with Call/ Put Options** – The RBI has the right to redeem the bond before maturity (call) or the holder has the right to cash in the bond before maturity (put).
- **Sovereign Gold Bond** (SGB) – payable in cash, but the value of the bond is linked to the price of gold.
- **Treasury Bills** (T-Bills) – these are short-term government bonds that mature within a year.
- **Cash Management Bills** (CMBs) – very short-term government bonds with a maturity of less than 91 days.

2-76

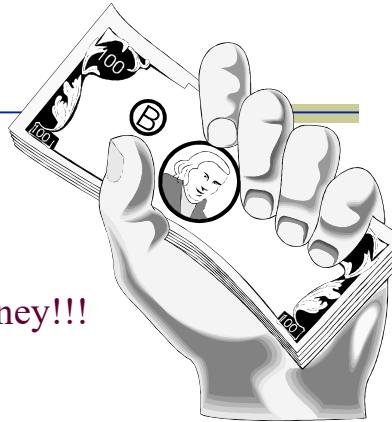
India's Debt Clock

| | |
|--------------------------------|-----------------------------|
| ■ National Debt | ■ National Debt Per Citizen |
| ■ ₹ | ■ ₹57,956 |
| 76,791,640,763,613 | ■ Debt as % of GDP |
| ■ Interest Payments Per Year | ■ 45.68% |
| ■ ₹4,925,575,536,526 | ■ GDP Of India |
| ■ Interest Payments Per Second | ■ ₹168,121,817,088,900 |
| ■ ₹156,189 | ■ India Population |
| | ■ 1,325,000,000 |

2-77

What is Money?

Money, Money, Money
Better than Sunshine
Sweeter than Honey!!!



2-78

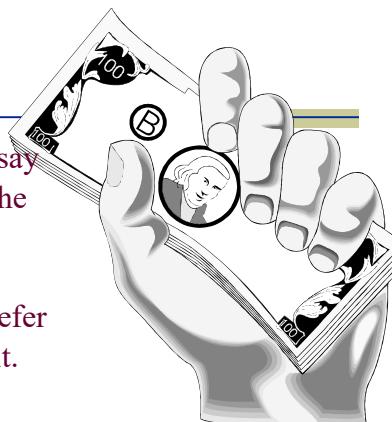
What is Money?

Lay man definition – When we say a person has lot of money – we mean he or she is wealthy.

❖ **To economists** – Money does not refer to all wealth – but only to one type of it.

❑ Money is the stock of assets – that can be readily used to make X-actions

❑ Roughly speaking, Rupees in the hands of the public make up nation's stock of money.



2-79

Money - definitions?

- Money
 - Stock of assets
 - Used for transactions
 - A type of wealth



2-80

Functions of Money



■ Money has primarily 3 functions:

- Store of value
- Unit of Account
- Medium of Exchange

❖ Store of Value

Money is a way to transfer purchasing power from the present to the future

If I work today and earn Rs. 1000, I can hold the money and spend it tomorrow or next week or next month.....

➤ Provided prices are not rising drastically

2-81

Functions of Money



❖ Unit of Account

- ❑ Money is the yardstick with which we measure economic transactions and debts.
- ❑ E.g., price of every commodity – car, shirt, food item etc.

❖ Medium of exchange

Money is used to buy goods and services – a legal tender from GOI.

The ease with which money is converted into other things – goods and services – is sometimes called money's *liquidity*.

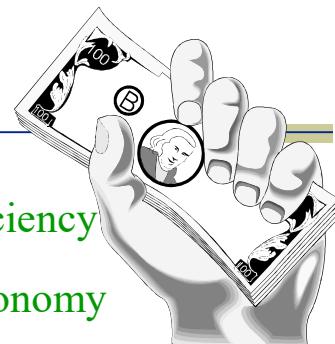
2-82

When is Money not needed?

Without Money

Self-sufficiency

Barter economy



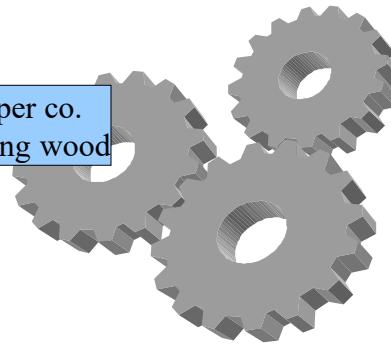
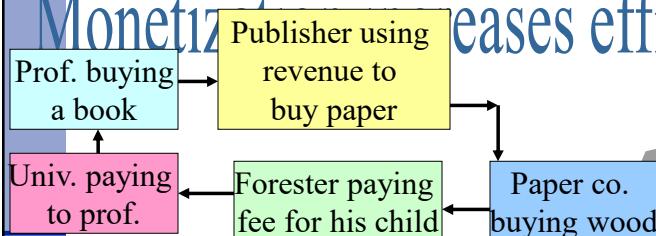
Without money – in a barter economy
- Trade requires **double coincidence of wants**.
i.e., the unlikely event of two people – each having a good that the other wants at the right time and place to make the transaction.

2-83

Monetization increases efficiency!!!

Money makes more indirect transactions possible.

Monetization increases efficiency!!!



2-84

Type of Money

Fiat money is money by declaration.
It has no intrinsic value
e.g., Rupee or Dollar.



Commodity money is money that has intrinsic value – e.g., Gold, tobacco.

Gold has an intrinsic value – it can be used for jewelry, dental fillings etc.

When people use gold as money, the economy is said to be on a **gold standard**.

2-85



Money in a POW Camp

- An unusual form of money developed in some Nazi POW camps during WWII.
- Red Cross supplied prisoners – food, clothing, cigarettes etc.
- Supply without keeping preferences in mind.
⇒ Allocations were inefficient
- One prisoner may have preferred chocolate, other cheese and third may have preferred coffee.....
- Differing tastes and endowments → trade among prisoners.
 - ❖ Barter not feasible – due to required ‘double coincidence of wants’
 - ❖ Cigarette became established currency – in which prices were quoted and with which trades were made.

2-86



Money in a POW Camp

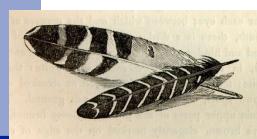
- A shirt e.g., costed 80 cigarettes
 - A laundry for 2 cigarettes / garment.
 - Even non-smokers happily accepted cigarettes – knowing they could trade the cigarettes in the future for some good they did enjoy.
- ⇒ Within the POW Camp, cigarettes became
- ❖ Store of value
 - ❖ Unit of Account and
 - ❖ medium of Exchange

2-87

Money throughout the history of the world



Shells
Live stock
Precious stones



Skulls
Pearls
Wheat
Feathers
Brass
Silver
Gold

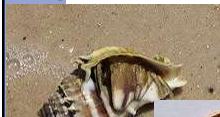


Paper money



2-88

Commodity money to Fiat money?



<http://en.wikipedia.org/wiki/>

2-89



Moving from Commodity Money to Fiat Money

Q. Why people value something that is intrinsically useless?

- ❖ This requires understanding - how evolution from commodity money to fiat money takes place.
- ❑ Imagine an economy where people carry bags of gold.
- ❑ When a purchase is made, buyer measures out appropriate amount of gold.
- ❑ If seller is convinced of the weight and purity of gold, transaction takes place.
- ❑ Govt. might first get involved in the monetary system to help people reduce transaction costs.
- ❑ Using raw gold as money is costly

WHY?

2-90



Moving from Commodity Money to Fiat Money

- ❖ Because it takes time to verify the purity and exact quantity.

Step 1: To reduce these costs, govt. can mint gold coins of known purity and weight.

- ❑ Coins are easier to use than gold bullion as their values widely recognized.

Step 2: Govt. to accept gold from public in exchange for gold certificates – piece of paper that can be redeemed for a certain quantity of gold.

- ❑ If people believe the govt.'s promise to redeem the paper bills for gold, bills are just as valuable as the gold.
- ❑ Since bills are lighter than gold (and gold coins), they are easier to use in transaction.
- ❑ Eventually no one carries gold – these gold backed govt. bills become the monetary standard.

2-91



Commodity Money to Fiat Money

- ❑ Finally, the gold backing becomes irrelevant.
- ❑ If no one ever bothers to redeem the bills for gold, no one cares if the option is abandoned.
- ❑ As long as everyone continues to accept the paper bills in exchange, they will have value and serve as money.
- ❑ Thus, system of commodity money evolves into a system of fiat money.

NOTE: Use of money in exchange is a social convention – everyone values fiat money because they expect everyone else to value it.

Other example: Paper in circulation in Ahmedabad.

2-92

Island of Yap





<http://en.wikipedia.org/wiki/Yap>

2-93

Island of Yap..... A small island in Pacific

- Earlier had a type of money – something in between commodity and fiat money

- Fei

- Stone wheels upto 12 feet in dia



- Stones had holes in the centre so that they could be carried on poles and used for exchange.

2-94

Money in Yap....



<http://www.dankainmicronesia.com/alliance.html>

2-95

Money in Yap.....



2-96

Bit Coin (s)



- A **peer-to-peer** internet currency that allows **decentralized** transfers of value between **individuals and businesses**.
- Bitcoins(system) vs Bitcoin (Unit)
- Released by Satoshi Nakamoto 2008
- Effectively a bank run by an ad hoc network
 - Digital checks
 - A distributed transaction log
- Number of BitCoins in circulation 11.8 million (December 2013)
- Total number of BitCoins generated cannot exceed 21 million
- Average price of a Bitcoin: around **\$6121**
 - **Price has been unstable.**
- Total balances held in BTC 1B\$ compared with 1,200B\$ circulating in USD.
- 30 Transactions per min. (Visa transaction 200,000 per minute.)

2-97

How Quantity of Money is Controlled?



2-98

The Money Supply

- The **money supply** (or **money stock**): the quantity of money available in the economy
- What assets should be considered part of the money supply? Two candidates:
 - **Currency:** the paper bills and coins in the hands of the (non-bank) public
 - **Demand deposits:** balances in bank accounts that depositors can access on demand by writing a check

2-99

Measuring Quantity of Money

- ❑ Given the aim – how money supply affects the economy – we need to know ‘**How Quantity of Money is measured?**’
- ❑ Most obvious asset to include in the quantity of money is ‘currency’ – the sum of outstanding paper money & coins.
- ❖ Most day-to-day transactions use currency as the medium of exchange.
- ❑ **Demand deposits** – the funds people hold in their saving account - a second type of asset used for transaction.
 - If most sellers accept personal checks, assets in saving account are as convenient as currency.
 - ❖ Depending upon the (timeline) of liquidity of an asset, we can measure money in four different forms.

2-100

Measures of Money – India

| | Measure of Money | Description |
|-----------|-------------------------|---|
| M0 | Reserve Money | Currency in circulation + other deposits with RBI + Bankers deposits with RBI |
| M1 | Narrow Money | M0 – Cash with Banks + Demand Deposits |
| M3 | Broad Money | M1 + Time Deposits |

2-101

Measures of Money – India vs. USA

| Symbol | Assets included - India | In USA |
|--------|---|--|
| C | Notes and coins in circulation + cash with public – currency with banks | Currency |
| M1 | C + demand deposits with banks and other deposits with RBI | C + demand deposits+ Traveler's checks + other checkable deposits |
| M2 | M1 + Post office savings + Bank deposits | M1 + Retail Money market Mutual fund balances + Saving deposits + Small time deposits |
| M3 | M2 + Time deposits | M2+ large time deposits+ repurchase agreements + Eurodollars + institutional- only money market mutual fund balances |
| M4 | M3 + Total Post office deposits | |

2-102

Money Measures comparison – India (2006-07) vs. USA (2001)

| Symbol | India (Rs. Crores) | India (%) | USA (billion \$) | USA (%) |
|--------|--------------------|-----------|------------------|---------|
| C | 483,471 | 14.5 | 539 | 7.4 |
| M1 | 965,195 | 28.9 | 1111 | 15.2 |
| M2 | 970,236 | 29.1 | 5100 | 69.6 |
| M3 | 3,310,278 | 99.2 | 7326 | 100 |
| M4 | 3,336,247 | 100 | | |

2-103

Money Measures comparison – India vs. USA (2010-11)

| Symbol | India (Rs. Crores) | India (%) | USA (billion \$) | USA (%) |
|--------|--------------------|-----------|----------------------|---------------------|
| C | 914,197 | 13.8 | 942 | 10.5 |
| M1 | 1635,569 | 24.7 | 1907 | 21.2 |
| M2 | 1662,027 | 25.11 | 8994 | 100.0 |
| M3 | 6,499,548 | 98.2 | In March Board | 2006, the Ceased |
| M4 | 6,619,380 | 100 | publication monetary | of the M3 aggregate |

2-104

Money Measures comparison – India (2010-2011) vs. USA (2010-2011)

| Symbol | India (Rs. Crores) | | India (%) | USA (billion \$) | |
|--------|--------------------|-------------|-----------|--|-----------|
| | 2009-2010 | 2010-2011 | | 2009-2010 | 2010-2011 |
| C | ₹ 767,493 | ₹ 914,197 | 13.81 | \$875 | \$942 |
| M1 | ₹ 1,489,301 | ₹ 1,635,569 | 24.71 | \$1,730 | \$1,907 |
| M2 | ₹ 1,511,991 | ₹ 1,662,027 | 25.11 | \$8,581 | \$8,994 |
| M3 | | | 98.19 | In March 2006, the Board ceased publication of the M3 monetary aggregate | |
| M4 | ₹ 5,719,624 | ₹ 6,619,380 | 100 | | |

2-105

Measures of Money.....

From the comparison between India and US – **what can be inferred?**

- More money in circulation in India!
- Skewness in measures – Financial markets not highly developed.
- * What are the most common measures for studying the effects of money on the economy?
 - ❖ – M3 in India and
 - ❖ – M1 and M2 in US.
- During 1998-99, the net lending by the RBI to the Indian government was about 10% of the gross fiscal deficit for that year, precipitating an 18% increase in M1.

2-106

Liquidity Indicators

Along with the above monetary aggregates for the proper assessment of the liquidity the RBI also compiles and evaluates three different liquidity indicators L1, L2 and L3.

$L1 = NM3 + \text{All deposits with the post office savings banks (excluding National Savings Certificate)}$

2-107

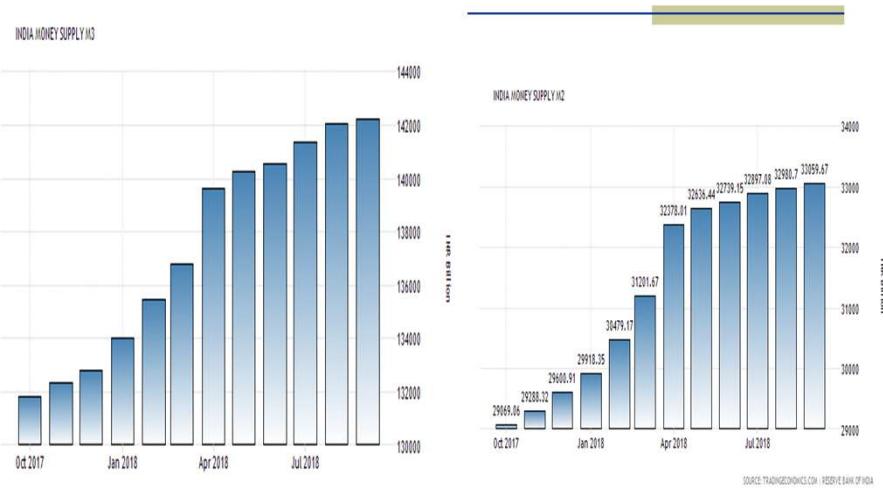
Liquidity Indicators

$L_2 = L_1 + \text{Term deposits with term lending institutions and refinancing institutions (FIs)} + \text{Term borrowing by FIs} + \text{Certificate of deposits issued by FIs}$

$L_3 = L_2 + \text{Public deposits of non-banking financial companies.}$

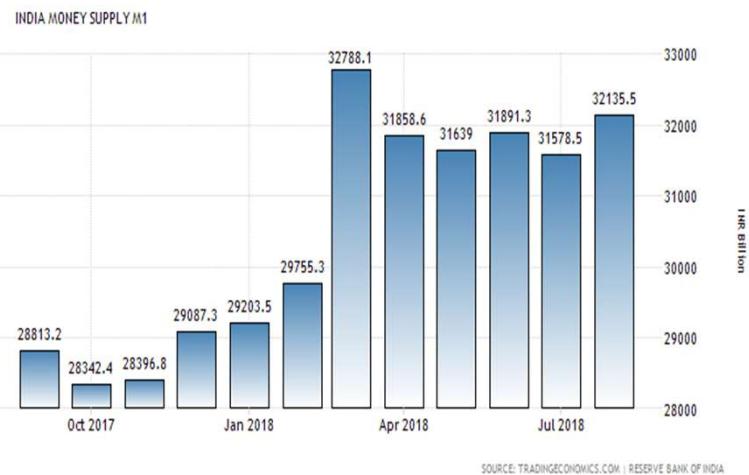
2-108

Money supply M2/M3



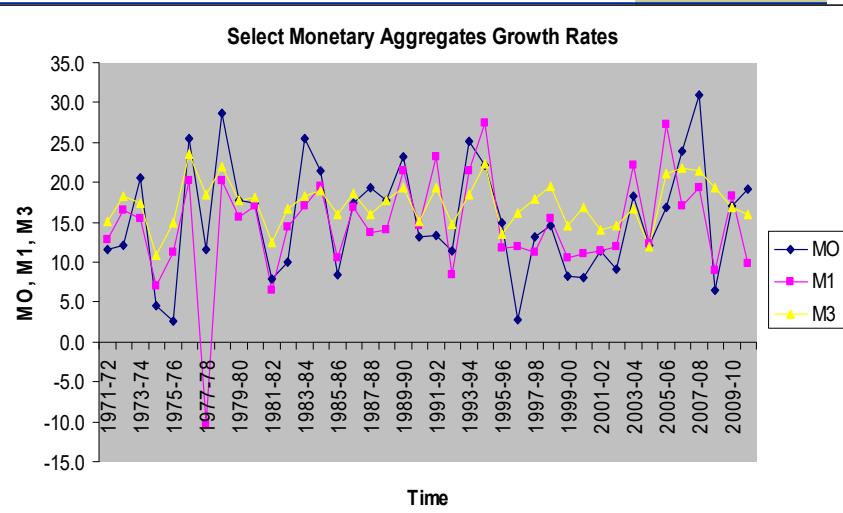
2-109

Money Supply M1



2-110

Growth rate of different money measures



2-111

Bank Reserves

- In a **fractional reserve banking system**, banks keep a fraction of deposits as **reserves** and use the rest to make loans.
- The RBI sets **reserve requirements**, regulations on the minimum amount of reserves that banks must hold against deposits.
- Banks may hold more than this minimum amount if they choose.
- The **reserve ratio, R**
 - = fraction of deposits that banks hold as reserves
 - = total reserves as a percentage of total deposits

2-112

Bank T-account

- **T-account:** a simplified accounting statement that shows a bank's assets & liabilities.

- Example:

| | | FIRST NATIONAL BANK | |
|----------|-------|----------------------------|--------------------|
| | | Assets | Liabilities |
| Reserves | \$ 10 | Deposits | \$100 |
| Loans | \$ 90 | | |

- Banks' liabilities include deposits, assets include loans & reserves.
- In this example, notice that $R = \$10/\$100 = 10\%$.

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2-113

Banks and the Money Supply: An Example

Suppose \$100 of currency is in circulation.

To determine banks' impact on money supply,
we calculate the money supply in 3 different cases:

1. No banking system
2. 100% reserve banking system:
banks hold 100% of deposits as reserves,
make no loans
3. Fractional reserve banking system

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2-114

Banks and the Money Supply: An Example

CASE 1: No banking system

Public holds the \$100 as currency.

Money supply = \$100.

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2-115

Banks and the Money Supply: An Example

CASE 2: 100% reserve banking system

Public deposits the \$100 at First National Bank (FNB).

FNB holds

100% of

deposit

as reserves:

| FIRST NATIONAL BANK | |
|----------------------|---------------------|
| Assets | Liabilities |
| Reserves \$100 | Deposits \$100 |
| Loans \$ 0 | |

Money supply

$$= \text{currency} + \text{deposits} = \$0 + \$100 = \$100$$

*In a 100% reserve banking system,
banks do not affect size of money supply.*

2-116

Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

Suppose $R = 10\%$. FNB loans all but 10% of the deposit:

| FIRST NATIONAL BANK | |
|----------------------|---------------------|
| Assets | Liabilities |
| Reserves \$ 10 | Deposits \$100 |
| Loans \$ 90 | |

Money supply = \$190 (!!)

Depositors have \$100 in deposits,
Borrowers have \$90 in currency.

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2-117

Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

How did the money supply suddenly grow?

When banks make loans, they create money.

The borrower gets

- \$90 in currency (an asset counted in the money supply)
- \$90 in new debt (a liability)

A fractional reserve banking system creates money, but not wealth.

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2-118

Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

Suppose borrower deposits the \$90 at Second National Bank (SNB).

Initially, SNB's T-account looks like this:

| SECOND NATIONAL BANK | | | |
|----------------------|--------|-------------|-------|
| | Assets | Liabilities | |
| Reserves | \$ 9 | Deposits | \$ 90 |
| Loans | \$ 81 | | |

If $R = 10\%$ for SNB, it will loan all but 10% of the deposit.

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2-119

Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

The borrower deposits the \$81 at Third National Bank (TNB).

Initially, TNB's T-account looks like this:

| THIRD NATIONAL BANK | |
|---------------------|----------------|
| Assets | Liabilities |
| Reserves \$ 8.10 | Deposits \$ 81 |
| Loans \$72.90 | |

If $R = 10\%$ for TNB, it will loan all but 10% of the deposit.

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2-120

Banks and the Money Supply: An Example

CASE 3: Fractional reserve banking system

The process continues, and money is created with each new loan.

Original deposit = \$ 100.00

FNB lending = \$ 90.00

SNB lending = \$ 81.00

TNB lending = \$ 72.90

⋮

In this example, \$100 of reserves generates \$1000 of money.

Total money supply = \$1000.00

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2-121

The Money Multiplier

- **Money multiplier:** the amount of money the banking system generates with each dollar of reserves
- The money multiplier equals $1/R$.
- In our example,
 $R = 10\%$
 $\text{money multiplier} = 1/R = 10$
\$100 of reserves creates \$1000 of money

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ACTIVE LEARNING 1 Banks and the money supply

While walking on the road you find a Rs 2000 note
You deposit the money in your savings account.
The RBI's reserve requirement is 20% of deposits.

- A. What is the maximum amount that the money supply could increase?
- B. What is the minimum amount that the money supply could increase?

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ACTIVE LEARNING 1**Answers**

You deposit Rs 2000 in your savings account.

- A.** What is the maximum amount that the money supply could increase?

If banks hold no excess reserves, then
money multiplier = $1/R = 1/0.2 = 5$

The maximum possible increase in deposits is
 $5 \times \text{rs } 2000 = \text{Rs } 10000$

But money supply also includes currency,
which falls by Rs 10000.

Hence, max increase in money supply = Rs 10000.

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ACTIVE LEARNING 1**Answers**

You deposit Rs 2000 in your checking account.

- A.** What is the maximum amount that the money supply could increase?

Answer: Rs 10000

- B.** What is the minimum amount that the money supply could increase?

Answer: Rs 0

If your bank makes no loans from your deposit,
currency falls by rs 2000, deposits increase by Rs 2000, money supply does not change.

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2-125

Money Supply vs. Monetary Policy

- Quantity of money available is called as the ***money supply***.
- If an economy uses commodity money, the money supply is the quantity of that commodity (e.g., No. of cigarettes or gold qty)
- The control over the money supply is called ***Monetary Policy***.
- In India, monetary policy is conducted in a partially independent institution called the ***Reserve Bank of India***.
- In US it is ***Federal Reserve, or Fed.***



2-126

MONETARY POLICY

It is a policy statement, traditionally bi-annual, through which RBI targets a key set of indicators to ensure price stability in the economy.

RBI monetary policy provides a platform for the Apex Bank to announce norms for financial bodies governed by it like banks, financial institutions, non-banking finance companies, primary dealers, etc.

https://www.rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=44636

2-127

MONETARY POLICY

- Changing the supply of money stock and rate of interest for the purpose of stabilizing the economy at full employment or potential output level by influencing the level of aggregate demand.
- At **times of recession** monetary policy involves the adoption of some monetary tools which tend to increase the money supply and lower interest rate so as to stimulate aggregate demand in the economy.
- At the **time of inflation** monetary policy seeks to contract aggregate spending by tightening the money supply or raising the rate of return.

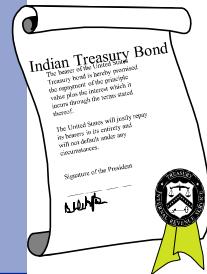
2-128

The RBI's 3 Tools of Monetary Control

1. **Open-Market Operations (OMOs)**: the purchase and sale of Indian government bonds by the RBI.
 - To increase money supply, RBI buys govt bonds, paying with new rupees.
 - ...which are deposited in banks, increasing reserves
 - ...which banks use to make loans, causing the money supply to expand.
 - To reduce money supply, RBI sells govt bonds, taking Rupees out of circulation, and the process works in reverse.
 - OMOs are easy to conduct, and are the RBI's monetary policy tool of choice.

2-129

Controlling Money Supply: Government Bonds



❖ To expand the Money Supply:

The Reserve Bank of India buys **Government Bonds** and pays for them with new money.

❖ To reduce the Money Supply:

The RBI sells **Government Bonds** and receives the existing Rupees and then destroys them.

Open-market sale of bonds takes some Rupees out of the hands of the public, thereby reducing the quantity of money in circulation.

2-130

The RBI's 3 Tools of Monetary Control

2. Reserve Requirements (RR): (Cash reserve ratio/statutory liquidity ratio) affect how much money banks can create by making loans. (current CRR is 3%)
 3. SLR = 18% (minimum percentage of deposits to be maintained by banks in the form of liquid cash, gold or other securities)
- To increase money supply, RBI reduces RR.
Banks make more loans from each Rupee of reserves, which increases money multiplier and money supply.
 - To reduce money supply, RBI raises CRR, and the process works in reverse.
 - RBI rarely uses reserve requirements to control money supply: Frequent changes ¹³⁰would disrupt banking.

2-131

The RBI's 3 Tools of Monetary Control

- Reverse Repo rate is the what the banks get when they deposit their excess funds with RBI for short periods.
- A term called as "Basis Points" is often used in monetary policy reviews. What is Basis Point? 1% is equivalent to 100 basis points.e.g. If Repo Rate is 7.75% and RBI increases it by 25 basis point, then new rate will be 8% as 25 basis point will be equal to 0.25%)
- It is 3.35 percent at present in 2021

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2-132

The RBI's 3 Tools of Monetary Control

3. **The Discount Rate** (Bank rate) – Rate of interest which a central bank charges on its loans and advances to commercial banks (loans), Bank rate is 4.25%
- Repo Rate – rate at which commercial banks borrow money from RBI by selling their securities (repurchase agreement of securities). It is at present 4%.
5. ■ Reverse repo rate is the rate of interest offered by RBI, when banks deposit their surplus funds with the RBI for short periods. When banks have surplus funds but have no lending (or) investment options, they deposit such funds with RBI. Banks earn interest on such funds.
- The RBI uses discount lending to provide extra liquidity when financial institutions are in trouble, If no crisis, RBI rarely uses discount lending – RBI is a “lender of last resort.”

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2-133

How Repo Rate affects money supply?

- Repo Rate – rate at which banks borrow short-term funds from RBI.**
 - It is a secured nature of borrowing similar to a loan against FD!
- NOTE: Banks are mandated to invest a quarter of their overall deposit (and borrowings) inflows into govt. securities.**
- Only excess over the mandated investment in govt. securities can be used to borrow funds from repo window.
 - Generally, this kind of borrowing is of last resort as banks' core borrowing to come from more traditional sources such as deposits.
 - Liquidity has been scarce of late as banks were offering paltry rates to depositors.
- ⇒ Banks used repo window during tight liquidity scenario.

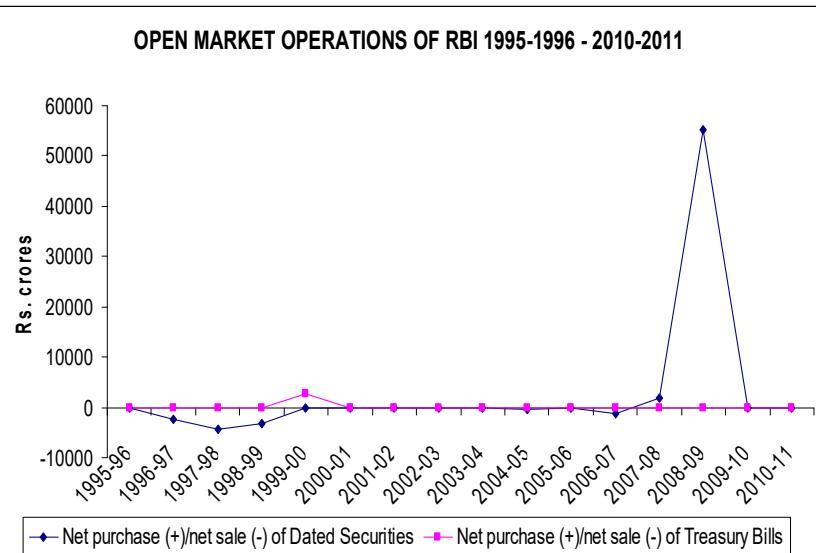
2-134

How Repo Rate affects money supply?

- RBI raises Repo Rate to increase overall cost of funds in the banking system.
 - Higher costs keeps the check on demand for funds.
- ⇒ **As demand slows – demand pull inflation also slows.**
- In a tight liquidity scenario – repo rate acts as base rate (or min. rate) at which banks can borrow funds.
 - If availability of funds is scarce, and banks are not able to borrow at repo rate, they may have to ↑ deposit rates upwards to attract depositors (an ↑ of 2% on various maturities).
 - This would also lead to increase in interest rates for borrowers (loan rates) and EMIs – Housing!!!!!!
 - Same is the case with firms
 - Hence trade-off between inflation and growth**

2-135

OPEN MARKET OPERATIONS OF RBI 1995-1996 – 2010-2011



2-136

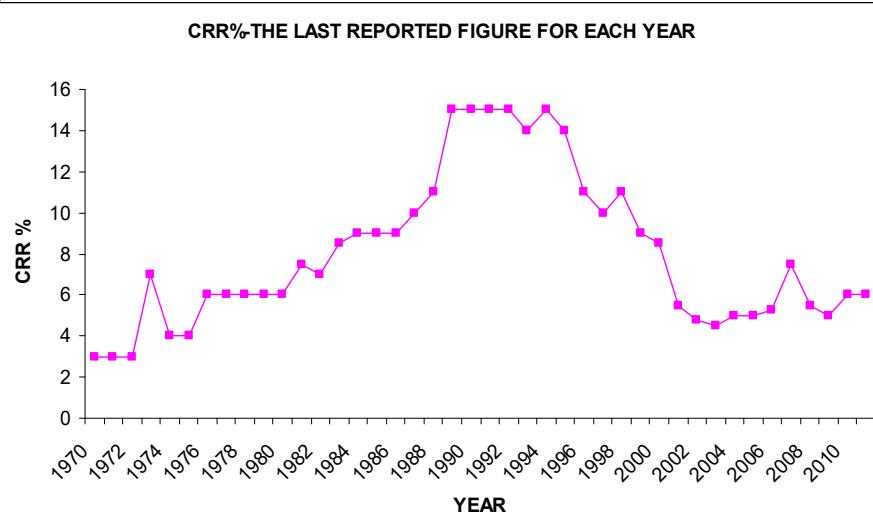
India's 'Operation Twist'

RBI To Buy 10-Year Bonds Via OMO



2-137

CRR%-FROM 1970-2012 IN INDIA



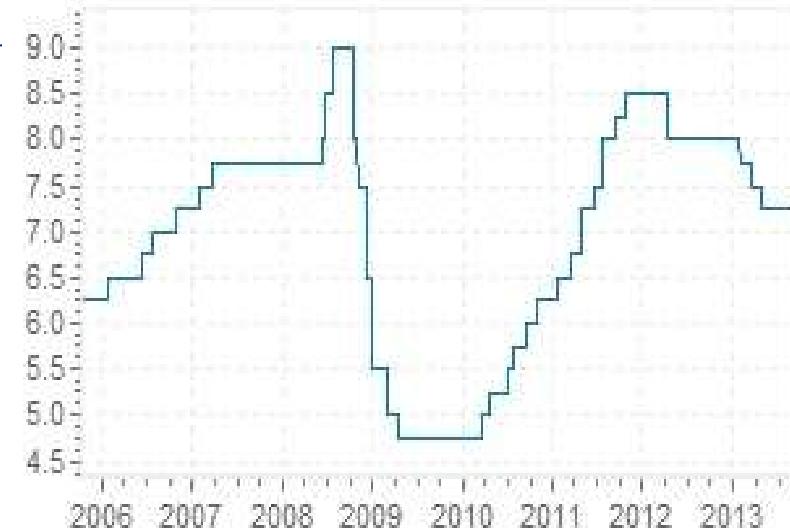
2-138

Bank Rate movement over 75 years period in India



2-139

Repo Rate movement since 2006

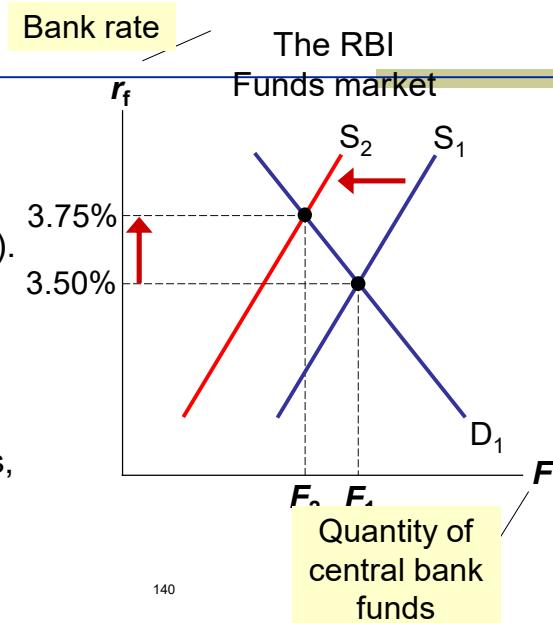


<http://www.global-rates.com/interest-rates/central-banks/central-bank-india/rbi-interest-rate.aspx>

2-140

Monetary Policy and the Bank Rate

To raise Bank rate, RBI sells govt bonds (OMO). This removes reserves from the banking system, reduces supply of central bank funds, causes r_f to rise.



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2-141

Problems Controlling the Money Supply

- If households hold more of their money as currency, banks have fewer reserves, make fewer loans, and money supply falls.
- If banks hold more reserves than required, they make fewer loans, and money supply falls.
- Yet, RBI can compensate for household and bank behavior to retain fairly precise control over the money supply.

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Bank Runs and the Money Supply

- A **run on banks**: When people suspect their banks are in trouble, they may “run” to the bank to withdraw their funds, holding more currency and less deposits.
- Under fractional-reserve banking, banks don’t have enough reserves to pay off ALL depositors, hence banks may have to close.
- Also, banks may make fewer loans and hold more reserves to satisfy depositors.
- These events increase R , reverse the process of money creation, cause money supply to fall.

2-143

Bank Runs and the Money Supply



In 2008, Wall Street's worries made their way to India Tuesday as ICICI Bank, the country's largest private-sector bank, saw hundreds of clients withdrawing cash at branches and ATMs in some parts of the country on rumors that the bank could fail.

During 1929-1933, a wave of bank runs and bank closings caused money supply to fall 28%.

Many economists believe this contributed to the severity of the Great Depression.

Since then, federal deposit insurance has helped prevent bank runs in the U.S.

In the U.K., though, Northern Rock bank experienced a classic bank run in 2007 and was eventually taken over by the British government.

In this chapter,
look for the answers to these questions:

- How does the money supply affect inflation and nominal interest rates?
- Does the money supply affect real variables like real GDP or the real interest rate?
- How is inflation like a tax?
- What are the costs of inflation? How serious are they?

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Money supply, demand, growth and inflation

- This chapter introduces the **quantity theory of money** to explain one of the Ten Principles of Economics from Chapter 1:
Prices rise when the govt prints too much money.
- Most economists believe the quantity theory is a good explanation of the long run behavior of inflation.

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Quantity Theory of Money

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The Quantity Theory of Money

- Developed by 18th century philosopher David Hume and the classical economists
- Advocated more recently by Nobel Prize Laureate Milton Friedman
- Asserts that the quantity of money determines the value of money
- We study this theory using two approaches:
 1. A supply-demand diagram
 2. An equation

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The Value of Money

- P = the price level
(e.g., the CPI or GDP deflator)
- P is the price of a basket of goods, measured in money.
- $1/P$ is the value of ₹1, measured in goods.
- Example: basket contains one candy bar.
 - If P = ₹2, value of ₹1 is 1/2 candy bar
 - If P = ₹3, value of ₹1 is 1/3 candy bar
- Inflation drives up prices and drives down the value of money.

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2-149

The Quantity Theory of Money

- Developed by 18th century philosopher David Hume and the classical economists
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 1. A supply-demand diagram
 2. An equation

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Money Supply (MS)

- In real world, determined by RBI, the banking system, consumers.
- In this model, we assume the RBI precisely controls MS and sets it at some fixed amount.

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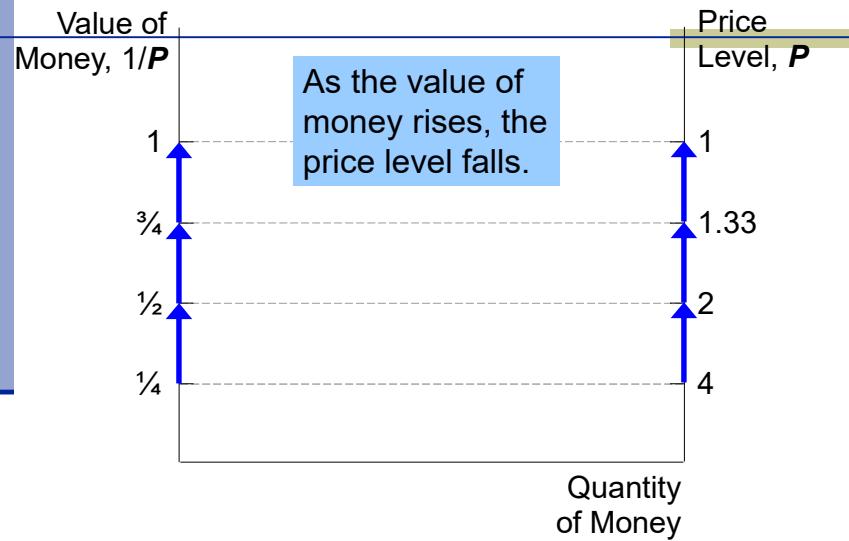
Money Demand (MD)

- Refers to how much wealth people want to hold in liquid form.
- Depends on P :
An increase in P reduces the value of money, so more money is required to buy g&s.
- Thus, quantity of money demanded is negatively related to the value of money and positively related to P , other things equal.
(These “other things” include real income, interest rates, availability of ATMs.)

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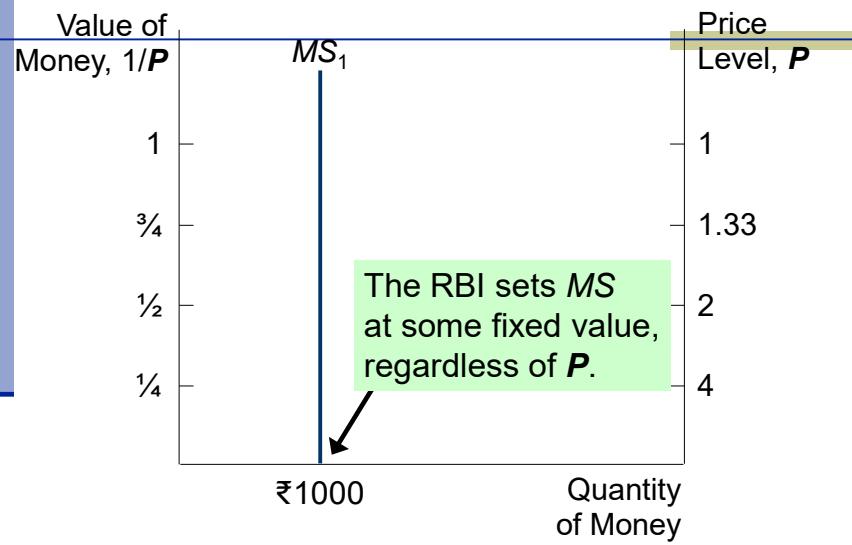
The Money Supply-Demand Diagram



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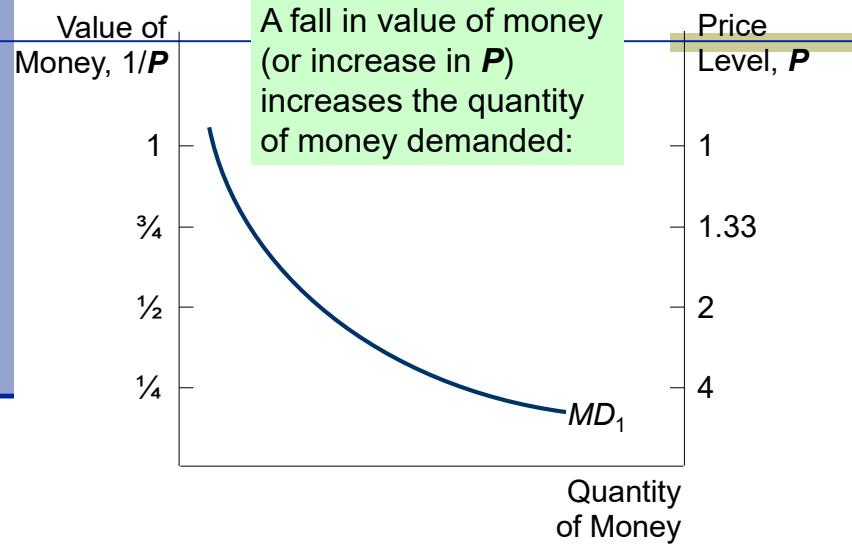
The Money Supply-Demand Diagram



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The Money Supply-Demand Diagram

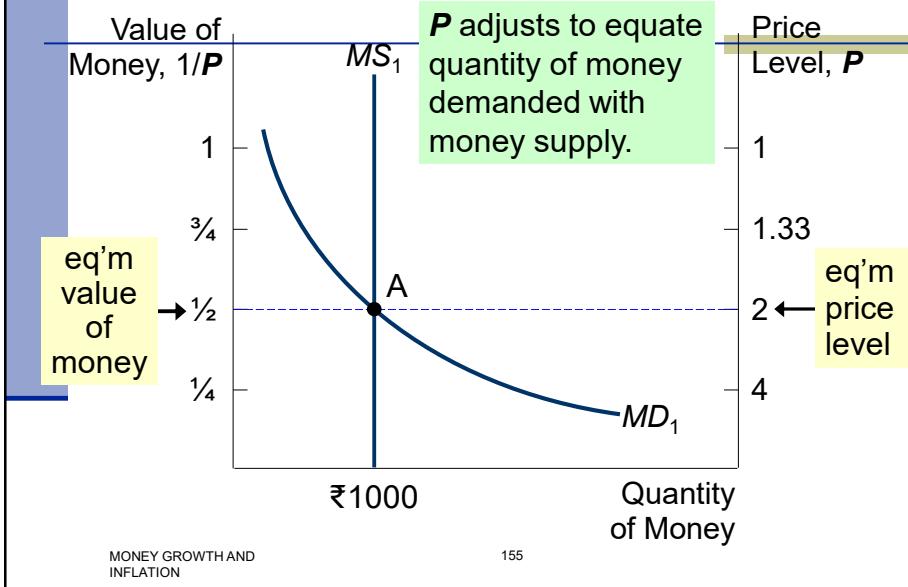


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MONEY GROWTH AND INFLATION

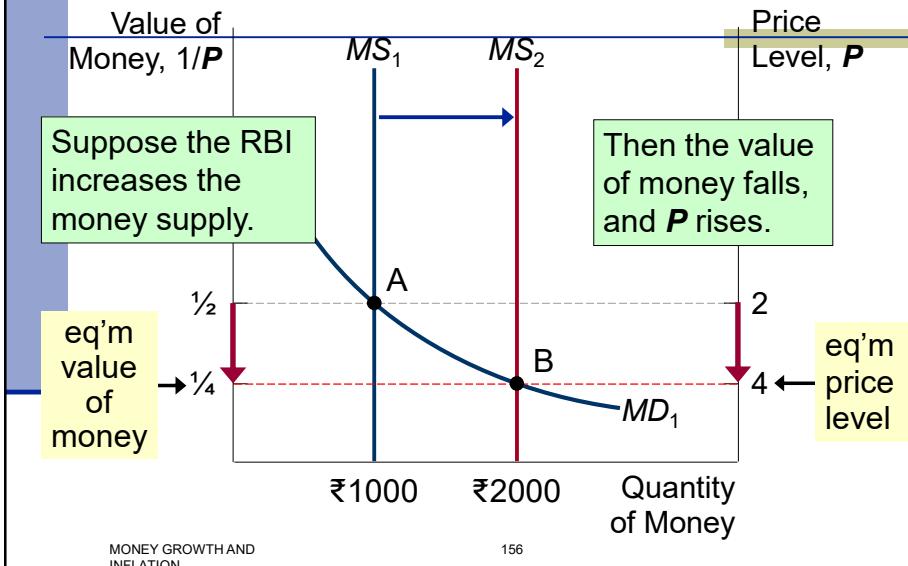
2-155

The Money Supply-Demand Diagram



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The Effects of a Monetary Injection



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A Brief Look at the Adjustment Process

Result from graph: Increasing MS causes P to rise.

How does this work? Short version:

- At the initial P , an increase in MS causes excess supply of money.
- People get rid of their excess money by spending it on g&s or by loaning it to others, who spend it.
Result: increased demand for goods.
- But supply of goods does not increase, so prices must rise.

(Other things happen in the short run, which we will study in later chapters.)

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Real vs. Nominal Variables

- **Nominal variables** are measured in monetary units.

Examples: nominal GDP,
nominal interest rate (rate of return measured in \$)
nominal wage (\$ per hour worked)

- **Real variables** are measured in physical units.

Examples: real GDP,
real interest rate (measured in output)
real wage (measured in output)

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Real vs. Nominal Variables

Prices are normally measured in terms of money.

- Price of a compact disc: ₹15/cd
- Price of a pepperoni pizza: ₹10/pizza

A **relative price** is the price of one good relative to (divided by) another:

- Relative price of CDs in terms of pizza:

$$\frac{\text{price of cd}}{\text{price of pizza}} = \frac{\text{₹15/cd}}{\text{₹10/pizza}} = 1.5 \text{ pizzas per cd}$$

Relative prices are measured in physical units, so they are real variables.

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Real vs. Nominal Wage

An important relative price is the real wage:

W = nominal wage = price of labor, e.g., ₹15/hour

P = price level = price of g&s, e.g., ₹5/unit of output

Real wage is the price of labor relative to the price of output:

$$\frac{W}{P} = \frac{\text{₹15/hour}}{\text{₹5/unit of output}} = 3 \text{ units output per hour}$$

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The Classical Dichotomy

- **Classical dichotomy:** the theoretical separation of nominal and real variables
- Hume and the classical economists suggested that monetary developments affect nominal variables but not real variables.
- If central bank doubles the money supply, Hume & classical thinkers contend
 - all nominal variables – including prices – will double.
 - all real variables – including relative prices – will remain unchanged.¹⁶¹

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The Neutrality of Money

- **Monetary neutrality:** the proposition that changes in the money supply do not affect real variables

- Doubling money supply causes all nominal prices to double; what happens to relative prices?
- Initially, relative price of cd in terms of pizza is

$$\frac{\text{price of cd}}{\text{price of pizza}} = \frac{\text{₹15/cd}}{\text{₹10/pizza}} = 1.5 \text{ pizzas per cd}$$

- After nominal prices double,

$$\frac{\text{price of cd}}{\text{price of pizza}} = \frac{\text{₹30/cd}}{\text{₹20/pizza}} = 1.5 \text{ pizzas per cd}$$

*The relative price
is unchanged.*

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The Neutrality of Money

- **Monetary neutrality:** the proposition that changes in the money supply do not affect real variables
- Similarly, the real wage W/P remains unchanged, so
 - quantity of labor supplied does not change
 - quantity of labor demanded does not change
 - total employment of labor does not change
- The same applies to employment of capital and other resources.
- Since employment of all resources is unchanged, total output is also unchanged by the money supply.

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2-164

The Neutrality of Money

-
- Most economists believe the classical dichotomy and neutrality of money describe the economy in the long run.
 - In later chapters, we will see that monetary changes can have important *short-run* effects on real variables.

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The Quantity Theory of Money

⌘ To see how quantity of money affects economy – we need to see how it is related to other economic variables – P and Y.

□ People hold money to buy goods & services. The more money they need for such transactions – the more money they hold.

⇒ Quantity of money in the economy is related to the number of Rupees exchanged in transactions.

□ The link between transactions and money is called the **quantity equation**.

□ Quantity equation is the money supply (M) times the velocity of money (V) which equals price (P) times transaction (T):

$$\text{Money} \times \text{Velocity} = \text{Price} \times \text{Transaction (proxied by Y)}$$

$$M \times V = P \times T$$

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$$\text{Money} \times \text{Velocity} = \text{Price} \times \text{Transaction}$$

$$M \times V = P \times T$$

❖ RHS of Quantity Equation tells us about transactions.

□ T is number of times in a year that goods or services are exchanged for money.

□ P is price of a typical transaction – no. of Rupees exchanged.

□ Product of the price of a transaction and the number of transactions i.e., PT = the number of Rupees exchanged in a year.

❖ LHS of Quantity Equation tells about money used to make transactions.

□ M is the quantity of Money.

□ V is called the ‘transactions velocity of money’ – measures the rate at which money circulates in the economy.

□ In other words, velocity tells us number of times a Rupee note changes hands in a given period of time.

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Quantity Equation - Example

For example:

- ❑ If 60 'Good day' biscuit packets are sold in a year for Rs. 10 each. Then $T = 60$ per year, and $P = \text{Rs. } 10$ per packet.
- ❑ Total Number of Rupees exchanged = $PT = 60 \times 10 = \text{Rs. } 600/\text{yr}$.
 \Rightarrow Rs. 600 is the Rupee value of all transactions.
- ❑ Assuming that the quantity of money in the economy is Rs. 200.
 Since Velocity (V) = PT/M

$$= (\text{Rs. } 600/\text{year})/(\text{Rs. } 200)$$

$$= 3 \text{ times per year}$$
 \Rightarrow For Rs. 600 of transactions per year to take place with Rs. 200 of money, each Rupee must change hands 3 times per year.

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The Quantity Equation

NOTE: The *quantity equation* is an *identity*: the definitions of the four variables make it true.

- ❑ If one variable changes, one or more of the others must also change to maintain the identity.
- ❖ For example: if the quantity of money increases and the velocity of money stays unchanged then either
 - the price or
 - the number of transactions must rise.

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From Transactions to Income

- Problem with previous equation????

- ❖ Number of transactions are difficult to measure.

What is the way out?

- ❖ Number of transactions T is replaced by the total output of the economy Y.

NOTE: Transactions and Output are related

How?

- Because the more the economy produces , the more goods are bought and sold.

NOTE: Transactions and Output are not the same.

How?

- When a person sells a used car, a transaction is made, though the used car is not part of current output.

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From Transactions to Income

- If Y denotes the amount of output and P denotes the price of 1 unit of output, then the Rupee value of output is PY.

- Recalling NIA – Y is real GDP, P is the GDP deflator and PY is nominal GDP.

The quantity equation becomes:

$$\text{Money} \times \text{Velocity} = \text{Price} \times \text{Output}$$

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

- Because Y is also total income, V in the quantity equations is called the **income velocity of money**.

- **Income velocity of money** tells us the number of times a Rupee note changes hands in a given period of time.

2-171

The Quantity Equation

Velocity formula: $V = \frac{P \times Y}{M}$

- Multiply both sides of formula by M :

$$M \times V = P \times Y$$
- Called the **quantity equation**

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The Quantity Theory in 5 Steps

Start with quantity equation: $M \times V = P \times Y$

1. V is stable.
2. So, a change in M causes nominal GDP ($P \times Y$) to change by the same percentage.
3. A change in M does not affect Y :
 money is neutral,
 Y is determined by technology & resources
4. So, P changes by same percentage as $P \times Y$ and M .
5. Rapid money supply growth causes rapid inflation.

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ACTIVE LEARNING 2

Exercise

One good: corn. The economy has enough labor, capital, and land to produce $Y = 800$ bushels of corn. V is constant. In 2008, $MS = ₹ 2000$, $P = ₹ 5/\text{bushel}$.

For 2009, the RBI increases MS by 5%, to ₹ 2100.

- Compute the 2009 values of nominal GDP and P . Compute the inflation rate for 2008-2009.
- Suppose tech. progress causes Y to increase to 824 in 2009. Compute 2008-2009 inflation rate.

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ACTIVE LEARNING 2

Answers

Given: $Y = 800$, V is constant,
 $MS = ₹ 2000$ and $P = ₹ 5$ in 2008.

For 2009, the RBI increases MS by 5%, to ₹ 2100.

- Compute the 2009 values of nominal GDP and P . Compute the inflation rate for 2008-2009.

$$\begin{aligned} \text{Nominal GDP} &= P \times Y = M \times V \quad (\text{Quantity Eq'n}) \\ &= ₹ 2100 \times 2 = ₹ 4200 \end{aligned}$$

$$P = \frac{P \times Y}{Y} = \frac{₹ 4200}{800} = ₹ 5.25$$

$$\text{Inflation rate} = \frac{₹ 5.25 - 5.00}{5.00} = 5\% \quad (\text{same as MS!})$$

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ACTIVE LEARNING 2**Answers**

Given: $Y = 800$, V is constant,
 $MS = ₹ 2000$ and $P = ₹ 5$ in 2005.

For 2009, the Fed increases MS by 5%, to \$2100.

- b.** Suppose tech. progress causes Y to increase 3% in 2009, to 824. Compute 2008-2009 inflation rate.

First, use Quantity Eq'n to compute P :

$$P = \frac{M \times V}{Y} = \frac{₹ 4200}{824} = ₹ 5.10$$

$$\text{Inflation rate} = \frac{₹ 5.10 - 5.00}{5.00} = 2\%$$

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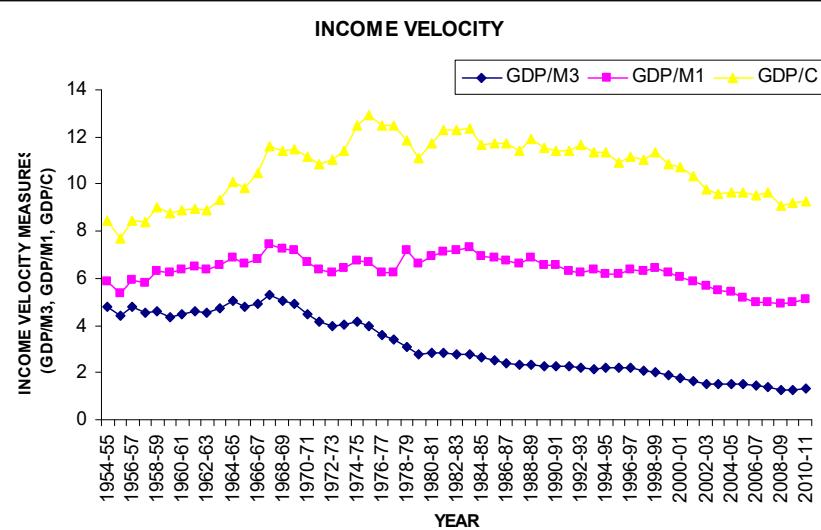
ACTIVE LEARNING 2**Summary and Lessons about the Quantity Theory of Money**

- If real GDP is constant, then inflation rate = money growth rate.
- If real GDP is growing, then inflation rate < money growth rate.
- The bottom line:
 - Economic growth increases # of transactions.
 - Some money growth is needed for these extra transactions.
 - Excessive money growth causes inflation.

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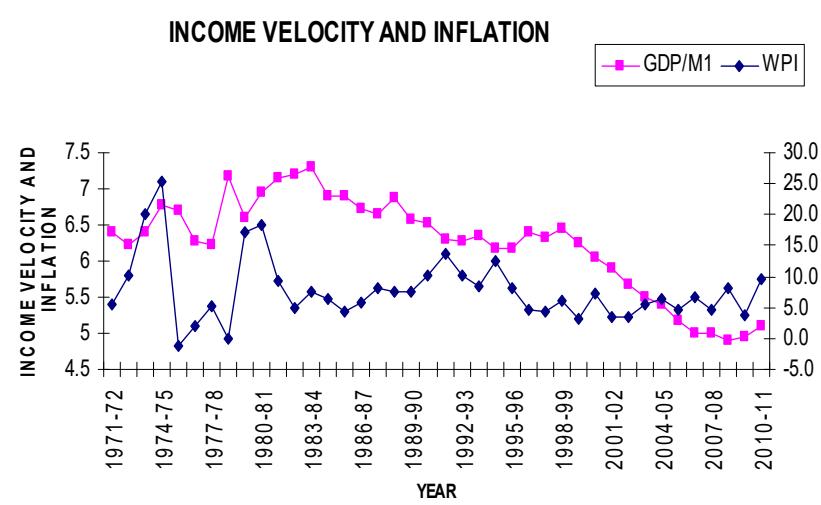
2-177

Income Velocity of Money – Different Money measures



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Income Velocity of Money and WPI



2-179



Money, Prices and Inflation

Three building blocks that determine the economy's overall level of prices:

- 1) The factors of production and the production function determine the level of output Y.
- 2) The money supply determines nominal value of output, PY.
 This follows from the quantity equation and the assumption that the velocity of money is fixed.
- 3) The price level P is then the ratio of the nominal value of output, PY, to the level of output Y.

⇒ **Productive capability of the economy determines real GDP, quantity of money determines nominal GDP, and GDP deflator is the ratio of nominal GDP to real GDP.**

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In other words, if Y is fixed because it depends on the growth in the factors of production and on technological progress, and we just made the assumption that velocity is constant,

$$M\bar{V} = P\bar{Y}$$

or in percentage change form:

$$\% \text{ Change in } M + \% \text{ Change in } V = \% \text{ Change in } P + \% \text{ Change in } Y$$

if V is fixed and Y is fixed, then it reveals that % Change in M is what induces % Changes in P.

Quantity Theory of Money states that central bank, which controls the money supply, has the ultimate control over the inflation rate.

❖ **If the central bank keeps the money supply stable, the price level will be stable.**

❖ **If the central bank increases the money supply rapidly, the price level will rise rapidly.**

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Seigniorage

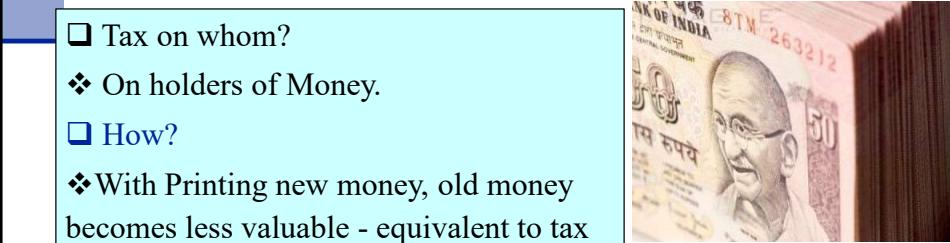
- All governments spend money
 - ❖ to buy goods & services (e.g., roads, police etc.)
 - ❖ to provide transfer payments
- A government can finance its spending in three ways:
 - ❖ Raising revenue through taxes – such as IT, Corporate Tax
 - ❖ Borrowing from public by selling government bonds
 - ❖ Printing Money
- Revenue raised through printing money
is called as **Seigniorage**.
- Term comes from ‘Seigneur’- the French feudal lord – who in Medieval Times were allowed to coin their money



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Seigniorage: The Revenue From Printing Money

- Seigniorage or Printing money to finance expenditure,
 - ↑ money supply.
 - Inflation.
- Printing money to ↑ revenue is like imposing an **inflation tax**.



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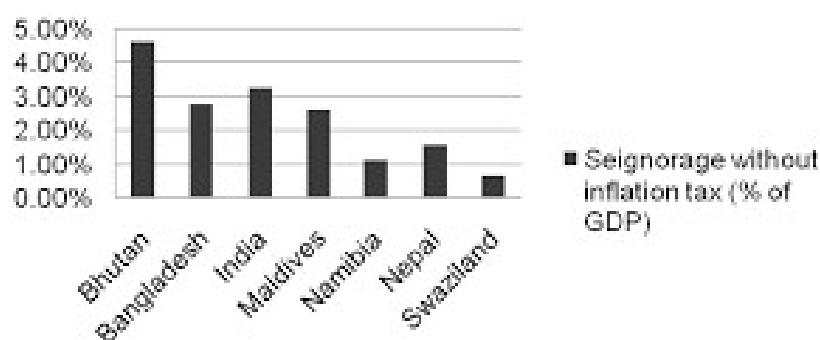
Extent of Seigniorage in different countries

- ❖ What is the extent of Seigniorage in different countries?
 - Click (1998) documents that between 1971 and 1990, in a wide cross section of countries, currency **seigniorage** as % of GDP ranged from 0.3% to 14%, and
 - seigniorage** as % of government spending ranged from 1-148%.
 - In US, seigniorage - < 3% of government revenue.
 - In Italy and Greece – it is often >10% of government revenue



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Seigniorage Revenue for Bhutan and Selected Countries: 2010



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The Costs of Inflation

- The inflation fallacy: most people think inflation erodes real incomes.
- But inflation is a general increase in prices of the things people buy and the things they sell (e.g., their labor).
- In the long run, real incomes are determined by real variables, not the inflation rate.

MONEY GROWTH AND
INFLATION

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The Costs of Inflation

- **Shoelather costs:** the resources wasted when inflation encourages people to reduce their money holdings
 - Includes the time and transactions costs of more frequent bank withdrawals
- **Menu costs:** the costs of changing prices
 - Printing new menus, mailing new catalogs, etc.

MONEY GROWTH AND
INFLATION

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The Costs of Inflation

- **Misallocation of resources from relative-price variability:** Firms don't all raise prices at the same time, so relative prices can vary... which distorts the allocation of resources.
- **Confusion & inconvenience:** Inflation changes the yardstick we use to measure transactions. Complicates long-range planning and the comparison of rupee amounts over time.

MONEY GROWTH AND INFLATION

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The Costs of Inflation

- **Tax distortions:**

Inflation makes nominal income grow faster than real income.

Taxes are based on nominal income, and some are not adjusted for inflation.

So, inflation causes people to pay more taxes even when their real incomes don't increase.

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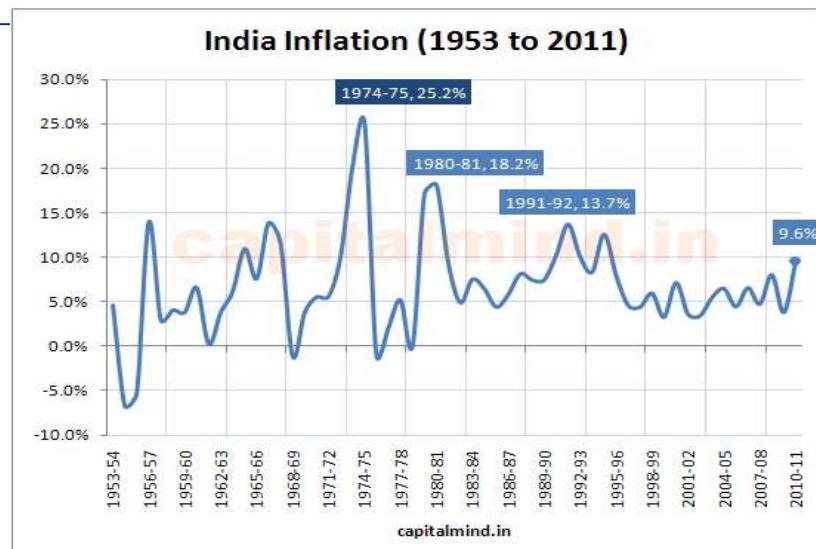
The Costs of Unexpected Inflation

- ❑ Unanticipated inflation is unfavorable because it arbitrarily redistributes wealth among individuals.
- ❑ For example, it hurts individuals on fixed pensions.
- ❑ Often these contracts are not created in real terms by being indexed to a particular measure of the price level.

Benefit of Inflation

- ❑ There is a benefit of inflation— many economists say that some inflation may make labor markets work better. They say it “greases the wheels” of labor markets.
- ❑ Because Nominal wages - rigid despite trough in business cycle.

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Hyperinflation

- ❑ **Hyperinflation** is defined as inflation that exceeds 50% per month, which is just over 1% a day.
- ❑ Costs such as **shoe-leather** and **menu costs** are much worse with hyperinflation— and tax systems are grossly distorted.
- ❑ Eventually, when costs become too great with hyperinflation, the money loses its role as store of value, unit of account and medium of exchange.
- ❑ Bartering or using commodity money becomes prevalent.

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Causes and remedies of HyperInflation

Q. Why Hyperinflation?

- ❑ Caused by excessive growth in the supply of money.
- ❑ When the central bank prints money, the price level ↑, when it prints more rapidly, prices rise become hyperinflation.
- ⇒ **To stop hyperinflation, central bank should reduce the rate of money growth.**
- ❑ But this leaves an important question – why in hyperinflating countries, central bank chose to print so much money.
- ❑ Answer to this question lies in - **fiscal policy**.
- ❑ Most hyperinflation begin when govt. has inadequate tax revenue to pay for its spending.

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Causes and remedies of HyperInflation

- ❑ Though govt. prefers to finance this budget deficit by issuing debt, it may find itself unable to borrow.
- Why?**
- ❑ Because lenders perceive govt. to be a bad credit risk.
 - ❑ To cover the deficit – govt. turns to the only weapon in its arsenal – printing press.
 - ❑ The result is rapid money growth and hyperinflation.
 - ❑ Once hyperinflation, fiscal problems become even more severe.
 - ❑ Because of delayed tax collection, real tax revenue ↓ as inflation ↑.
 - ❖ Thus, govt. need to rely on seigniorage is self-reinforcing.

2-194

Causes and remedies of HyperInflation

- ❑ Rapid Money creation → hyperinflation
-
- ```

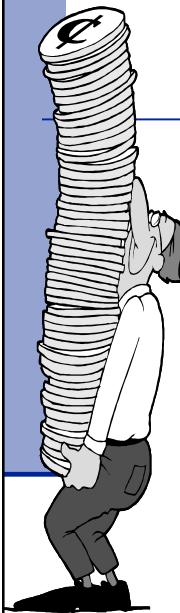
graph TD
 A[rapid Money creation] --> B[hyperinflation]
 B --> C[larger budget deficit]
 C --> A

```
- End of hyperinflation coincides with fiscal reforms.**
- ❑ Govt. need to muster political will to reduce government spending and ↑ taxes.
  - ❑ Fiscal reforms → ↓ need for seigniorage
- 
- ```

graph TD
    A[fiscal reforms] --> B[↓ need for seigniorage]
    B --> C[↓ Money growth]
    
```
- ⇒ Even if inflation is always, and everywhere a monetary phenomenon – end of hyperinflation is often a fiscal phenomenon as well.

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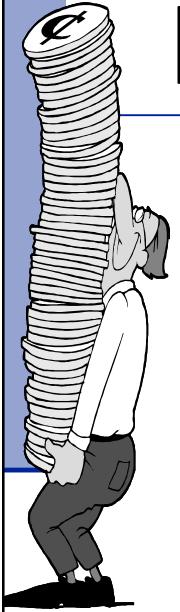
Hyperinflation - Examples



- ❑ Germany in 1923 when rate of inflation hit 3.25×10^6 percent per month (prices double every 49 hrs).
- ❑ Greece during its occupation by German troops (1941-1944) with 8.55×10^9 percent per month (prices double every 28 hours).
- ❑ The most severe known incident of inflation was in Hungary after the end of WW II at 4.19×10^{16} percent per month (prices double every 15 hrs).
- ❑ More recently, Yugoslavia suffered 5×10^{15} percent inflation per month (prices double every 16 hrs) between October 1, 1993 and January 24, 1994.

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Life during Hyperinflation - in Bolivia



Bolivia Hyperinflation in 1985 (source: Wall street journal).

- ❑ La Paz, Bolivia – When Edgar Miranda gets his monthly teacher's pay of Rs. 25 million pesos ($\equiv 50\$$ as $1\$ = 500,000$ pesos) – he doesn't have a jiffy to lose:
 - ❖ while his wife rushes to the market to lay in a month's supply of rice and noodle,
 - ❖ he is off with rest of the pesos to change them into black market dollars.

Note: Mr. Miranda is practicing the First Rule of survival in a society having out of bound inflation.

2-197

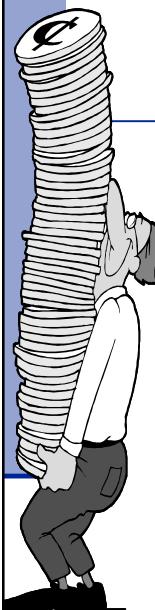
Life during Hyperinflation - in Bolivia



- ❑ In one 6-month period, prices soared at an annual rate of 38,000%.
- ❖ In 1984 – the inflation rate was 2000% and
- ❖ in 1985, it was expected to be 8000%.
- ❑ In any event, Bolivia's rate dwarfs Israel's 370% and Argentina's 1,100% - two other cases of extreme inflation.
- Q. What happens to Miranda's pay if he doesn't act?**
- ❑ The day he is paid 25 million pesos, he receives 50\$.
- ❑ Just few days later, with rate as 900,000/\$ - he would have got only 27\$.

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Life during Hyperinflation - in Bolivia



- ❑ Intent on survival, Civil servants won't hand out a form without a bribe.
- ❑ Lawyers, accountants, hairdressers – everyone have given up working to become money changers in streets
- ❑ Workers stage repeated strikes & steal from the bosses.
- ❑ Bosses smuggle production abroad, take phoney loans, duck taxes – anything to get dollars for speculation.
- ❑ Prodⁿ at state mines ↓ by 33% from 18000 tons to 12000 tons in a year.
- ❑ Miners pad their wages by smuggling out the ore to Peru.
- ❑ Interesting, Peru having no tin mine – exported 4,000 tins in 1984.

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Hyperinflation - in Germany

Price of a daily newspaper in 1920s

| DATE | PRICE (in mark) |
|---------------|-----------------|
| Jan. 1922 | 0.30 |
| May 1922 | 1 |
| October 1922 | 8 |
| Feb. 1923 | 100 |
| Sep. 1923 | 1000 |
| Oct. 1, 1923 | 2000 |
| Oct. 15, 1923 | 20,000 |
| Oct. 29, 1923 | 1 million |
| Nov. 9, 1923 | 15 million |
| Nov. 17, 1923 | 70 million |

2-200

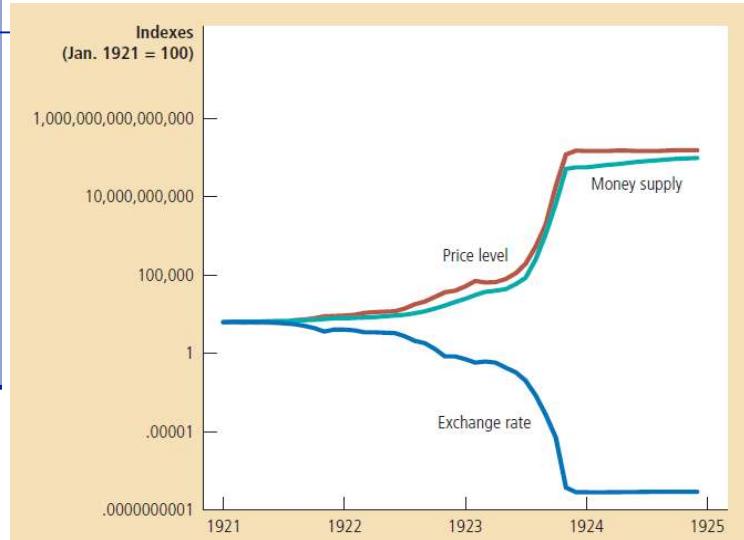
Hyperinflation - in Germany

Marks needed to buy 1 ounce (28.35 grams) of gold

| Date: | German Marks needed to buy one ounce of gold |
|-------------------|--|
| Jan 1919..... | 170.00 |
| Sept 1919..... | 499.00 |
| Jan 1920..... | 1,340.00 |
| Sept 1920..... | 1,201.00 |
| Jan 1921..... | 1,349.00 |
| Sept 1921..... | 2,175.00 |
| Jan 1922..... | 3,976.00 |
| Sept 1922..... | 30,381.00 |
| Jan 1923..... | 372,477.00 |
| Sept 1923..... | 269,439,000.00 |
| Oct 2, 1923..... | 6,631,749,000.00 |
| Oct 9, 1923..... | 24,868,950,000.00 |
| Oct 16, 1923..... | 84,969,072,000.00 |
| Oct 23, 1923..... | 1,160,552,882,000.00 |
| Oct 30, 1923..... | 1,347,070,000,000.00 |
| Nov 5, 1923..... | 8,700,000,000,000.00 |
| Nov 30, 1923..... | 87,000,000,000,000.00 |

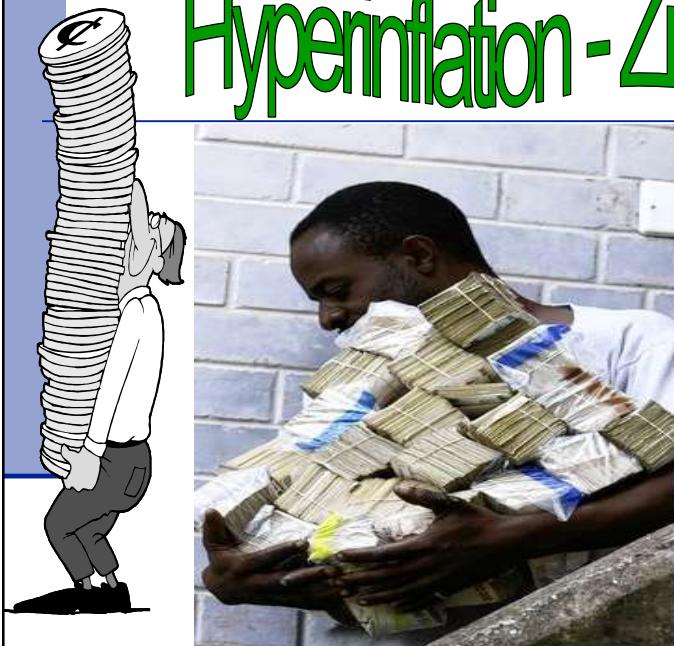
<http://www.silverbearcafe.com>

2- Money, Prices and the Nominal Exchange Rate During the German Hyperinflation



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Hyperinflation - Zimbabwe



A man in
Harare,
Zimbabwe,
carried cash
for groceries in
2008.

<http://online.wsj.com/article/SB10001424052748703730804576314953091790360.html>

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The 100 trillion Zimbabwean dollar banknote (10^{14} dollars), equal to 10^{27} pre-2006 dollars.

Source: http://en.wikipedia.org/wiki/Zimbabwean_dollar

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A selection of Reserve Bank of Zimbabwe bearer cheques printed between July 2007 to July 2008 (now expired) that illustrate the hyperinflation rate in Zimbabwe.

Source: http://en.wikipedia.org/wiki/Zimbabwean_dollar

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Hyperinflation - Zimbabwe

 An illustration of a person with a very large head, wearing a white shirt and dark trousers, carrying a massive stack of coins on their back. The stack is so tall it reaches almost to the top of the frame. The word "Hyperinflation - Zimbabwe" is written in large, bold, green letters above the illustration.

- ❑ In [the Guardian](#), on 18 July 2008, a report on Zimbabwe's inflation, said that an egg costs ZW\$50 billion (GBP 0.17, US\$ 0.32), and it showed adverts for prizes of Z\$100 trillion in a Zimbabwean derby and ZW\$1.2 [quadrillion](#) (\$1,200,000,000,000,000.00: approx. GBP 2100; US\$ 4,200) in a [lottery](#).
- ❑ It also showed a monthly war pension currently is ZW\$109 billion (GBP 0.37, USD 0.74),
- ❑ Shops can only cash cheques if customer writes double the amount, because the cost will go up by the time the cheque has cleared, and people can only withdraw a maximum of ZW\$100 billion from ATMs.

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Sign in a public restroom in Zimbabwe



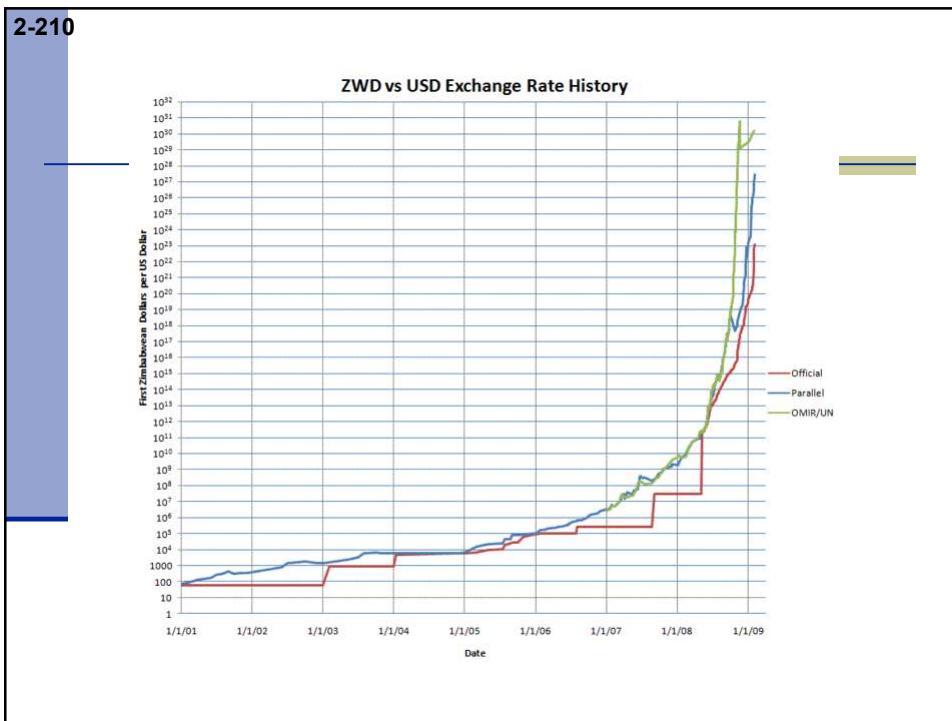
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Hyperinflation - Zimbabwe

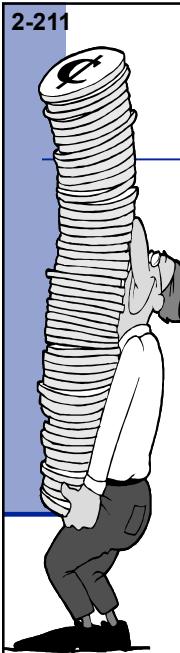
- How Zimbabwe came out of this trap?
- Abandoning the currency on April 1, 2009
- Today, all transactions are in foreign currencies, mainly the U.S. dollar and the South African rand.

y•d•e

| <u>Zimbabwean inflation rates (official) since independence</u> | | | | | | | | | | | |
|---|------|------|------|------|--------|------|---------|------|------|------|------|
| Date | Rate | Date | Rate | Date | Rate | Date | Rate | Date | Rate | Date | Rate |
| 1980 | 7% | 1981 | 14% | 1982 | 15% | 1983 | 19% | 1984 | 10% | 1985 | 10% |
| 1986 | 15% | 1987 | 10% | 1988 | 8% | 1989 | 14% | 1990 | 17% | 1991 | 48% |
| 1992 | 40% | 1993 | 20% | 1994 | 25% | 1995 | 28% | 1996 | 16% | 1997 | 20% |
| 1998 | 48% | 1999 | 58% | 2000 | 56% | 2001 | 132% | 2002 | 139% | 2003 | 385% |
| 2004 | 624% | 2005 | 586% | 2006 | 1,281% | 2007 | 24,059% | 2008 | % | 2009 | % |
| 2007 – 66,212%, 2008 – 231,150,888.87% (July) | | | | | | | | | | | |



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How Germany Came Out?

- Just as Fiscal problems caused the German **hyperinflation** – a fiscal reform ended it.
 - ❖ At the end of 1923, the number of govt. employees was cut by one third.
 - ❖ Reparations payments were temporarily suspended and eventually reduced.
 - ❖ At the same time, a new central bank – Rentenbank – replaced the earlier central bank - Reichsbank.
- Rentenbank was committed to not financing the govt. by printing money.

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Inflation and Interest Rates

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Real and Nominal Interest Rates

- Economists call the interest rate that the bank pays the **nominal interest rate** and
- the increase in the purchasing power - **real interest rate**.

$$r = i - \pi$$

❖ Above equation shows the relationship between the nominal interest rate and the rate of inflation, where

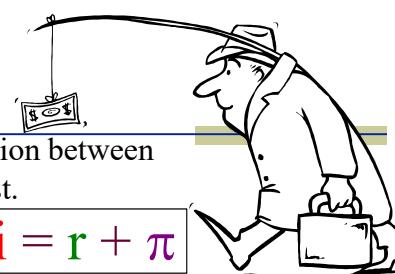
- r is real interest rate,
- i is the nominal interest rate and
- π is the rate of inflation,

NOTE: π is simply the percentage change of price level P .

- Real Interest Rate is the difference between the nominal interest rate and rate of Inflation.

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The Fisher Effect



Fisher Equation gives the distinction between the real and nominal rate of interest.

Fisher Equation:

One-to-one relationship between the inflation rate and the nominal interest rate is the **Fisher Effect**.

$$i = r + \pi$$

Actual (Market)
Nominal rate of
interest Real rate
of interest Inflation

It shows that the nominal interest can change for two reasons:

- if real interest rate changes or
- if inflation rate changes.

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- ❑ The quantity theory and the Fisher equation together tell us how money growth affects the nominal interest rate.
- ❑ According to the quantity theory, an 1% ↑ in the rate of money → a 1% ↑ in the rate of inflation.
- ❑ According to the Fisher equation, a 1% ↑ in the rate of inflation in turn → a 1% ↑ in the nominal interest rates.
- ❑ Here is the exact link between the two equations:

$$\% \text{ Change in } M + \% \text{ Change in } V = \% \text{ Change in } P + \% \text{ Change in } Y$$

\uparrow % Change in M + % Change in V = $\uparrow \pi$ + % Change in Y

$$\uparrow i = r + \uparrow \pi$$

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Ex Ante versus Ex Post Real Interest Rates

- ❑ When a borrower and lender agree on a nominal interest rate – they do not know what the inflation rate over the term of the loan will be.
⇒ Need for distinguishing *ex-ante* and *ex-post* real interest rates.
- ❑ The real interest rate the borrower and lender expect when a loan is made is called the *ex ante real interest rate*.
- ❑ The real interest rate that is actually realized is called the *ex post real interest rate*.
- ❑ Although borrowers and lenders cannot predict future inflation with certainty, they do have some expectation of the inflation rate.

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Ex Ante versus Ex Post Real Interest Rates

- ❖ Let π denote actual future inflation and π^e the expectation of future inflation.
- ❖ The *ex ante* real interest rate is $i - \pi^e$, and the *ex post* real interest rate is $i - \pi$.

NOTE: Two interest rates differ when actual inflation π differs from expected inflation π^e .

Q. How does this distinction modify the Fisher effect?

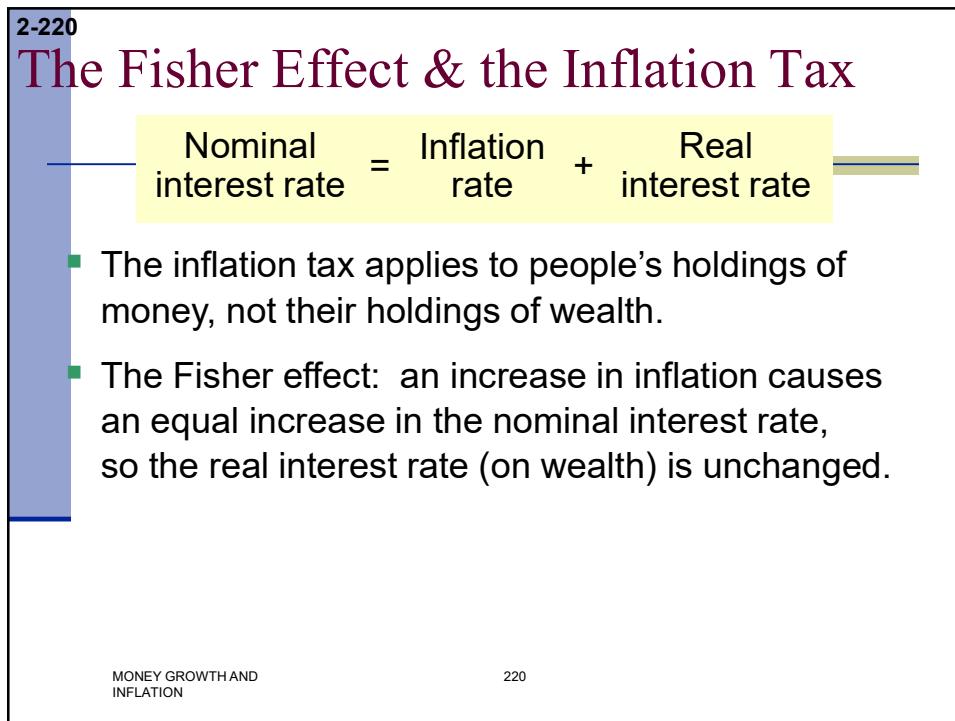
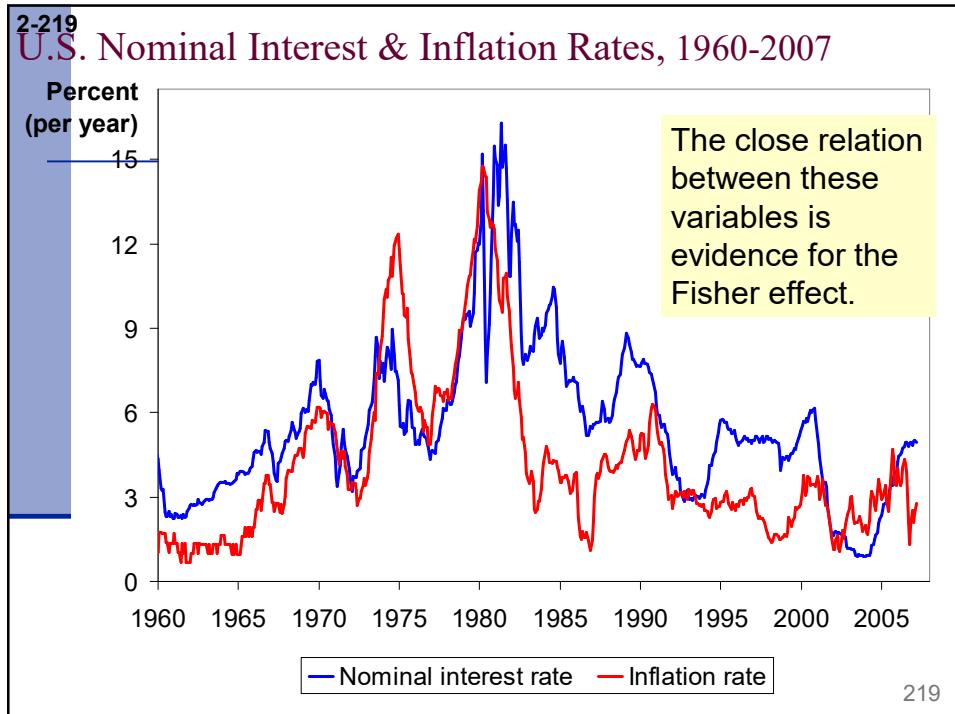
- Clearly the nominal interest rate cannot adjust to actual inflation, because actual inflation is not known when the nominal interest rate is set.
- The nominal interest rate can adjust only to expected inflation.
- ❖ Thus, the Fisher effect would be:

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Modified Fisher Effect

$$i = r + \pi^e$$

- The *ex ante* real interest rate r is determined by equilibrium in the market for goods and services, as described by the model earlier (GE model).
- The nominal interest rate i moves one-for-one with changes in expected inflation π^e .



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ACTIVE LEARNING 3

Tax distortions

You deposit Rs1000 in the bank for one year.

CASE 1: inflation = 0%, nom. interest rate = 10%

CASE 2: inflation = 10%, nom. interest rate = 20%

- a. In which case does the real value of your deposit grow the most?

Assume the tax rate is 25%.

- b. In which case do you pay the most taxes?

- c. Compute the after-tax nominal interest rate, then subtract off inflation to get the after-tax real interest rate for both cases.

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ACTIVE LEARNING 3

Answers

Deposit = Rs1000.

CASE 1: inflation = 0%, nom. interest rate = 10%

CASE 2: inflation = 10%, nom. interest rate = 20%

- a. In which case does the real value of your deposit grow the most?

In both cases, the real interest rate is 10%, so the real value of the deposit grows 10% (before taxes).

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ACTIVE LEARNING 3**Answers**

Deposit = Rs 1000. Tax rate = 25%.

CASE 1: inflation = 0%, nom. interest rate = 10%

CASE 2: inflation = 10%, nom. interest rate = 20%

b. In which case do you pay the most taxes?

CASE 1: interest income = \$100,
so you pay Rs 25 in taxes.

CASE 2: interest income = Rs 200,
so you pay Rs 50 in taxes.

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ACTIVE LEARNING 3**Answers**

Deposit = Rs1000. Tax rate = 25%.

CASE 1: inflation = 0%, nom. interest rate = 10%

CASE 2: inflation = 10%, nom. interest rate = 20%

c. Compute the after-tax nominal interest rate,
then subtract off inflation to get the
after-tax real interest rate for both cases.

CASE 1: nominal = $0.75 \times 10\% = 7.5\%$
real = $7.5\% - 0\% = 7.5\%$

CASE 2: nominal = $0.75 \times 20\% = 15\%$
real = $15\% - 10\% = 5\%$

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ACTIVE LEARNING 3

Summary and lessons

Deposit = Rs 1000. Tax rate = 25%.

CASE 1: inflation = 0%, nom. interest rate = 10%

CASE 2: inflation = 10%, nom. interest rate = 20%

Inflation...

- raises nominal interest rates (Fisher effect)
but not real interest rates
- increases savers' tax burdens
- lowers the after-tax real interest rate

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A Special Cost of Unexpected Inflation

Arbitrary redistributions of wealth

Higher-than-expected inflation transfers purchasing power from creditors to debtors:

Debtors get to repay their debt with rupees that aren't worth as much.

Lower-than-expected inflation transfers purchasing power from debtors to creditors.

High inflation is more variable and less predictable than low inflation.

So, these arbitrary redistributions are frequent when inflation is high.

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The Costs of Inflation

- All these costs are quite high for economies experiencing hyperinflation.
- For economies with low inflation (< 10% per year), these costs are probably much smaller, though their exact size is open to debate.

MONEY GROWTH AND
INFLATION

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CONCLUSION

- This chapter explains one of the Ten Principles of economics:
Prices rise when the govt prints too much money.
- We saw that money is neutral in the long run, affecting only nominal variables.
- In later chapters, we will see that money has important effects in the short run on real variables like output and employment.

MONEY GROWTH AND
INFLATION

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CHAPTER SUMMARY

- To explain inflation in the long run, economists use the quantity theory of money. According to this theory, the price level depends on the quantity of money, and the inflation rate depends on the money growth rate.
- The classical dichotomy is the division of variables into real & nominal. The neutrality of money is the idea that changes in the money supply affect nominal variables but not real ones. Most economists believe these ideas describe the economy in the long run.

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CHAPTER SUMMARY

- The inflation tax is the loss in the real value of people's money holdings when the government causes inflation by printing money.
- The Fisher effect is the one-for-one relation between changes in the inflation rate and changes in the nominal interest rate.
- The costs of inflation include menu costs, shoeleather costs, confusion and inconvenience, distortions in relative prices and the allocation of resources, tax distortions, and arbitrary redistributions of wealth.

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Key Concepts of Ch. 4

| | | |
|--------------------|--------------------------------|---|
| Inflation | Central Bank | Seigniorage |
| Hyperinflation | Federal Reserve | Nominal and real interest rates |
| Money | Open-market operations | Fisher equation |
| Store of value | Currency | Fisher effect |
| Unit of account | Demand deposits | Ex ante and ex post real interest rates |
| Medium of exchange | Quantity equation | Shoeleather costs |
| Fiat money | Transactions velocity of money | Menu costs |
| Commodity money | Income velocity of money | Real and nominal variables |
| Gold Standard | Real money balances | Classical dichotomy |
| Money supply | Money demand function | Monetary neutrality |
| Monetary policy | Quantity theory of money | |

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Money supply simulation game

- Rules for Bankers
- Maximize Profits (interest revenue from assets – interest cost of time deposits)
- Cash reserve assets and demand deposits earn zero interest
- Banks starts with no excess reserves and it can make loans only when it acquires more cash reserve assets than it needs from either the central bank or the depositor
- Bankers pay 7% interest rate on time deposits, charging 8% on loans
- Minimum cash reserve requirement – 10% for DD and no reserve requirement for time deposits
- Bankers are expected to issue IOU for any new deposits to them and record on the consolidated balance sheet of the banking system on the blackboard, any extra cash reserves they keep to satisfy the cash requirement

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Rules for loan customers

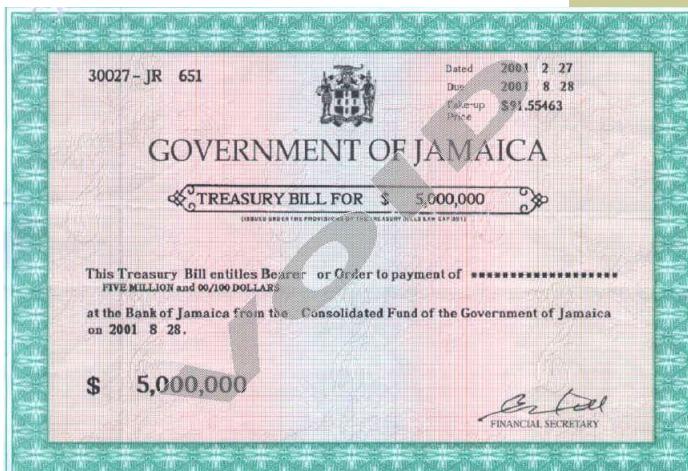
- Maximize profits (borrowing to finance any project whenever they can borrow at a rate lower than the project's expected rate of return)
- Each project is financed separately, and the scale of the project is assumed to match whatever amount the banker has to lend
- The entire amount of loan must be paid to whatever business firm supplies the loan project's requirement; loan customers keep none of the cash proceeds in cash or deposits
- Loan customers are expected to provide their banker with an IOU for any loan they arrange, and to record their extra loan on the consolidated balance sheet of the banking system, on the blackboard

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Rules for Business firms

- Business firms make a profit by filling loan customer's order
- Maximize profit in allocation of any funds received among cash, demand deposits, and time deposits. Cash and demand deposits earn zero interest
- Each business firm must keep in cash at least the proportion of any payment specified in that firm's scenario, rounded up to the nearest pebble
- Each business firm must put into a demand deposit at least the proportion of any payment specified in that firm's scenario as being needed soon, rounded to the nearest integer. The remaining can be put into time deposit
- If the business firm tries to hide its transactions, it holds all in cash
- Business firms are expected to record their extra bank deposits on the consolidated balance sheet of the banking system, on the blackboard

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