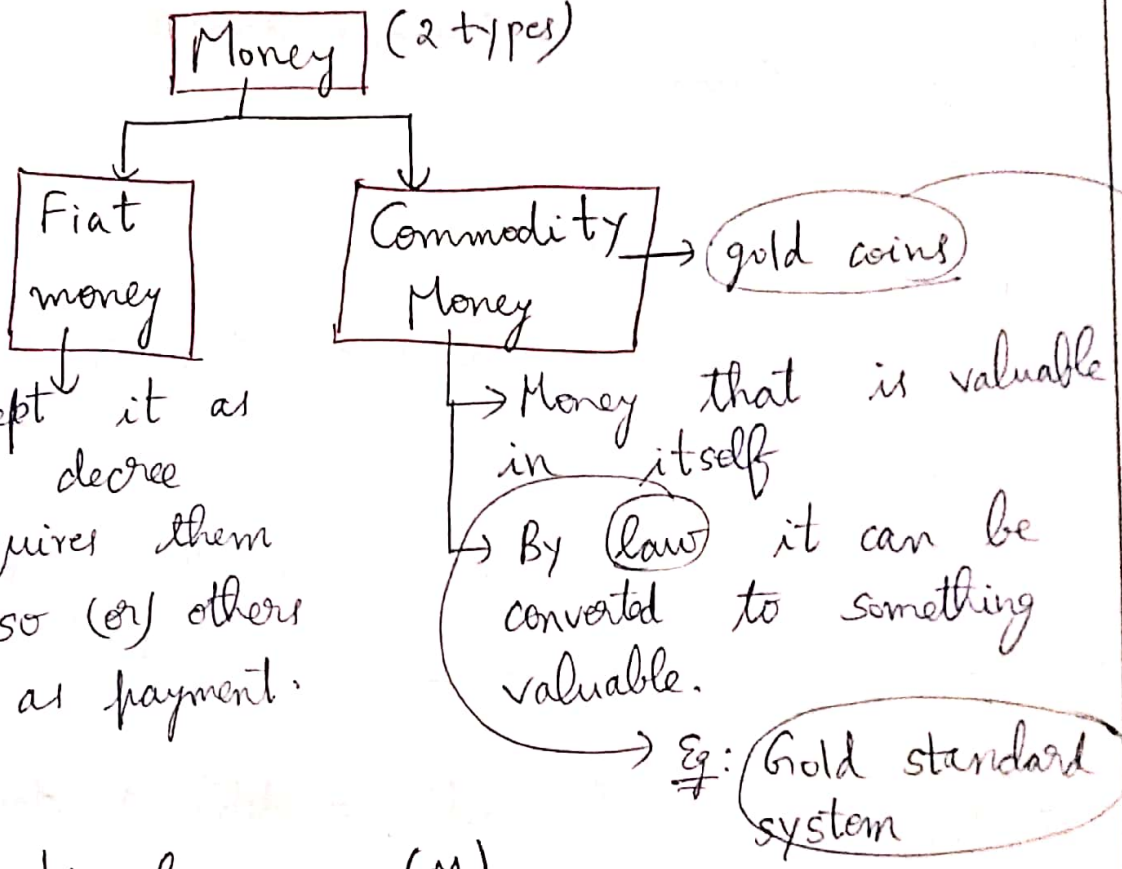
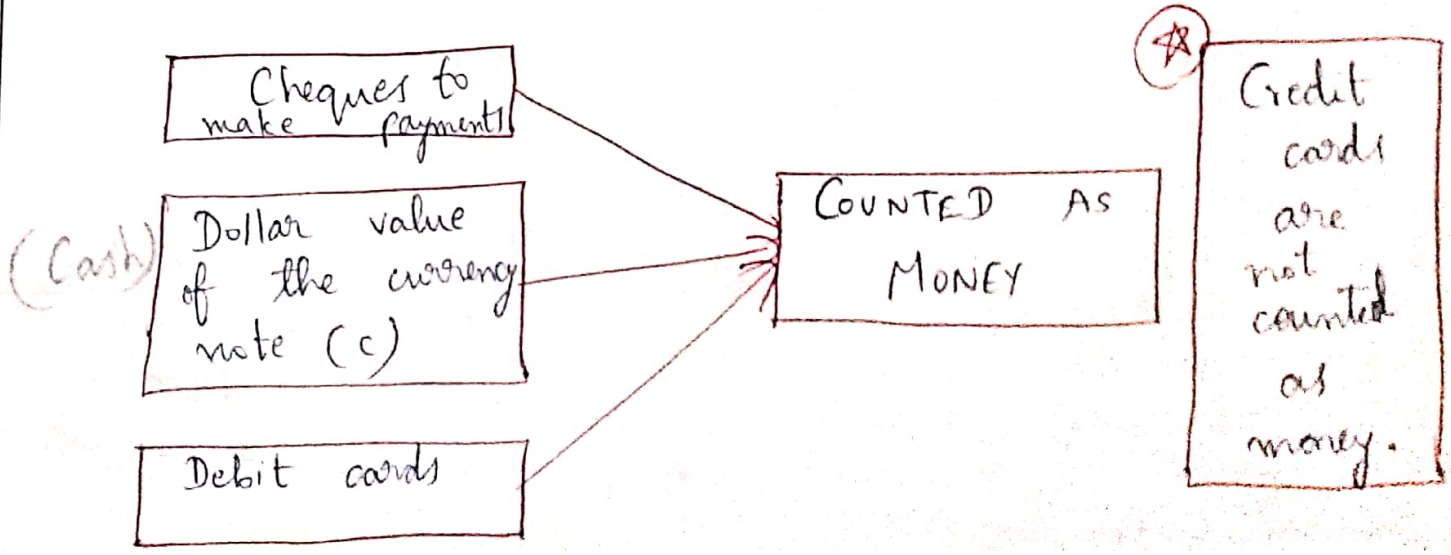
Monetary System.

- **Money:**
  - → medium of exchange
  - → Money is anything that can be directly used (Creadily) to pay for purchases.
  - → Store of value.



- **Qty / Amt / Supply of money: (M)**
  - → Total value of all assets in the economy that can be used as money.



→ The Measures of M :

M → M1 = C + demand deposits + traveler's check + other checkable deposits

M → M2 = M1 + saving deposits + mutual fund balances + small time deposits.

M → C (Currency)

M1 = C + D

C → Qty/ Money Supply

D → Demand deposits

↳ Banks :

→ get money through deposits of depositors.

→ borrow money by selling bonds → debt of bank.

→ Bank owners must invest their own money in their bank → bank's capital/ equity

Total bank liabilities = debt + deposits

Total bank funds = Liabilities + Capital

Some are kept in the bank's vaults as reserves (R).

↳ portion of deposits that banks have not lent

source of

Some are used to make loans

↓

bank gets interests from borrower.

↓

income for bank

Some for securities purchased

↳ source of income for bank.

Total bank assets = Reserves + loans + securities purchased.

Hence, banks funds are used to buy assets.

→ Bank's leverage : Use of borrowed money (debts / deposits) to supplement owners' funds for investment purposes.

$$\text{Leverage Ratio} = \frac{\text{Assets}}{\text{Capital}}$$

Eg: ① Assets

Reserves → $200

Loan → 500

Security purchases → 300

Liabilities & Owner's equity

Liabilities: Deposits → $750; Debt → 200

Capital → 50

Leverage ratio = (200 + 500 + 300) / 50

= 20.

Being ↑ leveraged ⇒ banks in danger!

↳ In Eg ①, if assets ↓ by 5%,

assets = 1000 − $\frac{5}{100}$(1000) = $950 → = 0 when assets = liability

liability = 750 + 200 = 950

Capital = assets − liability = 950 − 950 = $0.

↳ Capital leverage ratio should be less.

→ Capital requirements for a bank:

① Capital ≥ liabilities ⇒ banks → able to pay deposits & repay their debts.

② Banks with riskier assets ⇒ need ↑ capital requirements.

③ Avoid financial crisis

④ Encourage lending

Central Bank in Monetary System : (Algebraic Model)

① $M = C + D$. All M, C & D variables are endogenous

② $B = C + R$ → reserves

B → exogenous

C & R → endogenous (internal cha

Monetary base → of a country determined only by its central bank. (currency only a ₹10 is ba

③ $cd = C/D$ → currency - deposit ratio

④ $rd = R/D$ → reserve - deposit ratio

cd & rd → exogenous

$(0 < rd < 1)$

③ ⇒ $C = cd\,D$, ④ ⇒ $R = (rd)D$

⑤ & ⑥ ⇒ exogenous variab used to expres endogenous va

② ⇒ $B = (cd)D + (rd)D$

$B = (cd + rd)D$

$D = \left(\frac{1}{cd + rd}\right) B$ ⑤

B, cd, rd → exogenous

D → endogenous.

① ⇒ $M = (cd)D + D$

$= (cd + 1)D$

$M = \left(\frac{cd + 1}{cd + rd}\right) B$ ⑥

M → endogenous.

money multiplier (m)

$M = mB$ Ⓐ

$0 < rd < 1$

⇒ $m > 1$.

∴ For every dollar of monetary base supplied by th central bank, money supply of the country ↑ ∞ and it > $1.

$C = cd \cdot D$

$$C = (cd)\left(\frac{1}{cd + rd}\right)B \quad \#$$

$R = rd \cdot D$

$$R = (rd)\left(\frac{1}{cd + rd}\right)B \quad \#$$

→ C also in terms of exogenous variables B, cd, rd.

$M = C + D$

$$= \left(\frac{cd}{cd + rd}\right)B + \left(\frac{1}{cd + rd}\right)B$$

$$M = \left(\frac{cd + 1}{cd + rd}\right)B \quad \#$$

$$m = \frac{cd + 1}{cd + rd} \quad \#$$

→ Money multiplier (m)

→ (i) $B \uparrow^{ser} \Rightarrow M \uparrow^{ser}$

Monetary base $\uparrow^{ser} \Rightarrow$ money supply also $\uparrow^{ser}$.

→ (ii) $rd \downarrow^{ser} \Rightarrow M \uparrow^{ser}$

Reserve-deposit ratio decreases ⇒ money supply increases

→ (iii) $cd \downarrow^{ser} \Rightarrow M \uparrow^{ser}$

Currency-deposit ratio $\downarrow^{ser} \Rightarrow$ money supply increases.

directly controlled by central bank

indirectly controlled by central bank

→ Central bank controls monetary supply of money (M)

How do central banks (fed) change monetary base (B)?

→ print money (dollar) to buy securities from banks/public ⇒ R ↑, C ↑

↳ does not use money from reserves

$B = C + R \Rightarrow B \uparrow^{ser}$

→ banks' reserves $\uparrow^{ser}$

→ When banks do not trust private lenders, Fed → loans to banks ⇒ $\uparrow^{ser}$ banks' reserves.

Central bank lends loans to banks in 2 ways → Discount Window

↓

Term Auction Facility (TAF)

- happens as a response to financial crisis
- Central bank decides how much it wants to lend as loans
- Eligible banks apply for these loans.
- Only those banks ~~get loan~~ which offer to pay the highest interest get loans.

↳ For these banks, $R \uparrow^{sel} \Rightarrow B \uparrow^{sel}$.

Central Banks lends loans directly to the other banks @ some interest rate (commercial banks)

↳ discount rate.

↓ less ⇒ banks borrow ↑ loans ⇒ banks' reserve (R) $\uparrow^{sel}$

$B = C + R \Rightarrow B \uparrow^{sel}$.

↳ How do central banks indirectly control rd?

⇒

Maintain reserve requirements for banks

done by

→ imposing a min. rd (RD) ratio ⇒ to ensure min. money in banks for depositors to withdraw it.

→ Reserve requirements ↓ ⇒ rd ↓ ⇒ m ↑ ⇒ M ↑.

Charging interest on banks' reserves.

→ Banks keep their reserves with the Central bank.

⇒ Central bank pays interest to these banks

when this interest ↓sel ⇒ banks keep ↓ reserves ⇒ rd ↓ ⇒ m ↑ ⇒ M ↑

↳ 100-percent-reserve banking:
A system in which a bank holds all their deposits as reserves.

↳ Fractional-reserve banking:
→ A system in which a bank holds only a fraction of their deposits as reserves.
→ Creates money but it does not create wealth.
→ Provide loans to borrowers ⇒ new debts.

Eg: Consider a bank → 20% of deposits as reserves.

Bank's Balance Sheet	
Assets	Liabilities
Reserves: $200	Deposit: $1000
Loans: $800	

deposit = $1000.
⇒ Reserves = $\frac{20}{100} \times 1000^{10}$
= $200
loans = $\frac{80}{100} \times 1000^{10}$
= $800

Capital = 1000 − 1000 = $0
⇒ Assets > Liabilities (Capital) → capital requirements

↳ M = C + D.
D ↓ ses (ppl deposit ↓ in banks & hold ↑ currency) ⇒ banks can't supply ↑ money.
M ↓ ses.

↳ $M = m \times B = \left(\frac{cd+1}{cd+rd}\right) B$
cd ↑ ses ⇒ cd ↑ ses in denominator ↑ than in numerator. → M ↓ ses.

↳ Instruments of the Monetary Policy (3)
(See later)

- Open market operations
  - [Other method (print money to buy securities ...) ↓ Central bank]
  - → most frequently used.
- Reserve requirements
  - [controls cd indirectly]
  - → least frequently used
- discount rate
  - [The Central bank controls B by lending loans]
  - → "lender of last resort"
  - → symbolic.

↳ The Central bank cannot control M direcly.

$M = m \times B, \quad m = \frac{cd+1}{cd+rd}$

→ controls B directly & cd indirectly ⟹ M ⟸ also changes accordingly.

↳ Money Demand Theories

- Portfolio
  - emphasizes on "store of value" func" of money
- Transactions → emphasizes on "medium of exchange" func" of money.

↳ simple portfolio theory:

$$(M/P)^d = L(r_s, r_b, \pi^e, W)$$

$r_s \rightarrow$ expected real return on stocks

$r_B \rightarrow$ " " " " bonds

$W \rightarrow$ real wealth

$\pi^e \rightarrow$ expected IR (inflation rate)

↳ Baumol-Tobin Model (B-T Model): (Transactions Money demand theory)

$Y \rightarrow$ total spending done annually

$i \rightarrow$ interest rate on savings account

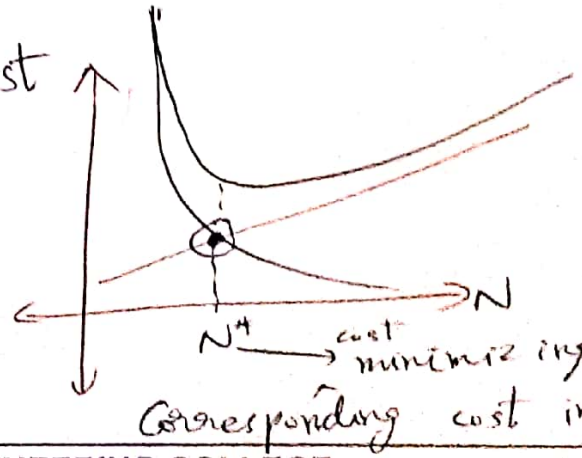
$N \rightarrow$ no. of trips consumer takes to go to bank to withdraw money

$F \rightarrow$ Cost of 1 trip to the bank.

- Avg. money holdings $= \frac{Y}{2N}$ — ①
- Foregone interest $= i\left(\frac{Y}{2N}\right)$
- Cost of N trips to bank $= F \times N$.

$$\text{Total Cost} = \left(\frac{Y}{2N}\right) i + F \times N$$

- Cost-minimising N:
  - $-FN$ (Cost of trips)
  - $-$ Total Cost
  - $- i\left(\frac{Y}{2N}\right)$ Foregone interest



$$N^* = \sqrt{\frac{iY}{2F}} \quad \text{--- (1)}$$

Avg. money holding $= \frac{Y}{2N^*} = \frac{Y}{2\sqrt{\frac{iY}{2F}}}$

$$= \frac{Y\sqrt{2F}}{2\sqrt{iY}}$$

$$= \frac{\sqrt{Y}\sqrt{F}}{\sqrt{2i}}$$

$$\boxed{\text{Avg money holding} = \sqrt{\frac{YF}{2i}}}$$ → Money demand function

↓

$$\left(\frac{M}{P}\right)^d = \sqrt{\frac{YF}{2i}} = L(Y, F, i)$$

[Tells how money demand depends on F]

Money demand $\propto Y, F$

$\propto \frac{1}{i}$

↳ Near money:

- Non-monetary assets having some of the liquidity of money → near money.
- ↑ in near money ⇒ ↓ stability of money demand ⇒ complicates monetary policy.