Week 8. Banking & Monetary Policy

1. **Definition of Money**
   a. Medium of Exchange: standard object used in exchanging goods and services
   b. Unit of Account: standard unit in quoting prices
   c. Store of Value: an item used to store wealth from one point in time to another

2. **Evolution of Money**
   a. Barter System
      i) non-monetary exchange system
      ii) requires *double coincidence of wants*.
   b. Commodity Money: has intrinsic value (e.g. gold & silver)
   c. Fiat Money: has no intrinsic value, but backed i) fully by gold & silver of equal value held in the issuer's vault (full-bodied paper money); ii) partially by gold & silver (certificates or bank notes); iii) only by confidence (present day)

3. **Measuring Quantity of Money**
   a. M1 = Sum of all coins and paper money in circulation (Currency) + checkable deposit balances in banks and savings institutions (**Completely liquid**)
   b. M2 = M1 + savings account balances + shares in money market mutual funds + small-denomination time deposits (CD) (less liquid than M1)
   c. M3 = M2 + large-denomination time deposits (CD)
   d. Near Moneys: Liquid assets that are close substitutes for money, but not included in Money Supply (e.g. short-term government bonds)
   * *Liquidity refers to the ease w/ which it can be converted into cash*

4. **Money Market & Capital Market**
   a. Money Market: Short-term, highly-liquid debt securities
   b. Capital Market: Long-term debts & stocks

5. **Fractional Reserve Banking** requires only min reserve ratio to be kept in the vault, while the bank can i) pursue profitability (by accepting deposits @ 0 or low *i*, but charge high *i* to loans); ii) have discretion over money supply, iii) be exposed to runs.

6. **Bank Regulation**
   a. Deposit Insurance: a system that guarantees that depositors will not lose money even if the bank goes bankrupt due to bank run, … etc.. (e.g. FDIC)
   b. Bank Examination
   c. Minimum Required Reserves: min amount of reserves to be kept in the vault (vault cash) required by law proportional to the volume of cash.

7. **Simple Accounting of Bank's Balance Sheet Book-Keeping**

Assets			Liabilities & Net Worth		
Assets			**Liabilities**		
Reserves @20% RR	$	1,000,000	Checking Deposits	$	5,000,000
Loans Outstanding	4500000 (4000000+N.W.)				
Total	$	55,000,000			
Addendum: Bank Reserves			**Net Worth**	(=Accounting convention	
Actual Reserves	$	1,000,000	Stockholder's equity	$	500,000
Required Reserves	$	1,000,000			
Excess Reserves	$	-	**Total**	$	5,500,000

What they owe you + what you owe no one. What you owe them.

Asset = Liabilities + Net Worth

8. **Federal Reserve System**

Commercial Banks			Federal Reserve			
Assets		**Liabilities**	**Assets**		**Liabilities**	
Reserves	100 mil	4,	T-Bills	100 mil	Bank Reser	100 mil
T-Bills	-100 mil	2,	buys/receive	1,	pays/owes	3,
Addendum: Changes in Reserves						
Actual Reser	100 mil					
Required Re	No Change	Assume the bank already met RR before this transaction.				
Excess Rese	100 mil					

Effects of an Open Market Purchase of Securities on the Balance Sheets of Banks and the FED

i) Fed buys U.S. gov't securities. → pays by creating new bank reserves w/ Fed. → Ms↑ (monetary expansion through money multiplier)

ii) Fed sells U.S. gov't securities. → collects by reducing bank reserves w/ Fed. → Ms↓

a. **Multiple Money Creation by a Series of Banks**

$$D_\infty = D_0 \times \left[1 + R + R^2 + R^3 + \cdots + R^\infty\right] = \frac{1}{1-R} \times D_0 = \frac{1}{1-(1-m)} = \frac{1}{1-.8} \times \$100{,}000 = \$500{,}000,$$

where m = *required reserve ratio*

$$L_\infty = L_0 \times \left[1 + R + R^2 + R^3 + \cdots + R^\infty\right] = \frac{1}{1-R} \times L_0 = \frac{1}{1-(1-m)} = \frac{1}{1-.8} \times \$80{,}000 = \$400{,}000$$

$$R_\infty = D_0 \times (1-R) \times \left[1 + R + R^2 + R^3 + \cdots + R^\infty\right] = \frac{D_0 \times (1-R)}{1-R} = D_0, \quad or \quad D_\infty - L_\infty = \$100{,}000$$

			Running Sums		
Reserves @20%	**Lent Out**	**Reserves @20%**	**Deposits**	**Loans**
$ 20,000	$ 80,000	$ 20,000	**$ 100,000**	$ 80,000
$ 16,000	$ 64,000	$ 36,000	**$ 180,000**	$ 144,000
$ 12,800	$ 51,200	$ 48,800	**$ 244,000**	$ 195,200
$ 10,240	$ 40,960	$ 59,240	**$ 295,200**	$ 236,160
$ 8,192	$ 32,768	$ 67,232	**$ 336,160**	$ 268,928
continued	continued	continued	continued	continued
		$ 100,000	**$ 500,000**	$ 400,000

b. **Oversimplified Deposit Multiplier**: $\Delta Deposit = \frac{1}{m} \times \Delta \text{Re}serve = \frac{1}{1-R} \times \Delta \text{Re}serve$

i) The chain of deposit creation ends only when there are no more excess reserves to be loaned out. (when the initial deposit is exhausted in loans.)

ii) Since balance sheets must balance, the sum of all newly created assets (reserves + loans) must equal the sum of all newly created liabilities

c. **Oversimplified deposit multiplier is accurate only if**

i) Every recipient of cash must redeposit the cash into another bank rather than hold it. (*e.g.* If individuals and firms decide to hold more cash, the multiple expansion of deposits will be curtailed, because fewer dollars of cash will be used a s reserves to support new checking deposits.)

ii) Every bank must hold reserves no larger than the legal minimum. (*e.g.* if banks wish to keep excess reserves because of worsened outlook for loan repayment due to recession, the multiple expansion of deposits will be restricted.)

9. **Need for Monetary Policy**

a. During a recession, banks would be prone to reduce the M^s by increasing excess reserves, such a contraction of M^s would aggravate recession. On the other hand, banks will want to squeeze the max possible M^s out of cash reserves by keeping their reserves at the bare min when the demand for bank loans is buoyant, profits are high, and secure I opportunities abound. During an economics boom, banks are likely to make $M^s\uparrow$, adding undesirable inflationary momentum to the boom.

b. Bringing the money into analysis sheds a new light to explaining the biz cycle.

i) Inflationary gap: not due to exogenous I, but due to ↑Ms → money multiplier/ money illusion → AD↑ → π↑.

ii) T↓ (Fiscal) or $i\downarrow$ (Monetary) → C↑ & I↑ → AD↑ → π.

10. **How Fed Controls Money Supply**

a. OMO **(**Open Market Operation), Bond Prices, and Interest Rates

i) ↑Bond sale → ↓Pb → *Rf*↑ → *i*↑, since T-bond yield ≈ *Rf* return (interest rate). If bond yield is *Rf*, then the banks must pay at least the bond yield to attract deposit and charge higher interest on the loan.

ii) OMO bond purchase/sale not only ↑Ms/↓ Ms, but also ↓*i*/↑ *i*.

b. Discount Rate/Bank Rate

i) Fed, the lender of last resort, lends to commercial bank in trouble. → commercial bank's deposit account w/ Fed↑ → ↑Ms.

ii) Fed can influence the amount banks borrow by manipulating the rate of interest charged on these loans → discount rate.

iii) In the U.S., Fed relies primarily on OMO. Discount rate is secondarily and passively used to keep it in line w/ market *i*.

c. Reserve Requirements

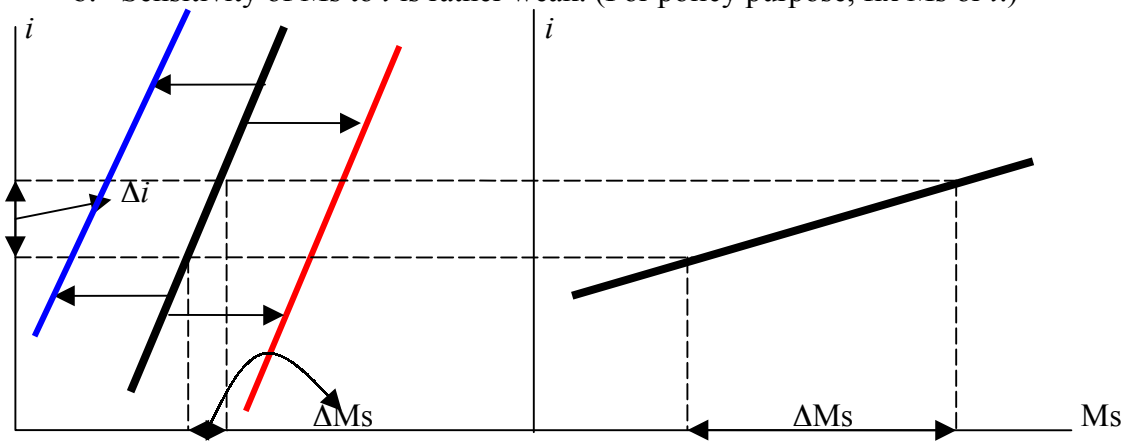
i) ↓R.R./↑R.R. → Ms↑/Ms↓.

ii) Fed no longer uses R.R. as a weapon of monetary control. Currently, R.R. is 10%.

11. **Money Supply Mechanism**

a. *Ms* = *f*(*i, Fed policy*): *i*↑→ Banks ↑loans & ↑deposits →↑Ms (mitigate↑Ms). However, the Fed can shift this relationship between *i* and Ms by employing either OMO, discount rate, or R.R..

b. Sensitivity of Ms to *i* is rather weak. (For policy purpose, fix Ms or *i*.)



Ms insensitive to *i* (Realistic) Ms sensitive to *i*

12. **Demand for Money**

$Md \text{ or } L = f(Y,i) = kY - hi$

a. $Y = \frac{\overline{M}}{k} + \frac{h}{k} i \text{ if } L = M \leftarrow LM$ &

$\therefore i = \frac{k}{h} Y - \frac{\overline{M}}{h}$

$Y = a + b(Y - T) + (c - dr) + G \leftarrow IS - curve$

$= \frac{a+c}{1-b} + \frac{G}{1-b} + \frac{-b}{1-b} T + \frac{-d}{1-b} r \leftarrow IS \text{ eqn}$

$IS = LM : Y = \frac{a+c}{1-b} + \frac{G}{1-b} + \frac{-b}{1-b} T + \frac{-d}{1-b}\left[\frac{k}{h} Y - \frac{\overline{M}}{h} \times \frac{1}{P}\right],$

where *kY* = Transaction D & *hi* = Storage Value D. As Y↑ or *i*↓ → Md↑ and vice versa.

$$L \rightarrow m_t - p_t = -\gamma\,(p_{t+1} - p_t)$$

$$m_t + \gamma\, p_{t+1} = \gamma\, p_{t+1} + p_t = (\gamma + 1)p_t$$

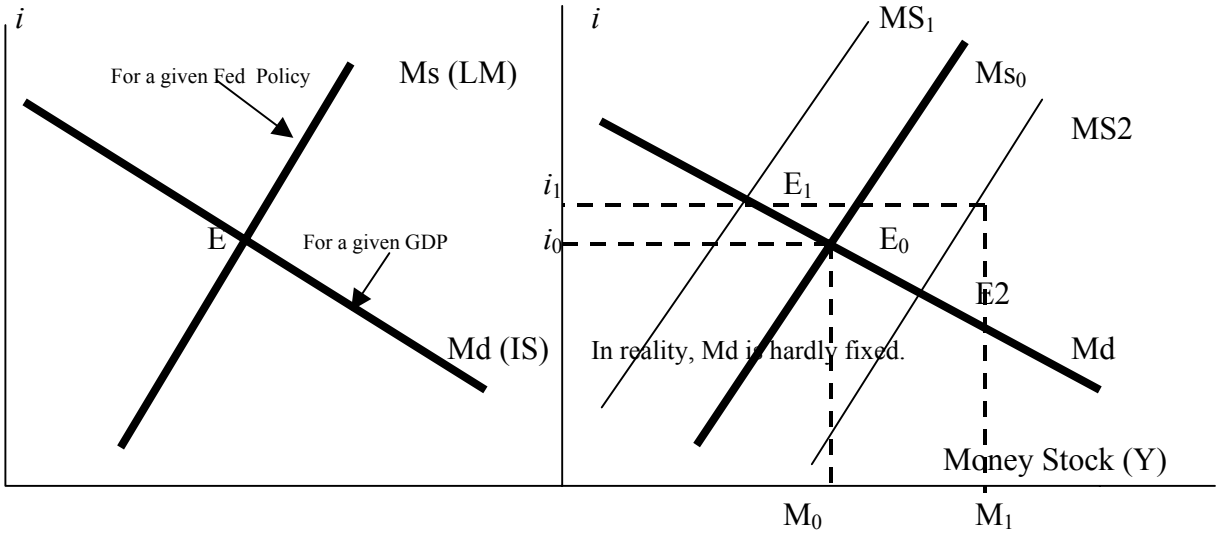
$$p_t = \frac{m_t + \gamma\, p_{t+1}}{\gamma + 1} = \frac{1}{\gamma + 1} m_t + \frac{\gamma}{\gamma + 1} p_{t+1}$$

* Cagan's Md Function: $p_{t+1} = \frac{1}{\gamma + 1} m_{t+1} + \frac{\gamma}{\gamma + 1} p_{t+2}$

$$p_t = \frac{1}{\gamma + 1} m_t + \frac{\gamma}{\gamma + 1}\left(\frac{1}{\gamma + 1} m_{t+1} + \frac{\gamma}{\gamma + 1} p_{t+2}\right)$$

$$= \frac{1}{\gamma + 1}\left(m_t + \frac{1}{\gamma + 1} m_{t+1} + \frac{\gamma}{(\gamma + 1)^2} m_{t+2} + \frac{\gamma^2}{(\gamma + 1)^3} m_{t+3} + \cdots\right)$$

b. To measure Md, Y or GDP must be held constant. Otherwise the curve will shift.



13. **Interest Rates and Total Expenditure**

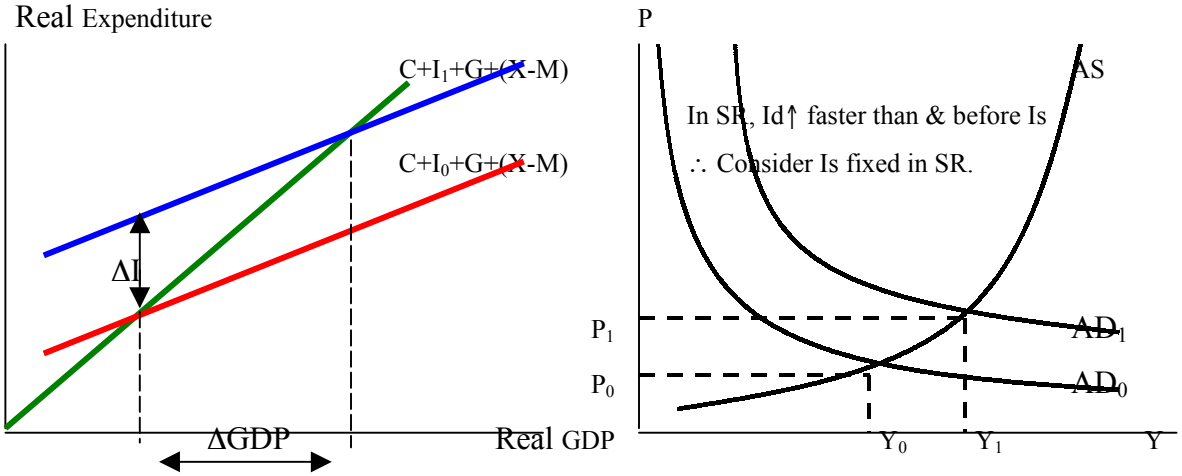
$i \uparrow / i \downarrow \rightarrow$ I↓ & (X–M)↓ / I↑ & (X–M)↑. (Since if $i\uparrow \rightarrow {}_F L_H \uparrow \rightarrow \frac{C_H}{C_F \uparrow} \downarrow = e \downarrow$)

↓I & ↓(X–M) / ↑ I & ↑(X–M) → [C+I+G+(X–M)]↓ / [C+I+G+(X–M)]↑

14. **Monetary Policy & AD**

Fed targets @ stabilizing *i* by changing Ms.

$$\boxed{\text{Fed Policy}} \rightarrow \underset{\uparrow \frac{\Delta i}{\Delta Ms}}{\boxed{\text{Ms (where Md is fixed) \& } i}} \rightarrow \underset{\uparrow \frac{\Delta I}{\Delta Ms}}{\boxed{\text{I}}} \rightarrow \underset{\text{AD}}{\overset{\frac{\Delta C}{\Delta Ms}}{\boxed{\text{C+I+G+(X-M)}}}} \rightarrow \underset{\text{Multiplier}}{\boxed{\text{Y}}}$$



15. **Money and Price Level**
    a. Fiscal Policy: directly ↑AD → Firms ↑Q (Output) → ↑P level → mitigated ↑Y
    b. Monetary policy: Fed ↑Ms → ↓*i* → ↑I → ↑AD → ↑P level → mitigated ↑Y

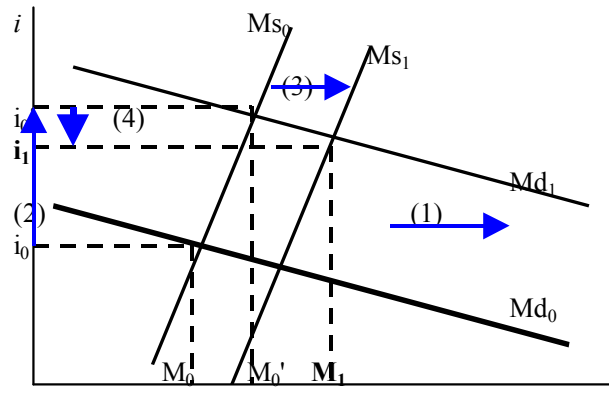
Fed Policy → Ms (where Md is fixed) & *i* → I → C+I+G+(X-M) → Y and P

16. **Two Reasons for Down-sloping AD Curve Revisited**
    a. ↑P_H → ↓Storage Value/↓PP of M & b → mitigates ↑C / ↑(X–M) → AD↓.
    b. ↑P_H or ↑Avg transaction money cost → ↑Nominal GDP → ↑Md @ r given.
    With $\overline{Ms}$, ↑Md → ↑*i* (the price of borrowing money) → ↓I /↓(X–M)→ AD↓.
    Now, the explanation is complete with C↓+I↓+(X-M)↓ → AD↓.

17. **Ms Shift in a Broader Context**

Although Ms = *f*(Fed Policy, *i*), Ms shift by *i* is not the immediate result of the Fed's monetary policy, but rather caused by the reaction of the commercial banks to the increase in *i*, - *i.e.*) *i* = *f*(Ms), which must clearly be distinguished from the increase in Ms by Fed's bond buyback. However, since people would rather not borrow at higher *i*, and rather keep their money in the bank, the intent of the commercial banks are partially cancelled.

1) When Md↑, there's a natural pressure on *i* to ↑.
2) i_0 increases to i_0' and Ms_0 shifts out to Ms_1. - *i.e.*) $Ms = f(i)$.

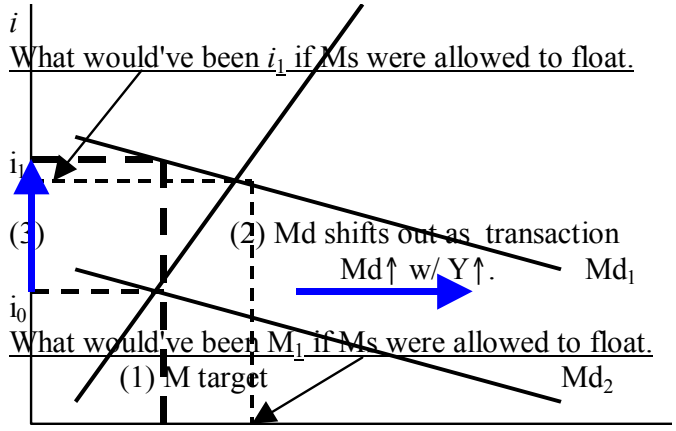


3) This *i*-induced Ms shift is not by Fed, but by commercial banks. (Normally, Fed does it, but then ↑Ms → ↓*i* - *i.e.*) *i* = *f*(Ms). When Fed does that, it's b/c Fed wants to fight the recession, so that ↑Ms → ↓*i* concurs with the Fed's intent. In such a case, Md is assumed fixed.)
4) Eventually, this will be the new *eqm*.

18. **Fed's Choice of Policy Target**

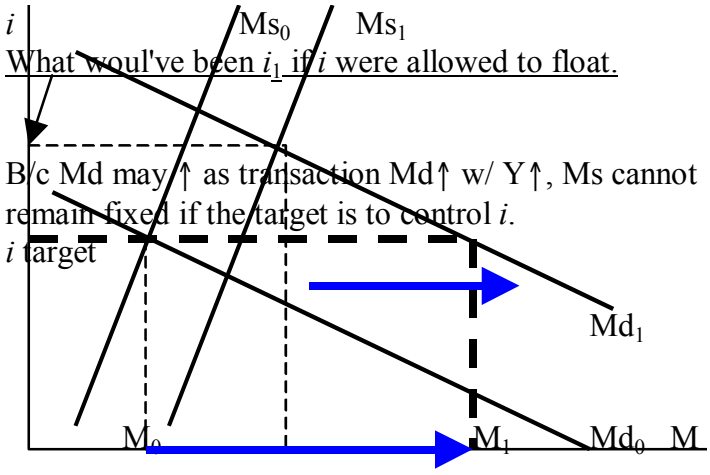
In implementing monetary policy, Fed can target at either one of the two objectives, but not both at the same time.

a. If the objective is to control the Ms to be at or around certain level, so that the economy's growth would stay on the well-behaved path (Remember they would do this to avoid either extremities of the business cycle, - *i.e.*) inflation & recession. As long as the Ms remains within certain upper & lower bounds, then there will be neither too loose nor too tight monetary situation, and hence, no extremities.), they



can't help but allow *i* to rise.

b. If the objective is to control the interest rate to be at or around certain level, so that the economy's growth would stay on the well-behaved path, they can't help but allow



Ms to shift out.