5. Monetary Policy

EE212 2/2016 : Section 464001-A. Sicha

Case & Fair, ch. 10-11; LCR, ch. 27-29, Froyen p.335-339

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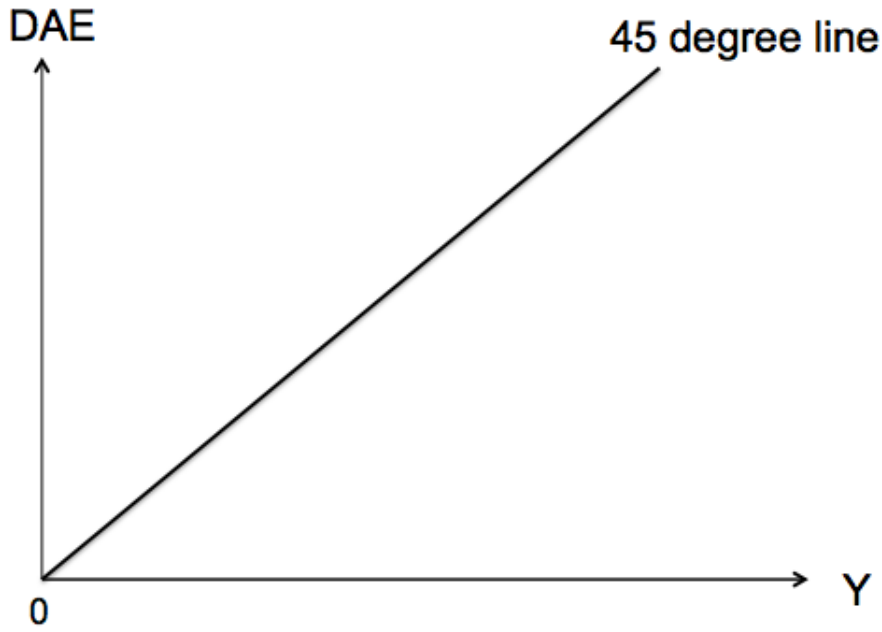
Contents

$$
\begin{aligned}
DAE &= C + I + G + (X - M) \\
&= [C_a - bT_a + I_a + G_a + X_a - M_a] + [b - bt + d - m]Y
\end{aligned}
$$

- At equilibrium $Y = Y^E = DAE$, Leakage = Injection

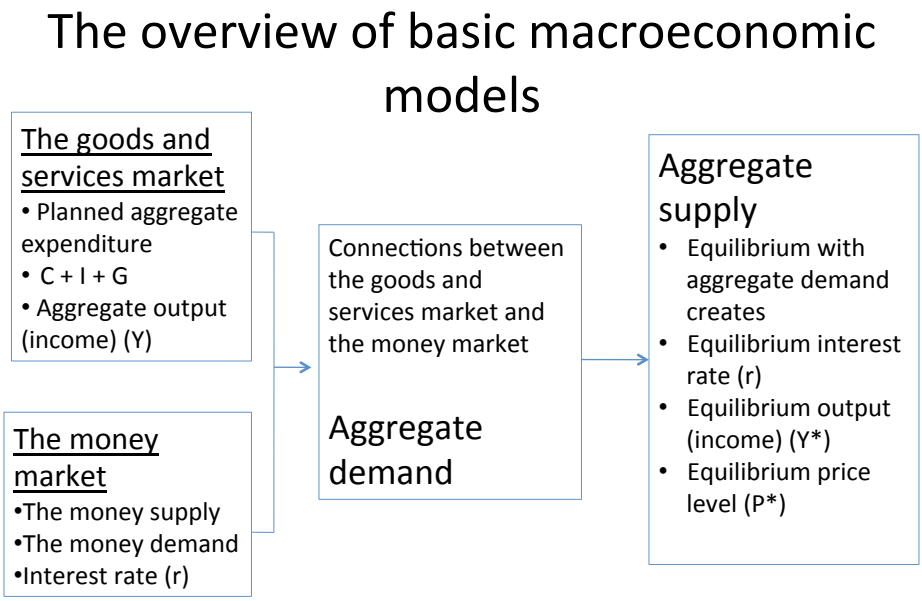
$$
\begin{aligned}
Y^E &= \frac{1}{1 - (b - bt + d - m)} \times [C_a - bT_a + I_a + G_a + X_a - M_a] \\
&= \text{multiplier} \times [\text{autonomous expenditure}]
\end{aligned}
$$

- multiplier (k) = $\dfrac{\Delta Y}{\Delta \text{Autonoumous Expenditure}} = \dfrac{\Delta Y}{\Delta AE}$
- $\Delta Y = k \times \Delta AE : k = \dfrac{1}{1 - \text{Slope of DAE}}$



- DAE shift up : autonomous expenditure $\uparrow$ (for example : $\{C_0, G_0, I_0, X_0\}$ $\uparrow$or $\{T_0, M_0\}$ $\downarrow$), Spending(Expenditure) on domestic goods $\uparrow$ for all levels of Y
- DAE shift down : autonomous expenditure $\downarrow$ (for example : $\{C_0, G_0, I_0, X_0\}$ $\downarrow$or $\{T_0, M_0\}\uparrow$), Spending(Expenditure) on domestic goods $\downarrow$ for all levels of Y
- Expansionary Fiscal policy, Contractionary(Tight) Fiscal Policy

1 Introduction



- We have studied the role of the government in managing the economy through fiscal policy.
- However, another important tool that can be used to manage the economy is "monetary policy", by affecting the money market. In what ways do think the government can affect the "money market"?
- And how doing so affect the economy?

2 Supply of Money

- The demand for and the supply of money will determine equilibrium interest rate.

2.1 Definition of money

- Money is anything that is accepted as a *medium of exchange*.
- Without money, we will need to resort to the use of "barter trade". But with the barter system, you'll always need "a double coincidence" of wants for trade to take place. Using a commonly accepted form of money eliminates the need for a double coincidence of wants, help enabling transactions to occur.

2.2 Functions of Money

- Medium of exchange
  - This promotes economic efficiency as it reduces transaction costs and it also allows people to specialize in what they do.
- Unit of account
  - It reduces transaction cost by reducing the number of prices that need to be considered
- Store of value
  - Money is used as a way to store purchasing power over time
  - This function is useful as we do not always want to spend our income immediately upon receiving it
  - It provides more liquidity (the relative ease with which as asset can be converted into a medium of exchange than other assets)

2.3 Types of money

(1) Commodity money

(2) Fiat money

2.4 Money Supply

- M^S= total amount of "money" in the hand of public at a specific time. It is a stock concept.
- There are several standard measures of the money supply. The definitions of money differ by their liquidity or specifically how different they are from currency.

    1. Narrow definition of money supply : M1 = currency in circulation + demand deposits at commercial banks
    2. Broader definition of money supply : M2 = M1 + saving and time deposits at commercial banks
    3. M3 = M2 + savings of other financial institutions (specialized banks)

- The government and the central bank are in charge of the amount of currency in circulation. Only the central bank can issue the currency.
- This course will focus on only M1.
- http://www2.bot.or.th/statistics/BOTWEBSTAT.aspx?reportID=6&language=ENG

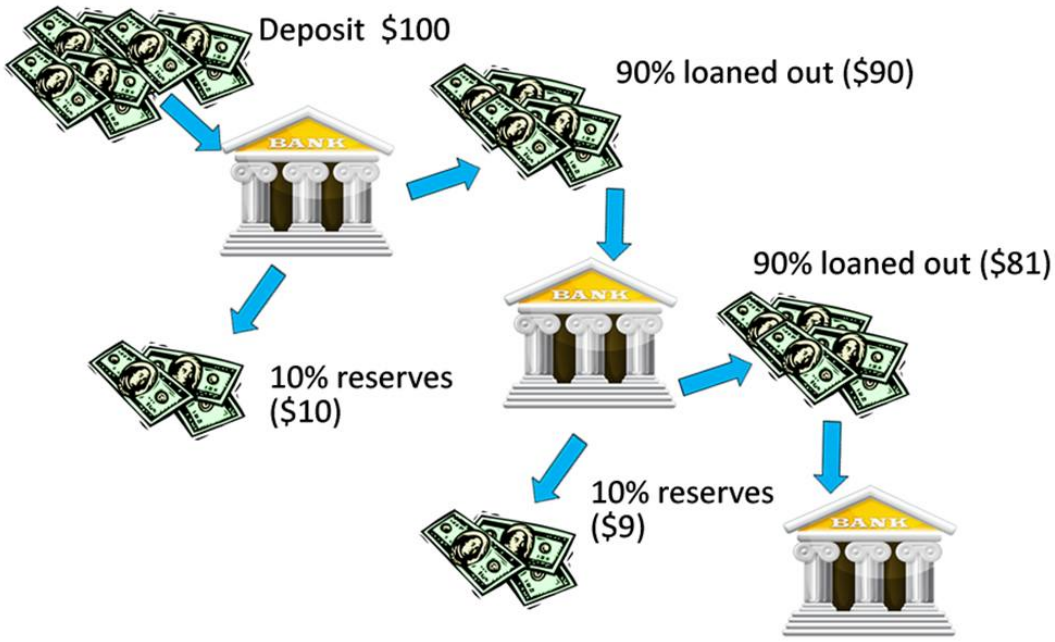
2.5 How banks create money?

2.5.1 Historical perspective: the goldsmiths

- Goldsmiths store gold and issue receipts for depositors.
- As goldsmiths issues loads of receipts, receipts functioned as a perfect substitute for gold. People deal with each other direct through gold-receipts.
- Goldsmiths then have "extra" gold sitting around.
- They can use the extra gold to create lending (issuing gold receipts) and earn interests.
- Their lending add money supply to a nation.
- The goldsmiths, like modern banks, have power to create more money.
- But there is one major problem! People cannot all withdraw their deposit at the same time.

2.5.2 Banks creation of money : Fractional Reserve Banking System

- Central bank imposes reserve requirements, minimum ratio of reserves to deposit commercial banks has to maintain.
- Excess reserves are bank reserves in excess of the reserve requirement set by a central bank.
- Banks can lend out excess reserves.
- Bank loans goes to the public. The public may deposit the money back to the bank.
- Total deposits is much greater than the primary deposits.



- How many times total deposits is greater than the primary deposits?
- Suppose initial case deposits = $P = 100$.
- Legal reserve ratio = $rr = 10\%$.
- A = Excess cash reserve of the first bank

- Assumptions :

  (1) Excess reserve is all loaned. The whole banking system must not keep excess cash reserve.

  (2) One must depost his money totally.

Bank	Deposits	Reserve (10%)	Loans
1	100	$(0.1 \times 100) =$	$(1-0.1) \times 100 =$ .....
2	90		
3	81		
...			
n+1			
Total			

$$\begin{aligned} \text{Total Deposits} &= 100 + (1-rr)100 + (1-rr)^2 100 + (1-rr)^n \\ &= \end{aligned}$$

- Assumes that $n \to \infty$.
  - Sum of a geometric sequence : $\sum_{k=0}^{\infty} ar^k = \dfrac{a}{1-r}$, where $0 < r < 1$.
  - Total Deposits $= \sum_{k=0}^{\infty} P(1-rr)^k : a =$ ..... , $r =$ .....

- ΔTotal Deposits $= \dfrac{Primary\ Deposits}{rr}$.
- deposit multiplier $= \dfrac{1}{rr}$,
- Total Demand Deposits Created by Banking Sector (D), the maximum amount of money that can be created

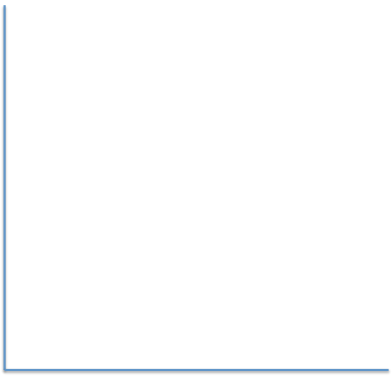
$$D = \frac{Primary\ Deposits}{rr} - Primary\ Deposits = \frac{(1-rr)P}{rr} = \frac{A}{rr}.$$

- From the example,
  - $P =$ ....., $rr =$ ..... ,
    - ΔTotal Deposits =
    - Demand Deposits Created by Banking Sector (D)
- In theory, the maximum amount of money that can be created is $D = \dfrac{P(1-rr)}{rr}$.
  - In practice, the amount of money that can be created is ..... than $\dfrac{P(1-rr)}{rr}$.
    - Excess reserve is ***not*** all loaned.
    - One ***does not*** deposit his money totally.
  - The private sector (financial institutions and the public) plays an important role, which could change the money supply.
  - Money Supply = currency in circulation + demand deposits at commercial banks

- Example: Suppose there is 1000 million baht in the hand of the public.

    1. People want to hold only cash. They do not want to deposit money in a bank. What is the money supply of the economy?
    2. Suppose people decide to deposit 500 million Baht in to the banking system. Required reserve ratio = 0.1. Assuming that the banking system has the potential to create deposits to the maximum. Calculate the total deposits in the banking system, deposit multiplier, and the deposits created by banks. What is the money supply of the economy?

- Graphically : Money Supply Change



- Money Supply does not depends on the interest rate
- Money supply $\uparrow$, MS shifts to the right
- Money supply $\downarrow$, MS shifts to the left

- Given the other things remain constant, if each of this following situation happens, how will the money supply change?

1. The central bank increases the legal reserve ratio (rr).
2. The central bank decreases the legal reserve ratio (rr)
3. The public would like to hold more cash (less deposits).
4. The public would like to hold more deposits (less cash).

3 Monetary Policy

- How does central bank control money supply?

Tools to control money supply :

1. Open Market Operation (OMO)
    - Buy government bonds
    - Sell government bonds
2. Bank rate (rediscount rate = interest rate that the central banks charge the commercial banks when they borrow the money from the central bank.)
    - Bank rate $\uparrow$
    - Bank rate $\downarrow$
3. Minimum Legal reserve requirement (rr)
    - rr $\uparrow$
    - rr $\downarrow$

Monetary Policy $\Rightarrow$ Money Supply

3.1 Types of Monetary Policy

1. Expansionary Monetary Policy : to increase money supply , How?
    - OMO : ..... government bonds
    - Bank rate/Rediscount rate .....
    - Minimum Legal Reserve Requirement (rr) .....
2. Contractionary Monetary Policy : to decrease money supply, How?
    - OMO : ..... government bonds
    - Bank rate/Rediscount rate .....
    - Minimum Legal Reserve Requirement (rr) .....

- Given the other things remain constant, if each of this following situation happens, how will the money supply change?
    1. The central bank prints more money.
    2. The central bank issues bonds.
    3. The central bank gives loans to commercial banks and commercial banks provide more credits to the private sector.
    4. The central bank buy government bonds from the public
    5. The central bank sell government bonds to the public
    6. The central bank increases rr
- Nominal Money Supply Versus Real Money Supply

4 Keynesian's Liquidity Preference Theory

- Demand for money : the amount of wealth that everyone in the economy wishes to hold in the form of money balances
- liquidity = how easy an asset can be quickly converted in to the medium of exchange, with a little loss of value.
- There are two main assets people use to store their wealth, Money and Bonds.
- Opportunity cost of holding money = income that you could have earned if you hold the bonds (or deposit money in a bank), which is interest.
- People hold the money because it provides liquidity.
- M1 = Currency in circulation + Demand Deposit
- Demand Deposit do not pay interest.
- Demand for Money consists of 3 components

    1. Transaction demand for money (M_T^d) : People want to hold money to meet their daily transaction
    2. Precautionary demand for money (M_P^d) : People hold some money to safeguard themselves from something that they cannot detect beforehand.
    3. Speculative demand for money (M_S^d) : People hold money for speculation

- $M^d = M_T^d + M_P^d + M_S^d$
- $M^d = f(Y, r, ...)$
- $Y \uparrow M^d$ .....
- $r \uparrow M^d$ .....

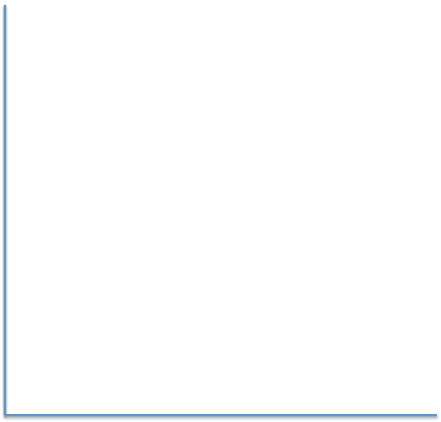
- Bond : A prototypical bond is a contract that commits the issuers to make a specified sequence of payments until a specified terminal date.

Government Bond
Pay 110 after one year

  - Price of the bond is equal to 100. Interest rate is .....
  - Price of the bond is increased, interest rate is .....
  - Price of the bond is decreased, interest rate is .....

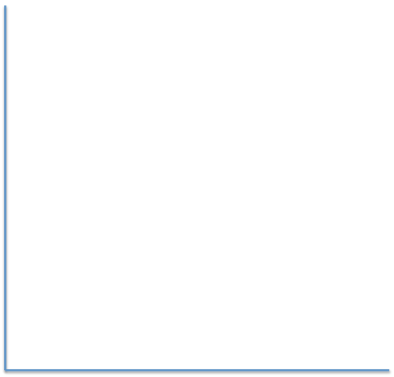
Bond price $\uparrow \Rightarrow$ Interest rate (r) $\downarrow$

- The relationship between money demand and interest rate



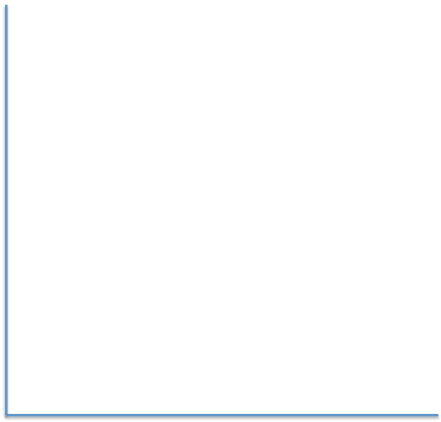
  - An increase in interest rate would lead to ..... in the quantity demand for money, ceteris paribus (keep Y and other factors determining M^d constant).
  - A decrease in interest rate would lead to ..... in the quantity demand for money, ceteris paribus (keep Y and other factors determining M^d constant).
  - $\Delta r \Rightarrow$ movement along the Money Demand Curve

- Shift in M^d

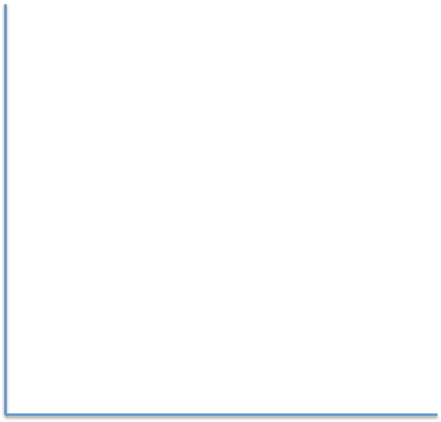


  - An increase in national income (Y) will lead to ..... in demand for money, ceteris paribus. (Money Demand shifts to the .....)
  - An decrease in national income (Y) will lead to ..... in demand for money, ceteris paribus. (Money Demand shifts to the .....)
  - $\Delta Y \Rightarrow$ Shift in M^d

5 Equilibrium in Money Market



- If interest rate is *lower* than the equilibrium interest rate,
- there will be excess money .....
- agents will ..... (buy/sell) more bonds,
- then bond price..... (increases/decreases),
- therefore the interest rate ..... (increases/decreases)
- adjust to equilibrium



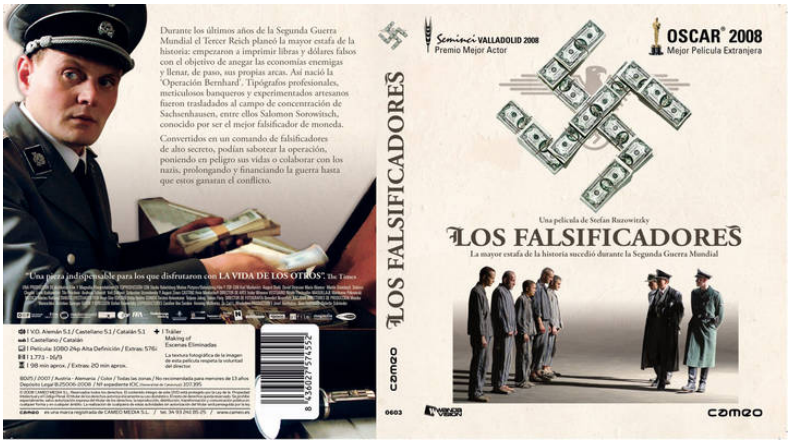
- If interest rate is *greater* than the equilibrium interest rate,
- there will be excess money .....
- agents will ..... (buy/sell) more bonds,
- (bond demand/bond supply) will (rise/fall)
- then bond price..... (increases/decreases),
- therefore, the interest rate ..... (increases/decreases)
- adjust to equilibrium

- Given the other things remain constant, if each of this following situation happens, how would it affect equilibrium in the money market?
  - Real national income (Y) increases
  - Money Supply increases
  - Price level increases
  - Real national income (Y) decreases
  - Money Supply decreases
  - Price level decreases

6 Other theories of the demand for money

6.1 The quantity theory of money

- Can the money supply be a weapon of mass destruction?
- Operation Bernhard
- The Nazi's secret plan to destroy the British economy by flooding London with fake bank notes.
  - See movie: Counterfeiters (2007)



- Previously, our concern has been with output, interest rate, and price.
- Yet, if our main concern is to control inflation, a different theory will be more helpful: the quantity theory of money.
- The quantity theory of money is based on the following quantity equation

$$MV = PY$$

  - Where Y = real output
  - P = price level

  - M = the level of money supply
  - V = the velocity of money

- The velocity of money
  - $V = \frac{P \times Y}{M}$
  - V is the number of times a dollar has to change hand in a year, in order to support the level of output and exchange represented by nominal GDP.
  - For the quantity of money to be a basis for a theory, an assumption needs to be added:
    - That the velocity of money is constant.
  - With V constant, money supply (M) and nominal GDP ($P \times Y$) is tightly related.

- The classical monetary theory :
  - Classical monetary policy builds on the quantity theory of money.
  - In addition to the assumption that the velocity of money is constant, it also assumes that Y is always at its full employment level.
  - In the classical view, therefore, the increase in money supply will only cause the increase in the price level (inflation).

The case of hyper-inflation : The quantity theory of money can be used to illustrate how hyperinflation happens.

- If money supply suddenly rises, people expect inflation to occurs, and they want to hold on to it as short as possible.
- In this situation, in addition to M, V will also rise.
- With Y still unchanged in the short-run, this causes P to rise even more.

6.2 Monetarism:

- A theory associated with Milton Friedman.
- The theory explain how “bad monetary policy” could have “bad effects” on the real economy.
- He argued, through pointing out from the experiences of the great depression, that the fall in money supply can cause both the reduction in the price level and the real GDP.

7 Examples.

Example. Suppose there is 1,500 million baht in the hand of the public.

1. People want to hold only cash. They do not want to deposit money in a bank. What is the money supply of the economy?

2. Suppose people decide to deposit 1,500 million Baht in to the banking system. Required reserve ratio = 0.1. Assuming that the banking system has the potential to create deposits to the maximum.

    - Calculate the total deposits in the banking system, deposit multiplier, and the deposits created by banks.
    - What is the money supply of the economy?
    - What is the total loans in the economy?
    - What is the total bank reserve in the economy?

Example. Given the other things remain constant, if each of this following situation happens, how will the real money supply change?

1. The central bank increases the legal reserve ratio (rr).

2. The public would like to hold more cash (less deposits).

3. The public would like to hold more deposits (less cash).

4. The central bank prints more money.

5. The central bank issues bonds.

6. The central bank gives loans to commercial banks and commercial banks provide more credits to the private sector.

7. The central bank buy government bonds from the public

8. The central bank sell government bonds to the public

9. Price level increases

Example.

- Assumption - Keynesian Demand for money : what are the two main assets people use to store their wealth?
- What are the three components of Keynesian Demand for Money?
- What are the determinants each component?
- How does interest rate change when a bond price increases? Explain why.

Example.

- What is the relationship between interest rate and bond price?
- If the interest rate is below the equilibrium interest rate, explain how the money market will adjust to equilibrium.
- Given the other things remain constant, if each of this following situation happens, how would it affect equilibrium in the money market?
  - Real national income (Y) increases
  - Money Supply increases
  - Price level increases
  - Real national income (Y) decreases
  - Money Supply decreases
  - Price level decreases
- Quantity Theory of Money : Equation
- In the short run, V and Y are constant, Money supply increases -> price level?

Example. Suppose there is 1,500 million baht in the hand of the public: 500 in form of currency in circulation and 1,000 in form of demand deposit. The legal reserve requirement ratio is 0.1.

- What is the money supply of the economy?

- Suppose people preference toward cash and deposit changes. They want to deposit 50 million Baht more into the banking system. What is the new money supply of the economy? Assuming that the banking system has the potential to create/destroy deposits to the maximum.

- Suppose people preference toward cash and deposit changes. They want to withdraw 50 million Baht deposits. What is the new money supply of the economy? Assuming that the banking system has the potential to create/destroy deposits to the maximum.

Example.

- Suppose that Lloyd Bank has reserves totaling $100,000 on $1,000,000 of deposits. Lloyd Bank lends out $900,000. The reserve requirement is 10 percent. Can **this bank** make any new loans? Explain.

- Suppose Stefan deposits $20,000 into Lloyd Bank. Suppose banks lends out all of its excess reserve. The reserve requirement is 10 percent. By how much will the banking system can increase total loans? What is the final total deposits in the banking system? How much money creation that the banking system can create? Show your work.

- Suppose that Stefan, fearing an impending financial crisis, withdraws $20,000 from his account at Lloyd Bank and buries the cash in his backyard. The reserve requirement is 10 percent. Suppose the bank lends out all of its excess reserve. By how much will the bank have to reduce its loans? Calculate the maximum amount the money supply may contract as a result. Show your work.