Money, the Price Level, and Inflation

Money is any commodity or token that is generally acceptable as a means of payment

Functions of Money

Money serves as

1. A means of payments or Medium of exchange accepted by both sellers and buyers

2. A unit of account

Quote prices in dollars and cents

3. A store of value

You may decide to store your wealth in the form of money

- Money is an asset that can be used to transport purchasing power from one period to another.

Other stores of value:
Diamonds
Antique paintings

Barter economy

An economy without money involves the direct exchange of goods and services for other goods and services.

- Barter exchange requires the double coincidence of wants

Monetary Economy

An economy with money. Individuals do not exchange goods and services directly for other goods and services

- Money eliminates the double coincidence of wants problem.

Advantages of money over other stores of value

- Convenient denominations
- Easily portable
- Highly liquid
  Money is easily spent

Disadvantages of money

Money has a constant nominal value

The value of money falls when the prices of goods and services rise.

The more stable the value of money, the more useful it is.

Fiat money

Money in Canada today is FIAT MONEY

Currency is money because the government declares it to be so.

The dollar is a legal tender

The currency is backed by the government

Official definitions of money

1. Currency in public circulation (currency held outside banks).

   Currency = Coins and Bank of Canada notes

2. privately held demand deposits
3. personal savings accounts
4. Deposits at trust and mortgage loan companies

- They can be converted into currency and can be used to settle debts.

Not considered Money

- Credit cards
- Debit cards
- Cheques

  Cheques are used to transfer money

Official measures of money

1. M1 definition

- currency in public circulation (held outside the banks)
- Demand deposits at chartered banks that owned by individuals and businesses.

M1 is money because currency and demand deposits (chequable deposits) serve as a means of payment

2. M2+ definition "

M1 + personal savings deposits

+ nonpersonal notice deposits at Chartered banks

+ deposits at trust and mortgage loan companies

+ deposits at credit unions and caisses populaires

+ Deposits at other financial institutions.

- Some of the savings deposits in M2+ are not means of payment.
- They are liquid assets and can be converted quickly into currency and demand deposits
- Demand deposits are more liquid than personal savings deposits.

Banking System

Financial institutions that take deposits and make loans are called depository institutions

- chartered banks
- Credit unions and Caisse populaires
- Trust and mortgage loan companies

Canada has historically made a legal distinction between banks and other depository institutions

Over the years, the economic functions of all depository institutions have become similar.

They are in business to make profit.

Chartered Banks

They are chartered (operate) under the Bank Act of 1992 to receive deposits and make loans

Banks' Liabilities

- Deposits
  The bank must repay your deposit

Banks' Assets

- Loans
- Investment securities
  Long-term Canadian government bonds
- Canadian government treasury bills

Risk-free assets

Banks' reserves

- cash in a bank's vault
- A bank's deposits at the at the Bank of Canada

Reserves are kept to

1. meet demand for cash
2. Their deposits at the Bank of Canada are used to settle debts with other banks.

Credit Unions and Caisses populaires
and
Trust and Mortgage loan Companies

They are not called banks

They receive deposits and make loans

Economic Functions of Financial Intermediaries

1. Create Liquidity
   They take deposits and make loans (Financial intermediation)
2. Minimize the cost of borrowing
3. Minimize Risk
   Diversify lending

Bank of Canada

It is the central bank of Canada

- conducts monetary policy
- supervises other banks and financial institutions
- Lender of last resort
- sole issuer of bank notes

Payments system

The system through which banks make payments to each other.

The payments system is operated by the Canadian payments Association (CPA)

Two payments systems

1. Large value Transfer system (LVTS)
   An electronic payments system for large payments

2. Automated Clearing settlement system (ACSS)

handles cheques and small-value electronic payments (debit cards).

How Banks Create Money

Banks create credit money (deposits) by making loans

Reserves

1. Desired reserves

Banks hold some reserves <u>for each dollar</u> deposited

The bank keeps 25¢ in reserves and lends out the rest.

Desired Reserve Ratio

The ratio of reserves that banks wish to hold divided by total deposits

$$\text{desired reserve ratio} = b = \frac{R}{D} = 0.03$$

With desired reserves of $3 for every $100 of M1 deposits, the desired reserve ratio is $b = 0.03$ or 3 percent.

$$\text{Desired Reserves} = b \times \text{Deposits}$$

- The greater the desired reserve ratio, the smaller is the quantity of deposits and loans that the banking system can create

Excess reserves

Reserves over and above desired reserves

Excess Reserves = Actual Reserves − Desired Reserves

Excess reserves are used to make loans and thus create (Credit) Money

Desired Currency Holding

People want to hold some proportion of their money in the form of currency (notes and coins).

Currency Drain ratio

For every dollar of M1 deposits, people hold 35¢ in currency

$$a = \frac{C}{D} = 0.35$$

Desired currency Holdings $= a \times$ Deposits

The greater the currency drain ratio, the smaller is the quantity of deposits and loans that the banking system can create.

Example

You are given the following simplified balance sheet of a bank

Assets		Liabilities	
Reserves	$500	Deposits	$3,500
Loans	3,000		

The bank desired reserve ratio is $b = 10\%$

(a) How much will the bank hold as reserves, given its deposits of $3,500.

The bank will hold

$0.1 \times \$3,500 = \$350$ in desired reserves

(b) How much are its excess reserves

Excess Reserves = $3,500 - 350

= $3,150

(c) By how much can the bank increase its loans?

The bank can lend out an additional $3,150.

(d) Suppose a depositor comes to the bank and withdraws $150 in cash. Show the bank's new balance sheet, assuming that the bank obtains the cash by drawing down its reserves.

The New Balance Sheet

Assets		Liabilities	
Reserves	$350	Deposits	$3,350
Loans	$3,000		

(e) Does the bank now hold excess reserves?

Desired reserves are now
$0.1 \times 3,350 = \$335$

$$\text{Excess Reserves} = \$350 - 335 = \$15$$

The money creation process

- The money creation begins when the banks have excess reserves
- Banks lend excess reserves
- Bank deposits increase
- The quantity of money increases

Example

Suppose the desired reserve ratio $b = 0.1$ = 10 percent

The currency drain ratio $a = 0.5$ = 50 percent

A bank has #100,000 excess reserves to lend

$$\text{Change in deposits } (\Delta D) = \frac{\text{Change in excess reserves}}{a+b}$$

$$= \frac{\#100{,}000}{0.5+0.1} = \frac{\#100{,}000}{0.6}$$

$$= \#166{,}667 \equiv \text{Loans} \equiv \text{Credit Money}$$

$$\text{Deposit Multiplier} = \frac{1}{a+b}$$

$$= \frac{1}{0.5+0.1} = \frac{1}{0.6}$$

$$= 1.667$$

When the Bank of Canada supplies the banking system with $1 of additional reserves, deposits increase by a multiple of this amount.

The banking system as a whole can generate a multiple expansion of deposits

Each bank makes a loan and creates deposits, the reserves go to another bank, which uses them to make additional loans and create additional deposits.

Monetary Base (MB)

The sum of Bank of Canada notes held outside the Bank of Canada,

bank deposits at the Bank of Canada, and

coins held by banks and the public

Monetary base (MB)

= Desired Currency holdings (C)

+ desired Reserves (R)

Money Supply (M1) = Demand Deposits (D) + Desired currency Holding (C)

$MB = C + R$

$M = C + D$

37(k)

$$MB = C + R \qquad C = \alpha D$$
$$= \alpha D + bD \qquad R = bD$$
$$= (\alpha + b) D$$

$$M = C + D \qquad C = \alpha D$$
$$= \alpha D + D$$
$$= (1 + \alpha) D$$

$$\Delta MB = (\alpha + b) \Delta D$$

$$\Delta M = (1 + \alpha) \Delta D$$

Δ = change

Consider the ratio of M to MB:

$$\frac{M}{MB} = \frac{C + D}{C + R}$$

Divide by D = demand deposits

$$\frac{\frac{M}{D}}{\frac{MB}{D}} = \frac{\frac{C}{D} + \frac{D}{D}}{\frac{C}{D} + \frac{R}{D}}$$

37 (c)

$$\frac{M}{MB} = \frac{\frac{C}{D} + 1}{\frac{C}{D} + \frac{R}{D}}$$

$$a = \frac{C}{D} = \text{desired drain ratio}$$

$$b = \frac{R}{D} = \text{desired reserve ratio}$$

$$\frac{M}{MB} = \frac{1+a}{a+b}$$

$$M = \frac{1+a}{a+b} \times MB$$

Δ = Change

$$\Delta M = \frac{1+a}{a+b} \Delta MB$$

The Money Multiplier

The ratio of the change in the quantity of money to the change in the monetary base.

$$\frac{\Delta M}{\Delta MB} = \frac{1 + \text{desired currency ratio}}{\text{desired currency ratio} + \text{desired reserve ratio}}$$

$$\frac{\Delta M}{\Delta MB} = \frac{1 + a}{a + b}$$

Example

$a = 0.5$

$b = 0.1$

The monetary base (MB) increased by $100,000

(a) The money multiplier:

$$\frac{\Delta M}{\Delta MB} = \frac{1+a}{a+b} = \frac{1+0.5}{0.5+0.1}$$

$$= \frac{1.5}{0.6} = 2.5.$$

A $1 increase in the monetary base leads to a $2.5 increase in the Money supply (M1)

(b) The increase in the money supply:

$$\Delta M = (2.5)(\Delta MB)$$

$$= (2.5)(\$100,000)$$

$$= \$250,000$$

Example

b = desired reserve ratio = 0.05

C = currency in circulation = #40 billion

D = chequable (demand) deposits = #160 billion

a = currency drain ratio $= \frac{C}{D} = \frac{40}{160} = 0.25$

M = Money supply $= C + D$

$= 40 + 160$

$= \#200$ billion

$$\text{Money multiplier} = \frac{1+a}{a+b}$$

$$= \frac{1+0.25}{0.25+0.05}$$

$$= \frac{1.25}{0.3} = 4.17$$

Example

suppose that the banking system has excess reserves of $10 million, the desired reserve ratio is 10 percent and the currency drain ratio is 40 percent. How much will be the expansion of money? ($ millions):

$$\Delta \text{Deposits}(D) = \frac{1}{a+b} \times \Delta R$$

$$= \frac{1}{0.4+0.1} \times 10$$

$$= \frac{1}{0.5} = \$20 \text{ million}$$

$$MB = \text{currency} + \text{reserves}$$

$$= C + R$$

$$= (a \times D) + (b \times D)$$

$$= (a+b)D$$

$$D = \frac{1}{a+b} \times MB \Rightarrow \Delta D = \frac{1}{a+b} \times \Delta MB$$

$$20 = \frac{\Delta MB}{0.4+0.1} \Rightarrow$$

$$20 = \frac{\Delta MB}{0.5} \Rightarrow \Delta MB = (0.5)(20)$$

$$= 10$$

$$\Delta M = \frac{1+a}{a+b} \Delta MB$$

$$= \frac{1+0.4}{0.4+0.10}(10) = \frac{1.4}{0.5}(10)$$

$$= (2.8)(10) = \#28 \text{ million}$$

The Demand for Money

Nominal money

The quantity of money measured in dollars

Real money

The quantity of money measured in constant dollars (in 1997 dollars).

Example

$$\text{Real Money} = \frac{\text{Nominal Money}}{\text{Price Level}} = \frac{M}{P}$$

Consumer Price Index = 150

Nominal Money balances = $900,000 billion

$$\text{Real money balances} = \frac{\$900{,}000}{150} = \$6000 \text{ billion}$$

Determinants of the Demand for money

The quantity of money that people choose to hold depends on

1 The price level you need to keep your real money balances constant to be able to buy the same quantity of goods as before

If the price level rises by 10 percent, people hold 10 percent more nominal money so that they can keep real money constant

. The quantity of real money held does not depend on the price level.

2. The interest rate

The higher the interest rate, the smaller is the quantity of real money demanded

The interest rate is the opportunity cost of holding money.

The higher the expected inflation rate, the higher is the interest rate and the higher is the opportunity cost of holding money.

3. Real GDP

You spend more at higher income, and therefore you keep a larger amount of money on hand.

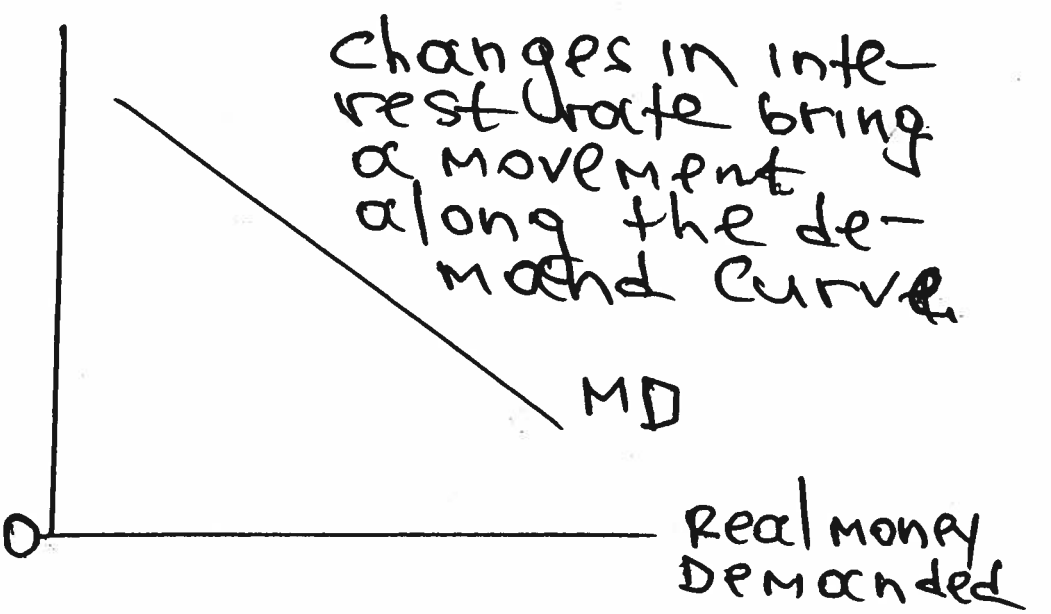
4. Financial Innovation

The spread of the use of credit cards is one of the financial innovations.

Credit cards and debit cards lower the demand for money.

The Demand for money Curve

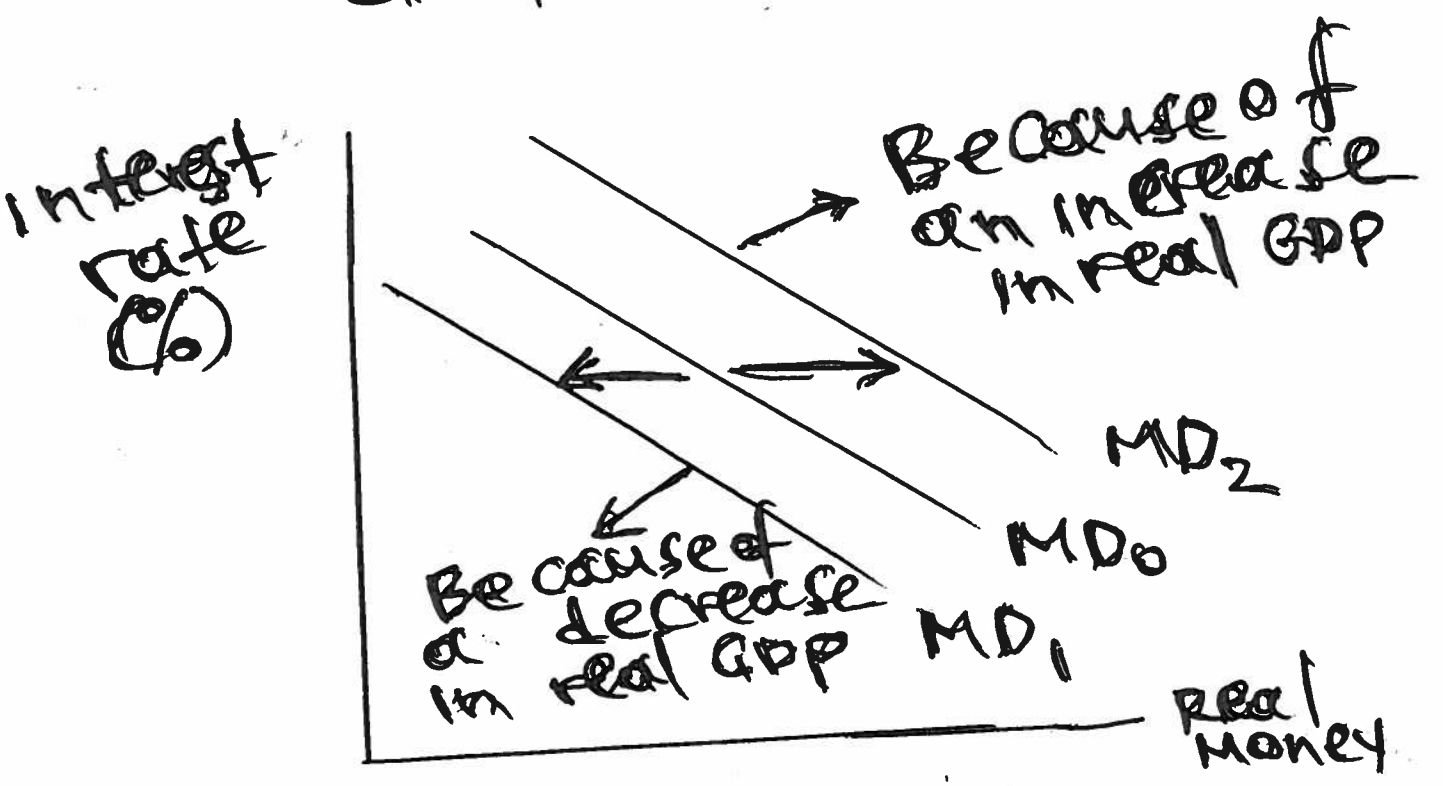
It shows the relationship between the quantity of real money demanded and the interest rate, keeping everything else constant



Shifts in the Demand for Money Curve

As a result of

1. A change in real GDP
2. A change in financial innovation

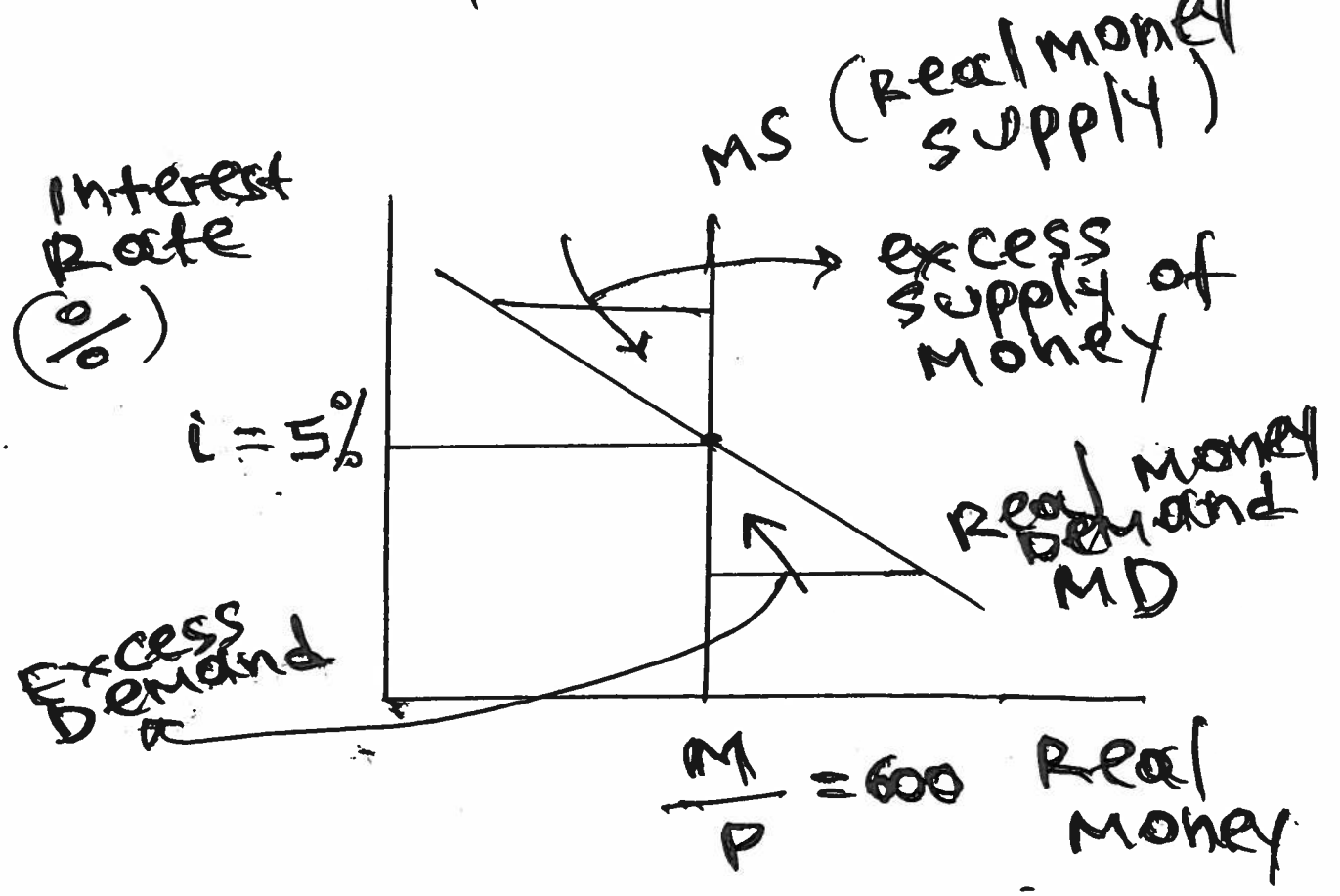


The increased use of credit cards decreased the demand for M1, shifting the demand for money curve to the left.

M1 = Currency in public circulation
plus
Demand deposits (chequing Account balances)

Money Market Equilibrium

The interest rate is determined in the money market.

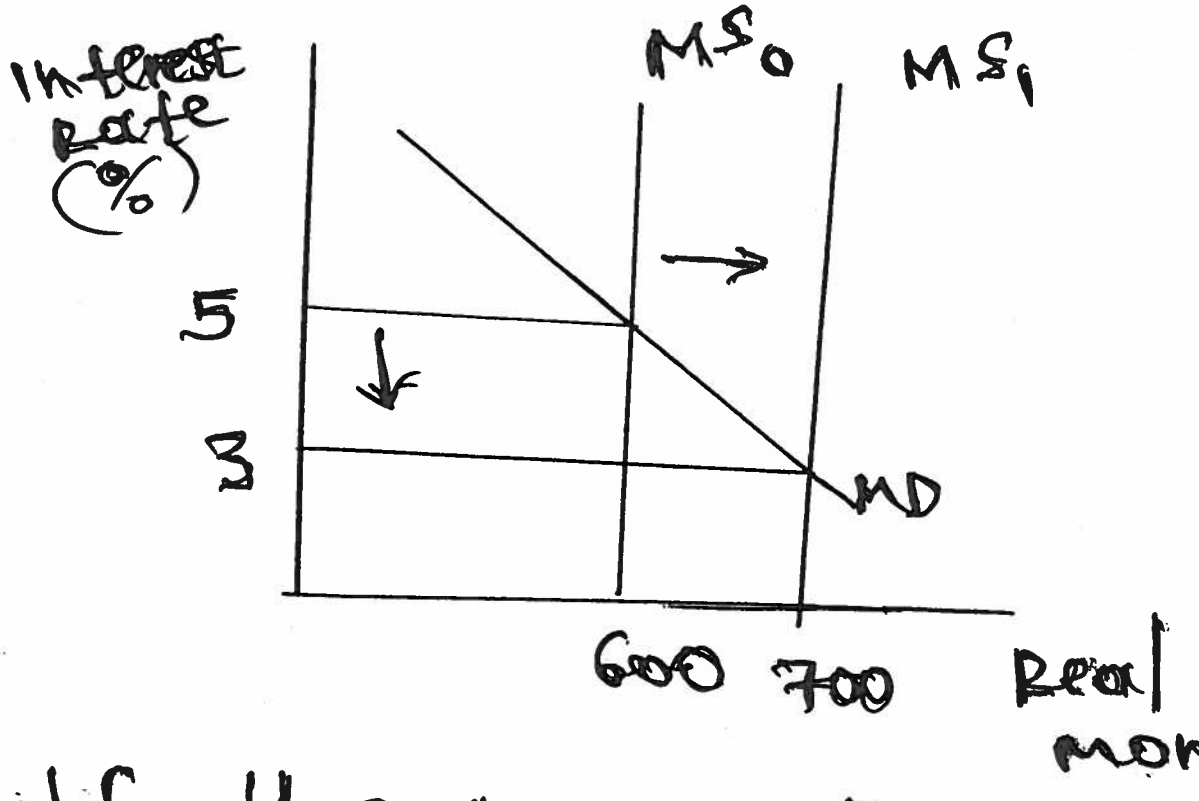


The Money supply curve is drawn vertical because the Bank of Canada can influence the quantity of money

The actions of the Bank of Canada and the banking system determine the quantity of money supplied

The real demand for money curve intersects the real money supply curve to determine the equilibrium interest rate.

Influencing the interest Rate



If the Bank of Canada increases the quantity of real money in the economy, MS_0 shifts to MS_1.

The interest rate decreases

Quantity theory of money

There is a general tendency for money growth and inflation to be correlated

The quantity theory of money implies that inflation is caused by money growth in the long run

It gives us a long-run theory of inflation.

Start with the equation of exchange

Quantity of Money × Velocity of Circulation = Price level × Real GDP

$$MV = PY$$

velocity of circulation (V)

The average number of times a dollar is used annually to buy the goods and services that make up GDP

Nominal GDP = Price level × Real GDP

$GDP = P \times Y$

The value of nominal GDP is equal the quantity of money times the velocity of circulation

Value of nominal GDP $= PY = MV$

\# 1,000 = ($250 billion) × (4)

M = #250 billion

V = 4

In the long run, the ratio $\frac{V}{Y}$ = constant

1. velocity of circulation is constant
2. Real GDP (Y) equals potential GDP

we can write

$$P = M\left(\frac{V}{Y}\right)$$

with $\frac{V}{Y}$ constant, a change in M brings a proportional change in P.

Also, $\Delta P = \Delta M \left(\frac{V}{Y}\right)$

Δ = the change

In the long run, a change in the money supply leads to a change in the price level

The evidence is consistent with the quantity theory of money

Example

$Y = \$2,560$ billion

$M = Q = \$800$ billion

$v = 4$

According to the quantity theory of money, the price level is

$$P = M\left(\frac{v}{Y}\right)$$

$$= 800\,\frac{4}{2,560}$$

$$= \frac{3200}{2,560}$$

$$= 1.25 \text{ or } 125$$

The rate of inflation in the long run is determined as

$$\text{Inflation Rate} = \text{money growth rate} - \text{Real GDP growth rate}$$

under the assumption that, in the long run, the rate of velocity change is approximately zero.

Example

$Y = \$2,560$ billion

$P = 125$ or 1.25

$V = 5$

$$M = \frac{PY}{V}$$

$$= \frac{1.25 \times 2,560}{5}$$

$$= \frac{320,000}{5}$$

$= \$640$ billion