# Chapter 10

# The Monetary System

# What is Money and Why is it Important?

**What is money? Paper, cheap metals…why is it worth so much?!**

Without money, trade would require **barter** = the exchange of one good or service for another.

Every barter transaction would require a **double coincidence of wants** = the buyer would have to have exactly what the seller wants.

This would be unlikely and difficult to coordinate.

That's a pretty nice pinecone, but is it REALLY worth three leaves?

# Money: Its Functions

## Functions of money

- **Medium of exchange**: **buyers give it to sellers to purchase G&S.**
- **Unit of account**: **the unit of measurement for prices and debts.**
- **Store of value**: **people can use money to transfer purchasing power from the present to the future.**

# Liquidity


"Liquidity. That's when you look at your investments and wet your pants."

Many assets can store value, like real estate or stocks and bonds, but money is the only asset that can be regularly used to make purchases.

**Liquidity**: **the ease with which an asset can be converted into the economy's medium of exchange.**

Money is the most liquid asset available.

Stocks and bonds are more liquid than real estate.

# Two Kinds of Money

1) **Commodity money**: **money that has intrinsic value.**
   E.g. gold, salt, cigarettes in prison camps

2) **Fiat money**: **money without intrinsic value that has value because of government decree.**
   The paper money that we use nowadays is fiat money.


# Money in the Canadian Economy

The quantity of money circulating is called the **money stock** which includes:

**Currency** = **cash in the hands of the public circulating in the economy**

**Demand deposits** = **balances in bank accounts that depositors can access on demand by writing a cheque or using a debit card.**

# Measures of the Money Stock

There are two measures of the money stock:
M1 and M2

M1 = **currency + demand deposits**
M2 = **M1 + saving deposits + term deposits**

**→Money supply (Ms) = M1**

What about credit cards?
"Paying" with a credit card is not really paying → it is *deferring payment*. **A credit card is not an asset, it is a convenient way to borrow money.**

# The Central Bank

**Central bank** = **a publicly owned non-profit seeking financial institution that regulates the money supply**

The **Bank of Canada** is the central bank of Canada.


The central bank has four jobs:

- To **issue currency**
- To **act as banker to commercial banks**
- To **act as banker to the government**
- To **control the money supply**

Decisions about the money supply by policymakers in the central bank is called **monetary policy.**

# Commercial Banks

**Commercial banks** are privately owned profit seeking financial institutions.

The primary functions of commercial banks are

a) To accept deposits
b) To make loans to households and business firms

# Commercial Banks and the Money Supply

Commercial banks influence the money supply through their operations.

**Suppose $100 of currency is in circulation.**

Let's compare three different cases:

1) There is no banking system
2) There is a 100%-reserve banking system: banks hold 100% of deposits in reserves, and make no loans.
3) Fractional-reserve banking system banks hold *some* of deposits in reserves, and loans the remainder.

# Case 1: No Banking System

The general public holds the $100 as currency.

Money supply = total amount of currency in circulation =

# Case 2: 100%-Reserve Banking System

**(Desired) Reserve** = **deposits that banks have received but have not loaned out**

The general public deposits the $100 at First National Bank (FNB).

FNB holds 100% of deposit as reserves.

The financial position of the bank can be described with a *T-account*:

| FNB | |
|---|---|
| Assets | Liabilities |
| Reserves: **$100** | Deposits: **$100** |

# Case 2: 100%-Reserve Banking System

**Money supply** = currency + deposits =

- Without banking system, money supply =
- With the 100% reserve banking system, money supply =

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

# Case 3: Fractional-Reserve Banking System

**Fractional-reserve banking**: **banks hold only a fraction of deposits as reserves**

**(Desired) reserve ratio (drr)** = **the fraction of deposits that banks hold as reserves**

Suppose the reserve ratio = 10%. FNB keeps 10% of the deposit as reserves and lend out 90% of the deposit.

| FNB | |
|---|---|
| Assets | Liabilities |
| Reserves:<br>Loans: | Deposits: |

Depositors have $100 in deposits (D), borrowers have $90 in currency (C).

Now, money supply
= **C + D =**

# 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 that increases the money supply
- $90 in new debt — a liability that does not affect the money supply

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

# Case 3: Fractional-Reserve Banking System

FNB's borrower deposits the $90 at Second National Bank.

SNB will lend out

SNB's borrower deposits the $81 at Third National Bank.

TNB will lend out

| SNB | |
|---|---|
| Assets | Liabilities |
| Reserves:<br>Loans: | Deposits: |

| TNB | |
|---|---|
| Assets | Liabilities |
| Reserves:<br>Loans: | Deposits: |

# Case 3: Fractional-Reserve Banking System

Original deposit = $ 100.00

1st loan = $ 90.00 [= $100 × 0.9]

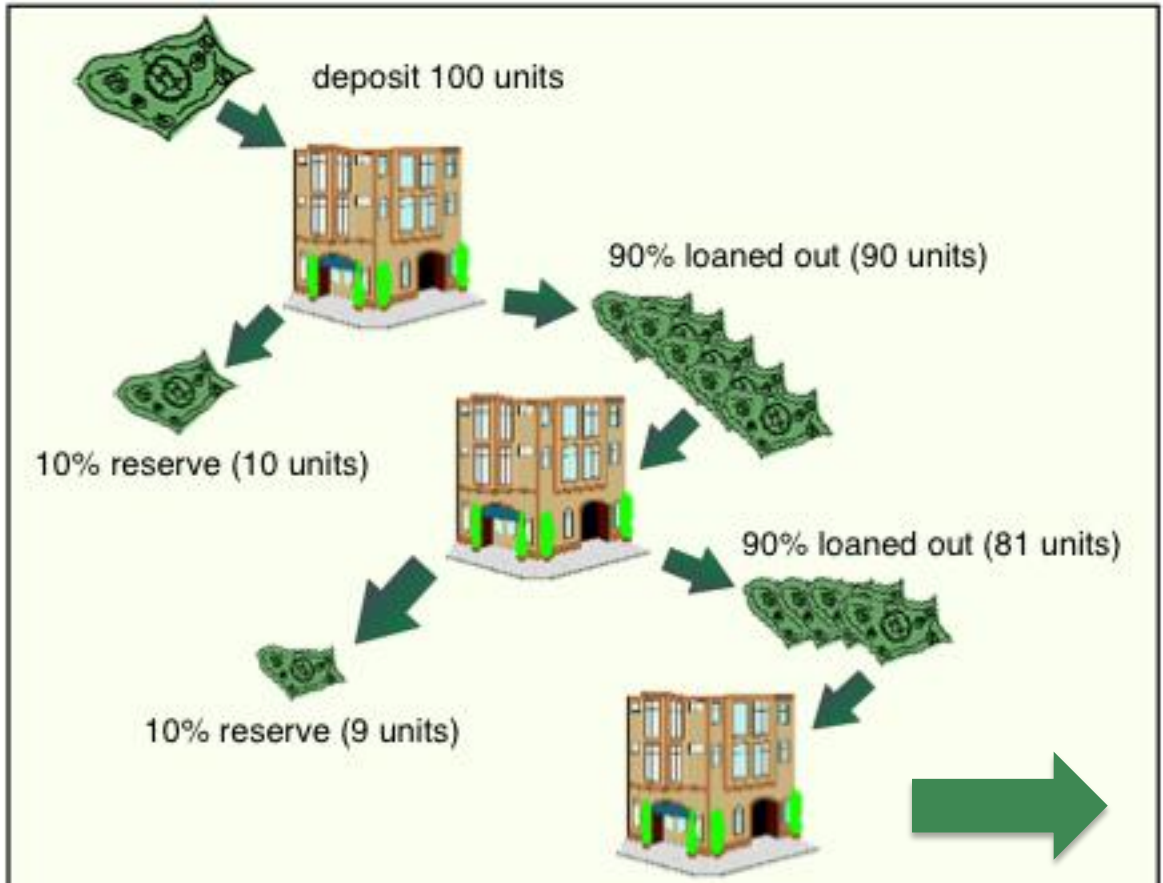
2nd loan = $ 81.00 [= $100 × $0.9^2$]

3rd loan = $ 72.90 [= $100 × $0.9^3$]

Total so far = **$343.90**

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

How much money will eventually be created in total?




Banks artificially create money in the economy by making loans based on fractional reserve banking. In this example, what started out as 100 units of money deposited becomes 171 units of money loaned.

# Calculating an Infinite Geometric Series

To calculate the total money supply we can use the following formula for geometric series:

For $-1 < a < 1$, $\Sigma(1 + a + a^2 + a^3 + \ldots + a\infty) = 1/(1 - a)$

Total money supply = $\$100 + \$100\times0.9 + \$100\times0.9^2 + \$100\times0.9^3 + \ldots$

$= \$100 \times [1 + 0.9 + 0.9^2 + 0.9^3 + \ldots]$

$= \$100 \times 1/(1 - 0.9)$

$= \$100 \times 10$

$= \$1000$

**So $100 in reserves becomes a total of $1000.**

# Money Multiplier

**Money multiplier (m)**: **the amount of money the fractional banking system generates with each dollar of reserves**

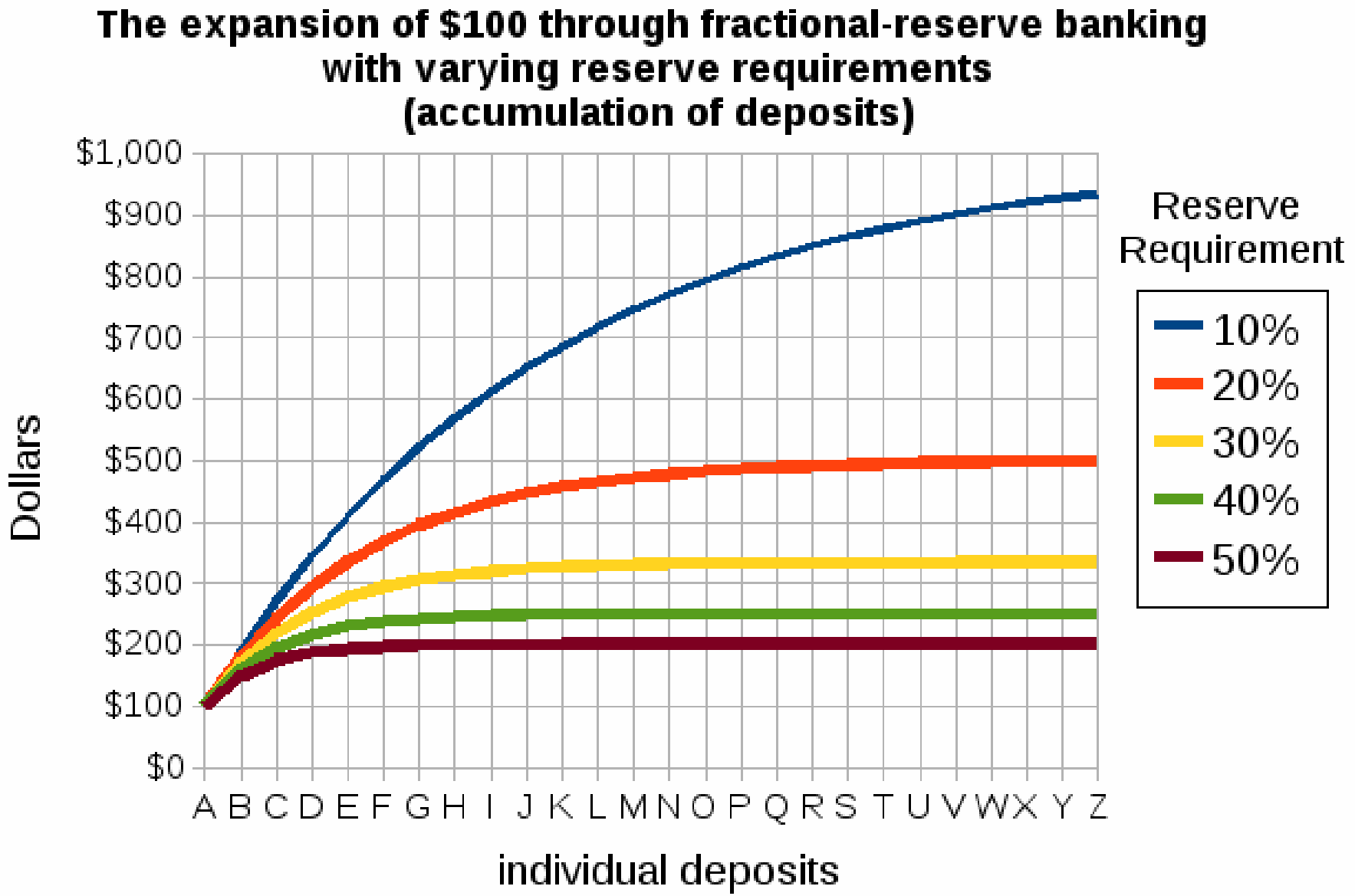
The money multiplier = **1/*reserve ratio =1/rr***

In our example,

***rr*** = 10% or 0.1

money multiplier = 1/*rr* =

$100 of reserves creates $1000 of money


The expansion of $100 through fractional-reserve banking
with varying reserve requirements
(accumulation of deposits)
$1,000
$900
$800
$700
$600
$500
$400
$300
$200
$100
$0
Dollars
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
individual deposits
Reserve Requirement
10%
20%
30%
40%
50%

# A More Challenging Question

Initially the amount of currency in circulation is $100. If people hold equal amount of currency and demand deposits, and banks maintain a reserve ratio of 10%. What is the quantity of money?

# Answer

| | Currency | Deposits |
|---|---|---|
| 1) People hold $50 as currency, and deposit $50 in bank. | | |
| 2) 1st loan = | | |
| 3) 2nd loan = | | |
| | ⋮ | ⋮ |

# Answer

OR, mathematically let: C = currency
D = deposits

# The Central Bank's Tools of Monetary Control

1) Open-Market Operations
2) Foreign Exchange Market Operations
3) Changing Reserve Requirements
4) Changing the Bank Rate and Overnight Rate

# Open-Market Operations

**Open-market operations** = **when the central bank buys government bonds from or sells government bonds to the public**

**Buying** bonds causes the money supply to **increase.**
Why? The dollars the central bank pays for the bonds increase the amount of money in circulation.

**Selling** bonds causes the money supply to **decrease.**
Why? The public pays for the bonds with its holdings of currency or deposits, reducing the amount of money in circulation.

# Foreign Exchange Market Operations

**Foreign exchange market operations** = **the purchase and sale of foreign money by the central bank**

When the Bank of Canada **buys** foreign currency with Canadian dollars the money supply **increases.**

When the Bank of Canada **sells** foreign currency for Canadian dollars the money supply **decreases.**

**Sterilization**: **the process of offsetting foreign exchange market operations with open market operations to keep money supply constant.**

# Changing Reserve Requirements

**Reserve requirement = the minimum amount of reserves that banks must hold against deposits, normally the central bank will set a required reserve ratio (rrr) to regulate commercial banks.**

**Desired reserve ratio vs. Required reserve ratio:**

- The desired reserve ratio is chosen by commercial banks, while required reserve ratio is set by the central bank.
- Generally speaking, the reserve ratio is larger than the required reserve ratio because commercial banks like to hold extra reserves.
- Excess reserves = actual reserves – required reserves = (drr – rrr) X D
- If the reserve requirement *increases*, banks hold more of deposits as reserves and have less to lend out. As a result, the money supply **decreases**, and vice versa.

# Changing the Bank Rate and Overnight Rate

**Bank rate** = **the rate of interest central banks charge commercial banks for loans.**

**Overnight rate** = **the rate of interest on very short-term loans between commercial banks.**

These two rates are always very close (or *in equilibrium*) because commercial banks are free to choose from whom to borrow.

The Bank of Canada can alter the money supply by changing the bank rate, which in turn causes an equal change in the overnight rate.

As the bank rate *increases*, banks borrow less from the central bank, which reduces the quantity of reserves in the banking system, and therefore ***decreases*** the money supply.

A *decrease* in the bank rate ***increases*** the money supply.

# Problems in Controlling the Money Supply

The Bank of Canada's control of the money supply is not precise.

The Bank of Canada must wrestle with two problems that arise due to fractional-reserve banking:

1) The Bank of Canada does not control the amount of money that households choose to hold as deposits in banks.
2) The central bank does not control the amount that commercial banks choose to lend.

In a system of fractional reserve banking, the amount of money in the economy depends in part on the behaviour of depositors and bankers.

# Exercise

While cleaning your room, you look under the sofa cushion and find a $50 bill (and a half-eaten taco). The required reserve is 20% of deposits.

1) What is the maximum amount that the money supply could increase?
2) What is the minimum amount that the money supply could increase?

# Answer