3543 Fiscal and Financial System in Japan A / KC3002 International Finance

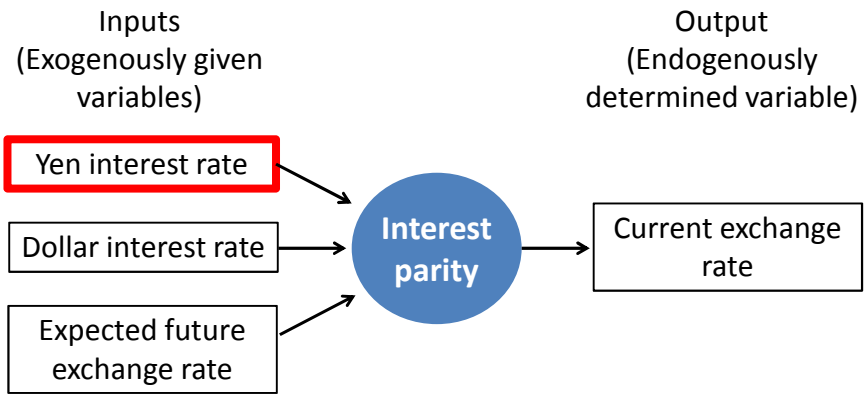
Fall 2012

Lecture 7(Nov 27)
Interest Rates

Hideyuki IWAMURA
Faculty of International Studies
MEIJI GAKUIN UNIVERSITY

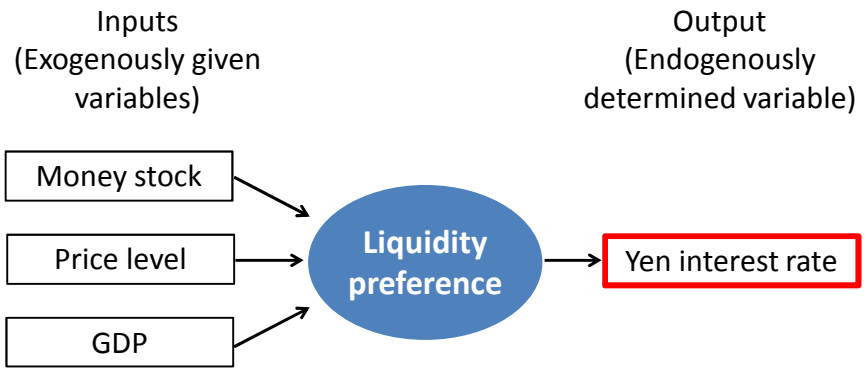
1

Previous Lecture



2

Today's Lecture

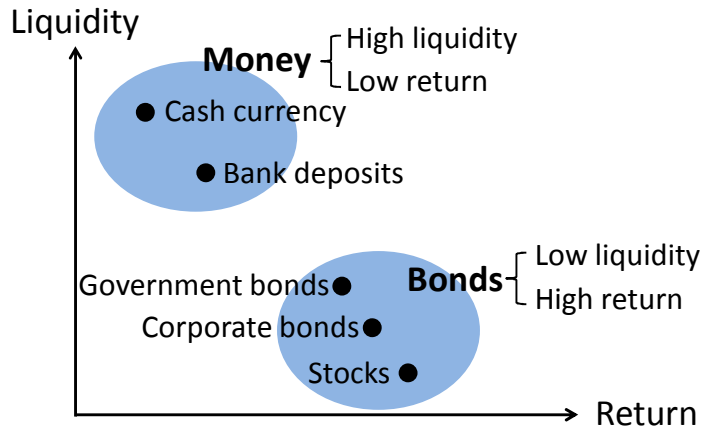


3

Various types of assets

Cash currency	IOU issued by the central bank
Bank deposits	IOUs issued by the commercial banks
Government bonds	IOUs issued by the central or local governments
Corporate bonds	IOUs issued by the firms

"Money" and "Bonds"



Liquidity : the ease and speed with which an asset can be used to purchase goods/services

Composition of an Individual's Wealth

Total Wealth ¥100,000

Suppose you want to hold more money.

For a short period, you can't "add" money to your total wealth.

You can only *replace* part of your bonds with money, by selling bonds and receiving money in exchange.

6

Cost of Holding Money

For a short period of time, you can increase money only by reducing bonds.

Holding more money means holding fewer bonds.

Increasing money by ¥100,000 means reducing ¥100,000 of bonds, therefore giving up the interests those bonds would earn.

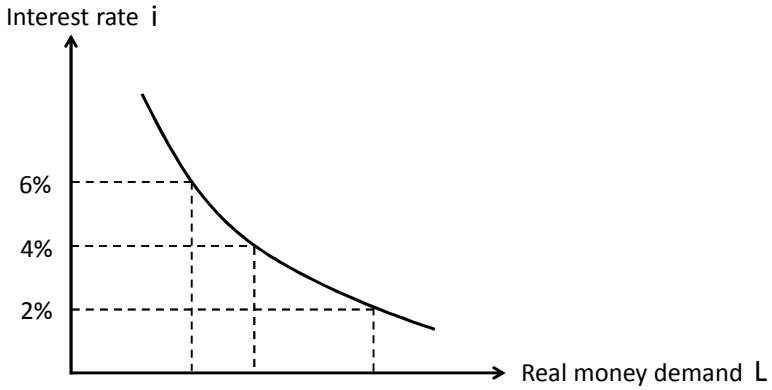
→ **Costs of holding money (opportunity cost)**

A higher interest rate ➔ A higher cost of holding money
➔ Smaller demand for money

A lower interest rate ➔ Smaller cost of holding money
➔ Larger demand for money

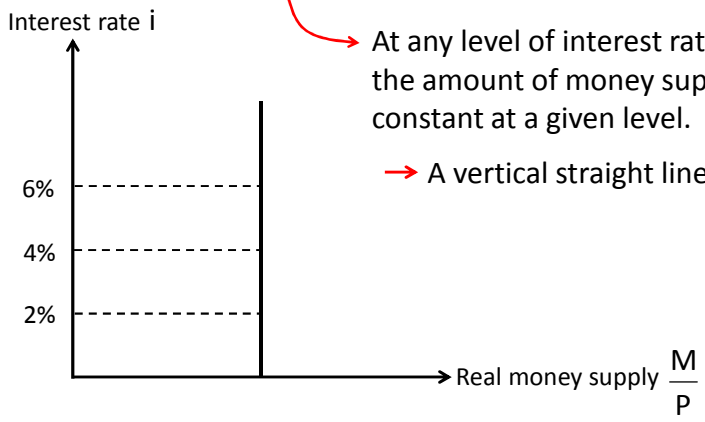
Demand for Money

Demand for money is negatively related with interest rates on bonds.



Supply of Money

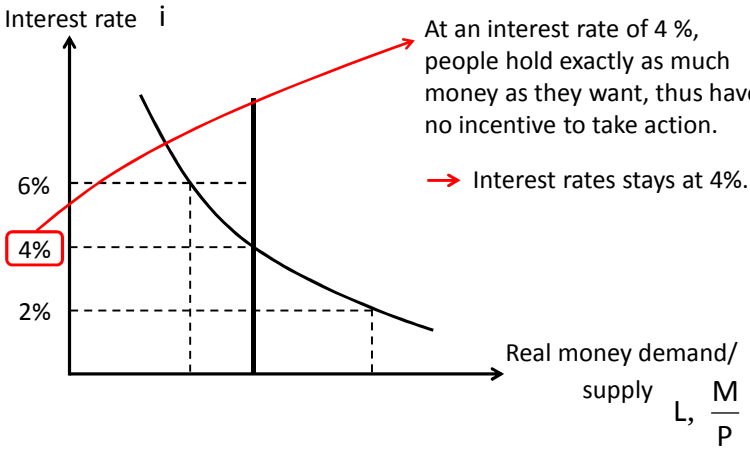
Supply of money is assumed to be controlled by the central bank, thus be independent of interest rates.



At any level of interest rate, the amount of money supplied is constant at a given level.

→ A vertical straight line.

Determination of interest rates

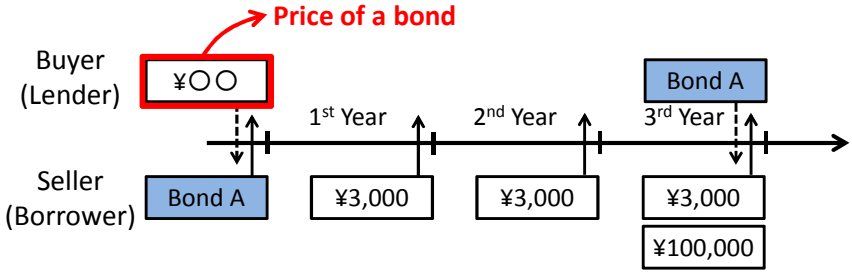


At an interest rate of 4 %, people hold exactly as much money as they want, thus have no incentive to take action.

→ Interest rates stays at 4%.

But what if the interest rate is 6% or 2%?
Do markets drive it toward 4%?

Bond



How much do you pay for this bond *today*?

How much do you pay for this stream of *future* payments *today*?

➔ **price of a bond**

The price of a bond rises as its demand rises,
while the price falls as its demand falls.

Interest rates (1)

Interest rate: the amount of money you can earn by lending <u>one yen</u> for <u>one year</u>

Interest rate of Bond A:
the amount of money you can earn for one yen/year by holding Bond A

Suppose that you buy this bond for ¥99,000.
How can we calculate the interest rate of Bond A?

Interest rates (2)

Divide ¥99,000 into three parts.

	Today	1 year after	2 years after	3 years after
A	a_1 →	3,000		
B	a_2 →		3,000	
C	a_3 →			3,000+100,000

A: a part lent for one year and earns interests for one year

B: a part lent for two years and earns interests for two years

C: a part lent for three years and earns interests for three years

Interest rates (3)

Today	1 year after	2 years after	3 years after
A a_1 →	$a_1\times(1+i)$ $=3,000$		
B a_2 →	$a_2\times(1+i)$ →	$a_2\times(1+i)^2$ $=3,000$	
C a_3 →	$a_3\times(1+i)$ →	$a_3\times(1+i)^2$ →	$a_3\times(1+i)^3$ $=3,000+100,000$

$$a_1\times(1+i)=3,000 \longrightarrow a_1=\frac{3,000}{1+i}$$

$$a_2\times(1+i)^2=3,000 \longrightarrow a_2=\frac{3,000}{(1+i)^2}$$

$$a_3\times(1+i)^3=3,000+100,000 \longrightarrow a_3=\frac{3,000+100,000}{(1+i)^3}$$

Interest rates (4)

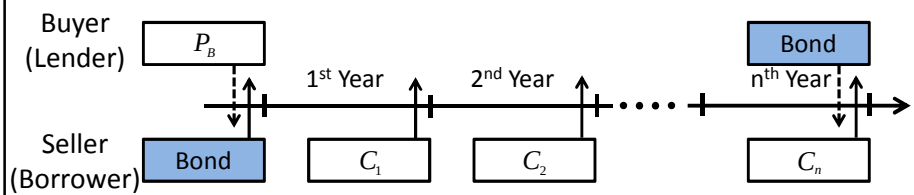
	Today	1 year after	2 years after	3 years after
A	$\frac{3{,}000}{1+i}$ →	3,000		
B	$\frac{3{,}000}{(1+i)^2}$ →	$\frac{3{,}000}{1+i}$ →	3,000	
C	$\frac{3{,}000+100{,}000}{(1+i)^3}$ →	$\frac{3{,}000+100{,}000}{(1+i)^2}$ →	$\frac{3{,}000+100{,}000}{1+i}$ →	3,000+100,000

Remember we divided ¥99,000 into A, B and C.
Then, the sum of A, B and C must be equal to ¥99,000.

$$\frac{3{,}000}{1+i} + \frac{3{,}000}{(1+i)^2} + \frac{3{,}000+100{,}000}{(1+i)^3} = 99{,}000$$

This is an equation for the interest rate, and the solution gives the interest rate of Bond A.

Interest rates (5)



$$\frac{C_1}{1+i} + \frac{C_2}{(1+i)^2} + \cdots + \frac{C_n}{(1+i)^n} = P_B$$

If the stream of payments and the price of a bond are given, the equation gives the interest rate that the bond offers.

The equation also shows how the price of a bond and its interest rate are related.

Bond price and interest rate

What if you buy at a lower price?

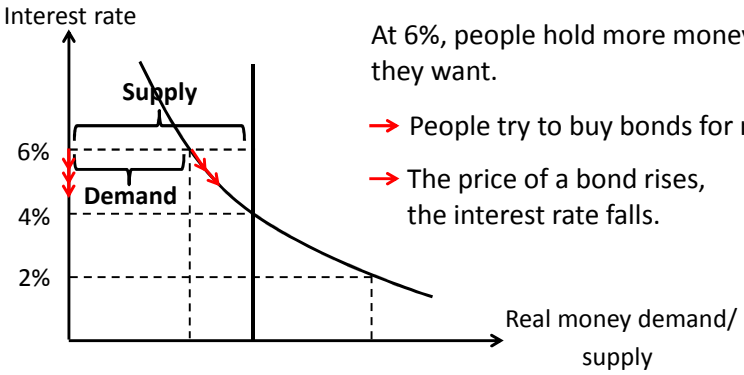
$$\frac{3{,}000}{1+i}+\frac{3{,}000}{(1+i)^2}+\frac{3{,}000+100{,}000}{(1+i)^3}=\boxed{99{,}000} \qquad i=0.0356$$

$$\downarrow \qquad\qquad \downarrow$$

$$\frac{3{,}000}{1+i}+\frac{3{,}000}{(1+i)^2}+\frac{3{,}000+100{,}000}{(1+i)^3}=\boxed{95{,}000} \qquad i=0.0483$$

With the stream of payments constant, as the price of a bond falls, its interest rises.

Equilibrium interest rate (1)



At 6%, people hold more money than they want.

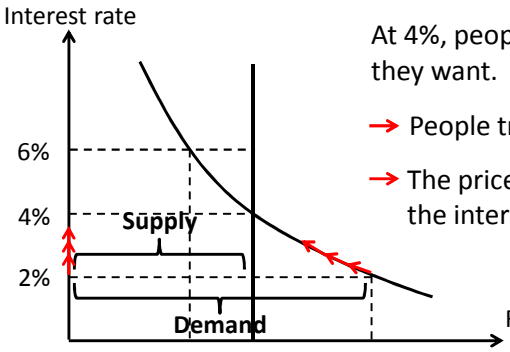
→ People try to buy bonds for money.

→ The price of a bond rises, the interest rate falls.

→ The cost of holding money rises.

→ The demand for money falls.

Equilibrium interest rate (2)



At 4%, people hold less money than they want.

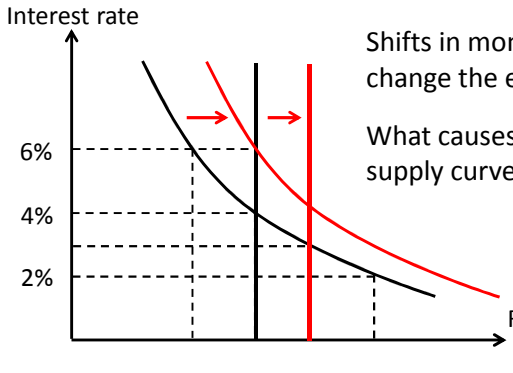
→ People try to sell bonds for money.

→ The price of a bond falls, the interest rate rises.

→ The cost of holding money falls.

→ The demand for money rises.

Changes in interest rates



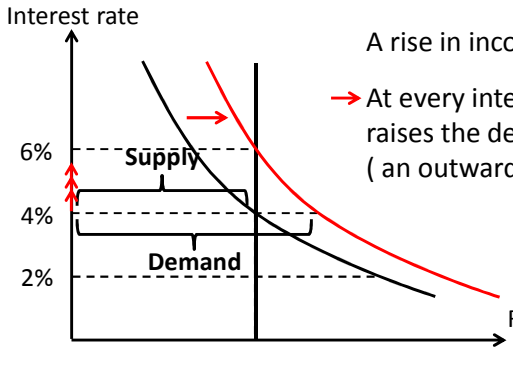
Shifts in money demand or/and supply change the equilibrium interest rate.

What causes money demand or/and supply curves to shift?

- Changes in GDP shift the demand curve.
- Changes in price level
- Changes in money stock

} shift the supply curve.

Changes in GDP(income)



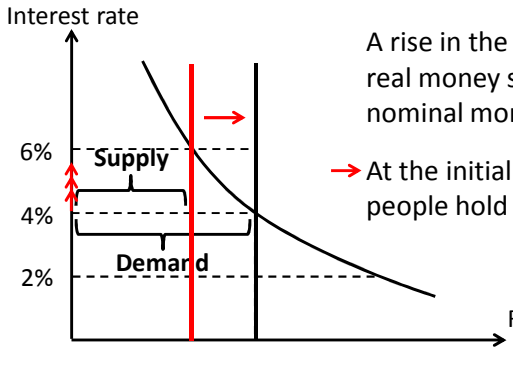
A rise in income increases transactions.

→ At every interest rate, a rise in income raises the demand for money.
(an outward shift in demand schedule)

→ At the initial equilibrium interest rate, people hold less money than they want.

→ A rise(fall) in income raises(lowers) the equilibrium interest rate.

Changes in the Price Level



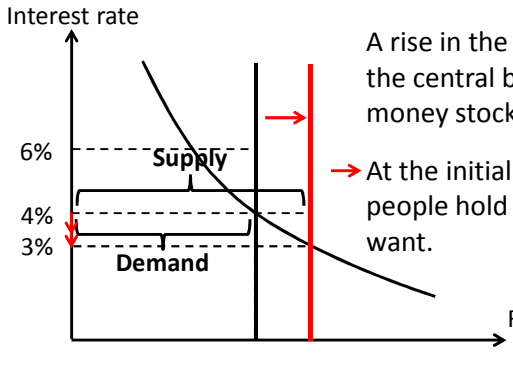
A rise in the price level decreases the real money stock, given the level of nominal money stock.

→ At the initial equilibrium interest rate, people hold less money than they want.

→ People try to sell their bonds for money.

→ A rise(fall) in the price level raises(lowers) the equilibrium interest rate.

Changes in the (Nominal) Money Stock



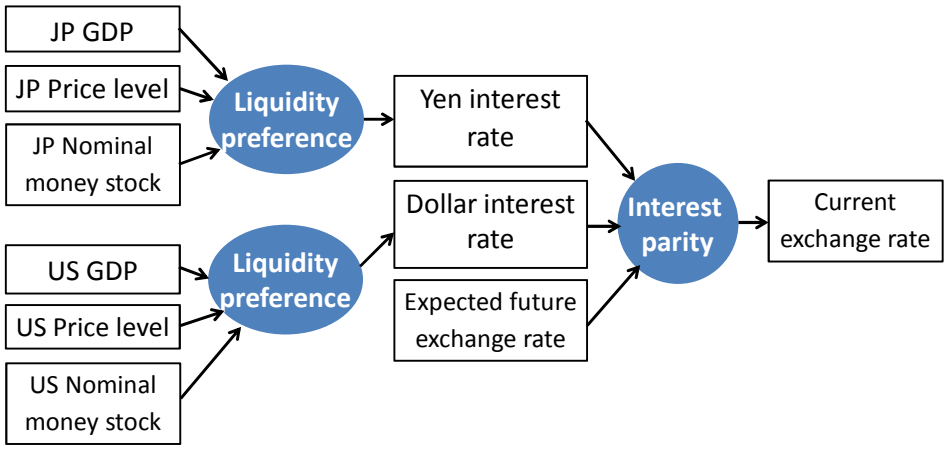
A rise in the nominal money stock by the central bank increases the real money stock, given the price level.

→ At the initial equilibrium interest rate, people hold more money than they want.

→ People try to buy bonds for their money.

→ A rise(fall) in the nominal money stock lowers(raises) the equilibrium interest rate.

Exchange rates in a wider framework



24

Exchange rates in a much wider framework