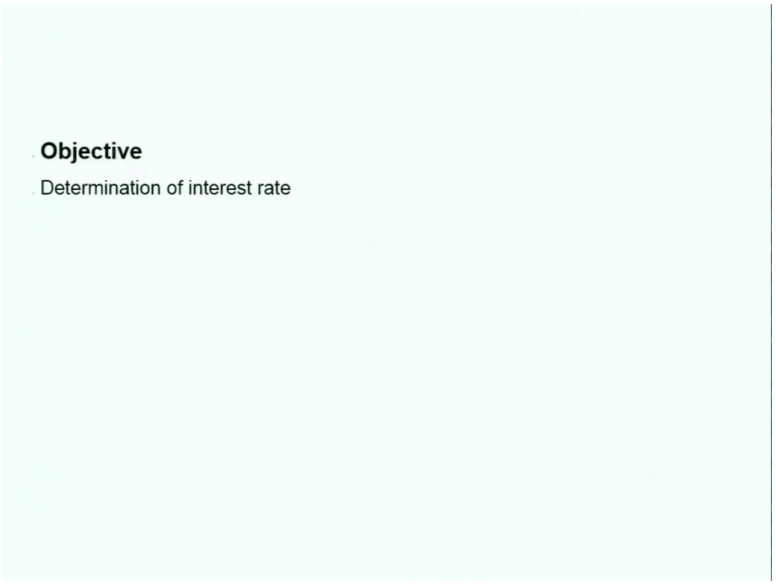
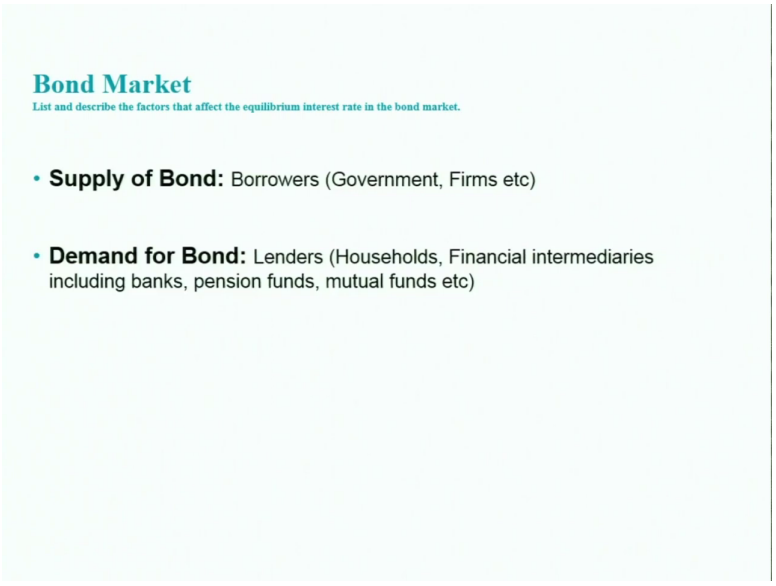
Economics of Banking and Finance Markets
Prof. Sukumar Vellakkal
Department of Economic Sciences
Indian Institute of Technology, Kanpur

Lecture - 05
Interest rate determination in bond market

(Refer Slide Time: 00:18)



(Refer Slide Time: 00:24)



Welcome. In this session we will continue our discussion on determination of interest rate. A quick overview of what we discussed in the previous class: in the bond market we have seen that there are supplies of bond and demands of bond. About the supplies of bonds, we have seen that they are the borrowers of fund in the loanable fund market and it mostly consists of government and firms.

And about the demand for bonds, they are the lenders of funds in the market it includes households, financial intermediaries including banks, pension funds, mutual funds etcetera.

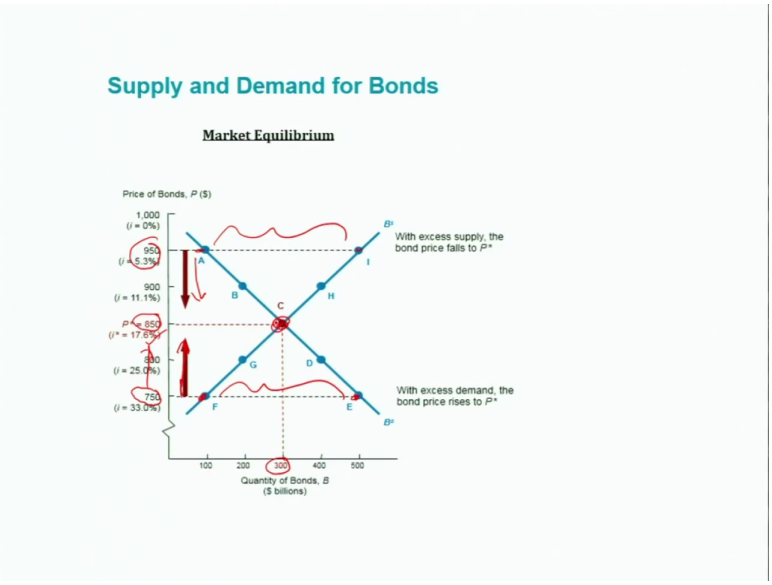
(Refer Slide Time: 01:05)

About the demand for fund, we have also seen that the demand curve slopes downward; that means, when the price is low keeping other things remaining constant, the quantity demanded of bonds is higher; that means, when the price is low (that means, when the interest rate is high in the market) those who want to lend money (those who want to demand bonds) will be demanding more bonds because they are getting high rate of interest, means they are getting high return for their investment. Because of that, lower the prices higher will be the quantity demanded, means there is an inverse relationship.

And, we have also seen that supply curves slopes upward from left to right, where we have seen that when the price is low) when the price is low means the rate of interest is high), other things remaining constant, the quantity supplied of bonds will be lower; that means, when the rate of interest is high, the cost of borrowing (the rate of interest) is high. When the cost of

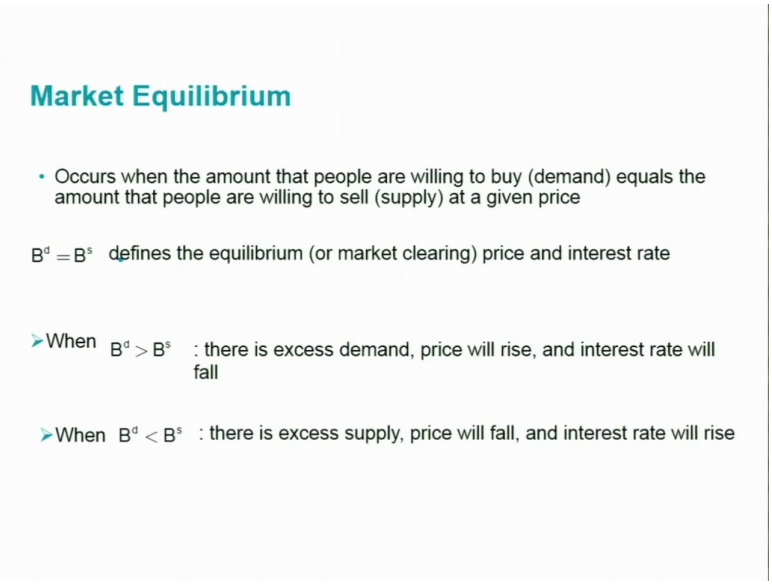
borrowing is very high, they will be supplying less bonds in the market; that means, they are borrowing less from the market.

(Refer Slide Time: 02:36)



We had also discussed the market equilibrium; we have seen that the point c is the point of equilibrium. In this figure, this is the demand curve and this is the supply curve where B^d is the demand curve and B^s is the supply curve, and we have seen that this is the point of equilibrium, and the quantity of bonds demanded and quantity of bonds supplied is equal to 300 billion when the price is 850; that means, when the rate of interest is 17.6.

(Refer Slide Time: 03:14)



So, we have also seen that this is the equilibrium point that B^d is equal to B^s. Other points cannot be equilibrium point for example, this point A or point I, these points cannot be the equilibrium point because there is excess supply because the rate of interest is very low, the bond price is very high. So, this will put a downward pressure on the price of bonds.

Similarly, point F and E, these points cannot be the equilibrium point because at price 750 the quantity demanded is very high whereas quantity supplied is only at the point till the point F; that means, excess demand is there, this much excess demand is there. This excess demand will put an upward pressure on the prices of the bonds, as a result, we can see that the price will be increasing, and the rate of interest will be declining.

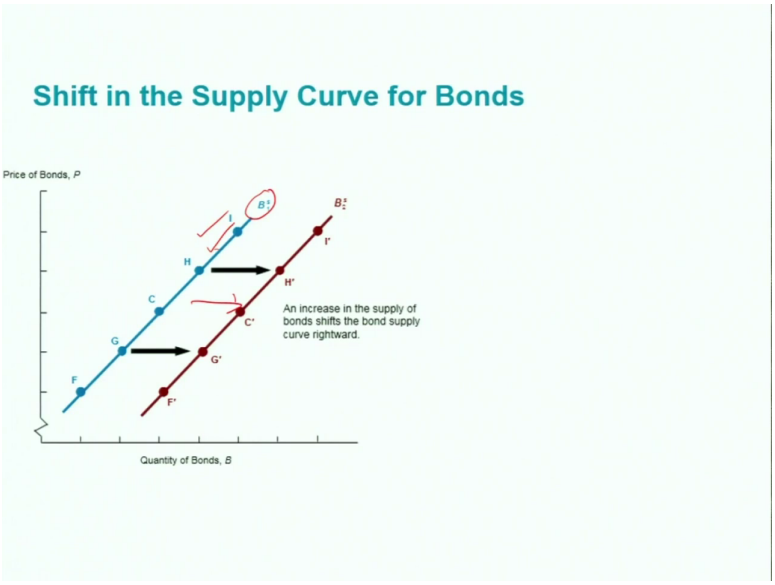
So, finally, we can see that if you move away from any of this equilibrium point, we can see that there will be pressure on it; if the price is above the equilibrium point then there will be a downward pressure on the price, and if the price is below the equilibrium price there will be a upward pressure on the price, and finally, we can see that the demand for bonds will be equal to the supply of bonds.

So, market equilibrium occurs when the amount that people are willing to buy equals the amount that people are willing to sell at a given price. So, this is what we talk about the market equilibrium, and the movement along the supply curve and demand curve. But there can be other factors. When we define demand for bonds and supply of bonds, we say that other things remaining constant.

(Refer Slide Time: 05:10)

What are the other things? Now we are going to discuss the ‘other things’; means, changes in equilibrium interest rates due to ‘other things’ in the market.

(Refer Slide Time: 05:16)



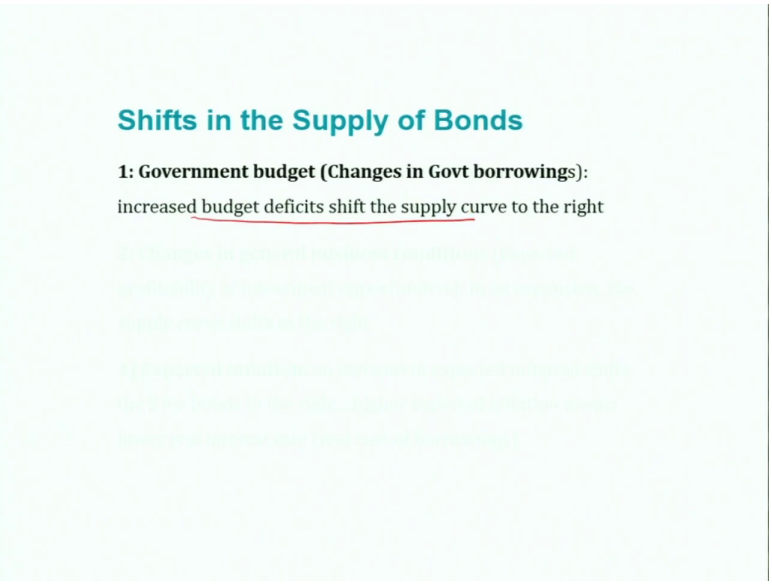
To start, here I am showing the supply curve alone. This is the initial supply curve. We have seen that the initial supply curve, look at this blue color curve, we can see that a point F, point G, point C, H, I etcetera.

What you can see that this is the movement along the supply curve; that means, when higher the price (lower interest rate), the quantity supplied in the market will be increasing, that is what we have already discussed, a positive slope that the positive relationship between price of bonds and quantity supplied in the market.

Now, we see that the price of bonds remaining constant, and due to some other factors, there can be an increase in the supply of bonds. May be government is thinking that they want to borrow more, or firms thinking that at the given interest rate (given price of bonds) they are willing to borrow more; that means, they increase the supply of bonds.

When there is an increase in the supply of bonds, the curve will be shifting rightwards we can see it is denoted with the red colored supply curve. This is what we are going to discuss now, what makes the supply curve to shift rightwards or leftwards.

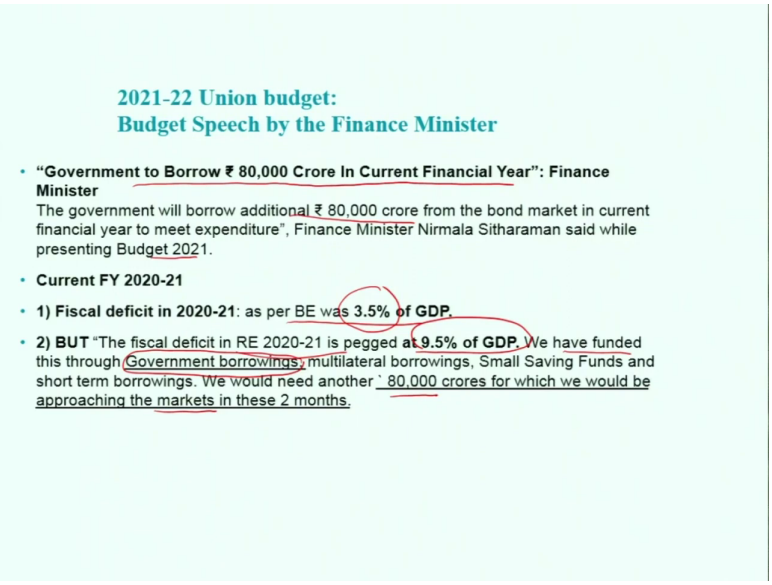
(Refer Slide Time: 06:47)



One of the reasons why the curve shift to the right is, for example, because of changes in government borrowings. When there is increased budget deficit, the budget deficit means increase in the borrowing requirement of the government; that means, when the government expenditure is greater than the government revenue, government needs to borrow from the market. Budget deficit denotes the borrowing requirement of the governments.

When the government is having more and more budget deficit; that means, they must borrow to make the government expenditure is equal to government revenue. Because of that the increased budget deficit is shifts the supply curve to the right.

(Refer Slide Time: 07:27)



Here I am giving some instances where the Finance Minister made a speech in the parliament with regard to the union budget 2021 2022 in the context of COVID pandemic. You can see that ,you might have read it somewhere; that means, government to borrow 80,000 crore in current financial year, that is the announcement made by the Finance Minister.

You can see that government will borrow additional 80,000 crore from the bond market in current financial year to meet the expenditure; that means, by government is issuing bonds. This is what Finance Minister told while during presenting budget 2021. Because, before the COVID pandemic you can see that the budget estimate of the fiscal deficit was below 3.5 percentage.

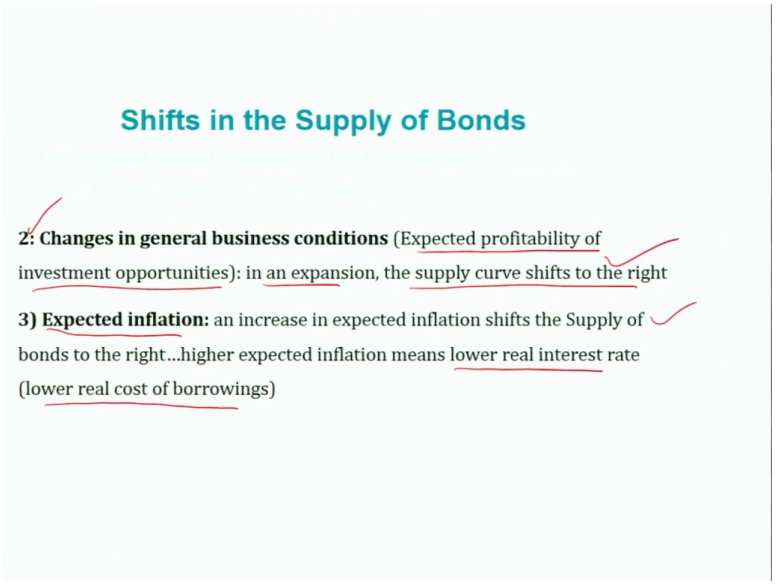
Forecast was 3.4 percentage, but because of the COVID pandemic you know that there was a decline in government revenue. Several social schemes were introduced, and social expenditure to meet the pandemic increased.

The main point is the forecasted budget estimate was the budget deficit was 3.5 percentage, but at the time of presenting the budget the fiscal deficit revised estimate it pegged to 9.5 percentage of the GDP. So, there is a huge increase in the budget deficit. So, how could government finance this? Anyway, they have to find out this much money to fill this gap, that is the fiscal deficit, that the government has to fill it out; that is the borrowing requirement.

Then, you can see here, the finance minister said that we have funded this through government borrowings; that means, government borrowings, multilateral borrowings, small savings funds, and short-term borrowings. So, of this the government borrowings consists of a big part; that means, we would need another 80,000 crores; that means, this "we would be approaching the market in these two months".

What the finance minister was referring here is the market, means approaching the bond market, they will be borrowing from the bond market. As a result, we can see that the curve will be shifting rightwards; that means, government will be borrowing irrespective of whether the price of bonds remaining constant; because of some other factors government is borrowing more. As a result the curve will be shifting rightwards.

(Refer Slide Time: 10:01)



If governments fiscal deficit condition is better, then the curve will be shifting leftwards. Government does not need to borrow much then the curve will be shifting from right to left instead.

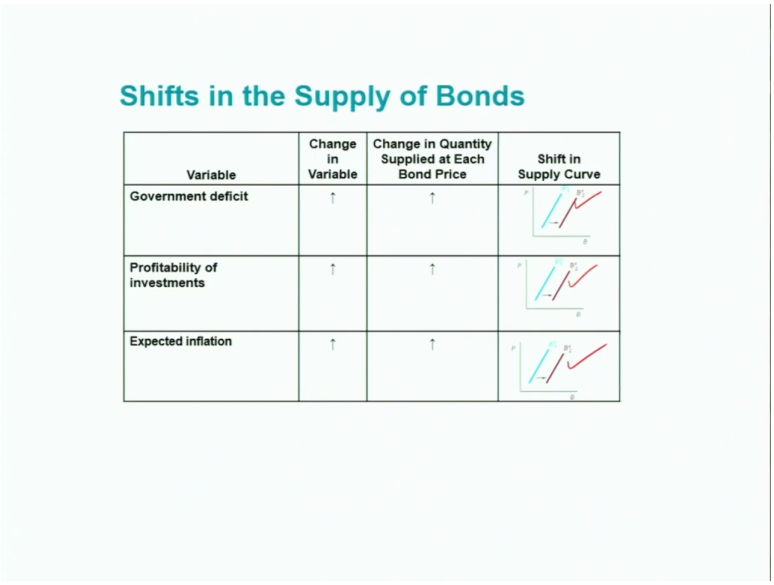
Another factor that makes shift in the supply of bonds is the changes in general business conditions. Suppose the economy is moving to a boom condition; that means, the economic the optimism in the economy, the overall business conditions in the economy improve; that means, an expansionary business cycle stage. At that time, you can see that the expected profitability of investment opportunities increases. During boom, you can see that the prices of goods and services will be increasing and slight increase and overall there is increased

demand for goods and services because overall is anticipated that the income of the people is going to increase and overall you can see that there is an increase in expected profitability of investment; that means, investment the aggregate investment in the economy increases during positive business environment.

In an expansionary economic state; that means, when firms are seeing that the business condition is going to improve, that is, there is going to be a boom,, they are willing to invest more; that means, they are willing to invest more on machines and factories; that means, the aggregate demand is going to increase for firms, and as a result they will be borrowing more because in order to finance the increased investment they need more fund. So, that they will be borrowing from the bond market.

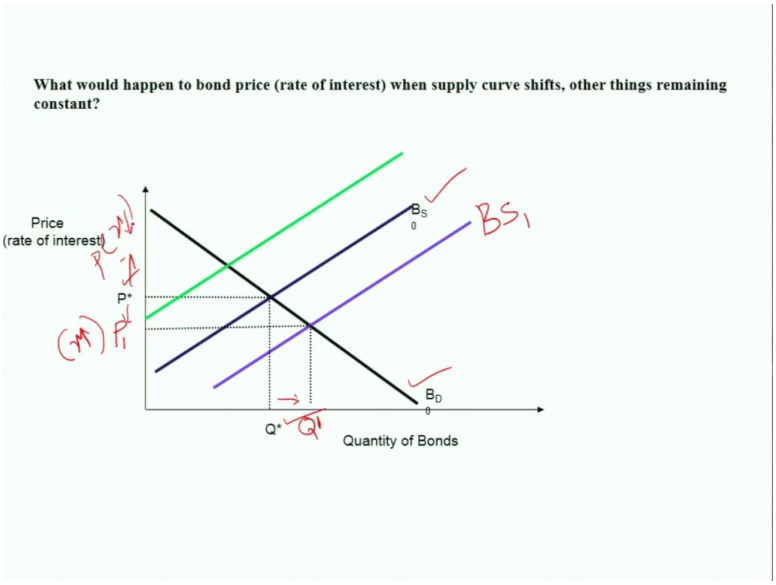
Because of that, you can see again, that the supply curve will be shifting rightwards. The third factor is the expected inflation: what if there is an increase in expected inflation? When the expected inflation increases, the supply of bonds (supply curve of bonds) shifts to the right. When firms anticipate that inflation is going to increase; that means, the payment the principal and the interest income they must repay, maybe after 1 year or after 5 years, will be less in real terms. When there is an inflation the purchasing power of money declines. That means, they are paying low lower real interest rate. Because in the future, see that after one year, there is going to be inflation; that means, the money they are going to return (the principal and the interest income) is going to be low in real terms. That means, lower real cost of borrowing when there is an expected inflation.

(Refer Slide Time: 13:04)



When I present all these things in a diagrammatically you can see that curve will be shifting rightwards like this. Here, we have mentioned increase in government deficit and increase in profitability of business investment and expected inflation, all these may change in quantity supplied at each bond price; that means, the quantity supplied will be increasing at the given bond price right.

(Refer Slide Time: 13:34)



Now, let us see what would happen to bond price when supply curve shifts, other things remaining constant. In these curves, you can see, we have stating here a downward slopping

demand curve and upward slopping supply curve. So, initial the price of bond is at P star and quantity demanded and supplied is at Q star.

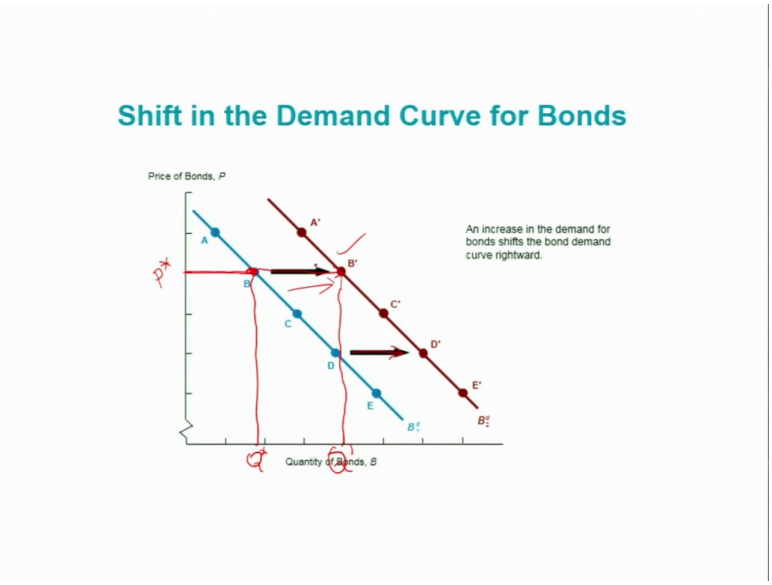
Now what we are going to introduce here that the supply curve, there is an increase in supply, all other things remaining constant and means even there is no change in demand condition overall business condition. Only we are going to say that some particular change is happening, maybe government is going to borrow more maybe because of increased fiscal deficit government is borrowing and the supply curve is going to shift rightwards. So, this is the new supply curve.

In this case, you can see that the new supply curve is this one this is Bs1 and you can see that this is going to be the new quantity supplied. So, when there is an increased pressure in the market to borrow more; that means, government is supplying more and more bonds, means they are issuing more government bonds in the market.

As a result, the price of bonds will be declining; that means, when the price of bond is declining means the rate of interest is going to increase; that means, the cost of borrowing (the rate of interest) in the market is going to increase; that means, price is declining when they are borrowing more. So, this is going to happen when there is increase in the supply, the supply curve shift to the right.

In contrast, you can see that, when supply curve is shifting leftwards (may be governments fiscal condition is very sound), it means they will be supplying less bonds; that means, they are borrowing less from the market. As a result, there is less supply in the market; they are borrowing less. As a result, you can see that, the price will be increasing; that means, the rate of interest will be declining in the markets. So, this is the likely impact here.

(Refer Slide Time: 15:55)

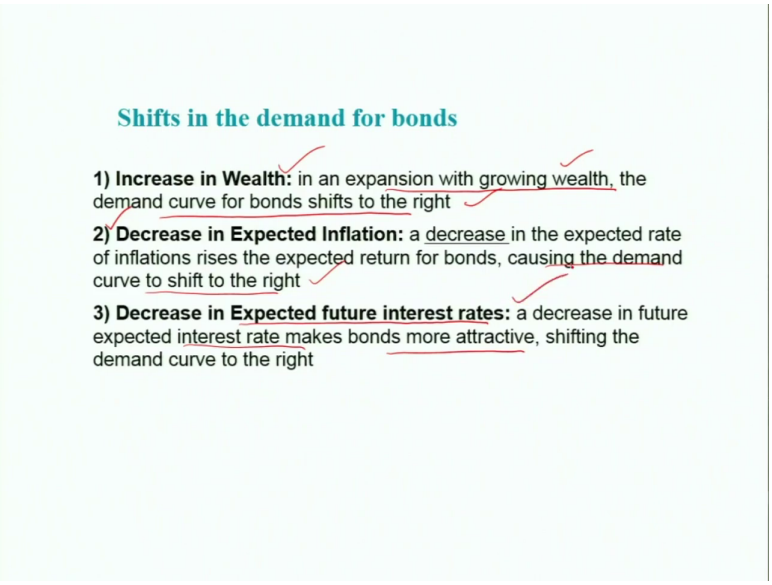


What we have discussed until now is mainly about the shift in the supply curve. Let us now focus on the other part, that is the demand part of the bond market, that is when the demand curve shift to the right what is going to happen. why it shifts and how does it affect the price and rate of interest in the bond market? About demand, we already mentioned that demand for bond means those who want to lend in the bond markets.

When there is an increase in the demand for bonds, it shifts the demand curve to the right, then we can see that, from the blue lined curve, it shifts to the right and we denote with a red line curve. So, you can see here that the curve shifted to the right mainly because there is an increase in the demand for bonds even at the given price. So, look at this.

When I say, that for example, the initial demand curve, you can see that the price is P star and quantity demanded is Q star. At the same price, due to, suppose the households they have more wealth, and they demand more, they want to invest more in the bond market. So, at the given price they demand more bonds, that means, at the given rate of interest or given bond they will be demanding this much. That means, you can denote this one at a new demand curve.

(Refer Slide Time: 17:33)



Now, see what are the factors that make the shift in the demand for bonds. So, one of the factor is increase in wealth when the households wealth increase overall the economy is growing economic growth is occurring; that means, the income of the members of the economy increase and income means a flow then as a result you can also see that the wealth also increase.

So, at this stage you can say that in an expansion with the growing wealth and they must park their increased wealth somewhere in the market. So, they will be preferring one of the options is to invest in bond markets. So, you can see that in an expansion with the growing wealth the demand curve for bonds shift to the right even in that the given rate of interest or at the given price the households and household may be households will be depositing their money in the bank or putting in pension fund or insurance companies and then banks insurance companies and pension funds they will be or mutual funds they will be investing these funds in the bond market.

All this happened because of increase in wealth. So, that we can see that the curve will be shifting rightwards. The next factor is the decrease in expected inflation. What if we are going to see that in the future the inflation rate is going to decline? People see that, household see that, this is an opportunity; that means, when the inflation is going to decrease in the future; that means, decrease in the expected rate of inflation rises the expected return

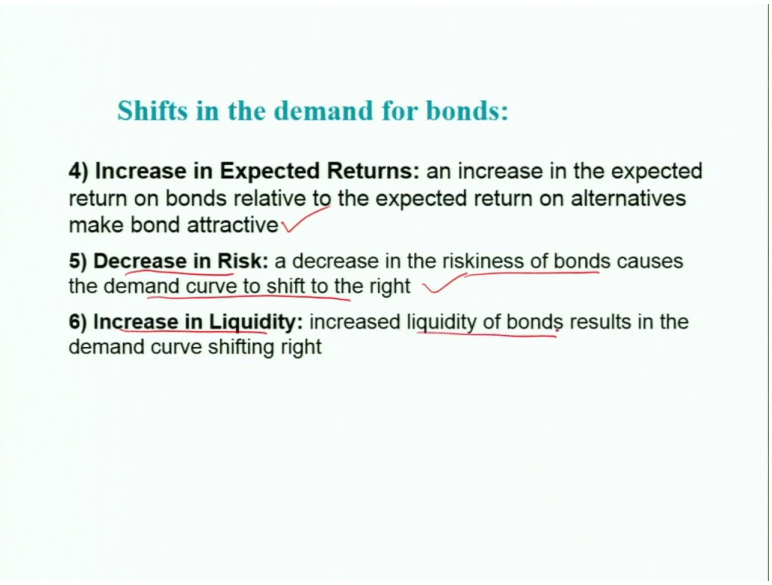
from bonds; that means, the future money including the principal and the interest income that they are going to get in the future (in real terms) is going to increase.

In real terms, the value of principal amount and the interest income is going to increase when there is a decrease in expected inflation. It causes demand curve shift to the right.

Similarly, when there is going to be a decrease in expected future interest rate, the households, the investors, the demanders of bonds or the lenders consider bonds more attractive. Because of the inverse relationship between interest rate and bond price when they anticipate that the interest rate is going to decrease, they expect a capital gain in the future because decrease in rate of interest means increase in the bond price.

It means, when they are selling the bond in the market the price at which, for example, they bought it at 1000 today and if they see that expected interest rate is going to decrease in the future. That means, the bond price is going to increase, maybe they can sell it at 1100 or 1200; that means, they are going to make some capital gain as well. To summarize, decrease in expected future interest rate is going to shift the demand curve to the right.

(Refer Slide Time: 21:04)



Similarly, increase in expected returns on bonds relative to the expected return on alternatives. Alternatives, for example, stocks equity or investment in mutual funds, pension funds etcetera also make bonds more attractive. And another factor is decrease in risk; suppose we see that overall economic conditions in the country is going to be more and more

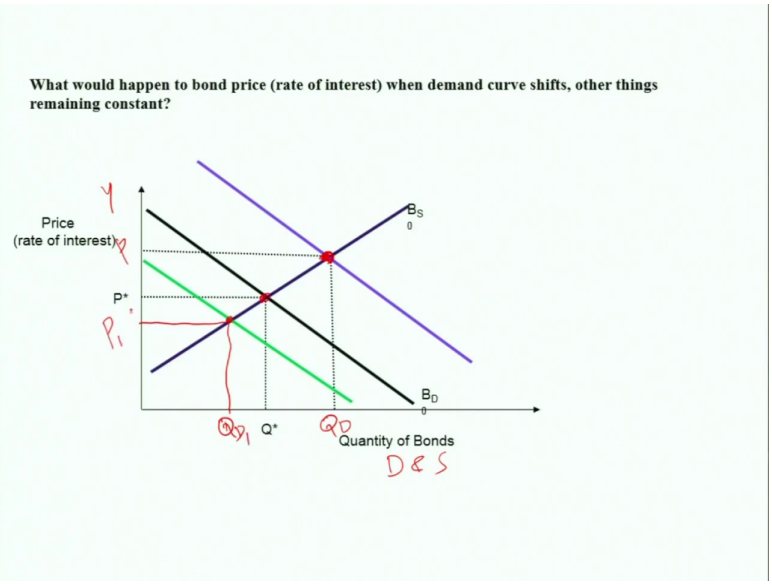
stable and is improving; suppose the political condition and economic condition; there is more stability, it will translate into decrease in risk.

When the there is a decrease in the riskiness of bonds, it causes the demand curve shift to the right. And for example, the overall credit rating for the country (sovereign rating for the country) improves, then you can say that there will be more inflow of foreign investment there is more inflow of foreign investment, the foreign currency (foreign capital) will be moving to the country; that means, they will be investing more of their funds in bond market because the default risk decreases. It makes bond market more attractive for them. More number of households invest, a greater number of foreigners invest if there is a decrease in default risk. It makes the demand curve shift to the right.

If there is an increase in liquidity of bonds, the demand curve shifts to the right. Liquidity means the ease at which you can convert these bonds into spendable form; for example, you can easily convert it into money without loss of time and value. if there is an increase in liquidity of the bonds; that means, the bonds that is that you are buying in the market if you see that you can sell it very fast and without loss of your time and without loss of much value. And suppose the transaction cost is very low, brokerage cost is very low, and the market is very well developed; that means, it is very easy for you to sell the bond that you are holding that also make.

That means, the increase in the liquidity conditions also make the demand curve shifting to the right; that means, when the bond market is well developed; that means, increase in liquidity also making the people make a finding that bond market more attractive and as a result they will be investing more, and as a result the curve will be shifting rightwards.

(Refer Slide Time: 23:46)



So, let us see what would happen to the bond price when demand curve shifts, other things remaining constants. So, in this curve. So, you can again see that on the left-hand side, on the Y axis we have denote price, on the right axis we denote quantity of bonds; that means, demand quantity demanded and supplied that is mentioned on the right-hand side.

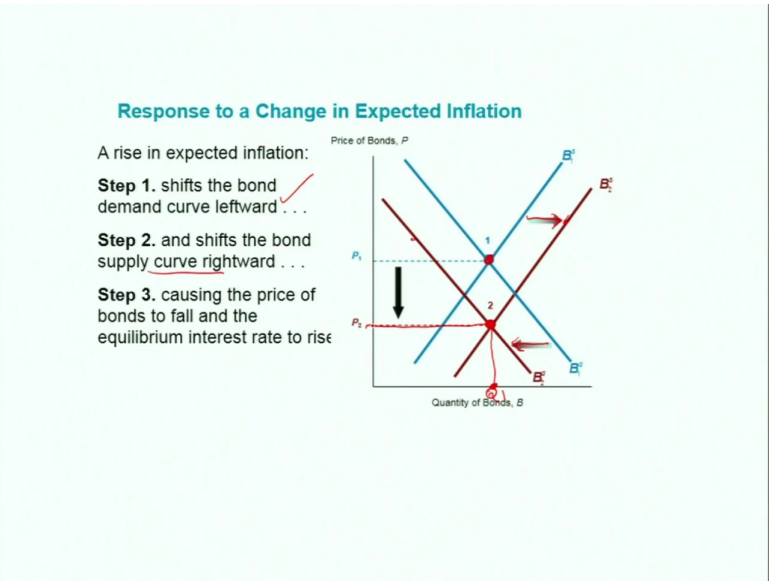
This is the initial equilibrium position you can say that market is at equilibrium at a price P star and quantity demanded and supplied at Q star. Due to the aforementioned factors (we discussed six factors here) suppose one of these factors occur here; that means, favorable conditions; that means, suppose the income of households increase, there is an economic growth and income of households and income, and wealth of households increase and then they demand more bonds and the bond demand curve shift to the right.

What can you see here? You can see here that, as a result, the bond price is going to increase; that means, when the bond price is going to increase; that means, the rate of interest is going to decline. This is going to be the new price; that means, low rate of interest and this is going to be the new quantity demand demanded. You can see that when the quantity demanded increase the demand curve shift rightwards, the new intersection is going to be this point, right at this point, the new demand curve intersect with the supply curve. This is going to be the new equilibrium point.

In contrast, let us see what would happen if there were a decrease in demand. You can see that quantity demanded will be declining, and this is going to be the new demand condition

(quantity demanded) and price will be declining at this point; that means, rate of interest is going to increase.

(Refer Slide Time: 25:54)



Similarly, we are going to introduce another condition: response to a change in expected inflation. Suppose we see that there is a rise in expected inflation, you can see that when both demand and supply changes, thus, there is shift in both supply curve and demand curve.

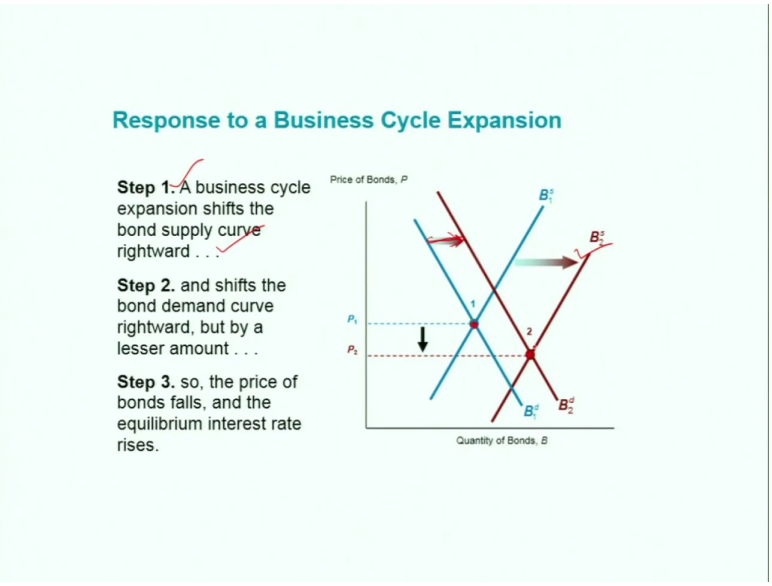
So, initial equilibrium condition you can see that this one is at one you can see that at this point price is P1 and the quantity demanded and supplied is at this point right Q1. Now suppose that there is a rise in expected inflation. You can see, due to both demand and supply responses, what is going to happen? The first one is that when there is a rise in expected inflation the demand curve will be shifting leftwards, this is the first change.

When this curve is shifting leftward and at the same time what is happened that the supply curve supply curve shifts rightwards when the expected inflation is going to increase. As future repayment of principal and interest income is going to decrease in real terms, the supply curve will be shifting rightwards; this curve will be shifting rightwards.

Now you can see that the new supply curve is this one: Bs2 this is the new supply curve, and this is the new demand curve, and the new intersection is going to happen at this point. So, you can, using this step 1 and step 2, you can see that this was the new equilibrium point. At this point and new quantity demanded and supplied is going to be this.

In this example, we are assuming different rate of supply curve response and the demand curve response, then we can see that the new price is going to be P1 and that means, prices declined and rate of interest was increased.

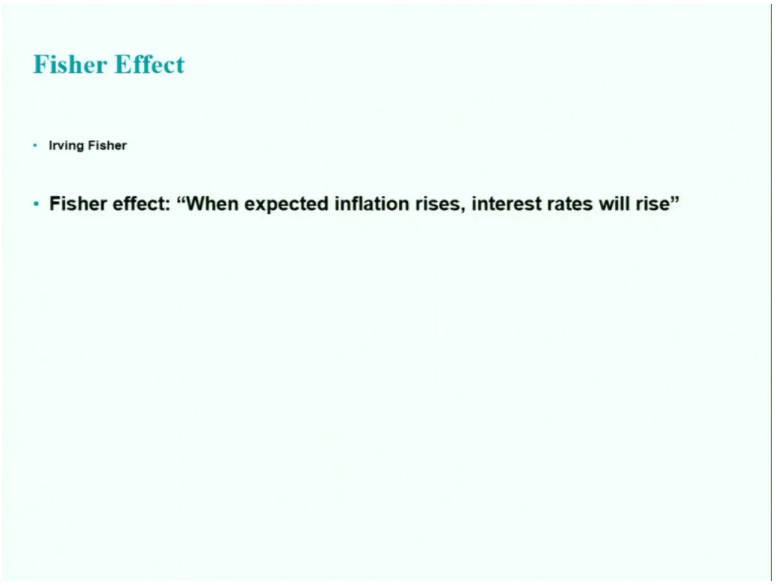
(Refer Slide Time: 27:56)



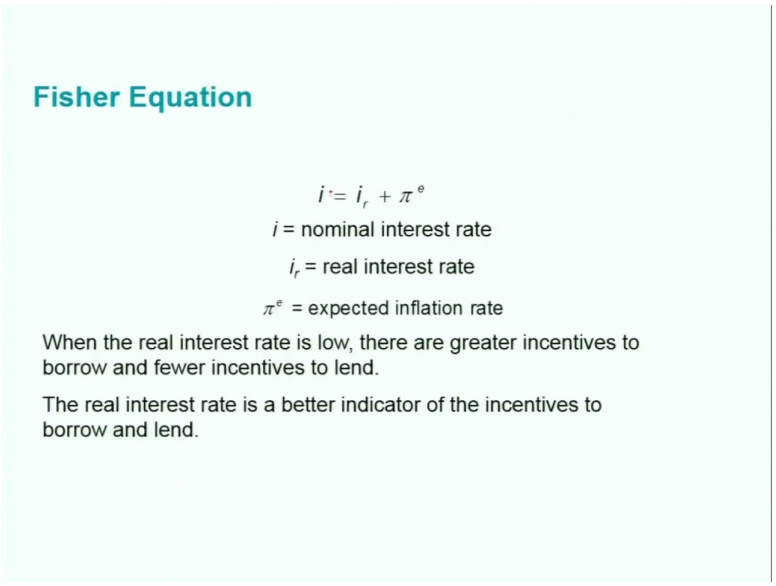
Similarly, we can expand this one response to business cycle expansion. Same logic can be applied; that means, step 1 is business cycle expansion, shift the bond supply curve to rightwards; that means, this is shifting rightwards. And shift in the bond demand curve it also shifts right rightwards but it at a lesser amount because the first movement/response will be made by the suppliers of bonds, that is, mainly firms because they see increased investment opportunities.

And the lateral the impact on demand for bond, it will take slightly some more time because their income is going to increase at a later stage, and they are expected increase in income then as a result they also demand more bonds. So, you can see that from initial equilibrium position is there to B2 new equilibrium position at this point; that means, price of bond decrease.

(Refer Slide Time: 28:57)



(Refer Slide Time: 29:08)



Before summarizing, let me also explain you the fisher effect. When there is an expected inflation rise, we can also say that interest rate also rise. the fisher equation it is denoted as i is equal to the nominal interest rate is equal to real interest rate plus expected inflation rate. When the real interest rate is low there are greater incentives to borrow and fewer incentives to lend. So, the real interest rate is a better indicator of the incentive to borrow and lend.

In the next session we will discuss alternative framework to determining rate of interest in the market, that is mainly by using the market for money.

Thank you.

Key words: bond market; Shift in demand curve, shift in supply curve; price; interest rate