Management of Fixed Income Securities
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Module No # 04
Lecture No # 19
The Term Structure of Interest Rates – VII

Welcome back! So, in the previous class, we started the discussion on the pure expectations theory and we have discussed that how the expectations about the future by the bond investors is going to change or going to affect the yield curve. And what we have seen that the implied forward rate should be always equal to the expected spot rate whenever there is any equilibrium. So, that is the way basically we have always explained this concept of the pure expectations theory.

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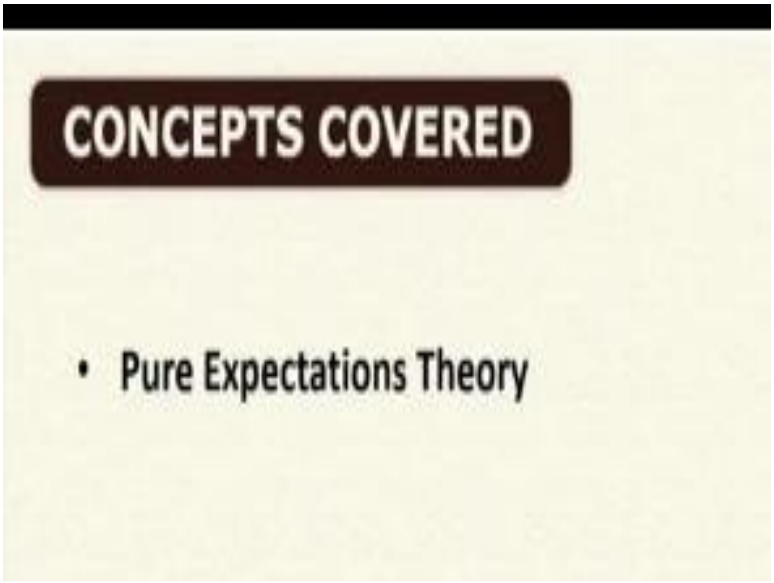

In today's class will be continuing with this particular discussion.

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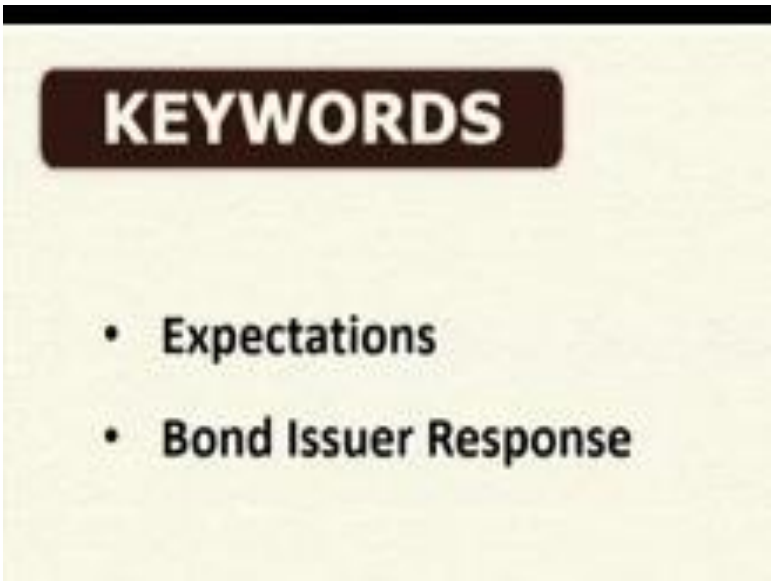

And through this particular class you will understand how the bond issuer's response is going to affect the yield curve, whenever they are also expecting that the interest rate is going to change in the future. In the previous case, we have assumed that only the expectations of the bond investors has some kind of impact or some kind of response towards the concept of the income. But, now we are incorporating both; bond investor and as well as the bond issuer. In that case also what is going to happen, that is the basic objective of the today's discussion.

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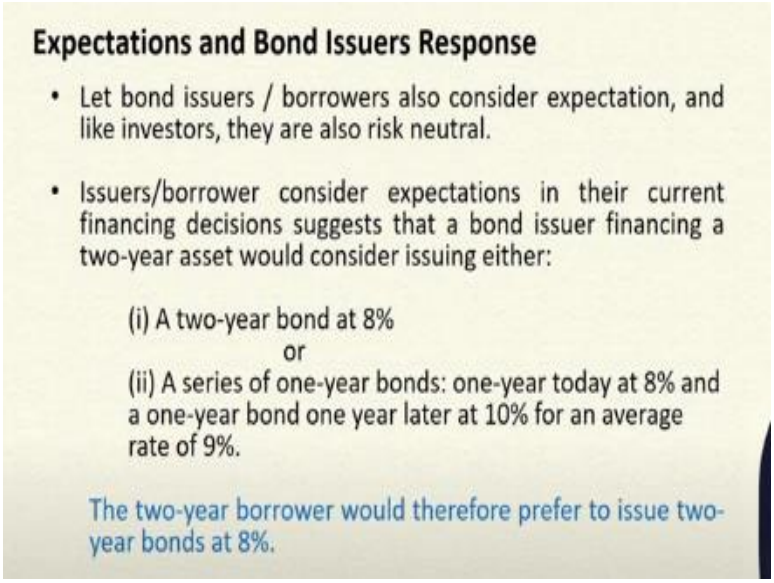

We will continue with the same example whatever we have we have taken. Let bond issuers also consider the expectation, and like the bond investors they are also risk neutral. The concept of risk neutral already we have discussed. Let we have taken again this hypothetical situation, the issuer

consider the expectations in their current financing decisions and they have 2 alternatives. One is they can issue a 2-year bond which is giving 8% return or a series of 1-year bond.

1 year today at 8 % and 1 year bond one year later at 10% for an average of the 9%. That already we have calculated. Then, what will happen from the issuer perspective? This issuer obviously will prefer to issue the 2-year bond because that is lower. The investor can go for the other alternative but the issuer perspective they will go for a bond which is basically giving the 8% because in the second case they have to give 9%. So, the 2 years bond issuer, prefer to issue the 2 year bond at a yield of 8%. is it clear?

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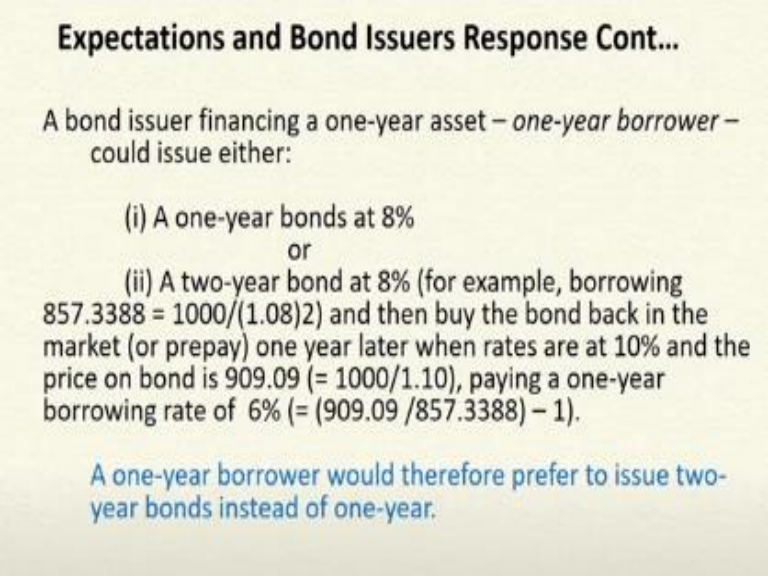

Second case, let there is a 1-year borrower. first case we have considered the horizon period of the bond issuer is 2 years. Second case, let we have assumed that the particular borrower horizon period is 1 year. then again 2 alternatives we have; 1 year bond at a rate of 8% Or a 2-year bond at 8%. For example, borrowing 857.33= $1000/(1.08)^2$ and then buy that particular bond back in the market one year later at a rate of 10% and the price of the bond is 909.09=(1000/1.10), then paying the one-year borrowing rate of 6%(=(909.09/857.3388)-1).

So, in that case a 1-year borrower would prefer to issue 2-year bonds instead of 1 year because the yield is only 6% in that case, effectively he has to pay 6% only.

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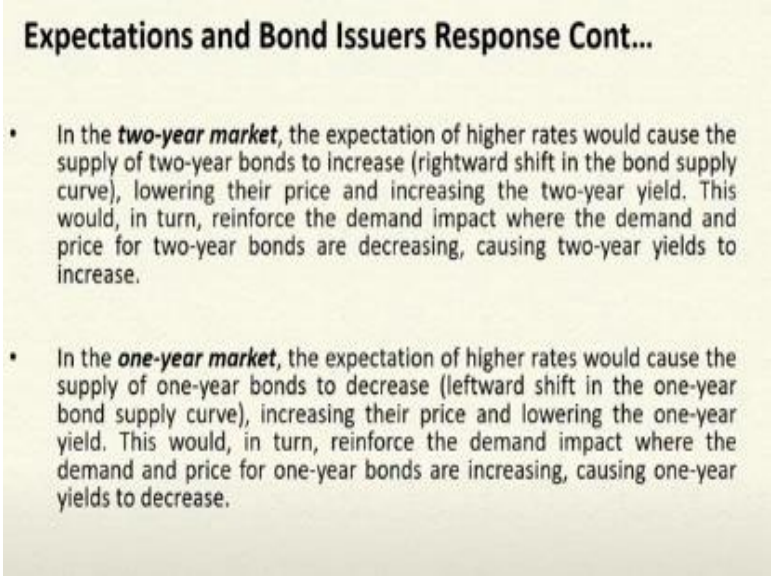

So, then what we have observed in this case? There are 2 markets in this case; one is a 2-year market, second one is a one-year market. So, what will happen in the 2 year market? The expectation of higher rates will cause the supply of the 2 years bond to increase. Then, there will be a rightward shift in the bond supply curve in that particular segment that will ultimately lower the price in increasing the 2-year yield.

But, at the same time that will reinforce the demand impact where the demand and price of 2 years bonds are decreasing. That we are linking it in the previous class, which basically causing the 2-year yields to increase because that time basically we have seen that the preference of the investor perspective is different. If you come back to the 1-year market then what will happen? the expectation of higher rates would cause the supply of 1-year bond to decline.

Because you are expecting that the rate will be more than the leftward shift in the 1-year bond supply curve which will increase their price and reduce the yield, the 1-year yield will be reduced. And again, if you look at the demand side the demand impact. The demand and price of the 1-year bonds are also increasing causing this 1-year yields to decline. So, in the 2 year market and 1 year market this kind of scenario is going to be prevailed.

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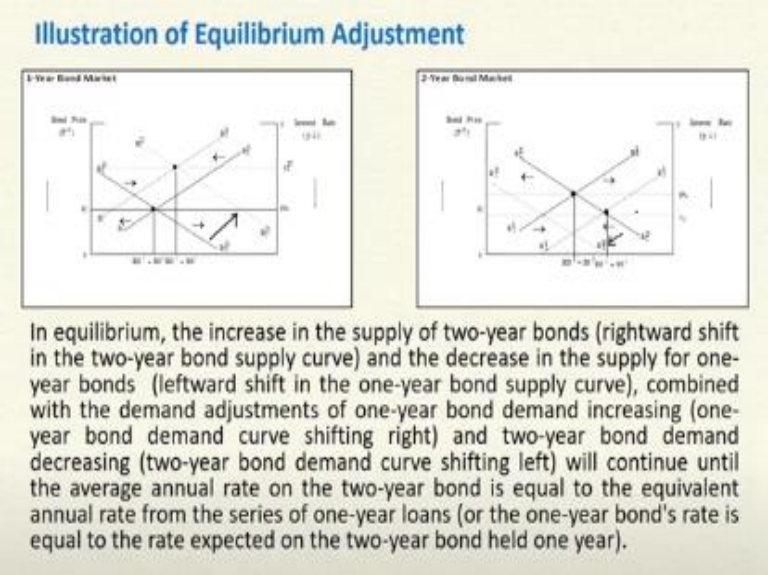

So, let us see that how that particular mechanism works? Now, if you look at this what will be happening in the equilibrium? Already we have seen there is an increase in the supply of the 2-year bond, that means the bond curve will shift rightward, the 2-year bond supply curve will shift to the right ward. So, here if you see that there is a 2-year bond market. if you look at it, then you will find that there is a shift in the demand curve and a decrease in the supply of the 1-year bond.

So, that's why there is a leftward shift in the 1-year bond supply curve. 1-year market the bond supply curve will shift the leftward right. So, if you combine these 2, the demand adjustment of 1-year bond is increasing, that means the 1-year bond demand curve is shifting right. So, that is the way basically it will shift right. And 2-year bond demand curve is decreasing so that is why this is basically shifting left. So, that is a moment which is going to happen.

And this same process will continue until the annual rate of series of the one-year bonds or one-year loans. if you see, or the one-year bonds rate is equal to the rate extracted on the 2-year bond and 1 year bond. This particular process basically will go on. So, because of the change in the demand-supply conditions in one-year bond market, in 2 year bond market this kind of scenario is going to be prevailed and this is the way the adjustment mechanism basically will work.

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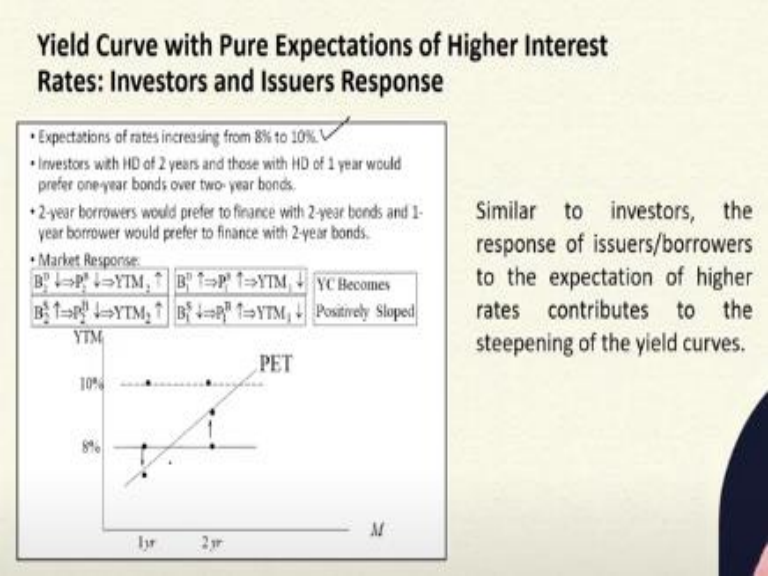

Now, if you see what basically exactly happens here? Here what is the assumption we have taken? There is a increasing expectations, that means the yield was 8% & yield is going to increase to 10%. That is why the expectations of rates is increasing from 8% to 10% that is the assumption whatever we have taken, that is the thing you keep in the mind. Then investors with horizon period of 2 years and also with the horizon period of 1 year would prefer one-year bonds over the 2-year bonds.

That is from the investor perspective that we have seen in the previous class. Now, the 2-year borrower would prefer to finance the 2-year bonds and 1-year borrower would prefer also to finance with the 2-year bonds. Right? So, from the demand side it is the preference is coming for the one-year bond and from the supply side it is coming with the 2 years. is it clear? Now, how the market basically will be responding towards that, what is the markets response?

Now, what is happening? The demand for the 2-year bond is low because the demand for the 1-year bond is higher from the demand side, from the investor side. So, the demand for the 2-year bond is low then the price of the bond will go down and the YTM will go up. And the demand for the one-year bond will be up and the price of one year bond will be up then the YTM will be down. here the YTM will be up and here the YTM will be down.

Come to the supply side, which is coming from the issuer perspective. The demand for 2-year bond supply is up so that is why the price of the 2 years bond will be down. Then, your YTM will be

down. sorry! the YTM will be up. Sorry! the supply of the 2 years bond will be up, so that is why the price will be down because the demand is not there so then what will happen? that the YTM will be up.

If the YTM will be up, then what will happen? in the one-year market if you observe the supply is less price will be higher, then the YTM will be down. So, then what will happen in that case? if you summarize this, the yield curve becomes also positively sloped. Initially, it was 8% now it has gone up to 10%. So, now what has happened in the 2 markets? if you look at the one-year market the yield has come down and the 2-year market the yield has gone up.

So, in that case what basically here we are trying to say? If you are expecting both the issuer and as well as the investor are expecting that the interest rate will be up. Then, that will have the impact on the short-term yield and as well as the long-term yield. The short-term yield is going down and the long-term is going to be up. So, like in the previous class in the demand case or the investor perspective whenever we have discussed.

The response of the issuers or the borrowers to the expectation of higher rates contributes to the steepening of the income. If you are expecting the issuer is also expecting the interest rate will be up and the investor is also expecting that interest it will be up. Then it will further make this yield curve steeper that is the thing basically you have to keep in the mind.

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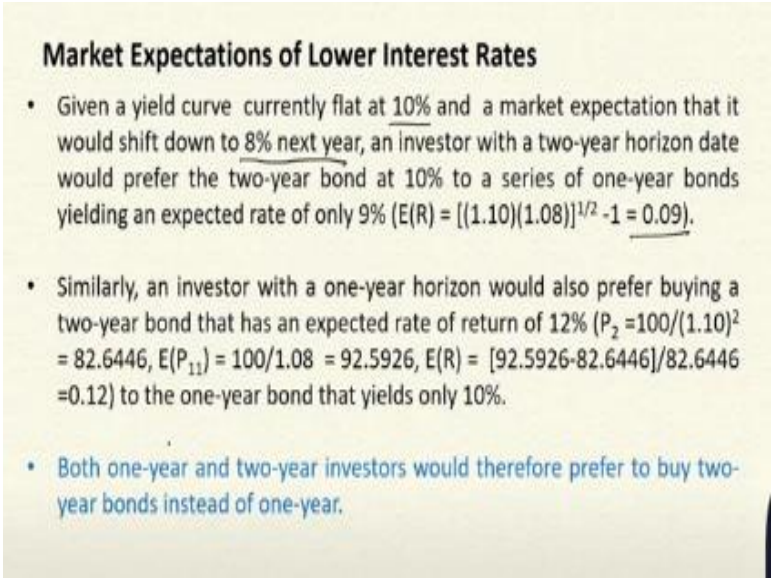

Let us see, if you are expecting that the interest rate is going to be down. Here, we have seen that the interest rate is going to be up. Let you assume there is a flat yield curve and that is basically your 10%. let the market expectation is like that it will shift down to 8% in the next year. Then, what will happen? then the investor with a 2-year horizon date would prefer the 2-year bond at a 10% to a series of one-year bond which can yield an expected rate of 9%.

$(E(R)= [(1.10)(1.08)]^{1/2}-1=0.09)$

So if you look at the investor with a one-year horizon they will prefer buying a 2-year bond that has an expected rate of 12%. How you got this 12%? Let we assume that principal is 100 then 100 divided by 1.1 square that will the price will be 82.6446. Then your expected price will be 100 divided by 1.08 that is 92.5926. Then expected return will be your 92.5926 – 82.6446 divided by 82.6446 that will give you 1 % to the one year bond which is yielding only the 10% now.

$P_2= 100/(1.10)^2=82.6446$

$E(P_{11})= 100/1.08=92.5926$

Expected return will be= [(92.5926-82.6446)/82.6446=0.12]

Here, P_2=Price and $E(P_{11})$= expected price

But, if you are going for your horizon period is one year, they should prefer a 2 years bond that has an expected return of the 12 % because it is giving you a yield of the 12%. So, both one-year and 2-year investors prefer to buy 2-year bonds instead of one year.

In the previous case whatever we have seen both the one-year and 2-year investors would prefer to buy one year bond instead of the 2-year bond,whenever there is expectations about the interest rate is higher right. So, now what is the mechanism which basically works here? how this particular concept or understanding basically works here?

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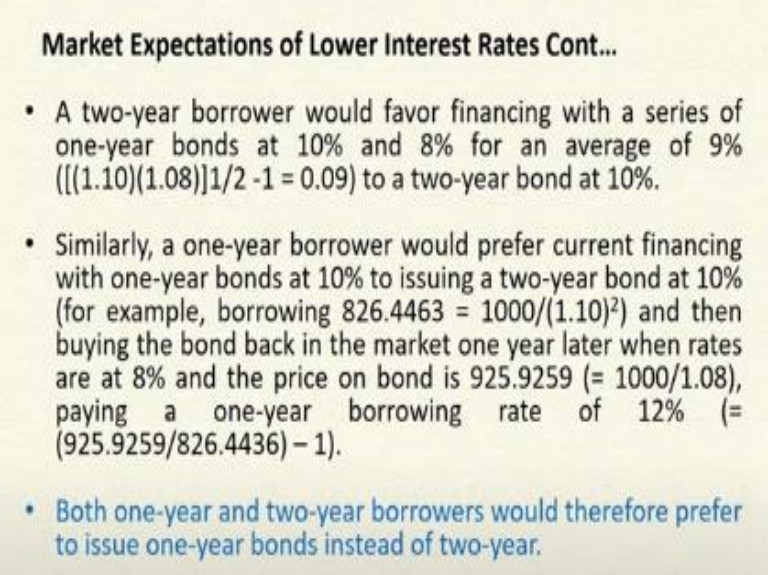

So, now what will happen from the issuer perspective? let us see the borrower perspective. Let this borrower's horizon period is 2 years, so a 2-year borrower would favor the financing with a series of one-year bond at a rate of 10% and 8% for an average of 9%($[(1.10)(1.08)]^{1/2}$-1=0.09) to a 2-year bond of the 10%. But, if the issuer's horizon period is one year, they would prefer the current financing with one-year bonds at 10% to issuing a 2-year bond at 10%.

How they can do this? for example, they can borrow $826.4463=1000/(1.10)^2$. Then buying the bond back in the market one year later when the rates are at 8% and the price of the bond will become 1000 divided by 1.08 that will give you 925.9259(=1000/1.08). And effectively paying a one year borrowing rate of 12%(925.9259/826.4436)-1).

So, both one-year and 2-year borrowers will prefer to issue the one-year bonds instead of the 2 years. Here, in the first case the interest rate is 9%, second case it is 10% or second case it is if you are going for the 2 years bond they have to pay 12%. So, from the investor side, what we have observed? we have observed that, they will prefer the 2-year bond and from the issuer perspective we have seen that, they will prefer the 1 year bond. Both type of investors having the one-year horizon period and 2-year horizon period, they will prefer to issue the 1-year bond instead of the 2 years bond. Right?

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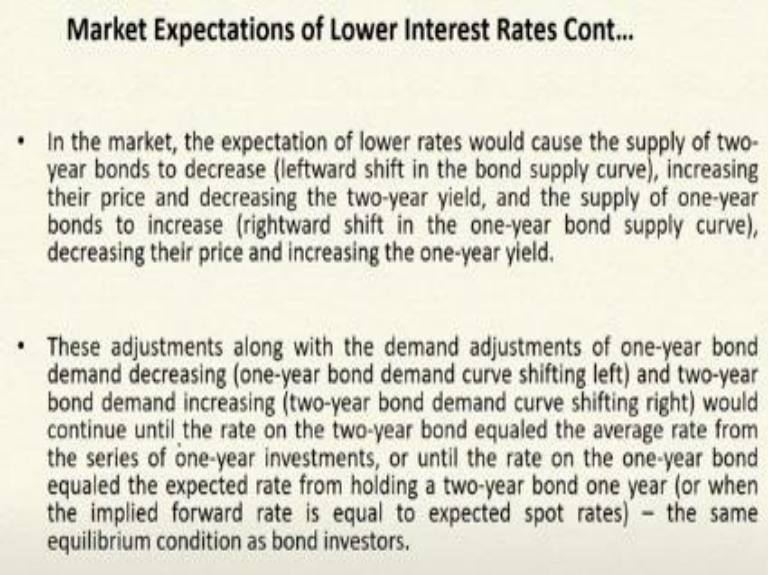

Then what will happen in that case? So, whenever you are expecting there is a lower rate that will basically cause the supply of the 2 years bond to decrease. That means that, there was a leftward shift in the bond supply curve and an increase. Obviously, whenever the supply is going to decline the price will be up. Because their preference is basically the one-year bond then if the price will be up then it will increase this 2-year yield.

And the supply of one-year bond to increase because their preference is 1-year bond. So, that is why they are ready to supply more 1 year bond. that is why there is a rightward shift in the one-year bond supply curve, that will decline the price and increase the 1-year yield. So, these adjustments basically along with the demand adjustments of 1-year bond demand is increasing and 2-year bond demand is increasing would continue until the rate on the 2-year bond equal the average rate from the series of the 1-year investments.

Or until the rate on the one-year bond, we called the expected rate from the holding a 2-year bond, one year this same equilibrium condition as the bond investors. That means, when the implied forward rate is equal to the expected spot rate. So that, particular condition will prevail up to that time this adjustment will go up and the price movement will go up and corresponds to that particular price whatever interest rate will be prevailed in the market, that interest rate will be called the equilibrium interest rate.

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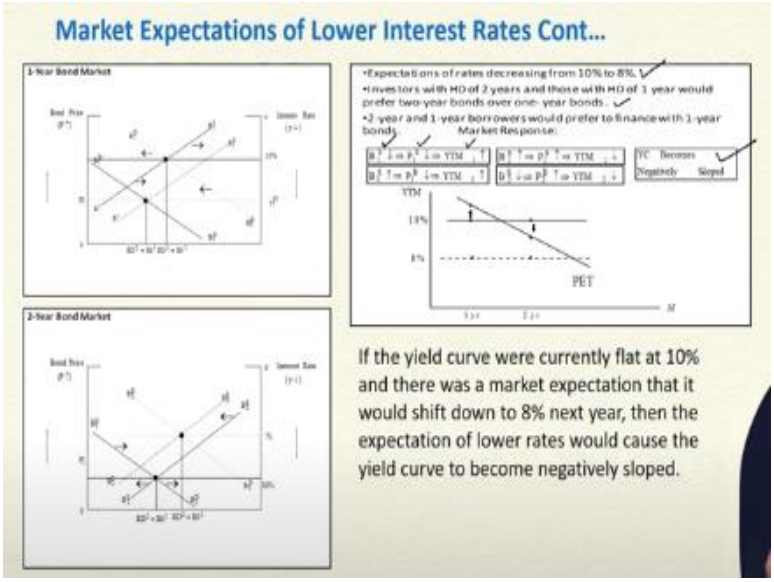

So, let us see that how basically it works? so whatever basically we have explained that is explained through this particular 2 pictures or 2 diagrams. You come back to this part. we are expecting that the interest rate is declining from 10 to 8%. Then, the investors with a horizon period of 2 years and those with a horizon period of one year would prefer the 2-year bond over the one-year bond, that is from the investment side.

And this issuer perspective, they would prefer to finance with one-year bond. investor need 2-year bonds, but issuer wants to supply one year bond. If you are expecting that the interest rate is going to be down or so then, what will happen both in the supply side and demand side? The demand for one-year bond will be down, then the price will be down, then YTM will be up; yield to maturity will be up**.**

And same thing what will happen in the supply side of the one year bond? investors are ready to supply more one year bond, then it will be up, price will be down, then your YTM will be up. So, what basically here it will happen, that it will have the YTM of the one year bond is going to be up. Come back to the 2-year market the demand is more that's why price is more, then YTM will be down. Supply will be less, then price will be up, then YTM will be down. both the things both in the same direction. is it clear?

So, then what will happen that the yield curve becomes negatively sloped? so, whenever the expected interest rate or the expectations about the market is up, then the yield curve is positively

sloped, but whenever the market expectation is there that, interest rate is going to be down then, your yield curve becomes negatively sloped.

So, what we have observed here? if the current yield curve is flat at 10% and there was a market expectation that it would shift down to the 8% next year then, the expectations of the lower rates would cause the yield curve to become negatively sloped.

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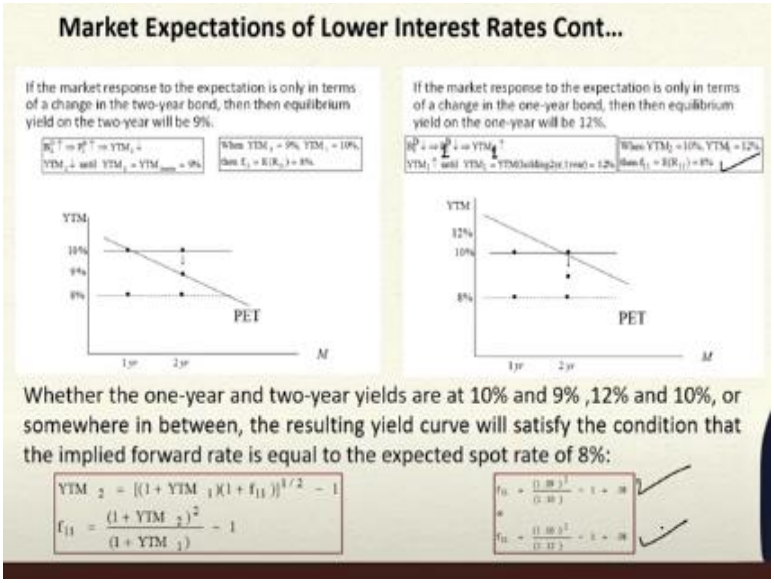

So, now here we have given certain situations. if the market responds to the expectations only in terms of change in the 2 years bond, then what will happen? The demand will be up, price will be up, then YTM will be down and this YTM 2 in the 2-year market will be down until your YTM 2 is equal to your YTM of the 2 series bonds that will be equal to 9%. So, then YTM 2 is a 9% YTM 1 was 10%, which was before, then your f 11 will be 8%.

That is the way basically we have here, it is calculated f 11 = 8%. If the market response to the expectations is only in terms of change in the 1-year bond, then the equilibrium yield on the one-year bond will be 12%. How? The demand is less, price will be less, then it will be up, then if this thing will go up until this f 11 will reach at 8%. So, in that case what basically here you can see? Ok! this is basically your price of one; this is basically your YTM1, because we are talking about one year bond so that will be equal to your 8%.

So, now whether the one-year, 2-year yields are 8%, 9%, 12% and 10% or some are in between, the resulting yield curve will satisfy the condition that, the implied forward rate is equal to the expected spot rate of the 8%. in any of the cases. The first case, we have seen that it is if 9% we got 8% is the forward rate implied forward rate second case also if it is one year rate will be 12%, then also we are getting it is it is 8%. So, that is what basically what we have observed in this particular case.

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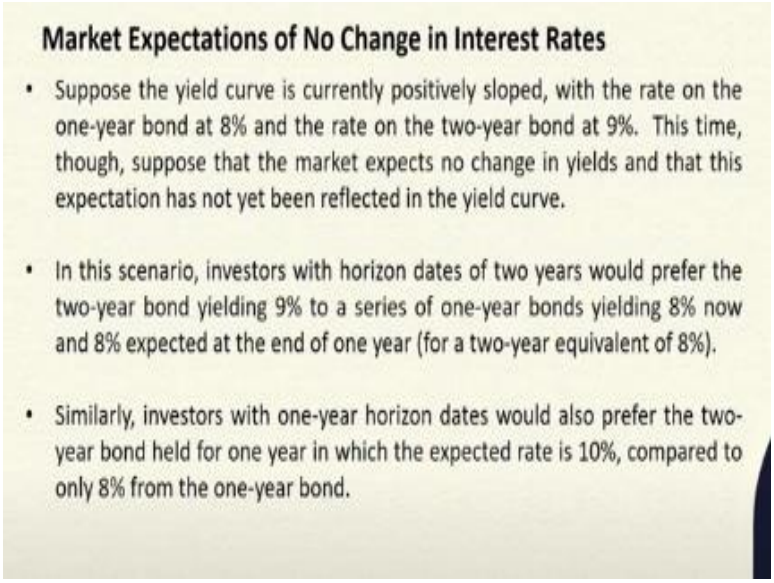

If you assume that there is no change in the interest rate and you assume that currently the yield curve is positively slopped, Then with the rate on the 1-year bond at 8% and rate on the 2-year bond is at 9%. This time, suppose that the market expects no change in the yield, then that means the expectation has not yet been reflected in the yield curve. Then, in that scenario the investors with horizon dates of 2 years would prefer the 2-year bond yielding 9% to a series of 1 year bond yielding 8% now and 8% expected at the end of the end 1 year, which is 2 year equivalent of the 8%.

Similarly, investors with 1-year horizon dates would prefer the 2-year bond held for 1 year, which is expected 10% compared to only 8% from the 1-year bond, if you are assuming that no interest rate happens in that particular case.

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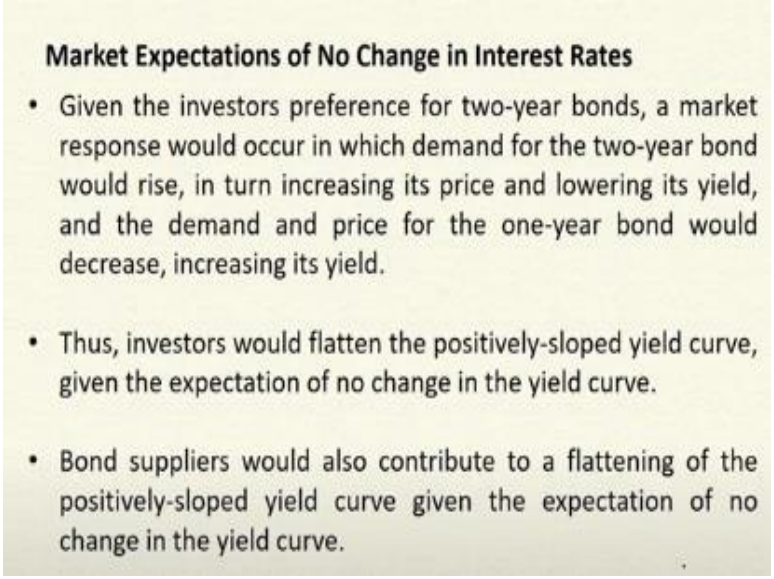

So, given the preference of the 2-year bond, the market response would occur in which the demand for 2-year bond would rise, which in turn increasing the price and lowering the yield. And the demand and price of the 1-year bond would decrease, which is basically increase the yield. So, the investor would flatten this positively sloped yield curve, given the expectation of no change in the yield curve.

Bond suppliers also would also contribute to the flattening this particular positively sloped yield curve given the expectations of no change in the yield curve. So, both demand side, supply side, they will contribute for a flat yield curve in that particular context, if you are assuming that there was a positively sloped yield curve before.

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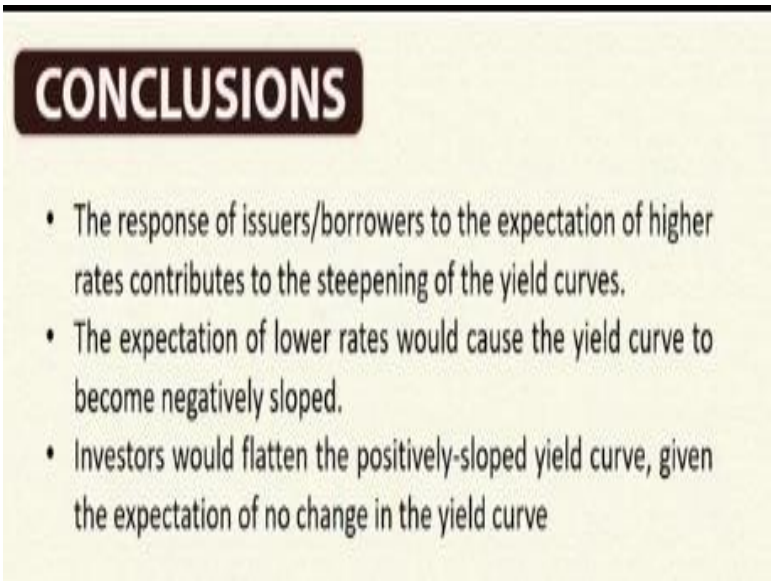

So, what we have seen? the response of the issuer and borrowers to the expectations of higher rates contribute to the steeping of the yield curves .and the expectation of lower rates will cause the yield curve to become negatively sloped. And investor would flatten this positively yield curve given the expectation of no change in the yield curve. So, that is what basically we have observed whenever the expectations from the both demand side and supply side comes here and as well as from the investor side and also the issuer side will be taken into the considerations.

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So, this is the reference what you can go through. Thank you.