Financial Institutions and Markets
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Lecture – 15
Term Structure Theories of Interest Rate –III

So, in the previous class, we discussed about the liquidity premium theory and the market segmentation theory. What we have seen that in the market segmentation theory, the market is highly segmented and the demand and supply forces of the market is confined to that particular segment only. There is a different supply side supply sources for the short term bonds and there are different kind of different type of investor who, demand the short term bonds. The same thing also can be present in the long term bond market. So, therefore, there is a difference between the long term bond and the short term bond or the return, the return from the long term bond is different from the return from the short term bond.

But, one thing you remember that the market segmentation theory tells that there is some kind of independent relationship exists between the long term bond and the short term bond rates. But in the practical sense, does it really happen or is there any possibility that this long term investor can move into the short term bond market and the short term bond investors can move into the long term bond market?

So, those kind of scenarios also can be established can be built up. So, assuming those kind of arguments, those kind of justifications any another theory was established that is called the preferred habitat theory.

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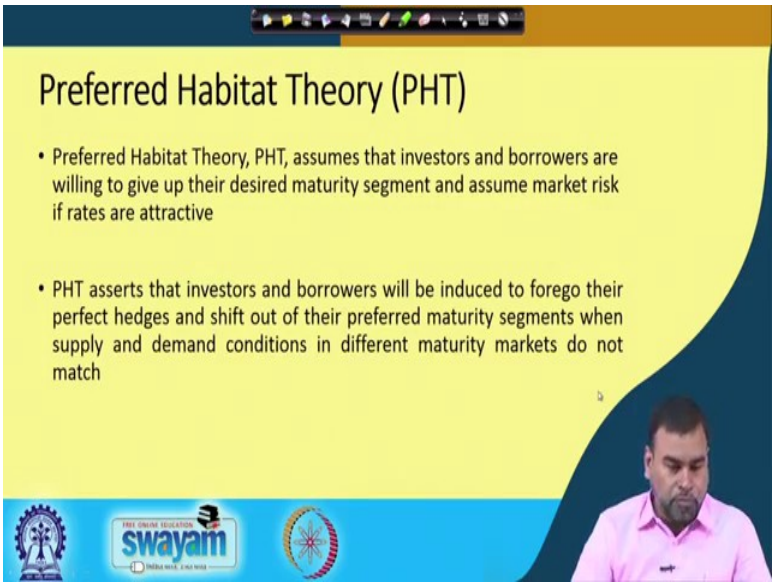

What this preferred habitat theory basically explains? The preferred habitat theory basically assumes investors and borrowers are willing to give up their desired maturity segment and assume the market risk, if the rates are attracted remember. If the rates are attractive, what does it mean? They know that there is a risk involved by moving from one segment to another segment.

Because, it does not fulfill their investment philosophy or investment horizon period there requirement, but still there ready to move if the risk is fully compensated or adequately compensated; that means, there is some kind of spillover can be possible. And when it will be possible? Whenever one segment investors will be rightly or adequately compensated by the different returns what they are expecting to get whenever they are moving from one segment to another segment.

So, in that context what this theory basically assumes that investors and borrowers will be induced to forgo their perfect hedges and shift out their preferred maturity segment when supply and demand conditions in different maturity markets do not match. When it is possible? It is possible whenever there is a demand supply disequilibrium in one segment.

If there is a demand and supply disequilibrium, it will affect the yield so; obviously, if the supply is more demand is not there then the yield will go down, you will see demand is there, but supply is not there, then the yield will go up. So, in that context what will

happen that they will find that whatever expectations they have whatever return they are expecting that particular segment and that return is not being realized because of the demand supply inequality, then what will happen? They will be ready to move if other segment is doing well in that particular point of time.

Obviously, these investor can sacrifice their preferred segment in that particular point of time. And the beginning we discussed about the segmentation part. But, even if there is a segmentation still the investors will be ready to move from one segment to another segment whenever they feel that there is some kind of disequilibrium exists in terms of the demand and supply in that particular segment where they are operating.

So, because of that what basically they will do, they can move from one segment to another segment. So, that is what; that means, that is not a perfect hedges which is existing in their segment. So, therefore, they will be preferred to go to another segment and that particular point of time.

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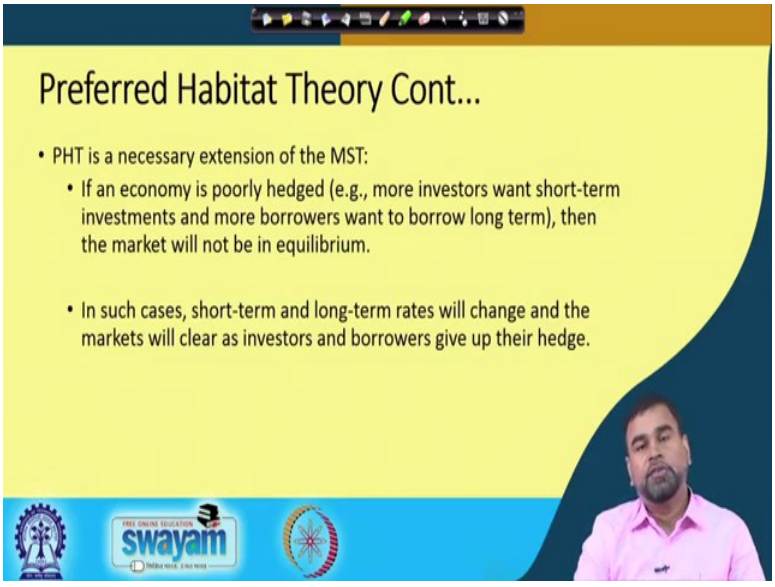

So, that is why we can call it that the preferred habitat theory is a necessary extension of the market segmentation theory. So, if an economy is poorly hedged; that means, more investor want short term investments and more borrowers want to borrow the long term. And obviously, it is not hedged perfectly, then the market will not being the equilibrium that just now what I was explaining or I was discussing with you that if the economy is poorly hedged, what does it mean? More investors want short term investments, but the

supplier basically the borrower want to borrow the long term. So, in that case what is happening? There is a disequilibrium which can exist between them. So, there is a disequilibrium the interest rate which can be prevailed in that particular point of time this is not an equilibrium interest rate which can be prevailed.

So, in such cases what generally happens the short term and long term rates will change and the market can be clear as investors and borrowers give up their hedge. They are basically will not be interested to stay in that particular segment and they will give up their asset liability matching concept, matching principle and they can move from one segment to another segment. This is what can be possible whenever this market is in the disequilibrium that is what basically can be observed.

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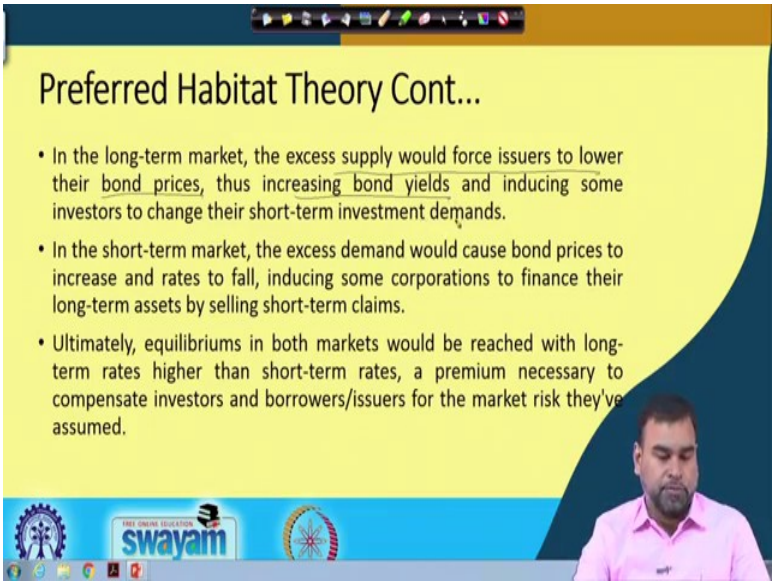

So, here if you see how basically it exactly happens. If you see this is the example in the long term market, the excess supply would force the issuer to lower their bond prices why? Because; obviously, what will happen that if there is an excess supply, but the demand is not there, then what will happen? Then; obviously, then it will reduce the bond prices that is why it is increasing the yield and the price goes down, the yield will go up which induce some investors to change their short term investment demands. You see if the yield is more in the long term bond market then; obviously, this short term investors or the market.

If we assume that the segmentation path, then who the investor, who are there in the short term segment, they will be attracted by the return what the long term bond market is giving. So, why they will stick to their short term bond market? They will be ready to move from short term bond market to long term bond market. In otherwise another condition if you see, in the short term market, the excess demand would cause bond prices to increase and they yield to fall or rate to fall. Then what will happen? That kind of scenario, it will induce some of the companies to finance their long term assets by selling the short term bond claims short term securities whatever they have.

So, the reverse can be possible; that means, here in overall we are trying to say, if there is some kind of disequilibrium which happens in one of the segments and another segment is more attractive in that particular point of time both investors and suppliers will be ready to move from one segment to another segment because, the yield is attractive in that particular segment or it is profitable for them to take their positions in that segment instead of sticking to the segment wherever they are already now. This is what basically the preferred habitat theory is trying to say.

So, ultimately what will happen? The equilibriums in both market should be reached with long term rates higher than the short term rates and a premium necessary to compensate investors and borrower or issuers for the market risk, they have assumed or they have taken. So, if there is a movement then what will happen? Obviously, there is a disequilibrium makes the movement.

And once the movement takes place over a period of time, this equilibrium can be established and market can take care of to come back to that equilibrium point because there is a mismatch which was created before, this mismatch will be overcome and obviously, the equilibrium can be established within that particular segment. Then how it is basically explained? It can be explained in this way.

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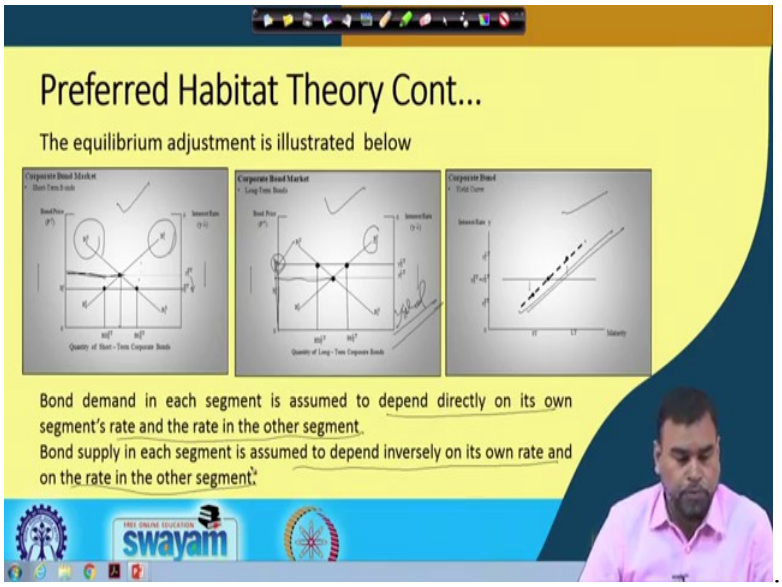

If you see this is the explanation what basically we can give. This is a short term bond market, this is a long term bond market and here this is your yield curve. What is happening? This is your supply of the short term bond, this is your demand for the long term bond, this is basically your original equilibrium all right. So, for example, now if you see this, the supply is more in that, then what is happening? Demand is not there so, in that particular point of time.

So, here if you go back whatever in the assumption we have taken that the interest rate the supply is more, demand is not there then what is happening that the interest rate has gone down. Here the price of the bond basically increases in that particular point of time what basically happening the there is a movement to the long term bond. So, in this case what basically we have seen? The interested which was there in this level, the interest rate has gone up to that level. So, here the demand has increased supplies there so, because of that the return will be higher. So now, the new interest rate or the yield will be more. So, now, the yield will be more in this particular segment.

So, finally, if you bring this back, this is basically your yield curve which can be drawn. So, what is the explanation we can give in this context that the bond demand in each segment is assume to depend directly on it is own segments rate and the rate in the other segment. Bond supply in segment is assumed to depend inversely on it is own rate and

the rate and the other segment that is the general notion of the relationship between the supply and demand with the yield.

Whenever, if you see that if you go back to our previous slide what basically we have seen that whenever there is an excess supply. The excess supply would force the issuer to lower their bond prices; thus increasing the bond yield. So, here what basically we are trying to say? If you see in this diagram also what here we are trying to show, there is an excess supply in the long term bond market, the excess supply in the long term bond market has increased the rate.

So, in that particular point of time, what has happened in the short term bond market? The short term bond market if you again if you see what assumption basically we have taken, the in a short term excess demand the excess demand basically has reduced this interest rate. Here there is an excess supply, here there is an excess demand. So, in this part, we have excess supply, here we have in this excess demand.

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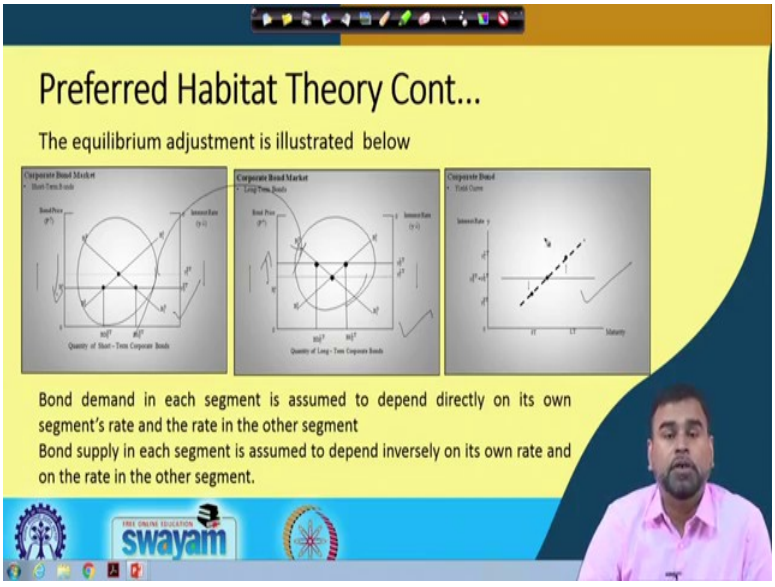

So, therefore, the interest rate has gone up in this segment and here the interest rate has gone down. So, then there is a movement from this to this because the yield is very attractive in this segment. So, there then; obviously, what will happen that again this two in the two different markets whenever this there is a moment, this demand will increase; then once the demand will increase, then it will compensate with the supply. Then

finally, what will happen a new equilibrium can be established in this segment. Here whenever this supply is there the demand is basically more.

Now, supply is not there and more people move into that then; obviously, what will happen that the demand supply equality also can be established and equilibrium can be established in this segment. So, in this context both the market will be in equilibrium and finally, what you can do that you can draw your yield curve. This is what basically we try to explain and the preferred habitat theory is trying to show.

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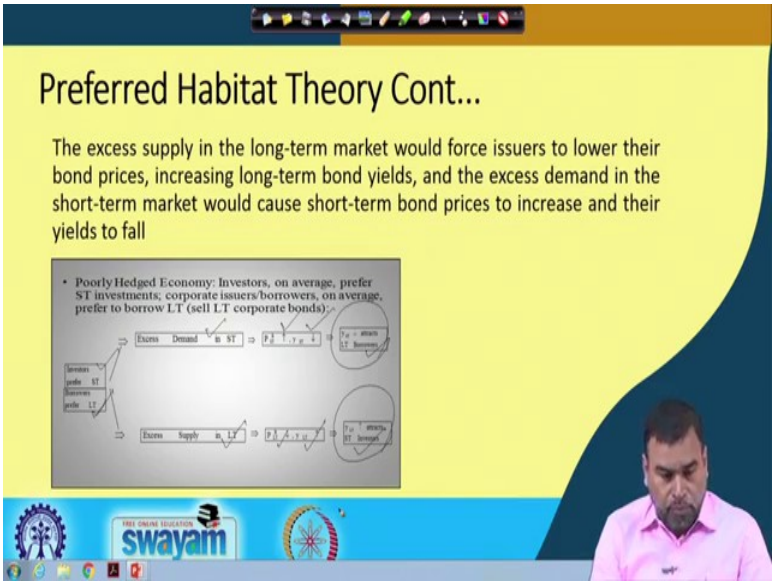

So, here if you can summarize in this way, the excess supply in the long term market would force the issuer to lower their bond prices, increasing the long term bond yield and excess demand in the short term market would cause the short term bond prices to increase and the yields to fall. So, then how it is basically explained you see in this context that is investor prefer the short term bond. So, that is why the excess demand in the short term bond market which increases the price of the bond, then the yield will go down and this particularly attracts the long term borrowers. Obviously, the rate of interest is very low, this will attract the long term borrowers more people wants to borrow the money from that particular market.

So, here the borrowers basically prefer the long term bond here the investor, here it is the borrower and excess supply in the long term market then the price of the bond goes down. When the price of the bond goes down, the yield will go up; the yield will go up,

then this attracts more investors. So, here this market will attract more borrower because the interest rate is very low and this market will attract more investors so; obviously, here there was an excess demand. Now, the supplier will be there in that particular segment investor on an average prefer the short term investments, then cooperate issuer borrowers and average prefer to borrow the long term and sell this long term corporate bonds into that particular segment.

So, therefore, the equilibrium can be established in two different segments and the spilling over from one segment to another segment can take place. This is what basically the overall theme of the preferred habitat theory where they can basically assume that there is kind of disequilibrium in the different market segments which were basically argued by the market segmentation theory can cause some kind of movement from one segment to another segment because of disequilibrium or between the demand and supply within that segment affects the field.

And once the yield is attractive in another segment, this movement can take place. So, this is what the preferred habitat theory is trying to explain. So, this is what basically this the basic notion of the different theories which are existing or which are arguing about the determination of term structure interest rate in the markets.

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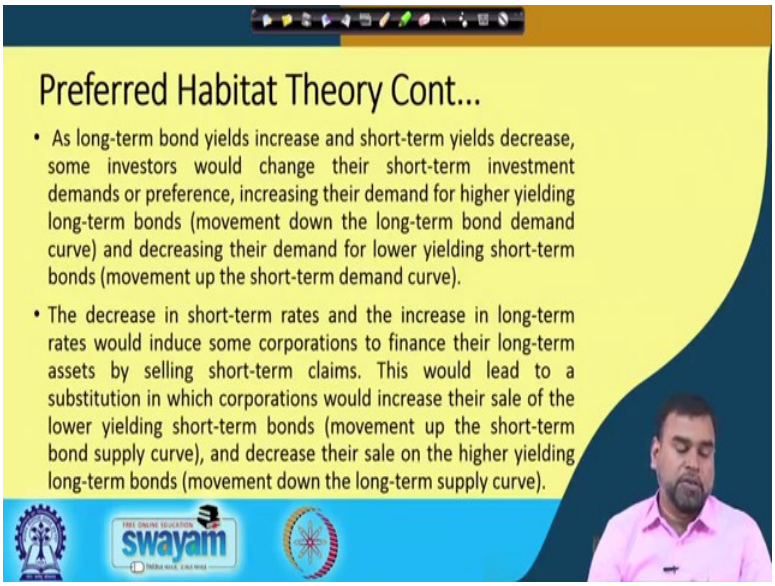

Then if you see that other thing is if you summarize that a long term bond yields increased and short term yield decreased and some investor would change their short

term investment demands or preference increase their demand for higher yielding long term bonds; that means, movement down the long term bond demand curve and decreasing their demand for the lower yielding short term bonds. So, movement up to the short term demand curve. The decrease in short term rates and increase in the long term rates so, induce some corporation some companies to finance their long term assets by selling the short term claims.

This will lead to a substitution in which the companies would increase their sale of the lower yielding short term bonds and decrease their sell on the higher yielding long term bonds. So, this is the conclusion what we can draw from the preferred habitat theory. So, here what we are trying to see.

So, in this kind of scenario, the there is a shift or they shifting can take place from one segment to another segment and as well as the interest rate may not be perfectly hedged or their risk may not be perfectly hedged within that particular segment. Therefore, it will have the impact of on the interest rate or the yield and finally, what will happen? The movement can make the equilibrium in both the markets and finally, accordingly the business units make their policy or strategies by that they can minimize the risk and as well as the interest rate of that particular system can be determined.

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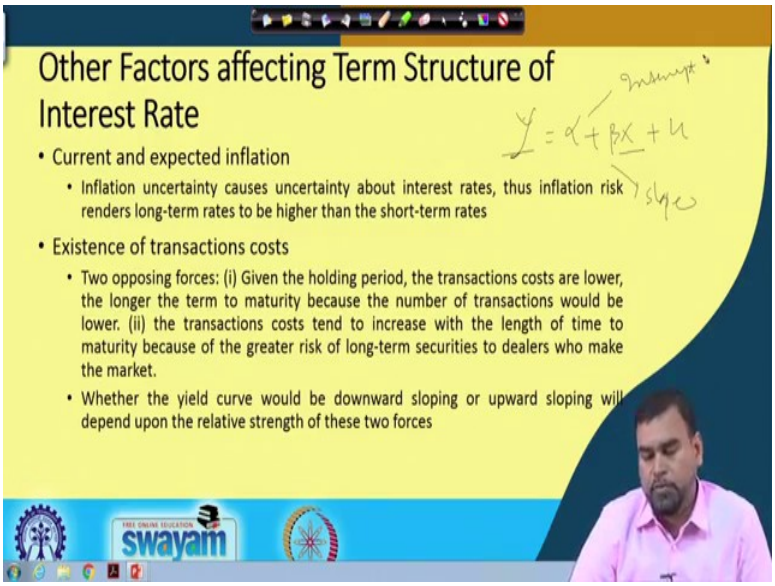

Then if you see that effort from all these theories in general sense whenever you talk about the term structure interest rate, why there is a differences? For example, the there

are some of the factors which are very general factors common factors, if anybody wants to specify econometric model that how the term structure interest rate is determined, what are those factors which makes the differences between the long term and short term bonds. Then in that context we have to specify a model and that model is basically derived on the basis of certain common or general factors which are affect the interest rate differential between these two types of bonds.

What are those? You know that whenever you talk about the models basically what we see your econometric model is basically defined in this way normal regression model your $y = \alpha + \beta x + u$. So, here your y is equal to your dependent variable x is equal to your independent variable, beta is the slope or the coefficient alpha is the intercept.

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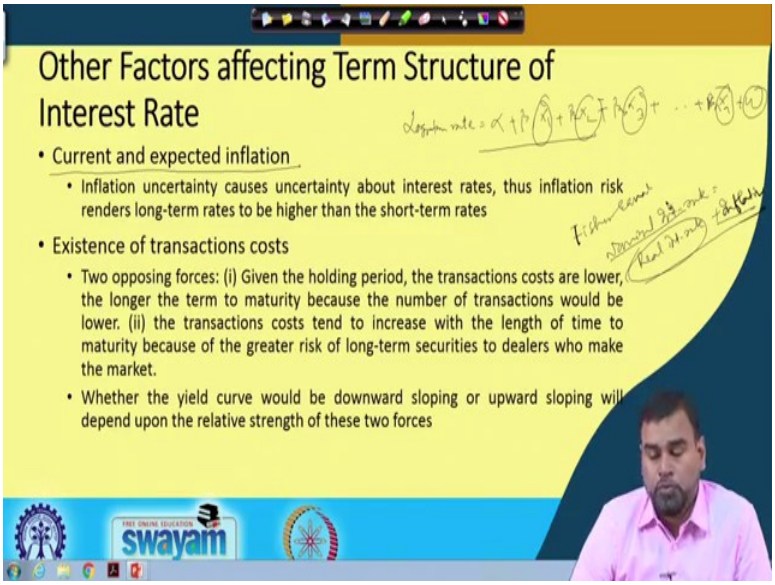

So, here it I have shown you that one single independent variable equation. What it can be also the multiple variable equation that if you see that if you want to write that why there is a difference between the long term and short term interest rate or we can say that the long term interest rate is a function of certain variables. Let you can write in the econometric way that long term rate = $\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + u$

u is the error term. So, here in this case what are those X_1 X_2 X_3 and X_n? So, we have to determine theoretically, we have to assume what are those possible factors which can determine the short term and long term interest rate differentials. So, this thing whenever you talk about; obviously, there are many factors which affect this the first factor which

comes to our mind that is the current and expected inflation. Current inflation already current purchasing power determines that what kind of inflation risk exist in the market.

Accordingly this interest rates in the market also gets changed already you know that your Fisher equation already we have explained that and this is nothing, but the nominal rate nominal interest rate is equal to the real interest rate plus inflation right that already we know or nominal interest rate minus inflation equal to real rate that is the equation what we have seen.

And another one is the expected inflation and; obviously, if the inflation risk is going to be more than the interest rate also is going to be more, then how it basically works? The what do you mean by the expected inflation? I can give you idea that expected inflation also can we measure. So, the practical measurement of expected inflation is you can measure this 3 years moving average, 3 years moving average of actual inflation rate can be proxy or expected inflation.

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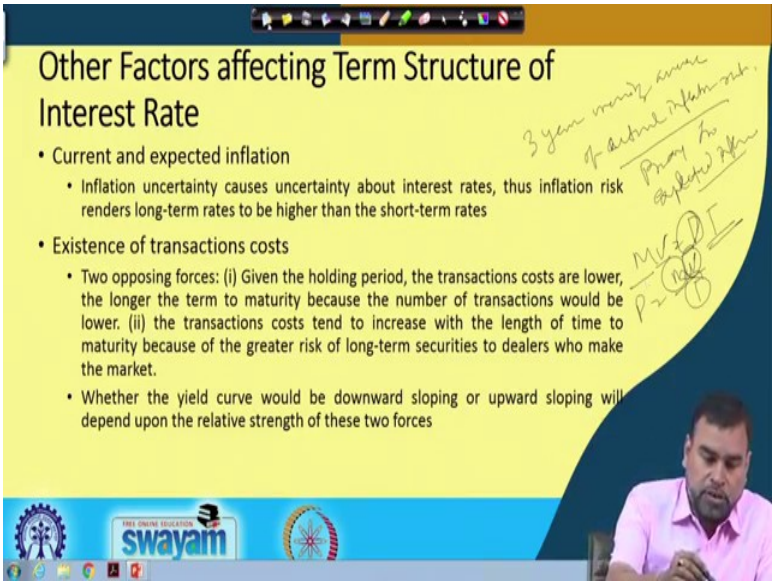

This is the popular measure unless you can measure also through this quantitative theory of money equation M = PT; M is equal to you money supply V is equal to velocity. P is equal to your inflation which is price level T is equal to transaction demand for money, then P is equal to MV/T. You can have the money supplied at high of the velocity data; it is more or less constant for a particular period. Here the transaction demand for money through that also the expected interest on can be calculated.

So, here what is the argument that if the expected inflation would be higher then the interest rate also will be higher. Then you have the transaction cost then; obviously, whenever you are using the transaction cost argument, there are two arguments always works in this some people argue that because, the transaction cost is lower for the long term maturity bond because once you have taken the position, you do not have to change the position for a large period of time or the longer period of time.

Then because the number of transactions will be low because of that the rate should be low, but other argument is that the transaction cost tends to increase with the length of time maturity because greater risk of long term securities to dealers who make the market. Because, whenever anybody invest in the market or the stock broke any kind of broker or dealer who basically invest or invest on behalf of you, they take also more risk whenever they invest in the long term bonds; then the short term bonds.

So, therefore, the transaction cost maybe more for the long term bonds than the short term bonds. So, therefore there are different counter arguments in that. So, keeping those everything in the mind expecting that the long term bonds more are riskier than the short term bonds, we should expect that the return from the long term bond also should be higher than the short term bonds.

So, then in that particular point of time if you read the yield curve, the yield curve can give you the answer. If whether the yield curve is downward slopping or upward slopping that will give you the answer whether which particular argument is more valid in that particular context, whether the transaction cost argument is valid in for first argument or the second argument. That means, the generation cost is low for investment in the long term bond or the transaction cost is higher for the investment in the long term bond that is basically another thing what we can observe.

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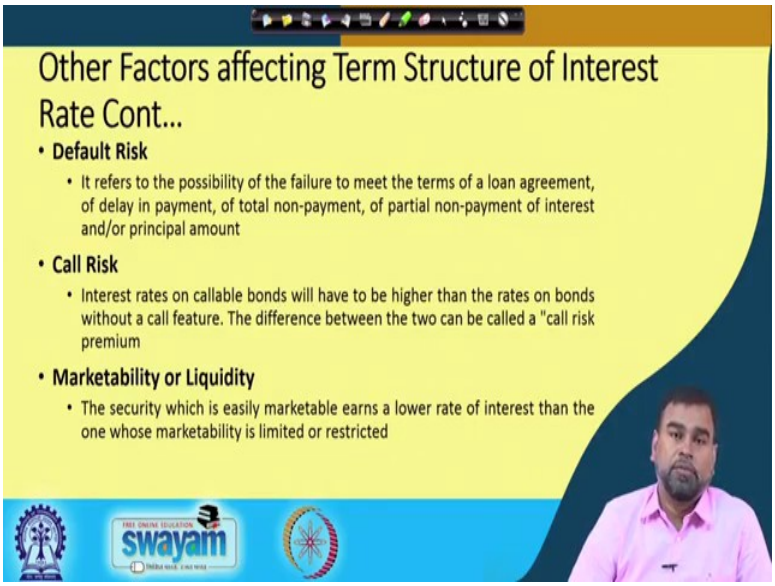

Then we have another factors, we have default risk. What do you mean by the default risk? The default risk is basically the possibility of the failure to meet the terms of loan arguments of delay in payment of total non payment or the partial nonpayment of interest and the principle amount. What is the probability that the money which should be paid is not paid at that particular point of time.

That means, for example if the bank has given the loan, what is the probability that the borrower is not able to repay the loan. So, that is basically we called the default risk are in our language also, we call it the credit risk. Then obviously, if somebody has invested in the long term bond, then bond issuer should pay the periodical coupons to them. And finally, the principle, but what is the probability that issuer will pay this particular coupon and principle over the period of time regularly?

So obviously, for long term bond the probability of repayment is there probability of nonpayment is there. So, because of that the credit risk is also will be high. So, if the credit risk will be expecting that credit risk will be high, then the investor always demands that more yield from that type of bond. So, therefore, the long term bond should give more yield more return than the short term bond that is why default risk is one of the major factor, then you have the call risk. What do you mean by the call risk? Some of the bonds of the call feature.

So, call feature means whenever the bond was issued at that particular point of time. It was mentioned after certain period, the issuer can called the bond on at a particular price, but the investor does not know when the bond will be called once the threshold limit is over. So, because of that what is happening? They feel that at that particular point of time if the interest rate is very low and if the bond will be basically called by them. Then whatever thing basically they are going to get that may not from the bond issuer that may not be sufficient enough to compensate the risk what they are going to face.

Because whatever proceedings they will find there if the value they will find at that particular point of time, the reinvestment in the market will be costlier for them or they may not get very high return in that particular point of time.

So, because of that they expect that the interest rate for the call bonds have been called it should be higher. Then another the most important factor is marketability. So, the security which is easily marketable can always earn lower return than the security which is relatively less marketable. Marketable means that liquidity whether the bond is easily treaded in the market or there is a demand for that particular bond in the market or not. If the marketability is high, then the return will be high. If the marketability will be low, then the return will be low.

So, these are the inflation, then you have the default risk, you have the call risk, you have the liquidity risk, you have the transaction cost these are the major factors which basically determine the term structure interested theory in the practical sense and the which makes the differentiation between the interest rate what we expect from a long term bond and a short term bond. This is all about the different arguments or different concepts related to terms structure theories of interest rate.

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Please go through this particular references for this particular session.

Thank you very much.