Management of Fixed Income Securities
Prof. Jitendra Mahakud
Department of Humanities and Social Sciences
Indian Institute of Technology, Kharagpur

Module No # 03
Lecture No # 13
The Term Structure of Interest Rates- 1

Welcome back. So, in the previous class, we discussed about the Keynesian theories of interest determination which is popularly known as the liquidity preference theory and also we discussed about the classical theory and the loanable fund theory which basically tries to explain that how the interest rate in the market is determined. So, broadly, we discussed about the 3 theories: one is your classical theory then we discussed about the loanable fund theory, then we discussed about the Keynesian theory.

Overall, if you see, today, we will start a discussion on a different note what we call the term structure interesting theory. But before that, I just wanted to share something with you.

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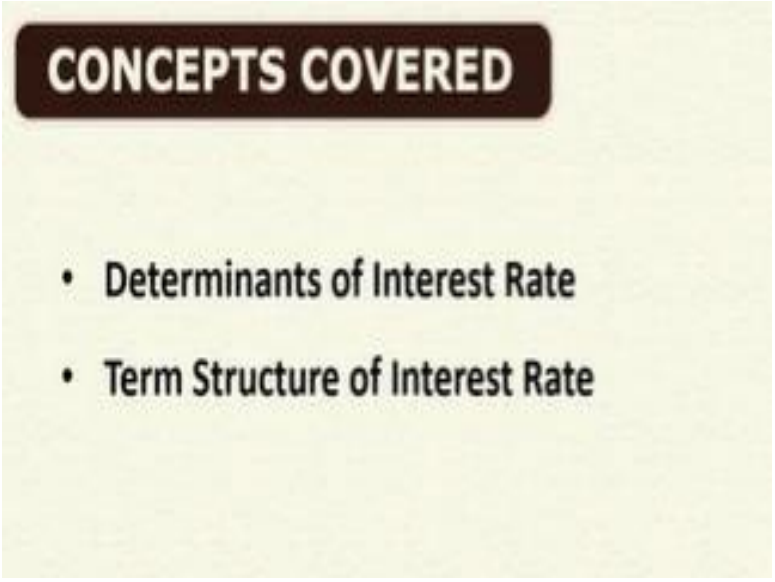

If you want to make a empirical framework of the determination of the interest rate the level form of interest rate, then how this particular model will look like?- number 1, number 2 we will start the discussion on the term structure of interest rate which is more relevant from the fixed income securities point of view.Right? Because if you see that whenever we discussed the bond yield concept the total return concept, then the concepts related to the different type of what we can the spot rate calculations, bootstrapping method and all these things.

So, those things are linked to the term structure of interest rate. Further, you will come across that how these particular things are basically linked.

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So, after this, you will understand certain things about the risk premium, yield curve and the concept of the maturity spread. So, those things basically will come to know after this discussion of the today's sessions.

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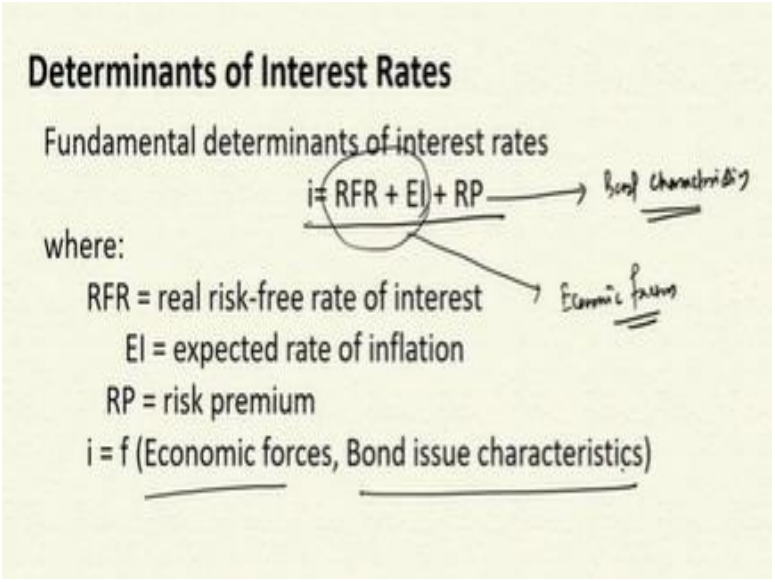

So, already I told you that you see that we have discussed about the three different theories of interest rate determination in the market. But if I want to formulate a model on the determinants of interest rate, how the model looks like and what are those fundamental

determinants of interest rates? Fundamental factors which; drive this interest rate or which affect the interest rates.

Here, I have just simply write a simple equation. Here, your i represent your interest rate and RFR basically the risk-free rate of interest, EI represent the expected rate of inflation then your risk premium you know what does it mean? It means these 2 the risk-free rate of return and this expected inflection that what I am talking about these two basically comes from the economic forces, economic factors.Right?

But whenever you talk about the risk premium, this basically based upon the bond characteristics, the types of the bond, the basic nature of the bond, how basically what type of bonds we are dealing with? Whether it is a corporate bond or it is a government bond or it is a long-term bond or it is a Short-term bond. So, those things basically responsible for determination of this particular interest rate, which basically a major part linked to the term-structure theory.

So, we have some economic forces some forces which come from the bond prospect typical type of bond prospect. So, this is the way we can decompose the factors.

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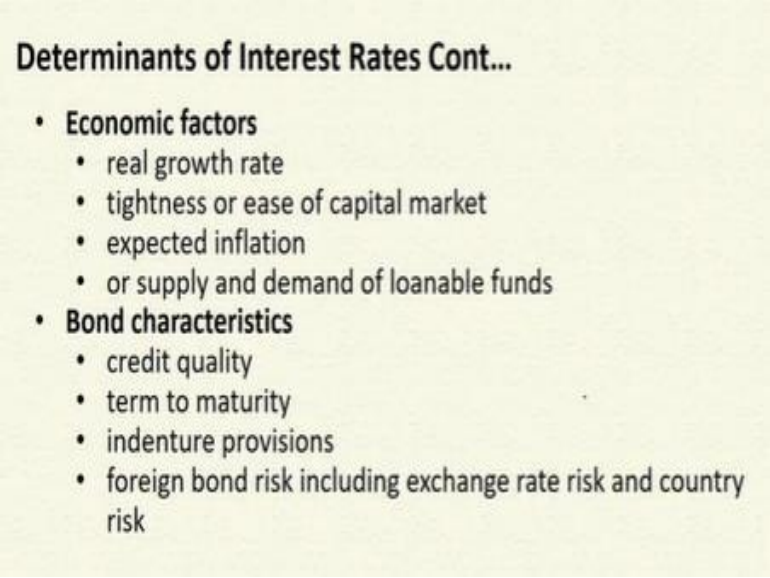

So, now what are those economic forces which are basically responsible? If you want to formulate a model empirical model for the determination of interest rate in a simple model, so, in that case, you will find that the real growth rate of the economy, which is again a proxy for the business cycle and other things then that we consider then the tightness or ace of the capital market, what is the condition of the capital market?

The capital market is quite developed, we can say that we can have a highly liquid capital market we have transaction cost are less. In that case, that will have the impact, that how the investors are inclined to invest in different type of securities, how they are inclined to invest in stocks? How they are inclined to invest in bonds? What is the return what they are expecting from the different assets? How they are going to basically change?

So, in that particular case, the tightness or the age of the capital market is a very important factor which can have the impact on the interest rate. Obviously, expected inflation how the inflation is going to affect the interest rate that we have discussed a lot. Then we have the supply and the demand for the loanable funds that we have discussed extensively. There are many factors which are affecting the supply and the demand for the loanable funds. So, you see this is a simple model what I am trying to discuss with you.

But there are other factors also which may have the implications and may have the impact on the interest rate determination and they can be considered as a economic factors. You see if you talk about India, the foreign capital inflow FII. So, these are also the responsible factor which can affect the interest rate. Another factor the government policies you see monetary policy authority can change any policy rate.Any policy rate change have the implications on the market rates.

For example, you talk about India if the repo rate will be changed, then it will have the impact on the call money rate because call money rate is an intermediate target. If the call money rate will be changed, then it will have the impact on the lending rate and the deposit rate. Then in that process, the whole market interest rates overall market interest rate is going to be changed.

So, the government policies monetary policy or the fiscal policy capital expenditure and other things also will have the implications on the interest rate. FII (Foreign Institutional Inflows), which is coming to India that basically also have the implications on the interest rate. So, there are many factors and those factors may vary from country to country on the basis of the types of the country on the basis of the regulatory norm and as well as the conditions the market conditions in that particular context.

So, that actually you can formulate a model you can also see the bond characteristics what type of bond it is credit quality? What kind of rating the bond has it is a triple A rated bond or

triple B rated bond or double B rated bond or only A rated bond what kind of bond it is accordingly, your interest rate will change.

Term to maturity: All of you know that we have discussed a lot that the long-term bonds are more risky than the short-term bonds because interest rate is not predictable accurately . If the interest rate cannot be predicted accurately then what will happen? Then it will have the implications on the the interest rate of the bond or the return from the bond. So, in that case, if somebody is interested to invest in the long-term bond market or the issuer wants to attract this investor to invest in the long-term bond market when they have to provide a certain premium.

The risk premium has to be given, so the higher term to maturity linked to the higher risk premium. Then we are talking about the indenture provisions.The indenture provision means this means, what type of agreement or contract the bond has whether the bond has a call feature, or it has a put feature, or is there any kind of options which are linked to that particular bond? That will have also the implications on the interest rate involved with respect to that bond or the risk premium what you are getting if you are going to invest in that bond.

So,that is that is another thing you have to keep in the mind that is called the indenture provisions of the bond. Then, if you are investing in a foreign bond, then you are also exposed to the exchange rate risk and the country risk. Country risk means you are talking about the political risk another type of risk which can prevail which is specific to that particular country. So, you can formulate your model based on aggregate macro-economic factors and as well as some of the factors which are responsible for the risk premium component.

In the beginning,I started the discussion with that that i is equal to your risk spread rate of return which is the minimum return what you are going to get plus your we can say that the inflation because expected inflation what we talk about then we have some risk premium. There are many factors which can affect the risk premium and some of the factors are responsible from the bond prospective or individual bond perspective.

So, these are the different characteristics which can affect the risk premium of the bond. So, overall, you can formulate your model in that particular context.OK?

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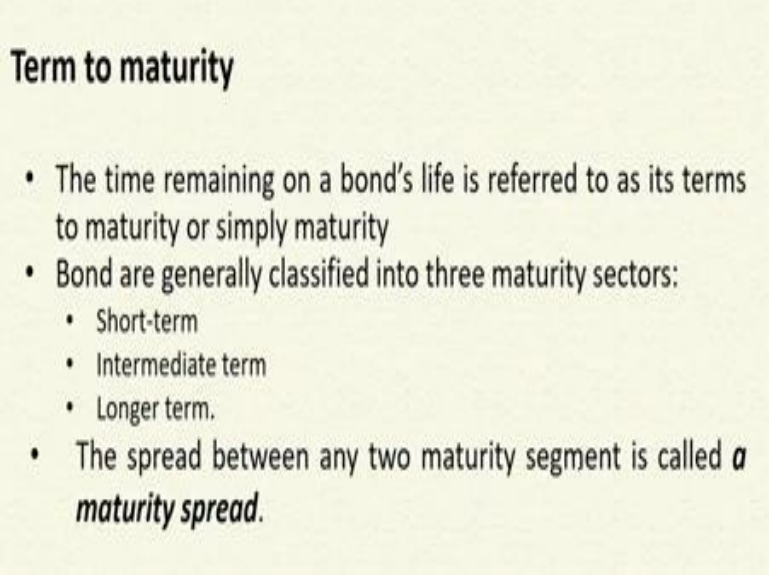

So, let us come back to our discussion, what basically we are trying to discuss in today's session that is basically your term structure interest rate theory or term structure interest rates. We will come back to the theory later. So, what basically exactly the term structure interest rate theory means or what do you mean by the term structure of interest rate? The term structure of interest rate basically gives your idea that why there is a return difference of the bonds with the different maturity keeping other things remains constant.

So, to understand that, we have to first understand, what does it mean? What do you mean by the term to maturity, all of you know that but what is the term to maturity? The term to maturity means it is the basically time which is remaining on a bonds' life.OK? And in general in the market if you look a,t there are three types of classifications you will find in terms of the maturity one is your short-term bonds, intermediate or long term bonds.

You see periods are varying some people say that the short-term bonds the maturity period is 1 to 3 years.In some countries, it takes 1 to 5 years.In U.S., it goes from 1 to 5 years. The intermediate term, somebody say that it is 3 to 5 years or 3 to 7 years but in U.S., it goes from 5 to 12 years and longer term bond, it goes beyond 12 years.

So, there is no proper definition that what up to what maturity we consider this is a short-term bond this is a long term bond this is intermediate term bond but these are the classifications you can make. Intuitively you can consider. Ok. If the bond's maturity is up to 3 hours, we can consider it is a short term; from 3 to 5 years, we can consider it is a intermediate term or 5 more than 5 years, it is a long term that you can decide there is no specific rule of thumb which can give you the idea that which one is long term and which one is short term.

So, there is a spread between the 2 maturity segment bonds which are traded in the market. Because the long term maturity bonds gives more return than the short term maturity bonds or intermediate term maturity bonds give more return than short term. Or if you compare between the long term and intermediate term, you will get more return in the long term that is the general notion and that spread is called the maturity spread.

You see I am talking from the general perspective but that may not happen also there are certain kind of situations where this kind of rule may not prevail, that will discuss that what context this may not prevail. But there is a spread which exists between the two maturity segments that is called the maturity spread. Right?

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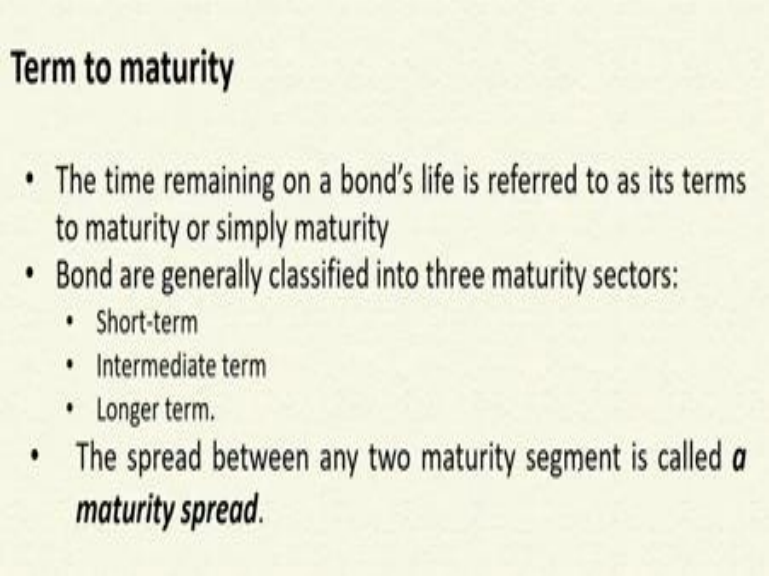

So, in that particular case, if you formally define what the term structure of interest rate means? How the interest rate differences can be observed between the similar bonds with different maturity? Remember similar bonds this is quite important. Second line, if you see the term structure of interest rate is a static function that relates the term to maturity to the yield to maturity for a sample of bonds at a given point of time. Time is important at a given point of time, that is important.

Similar type of bonds that is important, the term structure interest rate basically gives you the idea why there is a differences in terms of the yield of the same type of the bonds with the different maturity only maturity is different. But the characteristics of the bond are similar because if you change your characteristics, automatically return will be changed.Right?

So, because of this, you have to focus on these 2 and this term structure of interest rate what basically we are discussing here if you plot this YTM, again the term to maturity of the similar bonds that is called the yield curves.Why is it quite popular? We are very much aware about the concept of yield curve. Yield curve is nothing but shows the relationship between the yield to maturity and term to maturity of the similar bonds.

So, yield curve is a graphical representation of the term structure of interest rate the term structure of interest rate is if you want to graphically represent it, then yield curve is basically trying to explain that.Right?

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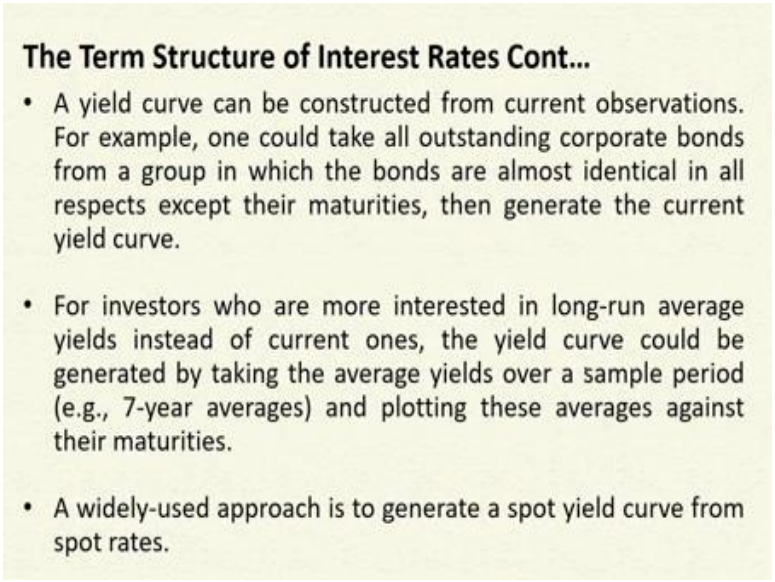

Now the question here is how the yield curve can be constructed? OK? The yield curve can be constructed from the current observations which are available in the market. For example, one could take all outstanding corporate bonds from a group in which the bonds are almost identical in all respects expect their maturity. Already I told you in all other aspects, all other kind of characteristics are more or less similar, only the maturities are different then you can generate a yield curve.

Here, all the bonds are corporate bonds maybe the industry is also more or less same from the similar industry.OK? But only difference is that the maturities are different. So, if you draw a curve between the yield to maturity and term to maturity, then you can get your current yield curve of particular bond, the corporate bonds. The investors who are basically interested in the long run average yields instead of the current ones.

Deal curve could be generated by taking the average yields over a sample period.That sample period, here, I have taken seven years you can take 5 years you can take 10 years there is no fixed time.OK? You take a average yield of a particular period then plot these averages against the maturity if you want to have a long run picture. These are practically happens in the market to understand that how this long run yield is behaving in the market.

How the long run yield curve looks like? You see yield curve is a very powerful technique for prediction of the interest rate, prediction of the business cycle etc…We call yield curve is a public good because everybody can use the yield curve to understand the behaviour of the market in a particular way. They can predict the interest rate. It is also considered as a strategy in the market for the investment for prediction of the interest rate and another approach is to generate a spot yield curve from the spot rates. That I will discuss with you later. Whenever we already we have derived the spot rates and also will derive the implied forward rate from the spot rate and after that, again we will go for plotting the yield curve by using the spot rates. If you recall, how the spot rates are determined? Spot rates are decided on the basis of the bootstrapping methods and in this case, we can also have a spot yield curve which can be drawn from the spot rates.Right? So, these are some of the examples whatever I have given by which the yield curve can be formulated or can be constructed.

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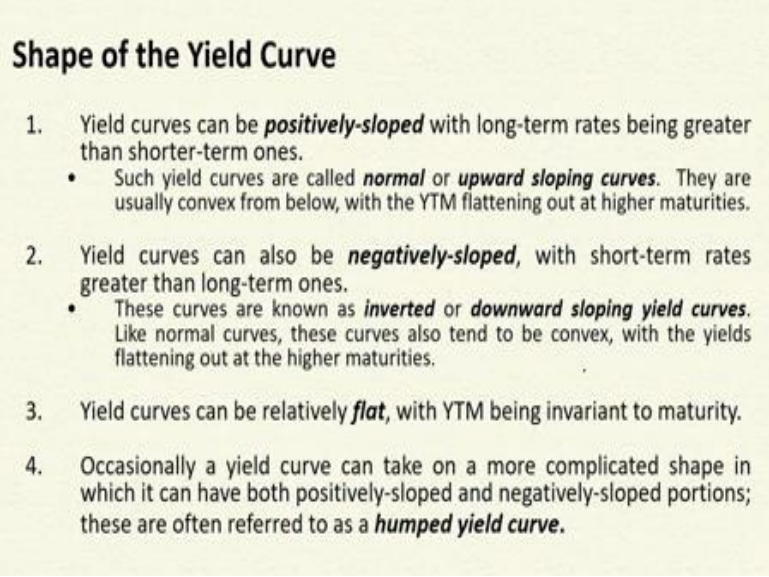

What is generally the shape of the yield curve? The yield curve can be positively sloped. That means the long term rates are higher than the short term rates and such kind of yield curves are called generally the normal yield curve which are upward sloping yield curves. These are

upward sloping and these are called the normal curves. They are usually convex from below and the YTM is going to be flattering out in the higher maturity.

The curve will be relatively more flatter whenever the maturity period will be more that is called the normal yield curve where the long-term bonds will give more return than the short-term bonds. We can have a negatively slopped yield curve also with what we call the inverted yield curve. Here, the short term rates give the greater returns than the long-term ones but these are very unlikely but that happens in some countries some period those kinds of curves we have observed we have seen.

So, these curves are basically known as the downward sloping yield curve. These curves also tend to be convex where the yields are flattering out at the higher maturity, but the shape of the yield curve is downward sloping that is another safe the yield curve can take. There are various reasons one of the reasons is high inflation rate I can share with you, when the purchasing power of the people is very low, in that time, that country can always experience or there is a possibility that it can experience a negatively sloped yield curve or a downward sloping yield curve but in regular context, in the normal conditions, you will not observe this inverted yield curve. Always, we find a upward sloping yield curve where the long term bonds will give you more return than the short term bonds and also the yield curve can flat irrespective of the maturity. Deal to maturity is not going to be changed completely horizontal to the x axis. So, that is also another step which is again a hypothetical case.

Occasionally, the yield curve also can take a more complicated shape. Here, it can have both positively sloped and negatively sloped versions. In some parts, it is positively sloped and in some parts, it is negatively sloped in a particular period. So, this is basically called the humped yield curve. That also you can experience where the some period, the long term rates are more than the short term rates and some period, the short term rates are more than the long term rates that possibility is also there.

You see these are very interesting kind of concept which can give a better idea about the economic system.So, that is why the shape of the yield curve speaks many things and we can judge about the economic conditions about the interest rate scenario and other things using this particular kind of yield curve concept or this by reading the yield curve or by analyzing the silicon. So, these are the different shapes what the yield curve can take.

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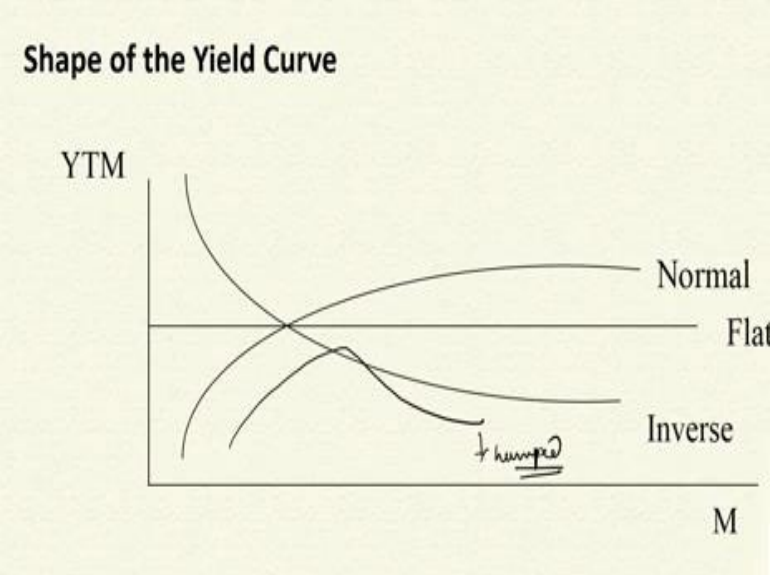

Let us see that how it looks like:- In the x-axis, you have term to maturity M.M represents the term to maturity here, it is your YTM it is your upward sloping yield curve and this is your downward sloping yield curve which is the inverse yield curve. This is a normal yield curve and it can be flat and that is a humped yield curve this can go up to this may be, it can go like this. In the beginning, it will be maybe It will go little bit in the upward sloping then started go like this so, this is called basically the humped one. This is called the humped yield curve that possibility is also there but this is very rare. In a particular period, either you can get a normal yield curve or you can get inverse yield curve.The flat yield curve is also again a kind of hypothetical conditions.

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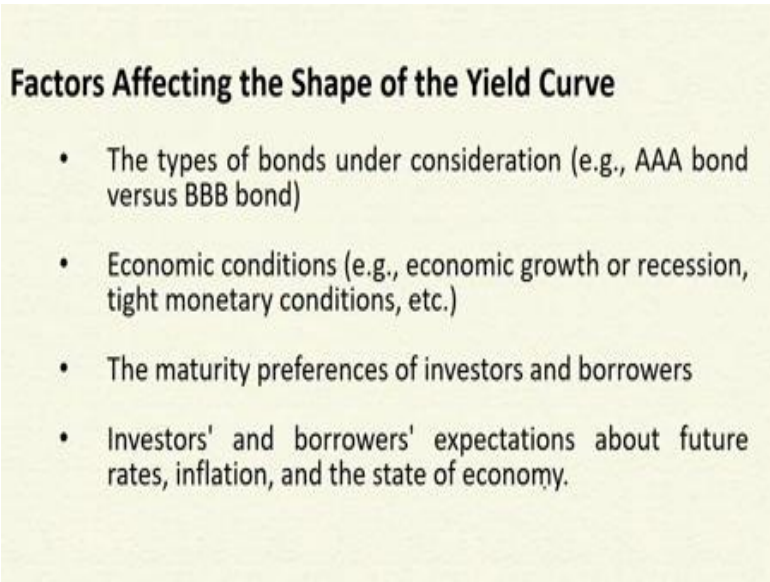

So, which are the factors which can affect the shape of yield curve? The types of the bonds what you are considering whether it is triple a-rated bond or whether it is a triple b-rated

bond or only b-rated bond like that. That is a factor because the triple-rated bond always gives lesser return than the triple b-rated bond because the riskiness of that kind of bond is relatively low. Economic conditions whether economic growth or recession is going on in the economy or there is a tight monetary conditions the monetary policy is very much restrictive.

There is a contractionary monetary policy, is operating in the system that also will have a impact on this. Most important is that we will discuss more about these two theories: the maturity preferences of the investors and the borrowers or these source maturity preferences. Whether they are more inclined more interested to invest in the short-term bonds or they are more inclined to invest in the long term bonds the horizon period, particularly the investment horizon period that is also quite important that also you have to keep in the mind.

Because of the demand in one segment is higher then obviously there is a return difference you will find may be short-term bonds will highly demanded that is why the short-term bonds' return will be more than the long-term bonds because the investment horizon period for the investor will be shorter than the shutter. So,that is why, there is a demand for the short-term bonds and long-term bonds demand is not there so, in that case, maybe the return will be more in that case and also the investors or the borrower's expectations about the future rates, inflations and the state of the economy. So, these are some of the broader factors what basically will give you the idea that how this particular shape of the yield curve looks like, but you keep in the mind the shape of the yield curve is explained through the term structure interest rate theories and we have 3, 4 theories which basically try to explain that.We have a market segmentation theory we have a preferred habitat theory, we have a pure expectations theory, we have a liquidity preference theory, or liquidity premium theory what we call it.

So, these are the different theories which basically try to explain the shape of the yield curve. So, we will discuss extensively about this, what these specifically theories talk about and how this long-term interest rate is determined through these different theories and what are the basic essences of this particular theory that basically over the sessions we will discuss. But these are the common factors you can keep in the mind which can have the influence on the shape of the yield curve.OK?

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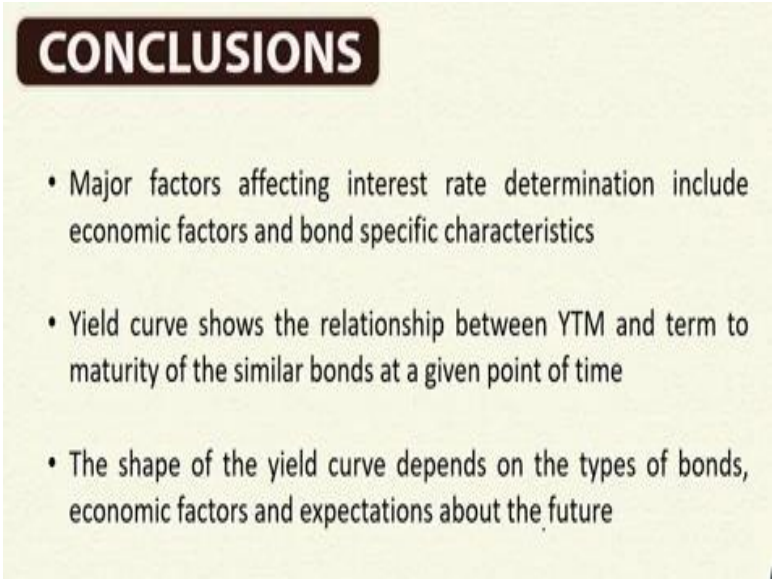

So, what we have discussed today? We have discussed the factors which are affecting the interest rate determination that mostly, there are some factors are economic factors and some factors are specific to the bond characteristics and the yield curve basically shows the relationship between the yield to maturity and term to maturity of the similar bonds at a given point of time. Again, I am emphasizing on that and the shape of the yield curve generally depends on the types of the bond, economic factors and the expectations about the future and further will be discussing how this shape of the curve is explained through different types of theories like your market segmentation theory or preferred habitat theory or the pure expectation theory or the liquidity premium theory. OK?

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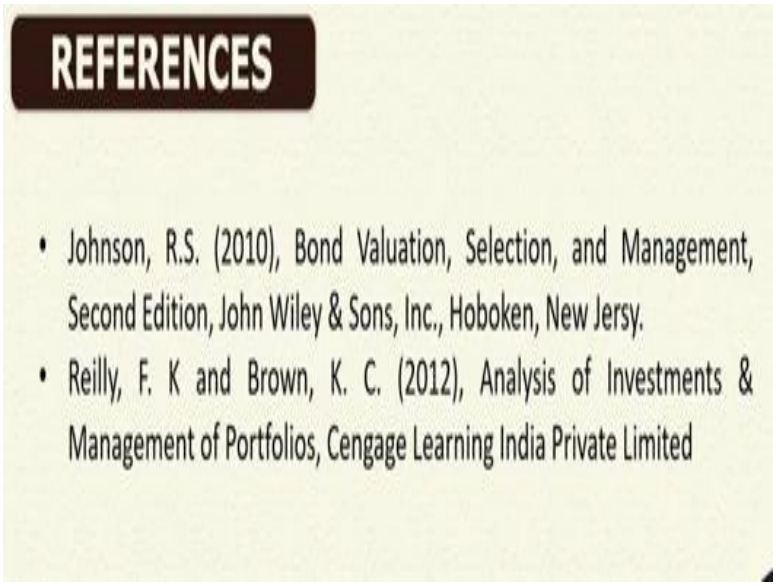

So, these are the references you can go through for a detailed discussion on this and further will be discussing about the how the different theories are able to explain this yield curve or the shape of the yield curve we can close today.

Thank you.