Financial Institutions and Markets
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Lecture - 41
Bond Analysis – I

So, after the discussion on the money markets or the different instruments which are traded in the money market, we are going to discuss today about the bond market. So, already if you remember in the beginning, I was discussing about the different type of instruments and the market classification on the different type of instruments on the basis of their term to maturity. Then, whenever we are discussing the money market what we have seen that, those instruments which are traded in the money market for those the maximum time to maturity is 1 year. But within that particular fixed incomes, fixed income means the particular securities which gives a regular periodical cash flow for that particular investment.

So, in that particular type of markets or fixed income securities market, we have two different segments. One segment, deals with the short-term securities what we have discussed in the money market part. Today, we will be discussing something related to the other type of fixed income securities which are relatively long term in nature. And here in this context whenever you talk about the long-term securities in India, if you particularly if you talk about. We have 3 types of markets; we have a government securities market or what we call it the dated securities market. Mostly the maximum term to maturity of that market is up to 30 years. And we have another market called the corporate bond market, then we have a public sector undertaking bonds PSU bonds.

So, these are the major type of instruments or major type of market which exist in India. So, before we will discuss about the different market structure or the characteristics of the bond market in particular, let us discuss certain features or the technical aspects related to bond. And the technical aspects related to the bond features is general characteristics of the bond and as well as the valuation of the bond. So, then in the forth coming classes we will be discussing the different aspects of the valuation as well as the different type of concepts which are related to the bond.

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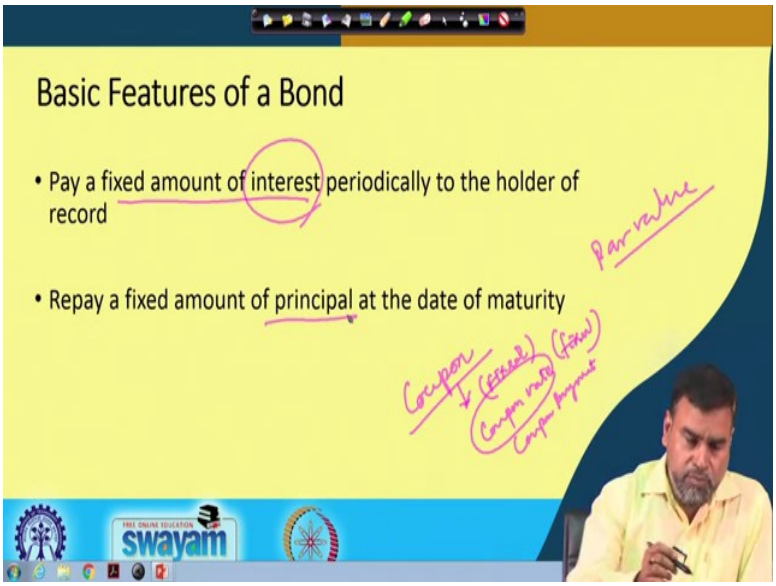

So, let us start the discussion; that whenever you talk about the bond market already told you, the bond market if you talk or the basic instrument like bond if you discuss, the typical characteristics is it gives a fixed amount of interest, periodically.

So, if you remember we were discussing about the typical bond whenever you talk little bit about the valuation part. There we have every bond has a coupon. The dated securities has a coupon and the coupon is fixed. And this is the coupon or the coupon rate is fixed, and in every periodical basis. The period may be the frequency maybe once in a year, twice in a year, thrice in a year or four times in a year that is a different issue.

So, every periodical basis you will be getting certain amount of coupon from this, coupon payments. In that sense, we call it the fixed amount of interest. And second is, there is another component in the bond that is basically in our language we call it the par value. So, what this par value means? The par value means at the time of maturity, once the bond will be matured then a fixed amount the investor gets or the bond holder gets that is basically defined as the principal.

So, whenever we talk about a bond instrument like bond these are the two major cash flows which are available. One is your coupon, which is fixed over a periodical over the period of time or every period you will get the fixed amount. Then we have a principal amount or the par amount which is basically will be given to the bond investor at the time of maturity. So, this is the basic feature of a bond in general or the long term bond in general.

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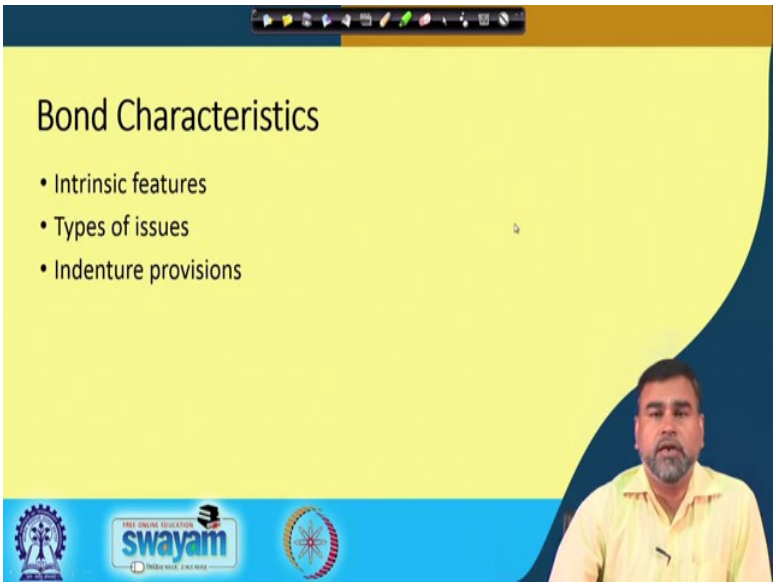

So, let us see that, what are those characteristics that is anybody goes in bond market for investment, what are those different characteristics the bond investor always face whenever they discuss about the bonds. What are those characteristics? The bond has some kind of intrinsic characteristics; number 1. And number 2, is basically what? The different type of bonds on the basis of the category or what are the different types of bonds which are traded in the market. Then we have the indenture provisions of the legal provisions which are involved in the bond market investment. So, these are the different characteristics always we look forward whenever we talked about the investment in the bond. Remember we are talking about a bond which is a regular plain vanilla bond; here we are not talking about bond with certain kind of options.

Either it is a call option or put option, this kind of things we have not considered in this analysis. That we will see later that how this particular options or features is going to affect the value of the bond.

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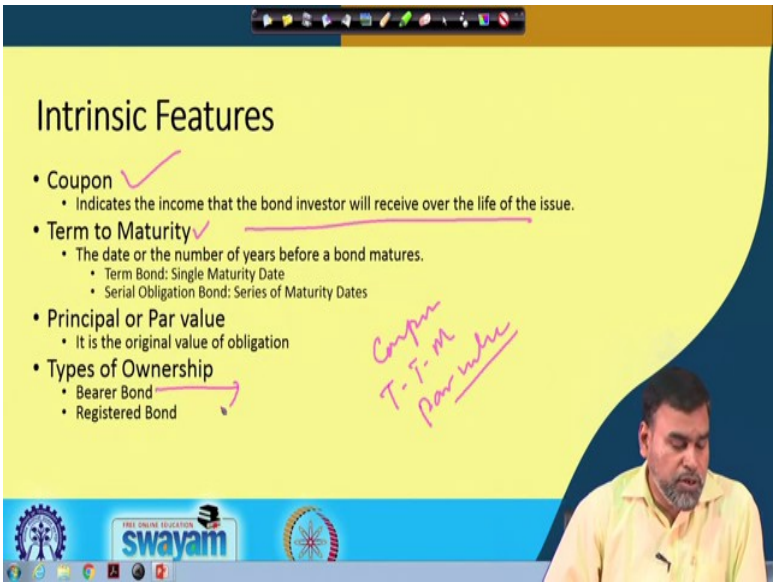

So, let us see what do you mean by this intrinsic feature? Already I told you, whenever you are defining a bond there are certain intrinsic features are always available in the bond. One is your coupon, which basically your income which is bond investor receive over the life of the issue.

Then we have the term to maturity. Whenever you talk about term to maturity it is basically the date or the number of years before a bond matures. Then, there are 2 types of bonds in terms of maturity we can observe in the market. One is, single maturity date, one is series of the maturity date. That is called the serial obligation bond where the bond certain amount of money will be getting it after certain period of time.

So, if there is a 10 years bond, after 3 years, one particular part will be matured, then another 3 years another part will be matured like that. You will have the series of the maturity dates, if the particular bond is a serial obligation bond.

So, we have 3 things already I told you. We have a coupon, we have a term to maturity, then we have the principle or the par value which you will be receiving after the bond mature. After the maturity period, the par value or the principle can be received by the investor. Then, on the basis of ownership also the bond can be categorized into 2. What are those? One is called the bearer bond another one is the registered bond. The registered bonds are basically traded in the market.

The whenever the bearer bond we are talking about, there is no particular owner of this particular bond. Who is bearing the bond? Who is carrying the bond? Those particular investor can redeem that particular bond with the issuer. But whenever it is registered, then the bond will be issued in the name of that particular owner and the all the payments and all these things will be made by the issuer to that particular registered owner of that particular bond. And those kind of bonds are mostly traded in the bond market.

So, in terms of ownership we have 2 types, we have 2 categories. One is bearer bond another one is the registered bond. This is the way we can define, or we can explain the intrinsic features of a typical bond. Already I told you, the typical bond means, I refer to the bond which is a plain bond without any kind of options.

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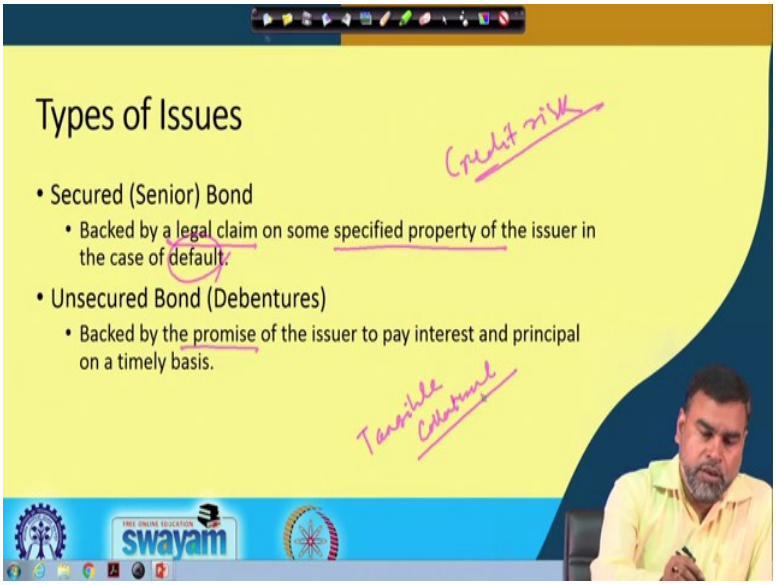

Then if you see the issues mostly broadly there are 2 types of bonds we can get. One type of bond is called the secured bond and another one basically called the unsecured bond. What do you mean by the secured bond? The secured bonds are basically what? The secured bonds are issued against any kind mortgage or the collaterals. So, either the bonds are issued against any kind of legal claim or specified property of the issuer in the case of default.

For example, you have for the particular issuer has issued the bond and you have invested certain money. So, there is a possibility that the bond issuer may not be able to pay the coupon or may not be fail to pay this matured amount at the time of maturity. So, if that particular bond issuer is not able to pay the matured amount at the end of the maturity or the

any kind of coupon, then there is a probability of default which our language we call it the credit risk.

So, there is some kind of credit risk involved whenever we go for the bond market investments. So, whenever the bond market investment we are facing this to avoid or to minimize this credit risk, most of the cases the bonds are basically backed by certain kind of collateral or the mortgages. And mortgages are used if there is any kind of default, then those mortgages can be liquidated and the money can be paid to the investor. That is why those kind of bonds are basically called the secured bond or the senior bond.

And whenever you talk about the unsecured bond, the unsecured bonds are nothing but the debentures. Other name of that thing is debentures, but some of the debentures are also secured, but commonly it is known as debentures which is used by the long term securities which are issued by the corporates. So, whenever we talk about the, unsecured bond the unsecured bonds here, that is basically the question. Here there is no such kind of mortgage or such kind of collaterals which are backed by this particular security.

So, here it is the only promise, the bond issuer has promised that he will pay the interest and the principle on the timely basis. The interest and principal both paid on the timely basis. There is no such kind of tangible collateral, which is involved in this particular process or whenever the issuance of this unsecured bonds are there in the market.

So, this is the way the types of issues can be defined in the context of the bond market investments.

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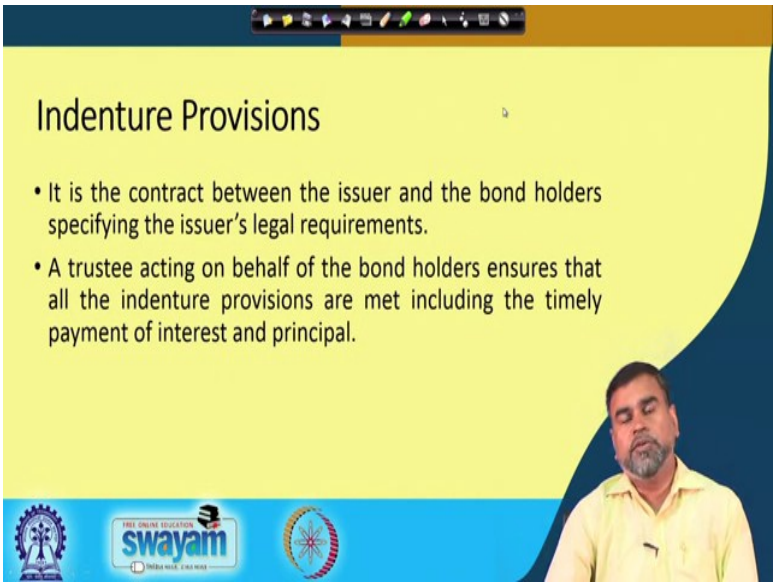

Then we will see that, what those indenture provisions are. The indenture provisions is nothing but it is a contract. And there are certain provisions will be written in the contract between the investor and the issuer of the bond or the bond holder and the bond issuer. So, indenture provision is nothing but it is the contract between the issuer and the bond holders specifying the issuers legal requirements.

So, here what is happening? Whenever we are going to buy the bond from some issuer. Then there is always a legal conditions. There are always a legal issues, legal aspects are involved in that. When the bond will be matured, if there is a default then what is going to happen? At what period of time the coupon will be paid? So, all kind of details will be mentioned. So, all these information what basically we are talking about, if all those information that you add up, these are basically always reported in a particular contract document or a policy document. So, that is basically called as indenture provisions.

So, whenever we write the indenture provisions, it is nothing but a contract between these two, always it is not necessary that indenture provision is directly made by the investor or made by the issuer. So, on behalf of the bondholders, there is a trustee or there is agent who works, who is responsible to basically go for drafting this indenture provisions for the bond investment. And that trustee always ensures that all the legal documents are made including the timely payment of coupon and the principal.

So, there are different clause, different kind of regulations, different kind of a if's not's but is and everything will be mentioned in that provision. So, in that provision is always or that agreement is always made by the bond issuer and the bond holder. But on behalf of the bond holder, any trustee can act or they always make this provision so indenture provisions with the bond issuer. So, this is basically about the indenture provisions in the context of the bond market investments.

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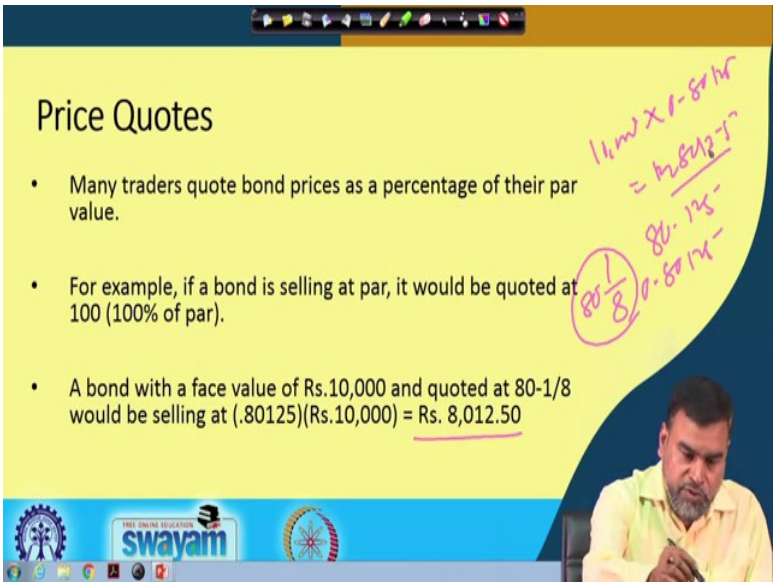

And let us see you might have seen that the bond prices are quoted in the market in the various ways, but exactly how to read this quotes? Whatever way the bond price are quoted, then how the quotations can be read? You remember the bond price is always quoted as a percentage of their par value. The percentage of the par value; for example, if the bond is selling at par; it would be quoted as hundred; that means, 100 percent of the par value.

If a bonds par value or the face value is let 10000 and it is quoted 81 by 8 then, obviously it will be selling at 10000 multiplied by it is 80 percent 1 by 8 basically 1.125, then it is 80.125 this is nothing, but 0.80125. Then the bond will be selling at this 8012. This is 81 by 8. So, that means, 80.125, so 0.80125 then 10000 multiplied by 0.80125 you got it 8012.5, which is basically the selling price or the actual price in the market at that particular point of time.

So, this is the way in general the bond prices are reported in the statement or in the quotations.

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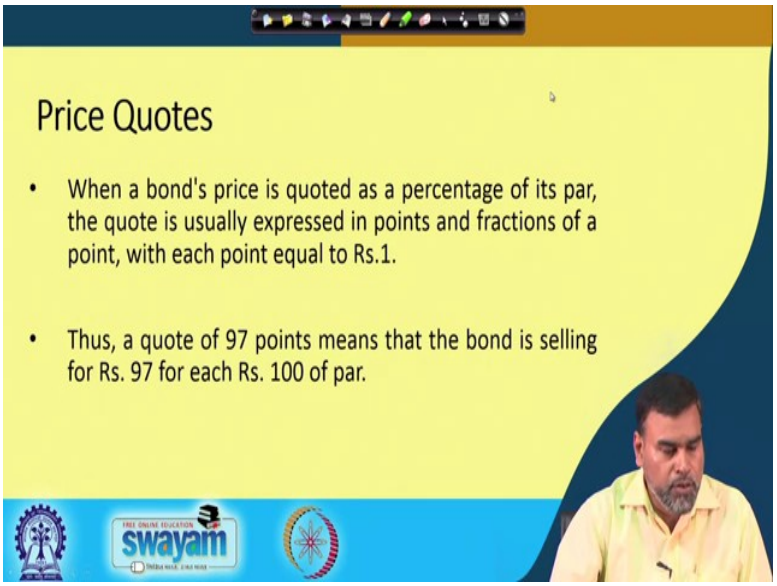

So, when a bond price is quoted as percentage of its par, the quote is usually expressed in points and the fraction of a point and each point is equal to rupees 1 or dollar 1 whatever it may be. That means, if 97 point means that bond is selling at rupees 97 for each hundred rupees of the par. That is the way basically it is represent 1 unit basically nothing, but the 1 rupee or the 1 dollar. Depending upon the currency, this thing can be quoted or can be interpreted.

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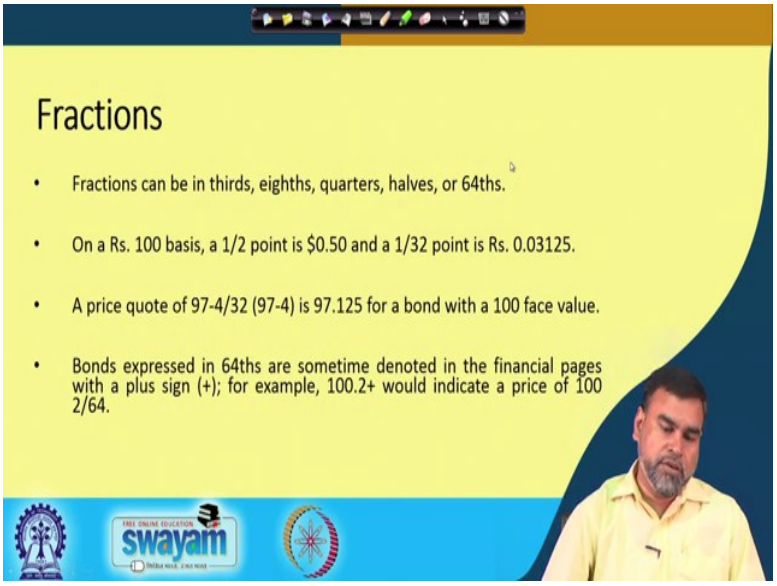

Then we have the different fractions, it can be reported as 1/2, it can be reported as 1 by 32.for example, price quote of 97.4 by 32 is nothing, but 97.125 with a face value of 100 rupees. So, bonds also expressed in 64 or sometimes denoted in the financial database or pages with a plus sign. For example, if it is written 100.2 plus, this would indicate a price of 102/64. That is the way basically, we interpret whenever the bonds prices are quoted in terms of the fractions. It can go up to 64, 1/64 ok.

So this is about the use of the different fractions about the bond price quotations.

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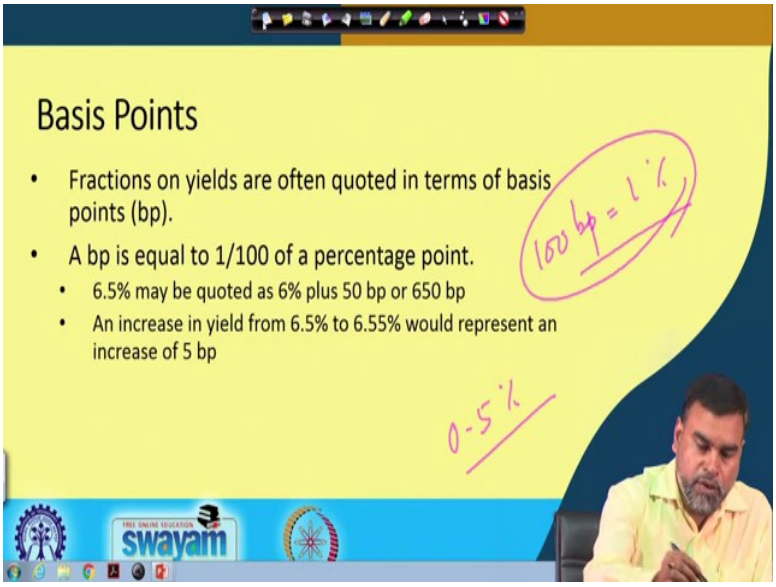

So, then we have a basis point, already you might have idea about what is the difference between the reporting in terms of the basis point and in terms of the what we can say that percentage. So, in a general sense, basically already all of you might have the idea that 100 basis point is equal to 1 percent; 100 basis point is equal to 1 percent. So, if any time even if in the policy rate also you are observing in the therefore, it has increased by 50 basis point; that means, it is nothing but the 0.5 percent.

So, 100 basis point is 1 percent. Accordingly you can interpret, 6.5 percent may be quoted as 6 percent plus 50 basis point or 650 basis point. So, increase in yield from 6.5 to 6.55 it is nothing, but at in case of the 5 basis point like that. So, if you remember 100 basis point is equal to 1 percent. You can interpret that particular quotations in that way. Basically that is the interpretation of the basis point in terms of the percentage.

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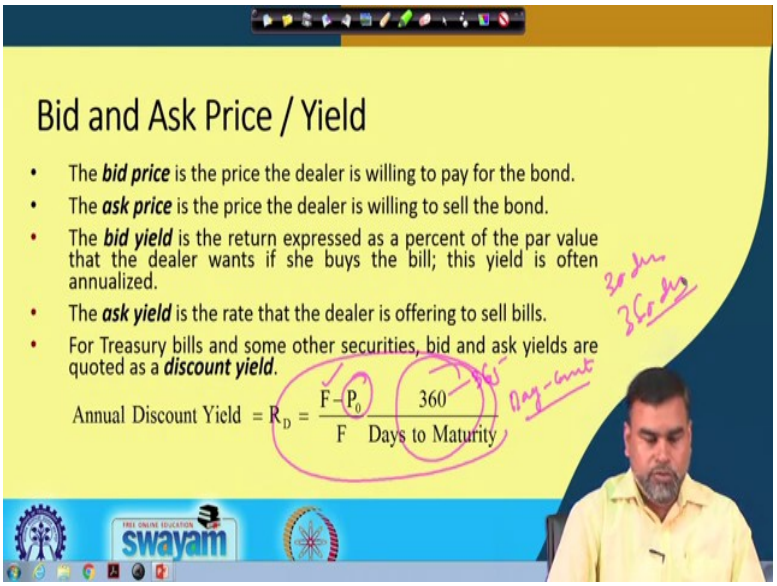

Then, we will see that how the bond prices are reported in terms of the yields.

So, whenever the bond prices are reported in terms of the yields or the return. So, there are two-way quotations the bond investors make. One is your bid price, another one in the ask price. Bid price means, whatever the buyer is willing to pay. And the asked price is whatever the dealer or the seller is willing to sell. At that particular price, the seller is willing to sell, which is nothing but the ask price and whatever price the bond holder is willing to buy that is basically the bid price.

So, whenever we talk about this bid and ask, these are quite important whenever you go for the two-way quotations in the market. So, the bid yield is the return, expressed as a percentage of the par value that the dealer once wants if this buys the bill and this yield is often annualized. Yield means, we are referring the bond. And the ask is nothing, but the rate at which the dealer is offering to sell the bids; that means, the bonds.

So, if you remember, whenever we are talking about the treasury bills we were also trying to calculate the yield of the treasury bill. So, yield of the treasury bill that formula if you remember this is basically the treasury bill yield the f is equal to the face value of the bond, and p 0 is a purchase price, and this is basically your day count factor, if it is actual here you will consider then it is 365, but if you are assuming roughly that every month is 30 days, then you considered 360 days in a year. Because, this particular reporting is always then always basically we do or always done on the basis of the annualized return or annualized yield.

So, if you want to calculate annualized yield, then this is the way basically this thing can be calculated whenever you talk about the annual discount yield for a particular bond. So, this is about the bond price quotations.

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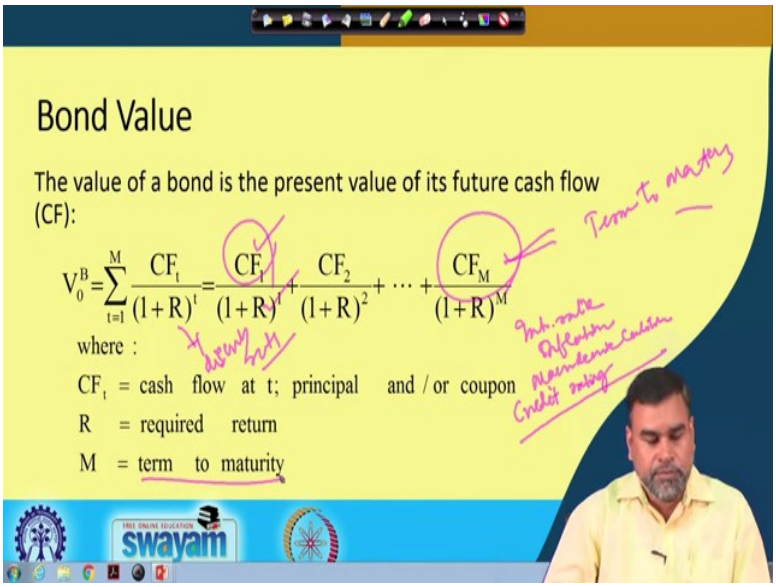

So, let us discuss that how the bond prices or the bond value is calculated? Whenever you talk about the bond value calculation already I told you, that the valuation of a particular asset is nothing but the present value of the future cash flows. So, already you know that what is the cash flow what we are going to get from the bond. The cash flow is basically the coupon and end of the period we are getting a cash flow that is basically your matured amount or the face value of the bond which is nothing but the par value of the bond.

So, we have two types of cash flow, one is your coupon and end of the period we are getting a cash flow which includes coupon and as well as the maturity value. And R is the discount rate. R is the discount rate and already you know that the discount rate can be determined by many factors. This can be determined by interest rate in the market, this can be determined by inflation, this can be interpreted by macroeconomic condition, and this is also can be determined by the credit rating of the bond issuer.

So, these are many factors which can determine this discount rate of that particular bond. The R is nothing but the required rate of return which is the discount rate for the valuation of that bond. And once the discount rate can be calculated and coupon is known to us and as well as the maturity value is known to us, then the valuation of the bond will be possible.

So, these are the 3 things what we need that is your cash flow, that is your discount rate, that is your par value, then another one also we have to know, that is term to maturity. So, M is the term to maturity. So, if this data is available or these inputs are available, then the value of the bond can be easily calculated. So, this is nothing, but the present value of the future cash flow.

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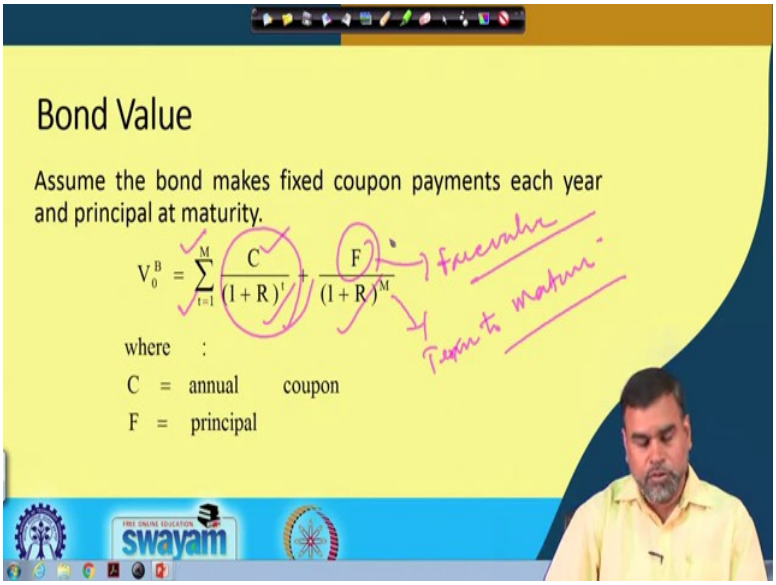

So, let us now divide these two components. One is your

$$\sum_{t=1}^{M} \frac{C}{(1+R)^t}$$

which is nothing, but the summation t is equal to 1 to M, because M is nothing but the term to maturity. How many cash flows you are getting about the period of time? How many times you are getting that? And how much? That is basically your C annual coupon payments. F is nothing, but the face value. F is nothing but the face value and M is basically nothing, but the term to maturity.

So, if you are discounting that cash flow and there with respect to that discount rate which is nothing, but the required rate of return from the bond, then the value of the bond can be easily calculated. So, this is the 2 components of the valuation of the bond.

So, let us see that how that particular notations or this formula is going to be changed.

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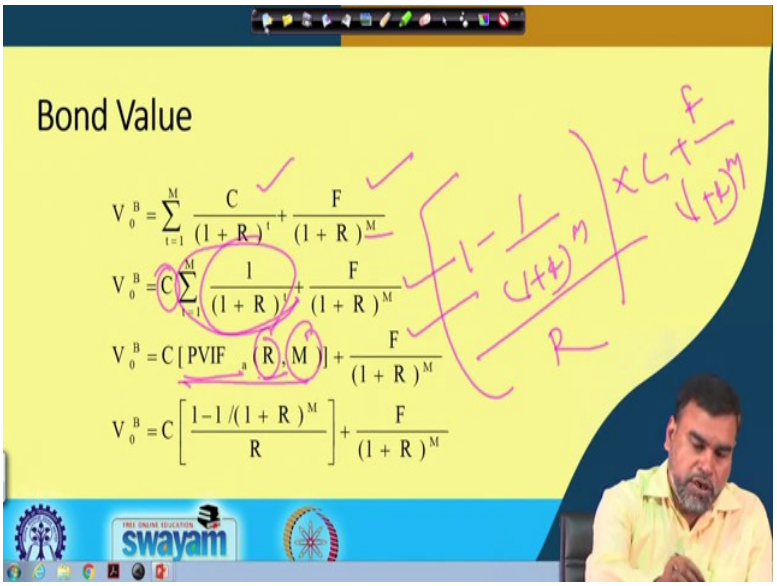

So, here whenever we talk about this particular thing can now be expanded. We can expand this like this. This is the original formula.

$$\frac{C}{(1+R)^t} + \frac{F}{(1+R)^M}$$

T is equal to time period at that particular point of time and M is equal to basically the maturity period.

Then if you see now C we are taking in this side, then we have 1 by 1 plus R to the power T plus F by 1 plus R to the power M. Then particularly this part is nothing but, the present value of interest factor. If you go back C your present value interest factor table, then you can find out at a particular R and particular maturity period, What is that PVIF ?

So, if you know the PVI value, then 1 by 1 plus R to the power T will automatically because this is calculated from the expansionary formula, geometric progression formula, that we will find out that present value of this particular cash flow multiplied by this C plus the F is basically, the maturity value or the face value divided by 1 plus R to the power T.

So, then if you see now this is nothing, but the

$$\sum_{t=1}^{M} \frac{1}{(1+R)^t}$$

which is nothing but the present value of the interest factor at a particular maturity period with this discount rate. We can now, if this particular thing if you expand it, you are getting that is 1 by 1 plus R to the power M 1 minus divided by R ok, so into C plus F by 1 plus R to the power M.

So, then what we can do? We can find out the value of that particular bond.

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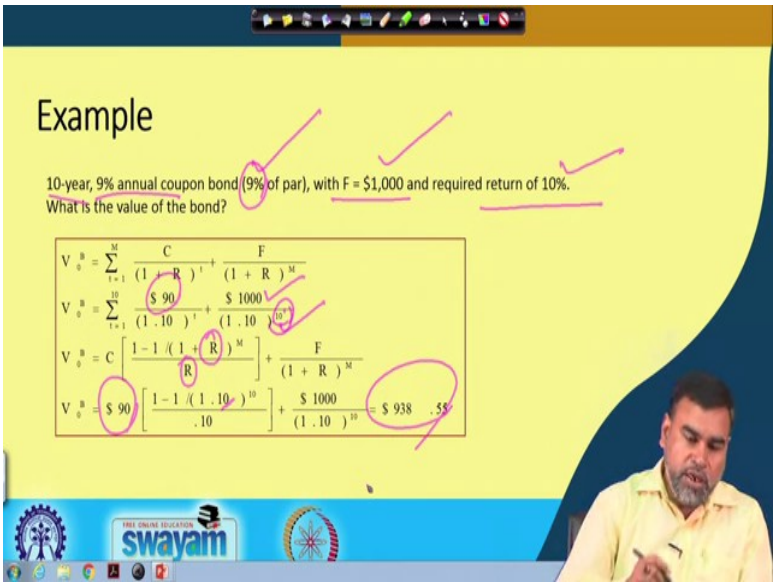

So, now let us see that, if you take the example, then how it is calculated? Let there is a bond which maturity period is 10 years, coupon payment is 9 percent which is annual. Your face value of the bond or the par value of the bond is 100 dollar and your R, R is equal to 10 percent.

So, if the 9 percent is the coupon rate what you are getting against this 1000 par value, then your coupon amount per year will be 90 / R is equal to 10 percent 1.1 to the power T plus 1000 which is the par value of the bond divided by 1.1 to the power 10. 10 is the maturity period, then we can find out. You can use that formula

$$\left[\frac{1-1/(1+R)^M}{R}\right] \times C + \frac{F}{(1+R)^M}$$

Then C is equal to 90 dollar what you are getting on the basis of the 9 percent coupon. Then 1 minus 1 by 1.1, 1.1 means R is equal to 10 percent means 0.1 to the power 10 divided by 0.1 which R plus 1000 divided by 1.1 to the power 10, then the value of the bond or that particular point of time will be 938.55.

So, if for example, the coupon is not paid annually, the coupon is paid semi-annually.

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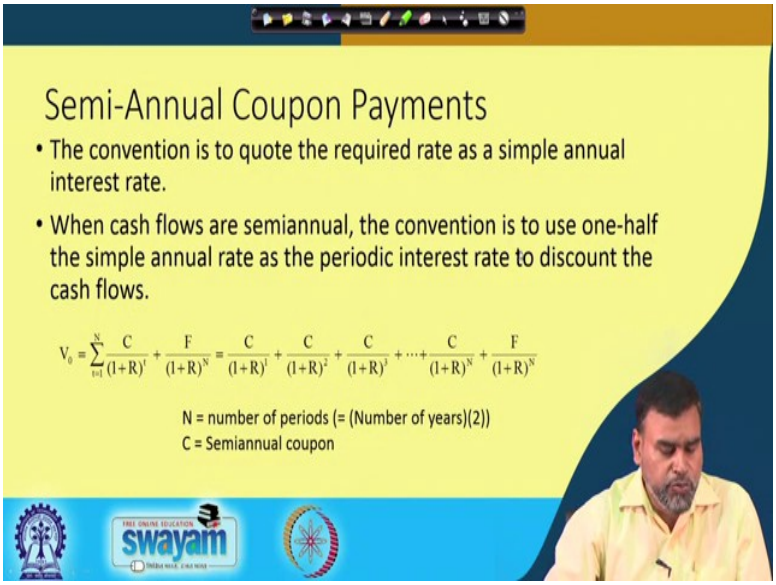

Then how it is going to happen? How it is going to operate the value of the bond? Then, what you can do? The convention is use the one-half of the simple annual interest rate as a periodic interest rate to discount the cash flow. So, then if you see this example then it will be more clear for you that for the semi-annual coupon payment, how it can be calculated?

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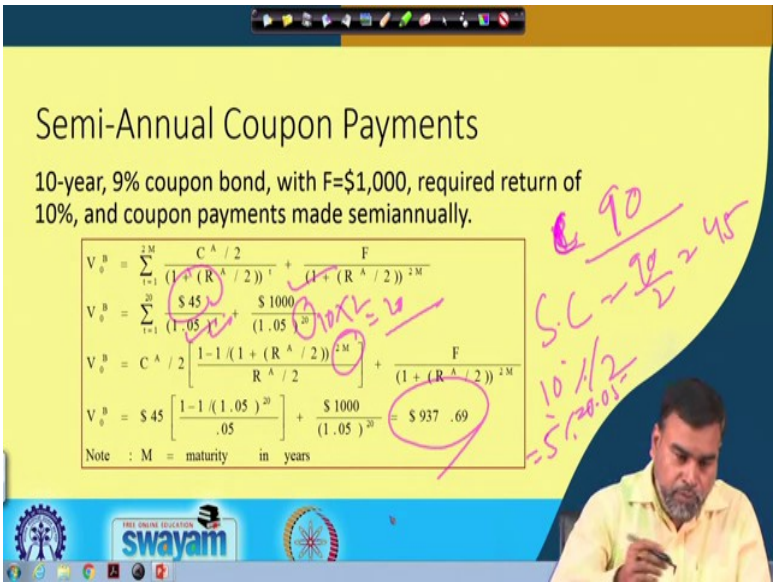

If you see now, every 6 months you are getting this coupon. So, per annual coupon was 90, annual coupon was 90. Now your coupon is 90, then semi- annual coupon will be 90/2=45. Then we have taken 45 dollar divided by then your annual interest rate or required rate was 10 percent. Now, it has become divided by 2, that has become 5 percent.

So, then we have 45 /1.5^{T}, 1000 / 1.5, 1.05 ^{20}. You see that 5 percent means, it is 0.05. So, 45 / 0.05 ^{T} + 1000 / 1.05 ^{20}. Previously it was 10.

Now, the period has increased 10 × 2 that is 20, then if you put that formula [1 – (1 + R/2) ^{M}]/R. Then now, it is divided by 2 everywhere and it become 2 M here, then you can find out the value has become 937.69, which implies that little bit there is a deviation, if the coupons are paid semi-annually.

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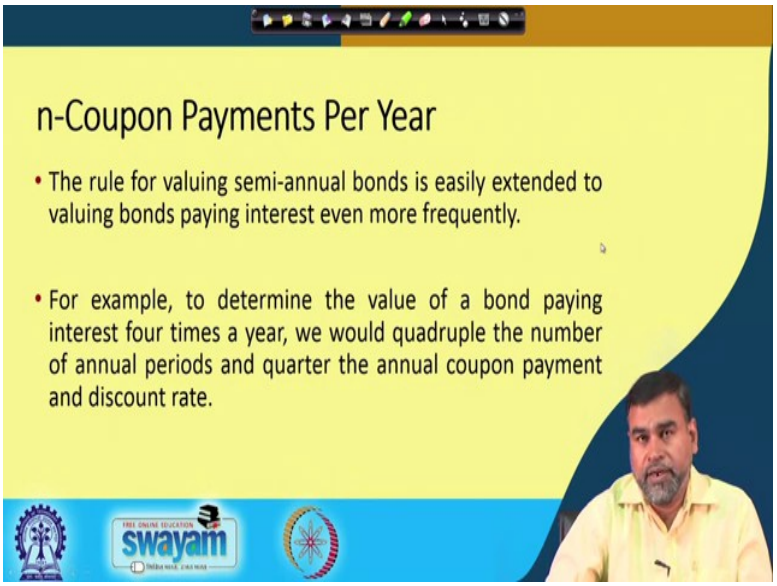

So, now if you now expand it little bit let periods are more, then whatever period you are taking you can multiply the N with the term to maturity. Then you divide your coupon with respect to that particular frequency at what frequency the coupons are paid. Then as well as the R also will be divided into that much number to get this required rate of return in that particular point of time or period of time.

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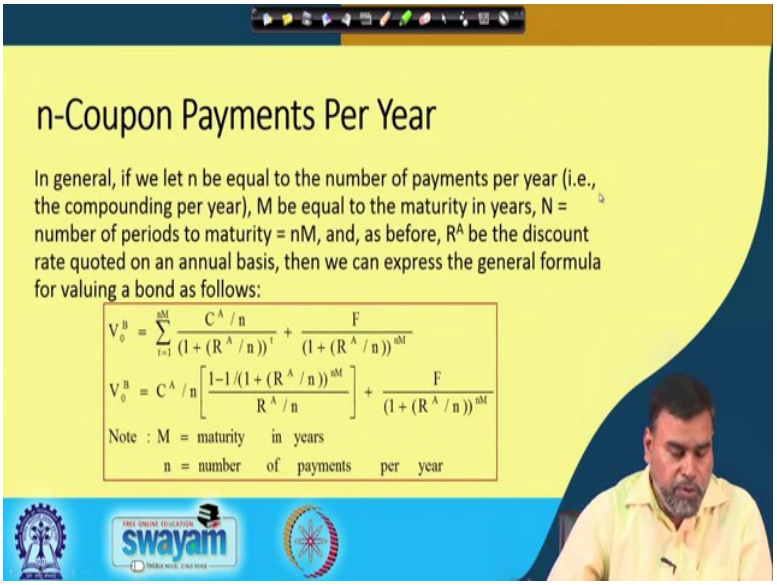

So, now the formula will become

$$\frac{C^A/n}{\left(1+\left(\frac{R^A}{n}\right)\right)^T}+\frac{F}{\left(1+\left(\frac{R^A}{n}\right)\right)^{nM}}$$

n M means, n represents how many times the coupon is paid in a particular year. Then finally, you can use the same formula to find out the value of the bond where M is equal to maturity, n is equal to the number of payments coupon payments per year.

So, this is the way the normal valuation of the bond is taken place. It is different from the equity in the sense. The equity there is no maturity value, but in the bond case we have a maturity value that is nothing but the par value. Then the periodic cash flow basically is the coupon. So, this is the way fundamentally the valuation of the bond is done. And there are some other issues related to the valuation that will be discussing in the next class.

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Please go through this particular references for this particular session

Thank you.