Valuation of Fixed Assets-1

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Lecture - 13

Management of Commercial Banking

Good morning. In the previous class we discussed about the valuation of the bank stocks or the different methods, which are used for valuation of the equity what the banks have and we also discussed about there are two ways or two methods or two approaches which are used for valuation of equity. One is your discount flow model and another one is the relative valuation models.

But whenever we are using the discount flow models, we are trying to calculate the intrinsic value of that particular equity, but whenever we are going for the relative valuation model mostly we are trying to compare the value of the particular asset with respect to the other comparative entity by that the investors can take the decision whether they want to invest in that particular stock or not.

So, today we will discuss about certain other securities where the bank always use for the investment as well as the day-to-day operational activities. Like they use the, their major operation is the deposits and the lending activities and as well as also they invest in the bonds. So, in that context that what are those different kind of interest rate concepts which are used for the deposit and lending activities and as well as the valuation of the bonds. So, these are the two things what basically we are going to discuss today.

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So, these are the 4 concepts what we are going to analyze or going to discuss today. One is what is the concept of simple and compound interest rate? And what do you mean by the compounding frequency? Compounding frequency in the sense that if the particular payments are made in the different frequency in a particular year, then how that particular valuation is done. Then we can also discuss about; what is the basic difference between bond valuation and equity valuation and how the bonds are basically evaluated in the market?

Then what is the concept of effective rate. That is with respect to the interest rate which prevailed in the market or how basically the effective rate of that particular or effective yield of that particular bond can be calculated. So, these are the major 4 concepts what we are going to discuss in today’s session.

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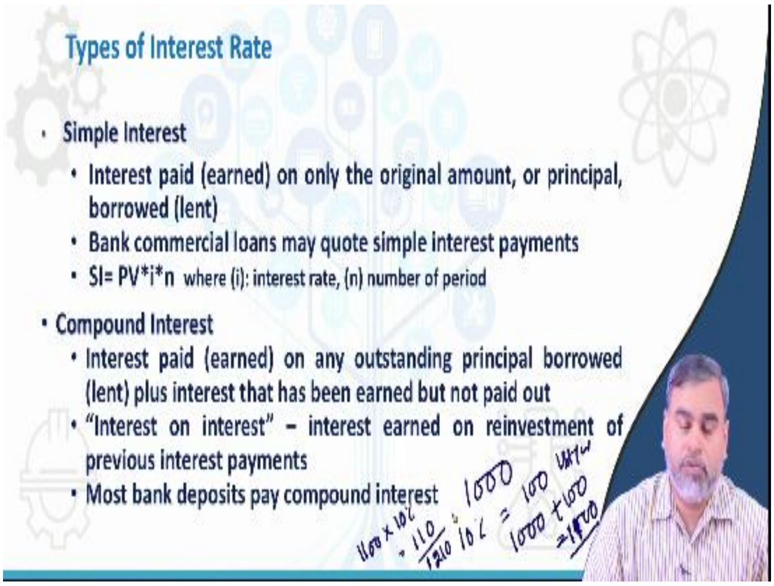

If you see that all of you is very much aware about this 2 concept. Whenever we are keeping the money in the banks or the banks give the loan, we always see that whether the interest is simple interest or the interest is a compound interest or the interest whatever you are receiving or interest whatever you are paying that is on the basis of the simple interest calculation or on the basis of the compound interest calculation.

But whenever you talk about the simple interest, mostly the interest basically paid on the original amount that means either whatever principal or the particular money whatever you have borrowed from the bank or whatever money the bank has lent. So this is the way basically the simple interest is calculated. Mostly the banks whenever they provide the loan they can use this simple interest calculation, whenever the loan giving activities take place for the commercial banks.

So, therefore, if you go by the formula wise your simple interest amount if you want to calculate that basically is calculated on the basis of the principal amount which is there in the particular account or particular loan account multiplied by the interest rate and multiplied by the N. N means the number of periods up to what period the particular money has been giving as the loan that basically will be considered in this case.

So, for example, if you have borrowed 1,000 rupees, when interest rate is 10 percent and the loan is taken for 5 years then for the 1,000 rupees your interest rate is basically 10 percent means per year you are getting 100 rupees and if you are keeping the money for 5 years straight forward you are getting this 10 percent 100 rupees multiplied by 5 that is the 500 rupees. So this is the way basically the interest rate is basically calculated simple interest rate is calculated from a particular bond or particular kind of loan, which is using the simple interest rate calculations.

Particularly this particular simple interest concept is used whenever the bank provide the loan. So, whenever we talk about this kind of concepts, we basically always keep in the mind that whether the particular activities is a deposit activities or it is a lending activities. So, in that context whenever we are going for the compound interest, basically whatever interest you are giving in end of the period that interest on that interest also we get the interest.

So, because of that the interest whatever we get on the compound interest that basically is on the basis of the outstanding principal plus the interest that has been earned, but not paid out that means if you are, for example, if you are keeping the money in the bank let the same 1,000 rupees then if it is the interest is basically paid annually and this is also compound interest rate basis you are getting this particular return from this.

Then how basically this thing is calculated, the 1,000 rupees multiplied by the 10 percent which will be getting after 1 year then that money will become 1,000 rupees 10 percent become the 100 rupees then that basically will be 100 rupees plus 1,000 rupees 1,100 rupees then that in the second year whenever you get the interest that interest we will be getting on the basis of that 1,100 rupees.

So, previously if you see what we are doing that in the previous case, in the simple interest case that interest on interest is not considered, but whenever you are going for the compound interest the interest on interest is considered. If you go by the example what we are considering that let your amount was 1,000 then the 10 percent of that you will get 100 rupees in the first year.

Then in the second year your total amount become 1,000 plus 100 that is 1,100, that is 1,100. So, now in the next year whenever you are going to get the interest you are receiving on the basis of the 1,100 rupees, that means in the next year interest amount will be 1,100 multiplied by the 10 percent or 0.1 that will give you 110 rupees. So, then next to next year that value become this 1,210 rupees.

So, like that cumulatively this particular interest payment what you are getting that will be basically considered to earn some more interest from this, but whenever it is simple interest the interest on interest we are not considering. So, therefore mostly the interest on interest concept is basically, we get it on the basis of the reinvestment of the interest payment what we receive from this particular money. And most of the banks basically used the compound interest for the deposits.

So that is mandatory maybe this particular money can be compounded quarterly, it can compounded also monthly also it can be compounded yearly. So, depending upon this regulations and as well as the particular banks policy, this mostly this is driven by the regulation that at what period basis, at what frequency the particular money will be your interest will be compounded accordingly the interest in particular customer can receive from the particular bank.

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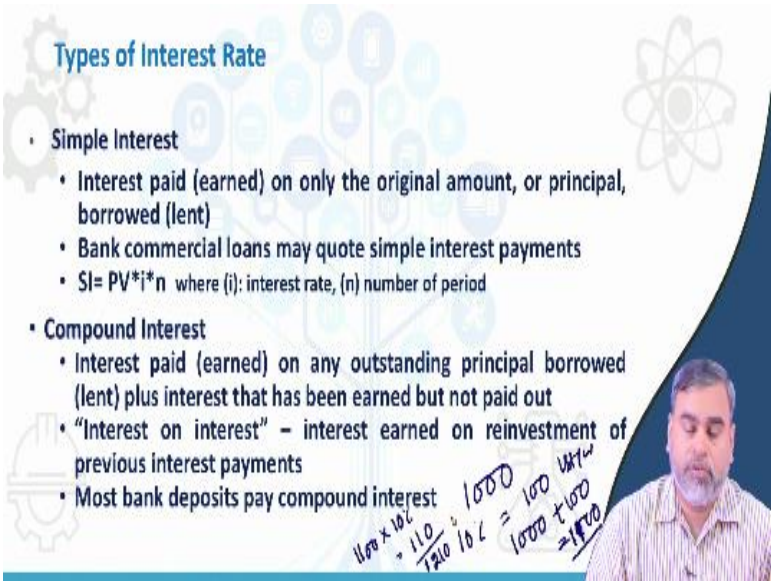

In the same way if you see this example that if your interest rate is 12 percent, your present value or the principal amount is 1,000, then your amount if you are going for the simple interest rate basis, in one year you will be getting 120 rupees and if you go by monthly then you are getting basically 10 rupees from this, 112 divided by 12 that will be 10 rupees. But if you are going to calculate the 1,000 rupees same 1,000 rupees which will be invested for 6 years at 8 percent interest.

Then if you go by the simple interest rate, you are in the end you are getting 1,480 rupees which is nothing but the future value of that particular money whatever you have deposited in the bank, but if you go by a compound interest straightway the money will be 1586.87, that means it is 1,000 into 1.08 to the power 6 that will give you 1586.87. With this particular money we will be arriving 1,000 into 1.08 whatever money we will be getting that we will be getting again this multiplied by 1.08 again for the second year.

Then this whatever money we will be getting again 1.08. So, if you go for that this is 1.08 to the power 6, then obviously that money will become 1586.87. So, this is the, that is why in the compound interest straightway we are getting more money the reason is basically the interest on interest component is added there, but whenever we are talking about simple interest the interest on interest calculation is not considered or that component is not considered for realization of the income.

So, this is the concept where the, from the banking prospective it is very important the reason is that on the basis of the simple and compound interest rate the total amount of interest expenses or interest income that also vary for this particular commercial bank.

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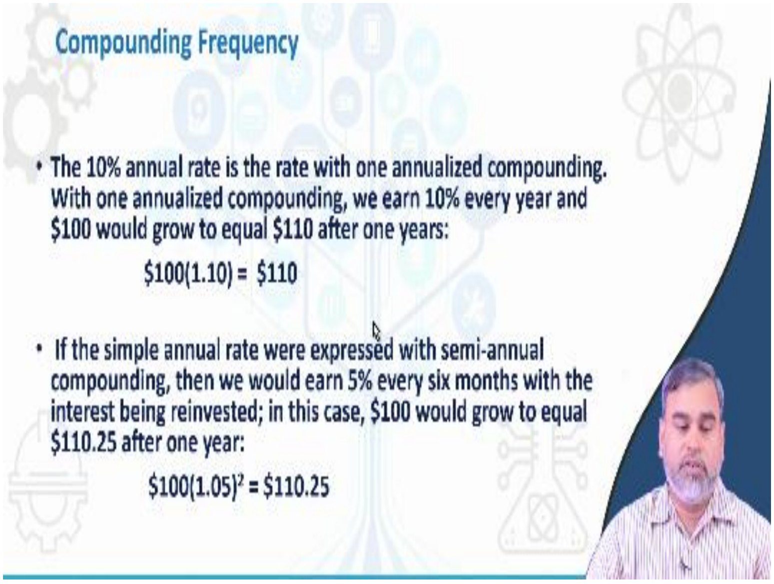

Then we have a compounding frequency what do you mean by the compounding frequency that for example there is a 10 percent annual rate of a particular interest which is annualized it is compounded annually then for each year this interest rate is 10 percent then after one year it become 110, but if the simple annual rate were expressed with semi-annual compounding that means every 6 months basis it is compounded then we earn 5 percent in every 6 months.

Then obviously with the interest being reinvested in this case what will happen that we are getting exactly the interest payment will be per year what we are getting 100 rupees multiplied by 1.05 to the power 2 that is 110.25. Previously we are getting 110 and now we are getting 110.25 dollar. So, the reason is basically what the interest after 6 months whatever you are receiving that also will be earning certain kind of interest from that particular investments. So, this is basically the concept of compounding frequency that already we have explained.

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But if the rate were expressed with monthly compounding. Just now I said this particular deposit interest rate what we get that maybe compounded monthly that also maybe compounded quarterly or that can be compounded yearly also. So, if for example, we express this things in the monthly compounding way then how much interest rate we can earn, per month we can earn 10 percent multiplied by 12 that is 0.833 percent that is per month interest what we can earn from this.

Then in this case how much money what we are going to receive from that particular investment after one year that will be 100 into 1.00833 to the power 12, 12 means it is 12 months, so then we are getting 110.47. Whenever it was compounded 6 months basis we are getting 110.25, but whenever we are getting we are basically compounding it with respect to the time frequency of one month we are getting 110.47.

So, if you extend this compounding to daily, then further again it will increase that means daily we will be getting 10 percent by 365 we are assuming 365 days per year, then we are getting 110.52. So, effectively if the compounding frequency will increase the amount of money basically what we are going to receive from that particular investment or particular deposits that also we will be increasing. Because of the again and again I am telling that is because of the interest on interest component which will be added to that. So, this is the concept of compounding frequency with the different time frequency consideration.

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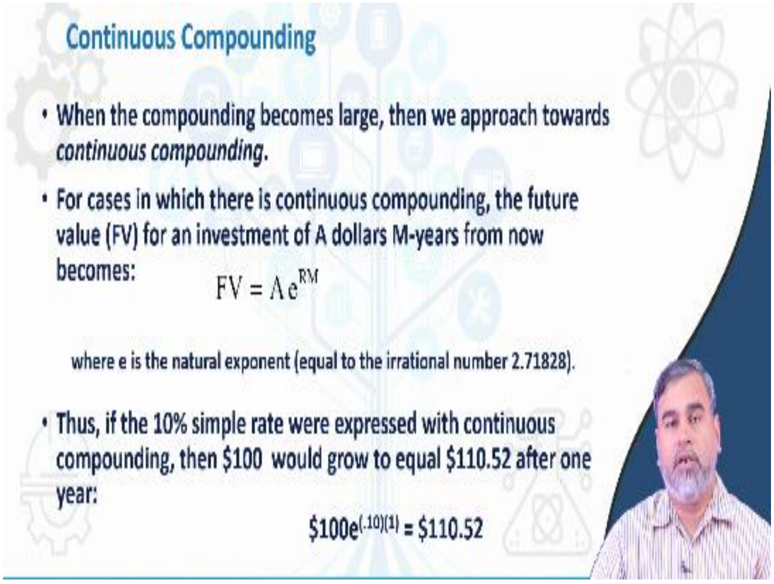

But whenever the compounding basically become very large then basically we can go for towards the continuous compounding. In this case your future value of that particular money whatever you have deposited or whatever you have basically borrowed that will be basically calculated in the different way. So if this is FV is basically the money what we are going to receive then A is the principal amount whatever you have deposited.

Then your total money will be FV equal to Ae to the RM. So, R is nothing, but the interest rate, M equal to the maturity period or the period up to which the particular money will be hold in the particular bank, and then e is nothing but the natural exponent which is irrational number, which is the value is close to 2.71828. So, if the 10 percent interest rate per annum is expressed as a continuous compounding way.

Then that will give you 100 e to the power 0.1 and if maturity period is 1 year then it will be 110.52. Whenever we are going by a simple compounding way we are getting 110.10, but whenever we are going by the continuous compounding we are getting 110.52. So, this is basically the difference between the continuous compounding and normal annual compounding of that particular investment.

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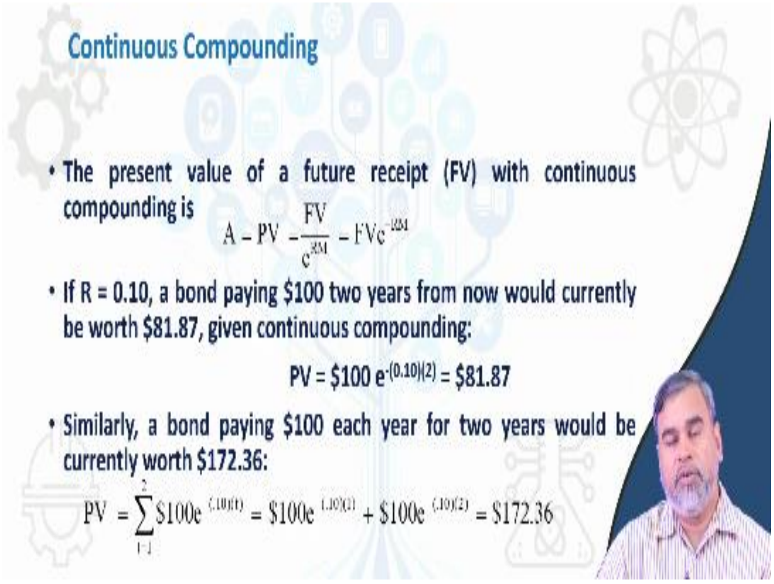

So, if you want to calculate the present value of a future receipt from that particular money then it is nothing but the, FV by divide by e to the power RM or FV into e to the power minus RM the FV basically the future value what we are going to receive from this and PV represents the principal value or money whatever you have deposited and if you want to convert this thing from this, then how much, what should be the present value.

Let for example if a bond is paying 100 dollar in 2 years from now, then how much money you should money you should invest, then this investment money will be 81.87, so if it is continuously compounded. Similarly, if a bond is paying 100 dollar each year for a 2 years, then it will be 100 e to the power minus 0.1 plus 100 e to the power minus 0.1 into 2, then it will be giving you 172.36.

But each year we are investing 100 dollar and for one year it is giving this much return and for second year it is giving this much return then the total value will be 172.36. So, this is the way the continuous compounding is used to calculate the present value from the future value or from the future value or from the future value to the present value or from present value to the future value.

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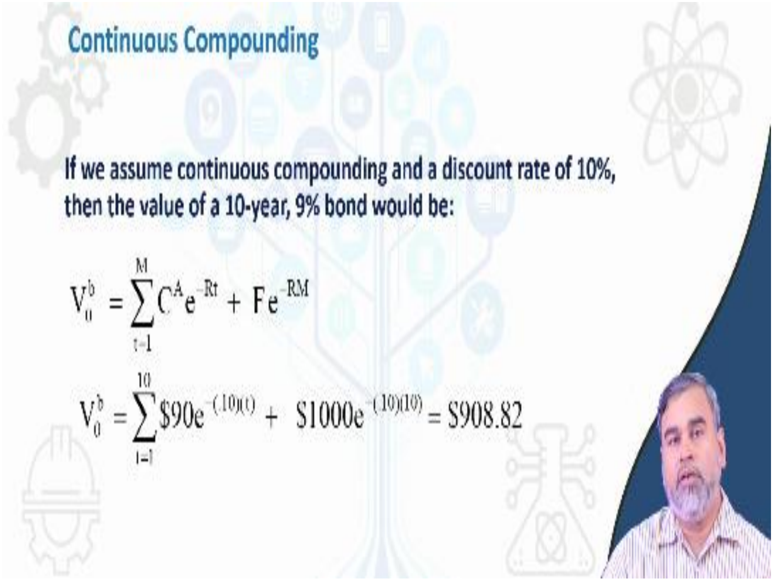

So, if you assume that in a discount rate of 10 percent then the value of 10 years 9 percent bond if you assume that par value of the bond is 1,000 rupees, then we will be getting 908.82. So, this is the way any example you can take you can consider in that way that how the continuous compounding can be used whenever we go for any kind of interest payment we are receiving from the deposits or the lending activities or in terms of the valuation of the bonds.

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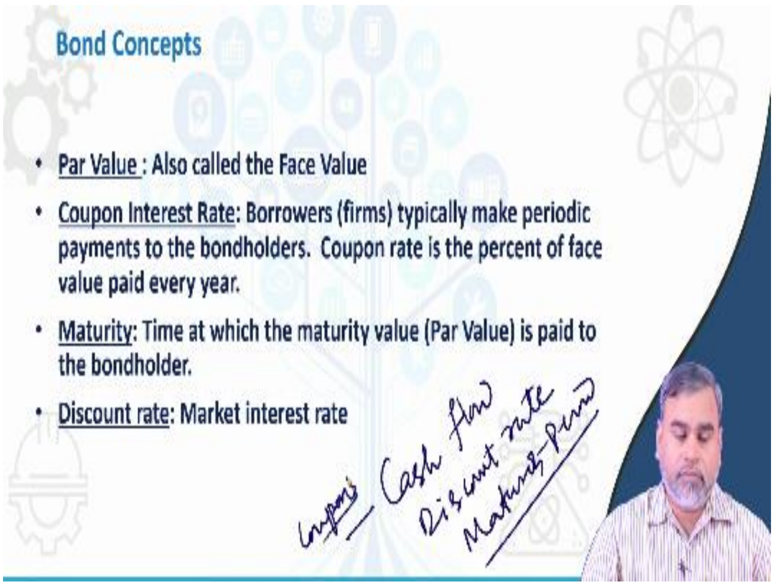

So, in general whenever we talk about the valuation of the bond all of you know that already or we have discussed in the previous class also for the any kind of valuation we need certain things what are the things specifically we need. We need a cash flow, we basically whenever we go for valuation of any bond we basically need a cash flow first, one is your cash flow and second one is we need a discount rate then what we need, we need a maturity period.

So this much was required whenever we are talking about the valuation of the equity, but whenever we are talking about the valuation of the bond we need another thing because bond has a par value or the face value. So if the bond has a par value or face value that also has to be discounted to get this particular price of the bond. So that is the basic difference that means whenever we are talking about the valuation of the equity.

We have one component where the periodic cash flows will be discounted with respect to a particular discount rate like cost of equity or cost of capital, then finally the intrinsic value or the value of the bond can be or value of the equity can be calculated, but whenever you talk about the valuation of the bond we generally calculate on the basis of 2 components. One is your periodic cash flow what you are receiving and as well as the par value of the bond or the face value of the bond.

So the par value is also called the face value that already I told you and when do the periodic cash flow we get the periodic cash flow we get in terms of the coupon. So, it is a coupon bearing bond, so coupon means that particular, coupon rate means there is a interest rate on which the periodic cash flow will be received by the bond investors or bondholder. So here the bond issuer will make this periodic payment.

And it is basically a percentage of the face value of this particular bond. So if it is 10 percent face value of the bond is 1,000 then for each year you will be getting 100 rupees your 10 percent in the coupon rate per annum and already I told you the maturity, the maturity means the time at which the particular bond will be matured and the discount rate on that particular rate, required rate or the discount rate is nothing.

But the market interest rate which prevails in that particular day in the particular market. So the particular cash flow has to be discounted with respect to that particular market rate or the discount rate then the value of the bond can be calculated accordingly. So, these are the different concepts which are used in the valuation of the bond.

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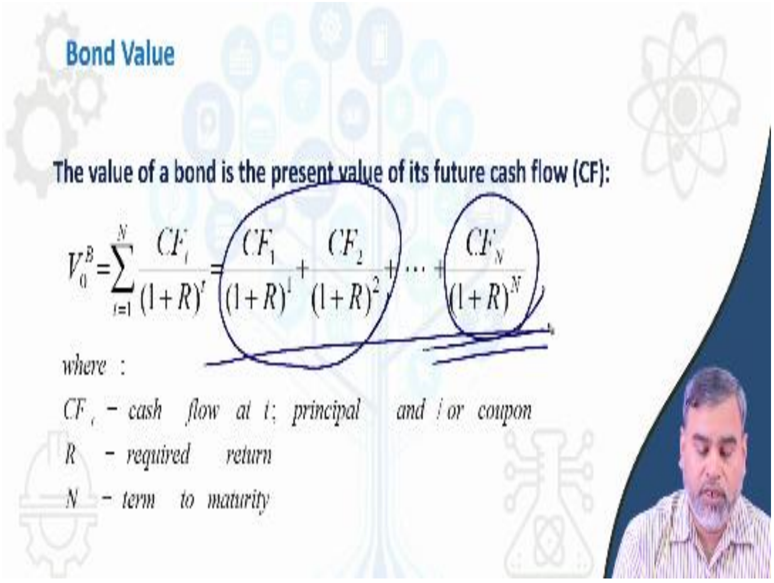

So then if you see in this context how the value can be calculated. Already I told you that whenever you go for the equity valuation we are only discounting the cash flows so only this part were there, but whenever we go for the bond valuation we have another component that is basically nothing, but what we can say that face value of that particular bond. So that will come in the end. So here what is written in the regular basis, but if you observe this one that in this sense how basically it is done.

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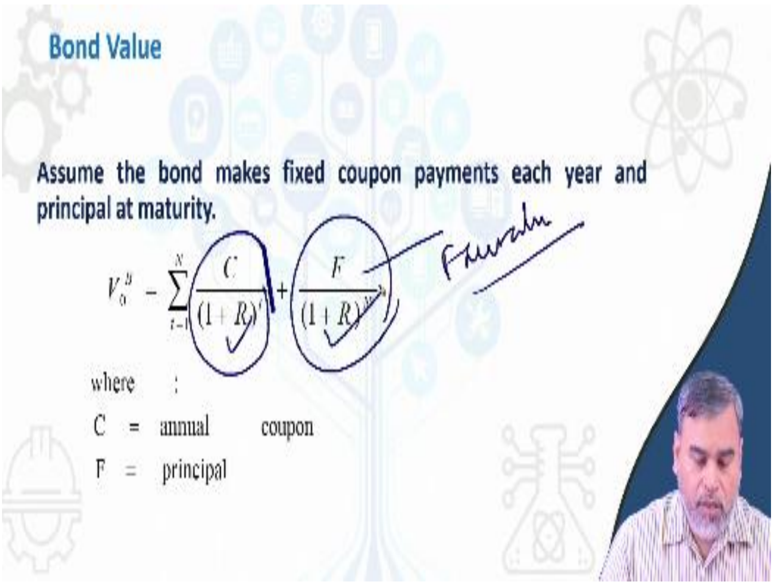

So, here if you see it will be more clear that here this C represents the periodic cash flow what basically we are receiving the periodic cash flow what we are receiving from this and this one is basically your F is nothing, but the face value. So, in the first part it was in general altogether we have written the cash flow we also assume that face value is also cash flow what we will be receiving after the maturity.

So therefore, there are 2 components we have to discount with respect to a discount rate. So, that discount rate maybe a periodic cash flow and as well as the face value of the bond. The periodic cash flow from the bond is nothing, but the coupon payments what the bondholder basically receiving. So, it is summation t equal to 1 to N, N is equal to the maturity period C by 1 plus R to the power t plus F by 1 plus R to the power N.

So, there are 2 components, but in the equity part we have only this component, but in the bond part we have the 2 components that actually you have to keep in the mind. Then in this context, if this is the way basically the value of the bond is calculated that means what we can conclude the particular bond value is nothing, but it is the present value of the cash flow or periodic cash flows what you are receiving from the particular bond. And as well as the present value of the face value or the par value of the bond. So, if you combine these two then the value of the bond on that particular point of time can be calculated.

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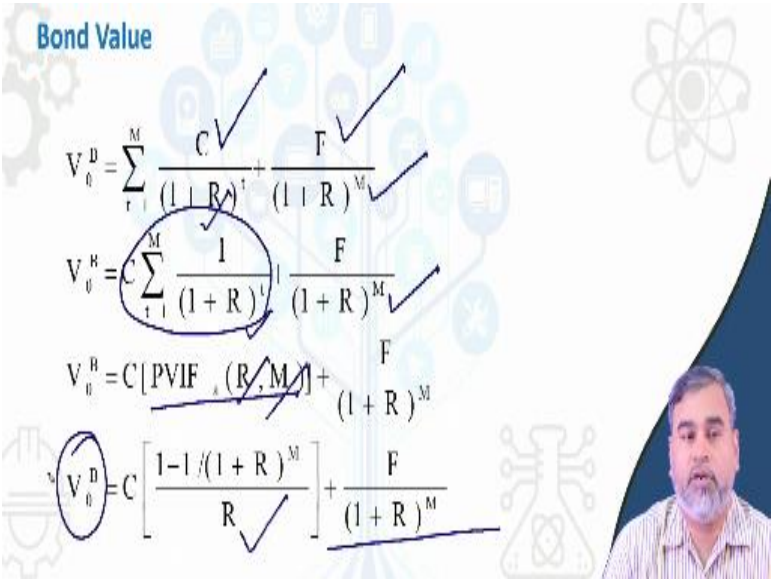

So, if you generalize it then how it basically looks like, it looks like in this way then this is what we have started C by 1 plus R to the t plus F by 1 plus R to the power M, your C represents the periodic cash flow, F represents the face value R represents the discount rate, then your M represents the maturity period. Then it is nothing, but if you take C common then it is 1 plus R summation t equal to 1 to M 1 plus R to the power t plus F by 1 plus R to the power M.

So, this part is nothing but C into the present value of the interest factor into R into M, R equal to discount rate, M is equal to the maturity plus F by 1 plus R to the power M. So this one is nothing but 1 minus 1 by 1 plus R to the power M divided by R. The R represents the discount rate plus F by 1 plus R to the M that already in different valuations ways whenever we consider this geometric progression of that we get basically this one. Then finally we are getting F by 1 plus R to the power M and as well as this component combining this 2 component we can get the value of this particular bond.

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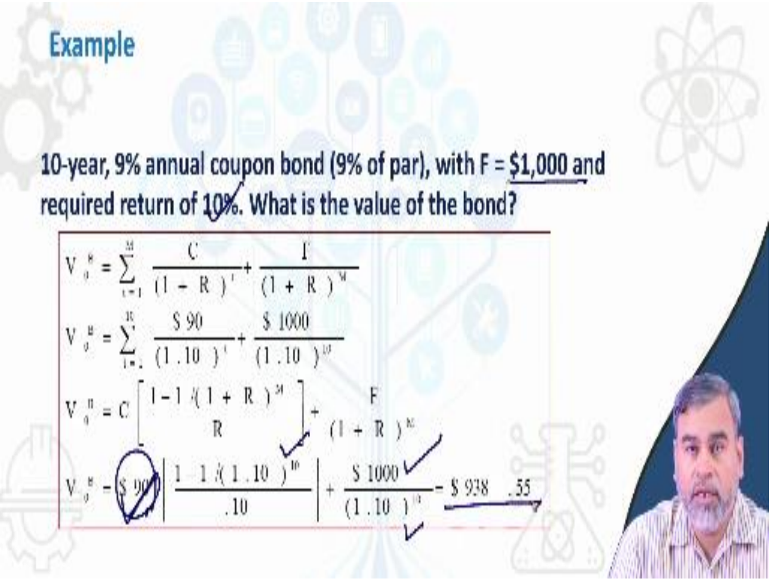

So, now if you see this example how basically we can get the value of the bond let there is a bond which maturity period is 10 years, the coupon rate is 9 percent and your face value of the particular bond is 1,000 and the required rate of return is 10 percent means the discount rate is 10 percent. Then what is the value of the bond, if you go by the same formula whatever just now we have discussed.

We find that it is 90, which is the coupon because 9 percent of the coupon against 1,000, we will be getting 90 dollars into 1 minus 1 by R 1 by 1 plus R, 1 plus R means it is 1 plus 0.1, 10 percent is the discount rate, 1.1 to the power M. M means this is the maturity period is 10 years divided by R this is 0.10, plus 1,000 which is the face value, which has also to be discounted then 1.1 to the power 10 then finally the value of the bond was 938.55.

So, this is basically the value of the bond where the coupon is paid annually and the face value of the bond is 1,000 and the coupon is 9 percent, coupon rate is 9 percent then the maturity period is 10 years. So, for example, if you see that now we will change this coupon frequency.

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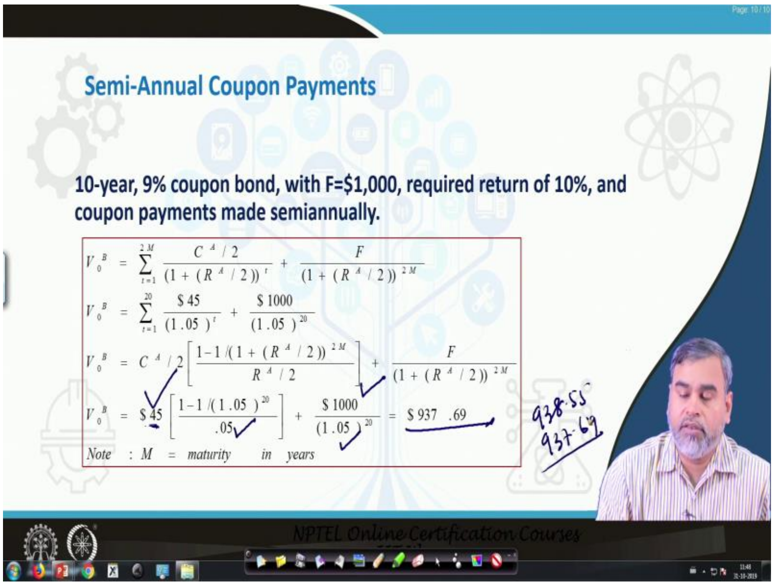

So, for example, if the cash flows are semiannual that means the coupons are paid semiannually. If coupons are paid semiannually then how basically this particular formula or the concept or particular value of the bond is calculated. So, here in this case your number of periods will be double because if the value the 10 years maturity period in the beginning, 10 years then basically we are receiving the coupon 20 times because every 6 months we are getting the coupon.

Then your C basically will be half, C will be half in the sense, the coupon what you are receiving 90 rupees annually that will become 45 rupees. So, in this case how basically we will find that the calculation is same or different and there is some minor differences in terms of the prices because coupon what you are receiving that basically in the semiannual basis. So, just now whatever I told you that it will be 45 which is your C by 2, basically this one is C by 2 which is the semiannual coupon payment whatever we are receiving.

1 minus 1 by 1 plus R, R means per annum you are getting 10 percent discount rate. Now, for 6 months it is 5 percent so this thing will be half this thing will be half and this period will be doubled because the cash flow what you are getting that is for 20 times then 1 minus 1 by 1

plus R to the power 2N, 2N means N represents or if you consider here we are talking about M, M represents the maturity period then it will be 2 M divided by R.

R here means the R for that particular 6 months that means it is 10 by 10 percent by 2 that means 5 percent plus face value was 1,000 that will remain same then R1 to the power 2M, 1 plus R to the power 2 M that is your 1 here the R equal to the 5 percent 1.05 to the power 20 that will give you 937.69. So, this is the way for example previous case we got 938.55 in this case we got 937.69, small minor differences always be realized because of the frequency of the payments of the coupons.

Because the cash flow is changing as well as the discount rate also we are making half and the period we are making double. So because of that some minor fluctuations will be there, but more or less the price will be close to that.

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So, like that if you want to go for n-coupons payments per year then your formula will be the rule is basically what you can go for nM in the period wise cash flow period will be nM and your interest rate will be RA by n and as well as your coupon will be also C by n.

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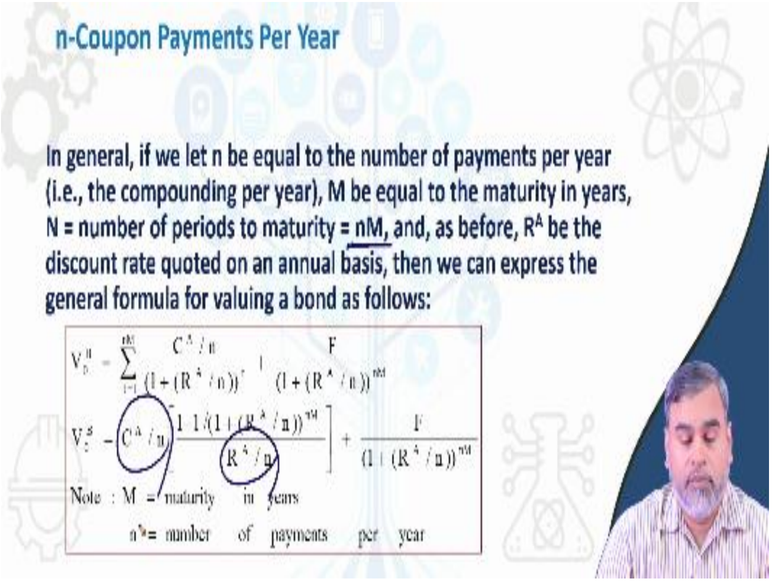

So in that case your formula will become CA by n into 1 minus 1 plus RA by n to the power nM divided by RA by n plus F by 1 plus RA by n to the power nM. So the periods become nM and your maturity period become nM and your rate of interest become RA by n and your coupon become CA by n. So, because of that we can generalize it if coupon is paid quarterly then you can use n equal to 4. If coupon is paid monthly then you make it CA by 12 so like that in this case basically the value of the bond can be calculated.

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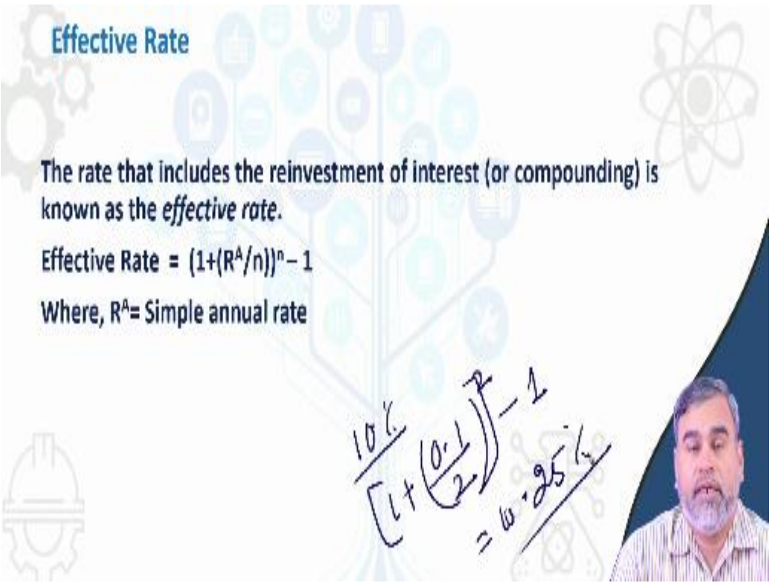

So then we have a concept called the effective rate. So what is the effective rate in this case? So whenever we are talking about the effective rate the effective rate basically includes the reinvestment of interest or compounding that means for example whenever you are going by semiannual coupon payments. So what we are getting that we are basically getting 1.05 to the power 2.

But the effective rate if you want to calculate then effective rate will be 1 plus RA by n to the power n minus 1. So in this case in the previous example if you take for example your interest rate was 10 percent so now it will be 1 plus 0.1 divided by 2. So this is what basically what this is the interest rate which is paid 6 months basis to the power 2 minus 1. So if you see that is basically what that is basically will give you that the effective rate.

So it will be coming 10.25 percent. So the actual annual rate was 10 percent, but whenever we go for the effective interest rate we are getting basically 10.25 percent 1 plus 0.1 divide by 2 whole to the power n minus 1 that will give you the 10.25 percent it is coming because of the reinvestment of the interest money whatever we are getting within that particular period.

So this is the way the effective rate of a particular bond can be calculated if the coupon are paid in the different frequency or instead of paying the coupon annually if the coupons are paid semiannually or quarterly then the effective rate calculation is quite important whenever we talk about the returns from the bond or the yield from that particular bond.

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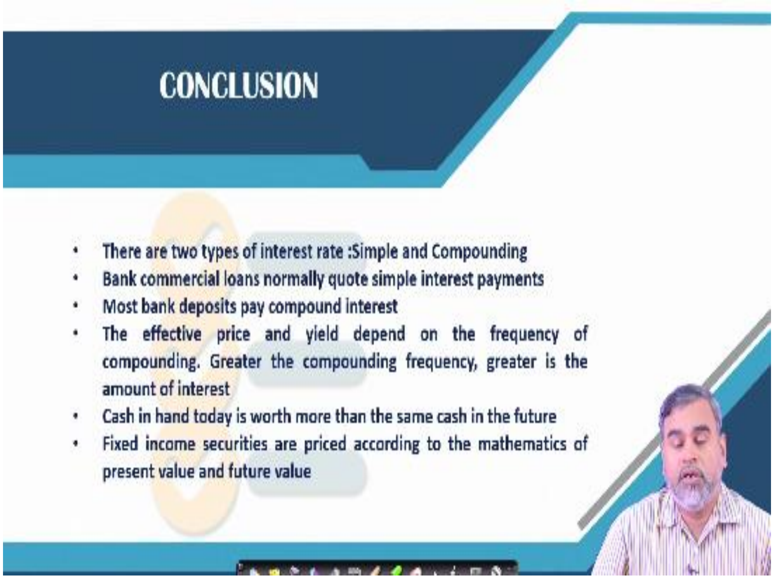

So, if you see the conclusion whatever we have discussed. We discussed about the concepts like simple interest rate and the compounding interest rate and banks generally provides the loans on the basis of simple interest, but the deposit always carry the compound interest. The effective price and the yields depends on the frequency of the compounding and greater the compounding frequency greater the amount of interest that already we have seen.

Then there is if you talk about the value of the money, the value of the money today is always more than the same amount of the money in the future because of the time value of money concept and the fixed income securities are basically priced according to the mathematics of the present value and the future value and the value of this particular bond is nothing, but the present value of the cash flows what we get it.

Or future cash flows what we get from that particular investment of that particular bond. So in this context the market value or the intrinsic value of the bond is nothing, but the present value of the coupons and as well as the discounted value of the coupons and as well as the discounted value of the principal or the face value of that particular part. So this is about the concepts what we use and some concepts related to the valuation of the bond.

Or the concepts related to simple and compound interest which is a major concern for the commercial banks for their deposit and lending activities. These are the references what you can go through for the detail analysis on this and in the next session we will be discussing about some other aspects related to the valuation of the bonds also. Thank you.