Project Management
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Module No # 6
Lecture No # 26
Discounting Rates and Project Pricing

Welcome back my dear students this is the twenty sixth class for Project Management. So we are continuing with fixed rate, fixed interest rate, variable interest rate and then net present value. So we consider the concept of Fixed Discounting Rate, which is Slide number three zero five.

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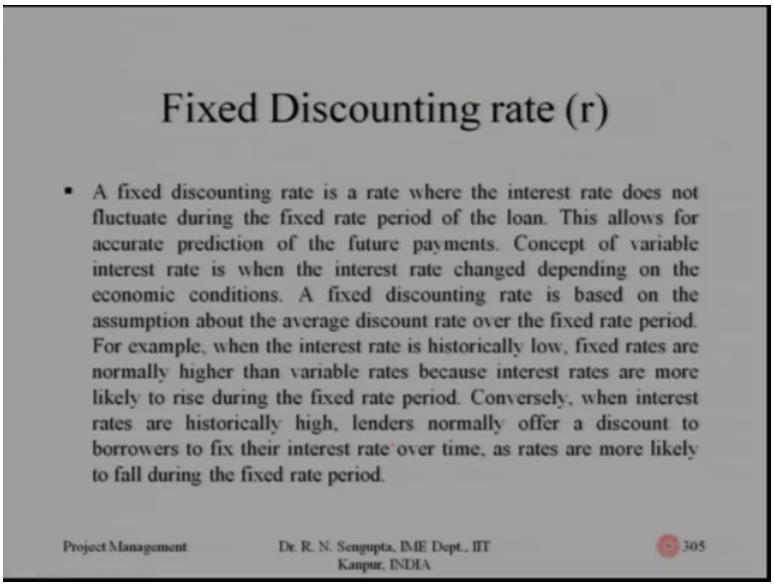

So as written down slide number three zero six, a fixed discounting interest rate is a rate where the interest rate does not fluctuate during the fixed rate period of the loan. If you remember I consider R is fixed and table also. This allows for accurate prediction of future per annum payments. Concept of variable rate is when the interest rate changed depending on economic condition, so changes accordingly a fixed discounting rate is based on the assumption about, about average interest rates over the fixed interest rate period.

For example, when the interest rate is historically low, fixed rates are normally higher than the variable rates, and conversion interest rates are more likely to rise during the fixed rate period. When interest rates are historically high, lenders normally offer a discount to borrowers to fix their interest rate over time, as rates are more likely to fall during the fixed rate period.

If you see in the international and in this domestic market, in international you may have heard about LIBIT and LIBOR which is London Inter Banking Interest Rates offer rate and bit rate LIBIT AND LIBOT. Similarly when you come to the concept of Indian market, you have MYBIT and MYBOR, which is the Mumbai Inter Bank Deposit Rate and the on other rate Bit rate and offer rate. That means two interest rates based on which money is exchanging between the banks.

If I hope not for the normal public, generally based on which banks offer to on other banks money or take money and how interest rates are calculated. So they are other factors also offering banks also which basically on the concept of Supply and Demand.

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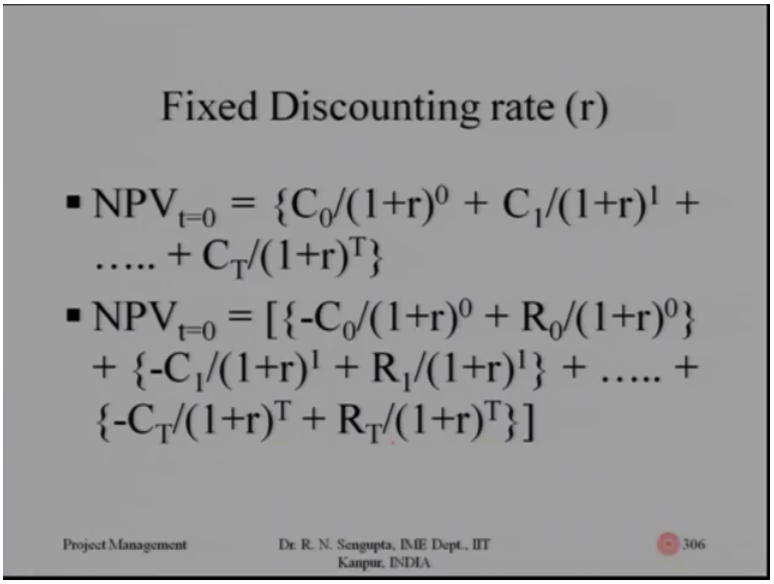

So again the fixed rate, I will using the same formulae as I have done in for concept of interest rate just discussion at fage end last five six minutes for the last lecture. So the net principal annual value is calculates based on the fixed that is C zero, C one and C two fixed are calculate

the net value of the input or output. R which is interest is fixed and for first term is one per cent and R zero, and for the correspondingly for the second term one plus R power one, till last term one plus R power T.

So this is the discounting factors which are coming to the pictures to find out the present value of the money which is Cone after time period C two after time period two and the last value means C suffix after time period after D. Net present value if I consider the input and the outputs. Input means the amount of money which is coming which going now. And again if I consider the revenue and the cost it is given with the negative value which is minus C0 – C1 – C2, corresponding values.

And the revenues are given us zero the suffix value so then R one, R two till the last value which is RT if you see the interest rate is R the same which may not be true as I mentioned the concept that if you go to the bank and take a loan and deposit the money. Or say for example when you go the SBIs foreign exchange counter you go and deposit euros so you go and basically and try to take some Euros out for travel abroad or vacation abroad whatever it is.

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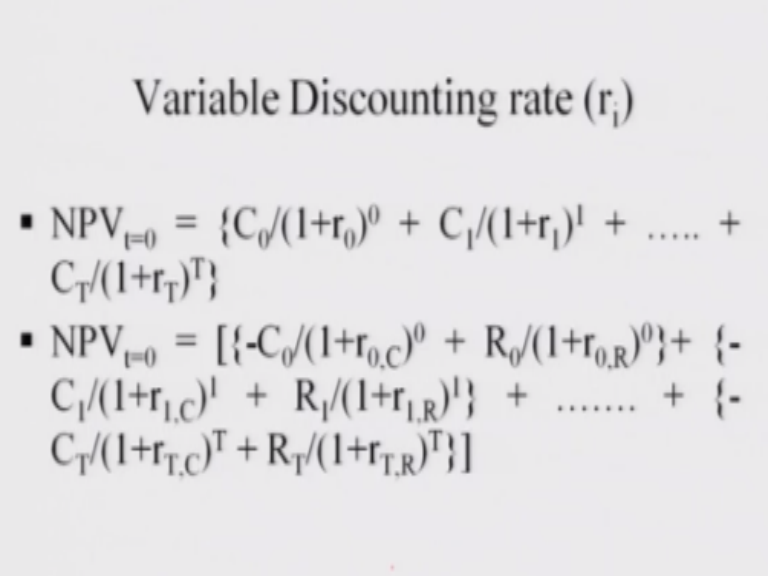

The variable interest rate again the concept is same only the value of the interest rate change are so in the same concept for the first one is variable interest rate so C zero, C one, C two are the

net input output values calculated to provided they are same per annum of time. And the interest rates are variable being R zero, R one, R two till R T.

And the net present value if I want o find out based on the fact the interest rate for the inputs and outputs demand and supply different. Here you see R suffix for the outflows are R zero, suffix zero R for the interest. So based on that you calculate the value minus C zero then minus one so the minus sign is here minus C T till the last term and R zeros are R plus R zero, R one till last term which is RT.

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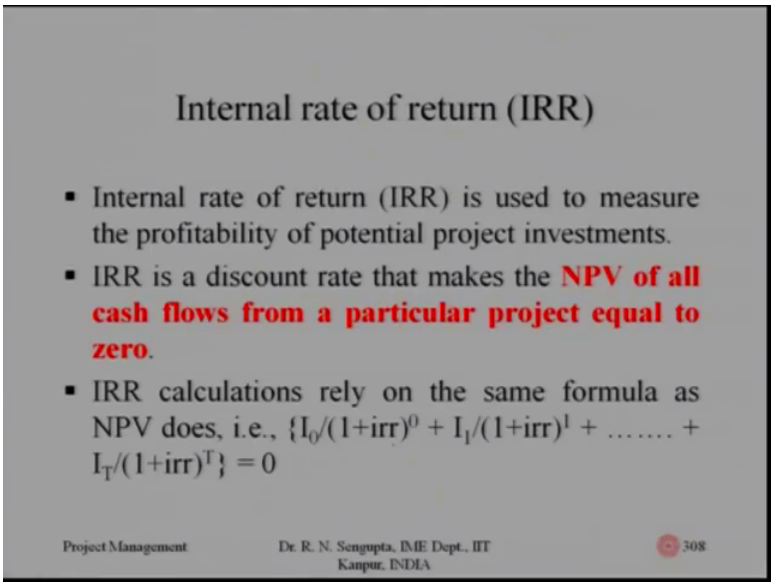

Now the next concept will cover with the internal rate of return IRR the internal rate of return to use the measure of profitability of the potential project investment. So IRR discount rate that makes the net present value of the all the cash flows from a particular project is equal to zero. I want to find out that per annum particular which will net flow of money input and output as on today which is time is zero.

Because based that I want to find out that what should be my quantum of different values of inflow and outflow which is happened to a future point of time such that considering the input – cost output fixed cost whichever I am doing. Today balance such that I neither make a profit or a

loss so obviously then the interest rate which I tried to find now the profitability of the loss of the project would be based on the fact that whether the value is more or less than the value of IRR.

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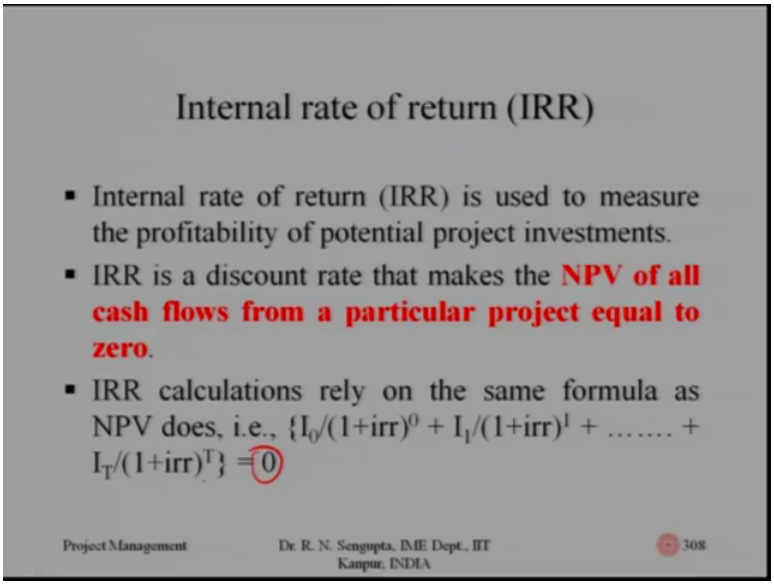

So the formula is Net Present value has to be zero we see if you see in the seventh slide on the left hand slide on both the equality equation it was net profit value suffix t zero so that value become zero as pointed out here.

And IRR is the interest rate so that I have I zero is the open investment time feasible zero divided by one plus IRR to the power zero because that is the time frame is zero. Then for the second time frame, a time period of T I one divided by one plus IRR to the power one and corresponding with last value is I t and I suffix capital T divided by one plus IRR to the suffix capital T. So this value is zero so what you will do is no till no I one I two till I T only thing is to be calculate is IRR use some simple method to find the value of IRR.

Now where IRR is important? If your actual interest based on which you are doing calculation is more than IRR you consider here if the value is more than the denominators are more, the denominators more that it would not may much sense for you to basically go into the invest. So if the net profit value is would be basically less because each term is reducing; if each term is

reducing then it will mean that the right hand the whole sum of value of left hand side must be less.

If IRR is more which means that it would have an effect such as based on the fact making investment decision has to be re looked in order to make the decision for the project justifiable whether it make profit or loss.

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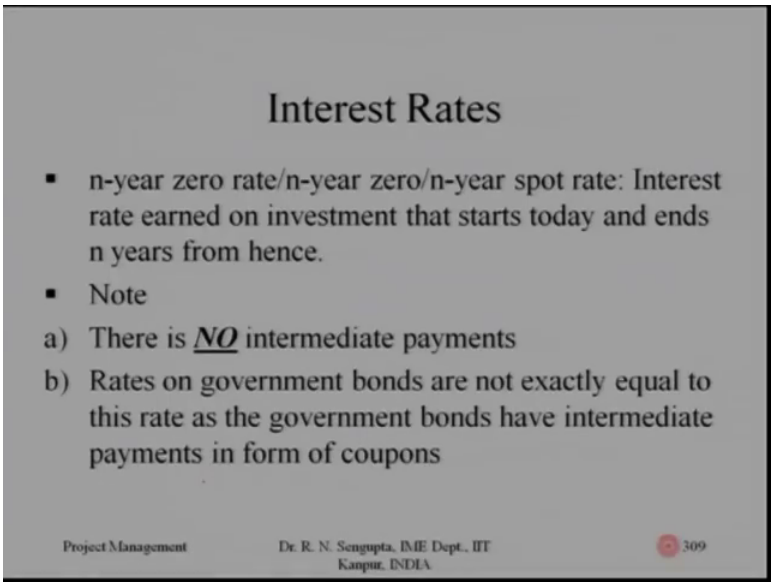

So now we will go into calculating the even though is not directly related to the project concept. As such we will try to find out how the interest rate project management can be calculated. So consider a mere zero rate n year zero and nth year rates. So these are of important for us and you have to calculate. So interest rate earned investment of a project and n years from now, n years again I am telling that n years need not be integers.

It can be three years four months or four years fifteen days, whatever the base calculation is. So note for this concept to find out the n year zero rate n years spot rate whatever calculation you want to do you will considering the intermediate there no payments so the value of AI zero, Ione, I two or C one C two C three or R One R Two R Three R Four.

All these values are not coming to the pictures so only you have I suffix T or C Suffix T based on that you will try to calculate the interest rates. So obviously it would mean once you do the first step of calculation any intermediate payments or intermediate calculations can be done on modeling. So that is not difficult. l once you find out the interest for projects for which there are not intermediate payment you can find out intermediate payment will come to that within few minutes.

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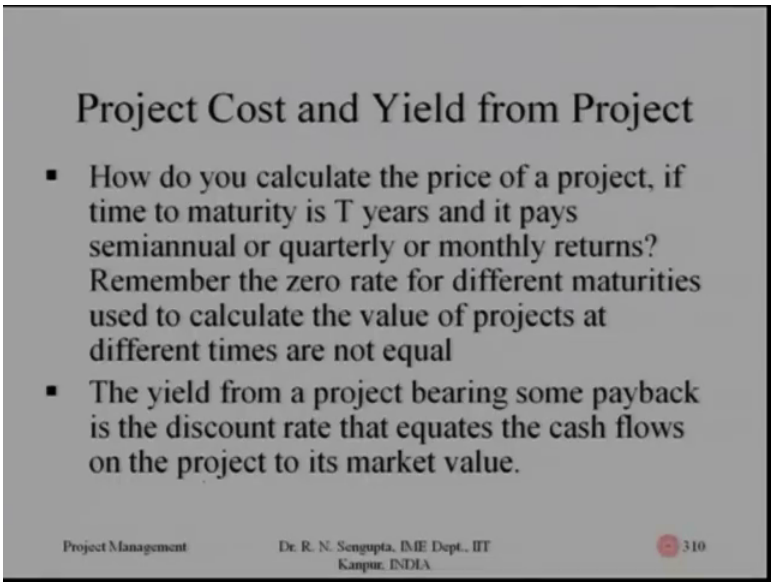

So project cost and yield for the project and we want to find out the what is the return how to calculate the if time to maturity is T years and semi-annual year or quarterly and monthly interest so there remember I did mentioned interest rate is calculated on per annum basis. But per annum payment can either happen quarterly, semi-annually, daily basis or weekly basis whatever it is.

So remember zero rate for different maturity and different times are not equal. So zero rate of different for different time per annum and righty pointed out in the discussion in the last ten fifteen minutes. The yield from the project bearing some pay back is the discounted rate that equal the cash flow of the project market value so the market value is the value based on which that demand and supply would be calculated. So market value being low or high would basically

have a sense whether the interest rate is low or high based on that which you can do your calculations for projects returns accordingly.

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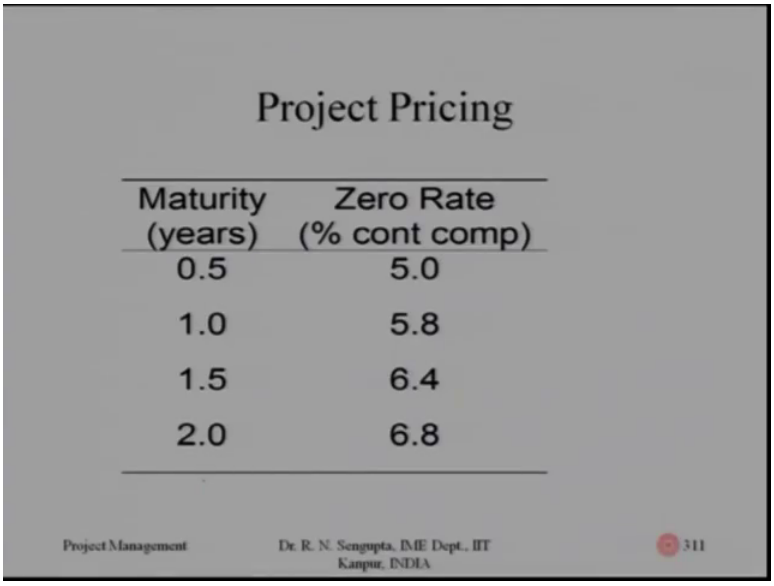

So consider the project pricing that means I want to find out the price of the project and the zero interest rate continuous comp are given. Continuous comp interest, I assume that all the students are aware of that. Based on that I am proceeding so maturity given n years zero point five it means of time period of six months. If you see the third value it is one point five.

A one year and six months so this was maturity in years after one year one and half year two years and the zero interest rates are calculated for six months it is five per cent for duration from the six months to one year period. It is from zero to one year period.

So if the maturity in years are given starting in January two thousand seventeen six months would be the middle of the two thousand seventeen and zero per cent one year would be end of June two thousand seventeen; this one point five year would be middle of two thousand eighteen and two years would be end of two thousand eighteen. And correspondingly the five per cent which you have is the interest rate calculated for the time period from January two thousand seventeen till middle of two thousand eighteen.

If I see five point eight it basically means starting January till end of two thousand seventeen. When I come to six point four it means starting from the January two thousand seventeen middle of two thousand eighteen and the last one June two thousand eighteen basically starting January two thousand seventeen till end of two thousand eighteen. So these are for the time period starting at T is equal to zero not intermittent are not there we need to find it out.

So consider where we have two year project within an initial value of rupees hundred crores and it provides a rate of six per cent per annum so now see here.

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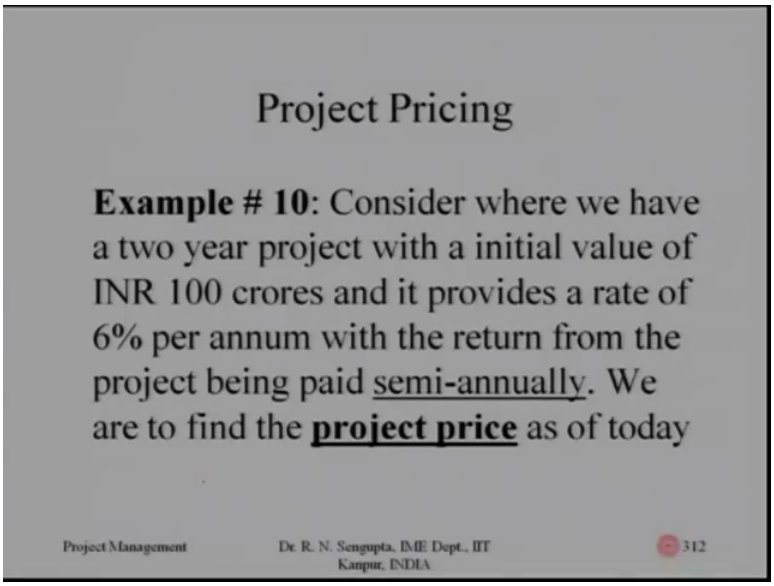

The six per cent per annum as I mentioned it is calculated at per annum basis and last Slide which we discuss which is Slide number three one one, we did mention that interest rate is calculated on a continuously compounded basis. So with return from the project but the payment is done on semi-annual basis so there are three important things.

one Per annum calculation it is continuous compounding value of calculating and the per annum payment happening on a semi-annual basis so it could have been either per annum remains as it continuous compounding interest can be continuous. The compounding concept can be comp concept monthly yearly quarterly whatever is and the payback are given here are semi-annually quarterly basis or a weekly basis whatever it is.

So we are we need to find out the project price. So before I go to the next Slide, I will again try to draw the people who are doing this course their attention on the important facts. One- Per annum, whether it is calculated on continuous comp or simple interest or on other concepts third point is that per annum payment is happening is a semi-annual basis. Can be quarterly, can be yearly, whatever it is. So these three concepts whether I continue doing the problem I will high light it time and again.

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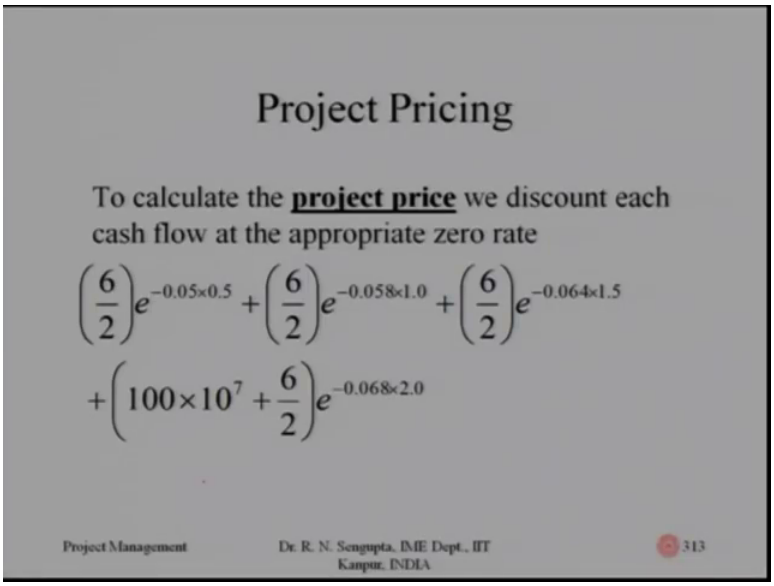

So to calculate the project price we discount each cash flow to the appropriate zero range rate so let us consider the first factor. So six was the interest rate being paid on an amount on a semi-annual basis so if the bear on semi-annual basis, so there would be two per annum payments on yearly six by two being paid for the time period six months. So if I consider the table, the first one which you had for a six month period the interest rate of five per cent.

So here if you see using the concept of continuous comp which basically means yield to the power whatever it is and the negative value means because I am trying to find out the time value of money as of now. So this zero point zero five is coming from the table which is the interest rate for zero interest rate for time period of six months and the zero point five is the time period which is half a year or six months.

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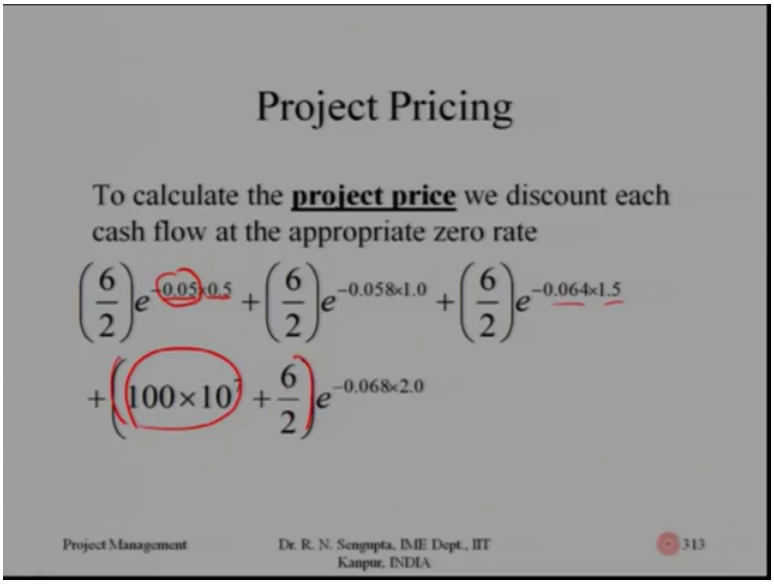

And this six by two is the semi-annual concept of payback the interest so if it was per annum quarterly so considering the fact that the year would be have quarters based on the calculation there the six the value six would be divided accordingly. If it was mention that it was being paid on monthly basis then in that case six would be divided by twelve.

But the values of five per cent which is the first term here, or the year which is half a year, those remain the same. If I go to the next term again semi-annual and six by two, the interest rate for one year period zero point zero five which is five point eight per cent and the time period if you see one point zero. The negative sign as I mentioned is basically the time value calculated as of now her time value calculated as of now.

Similarly If I go to the third term after one and half years the semi-annual concept remains to six by two and yield to the power of minus. You know why it is minus the interest rate is given six point four per cent. Hence it is zero point zero six four and the time frame is one and half years which is one point five, and the last term if you see, it consists of two terms in side the bracket. One is the interest rate six by two and one is the principal annual amount which was hundred crores.

So these values have to be brought to the fact that what is the price of those two principal amounts being per annum along with the interest rate is being per annum what the time value of that as of now. So as of now, hence it is e to the power minus the interest rate as given in the table is six point eight per cent and time period is two years hence it is two point zero.

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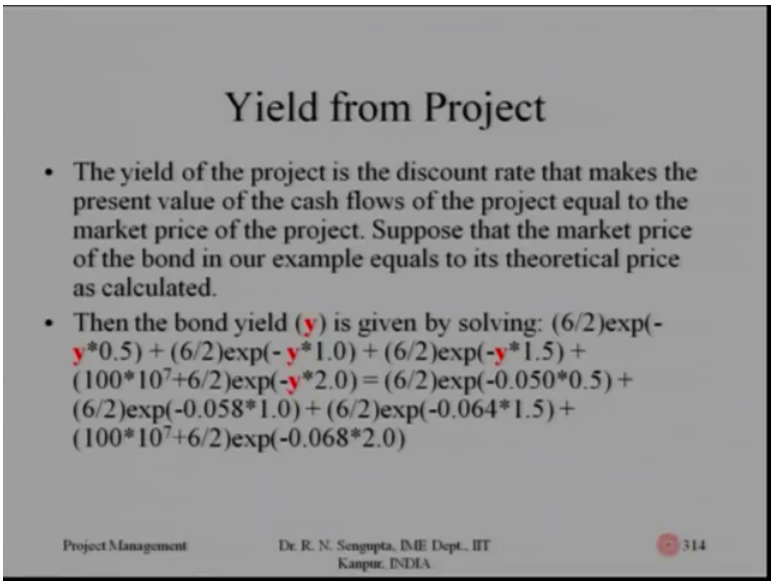

So this would basically give me the calculations based on which I can find out that what is the value of the project. Now, I want to find out the yield of the project. So yield has something do to with the concepts of IRRS. So the yield of project the discounted rate something to that it exactly similar to IRR yield of the IRR that makes the present value of the cash flow of the project equal to the market price of the project.

Suppose that the market price of the bond or the project in our example is equal to its theoretical price as calculated and consider the yield from the project is y is given. Price are being this equation this equation does not look intimidating it is very simple. If you consider the last equation we have solved which was in three hundred and thirteenth one so the term on to the right of the equality to sign to this part is exactly the same.

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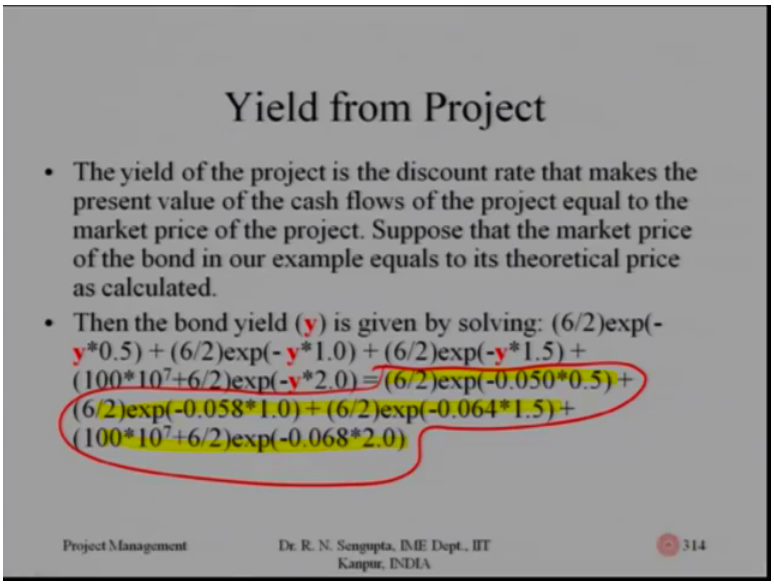

So this per annum RT I will highlight is exactly the same what six by two this is on a semi-annual one these point zero point zero five zero or zero point zero five eight or zero point zero six four or zero point zero six eight are the interest rate based on the calculation of the zero one zero rate for half a year one year, one point five years and two years.

And the time frames are given as zero point five, one point zero, one point five, two. So this has to be equated as a certain value based on the fact that those calculations are calculated using the yield of the project. So which is why Y is to be found out we again do the same calculation for the equation which I am just highlighting.

Now, but only based on the fact, that the semi –annual fact remain the same, six by two. Time frames remains the same the interest rate which we calculate and try to find out the yield so once we know Y is basically the so called return concept equal to based on which you can understand how good or bad the project is.

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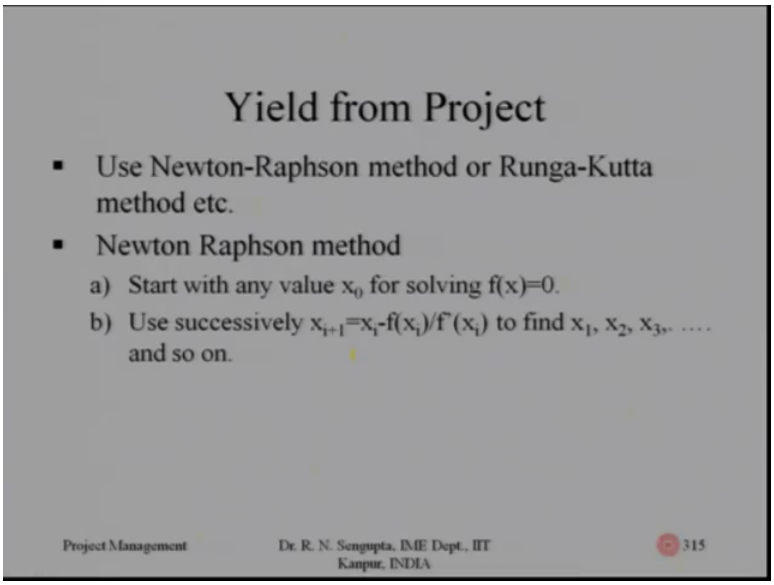

So we can use Newton Raphson Method or Runga-Kutta method and so on. So to find out the value of Y so start with value of X zero which base concept in Newton Raphson or any integrated method you successfully or successively a value of x one, x two, which is the consequent value of x based on the fact what is the rate of change of the function happening in which deduction till you are able to find out some integrated numbers the exact value or some near value based on the fact that it will give quite good estimate of y and you can find out what is the yield of the project.

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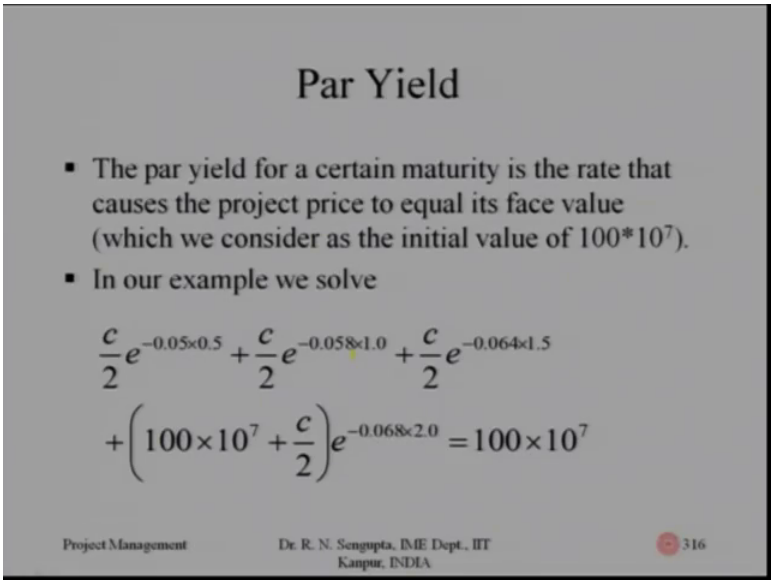

Now we will come to the concept of par value so the par value what we have done is exactly the same year. So the par yield certain maturity is the rate that costs the project price equal its face value face value what we have done is in the first instant IRR was when you put the net present value zero in a case yield we try to find out the what is value of five based on which the value considering the yield value is true.

Considering the actual interest are two what is the value of y such that is exactly balances and based on that you do find out y and par yield basically some interested based on the fact that it will exactly equal to the face value or when the project started.

So I am taking the face value as equal to the actual investment of hundred crores which so here again if the concepts are being information set remaining the same should semi-annual payment the zero interest rate as given five per cent, five point eight per cent, six point four per cent and six point eight per cent; time period being a half a month, one year, one point five year and two years.

And if you seeing the calculation the first term is based on the fact that c is the par annum yield and then you find out what is the present value of the monthly hence it is minus

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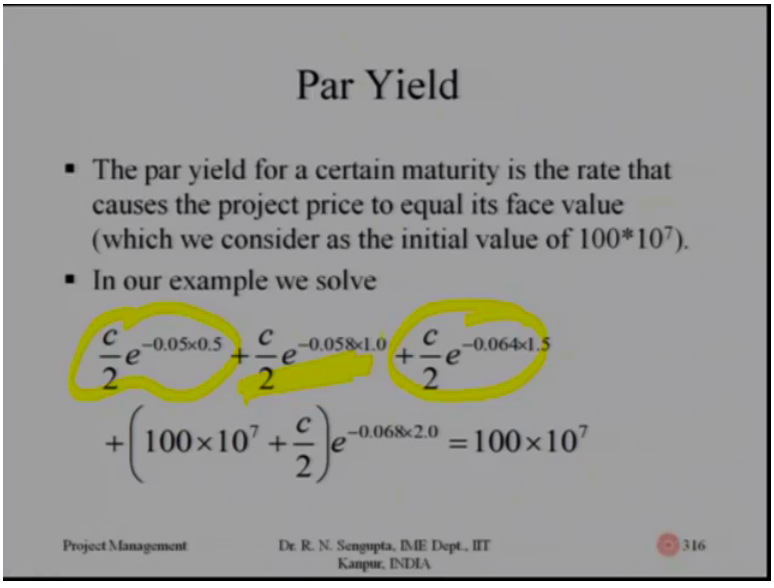

And then this term then if you want to find out the present value for the money for amount of payment after one year this the second term which now high lighting what is the amount of payment of the based on the fact what is the present value of that amount after one point five years the third term is the value and corresponding to the fact that overall project ends after two years.

So two terms one would be based on the fact that is hundred crores and another is the six per cent whatever you receive that are the C value of the per annum value of based on it is basically the divided on a semi-annual basis to find out. So that term has to be brought back as of now which is to be hence it is multiplied by the value of e to the power minus zero point zero six eight multiplied by two and that equated to hundred crores and what we find out C.

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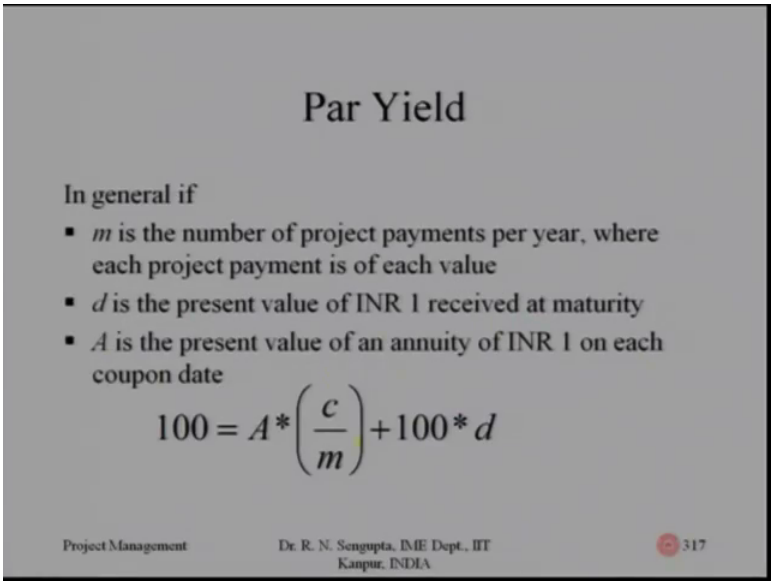

So the par yield considering the concept of par yield further in general if m is the number project payments per year where each project payment if each value is equal. So d is the present value of Indian rupee one received as maturity; and a is the present value of annuity of Indian value rupee one on each coupon so what I need to find out is that if a I equate what you will see is two things.

D is the present value Indian Rupee is to be maturity so what you will do is that t yr to find out the value of two terms. One is the present value of principal amount whenever is paid plus the

overall amount based on the fact what are the intermittent payment which are happened and you want to find out the present value of that.

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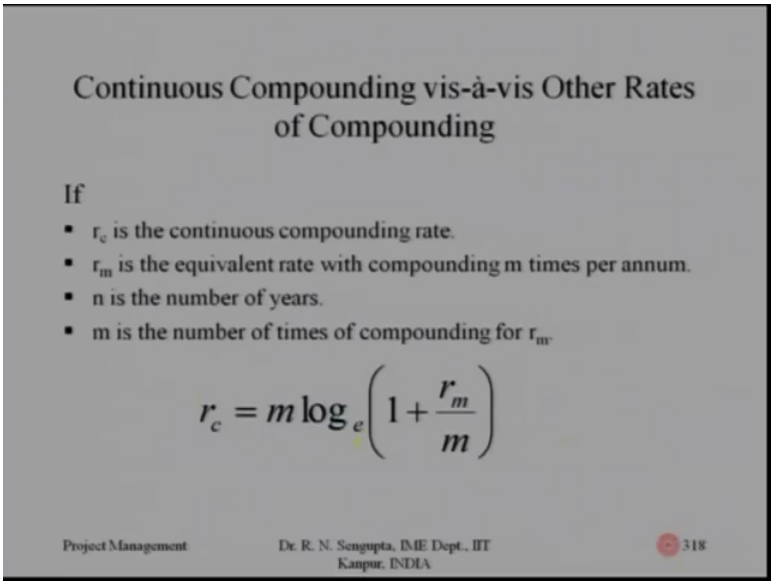

In case R c is the continuous R suffix C is the continuous compounding interest rate RM is the equivalent rate with compounding n number of times in year n is the number of years and m is the number of compounding happening for RM so if you remember I did mentioned the interest rate are calculate per annum basis.

The interest rate type of calculations based on the fact that they are compounding, compounding can happened at quarterly basis daily bass on a weekly basis or continuous compounding basis no. three is what is the per annum pay back concept. So there are two things. One is how the interest rate is calculated based on that I return the money and also is that what is the time frame for how many times I get back the money consider I have invested some amount of money in project.

So what is the time frame is it six month basis is it quarterly basis whatever it is so equal to in this formulae if you read the point m means the number of time compound is happening for RM and RM is the equivalent rate with compounding m number of times per annum.

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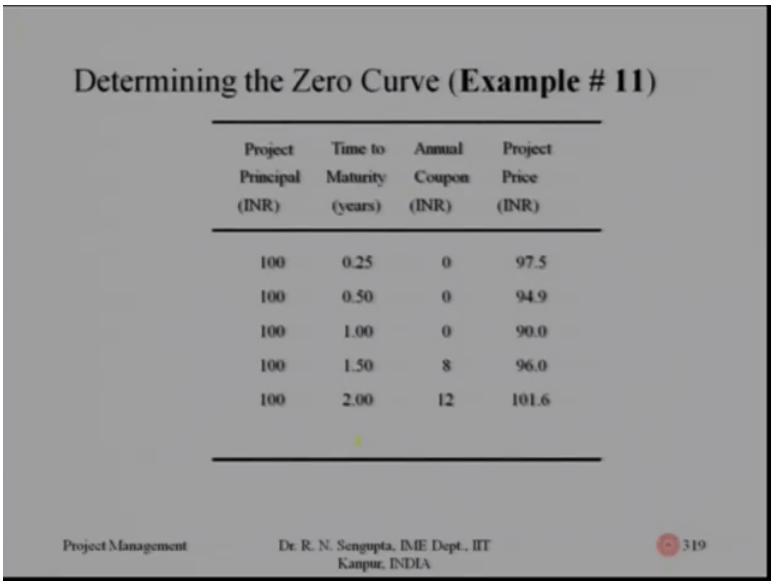

So consider the zero of and you have the project principal amount in the rupees it is given in the first column time is to maturity is given as one fourth of the year, one half of the year, one year, one point five year.

This is one year six months and last factor is two years and the annual coupons, the amount of money of per annum payment which is happening and for the first three instances is equal to t is zero, and for the second last the last one the coupon of per annum to their arbitrary value make to understanding and the project price is calculated based the fact it is ninety seven point five for one fourth of year till the last value hundred and one point six four, two year period.

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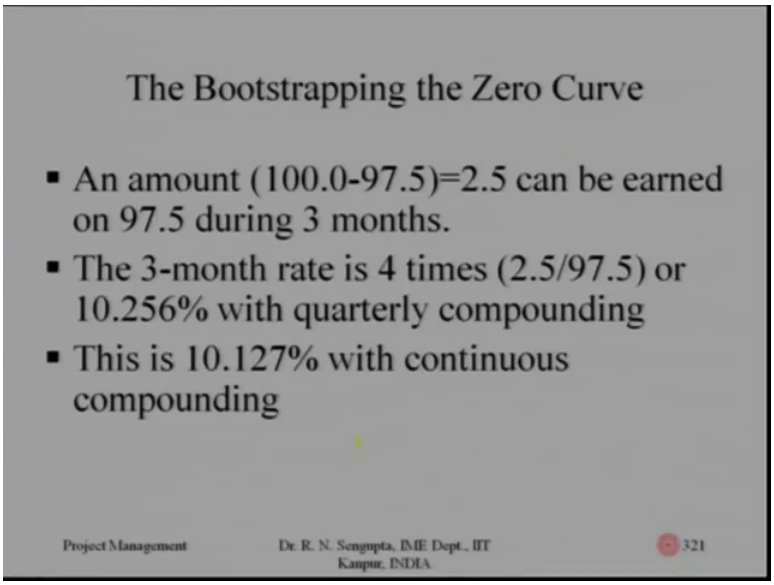

So we assume given as per the concept that half of the stated coupon is to be per annum every six month that is half year duration. So let us go to the calculations so slowly. If you see the first part, it says it is on a one fourth of a year, so one fourth of a year would be three months. If I consider the overall face value of so called project is hundred, and ninety seven point five is the value. Hence two point five can be earned on an investment of ninety seven point five during the three month period because the time frame was zero point five.

So this three month rate would be about because three months means in a year there will four times it will be four multiplied by two point five divided by ninety seven point five. So two point five I am getting based on what ninety seven point five how many times, once in a three months period. How many three months period in a year hence it is four multiplied by two point five divided by ninety seven point five.

On the interest rate is 10.275 with the compounding concept happening on a quarterly basis why because this two point five point zero point two five, if I basically extended on a yearly basis it will be four number of times. Hence quarters are four in number for the year so ten point two five six with the quarterly compounding concept, which we can convert, using the formulae which I discussed, will be ten point one two seven.

So for the first instance when the value of the project was ninety seven point five and the actual was hundred and you were able to find out what is so called efficiency of returns and how many times the returns were paid in a quarter- one quarter, two quarter, three quarter, four quarter. So there were four quarters. If it converted on a per annum basis continuous compounded concept the value comes to a ten point one two seven.

So with this I will close this lecture and continues with the discussion concept Bootstrapping and Zero Curve. And you can find out and utilize those concepts in project management sets thank you very much have a nice day.