Financial Management for Managers
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Lecture 20
Capital Budgeting - Part IV

Welcome all, so we are in the process of learning about the investment criteria and in the previous class we talked about the certain investment criteria and before concluding we were be discussing the first discounted investment criteria that was NPV Net Present Value and we saw that how we can calculate.

So, the decision criteria here is, that if NPV is positive we will go for acceptance of the project if it is negative, we will reject the project and if it is nil, you can call it as the NPV is 0, then certainly we will say that, we are indifferent we can go for that project or we may not go for that project but, that will depend upon the future cash flows.

That after force even period if some surplus cash flows are available then certainly the 0 NPV may become the positive NPV, so there we are indifferent we may go for that investment proposal or we may not go for that investment proposal.

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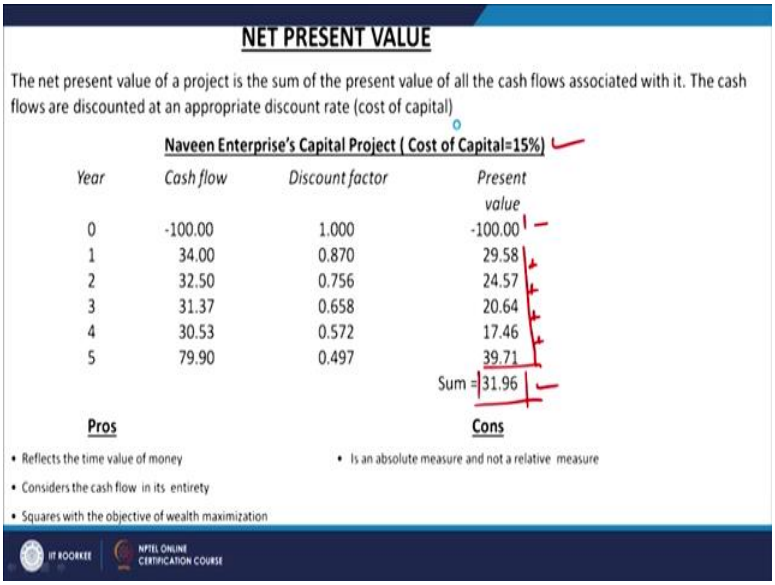

Here are some pros and cons given here in this if you look at some pros some means positive points of NPV are given here and first important point given here is the reflex the time value of money. This is a very important concentration because that is the beauty of that is the basic merit of the discounted criteria that they take into account the time value of money.

And that is more important also because, cash flows occur at the future say number of years and during those number of years means they are far into the future 1, 2, 3, 4, 5, 6, 10 years

up to or may be 20 years up to. So, that time value concept is very important and we should apply while calculating the discounted value of the or calculating the or comparing the cash outflows with the inflows.

Second is the important pros is that is the considers in the cash flows in its entirety, entirety means that we want to say look forward into future and what is the foreseeable period of the project, what is the foreseeable period of the project, all those cash flows are taken together we take the some of this.

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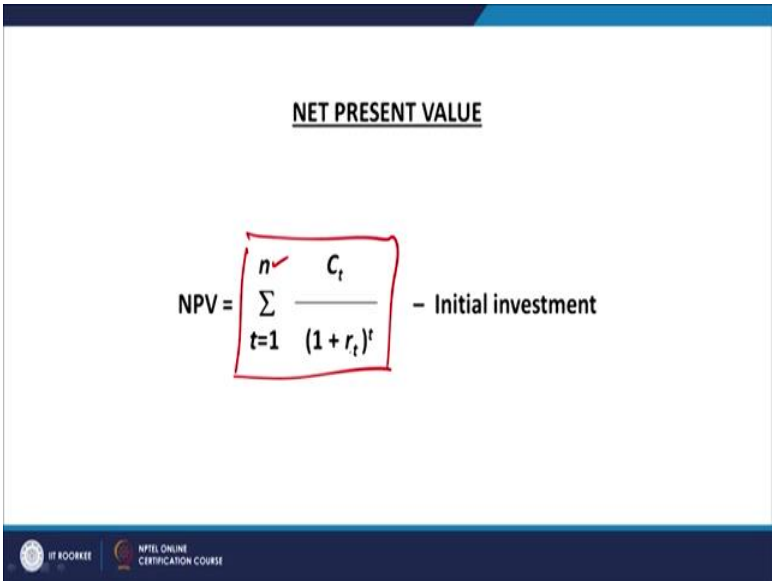

Even when we go back in the formula in this modal also this sigma is basically the entirety means the sigma, sigma is basically the sum of all the cash flows. They are not see in isolation that in the first year what is the cash flow in the second year what is the cash flow, in the third year what is the cash flow.

We do not see it like this we see it as a sum of the, the total number of the cash flows and we discount their values depending upon the year in which their cash flow is occurring sum it up, and then we try to compare the cash discounted value of the cash inflow with the present value of the cash outflow and then we try to take the decision. So, sum together we take all the cash flows here into account this is another important point.

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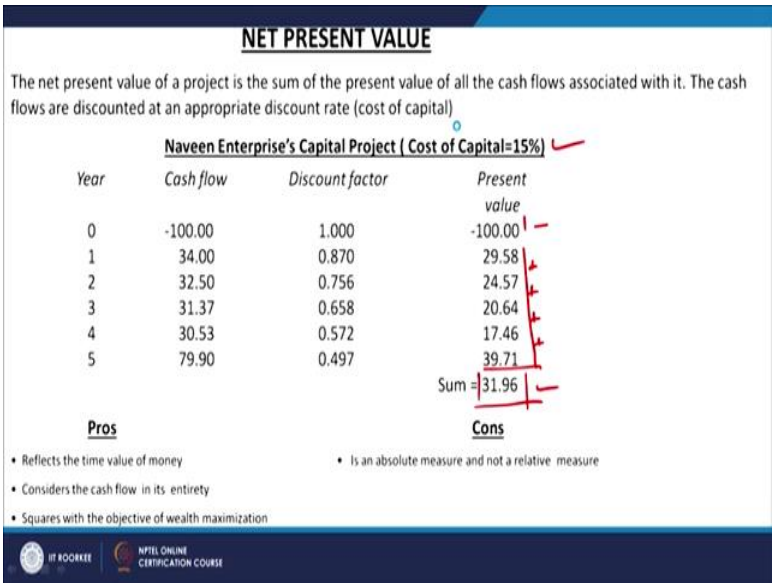

And third is, scares with the objective of wealth maximization because, we want to see how much NPV is available net present value is available, for example here we made the investment of 100 lacs may be or may be the 100 crores or the 100 million whatever this investment will be made here.

And the we are there going to have a surplus of after discounting the cash flows cash inflows we are going to have a surplus of 30.96 crores or 30.96 lacs it means now for example, you are evacuating three projects A B and C one is giving you 31.96 another is giving you 35 another is giving you 40 lacs or the 40 crores so it means what is our objective.

I want to make 100 crores as much as possible at the end of the foreseeable period of this project. Value maximization is the objective of every business, so when you want to achieve this objective of the value maximization NPV when it is taken together in the entirety in the total all foreseeable number of years in that case you compare there, what is the discounted value of these the sum of these inflows and we compare it with the outflows so we say, by making a certain amount of investment of 100 crores at the end of the foreseeable period of the project, how much that 100 crores are going to be back with me.

So, number one, the 100 crore is safe plus they are growing so, they have become 130, 140, 150 so it means ultimately this is the objective of every business is the value maximization or the wealth maximization and that is also going to be verified before going for that investment proposal that yes, I am whether I am going to get back this sufficient return or not, not. So, this is the three pros and then other cons that it says a NPV is an absolute measure and not the relative measure. It is not the relative measure.

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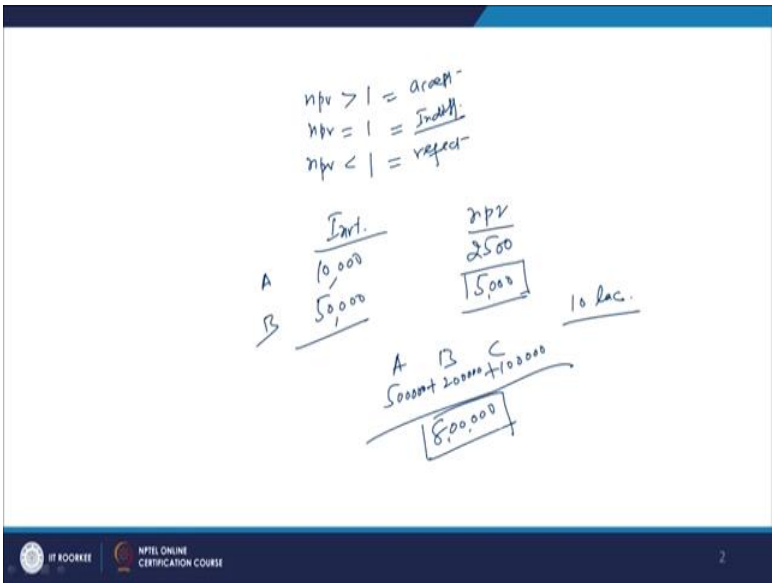

Now how would you explain it absolute measure not the relative measure. For example, there is a project and the say NPV of the project is we call it as the investment, this is an investment we are making and this is a NPV available from the project. This investment is so for example we are making investment of 10000 rupees and NPV available here it is 2500 rupees means after discounting everything and here second project is this is the project A and this is the project B and here you are making the investment of 50000 rupees and NPV available from this investment proposal is, 5000 rupees.

Now, if you have to choose between A and B you would as per this criteria we would go for this project that is given us the maximum NPV that is, 5000 which is double of the NPV available from the project A.

But here what is the limitation we are talking about is, an absolute measure and not the relative measure, is an absolute measure we are only looking at NPV, NPV is 5000 and in the other case NPV is 2500, we are not looking at the investment we are making here, that if you compare these two investments also, that in the project A, by just making investment of 10000 rupees we are getting back 2500 rupees in the project B just making investment of 50000 rupees, in the project B we are making the investment of 50000 rupees, and then, we are getting back 5000 rupees.

So, we do not take these two informations into account, it is not a relative evaluation it is a absolute evaluation and this absolute or relative evaluation the major limitation we look it at, we look at the projects which are given us the highest NPV and we do not compare it with the investment or the other projects.

We see that the projects which giving us the highest NPV that is accepted and the project which is giving lesser NPV that is rejected but we do not compare it with the investment and means it should be a proper cash outflow and inflow but, since it is a net present value, since it is the net present value.

So, advocates of the NPV say, that which one is going to add more values the second project is making 50000 as 55000 and the previous project A is going to make 10000 as 12500 so, the more appreciation is, in the project B in the absolute terms not in the relative terms so, means we will go for the project B which is the major limitation of the NPV criterion but, despite so many limitations and so many problems we make use of this NPV criterion. Now, we go for certain other things relating to this criterion of evaluation.

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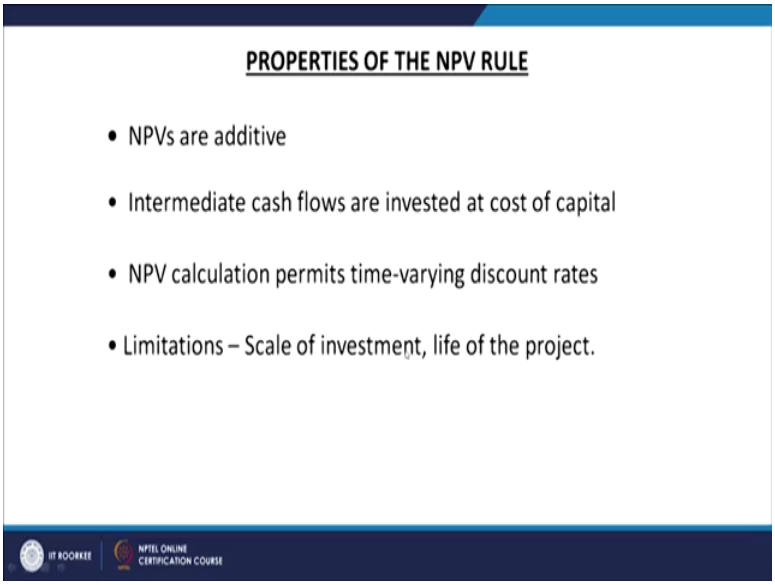

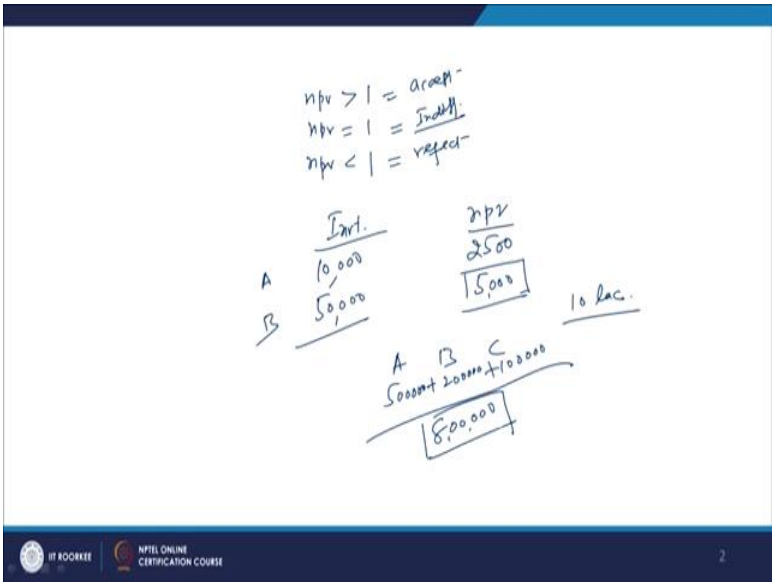

So, now we are talking about the properties of NPV rule, and the first property is a NPVs are additive means this is the very positive and very strength full property of NPV rule that NPVs of the different projects can be added up together. Now, how they can be done here.

For example we have three investment proposals here and if you talk about these three say we have small projects A B and C and total investment we are making here in these three projects say for example 10 lac rupees and here the NPV of this project is going to be how much, the 5 lac rupees this is 5 lac rupees, this is going to be 2 lac rupees and this is going to be 1 lac rupees, from the C it is going to 1 lac rupees.

So, it means if you want to find out the total NPV available, you can add up this and you can say the total NPV available, from all the three sub investment proposals is 8 lac rupees. The sub investment proposals is 8 lac rupees.

So, additive properties are there with the NPV rule which is not with the other investment criteria if you want to go for say the benefit cost ratio or if you want to go for the internal rate of return then these properties are not there. So, here if you use this NPV so it means the multiple proposals or the small proposals of the small investment level the when they are say discounted values or the NPVs are calculated they can be added together and we can say that from the total investment which has the multiple sub investment opportunities. What is going to be total say NPV available.

So, this is additive value that the NPV of the different small projects can be added together and the total net result can be worked out. Second major property is the intermediate cash flows are invested at cost of capital, intermediate cash flows are invested at cost of capital. So, it means when we are talking about the cash flows available here, the total cash flow available here for example, first year we got the 130 this 34 lac rupees cash inflow is there, second year 32.5 third year 31.37 then is 30.53 and then 79.90 cash inflow is available.

So, what we talk is that, we do not get these cash inflows back at the end of very year means these 34 lac is not rupees not going to be withdrawn. That is going to be re invested back so, when you make the investment in the say the investment in the at the end of the first year will be 100 plus 34.

So, that amount will be reinvested back and that reinvested will be at the rate of the cost of the capital, so intermediate cash flows are invested at the cost of capital so, whatever the cash flows are coming up, next year for example now if you talk about the cash flow coming up is

32.50 this is the result of the total investment of this 100 plus 34 so these cash flows we are not going to withdraw we are only simply calculating what is the cash inflow available.

What is the total say return is available so, if you want to find it out, then you have to look at here is that intermediate cash flows we are not going to withdraw from the project, we are simply saying that this cash flow will be available and that can be reinvested back into the business. So, at the reinvested back into the business at the cost of the capital and finally the all these cash flows can be discounted and their total value can be calculated.

Then is the NPV calculations permits time varying discount rates, NPV calculations permit the time varying discount rates. Now, it may be possible that because of the say changes taking place in the time these days, because of the changes taking place discount rates are not going to remain the same, when we are talking about the discount rate here in this case what we are say a writing in this model is 1 plus r t.

So, discount rate when we are writing here is a t it means for the whole of the period foreseeable period of the project may be it is a 4 year 5 year 6 year or 7 years all the say, for all the cash flows we are going to use the same discount rate. We are not going to change the discount rate, discount rate in this model is not time varying but sometimes it may be possible that because of changes of the interest rates in the market because of the inflation in the market because of other investment opportunities available in the market the, discount rate the cost of capital also keep on changing also keep on varying.

So, when there is a change in the rate of interest or the cost of capital. So, your discount rate also has to be changed and when you have to change the discount rate, so there is a little change in this model and then the model will be something like this how the model will become.

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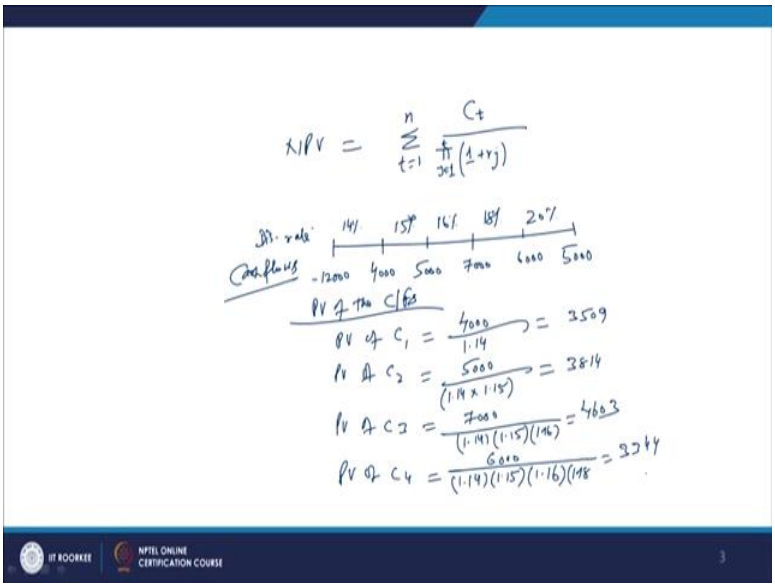

For calculating the NPV the model will become something like this that this is the sigma n and t is equal to 1, this part will remain the same and then it will be Ct that is the cash flow over the year t will be say again, what is there in the previous model this is t but, the denominator will change and this denominator will become something like this that this is the now the time because, there is going to be the say change in the discount factor.

So, this will become as the j for the year 1 and that is 1 plus r j, j is basically the time varying discount rate, j is only for the 1 period this r j is basically, this r it is not rt when it is rt, it means that you are going to use the same discount rate for all the years for which the cash flows are going to be calculated and discounted.

But when you are using this model you are using now, the rj the discounted rj and j is equal to 1 it means in the first year this is going to be a discount rate, in the second year the discount rate may be different, in the third year the discount rate may be different and in the fourth year the discount rate may be different.

So, when we have the time varying discount rates then, means how to calculate the NPV that is also possible to be worked out under the this NPV process so for example, I will solve some small some here, that we have a say project having the 5 years life total, and we take something here we give the shape to this we start from here and here we say that, this is the current period.

Then, this is the 1 2 3 4 and we call it as say this 5. So, this is the two things are going to be here we are going to take one is we are going to take is the discount rate, this is the discount rate we are going to take here as a discount rates and then we are going to take the second

thing is the investment, this is we are going to take here is the investment, amount that is the total this, cash flows you can call it as simple investment oblique cash flows.

So, we take here as the cash flows that will be better to understand this is the cash flows, now in this first case that is its current period that is 0 period in this period the cash outflow is taking place here is 12000 that is I put the minus sign here because , it is the cash outflow so in the first year we are getting the first inflow and at the end of the inflow which is coming to us is that is the 4000 rupees then we take it here as the 5000 rupees then is the 7000 rupees, in the third year then 6000 rupees in the fourth year and at the end of the fifth year we are getting back the 5000 rupees, these are the cash flows available.

For investment of 12000 rupees we are now getting the cash inflow in the, at the end of the first year 4000, then second year 5000, third year 7000, fourth year 6000, and the fifth year 5000 and mind it, these cash flows are occurring at the end of the period.

Period may be month year or whatever it is, one period is one year for example in this case. So, it is not occurring in the beginning of the period basically, it is the ordinary NOT I can say means ordinary this flow NOT I want say it NOT but it is like ordinary NOT that these have say flows so they are uneven that is why I am not calling it as NOT.

There uneven cash flows but they are occurring at the end of the period they are not occurring at the beginning of the period. So, this 4000 is coming at the end of the first year, 5000 at the end of the second year, 7000 at the end of the third year, 6000 at the end of the fourth year and, 5000 at the end of the fifth year, like wise.

Now, will we take the discount rates, discount rates is 14 percent here, then 15 percent here, then we take the 16 percent here, discount rate then we take here is the 18 percent because, with the passage of time discount rates are changing it is rather they are going up, and it becomes here as the 20 percent discount rate.

Now, if this is the case, how to calculate the present value from these say this situation or from these cash flows. For calculating the present value from these cash flows we can now, start calculating it, so now the present value of these cash flows we have to calculate and for calculating the present value of these, present value of the cash flows for calculating the present value what we have to do is.

Now, the present value of what, C1 cash flow 1 you call it as a C1, cash flow 1 because it is time varying what is the C1, in the period 1 it is 4000 and what is the discount rate here, the

discount rate is simply that is 1.14 you have to discount it against the 1.14. So, if you discount 4000 with the 1.14, this amount becomes a something called it as 3509. 3509 but, this discount rate of the 14 percent is valid for the current period only, not for the future period.

Then the present value of the C2, cash flow number 2, if you have to calculate the present value and what is C2 here, that is 5000 and how will you calculate now the present value for this, the present value for this, will be calculated 1.14 into 1.15.

And then you have to calculate the present value of this amount and if you calculate the present value of this amount this works out as 3814, then the present value for the C3, if we calculate what is C3 now C3 is 7000, and if you calculate the present value here, this becomes 1.14 into 1.15 into then the next one is how much is 1.16. So, if you calculate the present value of this amount this becomes 4603, then the Pv of present value of the C4, and if you calculate the present value of C4 what is this C4, 6000.

So, you have to discount it and for discounting again you have to take something like this 1 into 1.14 then 1 into 1.5 and then into 1.16. And then it is the last one is how much, 1.18 you have to take this so, these 4 you have to take multiplying this and for calculating these values you will be finding it out the present values like, 3344 will be the value. Here it is the 3344 is going to be the value and then we can calculate the present values of the present value of see Pv of C5.

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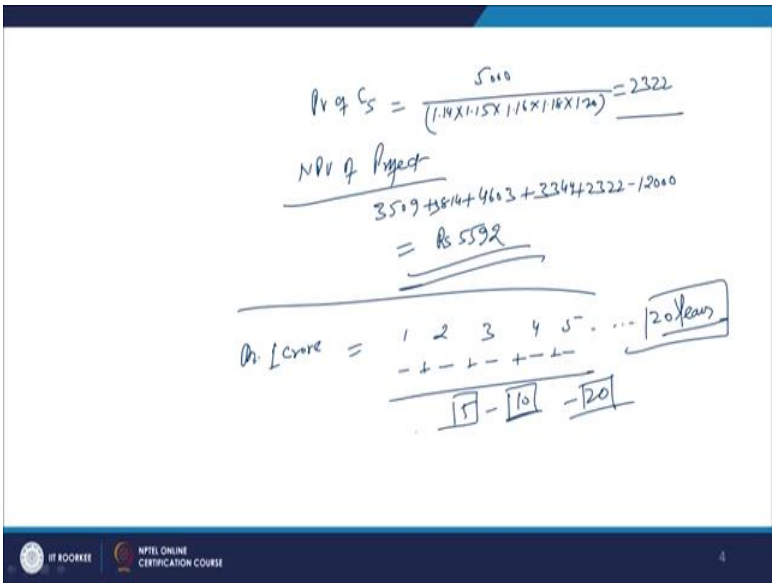

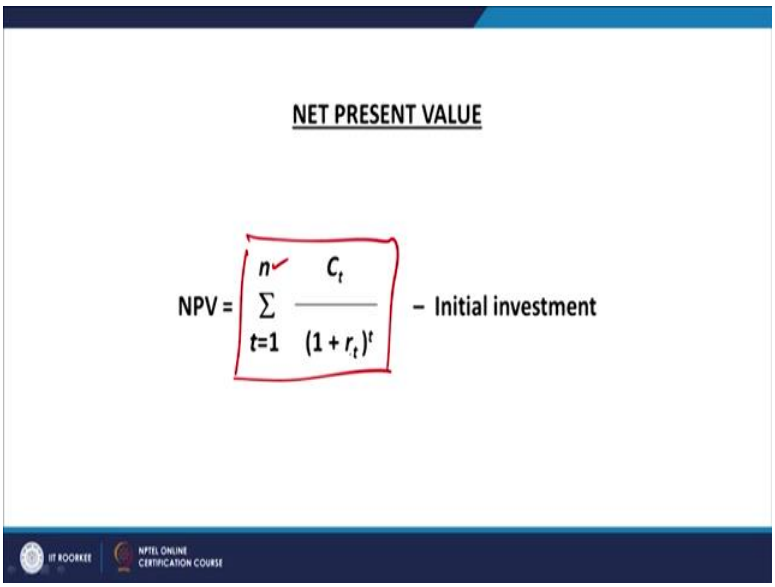

So, it is how much is the C5 here, if you want to calculate the C5 so, value of the C5 is going to be 5000, this is the cash flow and will be divided by what, it will be divided by 1.14 then it will be say 1.15, then it will be 1.16 then it will be 1.18 and then it will be 1.20, so it will be this value will become as 2322 now we have to find out the sum of these values. If we calculate the sum of these values so, we have to calculate now the.

NPV of the project, NPV of project for calculating the NPV of the project, what you have to do is, you have to take all the values so what is the first value, first value was 3509 second value is how much, second value was 3814, 3814 and then the say what was the next value 4603, 4603 and then fourth value was how much, fourth value is 3344.

This value is 3344, and then it is 2322 and now from these values if you now sum them up, what is the investment we have made here is, 12000 rupees. Minus 12000 rupees this plus, this plus, this plus this minus 12000 rupees so, NPV of the project becomes how much rupees, 5592 this is the NPV of the project.

It means by making a investment of 12000 rupees discounted value of all the cash flows available means after adjusting further discounted cash flows calculating the cash flows and discounting it against the say time varying rate of discount. If you find out the sum total value of it, this works out as the NPV is the net present value of the project is, 5592 rupees so it means, means if you want to find out the total amount which is coming back to us that will be equal to the 12000 plus 5592 rupees that surplus will be available to us.

So, the net present value of this project can be calculated where the discount rate is not stable is not a one discount rate single discount rate but, it is the time varying. But it is the time varying discount rate so it means in case of the time varying discount rates you can apply the NPV and this is one of the important property of this model, where literal change has to be done, and in this change what we have done is, here it is r t but, now it will not be r t it will be r j, because for every period the discount rate will be different and how we have to take it, it has to not to be taken as a single discount rate but, it has to be taken as the product of the two periods, product of three periods, product of four periods or the product of five periods.

So, that change is there so, NPV calculations permits time varying discount rates they can be applied here, and then is the say some limitations are also there some when we talk about the limitations of the this NPV method, first limitation is the scale of investment, and that scale of investment, I have already discussed with you that how that scale of investment is not taken care of is, that in this case for example when we are talking about the two projects here where the one investment we are making 10000 rupees.

NPV is 2500 rupees, second investment is 50000 rupees, NPV is 5000 rupees so we will not look at the means while evacuating the projects we will only look at the NPV and we will not look at the scale of the investment. Though there is a 5000 rupees absolute NPV available from the project B but, the investment also we are making 50000 rupees which is 5 times more than the investment we are making in the project 1.

So, while making 5 times more investments you are getting the amount of NPV which is just double of the investment which is being made in the project A, and that is the one fifth of the investment of the project B.

So, that we do not take care of sometimes which is the, some major limitation we always look at the NPV value and that to in the absolute form, and though it has an additive value but, looking at only the NPV and that two without comparing it with the investment is one of the say sometimes considered as the limitations of this criterion of the evaluation.

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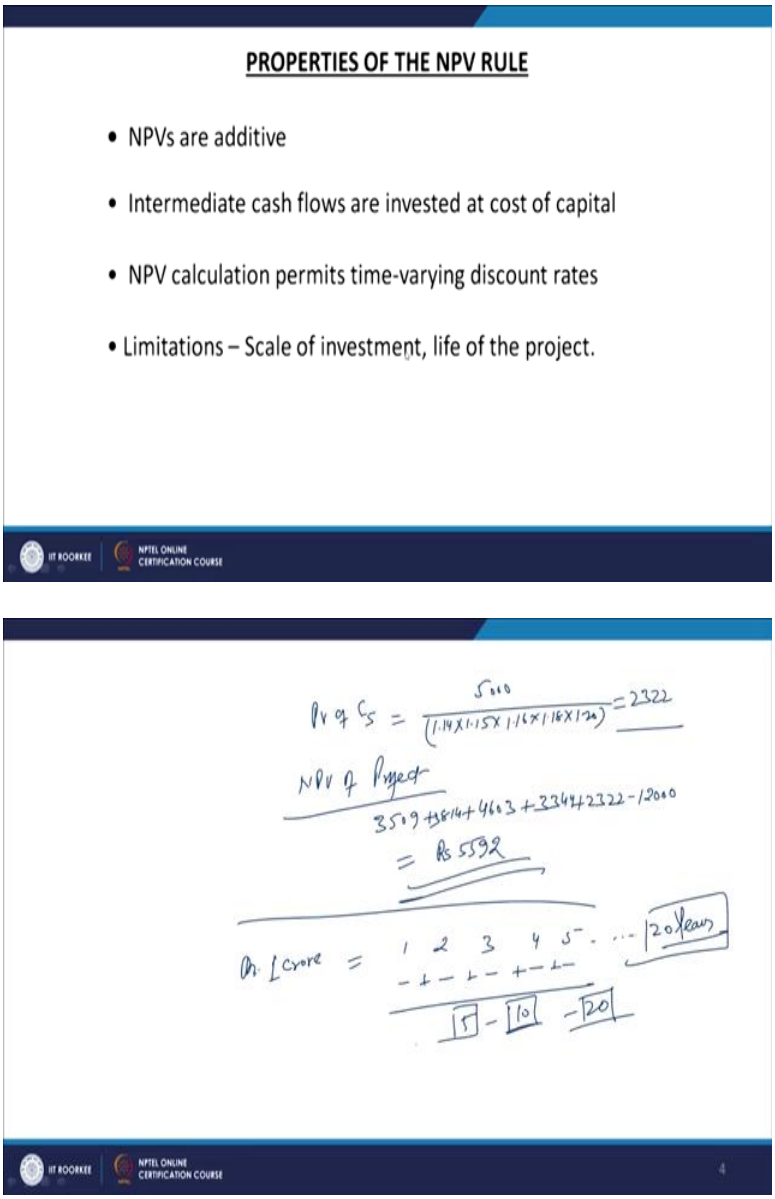

And then the second is the life of the project, life of the project, is very very important criterion here, how you can explain it how you can understand the life of the project, which is a major limitation you call it as say, for example we are making, we are talking about this project here and this project is requiring the investment of 1 crore.

This 1 crore rupees of the investment we are making in one project and whatever the means number of years we are calculating the inflows for, that is for the next 5 years 1 2 3 4 and 5

years because, they are the, there is a foreseeable period as per the information available as per the data available.

So, we will see there what is the cash inflows available, at this point, at this point, at this point, at this point and this point. So, you will sum them up, discount them and then finally the discounted value of all these 5 will be compared with this but it may be possible that this project is going to have total life of a 20 years, total life of 20 years.

So, it means when the total life of 20 years is going to be there, why do not you take the total cash inflows of the next 20 years and why only you are restricting your decision or basing your decision only upon the next 5 years, that is the major you can call it as the drawback of this method, and this all is not being done because, looking forward in to future for the next 20 years, the sometime does not become possible.

Only we depend upon for decision making under this criterion or any other criteria of decision making we only take the cash inflows for the period of time which is the foreseeable period of time which is identifiable period of time and the time which is the total life of the project.

Since, it is not our hands we do not have the data we cannot look beyond a certain point of time, maximum you can make it not 5 years but you can go for the 10 years but the total life of the project is 20 years, you can now look forward that what is going to happen say beyond 10 years, what is going to happen.

Let say 10 years beyond 10 years that is sometime not possible so in this case, you can go up to 10 years, you can go up to 5 years so this is the major one of important limitation also, some people say that we should be able to find out the say the total life of the project and the cash flow should be taken for the whole life of the project not for the only foreseeable period.

So, that is one of the important limitation but, see even say keeping all these limitations into consideration where there is a scale of investment or it is a life of the project. This criterion is very important very useful and it helps us to evaluate the different proposals and the decision criterion is based upon the absolute NPV or the NPV calculated in the absolute value which is calculated after say subtracting the discounted value of the cash inflows sum of the cash inflows from the cash outflow and then we try to see that how much is going to be the net present value available.

Decision criterion is that if NPV is more than 1 or you call it as positive, then we accept the project, less than 1 or negative we reject the project and if it is 0, then we are indifferent whether we go for this investment or we do not go for this investment.

So, this is some discussion about the first discounted criterion of the capital budgeting and that is net present value method remaining two criteria that is the benefit cost ration and internal rate of return, there also very very interesting and useful criteria but those two criteria I will take up and discuss in the next class, thank you very much.