Financial Management for Managers
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Lecture 27
Capital Budgeting Part 11

Welcome all. So, now we are in the process of winding up the discussion on capital budgeting, but as I discussed with you in the previous class that before we complete and wind up the discussion on capital budgeting, I would like to do certain problems with regard to this particular topic.

So, how we discuss means that what we discussed as the say the different investment criteria, how to apply that criteria maybe the discounted and not discounted for evaluating the different capital investment proposals. We are in the process of doing certain problems.

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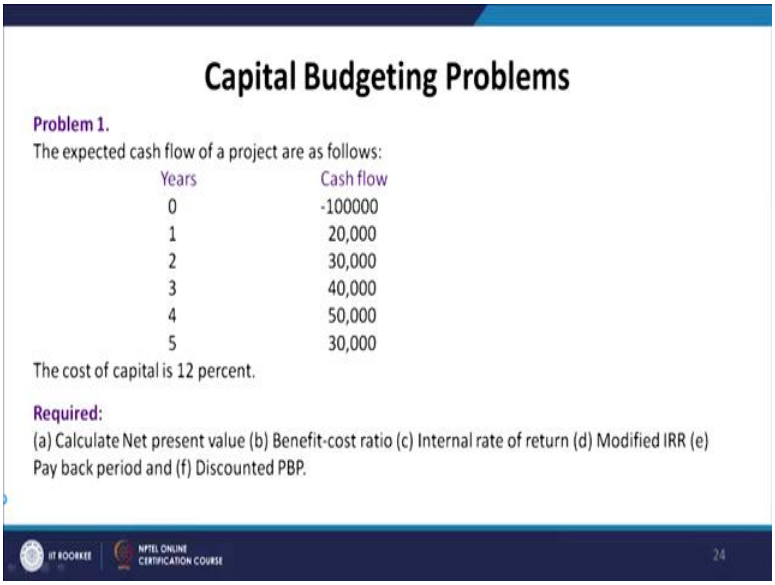

In the previous class also I did one problem where we say learned that how to apply all the 6 say parts of the evaluation criteria means both discounted and non-discounted, where we learned how to calculate NPV, then how to calculate IRR, how to calculate MIRR? How to calculate the benefit cost ratio, how to calculate the payback period accounting rate of return.

And then the, this payback period we are not accounting rate of return, we did it in the previous one and then the discounted payback period, yes discounted payback period we learned about. So, since we had all the discounted cash flows available with us while calculating NPV and IRR, so calculating discounted PBP was also not a difficult job. So, we applied this, we did not apply the accounting rate of return.

Because that criteria is not much in use because out of the non-discounted criteria, only payback period is the one or discounted payback period is the one which we normally use and accounting rate of return is one available in the literature, but used means very less because of no, so many limitations as I discussed with you that say it depends upon the PAT, not upon the cash flows and it is taking into account the total investment coming from both the sources, debt and equity, whereas PAT is only available to the equity shareholders not to the debt suppliers.

So, because of those inherent limitations, we do not use much the accounting rate of return. It was very much in use when the say discounted criteria was not there. Then it was very much in use, but now we use PBP so we learned in the previous problem and then the say discounted criteria we use in that also we use largely two methods, NPV and IRR.

If there also benefit cost ratio, because of some limitations attached to that we means seldom use the benefit cost ratio. So, in the discounted criteria we use the NPV and IRR. And in the non-discounted criteria we largely depend upon the PBP. So, we learned all these 6 methods that how to apply them in evaluating the capital investment proposals or the capital budgeting proposals.

And now we will do certain more in this class, in this as well as in the next class, I will devote two more classes means this class as well as the next class for doing some problems, practical problems. And then after that, we will move to the next part.

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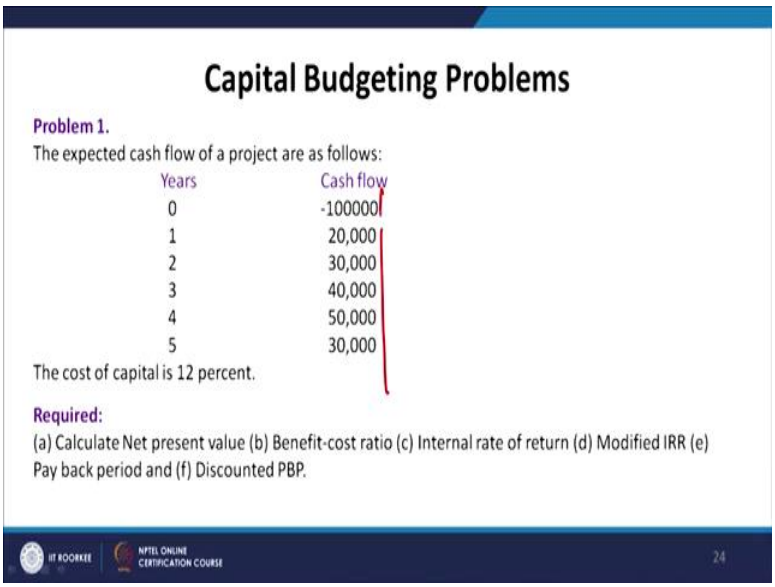

And the next part is the cash flow estimation, that whatever these cash flows we are showing here, these cash flows because we find that this process is very easy, calculating NPV, IRR, or maybe payback period. It seems to be very easy, but it becomes easy provided these inflows and these outflows are available with us.

So, it is means, it is a very complex job. It is a cumbersome job. It has a very means lengthier background procedure to arrive at these figures. These are not a one day job, means we have to prepare the detailed project feasibility report and after that we have to calculate these cash flows.

So, once the cash flows are available with us, yes we can evaluate the proposal with the help of the capital budgeting criteria, but arriving at these cash flows is a very very complex job and we will learn in the next part after completing discussion on capital budgeting, we will learn about the cash flow estimation and then means the different methods involved there and how to go for the cash flow estimation that we will be doing.

So, let us do some two, three more problems and then be clear about how to apply the say capital budgeting and different methods of the capital budgeting or the capital budgeting evaluation criteria.

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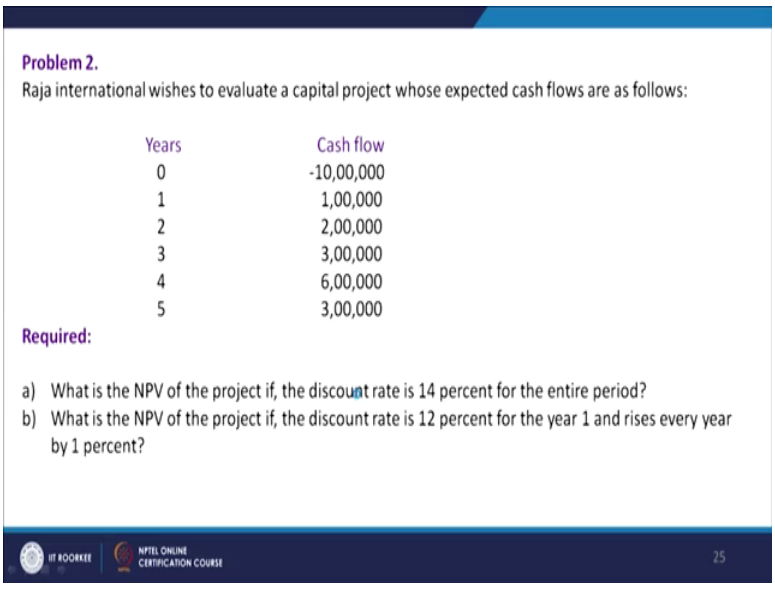

Here in this case now, for example, what is given to us? It is given to us is that Raja international wishes to evaluate a capital project whose expected cash flows are as follows. The cash flows are given to us here for how many years? 5 years, current year is the 0 year

and then is the cash inflow means only current air is causing the cash outflows and then after that, we are only having the cash inflows.

So, at the means end of or till the end of the 0 year current period, we have two shell out, 1 million rupees 10 lakh rupees for building of that project and after that in the first year, we will have the cash inflow of 1 lakh rupee first year. Second year we will have the cash flow of the 2 lakh rupees, third year we will have the cash inflow of 3 lakh rupees, fourth year we will have the cash inflow of the 6 lakh rupees and 5, year 5 we will have the cash inflow of the 3 lakh rupees.

And these all cash inflows are say assumed to have been earned at the end of the year, at the end of the year and this is also we say that till the end of the current period, 0 period we are incurring or we are shelling out or investing 10 lakh rupees 1 million rupees and that is going to give us the total annual inflow which is also at the end of the year.

Now required, what we have to do here is, what is the NPV of the project? If the discount rate is 14 percent for the entire period, if the discount rate is 14 percent for the entire period and b, second question is important, what is the NPV of the project, if the discount rate is 12 percent for the year one and rises every year by 1 percent and rises every year by 1 percent?

So, it means we have got now that differential discount rates which are rising, which are changing over a period of time. So, in the first case, we have to evaluate this proposal that if only one discount rate is available for discounting all the cash inflows. And in the second case, we will have to use the use the differential discount rates starting with the 12 percent and rising by 1 percent every year.

So, let us know how to evaluate this proposal and how to calculate the say NPV. In both the cases, we have to find out the net present value, so how to find out that NPV net present value we are going to do or we are going to learn something about that.

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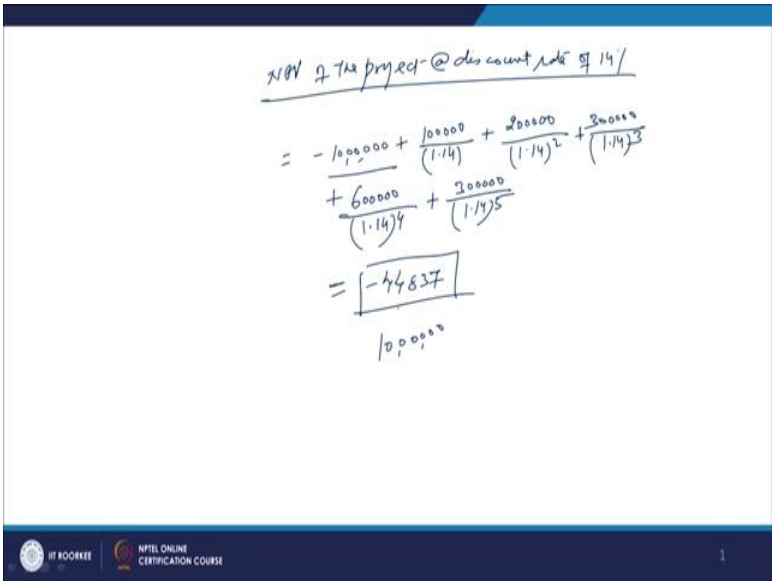

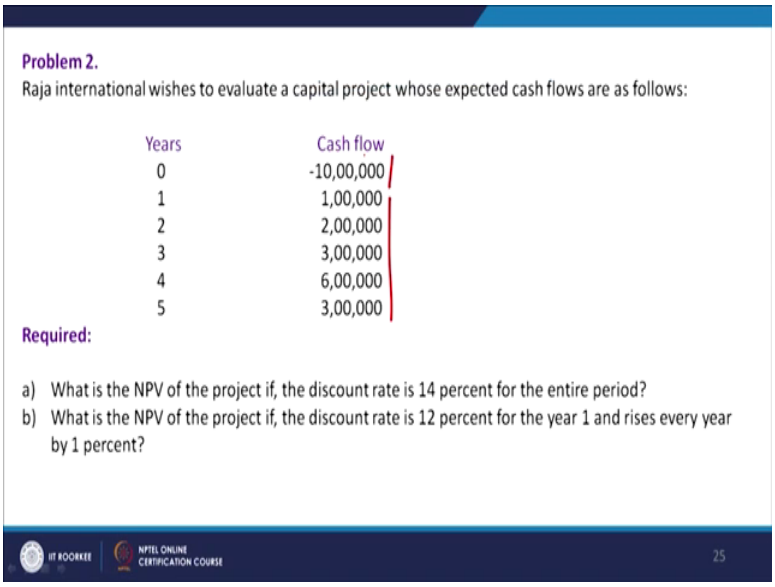

So, now in this case, we will write here NPV of the project, NPV of the project at discount rate, at discount rate of how many, 14 percent, at NPV of the project at the discount rate of 14 percent. So, we will have to now discount it and if we have to discount it, so, what we will do it here?

Now, we will start with the cash outflow and this is the first year cash outflow is how many? 1 million rupees or 10 lakh rupees then we will write here plus very simple means, by this time you must be clear about it. First year cash inflow is how much? 1 lakh rupees 100,000. So, we are going to discount it and for discounting we will have to use the discount rate which is 14 percent. So, this is 100,000 and 1.14 and there is no power as such because it is the year 1.

So, we, without also writing we assume that this is discounted, because it is coming to us at the end of the first year. So, we want to find out the present value of it. Second is how much? 200,000, so it is again 1.14 and power here it is 2 that is because at the end of the second year, so you have to discount it for the future cash flows to be discounted for the 2 years period of time.

Then we have got next thing is the 3 lakh rupees, 3 lakh rupees, 1.14 and power it is 3, 1.14 power 3. So, this is going to be discounted here for 3 years period of time and then we will go ahead with this plus, next is how much we will go to 6 and 3, only two cash flows are left. So, it is 6 lakhs divided by 1.14 and what is the year? Year is 4, year is 4 and then it is plus last is 3, 3 lakhs and then divided by 1.14 power 5, so total number of years are how many? 5, so we are discounting these.

So, we have only, very simple problem it is the one that is only the cash outflow is in the current period that is in the 0 period and in the subsequent 5 years. At the end of every year, we are getting a cash inflow 1 lakh rupees, 2 lakh rupees, 3 lakh rupees, 6 lakh rupees and 3 lakh rupees. So, now we have to calculate the net present value of it.

So, if you calculate the net present value of these cash inflows, this works out as if you solve this, this comes up as minus 44837; minus 44837. This is the net present value. So, it means the project is not worthwhile, we should not go ahead if your cost of capital is 14 percent and that should be the minimum means return available from the project.

And whatever the cash outflows are caused by the project, what are the cash inflows are available from the project, if you discount that and compare the net present value, so this is coming up as means against the say total expenditure of 10 lakh rupees. So, the discounted value is going to be lesser by this amount. So, it means somewhere we are going to get how much?

We are going to get somewhere is that you can call it as 956173. This is the only maximum say the discounted value of the cash inflows, some as a summed value comes up. So, it means 10 lakh we are investing which is equal to 10 lakh in the 0 period and what we are going to get back is discounted value.

Means in some totally if you say then in means we say, without any kind of analysis, you would say how many lakhs we are going to get back? We are going to get back 15 lakhs

against the investment of 10 lakh rupees in the current period over the 5 years, we are going to get back 15 lakh rupees.

But when this 15 lakh rupees coming back over a period of 5 years discounted at the rate of 14 percent. So, we are finding out that by shelling out or by investing 10 lakh rupees, you are getting somewhere 956173, this much amount is coming back as a discounted value. So, the project is not worthwhile or at least you can say that at least the return from the project is not 14 percent, it is lesser than that.

So, we will have to compare it with the cost of capital. If the cost of capital is 14 percent, so we want minimum return of the 14 percent. So, that our NPV is 0. We do not want to incur any kind of the loss, we may not be interested in the profit or maybe the say surplus or the positive NPV. But the decision criteria wants that normally an NPV should be positive more than 0 or more than 1.

But if it is not means, say more than 0, at least it should be 0 means so that whatever the investment we are making the discounted cash inflows coming out of that project over a period of next 5 years, that NPV should be 0. But in this case and it is coming up as a negative. So, the project is not worthwhile. And we can conclude that at least 14 percent return is not available.

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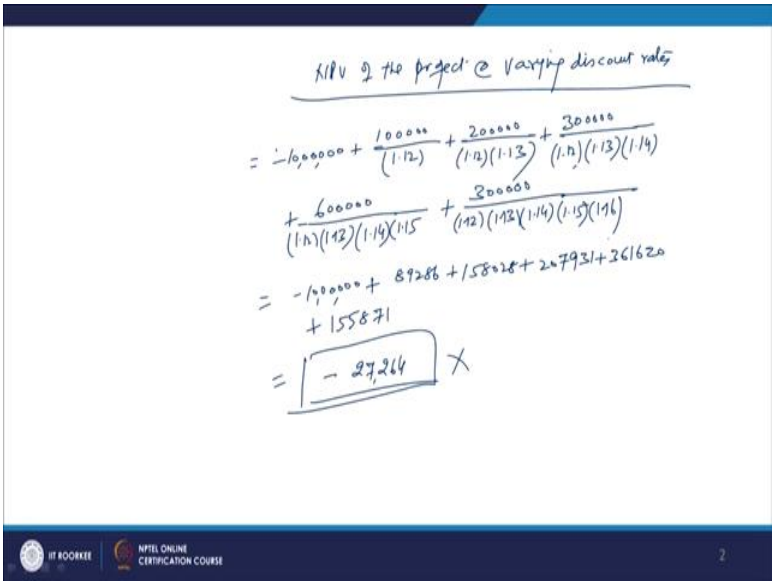

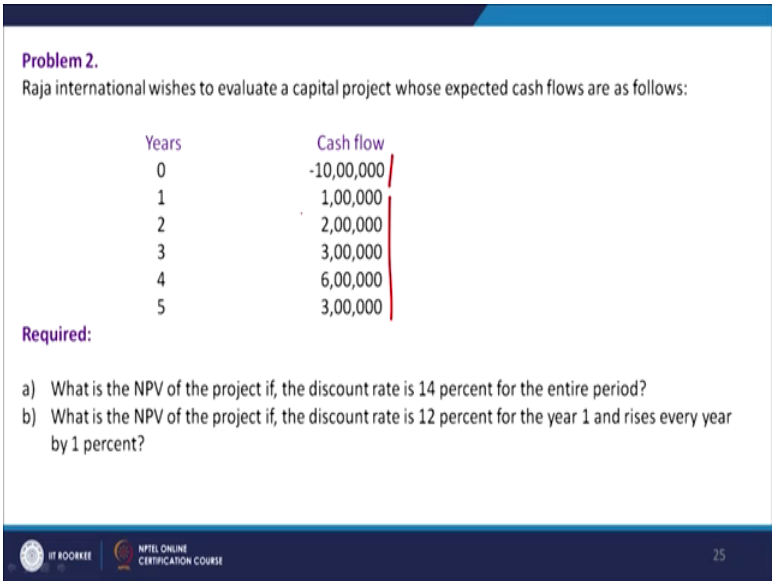

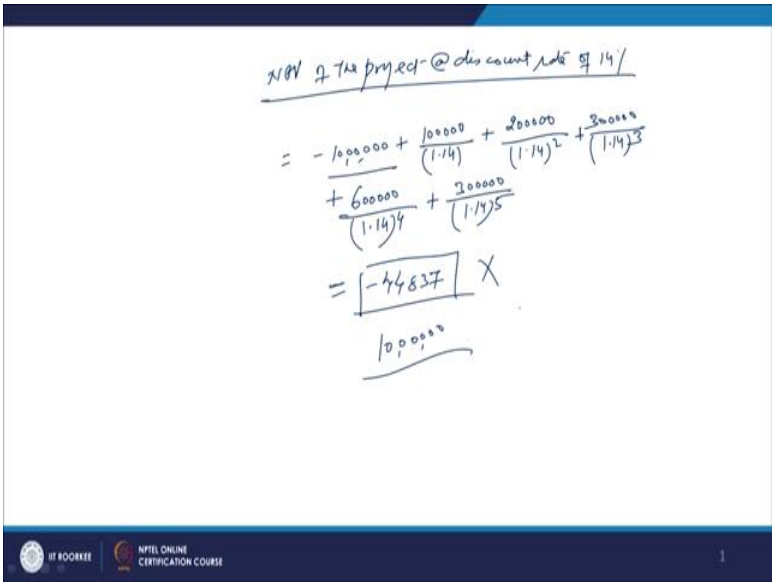

Now, we go for the say NPV of the project, calculating the NPV of the project, NPV of the project at varying NPV of varying discount rates, varying discount rates, we are given the varying discount rates and these discount rates are how much? These discount rates are means minimum is 12 and after that, the discount rate is increasing over the say years by 1 percent at the varying discount rates, so this is another problem.

We have discussed this conceptually also while discussing the theory, we have discussed this also that if the varying discount rates are there, how to solve that problem? So, we are going to solve that problem here, NPV of the project at varying discount rates and when you go for say calculating the NPV of this project, so what you take here is?

You take care is that is minus 1 million rupees, minus 1 million rupees 10 lakh rupees plus. So, the cash flow coming back is how much is, it is? 1 lakh rupees and it has to be discounted

at the rate of 1.12 and this is for a period of 1 year. Then we have to go for here is 2 lakh rupees, 2 lakh rupees and here we are going to discount it at a discount rate what? Varying discount rate.

So, it means current year for only 1 year it is 12 percent and for the next year it is increasing by means by 1 percent. So, it will become 13 percent. So, it will be becoming we have to, how we have to give the effect of it? 1.12 into 1.13 we are going to take it as 1.12 and 1.13. So, we are going to take it like this. So, 1., we are going to take these varying discount rates. So, when you are calculating the varying discount rates, we have to take them like the say product of the two discount rates.

So, we are going to write here 1.12 into 1.13, the two we are taking the product to two discount rates, not one discount rate because it is increasing. Then is the next and next year the next cash flow is how much? 300,000 rupees, 300,000 rupees, 3 lakh rupees, so here we will have to now increase the discount rate further and it will become now say little more complex part and this will be 1.12 into 1.13 and into increasing it by 1 more percent 1.14, this is 1.14 it will be, so we are increasing the discount rate here and we are taking the product of not only means 1 or 2 we are taking the 3.

So, 1.12, 1.13 and 1.14 and then what is the next cash flow now? Next cash flow is 3 lakh rupees and then after that it is 6 and 3. So, it is 6 lakh rupees this has to be discounted further by increasing a discount rate and then it will become if you take the discount rate here it will become the product of 4 discount rates and this will be 1.12 into 1.13 into 1.14 into 1.15. So, this is the product of the 4 discount rates 1.12, 1.13, 1.14 and 1.15 and then it is 6, then it is 3 lakh rupees.

3 lakh rupees means 1.12, then it is 1.13, then it is 1.14 and then it is 1.15, and then it is going to be 1.16 these are the discount rate. So, we are taking the product of the 5, 1.12, 1.13, 1.14, 1.15 and 1.16. If you solve this, so some figures will come up here. In this case it will be 10 lakh is equal to 10 lakh, this is 10 lakh is equal to 10 lakh plus the first discounted value will be how much? 89286, second value is 158028; and then 158028 and then is the 207931 and next value is 361620. And then it is going to be next value 155871.

So, how many? 1, 2, 3, 4, 5, so if you calculate the sum of it, the sum of it will become that is minus 27264, this is the net present value and again this net present value when you are

discounting at the varying rate and taking the product of not one only discount rate of 1.12 but the product of say the discount rates varying by 1 percent over the years.

So, in that case the final NPV comes out as 27264 and this NPV is also negative NPV. So, what we will do? Project is rejected. In case of the previous one, we have seen the NPV is negative project is rejected, you cannot go ahead with this investment proposal. We cannot take up this investment and we have to abandon this investment.

So, very simple in the first case we learned about how to apply the NPV criteria, when the discount rate is stable only 14 percent. In the second case we learned about when there is a varying discount rates then how to apply this discounting criteria and we varied the discount rate, we started the discount rate cost of capital was 12 percent but we varied it and increased it by 1 percent each and we went up to the 16 percent.

So, we took the product of 1.12, 1.13, 1.14, 1.15 and lastly the 1.16. So, these products were taken, and when we took the total products and we calculated the total values, so we have found out that the say NPV of the project has again become negative, though the NPV is means the negative figure has come down to 27000 from the 44000.

But still, it is negative. Because ultimately we wanted for selecting the project, we want that NPV should be at least 0. So, in this case, if the NPV is a negative, this is not worthwhile. There is no point going ahead with this kind of the proposal. So, we should abandon it and we should not make any kind of the investment, capital investment in this project.

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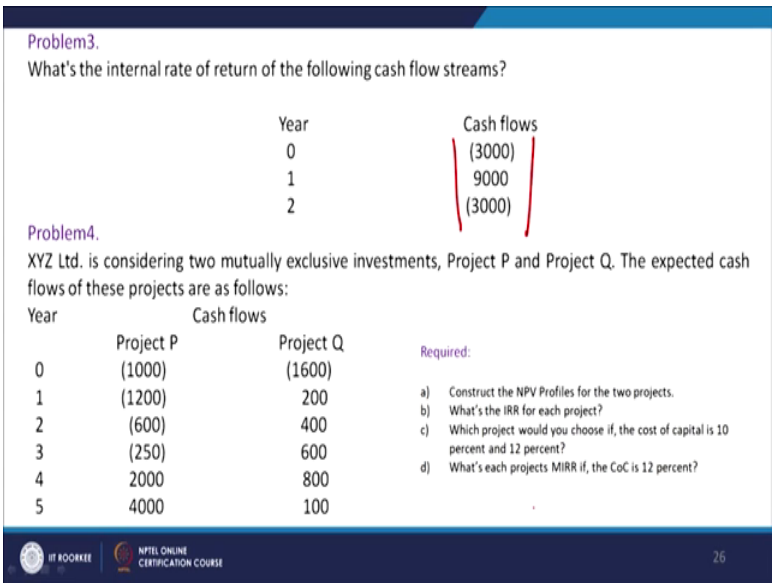

Now, the next thing is we will do one more problem here. And the next thing is that is, it is going to be again interesting problem that problem number 3 if you look at here. What is the internal rate of return of the following cash flow streams? What is that internal rate of return of the following cash flow streams?

And you look at if you look at these cash flows, they are non-conventional, if you look at these cash flows, they are non-conventional that in the first case in the 0 year, we had 3000 rupees of the, or 300,000 rupees of the 3 crore rupees of the say investment we are going to make.

Then the first year, at the end of the first year we are going to have an inflow of the 9000 and again in the second year, we have to again make investment of the same amount, what we made in the 0 period that is of the 3000 rupees. So, in this case there are say how many? There are 3, 2 means total 3 cash flows are there. And in this case, we have 2 cash outflows and the 1 cash inflow.

So, if you look at this, we have to evaluate this proposal and for evaluating this proposal what you have to find out is what is the internal rate of return? You have to find out the value of R, you have to find out the value of R and as I told you that normally the say R that is the internal rate of return, the limitation of internal rate of return is that when the cash flows are non-conventional, when the cash flows are non-conventional that you are making the investment in the 0 period and only the say cash flows are coming over the, cash inflows are coming over the subsequent years, then it is fine. This is a conventional cash flow problem.

But in this case when the cash outflow is going in the current period and then cash inflow is coming, then again cash outflow is going so it means it is a non-conventional cash flow. So, question arises, can we apply the internal rate of return criteria here? Let us see whether we can apply or not, we will calculate the say R, value of the R internal rate of return and then try to find out whether it is worthwhile to use the IRR criterion or not. So, in this case how to you do it?

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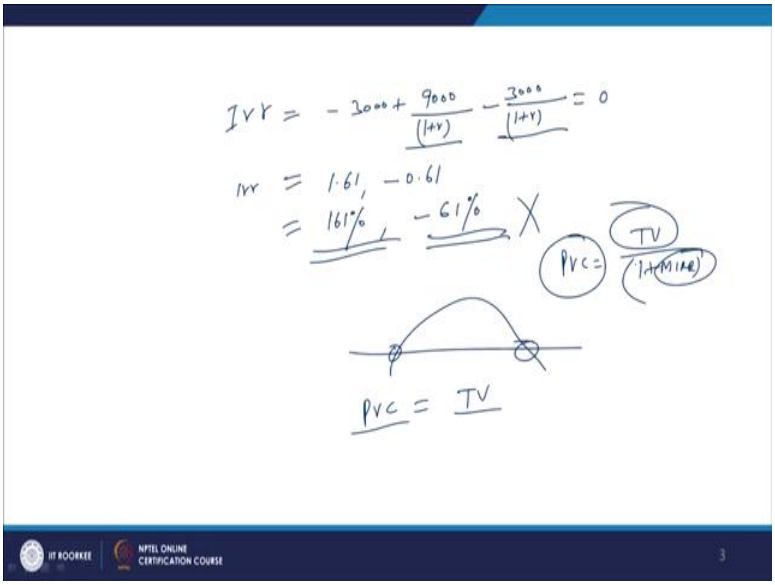

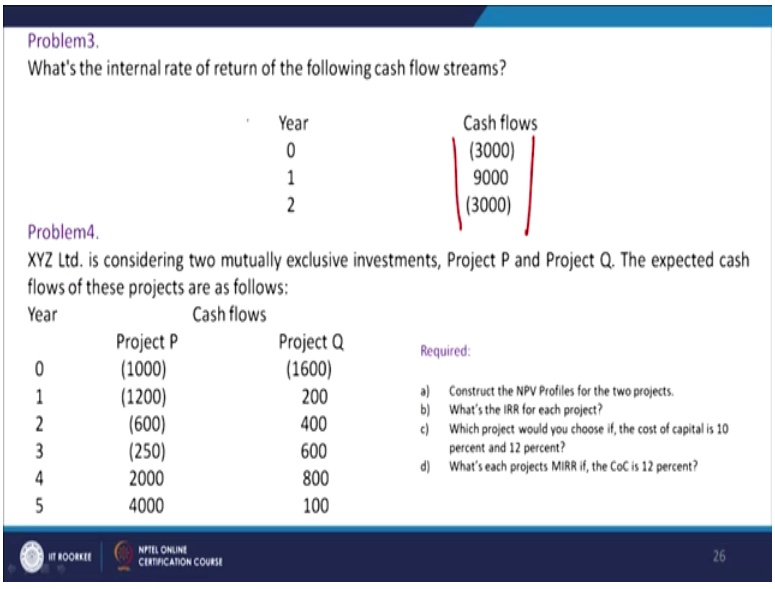

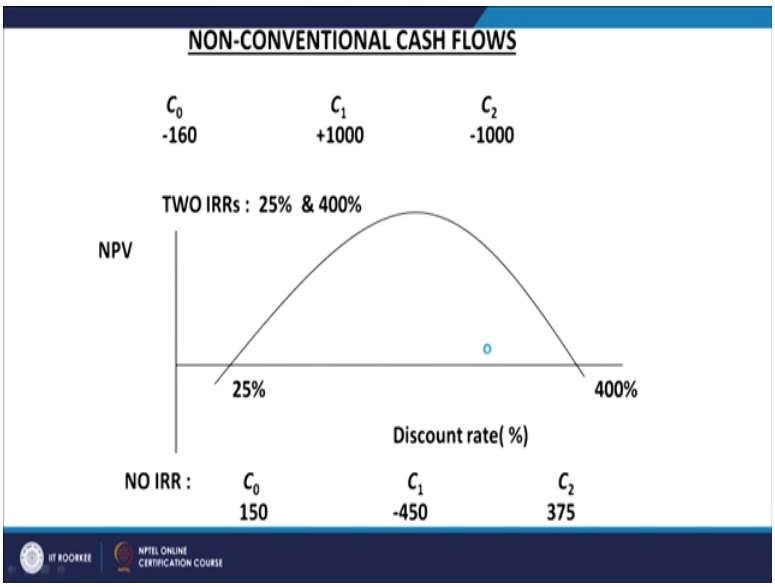

The, we have to find out the value of R that is the internal rate of return or we can call it as IRR. The question is that what you have to find out here is that what is the internal rate of return? So, we are going to find out the internal rate of return from these cash flows. So, these cash flows are what? 3000 rupees in the 0 period, so that is 3000 rupees no point of discounting it then it is the 9000 is coming up in the, at the end of the first year.

So, we have to discount it and we have to discount it with some figure and that is called as R and since it is at the end of the first year, so no power means only 1 which we do not write and then again the sign becomes negative and this sign is again 3000 rupees and here you have to discount it and for discounting will be 1 plus R power 2. So, it means when you are going to make this investment sorry this will not be 2 power 2 because we are making the investment not now. So, we are making the investment in the third year. So, means money will also be going out in the third year.

So, this will become minus 3000 equal to 3000, 9000 to be discounted for 1 year 1 plus R, and you are making investment not now, you are making investment after say, a period of means in the third year. When you are making investment, so it means finally, we have to means again discount it also and this value should be 0 that is minus 3 cash inflow and outflow, where the value is 0, the net present value is 0 that is the our selected internal rate of return.

So, if you solve this equation, if you try to find out this equation with the help of trial and error method, if you want to find out this equation, so what will be this? Value of the R internal rate of return will be if you calculate this, if you solve it and you apply the discounted criteria and try to find out the value of the R with the help of trial and error method.

So, the value of R will be in the one case it will come as 1.61 and in the second case, it will be minus 0.61, in the second case it will be 0.61. So, it means if you convert that into the percentage terms, this becomes 161 percent and this becomes minus 61 percent. So, we are getting the two discount rates, one is the 161 and second one is going to give us the 61 percent.

So, it means, what happens here, we want to find out the one internal rate of return that is the requirement ultimately. But in this case, we have found out the two internal rates of return,

one is positive for discounting the inflow and one is negative for discounting the outflow taking place in the third year.

So, it means the rule of the internal rate of return is means breaks down here, because you are not finding out which one to take. So, when you are going to calculate here as the NPV will be getting the, this kind of the 2 situation this is NPV 0 here, NPV 0 here also.

So, which one to select? You cannot select this. So, this limitation, which we discussed sometime back in the say the one problem that it is a in case of the non-conventional cash flows, if you want to apply the internal rate of return, it is not possible as this is a problem coming up.

So, it means in the one case it is coming up as say 25 percent and in other case it is coming up as 400 percent. So, it means, if you want to apply this you cannot apply and the rule of the, this internal rate of return is broken down here. So, when you are not able to find the one say internal rate of return, so, in that case, what we do?

We do not apply the internal rate of return, this is not possible and this kind of the cash inflows are not required for applying the cash inflow as well as outflows are not required for applying the internal rate of return criteria. So, your answer should be you should show this kind of the calculations working out of this kind of the calculations and then you should try to then find out that say, since we are getting the 2 rates here, two internal rates of return, so it is not possible to apply the internal rate of return criteria and the solution of this kind of the situations or this kind of the problems is that we can apply here the or we can calculate here the modified internal rate of return.

So, if you apply the modified rate of return, so you have to calculate the certain things like you have to calculate the present value of the cost, PVC you have to calculate, then you have to calculate the your say terminal value and then you have to apply the model and that model which you apply is that is a PVC is equal to TV divided by 1 plus MIRR. If you apply this model, then you will be able to calculate the modified internal rate of return.

So, here we are going to calculate the present value of the cost at for this say cost is present value of the cost we are going to get 3000 rupees and then again 3000 rupees and then we are going to discount means this have to be discounted, we are going to calculate the say future value, compounded value of the cash inflows and then we are going to apply this model.

So, if you apply this model you can calculate the value of here MIRR and MIRR is a solution of say in case there are the non-conventional cash flows and if the cash flows are conventional, you can calculate IRR.

But if the cash flows are non-conventional like this, you have outflow, inflow, outflow, inflow, then the solution is modified internal rate of return and not the internal rate of return. So, the answer is that in this kind of situation you cannot apply the say simple internal rate of return.

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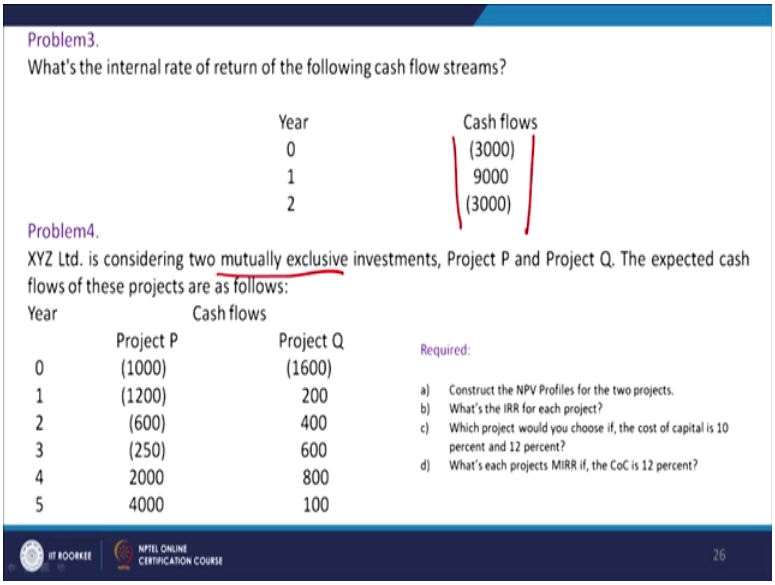

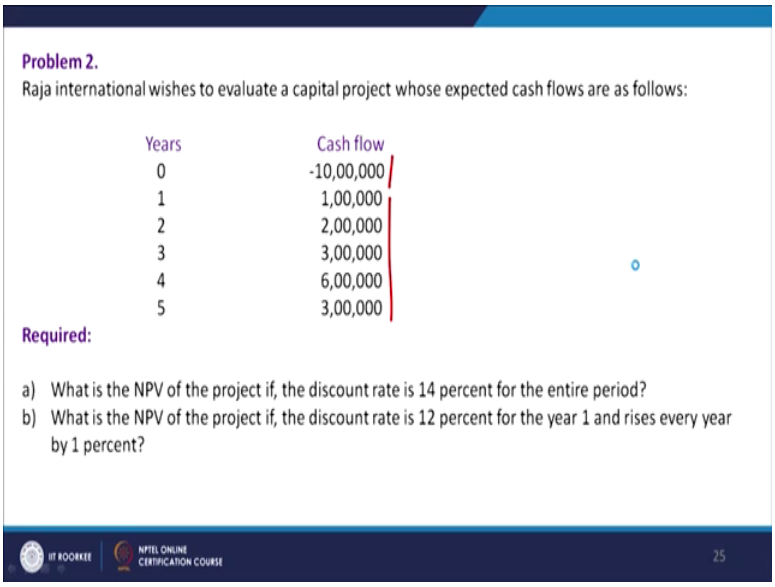

Next problem we go for it is that is a say XYZ limited is considering two mutually exclusive investments. XYZ limited is considering the two mutually exclusive investments. That is

project P and project Q, the expected cash flows of these projects are as follows. We are given here again the period of say 5 years and we are given the 2 projects now.

Now, we have the mutually exclusive projects, this problem is different from the previous 2, 3 problems which we did. There only we had one say project and only the one cash inflow and cash outflow only one issue was there, one project was there and we had to simply evaluate that problem.

But in this case, now the things are different, here we are given the again 5 years period of time, but we are given the two projects. Project P and the project Q and these two projects are what these two projects are? Mutually exclusive, if you can take one, you cannot take other, if you take the second, you cannot take first. So, we have to decide which one is the best product or project or the investment proposal and how should we go for means taking that decision. So, you have to means after looking at these cash flows here.

Now, these are the two different situations in this case, the first how many, 3 years 0 period at the end of last year, at the end of second year and at the end of third year, there are the negative cash flows. It means cash outflows are taking place only here 4 and 5 are giving us the inflow whatever the total information is available.

In this case, we have got the project where the cash outflow is occurring only in the current period, but over the subsequent 5 years, we are going to get the cash inflows. So, we have to evaluate it and there are some questions given here which we have to answer these questions.

So, first question is construct the NPV profile of the two projects, we have to construct the NPV profile of the two projects, one. Second is what is the internal rate of return? What is the internal rate of return for each project? We have to calculate the IRR for each project. C, which project would you choose, if the cost of capital is 10 percent and 12 percent? So, we are have to evaluate these are the two COC's cost of capitals and d is what is each projects MIRR if the cost of capital is 12 percent?

So, almost we have to answer all the questions, what we discussed conceptually with regard to this discounted criteria. Here largely we are going to talk about the discounted criteria, where we are going to calculate the NPV also, we are going to calculate the IRR also and we are going to calculate the MIRR also, only one thing that is the benefit cost ratio is not asked and we are not going to calculate it. And second thing is we are not going to calculate anything which is as per the non-discounted criteria.

So, to answer these four questions, important questions, and to evaluate these two projects, which are mutually exclusive, we have to again do the detailed analysis after say solving all these say questions and say trying to find out the answers for these questions based upon the process which we have learned through the conceptual discussion on the capital budgeting proposals.

So, this means particular problem, problem number 4, I will discuss with you at length, every question we will learn how to answer the every say particular question, but this problem, I will discuss and answer and solve it in the next class. Till then, thank you very much.