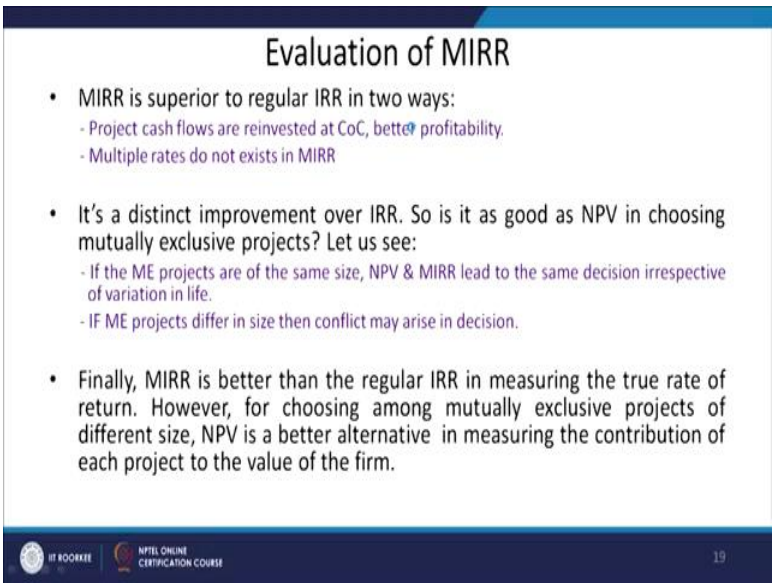
Financial Management for Managers
Professor Anil K. Sharma
Department of Management Studies
Indian Institute of Technology, Roorkee
Lecture 24
Capital Budgeting Part VIII

Welcome all. So, in the previous class we discussed in detail the modified internal rate of return. So, before we move to the next part that is the non-discounted criteria, that is payback period and the accounting rate of return, I would like to say, throw some light on the positive points or strengths of the modified internal rate of return.

Though I have discussed at length in the previous class but still some more points came to my mind that how it is a better rate of or better measure of say, the project profitability or may be the better criteria of discounting the cash flows or may be evaluating the capital investment proposals.

Some important points are here worth discussing so I thought I must share with all of you. So, first important point as given here is that is MIRR is superior to the regular IRR in two ways.

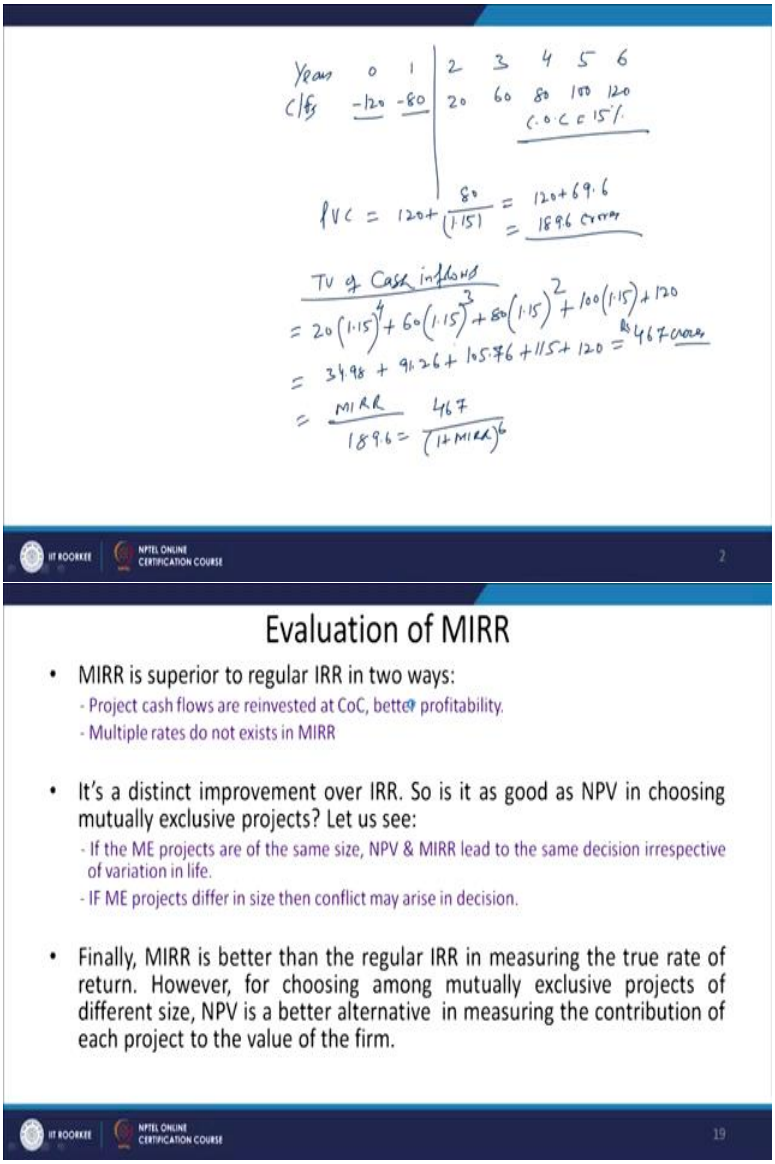
(Refer Slide Time: 01:16)



How it is superior? Number 1, project cash flows are reinvested at COC, not at the, say any other rate of return, means when you talk about the internal rate of return we assume that the project cash flows are reinvested back at the internal rate of return available from the project, whereas in case of MIRR we talk about the cost of capital and whatever the cash flows are

available from the project, they are reinvested back as the cost of capital. That is why you might have seen that when we calculated the terminal value.

(Refer Slide Time: 01:53)



They are at the cost of capital and we have shown here that 15 percent is the cost of capital. So, this is one important thing. In IRR we reassume that, the cash flows are reinvested back at the internal rate of return available from the project. So, second important thing is it gives us the better profitability because then you compare the return available with the cost of capital.

Returns available with the project with the cost of capital because that is the ultimate objective that as a investor, anyone expects that his cost of capital, the rate of return available from the project should be at least equal to the cost of the capital or the cost of the borrowings.

So, when you compare the rate of return available with the cost of capital, it means the better profitability is reflected from any project rather than simply, finding out the rate where the say, present value of the cash outflows is equal to the present value of the cash inflows. Then multiple rates do not exist in MIRR.

This is another important property that you have only one cost of capital, not the multiple rates. In case of the say, NPV also we have seen the multiple discounting rates are there, or they keep on changing. We have assumed one thing that if the multiple rates are there in NPV that for example, say discount rate changes in the year one, in the year two, in the year three or not at least in all the regular years but say, one after the another year, may be after the gap of one year when the discount rate changes, then there is a problem.

Similarly when you calculate the IRR then you try multiple rates means with the help of trial and error method you try to find test multiple rates and only one rate we have to find out and with the, for the precision we have to now use that further more you can call it as the precision formula, so that for example if it is coming in fractions, 16.5 percent.

So, 16 and 17 we can calculate but to make it 16.5 percent or 16.4 percent we have to use another formula. So, multiple rates, means the trial and error method, trial and error method is not required while using the modified internal rate of return. So, that is another property.

Second important point is it is a distinct improvement over IRR. So, is it a good, is it as good as NPV in choosing mutually exclusive projects? It is a very important consideration here. In is very important question also, that certainly we say that it is improvement over the IRR.

So, is it as good as, the NPV in choosing the mutually exclusive projects because mutually exclusive projects you cannot select with the help of the IRR, simple IRR. It is possible to, select or take a decision with regard to mutual exclusive projects with the help of NPV but IRR, means that was the major limitation of the IRR that in case of the mutually exclusive projects we are not able to find out which one is better. So, that was the important limitation in that IRR process.

So, once we have replaced the IRR with the MIRR, now the question arises, is it better than NPV because in NPV also mutually exclusive projects can be chosen and in, with the help of MIRR also the mutually exclusive projects can be chosen. So, here are the two important points to be borne in mind. If the mutually exclusive projects are of the same size, if the

mutually exclusive projects are of the same size NPV and MIRR lead to the same decisions irrespective of the variations in the life.

There can be variation of life, one is having the foreseeable life of 4 years, another is having the foreseeable life of 5 years, another is having the foreseeable life of the 6 years, but the size is same in terms of the investment we are going to make, size of the project in terms of the investment is same. May be the life of the projects is different.

Both the criteria's, MIRR and NPV are going to give us the same results that which one is better out of the two, out of the three, yes it is applicable. But if mutually exclusive projects differ in size then conflict may arise in decision, because one is requiring different amount of investment, another is requiring different amount of investment. Then yes, then the MIRR may give the different results, NPV may give the different results.

So, if the size is same, life is different, yes both are replaceable with each other, NPV and MIRR, but if the size is different then we cannot use MIRR in the same way as we can use NPV, so it means the results will differ. So, these are the two important conditions here. And third important point here is, finally we can say that MIRR is better than the regular IRR in measuring the true rate of return, in measuring the true rate of return.

However for choosing among mutually exclusive projects, it is advice here, however for choosing amongst the mutually exclusive projects of different size, NPV is a better alternative in measuring the contribution of each project to the value of the firm.

Different sizes of the mutually exclusive projects are there. Then you always use the NPV criterion though MIRR is better improvement oblique IRR but NPV and MIRR will give the same results in case of the mutually exclusive projects if the size is same, investment size is same.

If the investment size is different, overall size of the project is different then always it is advisable that we should use the NPV criterion, not the MIRR criterion but in other cases MIRR is a better option as compared to the internal rate of return and easily, easily we can replace the IRR with the MIRR and especially in the projects where the cash flows are non-conventional.

Means at the different durations the cash outflows are occurring, automatically cash inflows occur at the different duration but outflows are also occurring at points more than one, at

points more than one then certainly we should make use of the MIRR because that limitation of IRR not allowing to, means use IRR in case of the projects having the non-conventional cash flows is done away with the help of MIRR.

We can easily calculate the say, with the help of modified internal rate of return, the projects having the non-conventional cash flows can also be evaluated? So, this is all about the say, discounted criteria where we discussed the three methods, largely three methods NPV, benefit cost ratio and IRR. MIRR is improvement oblique of the IRR.

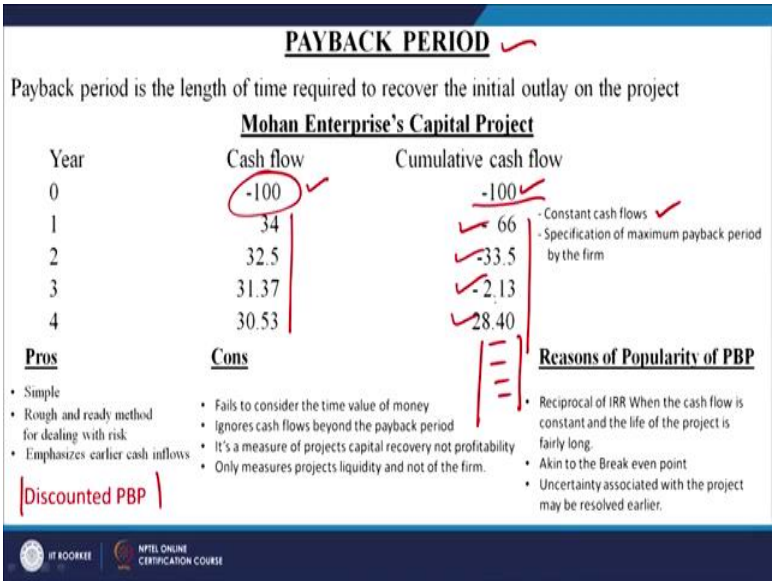
So, but in the real practice we use either the NPV or IRR, benefit cost ratio because of number of its limitations, because you cannot aggregate the projects of the smaller values or the smaller projects put together done at the same time by the firm. If you want to club them together and evaluate then the total investment is not possible. Aggregation is not possible.

Though it is giving you the better estimates in terms of that it say, evaluates the present value of benefits against each rupee of investment but it is not much in use. Only either we use the NPV or the IRR criterion, so then we talk about the MIRR also, that is also in the normal language, in the normal layman language we call it as that, sometimes we use NPV, sometimes we use IRR, but IRR because being in percentage terms is more say, wider in use as compared to even NPV. So, this is all about the discounted criteria.

Now, we move forward with the next part and some discussion on the say, this was the, previous was the discounted criteria, not non-discounted criteria, discounted criteria, whatever the three methods we have discussed till now, NPV benefit cost ratio and the internal rate of return, they pertain to the discounted criteria, and now some discussion upon some of the methods which pertain to the non-discounted criteria.

So, these are the methods like say, payback period method. First is the payback period method and one more method under the non-discounted criteria is the accounting rate of return. So, everything is given here about the payback period method, how it has been say, done or it is normally used, everything, pros, cons and some positive points, reasons for the popularity of the payback period, everything is given here in this slide, means at length. So, what is the payback period? Payback period is the length of the time required to cover the initial outlay on the project.

(Refer Slide Time: 10:58)



We are only concerned with the recovery of the initial outlay which we are going to make in the project and that is also the major limitation of the payback period because payback period is only limited up to that much number of the future years where we are going to recover the initial investment. Once the initial investment stands recovered then further beyond that any amount of the cash flows are available, we do not pay much attention towards those cash flows.

So, we are only comparing how much cash outflow going to take place over the number of subsequent years, future years, how much cash inflow is going to be there, how much say, future cash flow is going to be there over the years and then we try to calculate the sum total value of those say, future cash inflows and where, those the value of those cash inflows is equal to the cash outflows we say this is the payback period.

After that how many years life is there, how many cash inflows are going to be there, we do not pay much attention to those subsequent cash inflows coming over the subsequent years? So, here for example we have explained with the help of this example that we have got here the 4 years, period of time 0 to 4 years and then we have got the cash flows.

In this year we are going to make the cash outflow of 100 crores. This project requires the cash outflow of 100 crores and then over the next 4 years, we are going to have the cash inflows. In the first year, at the end of the first year the cash inflow is 34 crores, second year 32.5 crores, then 31.37 crores and 30.53 crores.

Now we have to calculate the payback period. It means we are only concerned about this particular part, 100 crores investment which we are making in the current period we want to recover that. We want to recover that investment and over the subsequent years when we are finding out the cash inflows available this information is available.

So what we do is we now move to the third column and third column is cumulative cash flows. When you go to the cumulative cash flows so what we see? We are now going to say that first we had minus 100, then plus 34 it means when we recovered out of 100, 34 so now the cumulative value has come down to 66 crores which need to be recovered.

Then minus this much, so now the amount remains to be recovered is 33.5 crores, then amount remains to be recovered is 2.13 crores. So, it means in the first 3 years, first, second and third year larger part of the amount is recovered. Only at the end of the third year 2.13 crores are required to be recovered, which are recovered in the beginning you can call it as the fourth year.

So, in this case for example if you find out then the payback period maximum, at max you can say is the four years for this project and, the total amount which we invested, first year we are going to recover the 34 crores, then we are going to recover 32 crores, then we are going to recover 31.37 crores and remaining balance, this amount becomes how much?

This becomes is 7, so yeah remaining balance somewhere you call it as 2.13 crores that is recoverable from the cash flow coming from the fourth. So, it means maximum you can say the payback period of this project is 3.5 years or 3.25 years or if you do not want to calculate in fraction so you can say as a rough estimate that maximum within a period of 4 years we are going to recover the total investment made here, that is of the 100 crore Rupees.

So, payback period for this investment of 100 crores is 4 years? But the major limitation here is what is as compared to the discounted criteria which we discussed earlier the three methods, now the major limitation of this non-discounted criteria is that is we do not discount these cash inflows. 100 is equal to 100, fine but remaining these four cash flows, they have to be, means to be, to be discounted against the time value of money.

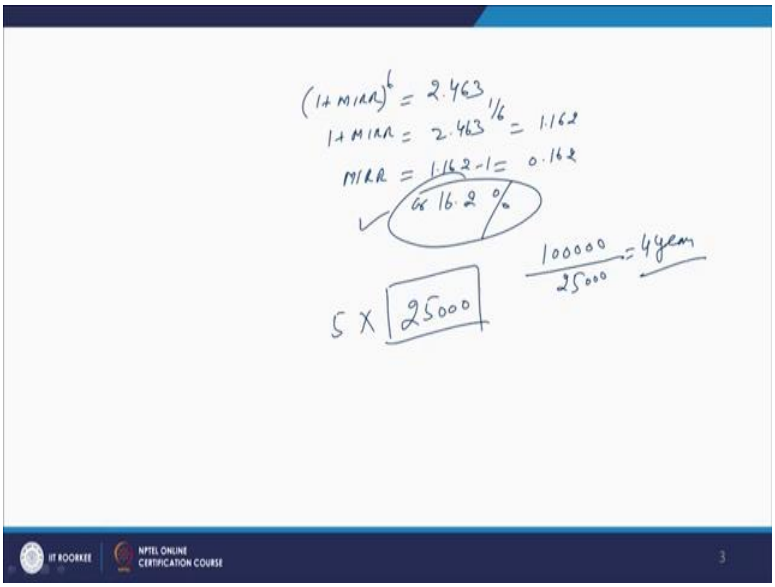
So, this criterion, payback period is of that time, olden time when the concept of time value money was not there in practice. People never recognized this money has the time value. So, when this was not in practice, time value of money concept was not in practice we were using even years and years, method is ages old, we were using at that time also.

So, payback period method, because of being very old, the oldest one in the, evaluation of the capital investment proposal methods so we are not discounting it. But this limitation also now these days has been done away and now we have started using the discounted payback period method.

Maximum what you can do is, you can add one more column here and for the given cost of capital we can discount these cash flows and then we calculate the discounted payback period. So, that is also possible. So, that limitation of the payback period also has been removed now but if you know the payback period in the beginning as the first method then it was considered as a non-discounted criteria and most popular non-discounted criteria or the method is the payback period method.

Now, we talk discuss some important points pertaining to this. In this case two points are important or to be taken into account. First thing is the constant cash flows. So, if you have the constant cash flows, constant cash flows means here we have the cash flows which are different. In the first year, at the end of the first year it is 34, then it is 32.5, then it is 31.37 and then it is 30.53.

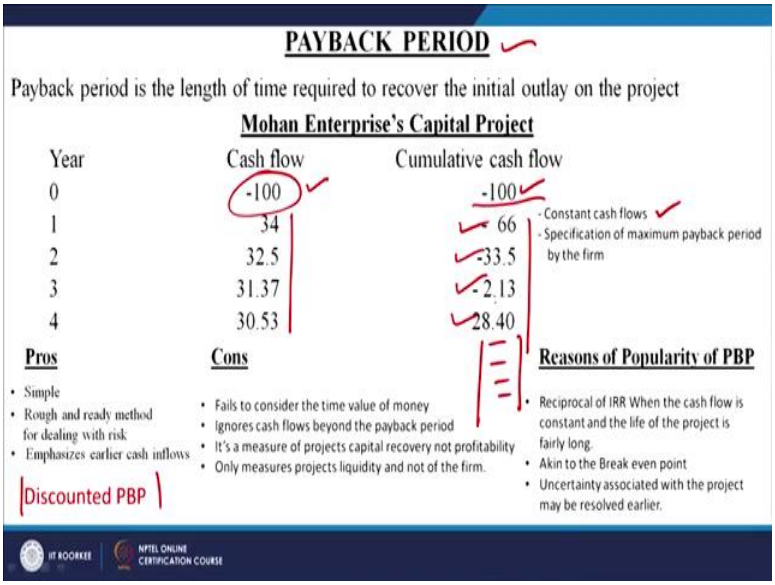
(Refer Slide Time: 16:59)



Constant means that if you have, say for example the cash flows of 25000 each or 25 crores, total investment we are making in any project is, say for example 1 lakh rupees. And in the next 5 years you are getting, next 5 years you are getting constant cash inflow of how many years, for next 5 years, you are getting every year the same, cash inflow is constant which means it is 25000.

So, what can you do is simply you divide this 100,000 by 25000 and it comes up as simply it is the 4 years. So, easily it can be worked out, means, if the cash inflow is constant over the subsequent years, every year we are going to get the same amount back, then for getting the payback period simply divide the cash outflow with the constant value of the cash inflow for 1 year and you can find out that easily the payback period can be worked out?

(Refer Slide Time: 17:54)



Second thing is specification of the maximum payback period by the firm. Normally what happens, that every firm specifies the normal payback period, that maximum we have 1 crore Rupee available or 100 crore Rupees available for the period of 4 years. That is pre-specified, normally.

If it is done, if in any case, if it is pre-specified how many years you can spend these 100 crore Rupees? For 4 years. Then you try to find out that investment proposal where the payback period of that total project is 4 years. So, if it is pre-specified then easily we can make use of the payback period because we know for how many years we can spare this investment.

We have to find out a proposal which has a normal life of the, that much number of years. So, both, if are comparable we can, with the help of the payback period method we can means easily find out those kind of the proposals where the investment can be made. At the end of that given period of time, pre-specified period of time, the investment can be liquidated.

So, either you have already known those specified years or you have to specify it. Both ways it can be done and if we are able to do it, for example we have the 4 years specified period,

we can evaluate the proposal. If any proposal is going to give us the total investment back in 4 years we are happy. We can go and make the investment, means in that proposal or in that particular project. So, these two important points are to be born in mind that constant cash flows and specification of the maximum payback period by the firm. This can be done. These points are very helpful.

Now, we talk of the pros and cons of the payback period method. Pros are, it is very simple, anybody can very easily use it, provided you have the cash flows. If you have the cash flows information, both cash outflow and cash inflow then it is very easy to use.

Second, rough and ready method for dealing with the risk, rough and ready method for dealing with the risk because risk comes up with the uncertainty. Risk comes up with the uncertainty, it is associated to the uncertainty and uncertainty comes up with the future course of action. How many years the project is going to last?

How many years the project is going to last. So, if you want to minimize the risk from any investment proposal then our objective should be to recover any investment made as early as possible. The recovery of our principal investment should be as early as possible, so with the help of the payback period we can find out the payback period.

So, we are going to evaluate the project proposals which are going to give us the shorter payback period. In one case it is a limitation also, that is only concerned with the recovery of the investment, nothing else. It does not take into account the future cash flows after recovery of investment. There is a limitation also but the, say if you want to minimize the risk we should be knowing that I am making investment today and in how many years I am going to get back the investment.

So, that project which is giving you the minimum period, number of years, future number of years, 4 years, 3 years, 5 years, there the two proposals, one is going to give you the return back in 6 years, one is going to get your return back in 4 years. So, the project which is going to return your investment back in 4 years is going to be the better option. So, means, rough idea of a, say managing the project risk because longer the duration of any project, higher will be the uncertainty and higher will be the element of the risk. So, we want to minimize that.

Third is, emphasis on earlier cash flows, emphasis earlier cash flows or on the earlier cash flows it means we are concerned about the say, the early recovery of investment so we are more concerned about the earlier cash flows. We are not concerned about the later cash flows.

So, it means how quickly we are able to, and because of that if you say, in a means say you can call it as unaware manner, we can say we are talking in terms of the time value of money because delayed recovery of any investment reduces the value of the investment or that inflows coming up. So, early recovery means the value of that inflows is going to be, say much higher as compared to the inflows coming at the later date or the later time. So, these are three positive points.

Cons are, limitations are fails to consider the time value of money. That is clear we have already discussed it. But that limitation has been removed now. That now we can have the discounted cash flows also. So, it can now be part of the discounted criteria also but largely we consider it as a part of the non-discounted criteria. So, this is the limitation.

Ignore the cash flows beyond the payback period. I discussed with you number of times that it is only concerned, for example in this case about, it may have the life of further subsequent years also, here 3 more years or the 4 more years. We are not concerned about these 4 more years. We are only concerned about that in how many years we are going to get these 100 crore rupees back and subsequent cash flows we are not concerned because it is payback period. In how many years our investment is going to come back to us.

It is a measure of project capital project's capital recovery, not profitability. It only helps us to find out the recovery of the capital that in how many years my investment is going to come back, not the profitability whereas in case of the NPV method what is the net present value? Net present value is the surplus available after recovering the initial investment by way of the inflows.

Because there evaluation criteria is what? The evaluation criteria is, in that the evaluation criteria is that is the higher the NPV better the project is. Minimum it should be 0, but higher the NPV we accept the project, lower the NPV we not go for it. And mutually exclusive projects also when we want to select, we also base the selection on the basis of the NPV.

So, that is quite possible because an NPV is basically, in a way you can call it as the profitability. Similarly, the benefit cost ratio, the name itself is the profitability index. And in

case of the internal rate of return also we talk in terms of the profitability whereas in this case, in this method we do not talk in terms of profitability. We talk only about the recovery of investment, not about the profitability. So, that is the second major limitation.

It is a measure of project capital recovery, not profitability. And third one is the, fourth one is the, that is the only measure, measures the project's liquidity and not of the firm, means it only concerned with the one project, only concerned with the one project, not of the firm as a whole.

How it will contribute towards the liquidity of the firm, overall cash flows of the firm? No, it is not going to give you that kind of information because it is not focusing upon the whole life cash inflows. It is only focusing upon that much limited number of years cash inflows which are going to help us to find out the recovery period.

So, when the total cash inflows we are not taking into account, how much value it is adding into the value of the firm it is not possible to be found out. So, in that case the liquidity position of the project can be known. That is why we are able to sum up that liquid cash flows and to get the investment back. But its contribution towards the firm's liquidity, that is not possible to be known.

So, these are the four limitations and three points of the merits are, we have just discussed here. Then we talk about some important reasons that despite all these limitations and some shortcomings of the method it is very popular. Even today we make use of it and knowingly or unknowingly, even ignorantly many a times when we talk of any investment proposal, any new investment proposal, we first criterion which comes in the mind, whether knowingly, consciously or unconsciously, it is the payback period.

Everybody thinks about, if I make investment even as an individual, anyone wants to make investment on his savings in the bank or maybe in any investment proposal he is more concerned about, in how many years my investment is going to get back to me? So, it is most popular and some 2-3 important points are worth, say knowing here considering here that, number 1, it is reciprocal of internal rate of return when the cash flow is constant and the life of the project is fairly long. It is reciprocal of internal rate of return.

In the internal rate of return also what we calculate, we calculate that in how many years, the net present value of the project is going to be 0. That is only rate we find out where the internal rate of return, where the present value of the cash outflows is equal to the present

values of the cash inflows and same thing is the thing we are going to do in the payback period method.

So, it is the reciprocal of the, internal rate of return. So, it is very very important property because it is comparable to some method which is a part of the discounted criteria. Second is akin to breakeven period. Here we are calculating the breakeven period, almost because concept, understanding the concept of the breakeven period is very easy. So, here also we are talking about the breakeven period. Breakeven period is the breakeven point, not period, breakeven point is the point where the total inflows are equal to the total outflows, no profits. It is a point of no profit, no loss.

So, in the payback period also we are talking something of the same thing, a point of no profit, no loss. How much we invested in how many years, it is going to get back to me? I am not concerned beyond that. And third important thing is uncertainty associated with the project may be resolved earlier because we emphasize, by using this method, we emphasize upon the shorter payback periods. We emphasize upon the shorter payback periods.

So, shorter the period of recovery of any investment is going to reduce the uncertainty of the project or the cash inflows available from the project and the risk associated to that project. So, if the risk is lower, when the risk is lower? When the period of recovery of that investment is lower, and if the period of recovery of investment is lower, certainly we can say that uncertainty can be minimized, risk can be minimized and we are more concerned here, we are more focused upon that in how many years or how quickly we are going to return the investment made in any project back and that is the point of concern here.

So, talking about all these say pros and cons and some points of concerns here or the reasons of the popularity of the payback period method means whatever the total discussion is done here when the discounted criteria was not there, when the NPV was not there, when the IRR was not there, when the benefit cost ratio was not there, payback period was there.

Even our forefathers, when they were, means illiterate, they were doing business but they were not the say management graduates or maybe they were not knowing the formal language of the business or how to do the business as we do it today, long back we have been doing.

For example we talk about the say, this family businesses in India, Tata's, Birla's means and their forefathers because when they started the business 100 years back, 150 years back, sometimes 200 years back, at that time this discounted criteria, NPV, IRR, benefit cost ratio nobody talked about that but payback period was at that time also the one important criterion prevalent even at that time also.

And even our forefathers also, how literate or illiterate they were, they always also used this and first question always came in their mind also, we are going to make investment of 10000 rupees in this project, in how many years I am going to get this investment back?

And that is ultimately the payback period method so it is evergreen, it is used today also and we do not use one single criteria for evaluating any investment proposal. So, it always goes with discounted criteria also. We can use NPV and payback period together, we can use IRR and the payback period together but it is never a case where we never use the payback period method.

So, this is all, everything about the payback period method, first method in the non-discounted criteria and one more method that is the accounting rate of return plus other some important points of concern with regard to the capital budgeting proposals, evaluation of the capital budgeting proposals that I will discuss with you in the next class. Thank you very much.