Project and Production Management
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Lecture - 5
Project Appraisal: Part II

In today's lecture we are going to continue the process of project appraisal which we had initiated in the last lecture and in this particular lecture we are going to be focusing primarily on the financial appraisal of a project which is in fact one of the the most important appraisals as far as the project is concerned. Let us look at what all is involved in the financial appraisal of a project. The first thing which is involved in the financial appraisal of a project is estimating the cost of the project and the timing of the costs. Both these things are very important. It is not only the cost of the project because many times the cost is incurred in phases and therefore one has to know exactly when the costs are likely to be incurred. This is a very important input to the financial appraisal of a project. Similarly the next important thing is the estimation of the likely revenues during each period of time. How much is going to be the profit and likely profit in various periods of time. These estimates are important and you can see that both these decisions are very vitally linked to the market and demand analysis. Only when you know how much is the likely demand and when the demand is likely to take place can you estimate these revenues.

The cost of capital is another important thing. The cost of capital is something that is governed not only by market conditions but also by the earning capability of the firm concerned. For instance if the firm is currently getting a return of 20% on the capital invested when it goes in for a new project it is probably looking for something higher or something better. In that sense the expectation of the firm in terms of what the return should be is governed by the company history as well the prevailing market conditions and what the current bank rate is and the state of the economy is. The planning horizon of the project is also very important. The planning horizon for instance could be anything from 3 years, 5 years or 10 years depending upon the nature of the project that you are trying to talk about. For large capital projects like hydel dams, the planning horizons could be as large as 20 years or even more. This is again an important thing when you are trying to consider the financial appraisal of the project.

What is the risk in the project as evidenced by the worst and best values of costs and revenues. The implication of risk is that you are not very sure of what the revenues are likely to be.

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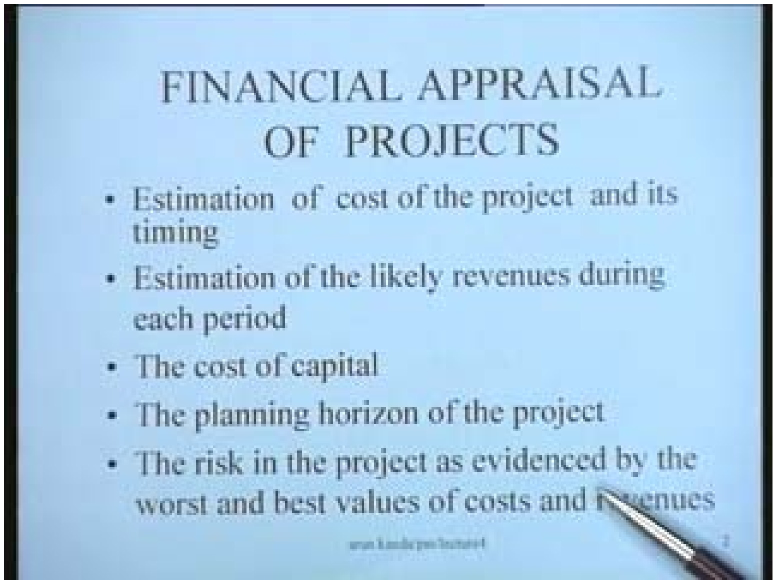

What is typically done is one would estimate the best and the worst values and probably associate some probabilities with them so that you can know exactly what is the risk involved in the project. This is very, very important.

Then let's look at some of the important financial criteria for purposes of project appraisal. I think you are all aware that the net present value is perhaps the single most important criteria, financial criteria for the evaluation of projects. It gives you a single indicator of how much the project is really worth and therefore is a universally accepted indicator of the worth of a project. We will see during the course of this particular lecture as to how we can compute this and the related parameters. The internal rate of return is another important criterion which measures how much you are earning on the capital. Simple before and after tax rates of return are sometimes used for the financial appraisal of a project. The equivalent annual cost; if you talk about the time value of money you can always convert any amount of time now, any amount of uh money spent now to money spent in the future or any future some of money to the present value now or convert it into an equivalent cost. You can use those simple time value of money formulas to bring about this conversion.

We can talk about the payback period. The payback period is something with which the entrepreneur or the investor is very much concerned about because this is the period of time in which he recovers his initial investment. Most investors would like to have as low a value of the payback period as possible. Then the discounted payback; if you take the time value of money into consideration you can talk about the discounted payback.

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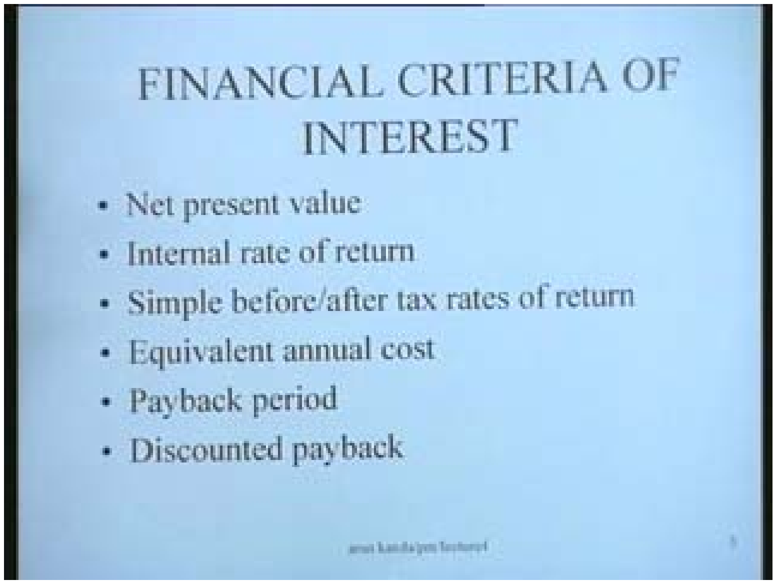

Yes; when you talk about the equivalent annual cost it only means that whatever is the NPV, the NPV is something that you earn right now. The NPV could be converted into a uniform equivalent annual cost. It’s like trying to say getting 20,000 now is equivalent to getting 5000 for the next 4 years. The equivalent annual cost would be 5000 rupees for each year for the next 4 years. You could present it in various ways. This is one way of presenting the information.

Let us now look at some of the criteria for debt repayment because the financial appraisal of a project has essentially two components. One is how much you are earning on your investment and the second is the capacity of the project to repay the loans that you had taken to finance the project and many financial institutions are concerned about these criteria. The typical criteria could be the benefit to cost ratio of the discounted cash flows. This could be one indicator of how much money you have to recover the cost. This is one but a more common ratio which is generally used is the debt service coverage ratio. We will see subsequently through an example as to what we mean by this and then one is talking about debt repayments a company’s reputation in terms of assets and liabilities and record of previous repayments is often considered by the financial institutions before disbursing a loan.

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This is important because for purposes of repayment most companies would look at your track record in payment of other loans and would keep this into consideration while sanctioning a loan.

Let us now take an example and try to compute or rather go through a financial appraisal for this sample project.

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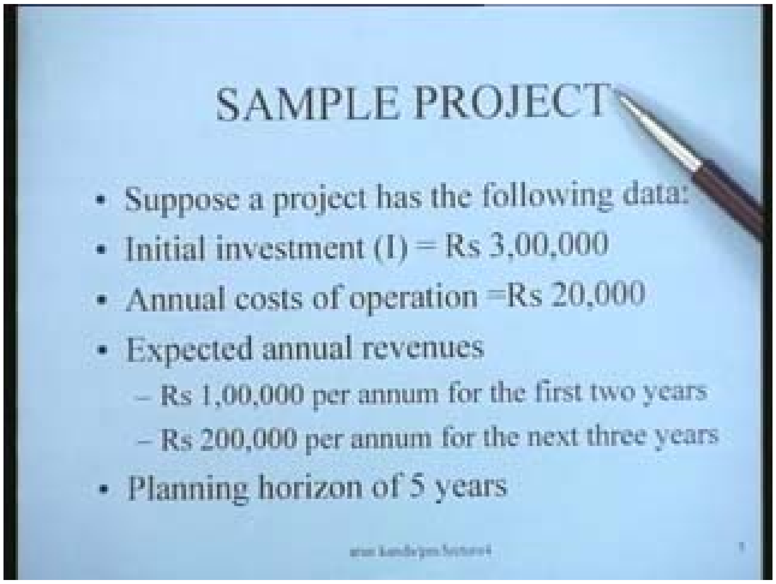

Let’s say that it is a project which has an initial investment of 3 lakhs of rupees, 3,00,000 rupees and let’s say that the annual cost of operation is 20,000 rupees and let’s assume that the expected annual revenues are 1 lakh per annum for the first 2 years and 2 lakh per annum for the next 3 years and let us keep a planning horizon of 5 years. The revenues would not be constant throughout the life of a project. In the beginning when the project is taking shape the revenues could be lower and subsequently the revenues could be higher and they could be tapering off subsequently. Let’s take this example as a basis and compute many of the important financial parameters that we were trying to talk about. From the data of investment, yearly costs and revenues which we have estimated let’s put it down on a time scale.

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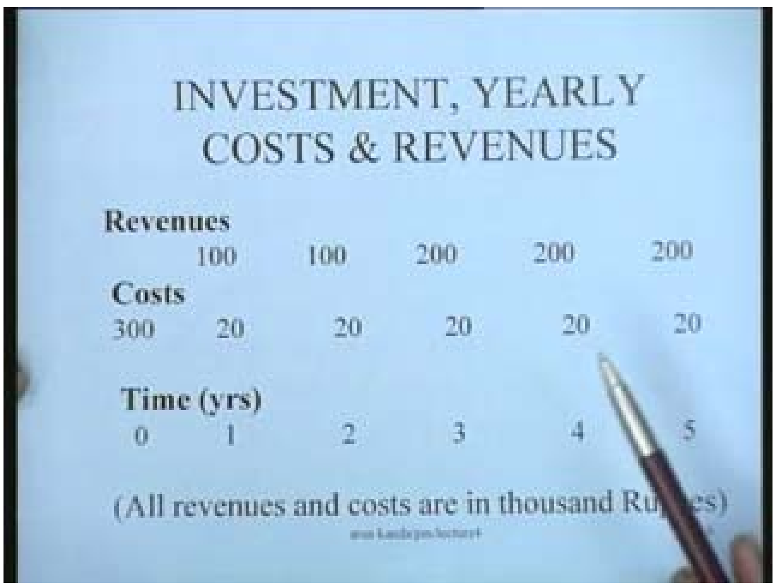

For instance if we take all revenues and costs in thousands of rupees the revenues are 1,00,000 and 1,00,000 in the first 2 years and 200, 200, 200 in year 3, 4 and 5. Similarly there is a cost of 3,00,000 that’s the investment right in the beginning and we are saying that there is an annual cost of operation which is to the tune of 20,000 rupees taken each year and this is therefore the data that we have on investments, revenues and the costs for this particular project. For this case we can very easily determine the gross cash flows. The gross cash flow means taking the negative sign to represent the costs and the positive sign to represent the net revenues. We find that there is a -300 here. For this particular project there is an initial cost. This cost showing that there is a cost of 3,00,000 rupees in the beginning and then there is a net revenue of 80,000 in the first year, 80,000 in the next year, 180,000 thousand in the next year, 180,000 subsequently and 180,000 right here. This is the pattern of cash flows of this particular project and all these cash flows are indicated in thousands of rupees the way they are here.

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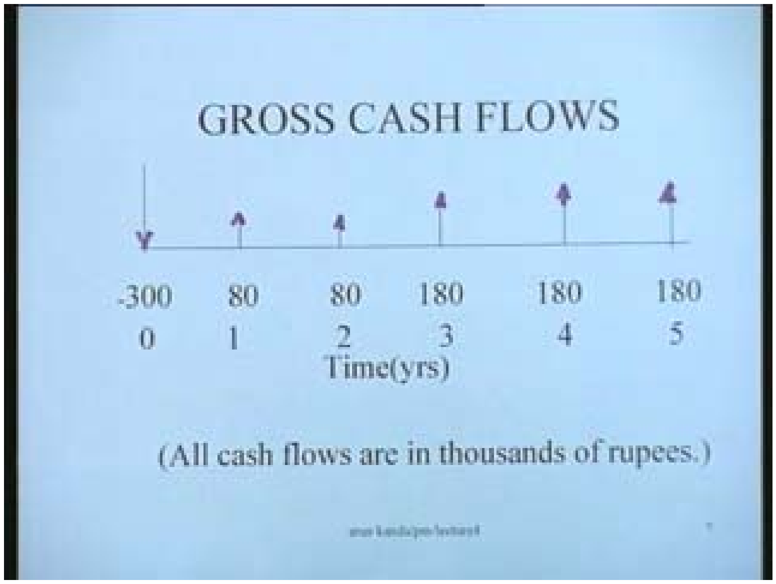

Now let us compute for this the undiscounted cash flows before tax. By this what we mean is if we have the cash flows of -300, 80, 80, 180, 180 and 180 we can construct the cumulative cash flows.

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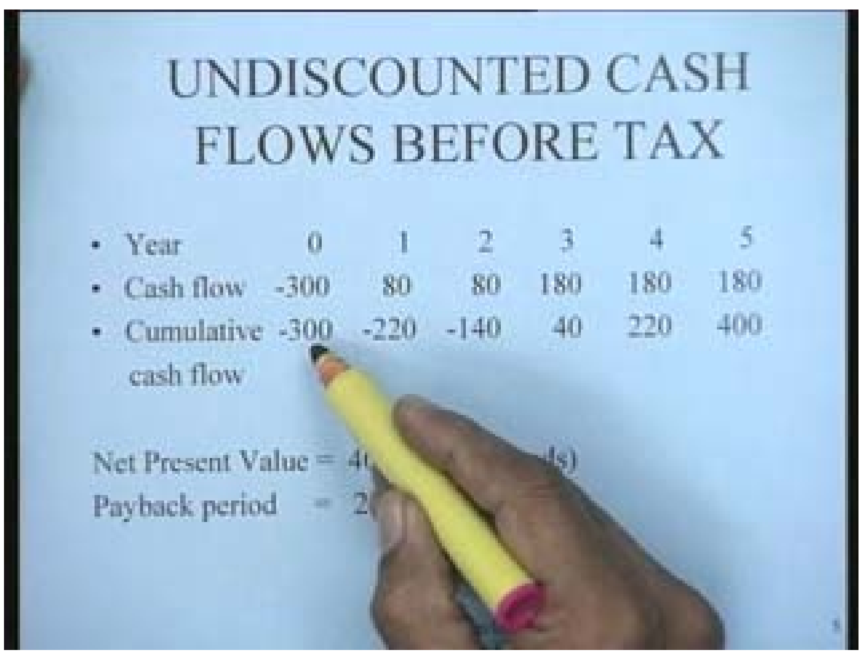

That means along the time -300; -300 + 80 is equal to -220; -220 +80 is equal to -140; -140 + 180 is 40; 40 + 180 = 220; 220 + 180 = 400. So this is the cumulative cash flow. Now the significance of this cumulative cash flow is that by the end of the first year for instance you have still an unrecovered expenditure of 220, 000. A negative sign shows unrecovered expenditure and by the end of the third year you have a net profit of 40,000 rupees. The payback for this particular thing will lie between the second and the third year and if we interpolate linearly between these two values we find that in this case the payback period works out to be 2.78 which is between these two particular values. It is in this case going to be 2 into 140 divided by 180 which is 2.78 years. That's what it is. We can estimate that in 2.78 years the money is recovered. That is the payback period and the net present value undiscounted that means for I is equal to zero is 400. So 400, 000 is in fact the NPV. We have computed the NPV and the payback period in the undiscounted cash for this particular project which we are considering.

Now we could similarly compute these values let's say the discounted cash flows for an interest rate of let us say 10%. If we want to do it for an interest rate of 10% all that would be required in our computations here would be that we would have to discount the values of the future cash flows; that's the only thing. A general format that can be taken is you write down the years and you write down the cash flows as before and then what you would need is the discount factor for each of these years. If the interest rate is I and if you are talking about the nth period then the discount factor is 1 upon 1+i whole to the power n. These values are: at time zero this value is 1. For time 1 it is point 0.909. For time 2 it is 0.826, 0.751, 0.683 and 0.621. These are the discount factors and tables were also available for getting these discount factors. We can then compute the discounted cash flow. The discounted cash flow is nothing but the multiplication of the discount factor with the actual cash flow which is there. This is -300. 80 multiplied with 0.909 gives us 72.72 and similarly here we get 66.08, 180 into 0.751 gives us 135.18. 180 into 0.683 gives us 122.94 and 180 into 0.621 gives 111.78. These are now the discounted cash flows. That means this much money at the end of the 4^{th} year, 180,000 rupees is actually worth 122.94 right now if you take an interest rate of 10%. That is the physical meaning.

Now we can work with these discounted cash flows and determine the cumulative discounted cash flow in the same manner and you can find that it is -300 plus this -227 and so on. These values which are obtained here clearly shows that the cumulative discounted cash flow changes sign from negative to positive between the 3^{rd} and the 4^{th} year. We can again linearly interpolate between these values and get the discounted payback for an interest rate of 10%. In this case the net present value works out to 208.7 and the payback period works out to 3.21 years which were the two important parameters here.

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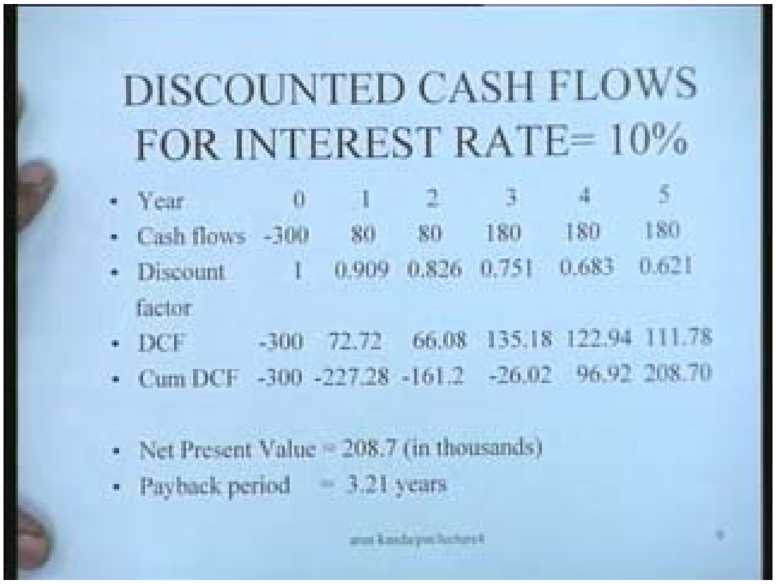

Now we need to compute the discounted cash flows for different rates of interest if we want to ultimately estimate the internal rate of return. So what we do next is we compute for instance for an interest rate of 20% calculate the discounted cash flow for an interest rate of 20% and what happens in this case is you find that the discount factors are now these values; 0.833, 0.694, 0.579, 0.482 and 0.402. If you carryout this process you can calculate the discounted cash flows and the corresponding cumulative discount cash flows and in this case you find again that the value of the cumulative discounted cash flow changes sign between the 3rd and the 4th year and again if you interpolate you find that the net present value has dropped significantly now to 85.5 thousand. Remember in the undiscounted case this net present value was 4,00,000. It has dropped from 400 to 85.5 in this case with an interest rate of 20% and the payback period has gone up from an initial value to the current value of 3.85 years. This is the discounted cash flow. But still we are interested in that particular value of the interest rate for which the net present value is equal to zero; so we further increase.

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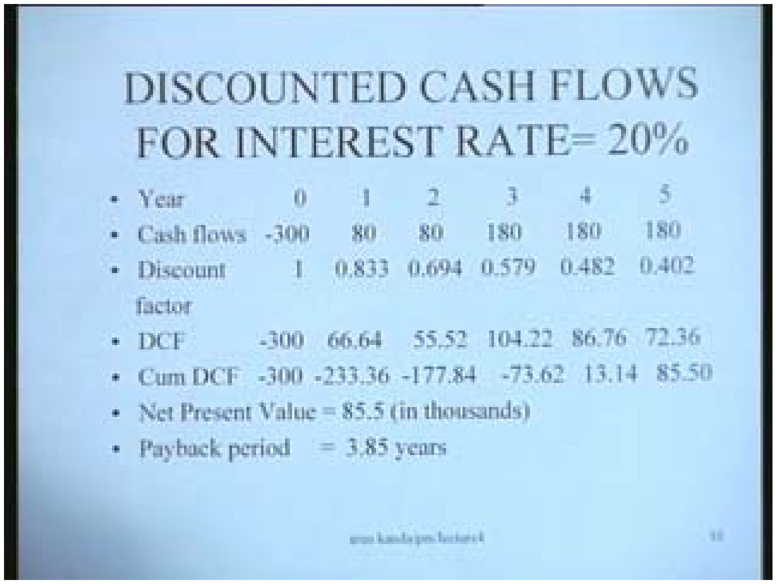

Let's try a value of interest rate of 25% for instance. If we try I is equal to 25% what would happen is that again the discount factors would change and corresponding to these discount factors the discounted cash flow values would change and the cumulative discounted cash flow would again be something like this and you find that it is now changing sign from between the 4th and the 5th year.

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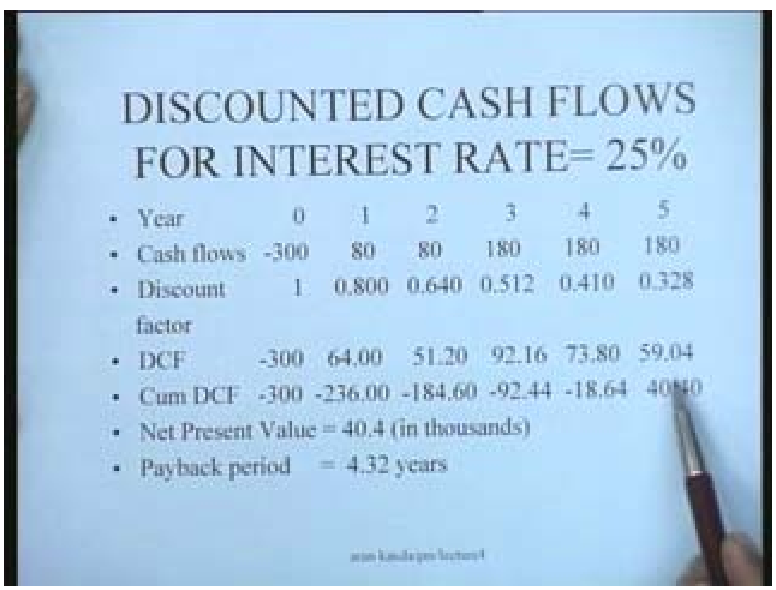

The net present value for 25% is 40.4 in thousands and the payback period has now increased to 4.32 years but it is still not zero. If we try for instance a discounted cash flow value for an interest rate of 30% for this particular situation again by a similar calculation you know that for 30% the discount factors would change and for these discount factors you can compute a net present value of 2.2 thousand which is fairly close to not zero but 2.2 thousand and the payback period has now gone up to 4.95 years.

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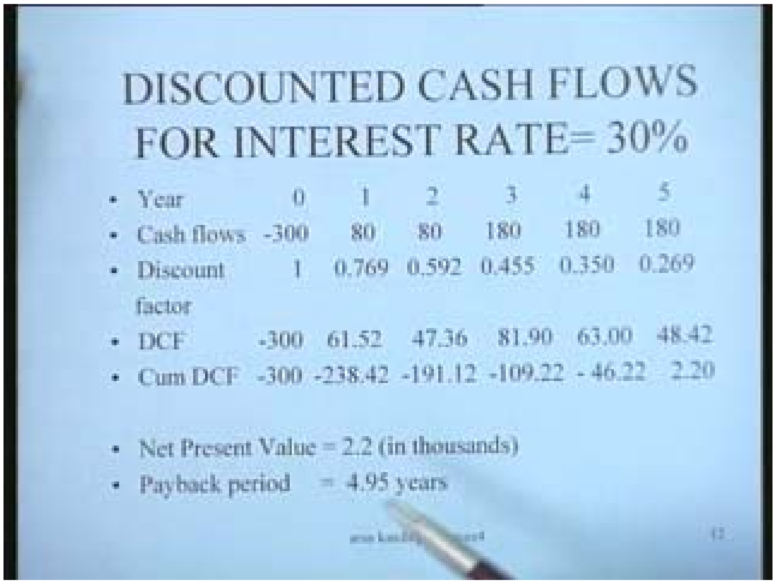

Now what you can also do is since we would like to estimate exactly, we can compute the discounted cash flows for interest rates of 35% for this example and what you find is that if you calculate for 35% the cumulative discounted cash flow value even at the end of 5 years is negative. The indication is clear that the internal rate of return would lie somewhere between 30 and 35%.

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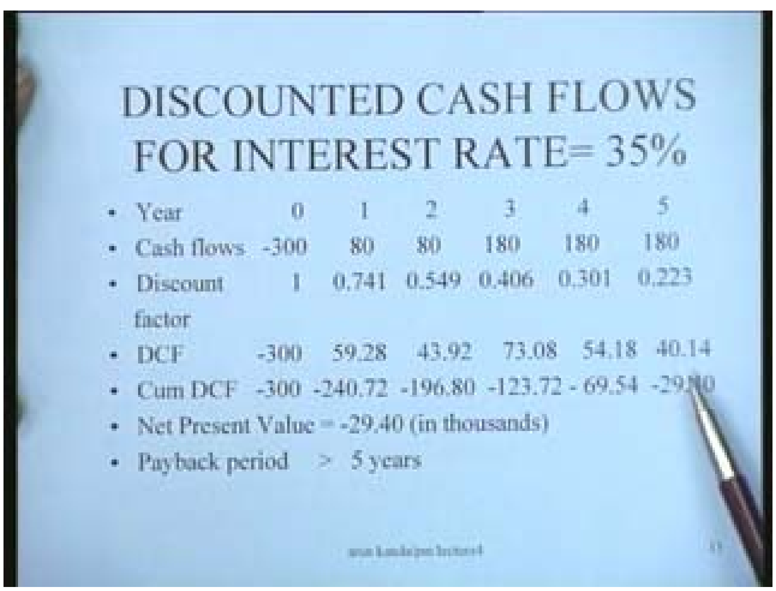

That’s what it is and the net present value corresponding to this figure here is -29.4 in thousands of rupees and since the capital is not recovered still the payback is greater than 5 years. We have not gone beyond 5 years. So just indicate that it is greater than 5 years.

If we were to now compute the internal rate of return you can see we can summarize these results as something like this. If you look at the situation we plot the net present value versus the interest rate. We in fact started off with a value of 400.This was the value that we first started with and then for an interest rate of 10% we got this particular value which had an NPV of 208.7. For an interest rate of 20% we got this particular value which had an NPV of 85.5%. For an interest rate of 25% we had got this particular value and value of 2.2 means very close here at 30% and at 35% we have got a value of -29.4 which was somewhere here. If we join these points on a kind of a common scale it would look something like this; this kind of a curve. The IRR for this, that is the point where this curve intersects this line, this value is slightly greater than 30% then it can be estimated to be 30.35%.

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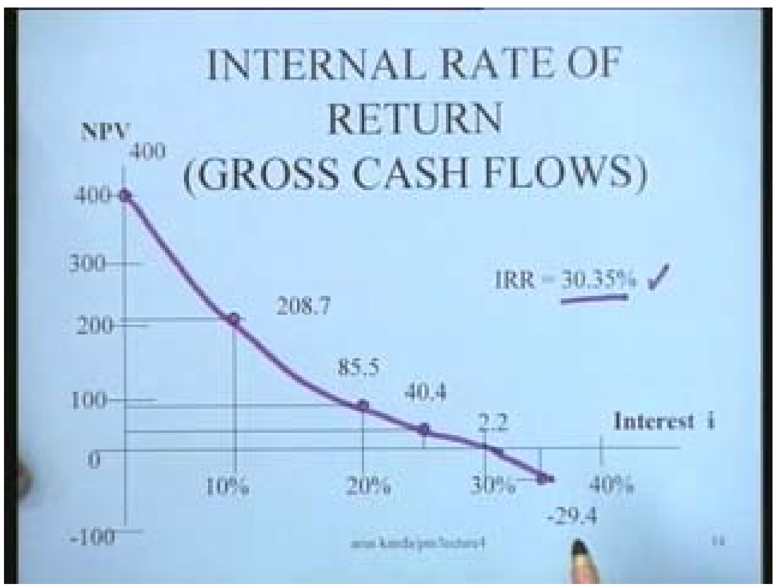

The internal rate of return for this particular project is 30.35%. This is the case when we are talking about the gross cash flows. That means we have not accounted for taxation and we have not accounted for any decrease in income because of taxation and since taxation is something very important we will talk about it a little later.

Similarly if you see how the payback period has changed for these gross cash flows what you find is that if you plot the unrecovered money or the cumulative NPV we are plotting the cumulative NPV which is what we calculate and we are talking in here in terms of years; 1 year, 2 years, 3 years, 4 years and 5 years and when we plot the cumulative NPV for 0% the curve looks something like this and our discounted cash flow is 2.78 years. This is what it is; 2.78 years. Then when we increase the interest rate to 10% what happens is actually that this particular curve shows this kind of a trend and our discounted payback period now goes up to 3.21. With 20% the curve assumes a shape somewhat like this and the discounted payback now is 3.85 years. With 25% the curve assumes a shape something like this and our payback period now becomes 4.32 years. For 30% it becomes approximately 4.95. It's something like this; it comes here and for 35% we found that this does not intersect the curve before 5 years.

This is the pattern of these curves for increasing values of the interest rate i and the discounted payback periods are determined by the points where these curves intersect the time axis and these are the values that we obtain for this particular example.

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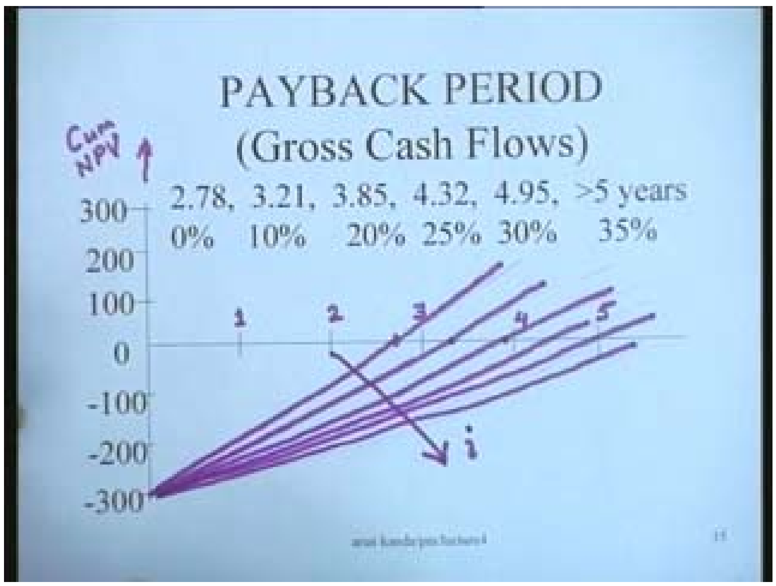

Thus we have illustrated how to compute the NPV's, the IRR's and the discounted paybacks for different values of the rate of interest.

Now let us talk about the important consideration of taxes and their computation because we perform these computations for the project with gross cash flows. How does one take tax considerations and how does one modify the cash flows when taxes are actually present. Let us talk about computing the after tax rates of return and compare them with the before tax rate of return for a project. Important thing to notice is that the notion of depreciation is used in computing after tax cash flows. This is a very important concept; how depreciation is used to compute the taxable income and we will talk about various methods of depreciation. The most commonly used method of depreciation is the straight line method of depreciation and the straight line method of depreciation assumes that the amount depreciated in each period is the same. If the investment I is to be depreciated in n periods in each period the amount to be depreciated will be I by n. This is what we mean by straight line method of depreciation. It assumes uniform depreciation. So the fallen value of the asset or the project is actually following a simple straight line.

One of the major defects you can say with straight line method of depreciation is that whether you are depreciating in the first year or you are depreciating in the tenth year the amount of depreciation that you are using is the same and therefore the benefits as far as taxation are concerned are just the same except for whatever changes may have taken place as a consequence of changing the tax structure. Normally firms prefer that they should get higher advantage of depreciation in the beginning so that because you know money has a time value and because of this time value if they get greater advantage in the beginning and suppose 100 is to be discounted rather than 20, 20, 20 over 5 years they would prefer 60 in the first year, 20 in the next year, 10 in the next year. That makes 90 and may be 5, 5 because that would give them greater tax benefits because of the time value of money. For this there are other methods.

The sum of digits method is something that tries to accomplish this. How is it done? For instance if I is to be depreciated in a total of n years you take S as the sum of the n digits. S is the sum of the n digits. So it is equal to simply n into n plus 1 by 2. What you do is in the first year you depreciate n by S fraction of I. n minus 1 by S is depreciated in the second year this fraction of I and so on. I by S is depreciated in the last period. What is happening is that you depreciate more in the first period, lesser in the next period and lesser in the next period. But the total amount of depreciation is the same and this gives certain disadvantages to the firm.

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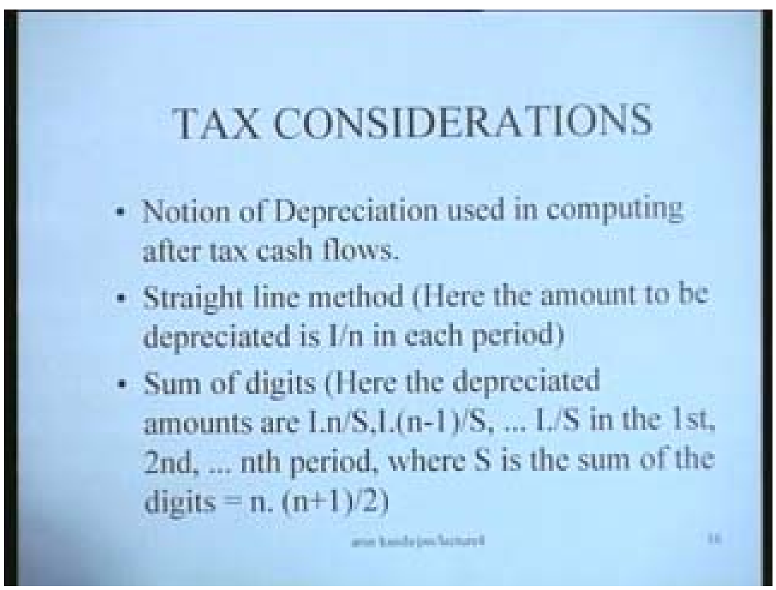

The third method of depreciation which is commonly used is the declining balance method and in the declining balance method what is actually being done is that the depreciation in any period is a constant percentage of the opening value of the asset. If I am worth 100 rupees and let’s say I use a figure of 10% then 10 rupees would be the depreciation. This would be the depreciation in the first year. At the end of the first year the value of the asset would become 90. Then in the next year 90 into 10%, 9 rupees would be the reduction in the value of the asset in the next year so that the value of the asset would then become 81 and then 8.1 and so on. So mathematically what it simply means is that if the initial value of the asset is I and the values after depreciation in successive periods are a fraction a; a or alpha or any constant term. a into I,. a square into I, a cube into I and so on you will have a n into I. These would be the values after depreciation.

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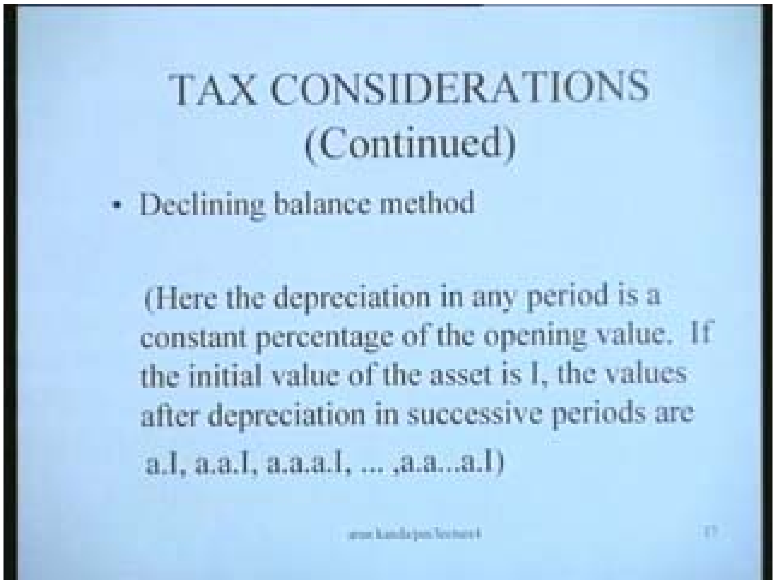

Let us try to see how this depreciation method would affect our example sample project. Let's compute the depreciation in this particular example project that we are talking about by these three methods. Number 1, the straight line method; number 2 the sum of digits method and number 3 the declining balance method. 1: look at the cash flows. This was our project. We have 5 years. At time zero I have to invest 3,00,000 and my gross cash flows are 80, 80, 180, 180, 180. If I use straight line depreciation that is the straight line depreciation here the total asset value is 300 by 5 which is 60. So 60,000 will be the depreciation in each year which is constant. Once you compute this you can calculate the amount of depreciation which is exactly this.

What would be the amount of depreciation if we use the sum of digits method? In the sum of digits method what you would simply be doing is the sum of these 5 digits is 15. So you would take in the first year because there are 5 years, 5 by 15, 4 by 15, 3 by 15, 2 by 15 and 1 by 15. The total sum of these is actually 15 by 15 which means 1. So the total depreciation will be 300 but this value works out to be 100 would be depreciation in the first year, 80 would be the depreciation in the second year, 60 would be the depreciation in the third year, 40 would be the depreciation in the fourth year and 20 would be the depreciation in the fifty year. The amounts of depreciation would vary depending upon the method.

Let me illustrate what would happen if I take for instance a factor of 0.3 in the declining balance. If I take a factor of 0.3, you could take any factor between 0 and 1 theoretically;

so 0.3, 0.3 into 0.3, 0.3 into 0.3 into 0.3 and these values. What would really happen in the declining balance method is that you would have a total depreciation of 90 in the first year, 27 in the second year, 8.1 in the third year, 2.43 in the fourth year and negligible amount of 0.729 in the fifth year. This is what it is.

Quite often the method of declining balance is utilized or we tend to use what is known as a double declining balance method. In the double declining balance method what really happens is that we depreciate the total amount in two installments. In the first installment we can use a certain value of alpha. This will bring down this and in the second installment we could change the value of alpha. So you could use a value of alpha 1 in the first installment and a value of alpha 2 in the second installment and thereby you can say that a certain amount say 60% of the total amount to be depreciated could be depreciated at alpha equal to 0.2 and the remaining could be depreciated at alpha is equal to 0.3 or something like that.

It will not total. So the total amount of depreciation is this. That is why as I indicated to you this amount will not add up to 300. It will add up to some value because after all this is a geometric series. You can find out the amount that is depreciated.

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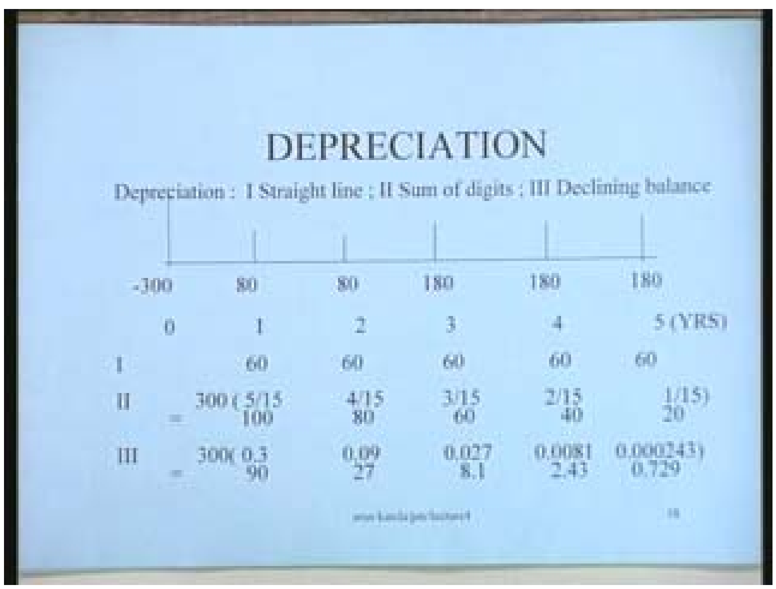

Once you want to depreciate a certain amount you can do it in two installments. That's why you typically use double declining for this.

How does one take this depreciation into consideration to compute the net cash flows? Whichever method depreciation you use you can determine what it is? We will illustrate this computation of net cash flows for the straight line depreciation because if this was any other method of depreciation you would use that particular value of depreciation. These options are available. In our case we are having gross income which is given here. We take the depreciation into consideration whichever way we calculate and gross income minus the depreciation is what we call the taxable income. The taxable income in this case works out to be 20, 20, 120, 120 and 120 and the tax rate depend on the companies financial position. Assuming that the company is in the 30% tax bracket then the tax would work out to be 6, 6, 36, 36, 36 as far as these. This is the taxable income. This is the tax on the taxable income. This was the gross income. You can subtract the tax from the gross income and determine your after tax cash flows in this particular manner.

The after tax cash flows after taking depreciation into consideration in this particular situation work out to 74,000, 74,000, 144,000, 144,000 and 144,000. This is how this can be done.

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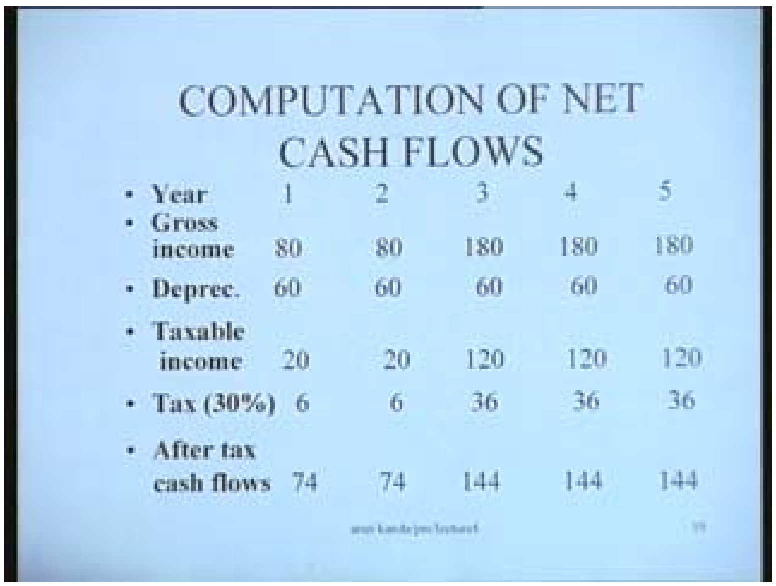

With these we can perform an analysis very similar to the kind of analysis that we performed earlier. If you take the work on the net cash flows rather than the gross cash flows which we worked on earlier and take an interest of 0% these are the net cash flows which we just computed. The cumulative net cash flow would be -300 + 74 = -226, -226 + 74 is this. This is the cumulative net cash flow and you can see here that it changes sign between the 3rd and the 4th year. In this particular case the net present value is only 280,000. Compare this with the 400,000 that we had computed in the case when the gross cash flows were considered and the payback period is between this and this. It can be estimated by linear interpolation; once again 3.06 years. This is the value that we obtain with 0% rate of interest.

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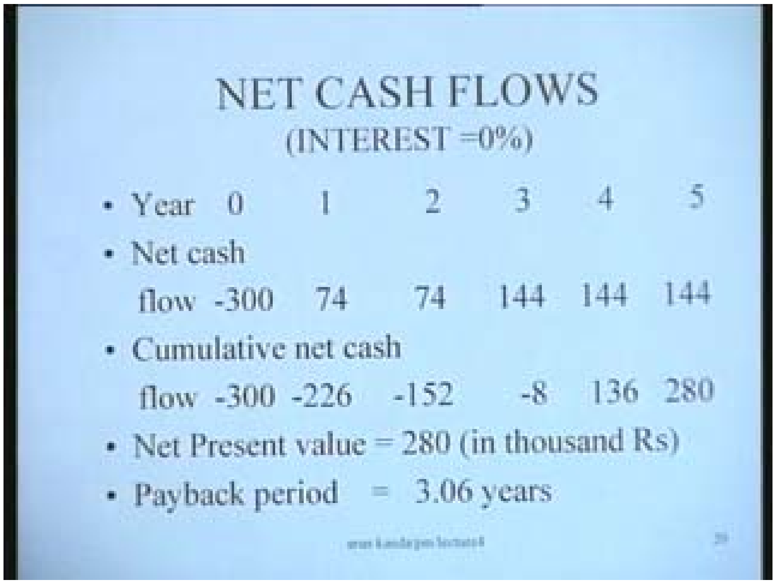

If the depreciation is more than the taxable income what it means is that you have no income for purposes of taxation. The tax is zero. That's all; that would be the implication. Then we can compute the net discounted cash flows for an interest rate of 10%. If you go through this exercise for 10% again we take the cash flows. We take the after tax cash flows for this. These are the before tax, these are the after tax cash flows. Take the appropriate discounting factors for 10%. You get the discounted cash flow which is again -300, 67.27 and so on for all these 5 years.

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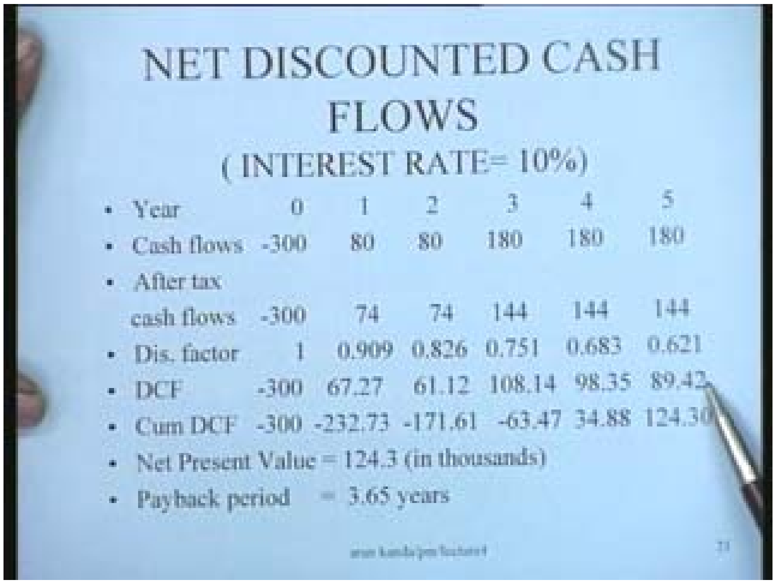

You can compute the cumulative discounted cash flow. We are primarily interested in the cumulative discounted cash flow because that's the only way we can estimate the payback period and also in the end of this, this particular value directly gives us the net present value. It's a kind of a two in one strategy and the cumulative discounted cash flows are then computed here and you find that the cumulative discounted cash flows again change sign between the 3rd and the 4th year. The net present value for this particular case works out to 124.3000 and the payback period is 3.67 years for this particular example.

Now if we look at an interest rate of 20% rather than 10% again what changes is the discount factors. Consequently it changes the discounted cash flows which are here and the cumulative discounted cash flows correspondingly and what we find is that the net present worth is now only 23.68 thousand and the payback period now lies between the 4th and the 5th period which can be estimated again by linear interpolation to be 4.6 years.

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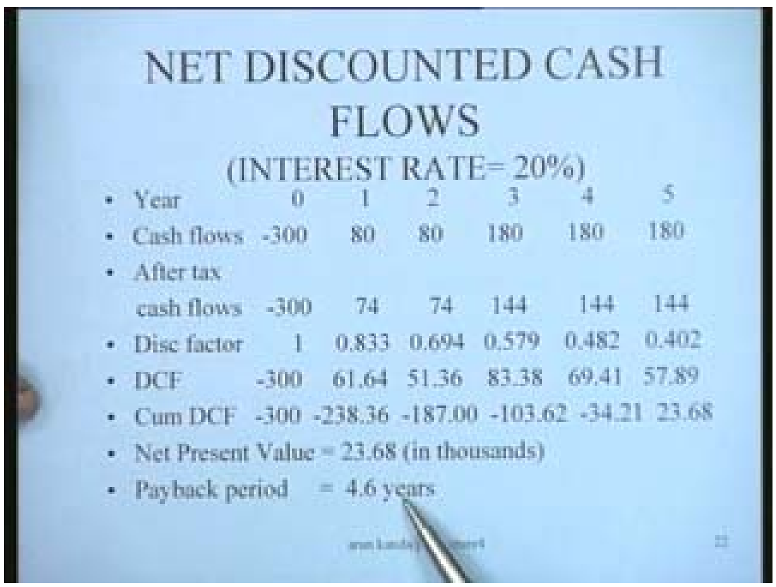

The payback periods are going up and the net present values are coming down as the interest rates are going up which is intuitively obvious.

Let us now compute the net discounted cash flows for an interest rate of 30%. Again if you consider 30% here are the cash flows. These are the after tax cash flows which we have computed. The discount factors would change. Actually the behavior of these discounted cash flow factors would be with different values of I and n.

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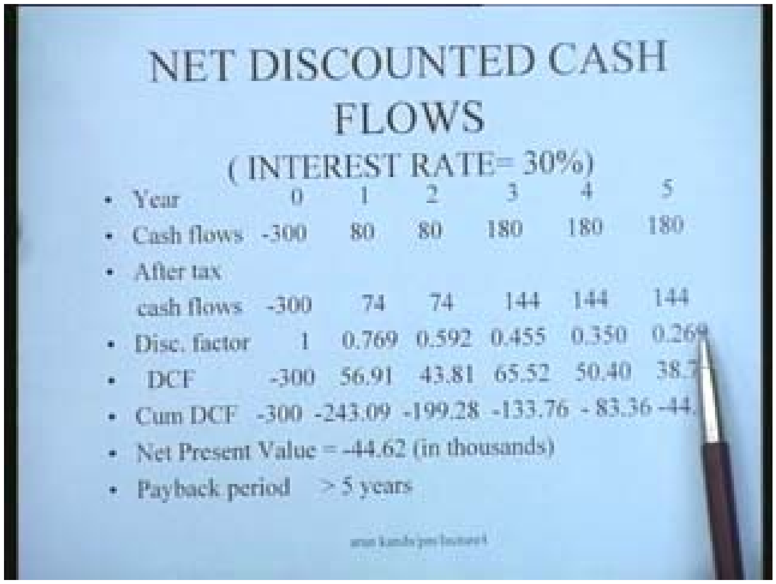

The behavior of the discounted cash flow factor would be something like this. I think this is also interesting. If I plot this particular value here and I have the number of years here it could be 1, 2 and so on up to n; n years or whatever it is and if I take the interest rate, if the interest rate is equal to 0% then the value here this is zero and this is 1 and this is the value of the discount factor. What would happen is as you are successively increasing the values of i in this direction the discount factors for different years would be different. If you are doing the undiscounted case the discount factor is 1 no matter whether you are talking about the first year, second year or the nth year. If you increase the value of i to let’s say 10% then you come here. So you have different discount factors depending upon each year and you know this is nothing but 1 upon 1 plus i to the power of n. This is how the plot of these factors would look like for different values of i.

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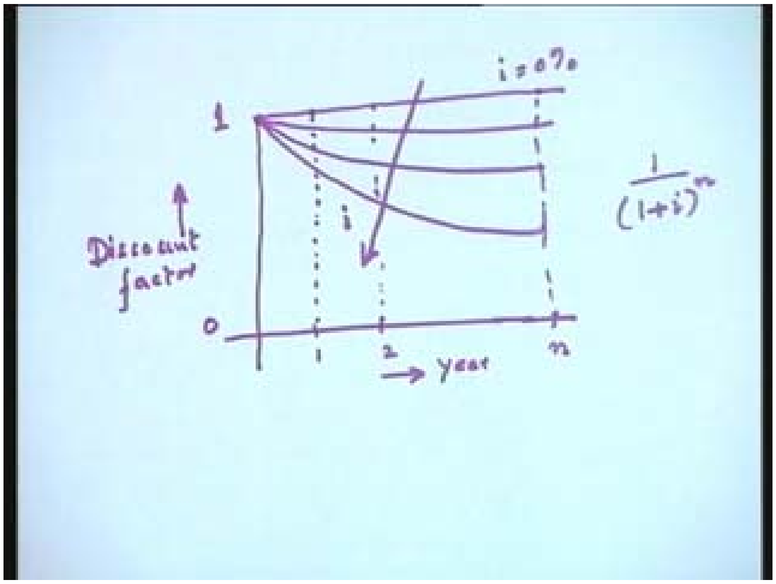

This gives you an indication of how the discount factors are actually different; how they keep on changing in that sense of the return. Let's therefore see that when i is equal to 30% you see that our net present value has in fact become negative in this case. The indication now is clear that for the after tax rate of return this is going to lie between 20 and 30% because that 30% it becomes negative. We can interpolate linearly and get the values.

Again let's see how the internal rate of return looks like for this particular case. This is the case where you have the net cash flows. Corresponding to i is equal to 0 we had an NPV of 280,000. Corresponding to i is equal to 10% we had an NPV of 124.31. Corresponding to 20% we had this particular NPV of 23.67 which is like this and corresponding to 30% we had a negative value which is -44.63. So we have these points. In this particular situation one can again join these points and estimate that particular value where you cross this particular axis here, this value. This is your IRR. This is the IRR. The IRR in this case works out to be 23.5%. So 23.5% is now the IRR.

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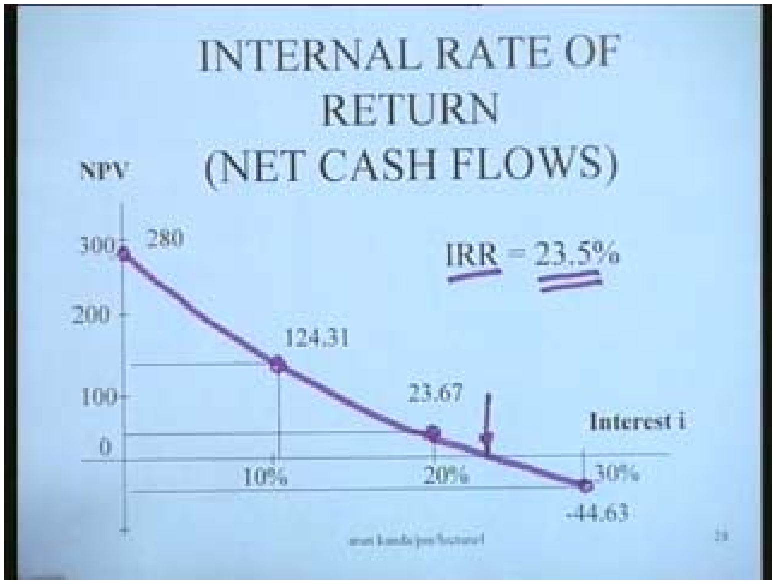

Do you recall what it was for the previous case? It was something like 30.53%. There is a drop in the value of IRR which is quite significant if you take the tax implications into consideration. You have just take a sample project to illustrate that the taxes could make a significant difference to the cash flows and correspondingly therefore you can talk about both a before tax and an after tax sort of internal rate of return from that point of view.

Similarly let's see how the payback period is affected in this particular situation. When one was computing the payback period we are plotting the cumulative NPV and on this side we have the years. In this case we have years. We talk about the first year, the second year, the third year, the fourth year and the fifth year of return and what we saw was for i is equal to 0 that means the undiscounted case the curve was something like this and the payback period was 3.06 years. It is roughly 3.06 years. For i is equal to 10% you found that in this particular situation the payback period increased and the new value was something like 3.65; this value 3.65. With 20% this became 4.6. The graph of this would look like this and for 30% this value would be greater than 5 years. It would not intersect below 5 years and we find again that the value of i increases here from 0% to 30% on this axis.

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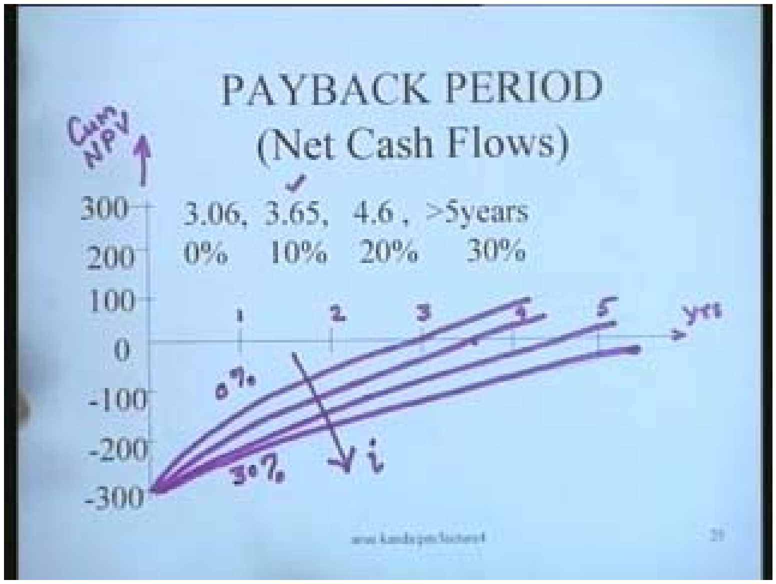

This gives us an idea of how the discounted payback period would be affected in both these cases. Let us make a comparison now between the before tax and the after tax cash flows. What we have seen is that for the undiscounted case that is 0% rate of interest we had an NPV of 400,000 for the before tax case. It dropped to 280,000 thousand for the after tax case and as far as the payback period here it was lower 2.78; it went up to 3.06 in this particular situation.

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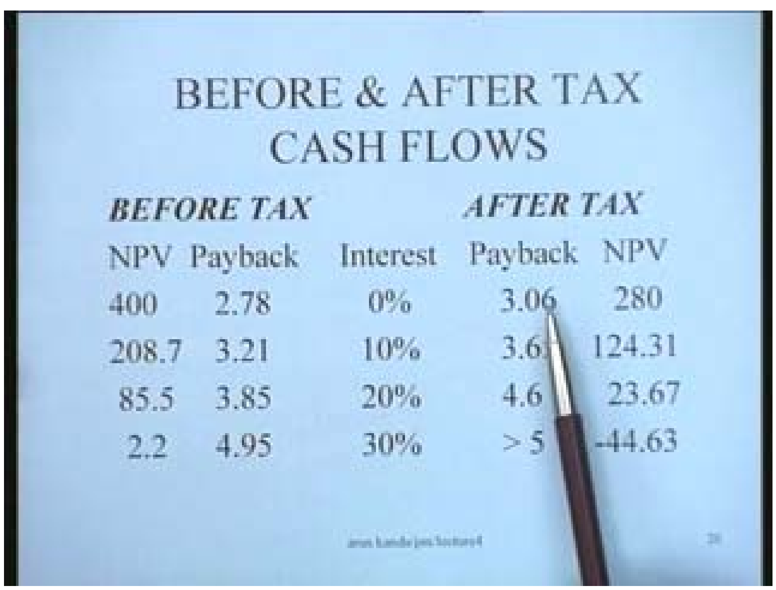

Similarly if the rate of interest was 10% the NPV here dropped to 208 and in this case it dropped to 124.31 and in this case the payback period was lesser. Here it was more at

3.65. Similarly when you increase the rate of interest to 20% the NPV was 85.5 here and only 23.67 here and here the payback period was 3.85 which was less and here it was much more and you had these kinds of performance figures for both before and after tax rates of return.

So far we have concentrated in this particular lecture on the important financial indicators like NPV, the benefit cost ratio. Once you have the stream of cash flows you can calculate the benefit to cost ratio. Actually NPV is nothing but benefits minus cost and then we have seen the discount. Let us now look at the debt servicing capability of a project which is a very important aspect too. When one talks about the debt service coverage ratio there are two things which are important here. The total cash accrual and the debt service requirements.

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The total cash accrual is determined by computing the profit after tax, adding to it the depreciation and the interest on the term loan which you are going to take. Once you have all these things added up together you get the total cash accrual. Depreciation is added because you have deducted depreciation to compute your taxable income and then you have computed the tax and in reporting the after tax rate of returns you are actually showing in the income a situation where depreciation is subtracted. But actually depreciation is the money that you would be getting. It would be an amount that is actually available. That is why it is added. This accrual tells you the total money in hand that you would have for repayment of your loans and for other things. Similarly the debt service requirement talks of only two things the interest on the term loan as well as the repayment of the term loan; both these things, the capital as well as the interest, the total debt requirements.

The debt service coverage ratio is defined as the ratio of the total cash accrual A to the debt service requirements B which we have just defined and generally a debt service coverage ratio of 1.5 to 2 is considered satisfactory by financial institutions. Incidentally if the debt service coverage ratio is less than 1.5 generally it means that, if the project is otherwise okay, you could be provided a loan of longer maturity. That means if you had applied for a 10 year loan you might get a 15 year loan because you don't have the capacity to pay that much and if it is greater than 2 the maturity period may be shortened.

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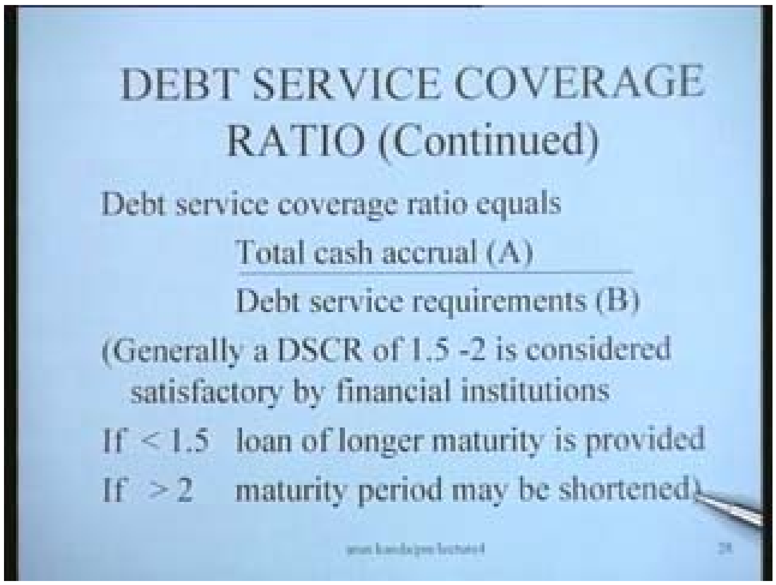

A higher debt service coverage ratio indicates that you have a higher capacity to clear the payment of these loans. How this is actually done is very simple because it's just this ratio. To give you an example, here are the cash flows over a 10 year horizon of the profit after tax. This is all in millions of rupees. You have the profit after tax, the series for 10 years. You have the depreciation say equal depreciation for the next 10 years and you have the interest on term loan which depending upon the loan could vary from period to period. That's what you have here. We take the total of these three. You would work out for the entire 10 year series that this is the amount A which could vary from period to period. This is the numerator of the DSCR, debt service coverage ratio.

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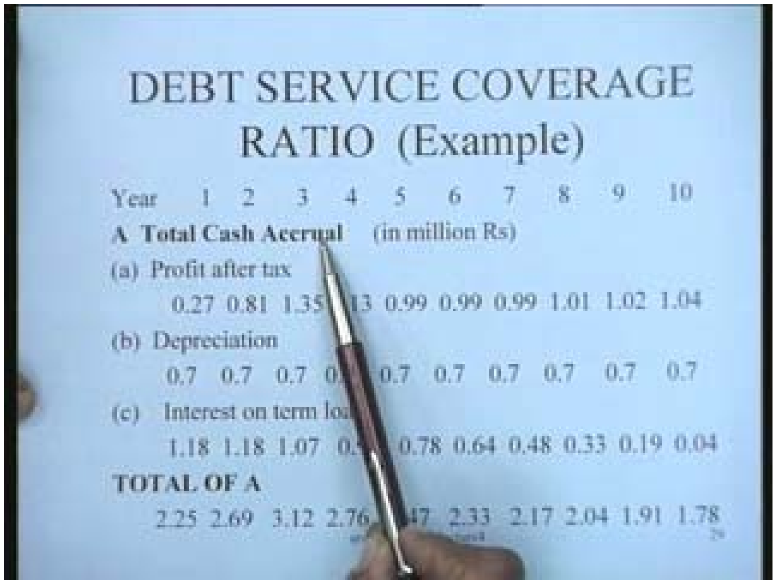

So we get this numerator. Similarly we compute this denominator. Denominator again we need two terms the interest on the term loan as well as the repayment of the term loan. These amounts could vary here and normally no repayment is made in the first year. So you have these values. The total of these gives the total of B which is this series.

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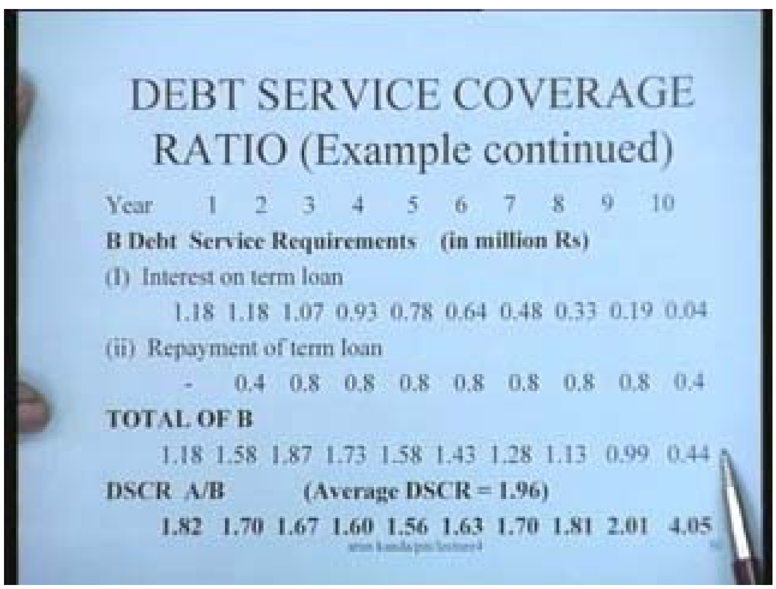

Taking the A by B value this value comes out. You will have a series for 10 years which is shown here in bold. What we find is that the debt service coverage ratio changes from here to here and this is the value. We can take the average debt service coverage ratio average of these values, the simple average which is 1.96. 1.96 is quite acceptable. As we said it lies between the range of 1.5 to 2 and if it is 2 or greater it shows that it's a healthy project from that point of view. This is how the debt service coverage ratio is used and the various financial institutions try to look at this particular value to find out the health of the project.

Let us summarize what we have tried to do in this particular lecture. We have tried to see that the financial appraisal of a project plays a very vital role in the overall project evaluation and we have tried to see that this financial appraisal is generally done through estimation of the investment, through the yearly costs and the revenues to obtain the gross cash flows. This is how it is generally done and then the depreciation and tax concepts which are used to obtain the net cash flows from these have been talked about in this lecture. We have also seen the computation of the NPV, the IRR, the benefit to cost ratio and the payback in this particular lecture through a sample project.

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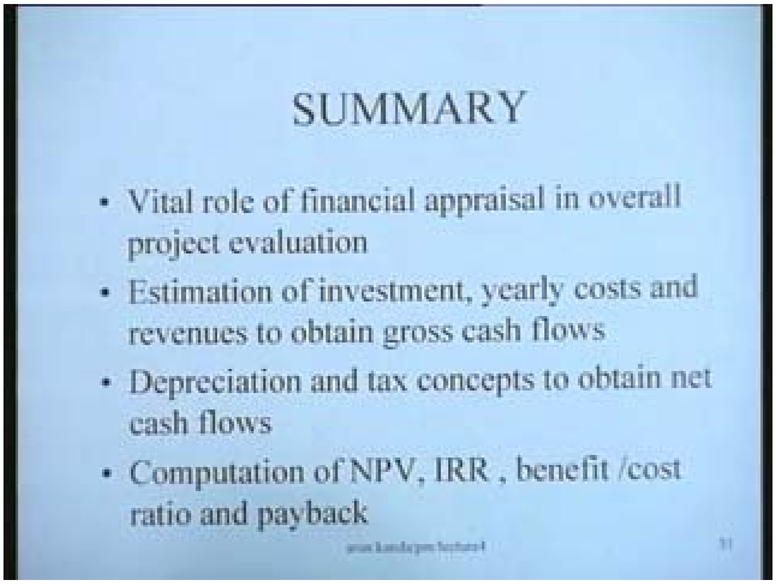

You have seen these computations and seen how they are actually used and we have looked at the debt service coverage ratio and its implications for financial institutions. You have seen that a debt service coverage ratio of 2 or more is worthwhile. We have also seen that the role of the financial appraisal of a project in conjunction with the other appraisals which you talked about in the last lecture namely the market appraisal, the technical, the economic and the ecological analysis is important in producing the project feasibility report.

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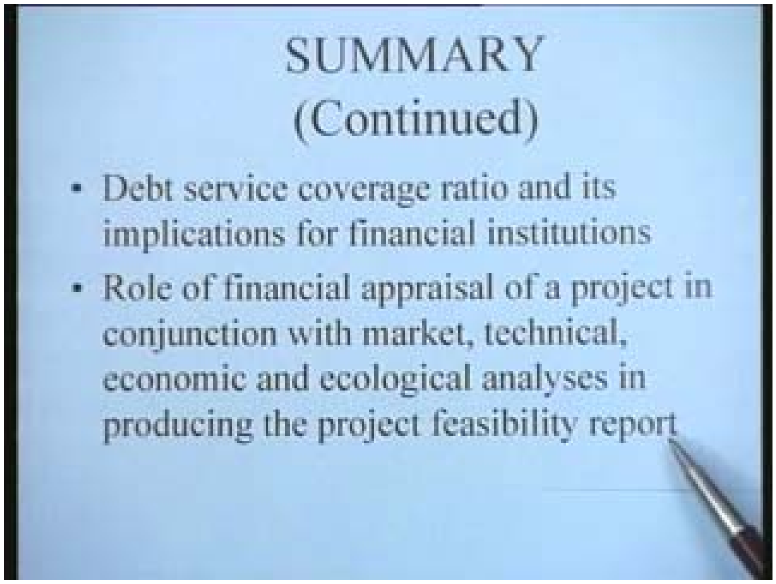

The project feasibility report is a document which is a very important document before a project can be initiated.