Depreciation, Alternate Investment and Profitability Analysis.

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Lecture-19.

Profitability Analysis – Discounted Cash Flow.

Welcome to the course Depreciation, Alternate Investment and Profitability Analysis. We are continuing with module 3 Profitability Analysis. In this lecture I will discuss a method for Profitability Analysis that is called Discounted Cash Flow Part 1. Now this discounted plot to cash flows are the type of method which use the time value of money. Earlier methods which we have discussed Profitability Analysis they do not use the time value of money.

But discounted cash flows use the time value of money so that is why these are the different methods than the earlier ones. In capital budgeting discounted cash flow analysis is a method for valuing a project, company or asset using the concept of time value of money while estimating the cost and benefit of a given project. Though there are many variations in this methods but all methods require cash flow to be discounted at a certain rate that is the cost of the capital, which is the minimum discounted rate earned on a project that leaves the market value unchanged.

These methods take into account all investment costs and benefits that the project incurs during its entire life period. The important characteristics of DCF, which is Discounted Cash Flow capital budgeting is that it takes into consideration the time value of money while estimating the cost and benefit of a given project. Theoretically the DCF is arguably the most sound method of valuation. Discounted Cash Flow models are powerful but they do have short comings.

Commercial banks have widely used Discounted Cash Flow as a method for valuing commercial real estate construction projects. This practice has 2 substantial short comings, number 1 the discounted rate assumption relies on the market for competing investment at the time of the analysis, which would likely change perhaps dramatically over time, and number 2 that straight line assumptions about, the straight line assumptions about income to increase are generally based upon historic increases in market rate, but never factors in the cyclic nature of many real estate markets.

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Thus, the Discounted Cash Flow Valuation should only be used as a method of intrinsic valuation for companies with stable, predictable cash flows.

Discounted cash flow (DCF) analysis includes methods like:

1. **Net present value method,**
2. **Internal rate of return method,**
3. **Net terminal value method and**
4. **Profitability Index(PI)**

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The net Present value(NPV) method

The net Present value(NPV) method is a Discounted cash flow(DCF) method in which Present Value (PV) of the DCF is used. NPV is described as the summation of the present value of Cash flow after tax(CFAT) in each year minus the summation of the present value of net cash out flow in each year.

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NPV can be mathematically expressed as:

$$NPV = \sum_{j=1}^{N} \frac{CF\text{-}AT_j}{(1+i)^j} + \frac{SV + WCA}{(1+i)^N} - \sum_{j=0}^{N} \frac{COF_j}{(1+i)^j}$$

Most loans are made during boom real estate markets and these markets usually last fewer than 10 yeaRupees Now thus the Discounted Cash Flow valuation should only be used as a method of intrinsic valuation for companies with stable, predictable cash flows. Discounted Cash Flow that is shortly in short it is called DCF Analysis includes methods like Net Present Value method, Internal Rate of Return method, Net Terminal Value Method and Profitability Index.

The Net Present Value method. The Net Present Value method is a Discounted Cash Flow method in which present value which is PV of the DCF is used, NPV is described as summation of the present value of the cash flow after tax, which is called CFAT, in each year - this summation of the present value of the net cash out flow in each year. Now the formula for this is NPV can be mathematically expressed as NPV is equal to summation I equal to sorry, J equal to 1 to N CFATj divided by 1+i to the power j+SV+WCA divided by 1+i to the power N - summation j is equal to N COFj 1+i to the power J.

Now where CFATj is the cash flow after tax at jth year, high rate of return generally based on cost of capital, N equal to lifespan of cash flow of project, SV Salvage Value of the project at the end of the lifespan. WCA is the working capital, COFj is the cash outflow at the j at here. The accept-reject rule for a project evaluated by NPV is to accept the project if NPV is positive and reject if its negative, now through examples let us explain this.

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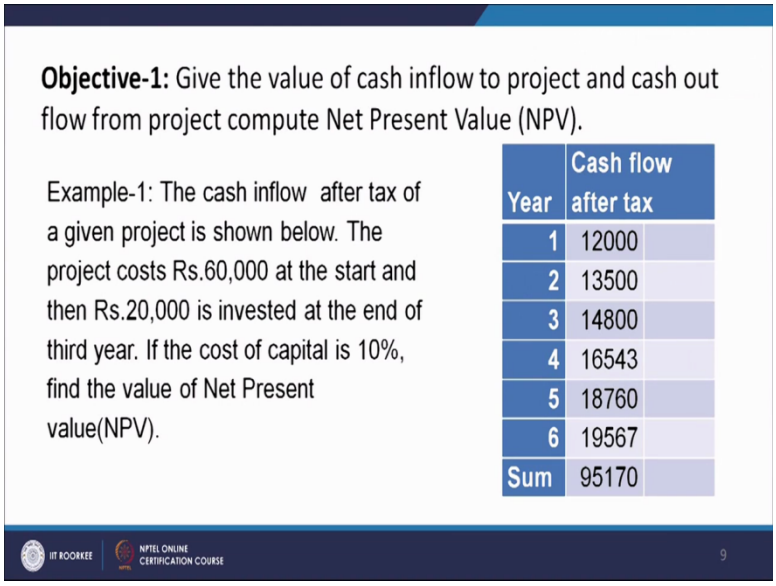

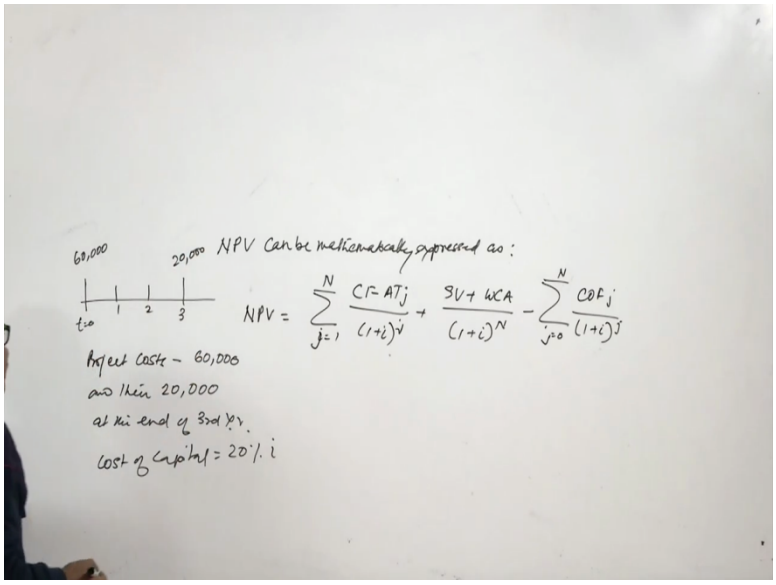

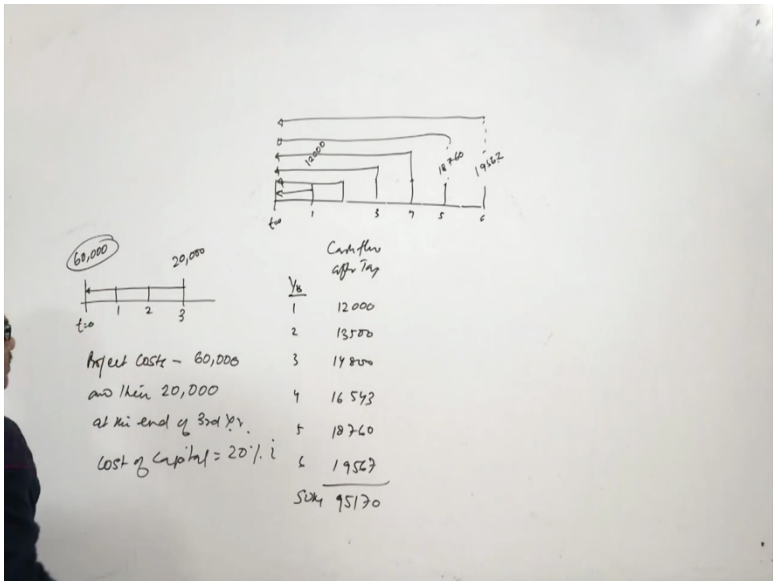

So for this purpose we take example number 1 the objective of this example with the value of cash in, given the value of cash inflow to project and cash outflow from project, compute Net Present Value that is NPV.

Example is the cash inflow after tax of a given project is shown below the project costs, project cost 60000 at the start and then 20000 at the end of third year cost of capital is equal to 20 percent this is basically I, find the value of the Net Present Value. So if I see time line at t equal to 0, 60000 is invested and t equal to 3 at the third year, end of the first year, end of second year, end of the third year another 20000 is invested in the project and whatever receipts, receipts are given here.

Year 1 2 3 4 5 6 cash flow after tax this is 12000 this is 13500 this is 14800 this is 16543 this is 18760 this is 19567 and the summation of this is 95170. Now, obviously this is Net Present

Value, so at t equal to 0, 60000 is invested and after 3 years end of 3 years, 20000 is invested so this has to be brought to this timeline. Similarly here all these values have to be brought to the timeline t equal to 0. So if I see here this t equal to 0, this is 1 2 3 4 5 6, so this is receipt is 19567, this is 18760, like this in the first year this is 12000, so all this has to be brought to the 0 timeline.

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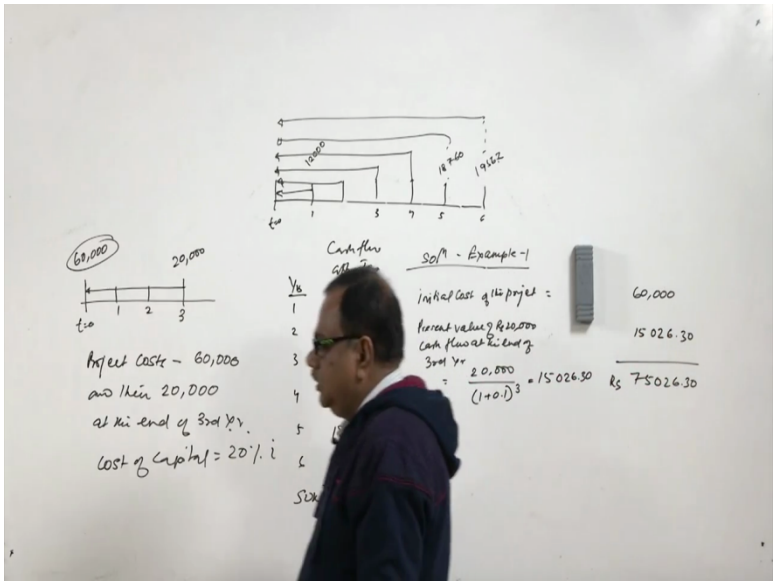

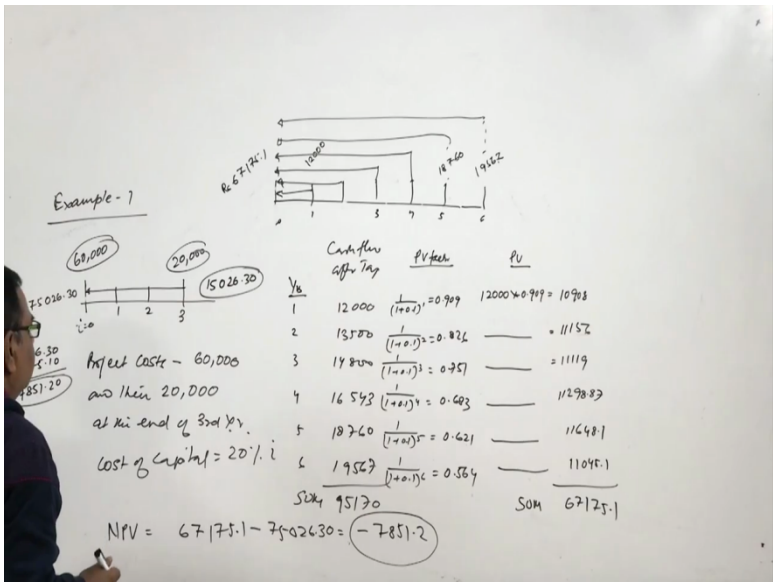

And then we add these values up, we add these values up and then take a difference and see whether the NPV Net Present Value is positive or negative. So let us solve this problem. Now solution example 1, initial cost of the project is 60000, now the cash out flow of the 20000 takes place at the end of third year, this 20000 takes place at the end of third year. So present

value of the cash flow value of Rupees 20000 cash flow at the end of third year is equal to 20000 divided by 1 + 0.3 this comes out to be 15026.30.

So I add here 15026.30 this comes out to be 7526.30. So this is my investment in the present value term. So this value here is Rupees 75026.30. Now all these values has to be converted into time t equal to 0 that means their present value needs to be computed and then added up. So if I do that, so the PV factor for this, present value factor for this is 1 divided by 1 + 0.1 to the power 1, this comes out to be 0.909 this is 1 divided by 1 + 1.1, 2, 1 + 0.1 3 similarly this 1.01 4 this is 1.01 5 this is 1.01 to the power 6. So I calculate these factors, these factors are 0.826 this is 0.751 this is 0.683 this is 0.621 and this is 0.564.

And if I multiply this with this with this, so my present value of this value is 12000 multiplied by 0.909, this comes out to be 10908. Similarly if I do this, this comes 11156, this comes 11119, this comes 11298.87, this comes 11648.1, this comes 11045.1 and if I add them together the sum is 67175.1. Now so NPV is equal to, so summation of all these things becomes Rupees 67175.1 so NPV is equal to 67175.1 - this value 75026.30 this comes negative 7851.2, so this is a negative quantity.

That means whatever I am investing, I am not getting due to the profit. So my conclusion is as the value of the NPV is negative and hence the project is not acceptable. But the further analysis shows, because if you see the difference, the difference is 75026.30 and 67175.10 point 21 0 now let me quickly do it without error, this is 75026.30 - 67175.10, this is coming 7851.20, this is the deficiency. Now if we see the investment what we have done here, the cost of the investment comes out to be, this investment costing me here is 15026.30. That is this is the value here, if I transfer this to the present value.

That means if I am not investing this money into the project then my NPV will be positive because the difference is only 7851.20 and if I drop this expenditure which is 15026.30, my NPV will be positive. So I should look that whether doing away this expenditure can solve my problem or not.

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Objective-2: Compare the present value(or discounted cash flow) of given cash flows when interest rate is given. Also compare Payback period for undiscounted as well as discounted cash flows.

Example-2: Find out the discounted cash flows (Present value) of two different machines "A" and "B" from the data given below:

cost of capital(r) : 10%
Initial cost of equipment "A": Rs.10,000
Initial cost of equipment "B": Rs.13000

Year	Cash Flow After Tax	
	Machine"A"	Machine"B"
1	2460	1980
2	3256	2678
3	3326	8769
4	2156	7650
5	5210	4320

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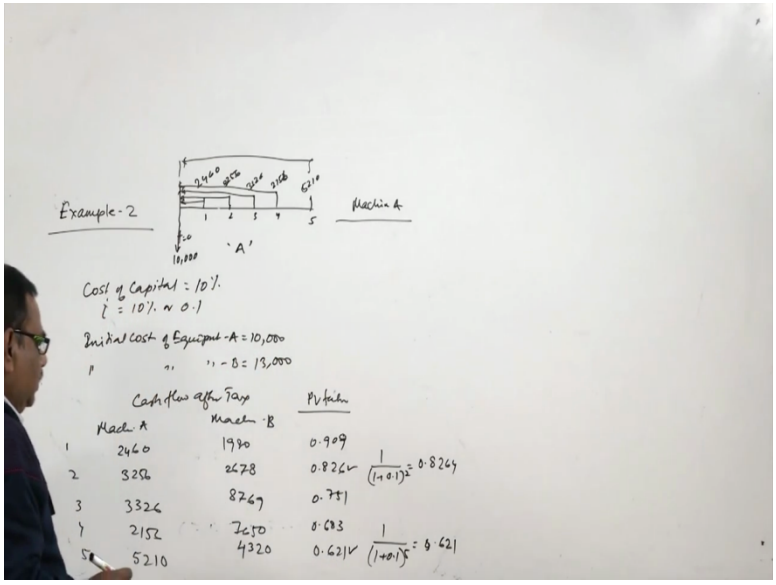

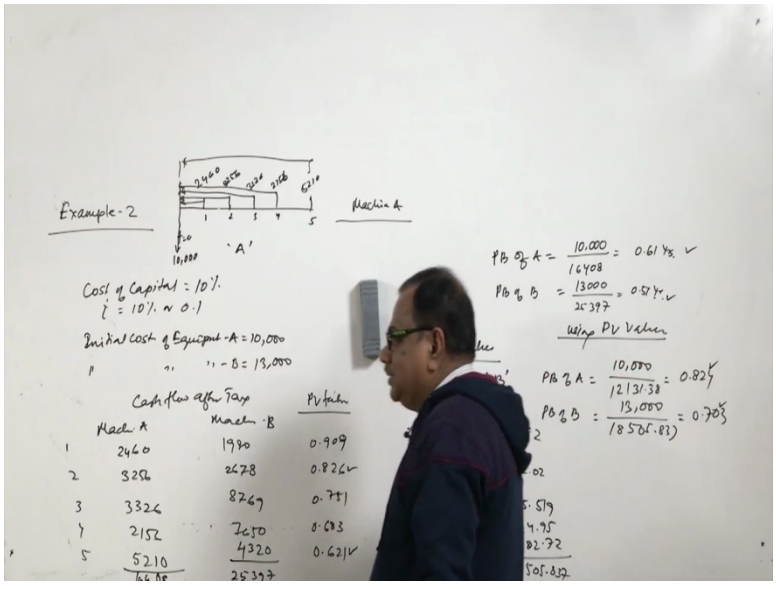

Now let us take another example, example number 2. Now the objective of the example number 2 is compare the present value or discounted cash flow of given cash flow when interest rate is given. Also compare payback period for undiscounted as well as discounted cash flow. Now the example number 2 is find out the discounted cash flow present value of 2 different machines A & B from the data given.

Now cost of capital, cost of capital is 10 percent that is I, i is 10 percent or 0.1 in fraction, initial cost of equipment A is equal to 10000, initial cost of equipment B is 13000 and cash flows after tax machine A machine B this is 1 2 3 4 5. This is 2460, 3256, 3326, 2156, 5210 this is 1980, 2678, 8769, 7650, 4320. So obviously these cash flows are at different Timelines and has to brought to the timeline 0.

Now for the machine A machine A if we take, this is timeline t equal to 0, I am sinking a money of 10000 this is A. And I am receiving money 1, 2, 3, 4, 5 now these values 2460, 3256, 3256, 3326, 2152, 2156, I think 2156, 5210, 5210, so all these money's have to be PV has be calculated. And then we have to add it up and whatever value comes we will deduct 10000 and see that NPV is positive or negative. So for this if I see the PV factor which is basically 1 by 1+i to the power j, so the PV factors are 0.909, 0.826, 0.751, 0.683, 0.621, now how this calculated, let us pick up this.

This is nothing but this investment 3256, so here this is for 2 years, it has to be brought back, that means this factor is 1+ i is point 1 to the power 2 and this comes out to be 1.1 to the power 2 and that inverse of it comes to be 0.8264. Similarly let us calculate for this, this is 1+0.1 to the power 5 comes out to be 1.1 to the power 5 equal to this as a inverse of this is 0.621. So I have shown you how this PV factor has been calculated.

Now if you multiply this then we get a present value, this is machine A, this is machine B, so I get present value 2236.14 this is 2689.456, 2497.826, 1472.548 and this is 3235.41 and if I do summation this is 12131.38. Similarly if I calculate this is 1799.82. 2212.08. this is 6585.519, this is 5224.95, this is 2682.72 and if this one, this is 1850, 51037. Now this is more and this is less, so the cash outflow for both the machines are negative and hence we cannot select this machine because the NPV is negative, we cannot select these machines.

But if we find out the payback period for this, if we find out the payback period of this PV of machine A is equal to 10000 divide by, because if we add them up here this is 16408 and this is 25397, so this is 10000 divided by 16408 comes to be 0.61 years and PV of B comes out to

be 13000 divided by 25397 is equal to 0.51 years. And if I use this discounted values, present values, then using PV values then PV of A is equal to 10000 divided by this value which is 12131.38, this comes to be 0.824 and PV of B is 13000 divided by this value 18505.837 comes out to be 0.703 now we see that these values are considerably increased when I am using the present value of the cash flow.

Now let us summarize, in this lecture I have started a new method which are called Net Present Value method, which comes under Discounted Cash Flow methods because Discounted Cash Flow methods are time adjusted methods and we have solved a few problems. We have also solved a problem using Net Present Value method and Payback Method and we saw that if Net Present Value of the cash flows are used then PV of the machines increase. Thank You.