Depreciation, Alternate Investment and Profitability Analysis.
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Lecture-18.
Profitability Analysis – Return on Investment.

Welcome to the course Depreciation, Alternate Investment and Profitability Analysis. We are continuing with the module 3 that is profitability analysis. Today's lecture is devoted to return on investment, return on investment, this is a profitability measure and is measured as the ratio of profit to investment. A high return on investment means the investments gains compare favorably to investment cost, although several measures of profit and investment could be used, the most common are net profit and total capital investment.

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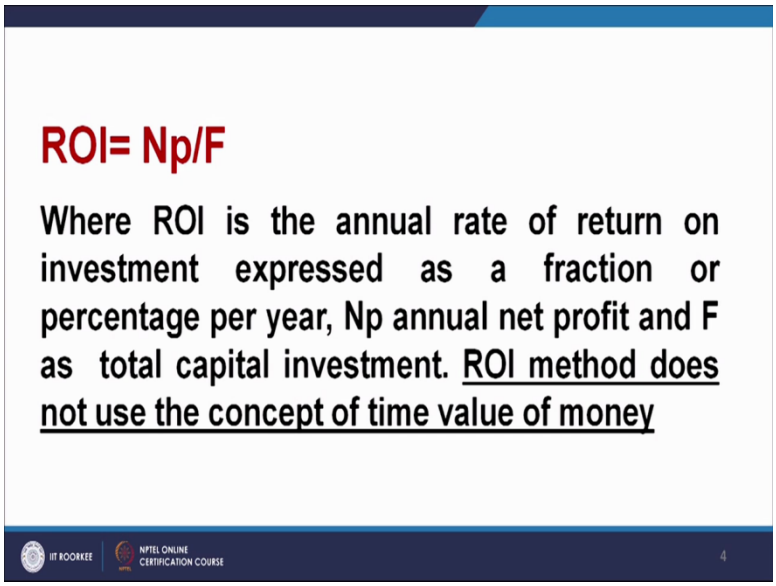

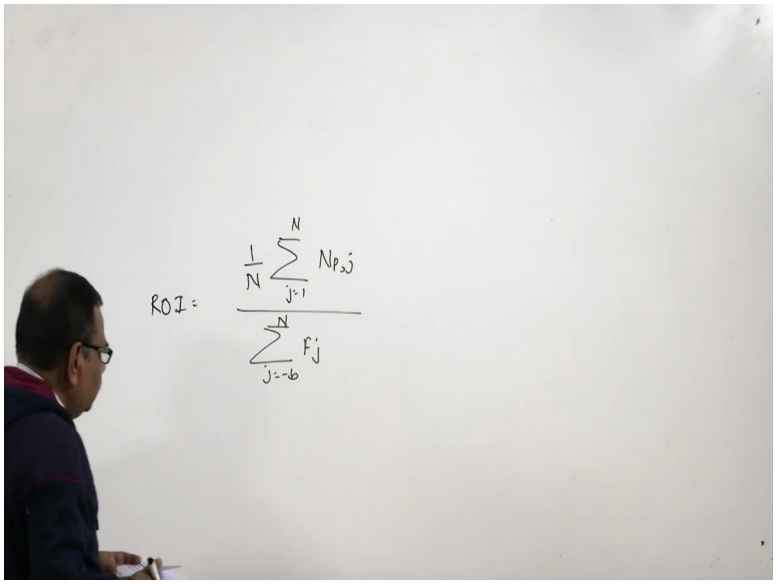

As a performance evaluator, ROI, that is Return On Investment is used to evaluate the efficiency of an investment or to compare the relative efficiency of a number of different investments. ROI is equal to Np by F where ROI is the annual rate of return on investment expressed as a fraction or percentage per year, Np annual net profit and F as total capital investment. ROI method does not use the concept of time value of money. Now let us see the formula which is used for the ROI computation. If net profit is not constant year to year and similarly if additional investment is carried out in the life span of the project, then ROI becomes 1 by N summation j equal to N to N Npj divided by summation j equal - b to N Fj.

Where N stands for the evaluation period of the project, Npj is a net profit in the jth year, - b is the year in which the first capital investment is made. In general capital investment is made before the start of the production and Fj is the total capital investment done in jth year.

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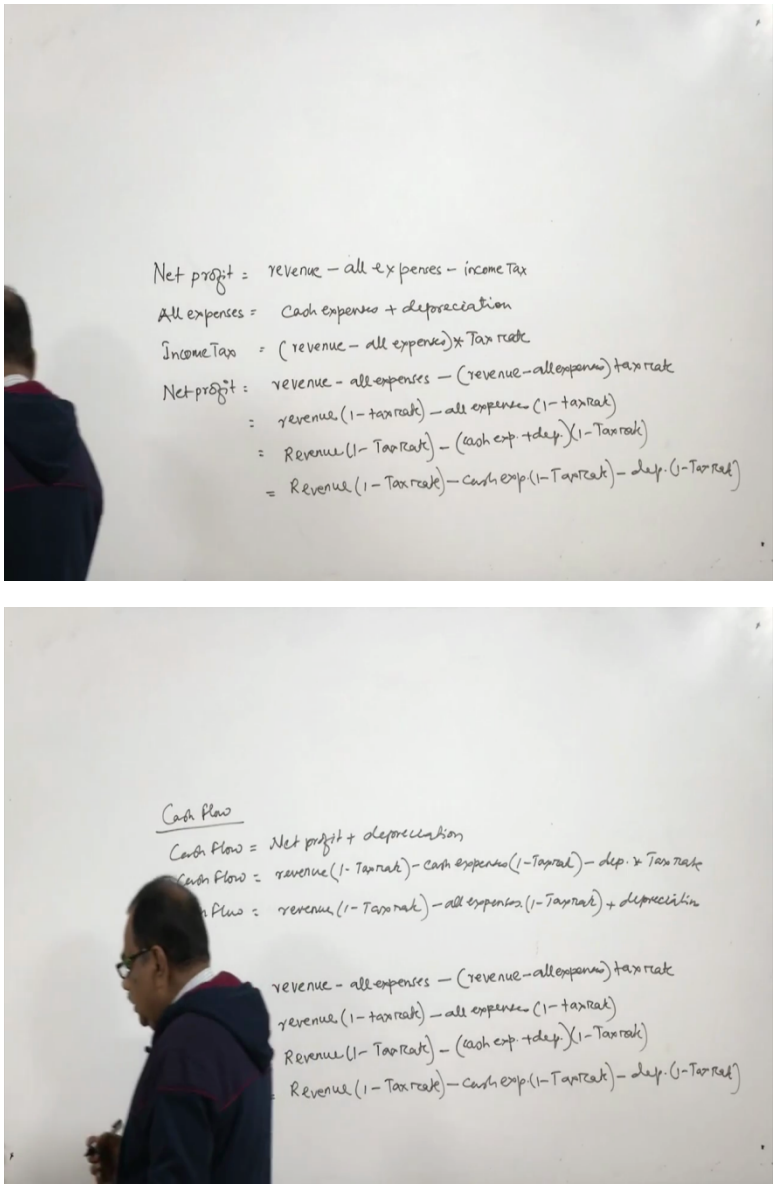

Now, let us derive some terms, net profit is equal to revenue - all expenses - income tax, all expenses is equal to cash expenses + depreciation. Income tax is equal to revenue - all expenses into tax rate. Now net profit is equal to revenue - all expenses - revenue - all expenses into tax rate, this is basically income tax, is equal to revenue 1 - tax rate - all expenses 1 - tax rate.

This is equal to revenue 1 - tax rate - cash expenses + depreciation into 1 - tax rate. This is equal to revenue 1 - tax rate - cash expenses 1 - tax rate - depreciation 1 - tax rate. Cash flow is equal to net profit + depreciation or cash flow if you can write down is equal to revenue - tax rate - cash expenses - 1 - tax rate - depreciation into tax rate or cash flow is equal to revenue 1 - tax rate - all expenses 1 - tax rate + depreciation.

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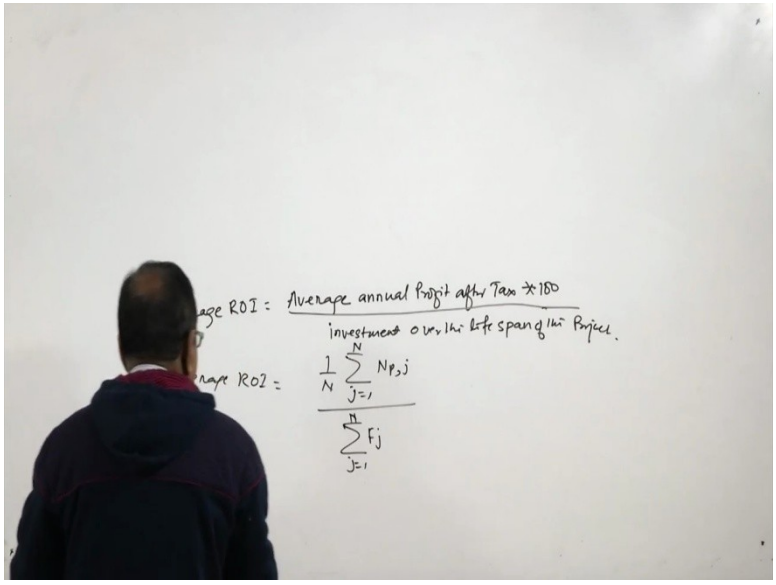
Net profits of a project are not generally constant throughout the life span(N) of the project. In such cases an average ROI called Average rate of return(ARR) is used:

Average ROI = Average annual Profits after Taxesx100/ investment over the life of the project

Average ROI = $\frac{(1/N)\sum_{j=1}^{N} N_{p,j}}{\sum_{j=1}^{N} F_j}$ where J = 1..N



There is another similar method for profitability method called average rate of return(ARR). Though there are many alternative methods for calculating ARR, the most commonly used definition of ARR is as follows:

ARR = Average annual Profits after Taxesx100/Average investment over the life of the project

Now these are some derivations, now net profit of a project are not generally constant throughout the life span N of the project. In such cases, an average ROI called averaged rate of return is used, so average ROI rate of return is equal to average annual profit after tax into 100 divided by investment over the life span of the project. So average ROI is equal to 1 by N summation j equal to 1 to N Npj divided by j equal to 1 to N Fj. There is another similar method, profitability method called Average Rate of Return ARR. Though there are many alternative methods for calculation of ARR, the most commonly used definition of ARR is as follows.

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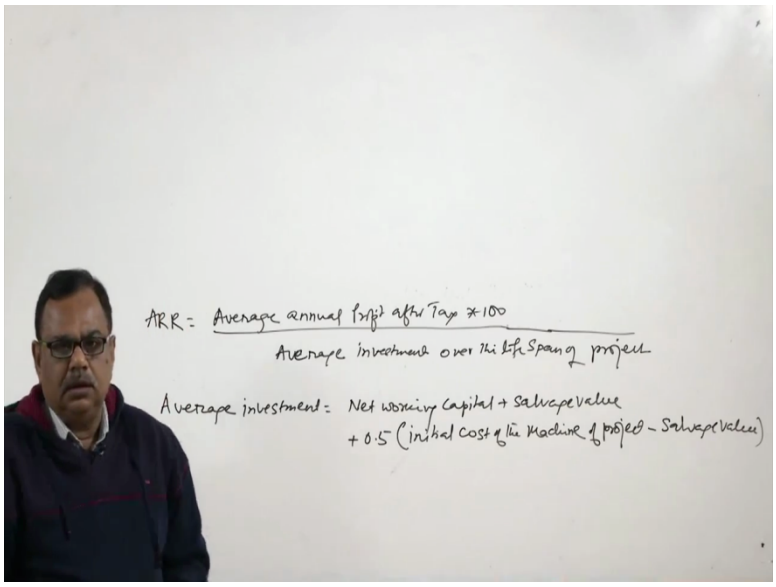

The average profit is computed by adding expected yearly profits after tax for the life period of the project and then dividing the results by the life of the project.

Average investment = Net working capital + Salvage value + 0.5(initial cost of the machines of project-salvage value)

Based on ARR, obviously, projects having higher ARR will be preferred to projects with lower ARR.

This method also does not use the concept of time value of money

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ARR average annual profit after tax into 100 divided by average investment over the life span of project. Now the average profit is computed by adding expected yearly profits after tax for

the life period of the project and then divided the result by the life of the project. Now average in investment in this case is computed as net working capital + salvage value + 0.5 into initial cost of the machine of project - salvage value. So based on ARR obviously the project having higher ARR will be preferred to project with lower ARR. This method does not use the concept of time value of money.

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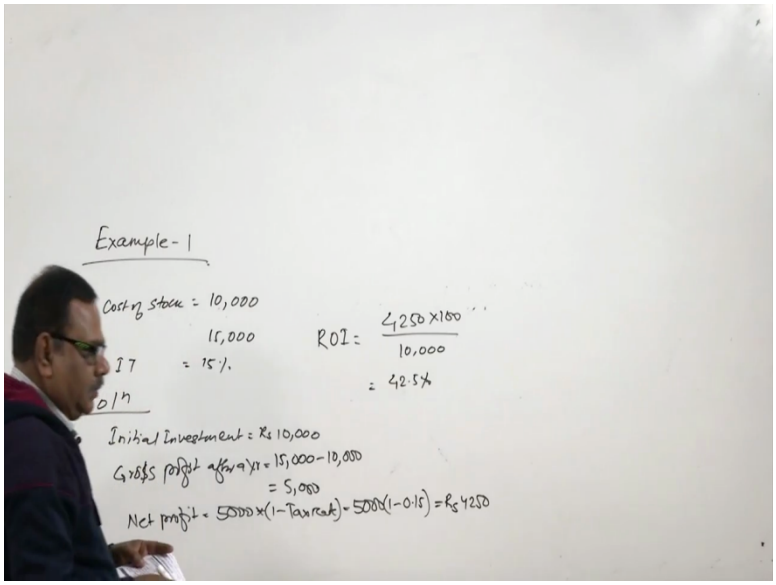

Now let us take example 1, an investor by stocks worth 10,000 cost of stock is equal to 10,000 and sells it after 1 year at a value of 15,000 if he pays the income tax at the rate of 15 percent, then calculate return on investment. Now initial solution initial investment equal to rupees 10,000, gross profit after a year is equal to 15,000 - 10,000 equal to 5,000, now net profit is equal to 5,000 into 1minus tax rate is equal to 5,000 into 1 - 0.15, this comes out to be rupees 4250. So ROI is equal to 4250 into 100 divided by 10,000 comes out to be 42.5 percent.

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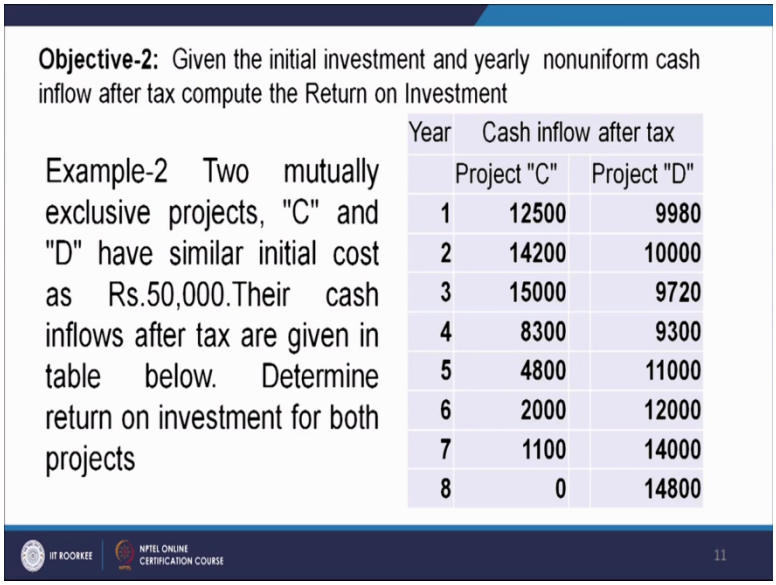

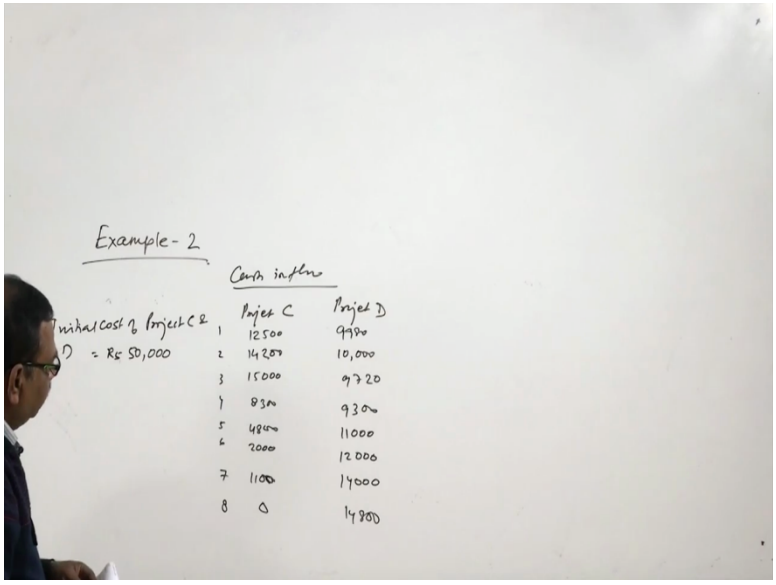

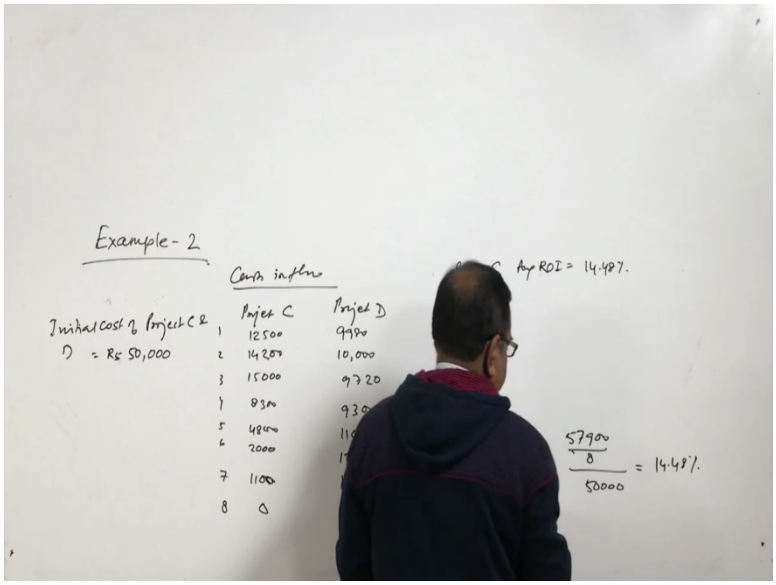

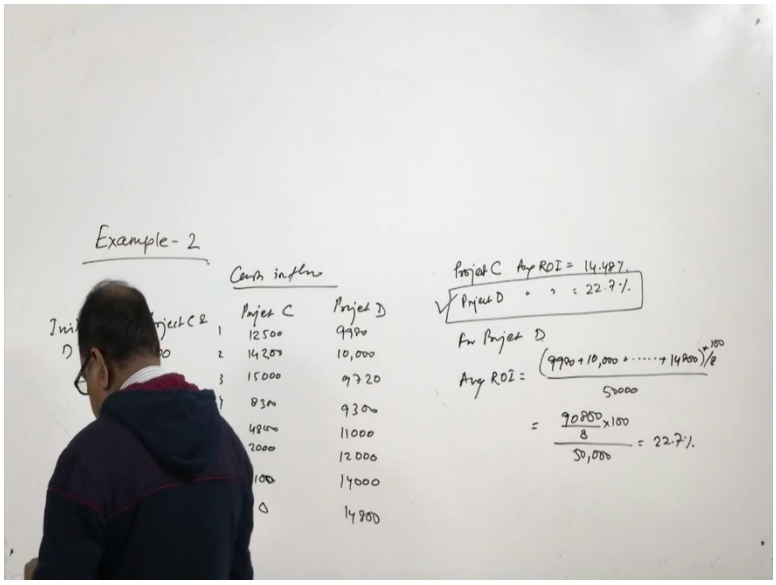

The Average ROI for project "D" is more than project "C" and hence project "D" is better. Please note that the above decision is contrary to the decision taken in Example-3 , Payback period. Please also note that the method does not use concept of time value of money and thus does not adjust the profits with time.

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Now take another example, now the objective of the example is given the initial investment and yearly non-uniform cash inflow after tax compute the return on investment. Now here, example 2, two mutually exclusive projects C and D have similar initial costs rupees 50,000, their cash inflow after tax are given in the side table. Determine the return on investment for both projects. So, we take example 2, initial cost of project C and D is equal to rupees 50,000. Now cash inflow project C project D this is 1, 2, 3, 4, 5, 6, 7, 8 this is 12,500, 14,200, 15,000, 8,300, 48,000, 2,000, 1,100 and 0 and this is 9,980, 10,000, 9,720, 9,300, 11,000, 12,000, 14,000, 14,800.

Now specialty of this is that after this 15,000 this is decreasing almost very marginal cash inflows to the project C whereas, project D is consistently doing better. Now if I use this method, you will remember that we have used this method in payback period and we have

reached to a wrong conclusion. Now let us see this example is giving us the right selection or not. Now average ROI average annual profit after tax into 100 divided by investment over the life period of project.

So average ROI of project C is equal to 12,500 + 14,200 so and so forth up to 1,100 divided by 8 divided by 50,000. Now this comes out to be 57900 divided by 8 divided by 50,000 this gives 14.48 percent. So we got for project C average ROI is equal to 14.48 percent.

Now if I compute this for D, project D average ROI is equal to for project D, average ROI is equal to 9980 + 10,000 dot dot dotthis is 14,800 divided by 8 divided by 50,000 (())(22:27) into 100 year then only the percentage will come out. And this comes out to be 90800 divided by 8 into 100 divided by 50,000, this comes out to be 22.7 percent. So this is 22.7 percent, so obviously my selection will be project D. As the average ROI of the project D is more than the project C, and hence the project D is better.

Now please note that the above decision is contrary to the decision taken in example 3 of payback period, please also note that the method does not use concept of time value of money and thus does not adjust the profit with time.

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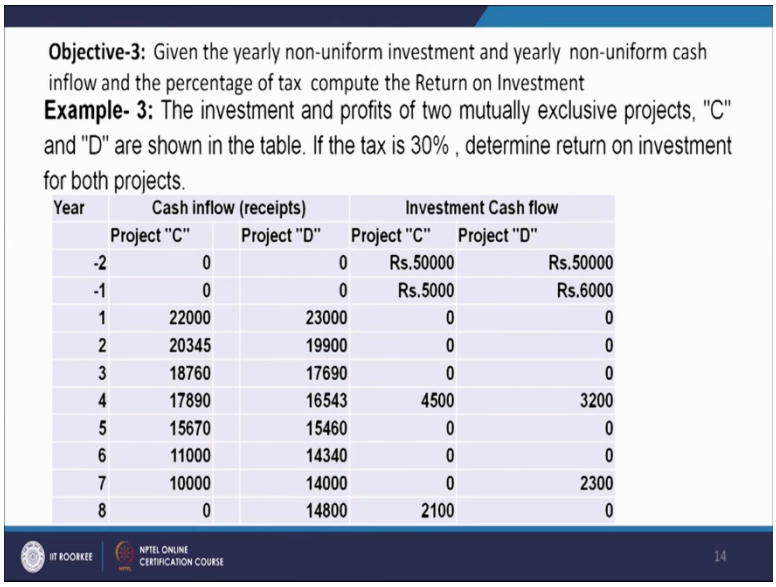

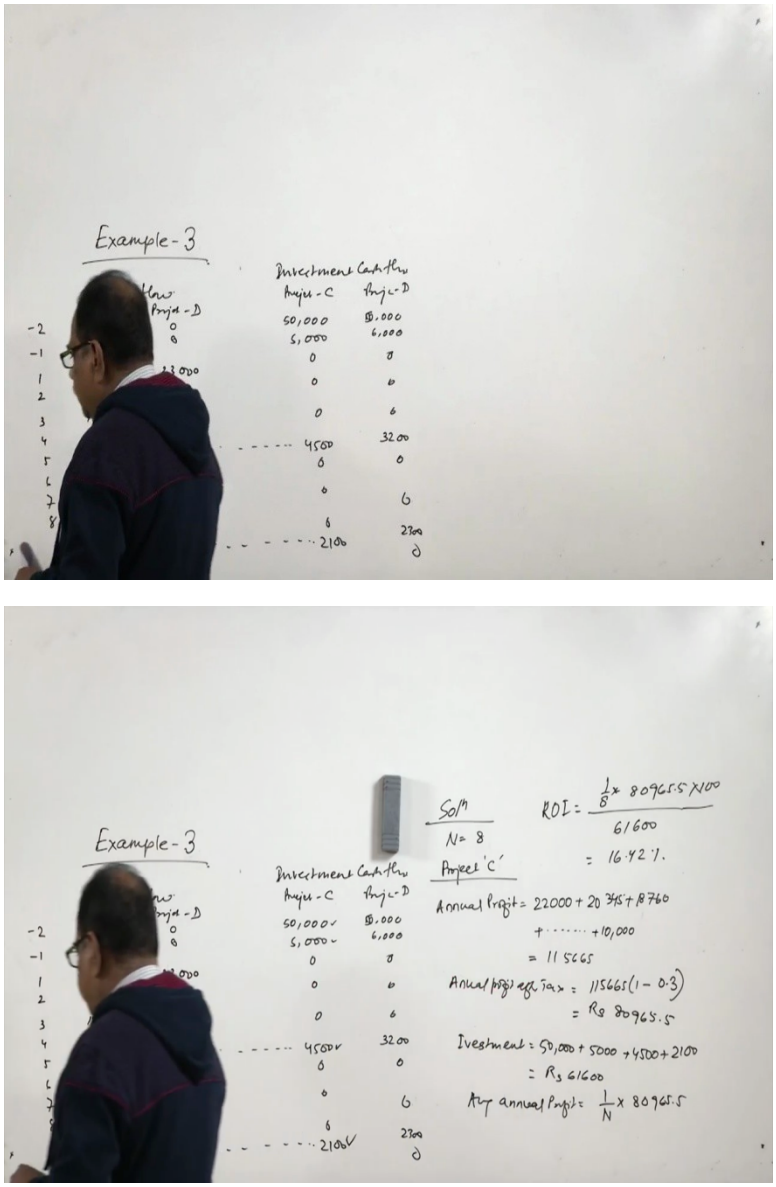

Now we go to the example 3, the objective of the example 3 is given the yearly non-uniform investment and yearly non-uniform cash inflow and the percentage of tax compute the return on investment. The example 3 is the investment and profit of two mutually exclusive projects C and D are shown in table and if the tax is 30 percent, determine the return on investment.

Now the projects are cash inflow this is - 2 - 1 1, 2, 3, 4, 5, 6, 7, 8 this is project C, this is project D, now this is 0, 0 because I will not get profit, profit starts at 1, now this is 2200 sorry 22,000, this is 20,345, this is 18,760, this is 17,890, this is 15,670, this is 11,000, this is 10,000 and this is 0, this is 0, 0 here, this 23,000, this 19,900, this is 17,690, this is 16,543, this is 54,060, this is 14,340, this is 14,000, this is 14,800. Now if you see the investment cash flow, now at - 2, you will remember that I was summing the investment with j is equal to

- b and there I have explained that that this when the profit starts, before that the investment takes place and due to that this - 1 and - 2 are coming.

So it is - 2 years my investment projects C, project D, this is 50,000, this is 5000, - 1 this is 5000, this is 50,000, this is 6,000, now at fourth year this there is a investment 4,500 and here there is a investment 3200 rest three digits are 0, 0, 0, 0 here 0, 0, 0 and at the end here there is a investment of 2,100, then 0, then investment of 2,300, here two zeros, here three zeros. Now this is the scenario, so there are different investments at different time lines and there are different receipts in different time lines.

If it is so, then how to compute the return on investment? Now for this solution, N is equal to 8 years, so ROI is equal to average annual profit after taxes into 100 divided by investment over the life period of the project, this I have already shown you. So annual profit for project C the annual profit is equal to 20,345 + 18,760 and basically, now the annual profit for project C is, now you write down all these figures that 22,000 + 20,345 + 18,760 + dot dot dot it goes up to this 10,000 this comes out to be 115665, this is annual profit.

So annual profit after tax will be 115665 into 1 - tax rate which is 0.3, because 30 percent tax is there. So remaining is 1 - 0.3 0.7 into this, so this is remaining amount after tax comes out to be rupees 80965.5. Now the investment, these are the investment figures, if I add them together 50,000 + 5,000 + 4,500 + 2,100 comes out to be rupees 61,600. Now average annual profit, the profit has to be divided by the project life span that is 8 . So this is 1 by N into 80965.5, now ROI is equal to now 1 by 8 into 80965.5 divided by, so into 100, divided by 61,600 this comes out to be 16.42 percent.

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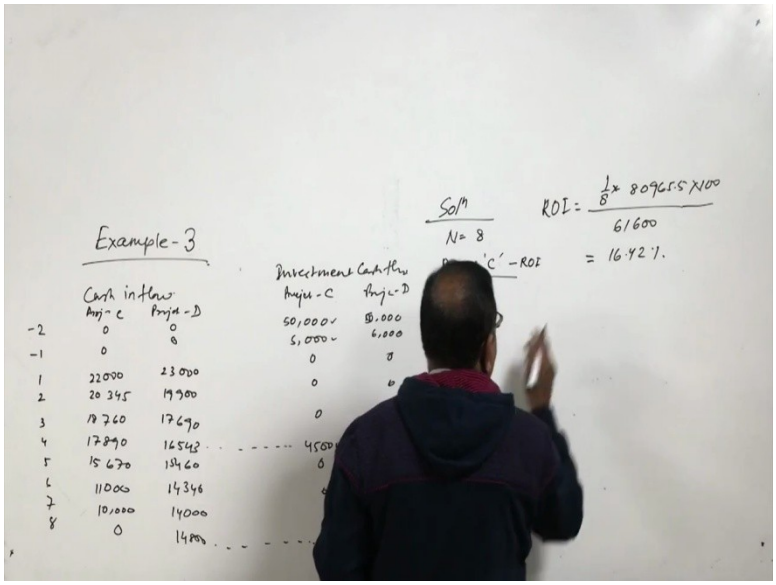

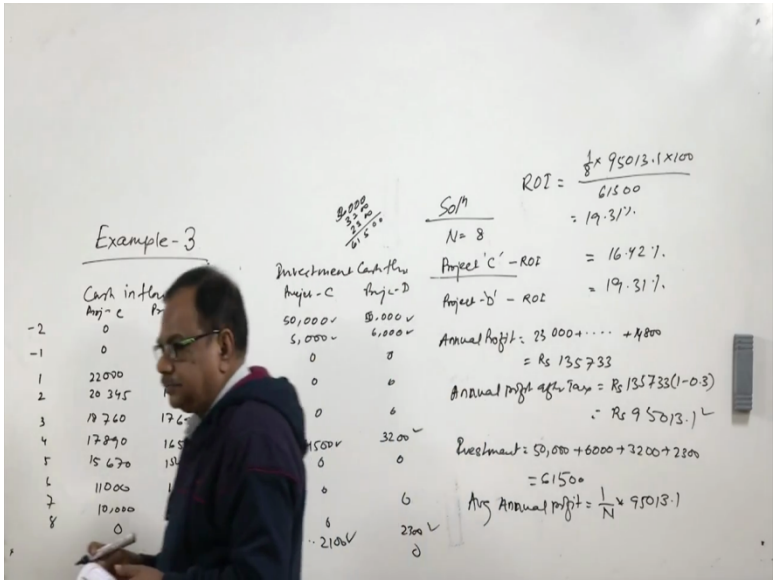

Now similarly, for project D also I can compute, project C ROI is equal to this, now project D ROI I have to calculate, this is annual profit is equal to addition of all these numbers 23 23,000 + dot t dot up to 14,800, this comes out to be rupees 135733 . So annual profit after tax is equal to rupees 135733 (1 - 0.3) it comes out to be rupees 95013.1. Now investment obviously this figure is investment, so that is five 50,000 + 6,000 + 3,200 + 2,300 this comes out to be 61,600 again. So average ROI sorry average annual profit, annual profit is equal to my profit after tax is this, so 1 by N into 95013.1.

So average ROI if I calculate this becomes 1 by 8 into 95013.1 into 100 divided by 61,500 this is investment is let me check the investment (())(35:10) 56,000 + 3,200 + 2,300 61,500 so this is 61,500 basically. So this is 61,500 and comes out to be 19.31 percent this is 19.31

percent. So we have computed up to example number 3. Let us summarize, we are dealing with the profitability analysis in this lecture and in the profitability analysis we have gone for the return on investment.

Now in the return on investment we have seen three examples and in one example which were solved for the payback period as well as return on investment we saw that the return on investment gives better results in comparison to the payback period, thank you.