Project Management for Managers
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Lecture - 15
Financial Analysis

Good morning friends, I welcome you all in this session. As you might be knowing that in last couple of sessions we discussed market and demand planning of the project let us discuss something called financial analysis. When I say financial analysis of the project you need to look at points like what is the cost of the project who would be funding that particular project is project profitable, what is breakeven point, what is payback period what is average rate of return and there are some other points. So, we will discuss all those points in this session.

So, the first of all let us look at ratio analysis we will quickly go through 4 different type of ratios. So, there is something called return on investment it is very simple right how much you are getting returns on your investments right.

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So, this is overall return on overall investment. So, how to calculate ROI? It is very simple right it is earning before interest and tax minus tax divided by whatever is your investment. So, this is actually return on investment right. Return on equity is similar to

return on investment, but instead of denominator rather than investment we write equity right. So, this is this measures returns for shareholders. So, it is earning after tax minus preferential dividend divided by equity this return on equity. Now you have got operating profit margin and net profit margin. So, operating profit margin measures profitability in its gross terms which is equal to a bit divided by sales right you know what is a bit its earnings before interest and taxes. Net profit margin is PAT its earnings after tax divided by total sets right. So, these are couple of ratios which you should keep in mind. Let us look at what is there in next slide this very important slide and I am going to ask you a question.

If I give you 1000 rupees today or 1000 rupees just after 30 days or next month which option will you go for just think for a while and then reply 100 rupees today are next month. So, I think you would have answered correctly and your answer I think if it is today then its right answer right why today why not after one month because it is very simple phenomenon the value of the rupee depreciate over a period of time or you can say because of inflation 1000 rupees would not remain 1000 after one month right. So, this is your answer right.
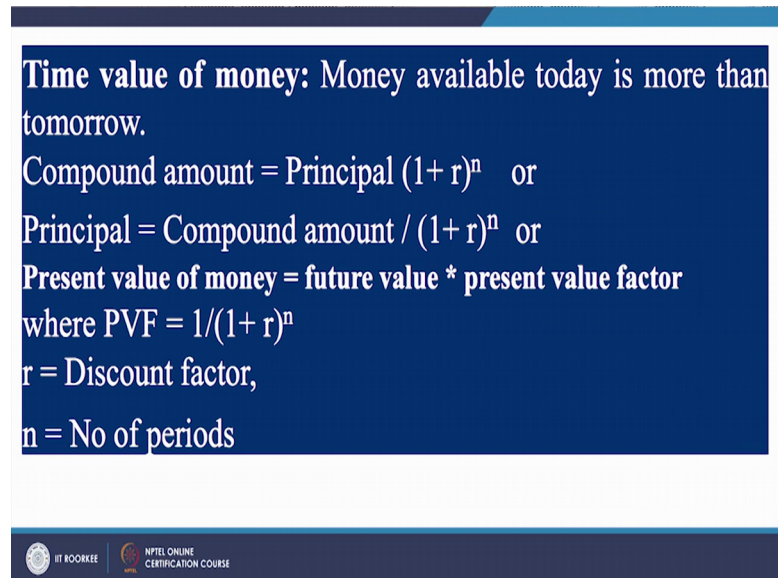
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Now, if I ask you second question the second question is 1000 rupees today or next month if interest rate is let us say 20 percent per week what would be your answer I think. Now you will change your answer you should change your answer right because

1000 rupees with 20 percent interest rate per week would be much much higher than inflation rate right. So, at the end of the day you would be having more money right. So, this is something called there is something called time value of money right. So, I am trying to talk about time value of money in next slide right. So, time value of money is nothing, but the money available today is more than money available tomorrow right.

(Refer Slide Time: 04:56)

Time value of money: Money available today is more than tomorrow.

Compound amount = Principal $(1+ r)^n$ or

Principal = Compound amount $/ (1+ r)^n$ or

Present value of money = future value * present value factor

where PVF = $1/(1+ r)^n$

r = Discount factor,

n = No of periods

So, this time value of money you must be knowing that compound interest is equal to principal into 1 plus r which is discount factor to the power n right number of periods right. So, you can also find out principal from this equation right which is equal to compound interest divided by 1 plus r to the power n right. In other words you can also write that the present value of the money is nothing, but whatever is its future value multiplied by present value factor right. So, let us say if present if its present value factor is 10 percent. So, and future money is let us say 10000 right. So, you can find out what is the present value of 10000 now right. So, that is known as present value of money right. So, this present value factor and r is discount factor and n is number of period. So, this is nothing, but a concept of time value of money very important.

Let it let me tell you there is something called capital budgeting capital budgeting are they are also known as investment appraisals right is the planning process whether we want to invest our money in some project or not. Let us say the project maybe of you want to buy a new machinery let us say you want to come up with a new product or let

us say you want to replace your old machines with new machines and such a decisions. So, we have to take a call here should we invest on all these would that decision would be worthwhile should refund those decisions all these things come under capital budgeting and a capital budgeting can be classified into broad categories.

So, there are several techniques of capital budgeting there are several ways in which you will come to know whether you should find a particular project or not right. So, that they there are multiple methods and some of them are non discounting methods and some of them are discounting methods when I say non discounting methods be generally we do not consider time value of money and these methods are payback period and average rate of return right and then there are several discounting techniques and think there are several these disadvantages of non discounting techniques. And because of that you have got discounting techniques right though discounting techniques do have couple of disadvantages and we will see couple of discounting techniques as well right. So, you have got discounted payback period its net present value profitability index and internal rate of return, right.

So, as I said you have got non discounting techniques these techniques do not take into account time value of money while discounting techniques do take into account time value of money right. So, we will see these techniques one by one. So, the first one is payback period. So, can you tell me what is payback period its very simple right payback period right. So, the period in which you get whatever money you have invested in a project right it is very simple right. So, the duration which duration within which you would be getting back your invested money is nothing, but payback period right. So, we will solve very simple problem on payback period method let us say there is a project and initial investment in a project is 300000, right.

(Refer Slide Time: 09:08)

PBP = Time period in which investor gets back his invested money in fixed assets from the project	
Example (PBP)	
Initial investment	300000
Annual cost of operation	20000
Expected annual revenues	
first two years	100000
next three years	200000
Planning horizone	5 yrs
Find : PBP ??	

So, initial investment is 300000 annual cost of operation is 20000 right. Now expected annual returns from that project are given year. So, first 2 years you would be getting 100000 rupees right. So, invested 300000 the first 2 years the revenues are 100000 and after first 2 years the next 3 years the returns are 200000 and the planning horizon is 5 years of now you are supposed to find out payback period right. So, how to proceed for this let me tell. So, for finding payback period there is a formula available right and that formula is very simple it is payback period is equal to Y 0.

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$$PBP = Y_0 - \left(\frac{C_4 \, CF_0}{CF_1} \right)$$
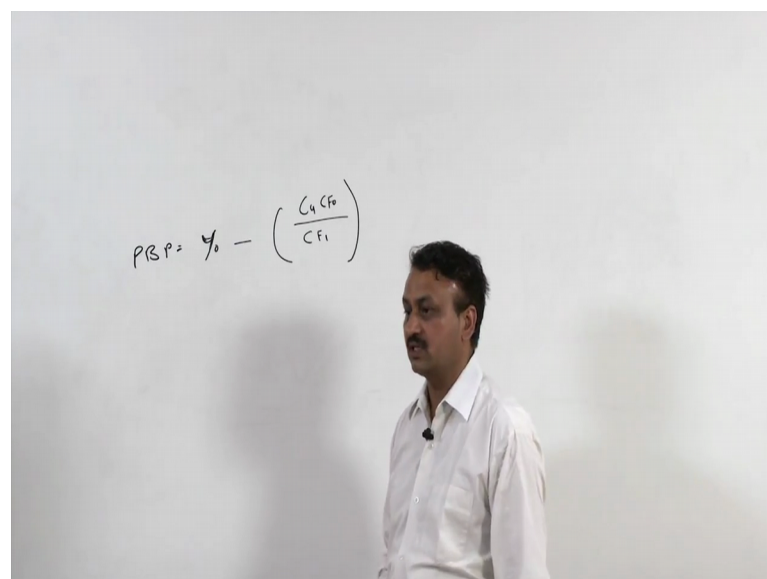
The year in which you are getting payback minus there is something called cumulative cash flow of the year Y 0 right divided by c f 1 the cash flow of payback year right. So, this is year just before this year right. So, we will solve this question right and let us look at this question once again; so, will solve this question.

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So, year 0 1 2 3 4 and 5 right cash flow. So, initial investment was 300000 right. So, this is minus 300000 right because you invested right this is cash outflow right then revenue in first year is 100000 right, but you also know that the annual cost of operation is 20000. So, your revenues 100,000 cost of operation is 20000. So, remaining is 80000 right. So, let me delete all these things and let us let it be like this right. So, the revenue in first year is 80, I have deleted 1000 terms from calculation right next year again revenue is 100000, but cost of operation is 20000. So, I am just taking it 80, then you have got next 3 years what is the revenue it is 200000 right and again annual operation cost is to be subtracted from 200000. So, this is 180 this is 180 and this is also 180 right understood. So, initially cash outflow initial in the first year inflow is 100,000 minus 20000 similarly here and similarly for third, fourth and fifth year also right now let us find out cumulative cash flow right.

Cumulative cash flow; so, cumulative cash flow is minus 300 plus 80. So, this is minus 220 right minus 220 plus 80 these becomes 160 or 140 is 140 right, so 220 minus 80. So, this is 20 then again 60. So, this is 1 4 0 right then minus 140 plus 180. So, this is 40

right 40 plus 180 it is 220 right and finally, 4 hundred now let us find out payback period right how to find out payback period we know our formula is is Y 0 right. So, payback period is equal to Y 0 minus its cumulative cash flow in the year Y 0 divided by c f 1 right even cash flow after that particular a year right. So, in this case this is minus 140 and this is 40. So, this is the year just before you are getting positive value right. So, this is 2 right year before payback period year before where this value is turning from negative to positive right. So, this is 2 right 2 minus cumulative cash flow for that particular year right it means 140. So, this minus 140 right divided by what c f 1 right cash flow after this particular year right. So, this is 180 you can divide this value. So, this is 2 plus 140 by 180 right you can get the answer and the answer you would be getting is 2.78 years.

So, this is very simple method and you can also go for interpolation if you are not going for if you are not applying is particular formula how to how to go for that you know that in this see in this year this is minus 140 and this is 40 right. So, how would you do this let us say this is second year and this is your third year right.

Now this is minus let us say this is minus 140; 240 this minus 140 and this is 40 right and this is your time right from here to here right. So, in 1 year's time, this is turning from minus 140 to 40. So, total change is what total change is 140 plus 40. So, 180 is the total change right. So, 180 is the total change in twelve months right. So, in one month how much it will change. So, you need to find out that particular point where these becomes 0 right. So, this is known as interpolation right very simple method.

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Let us find out payback for period for this particular question how to do this question this is again a simple 1.

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So, you have got cash flow minus 100 34 32.5 then you have got 31.37 and finally, yeah only these values this is minus 100 34 32.5 31.7 and forth year it is 30.53 right. So, you can now find out cumulative cash flow this is minus 100 plus 34, so minus 66 plus 32.5. So, this is minus 33.5 plus this you have got minus 2.13 and plus this you will get 28.4 right. So, how will you find out payback period? Now this is the year in which

cumulative cash flow is negative and here it is positive. So, 3 minus this is 3 minus 2.13 divided by 30.53, you will get your answer right very simple method 3.06 years right.

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Let us look at this project projected cash flow 30 lakh in first year cash flow is going to increase by 10 lakh. For next 3 years right and then decreases by 45 lakh and closes in fifth year initial investment is 140 lakh working capital requirement is 20 lakh the company force is to fetch net salvage value of 35 lakh after 5 years find out payback period.

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Just go through this question and we will solve this question now. So, what is the question what is the initial investment its 140 lakh right. So, this is minus 140 and what how cash flow is changing its 30 lakh in first year and cash flow is going to increase by 10 lakh for next 3 years. So, 40 50 and 60 right and then what decreases by 45 lakh which is 45 right. So, 60 minus 15 this is 45. Now in this question you need not require anywhere to use working capital and net salvage value we would be using those information in some other methods right.

So, what is what is payback period for this question its very simple I think you can calculate very easily this would be minus 140 this is minus 110 minus 70 minus 20 this 14 this 85 right. So, cash payback period is in between these 2. So, how to proceed this is 2 minus 20 by 60 right you will get the answer right this is its in third year actually this is the one. So, this is 3 minus yes right. So, payback period for this question is 3.33 years.

(Refer Slide Time: 21:53)

Example: Compare following projects using PBP

Year	Project A (CuCF0)	Project B (CuCF0)	Project C (CuCF0)
0	-110	-110	-110
1	20	20	0
2	30	30	0
3	40	40	90
4	30	30	30
5	20	20	20
6	20	10	20

Which project is best and why???

Now let us look at this question very important question compare following projects using payback period method and you need to select which is the best project and why. So, you have been given 3 projects and these are cumulative cash flows right. So, cumulative cash flow for project is minus 1 1 0 for this also minus 1 1 0 for this also right and 20 for project in sixth year 10 year for project been 20 year for project c. So, how to choose the best project yeah what you should do first of all find out payback

period for each of these projects right. So, just try to find out payback period first and then we will take a decision right.

So, the payback period can be calculated like this right. So, cumulative cash flow.

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	Project A			Project B			Project C	
Year	Cash flow	(CuCF0)	Year	Cash flow	(CuCF0)	Year	Cash flow	(CuCF0)
0	-110	-110	0	-110	-110	0	-110	-110
1	20	-90	1	20	-90	1	0	-110
2	30	-60	2	30	-60	2	0	-110
3	40	-20	3	40	-20	3	90	-20
4	30	10	4	30	10	4	30	10
5	20	30	5	20	30	5	20	30
6	20	50	6	10	40	6	20	50

PBP = 3- (-20/30) = 3.33yrs

So, these are these are cash flows these are cash flows and this is nothing, but cumulative cash flow right just see in this in this in this slide this is cash flow right this is not cumulative cash flow. So, cumulative cash flow is here right, so minus 1 1 0 minus 90 minus 60 minus 20. So, payback period is between third and fourth year right similarly here right it is between third and fourth year and here also between third and fourth year right. So, payback period for first year is its 3 minus minus 20 by 30 for this also 3 minus minus 20 by 30 and for this also 3 minus minus 20 by 30. So, payback period is same exactly same in all these 3 projects now how would you decide which is the best project now you can see here the cumulative cash flow in project is 50 here it is 40 right. So, we say that project a is better than project b right because you are getting 10 lakh extra over it right.

Now, when you compare project a and project c which is better yeah project a is better when you compare a and c right why a is better because here your ammines 20 here it is 0. So, you can re invest 20 lakh and you can get interest for this year as well as for this year right. So, 20 lakh interest can be obtained in these 2 years right similarly in second year here it is 0 and here it is 30. So, again you can get you can earn interest 30 lakh for

1 year right. So, interest of 20 lakh for 2 years interest of 30 lakh for 1 year right. So, project a is the best project out of these 3 right.

(Refer Slide Time: 25:17)

Project A			Project B			Project C		
Year	Cash flow	Cum CF	Year	Cash flow	Cum CF	Year	Cash flow	Cum CF
0	-110	-110	0	-110	-110	0	-110	-110
1	20	-90	1	20	-90	1	0	-110
2	30	-60	2	30	-60	2	0	-110
3	40	-20	3	40	-20	3	90	-20
4	30	10	4	30	10	4	30	10
5	20	30	5	20	30	5	20	30
6	20	50	6	10	40	6	20	50

A better than B, additional 10 lac, PBP is same for all three projects 3yrs and 8 months
A better than C, **early recovery**. 20lac in first year will fetch interest for 2 years and 30 lac (second year) will fetch interest for 1 year. An example depicts drawback of PBP

So, this is this is what I have written over here A is better than B and project A is better than C right because of early recovery right. So, this is payback period method right.

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Pros

- Simple

- Rough and ready method for dealing with risk

- Emphasizes earlier cash inflows

Now, there are certain pros and cons of this particular method let us say its advantages is very simple right and right you need not do much calculations over here it is a rough and ready method for dealing with risk, but our focus is and our focus is always on early

recovery of the investment right. So, these are pros and there are a couple of drawbacks also and because of these drawbacks generally we do not use much this particular method right. So, it does not consider working capital and salvage value which are 2 important points does not consider cash flows after payback period that is that is one of the biggest advantages right does not considered time value of money which one should consider no consideration of risk ignores cost of capital it measure projects capital recovery not profitable right. So, this is again one of the drawbacks right.

So, let us move onto next method which is average rate of return now this is better than previous method because it considers cash flows even after payback period also this method considers working capital and salvage value. So, average rate of return is nothing, but average return divided by average investment right. So, for calculating average return what you should do whatever are your cash flows just take a summation of those cash flows divided by number of years right.

(Refer Slide Time: 27:25)

Average rate of return (ARR): Considers cash flows after PBP, working capital and salvage value

ARR = average return / average investment

Average return = Sum of all CFs/n,

Average investment

$\quad$ = 1/2 (initial investment + terminal cash flow)

$\quad$ = 1/2 {(fixed investment + WC) + (WC + SV)}

$\quad$ = WC + ½ (FI + SV)
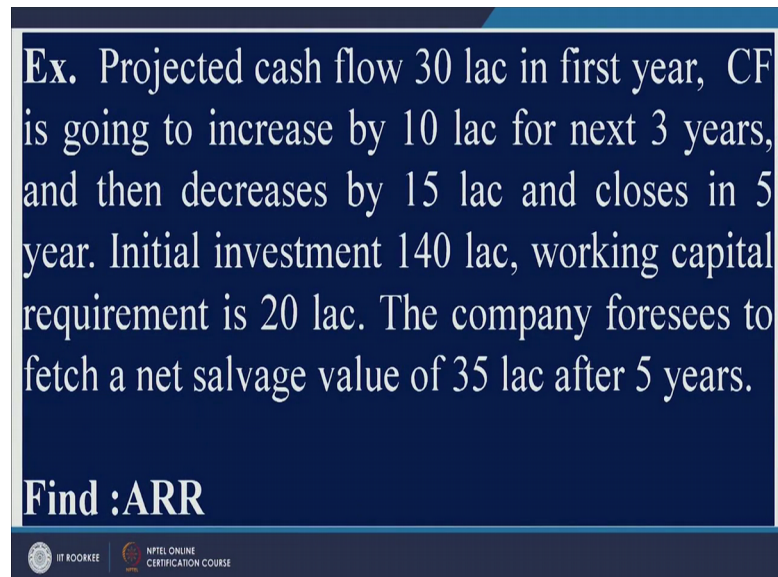
FI = fixed investment, WC = working capital, SV = salvage value

So, this is average return right average investment is what its initial investment plus terminal cash flow right and initial investment can be again broken down into 2 parts its fixed investment plus working capital. So, here working capital comes into picture right and terminal cash flow is working capital plus salvage value right. So, if you solve this equation you will get work average investment is nothing, but working capital plus half of some of fixed investment and salvage value right. So, just keep this formula in mind

and calculate average rate of return right. So, here is fixed investment the will working capital and as we see salvage value right. So, we will work out an example using this particular method right. So, this is basically a question which you would like you to work out right.

(Refer Slide Time: 28:35)

Ex. Projected cash flow 30 lac in first year, CF is going to increase by 10 lac for next 3 years, and then decreases by 15 lac and closes in 5 year. Initial investment 140 lac, working capital requirement is 20 lac. The company foresees to fetch a net salvage value of 35 lac after 5 years.

Find : ARR

So, what is the question projected cash flow is 30 lakh it is the same question which we solved a couple of minutes ago right. So, projected cash flow is 30 lakh in first year cash flow is going to increase by 10 lakh for next 3 years and then decreases by 15 lakh and closes in fifth year right initial investment is 140 lakh working capital requirement is 20 net salvage value is 30 lakh right after 5 years. So, you need to find out average rate of return and the formula is already available with you right.

So, I hope you would be able to solve this question I am not going to solve this question you just do it right. So, let us look at one more question. So, that. So, so you have you have investment you have invested in 2 different machines machine a and machine b. So, initial cost is 56125, machine b initial cost is this much right 85125.

(Refer Slide Time: 29:37)

So, this year initial investment right. So, the annual estimated income after deprecation and tax is given over here, so first year second year third, fourth and fifth year right. So, you have also been given total earnings. So, far this machine total earnings are 36875, here it is 36875 same right only the difference is initial investment right estimated life is same for both the machines estimated salvage value is also same right, which is better investment that is the question. So, you can solve this question by the method which I just talked about you can use this particular formula right. So, calculate average investment average return and then divide average return by average investment right. So, here is the solution for this particular question and finally, we will say that machine a is preferred because average rate of return for machine a is 25 percent.

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This is very simple question you can easily solve, you can easily calculate average rate of return for these 2 machines and for this particular example you would be selecting machine A. With this I complete this session.

Thank you very much for watching.