

## Capital Budgeting - Part 1

### Example 1

The cost of the project is ₹ 8,00,000. Life is 5 years. Profit before depreciation and tax is ₹ 3,00,000 p.a. Rate of depreciation is 25% p.a. on Written Down Value basis. Tax rate is 30%.

Assume that at the end of the fifth year the Written Down Value of the project's assets would be same as the realizable value on sale of such assets. Use 10% p.a. discounting rate and calculate the Net Present Value of the project.

### Example 2

Initial outlay in a project is ₹ 14,00,000. Life of the project is 6 years. Scrap value of the project at the end of the life is ₹ 2,00,000. Depreciation is to be provided on Straight Line Method basis. Tax rate is 45%. The profit before depreciation and tax during the life of the project are as under:

Year	Profit Before Depreciation and Tax
1	₹ 5,00,000
2	₹ 5,20,000
3	₹ 5,40,000
4	₹ 5,25,000
5	₹ 5,00,000
6	₹ 4,80,000

Determine the Net Present Value of the project using the discounting rates:

- 15%
- 18%

Determine the IRR (Internal Rate of Return) of the project.

### Example 3

Cost of the Project is ₹ 20,00,000.

Life of the project is 8 Years.

Applicable discounting rate is 15% p.a.

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You are required to determine the Discounted Pay-Back Period, if the annual Cash flows are:

Year	Annual Cash Flows ₹
1	5,98,000
2	5,97,300
3	5,94,000
4	5,95,500
5	5,98,000
6	5,98,000
7	5,98,000
8	5,98,000

### Example 4

X Ltd. started a project which requires initial investment of ₹ 40,00,000. The project has a life of 5 years without any scrap value. Depreciation is allowed on SLM basis. Amount of annual sales is ₹ 1,00,00,000. Variable costs are 60% of sales. Fixed cost other than depreciation is ₹ 20,00,000 every year. Tax rate is 30% the discounting rate applicable on the company is 15% p.a. Determine the following:

1. NPV of the Project
2. Profitability Index

### Example 5:

Following are the data on a capital projects being evaluated by the management of X Ltd:

	Project M
Annual Cash Flow	₹ 40,000
Useful life	4 Years
IRR	15%
Profitability index (PI)	1.064
NPV	?
Cost of capital	?
cost of project	?

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Payback	?
Salvage Value	0

Find the missing values considering the following table of discount factor only:

Discount Factor	15%	14%	13%	12%
1 Year	0.869	0.877	0.885	0.893
2 Years	0.756	0.769	0.783	0.797
3 Years	0.658	0.675	0.693	0.712
4 Years	0.572	0.592	0.613	0.636
	2.855	2.913	2.974	3.038

### Question 1

The cost of the project is ₹ 23,00,000.

Life of the project is 4 years.

Scrap value of the project at the end of life is ₹ 3,00,000.

Depreciation is allowed on SLM Basis.

Tax Rate is 30%.

Variable Costs are 40% of Sales.

Annual Cash Fixed Costs are ₹ 4,00,000.

Sales for 4 years are expected to be ₹ 20,00,000, ₹ 22,00,000, ₹ 25,00,000 and ₹ 20,00,000.

Discounting Rate is 15%.

Determine the following:

1. Net Present Value
2. Profitability Index
3. Internal Rate of Return
4. Annualised NPV
5. Discounted Pay back Period

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### Question 2

B Ltd. is required to invest into one of the 2 projects X and Y. Details of which are given below:

Particulars	Project X	Project Y
Cost	20,00,000	32,00,000
Life	5 years	5 years
Profit Before Depreciation & Tax p.a.	8,00,000	11,20,000
Scrap Value	-	2,00,000

Rate of tax for the company is 30%. Applicable rate of discounting is 10% per annum. You are required to, advice the company regarding, selection of one of the two projects.

### Question 3

X Ltd. has to select one of the 2 projects A and B, details of which are given below:

Particulars	Project A	Project B
Cost	30,00,000	30,00,000
Life	6 years	10 years
Annual Cash Flows	9,25,000	7,17,000

Applicable rate of discounting is 15% per annum.

You are required to, advice the company regarding, selection of one of the two projects.

### Question 4

X Ltd. has to select one of the 2 projects, details of which are given below:

Particulars	Project A	Project B
Cost (Present Value of Outflows)	20,00,000	20,00,000
Life	5 years	5 years

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Particulars	Project A	Project B
Cash Flows:		
Year - 1	12,00,000	5,00,000
2	10,00,000	7,00,000
3	8,00,000	9,00,000
4	6,00,000	12,00,000
5	4,00,000	14,00,000

You are required to determine the following:

1. Net Present Value of the two projects applying discounting rate at 10%.
2. Internal Rate of Return.

Why there is a conflict in Ranking between the two projects by NPV and IRR basis? Also determine the "Indifference Rate"

### Question 5

Cost of the project is ₹ 20,00,000

Life of the project is 4 years

ACF is ₹ 7,50,000 p.a.

Discounting Rate is 10% p.a.

Determine the following:

1. Net Present Value
2. IRR (Internal Rate of Return)
3. Modified IRR

### Question 6

NJ Ltd. is planning to start up a project with an initial outlay of ₹ 1,25,00,000. The project has life of 10 years and the residual value of assets at end of its life is expected to be ₹ 10,00,000. The depreciation rate as per tax law is 20% per annum on WDV basis and tax rate is 40%. The company targets minimum rate of return of 10% per annum.



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The following profit before depreciation and tax (PBDT) are expected to arise from the project:

Year	PBDT (₹)
1 & 2	10,00,000 p.a.
3 & 4	20,00,000 p.a.
5 - 7	30,00,000 p.a.
8 - 10	40,00,000 p.a.

You are required to advise NJ Ltd, whether it should start up this project based on following assumptions

1. NJ Ltd. is an existing and highly profitable company.
2. NJ Ltd. is a newly started company.

### Question 7

XYZ Ltd. is planning to introduce a new product with a project life of 8 years. Initial equipment cost will be ₹ 3.5 crores. Additional equipment costing ₹ 25,00,000 will be purchased at the end of the third year from the cash inflow of this year. At the end of 8 years, the original equipment will have no resale value, but additional equipment can be sold for ₹ 2,50,000. A working capital of ₹ 40,00,000 will be needed and it will be released at the end of eighth year. The project will be financed with sufficient amount of equity capital.

The sales volumes over eight years have been estimated as follows:

Year	1	2	3	4 - 5	6 - 8
Units per year	72,000	1,08,000	2,60,000	2,70,000	1,80,000

A sales price of ₹ 240 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount ₹ 36,00,000 per year. The loss of any year will be set off from the profits of subsequent two years. The company is subject to 30 per cent tax rate and considers 12 per cent to be an appropriate after-tax cost of capital for this project. The company follows straight line method of depreciation.

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Calculate the net present value of the project and advise the management to take appropriate decision.

The PV factors at 12% are

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

### Question 8

A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing process to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of ₹ 150 lakh per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of ₹ 90 lakh before the processing operation starts. This compensation is not allowed as deduction for tax purposes.

The machine required for carrying out the processing will cost ₹ 600 lakh. At the end of the 4th year, the machine can be sold for ₹ 60 lakh and the cost of dismantling and removal will be ₹ 45 lakh.

Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under:

	₹ in Lakhs			
Year	1	2	3	4
Sales	966	966	1,254	1,254
Material consumption	90	120	255	255
Wages	225	225	255	300
Other expenses	120	135	162	210
Factory overheads	165	180	330	435
Depreciation (as per income tax rules)	150	114	84	63

Initial stock of materials required before commencement of the processing operations is ₹ 60 lakh at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be ₹ 165 lakh and the stocks at the end of year 4 will be nil.

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The storage of materials will utilise space which would otherwise have been rented out for ₹ 30 lakh per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of ₹ 45 lakh in the year-1 and ₹ 30 lakh in the year-2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of ₹ 90 lakh per annum payable on this venture. The company's tax rate is 30%.

Consider cost of capital @ 14%, the present value factors of which is given below for four years:

Year	1	2	3	4
PV factors @14%	0.877	0.769	0.674	0.592

Advise the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

### Question 9

A chemical company is presently paying an outside firm ₹ 1 per gallon to dispose off the waste resulting from its manufacturing operations. At normal operating capacity, the waste is about 50,000 gallons per year.

After spending ₹ 60,000 on research, the company discovered that the waste could be sold for ₹ 10 per gallon if it was processed further. Additional processing would, however, require an investment of ₹ 6,00,000 in new equipment, which would have an estimated life of 10 years with no salvage value. Depreciation would be calculated by straight line method.

Except for the costs incurred in advertising ₹ 20,000 per year, no change in the present selling and administrative expenses is expected, if the new product is sold. The details of additional processing costs are as follows:

Variable : ₹ 5 per gallon of waste put into process.

Fixed : (Excluding Depreciation) ₹ 30,000 per year.

There will be no losses in processing, and it is assumed that the total waste processed in a given year will be sold in the same year. Estimates indicate that 50,000 gallons of the product could be sold each year.

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The management when confronted with the choice of disposing off the waste or processing it further and selling it, seeks your Advice. Which alternative would you recommend? Assume that the firm's cost of capital is 15% and it pays on an average 50% Tax on its income.

You should consider Present value of Annuity of ₹ 1 per year @ 15% p.a. for 10 years as 5.019.

### **Question 10**

NJ Ltd., a highly profitable company, has an existing machine with remaining life of 8 years, having WDV of ₹ 20,00,000 for tax purposes.

At the end of 8 years from now this machine is expected to have a realisable value of ₹ 1,00,000. The depreciation rate as permissible under tax law is 25% per annum on WDV basis. Tax rate is 40% and desired rate of return is 10% per annum.

This existing machine, which can be sold for ₹ 16,00,000 at present, is used to manufacture 55,000 units of a product which is currently sold at ₹ 300 per unit. The unit variable costs are ₹ 236 and annual fixed overheads (excluding depreciation) are ₹ 10,40,000. To keep the existing machine in proper working condition the company incurs annual repair and maintenance costs of ₹ 5,00,000 over and above the fixed overheads.

The company is considering to install a new machine, having life of 8 years, at a cost of ₹ 60,00,000. The residual value of the new machine at end of its life shall be ₹ 9,00,000. The installation of new machine will reduce the variable cost per unit by ₹ 16 and annual repair and maintenance costs by ₹ 4,00,000. However fixed overheads (excluding depreciation) will increase by ₹ 60,000. You are required to advice NJ Ltd regarding replacement of the existing machine with the new one.

### **Question 11**

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully

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depreciated for tax purpose but has a book value of ₹ 2,40,000 on 31st March 2021. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹ 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,00,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 4,50,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 7.5% is allowed taking that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old machine (₹)	New machine (₹)
Sales	8,10,000	8,10,000
Material cost	1,80,000	1,26,250
Labour cost	1,35,000	1,10,000
Variable overhead	56,250	47,500
Fixed overhead	90,000	97,500
Depreciation	24,000	41,500
PBT	3,24,750	3,87,250
Tax @ 30%	97,425	1,16,175
PAT	2,27,325	2,71,075

From the above information, analyse whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5
PVF	0.909	0.826	0.751	0.683	0.621

Year	6	7	8	9	10
PVF	0.564	0.513	0.467	0.424	0.386

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### Question 12

Xavly Ltd. has a machine which has been in operation for 3 years. The machine has a remaining estimated useful life of 5 years with no salvage value in the end. Its current market value is ₹ 2,00,000. The company is considering a proposal to purchase a new model of machine to replace the existing machine. The relevant information is as follows:

	Existing Machine	New Machine
Cost of machine	₹ 3,30,000	₹ 10,00,000
Estimated life	8 years	5 years
Salvage value	Nil	₹ 40,000
Annual output	30,000 units	75,000 units
Selling price per unit	₹ 15	₹ 15
Annual operating hours	3,000	3,000
Material cost per unit	₹ 4	₹ 4
Labour cost per hour	₹ 40	₹ 70
Indirect cash cost per annum	₹ 50,000	₹ 65,000

The company uses written down value of depreciation @ 20% and it has several other machines in the block of assets. The Income tax rate is 30 per cent and Xavly Ltd. does not make any investment, if it yields less than 12 per cent.

Advise Xavly Ltd. whether the existing machine should be replaced or not. PV factors @12%:

Year	1	2	3	4	5
PVF	0.893	0.797	0.712	0.636	0.567

### Question 13

Cost of the asset is ₹ 1,00,000 and its life is 3 years once installed. Its repairs and maintenance cost on annual basis will be as below:

Year 1	₹ 20,000
Year 2	₹ 25,000
Year 3	₹ 30,000



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The asset can be disposed at any of the following dates:

End of 3 <sup>rd</sup> Year	Salvage Value ₹ 10,000
End of 2 <sup>nd</sup> Year	Salvage Value ₹ 40,000
End of 1 <sup>st</sup> Year	Salvage Value ₹ 60,000

Therefore, the management requires the optimum replacement cycle for this asset whether 1 year or 2 years or 3 years. Discounting rate is 10% p.a.

### Question 14

A & Co. is contemplating whether to replace an existing machine or to spend money on overhauling it. A & Co. currently pays no taxes. The replacement machine costs ₹ 90,000 now and requires maintenance of ₹ 10,000 at the end of every year for eight years.

At the end of eight years it would have a salvage value of ₹ 20,000 and would be sold. The existing machine requires increasing amounts of maintenance each year and its salvage value falls each year as follows:

Year	Maintenance (₹)	Salvage (₹)
Present	0	40,000
1	10,000	25,000
2	20,000	15,000
3	30,000	10,000
4	40,000	0

The opportunity cost of capital for A & Co. is 15%.

When should the company replace the machine?

### Question 15

ABC Ltd. has a sheet cutting machine which may be replaced by a new machine now or after 1 year or at the most after 2 years. The cost structure of the existing machine as well as that of new machine is given below:



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Existing Machine	Year 0	Year 1	Year 2	Year 3
Running Cost	₹ 0	₹ 16,000	₹ 20,000	0
Repairs	0	0	₹ 3,000	0
Loss in Revenue	0	0	₹ 2,000	0
Scrap Value	₹ 8,000	₹ 6,000	₹ 500	0

New Asset (Life 3 Years)	Year 0	Year 1	Year 2	Year 3
Cost	₹ 40000	0	0	0
Running Cost	0	₹ 8,000	₹ 10,000	₹ 20,000
Scrap Value	0	₹ 26,000	₹ 20,000	₹ 16,000

The firm has a discount rate of 12%. Find out:

1. What is the Optimum Replacement Cycle of the new asset?
2. When should the existing asset be replaced by the new asset?

### **Question 16**

A Ltd. requires to install a new machinery that will cost ₹ 40 lakhs. This machine will have life of 5 years and its scrap value at end of five years will be nil. For simplicity, depreciation can be considered on straight line basis. This machine can generate EBITDA (Earnings Before Interest Tax Depreciation & Amortisation) of ₹ 16,00,000 p.a. The tax rate is 30%.

The company has two alternatives with respect to arranging the funds for acquisition of this new machine. The first alternative is to employ the available retained earnings and the second alternative is to raise a debt of ₹ 40 lakhs which has applicable interest of 10% per annum where interest is payable once at end of each year. This debt will be repaid by end of 5th year at par value.

The applicable discounting rate for the company is 20% per annum.

1. What will be the NPV (Net Present Value) of the new machine under both the available alternatives?
  - Case 1: Funded by Retained Earnings (Unlevered Case)
  - Case 2: Funded by Debt (Levered Case)
2. What is the Adjusted Present Value?

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3. How will you reconcile the Net Present Value in the unlevered situation with the applicable Adjusted Present Value?

**Question 19**

Company X is forced to choose between two machines A and B. The two machines are designed differently, but have identical capacity and do exactly the same job.

Machine A costs ₹ 1,50,000 and will last for 3 years. It costs ₹ 40,000 per year to run.

Machine B is an 'economy' model costing only ₹ 1,00,000, but will last only for 2 years, and costs ₹ 60,000 per year to run.

These are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore tax.

Opportunity cost of capital is 10 percent. Which machine should Company X buy?

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*End of Capital Budgeting - Part 1*

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