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Financial management

DSE6.2A

Unit 6,7

Capital Expenditure Decisions

Semester VI

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Umeschandra College

Investing decision-capital budgeting

- Estimation of cashflow
- The process of identifying, evaluating and selecting investments whose returns (cash flows) are expected to extend beyond one year i.e. Long term Investments.
- Cash flow indicates a cash outflow and cash inflows. It is necessary to estimate the cash flow in the process of analyzing investment proposal. While analyzing the cash flow, it is also necessary to estimate the cash outflow as well as cash inflow. Estimation of the net cash flow in an investment project should cover the following procedures:

Step 1: Determination of Net Investment or Net Cash Outlay Or Initial Cash Outlay.

Step 2: Determination of annual net cash inflow or cash inflow after tax.

Step 3: Determination of net cash inflow for the final year.

- **The process of identifying, analyzing, and selecting investment projects whose returns (cash flows) are expected to extend beyond one year.**

IMPORTANCE OF CASH FLOWS:

- Affect the profitability of the company –Earning Assets of the company.
- Will have a long term effect over the company
- Not easily reversible without much Financial loss.

- Involves huge costs and scarce resources

A criterion or rule is needed as the basis for deciding whether a particular project should be adopted. The conceptually sound criteria are following:

- **Payback period(PBP) – non-discounted**
- **Discounted payback period(DPBP) - discounted**
- **Accounting rate of return/average rate of return(ARR) – non-discounted**
- **Net present value (NPV) - discounted**
- **Internal rate of return (IRR) - discounted**
- **Profitability index (PI) – discounted**

Payback period

The payback period is the length of time required to recover the cost of an investment. The payback period of a given investment or project is an important determinant of whether to undertake the position or project, as longer payback periods are typically not desirable for investment positions. The payback period ignores the time value of money.

[Year 0 -1000] [year 1 +200] [year 2 +200] [year 3 +200] [year 4 +200] [year 5 +200] [year 6 +200]

Payback period = 5 years.

$$\text{Payback period} = \frac{\text{Total initial capital investment}}{\text{Annual expected after - tax net cash inflow}} = \frac{1000}{200} = 5 \text{ years}$$

If cashflows are not even:

	In Rs.
Initial investments	100000
Years	Cashflows
1	40000
2	30000
3	20000
4	20000
5	40000

	In Rs.	In Rs.

Initial investments	100000	
Years	Cashflows	Cumulative cashflows
1	40000	40000
2	30000	70000
3	20000	90000
4	20000	110000
5	40000	150000

$$3 \text{ years} + \frac{10000 \quad (100000 - 90000)}{20000 \quad (110000 - 90000)} \text{ years} = 3\frac{1}{2} \text{ years}$$

Initial investment is Rs. 20,00,000 and annually a profit is 3,00,000 after depreciation @ 12.50% (straight line method) but before tax 50%. The cash inflow is Rs. 4,00,000 calculated as follows: :`

Profit before tax	3,00,000
Less :Tax @ 50%	1,50,000
Profit after tax	1,50,000
Add :Depreciation written off	2,50,000
Total cash inflow	4,00,000

$$\frac{\text{Rs. } 2000000}{\text{Rs. } 400000} = 5 \text{ years}$$

Discounted payback period:

Initial investment is Rs. 750000

Year 1	Rs. 600000
Year 2	Rs. 200000
Year 3	Rs. 100000
Year 4	Rs. 500000

Discounting rate is 12 % p.a. then find out discounted payback period.

Year	Cash inflow Rs.	Discount factor 12%	Present value Rs.	Cumulative present value Rs.
1	600000	0.893	535800	535800
2	200000	0.797	159400	695200
3	100000	0.712	71200	766400
4	500000	0.636	318000	1084400

$$2 + \frac{750000 - 695200}{766400 - 695200} = 2.77 \text{ years}$$

Average rate of return or accounting rate of return:

$$\frac{\text{Annual average net profit (after tax)}}{\text{Average investment}} \times 100$$

Initial investment of a project is Rs. 500000 in a machine and the machine will run for 5 years and after 5 years the scrap value will become Rs. 100000. The annual net profits are Rs. 75000, Rs. 175000, Rs. 200000, Rs. 200000, Rs.500000 which are after depreciation and taxes. The rate of tax is 50% and depreciation is based on straight line method. Find accounting rate of return.

Particulars	Amount Rs.
75000+175000+200000+200000+50000	700000
Less: depreciation (500000 – 100000)	400000
Profit before tax	300000
Less: tax @50%	150000
Net profit (5 years)	150000

Annual average net profit (after tax) = Rs. 150000/5 = Rs. 30000

Average investment = (initial investment + scrap value)/2 = (Rs. 500000 + Rs. 100000)/2 = Rs. 300000

So accounting rate of return is = (Rs. 30000/Rs. 300000) x 100 = 10%

Net present value

Compute the net present value for a project with a net investment of Rs. 1, 00,000 and net cash flows year one is Rs. 55,000; for year two is Rs. 80,000 and for year three is Rs. 15,000. Further, the company's cost of capital is 10%?

[PVIF @ 10% for three years are 0.909, 0.826 and 0.751]

Year	Net Cash Flows	PVIF @ 10%	Discounted Cash Flows
0	(1,00,000)	1.000	(1,00,000)
1	55,000	0.909	49,995
2	80,000	0.826	66,080
3	15,000	0.751	11,265
			127340
Net Present Value		127340 - 100000	27,340

Profitability index

Profitability index is actually a modification of the net present value method. While present value is an absolute measure (i.e. it gives as the total Rs. figure for a project), the profitability index is a relative measure (i.e. it gives as the figure as a ratio).

Profitability index factor is calculated as below:

$$\frac{\text{Sum of discounted cash in flows}}{\text{Initial cash outlay Or Total discounted cash outflow (as the case may)}}$$

Decision Rule:

If PI $\geq$ 1 Accept the Proposal; If PI $\leq$ 1 Reject the Proposal

An initial investment of Rs. 1500000 generates Rs. 150000, Rs. 300000, Rs. 500000, Rs. 200000, Rs. 600000, Rs. 500000 and Rs. 100000 respectively. The discounting rate is 10 % p.a. find profitability index.

Discounting the Cash Flows of Project :

Rs.150,000 / (1.10)^1 = Rs.136,363.64

Rs.300,000 / (1.10)^2 = Rs.247,933.88

Rs.500,000 / (1.10)^3 = Rs.375,657.40

Rs.200,000 / (1.10)^4 = Rs.136,602.69

Rs.600,000 / (1.10)^5 = Rs.372,552.79

Rs.500,000 / (1.10)^6 = Rs.282,236.97

Rs.100,000 / (1.10)^7 = Rs.51,315.81

Present value of future cash flows:

Rs.136,363.64 + Rs.247,933.88 + Rs.375,657.40 + Rs.136,602.69 + Rs.372,552.79 + Rs.282,236.97 + Rs.51,315.81 = Rs.1,602,663.18

Profitability index of Project A: Rs.1,602,663.18 / Rs.1,500,000 = Rs.1.0684. so, Project creates value.

Internal rate of return

Internal Rate of Return Method (IRR): The internal rate of return method considers the time value of money, the initial cash investment, and all cash flows from the investment. But unlike the net present value method, the internal rate of return method does not use the desired rate of return but estimates the discount rate that makes the present value of subsequent net cash flows equal to the initial investment. This discount rate is called IRR.

Rate at which NPV becomes zero.

Steps to find IRR

Annuity discount factor, then

$$\frac{\text{Total initial cash disbursements and commitments for the investment}}{\text{Annual (equal) net cash flows from the investment}}$$

Step 2: the discount rate is the interest rate that has the same discounting factor as A in the annuity table along the row for the number of periods of the useful life of the investment. If exact value could be find in Present Value Annuity Factor (PVAF) table corresponding to the period of the project the respective discounting factor rate shall be IRR. However, it rarely happens therefore we follow the method

Step 1: Compute approximate payback period.

Step 2: Locate this value in PVAF table corresponding to period of life of the project. The value may be falling between two discounting rates.

Step 3: Discount cash flows using these two discounting rates.

Step 4: Use following Interpolation Formula

$$\text{Lower rate} + \frac{\text{NPV at lower rate}}{\text{NPV at lower rate} - \text{NPV at upper rate}} \times (\text{upper rate} - \text{lower rate})$$

A project generates annual average cash flow of Rs. 4000 for 5 years and the initial investment is Rs. 12000. Find out the internal rate of return.

Factor is 12000/4000 = 3

With the help of annuity table the present value of annuity of Re. 1 for 5 years is 3.058 @ 19% and @ 20 % it is 2.991.

NPV at 19%:

Present value of cash inflow is Rs. 12232 (Rs. 4000 x 3.058)

Less: initial investment Rs. 12000

Net present value Rs. 232

NPV at 20%:

Present value of cash inflow is Rs. 11964 (Rs. 4000 x 2.991)

Less: initial investment Rs. 12000

Net present value (-) Rs. 36

Now,

$$19 + \frac{232}{232 - (-36)} \times (20 - 19)$$

$$= 19 + \frac{232}{232 + 36)} \times (20 - 19)$$

$= 19 + 0.87 = 19.87$

Present value interest factor of an (ordinary) annuity of ₹1 per period at i% for n periods, PVIFA(i,n).

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
30	25.808	22.396	19.600	17.292	15.372	13.765	12.409	11.258	10.274	9.427	8.694	8.055	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979
35	29.409	24.999	21.487	18.665	16.374	14.498	12.948	11.655	10.567	9.644	8.855	8.176	7.586	7.070	6.617	6.215	5.858	5.539	5.251	4.992
40	32.835	27.355	23.115	19.793	17.159	15.046	13.332	11.925	10.757	9.779	8.951	8.244	7.634	7.105	6.642	6.233	5.871	5.548	5.258	4.997
50	39.196	31.424	25.730	21.482	18.256	15.762	13.801	12.233	10.962	9.915	9.042	8.304	7.675	7.133	6.661	6.246	5.880	5.554	5.262	4.999

Capital rationing

A company may have company has viable projects, means, with positive NPVs and at the same time the company cannot take all due to its capital constraints. Here the company needs to use capital rationing. The firm is constrained by external or self-imposed reasons to get funds to invest in all profitable projects.

Find the most desirable combination from the following projects. Maximum possible investable amount is Rs. 2500000. Out of the four following projects, project B and project C are mutually exclusive.

Projects are A, B, C and D.

Initial investment for project A is Rs. 1500000 and NPV of the project is 600000.

Initial investment for project B is Rs. 1000000 and NPV of the project is 450000.

Initial investment for project C is Rs. 750000 and NPV of the project is 360000.

Initial investment for project D is Rs. 600000 and NPV of the project is 300000.

Available investable amount is Rs. 2500000

Combination	Investment combination amount (Rs.)	NPV combination amount (Rs.)
AB	1500000 + 1000000 = 2500000	600000 + 450000 = 1050000
AC	1500000 + 750000 = 2250000	600000 + 360000 = 960000
AD	1500000 + 600000 = 2100000	600000 + 300000 = 900000
BD	1000000 + 600000 = 1600000	450000 + 300000 = 750000
CD	7500000 + 600000 = 1350000	360000 + 300000 = 660000

First combination which is AB is giving highest NPV of Rs. 1050000 and as a result it is the best alternative.

Reference: books as per the syllabus of University of Calcutta