Economic Evaluation of Capital Projects

23rd Jan 2017

Economic Evaluation

(Projects Financial Viability)

SO FAR (?):-

- Project has a defined technical solution
    - Flow Sheeting
- Project has a defined Cost
    - Capital Cost Estimate

NOW (?):-

- Is this project a good use of the companies money?

Economic Evaluation

Economic Evaluation is a method of assessing the benefits from an investment.

- Uses money as a method of method of measuring capital spent on resources to provide revenue/income/cash flow in years to come.

The economic evaluation determines if our project

- Viable
- Meets the companies ROI
- Is better or worse than alternative projects that could be invested in.

Economic Evaluation

- The objective of any evaluation is to get back the best return on the investment.

Economic Evaluation

(Simple Example)

Buy a second hand car for £2,000 in the morning.

Intent is to sell in the afternoon for £2,400.

- Is this a smart investment ? Is £ 2,000 available?
- What RISKS are involved? How much effort is required?
- What return will be achieved? Net ROI = £400 = 20%.
- Is the return rate adequate for the risk, effort that might be involved?
- What other opportunities are there ?

Economic Evaluation

- Note: Financial considerations are only a part and company strategic decisions may equally apply or be more important.

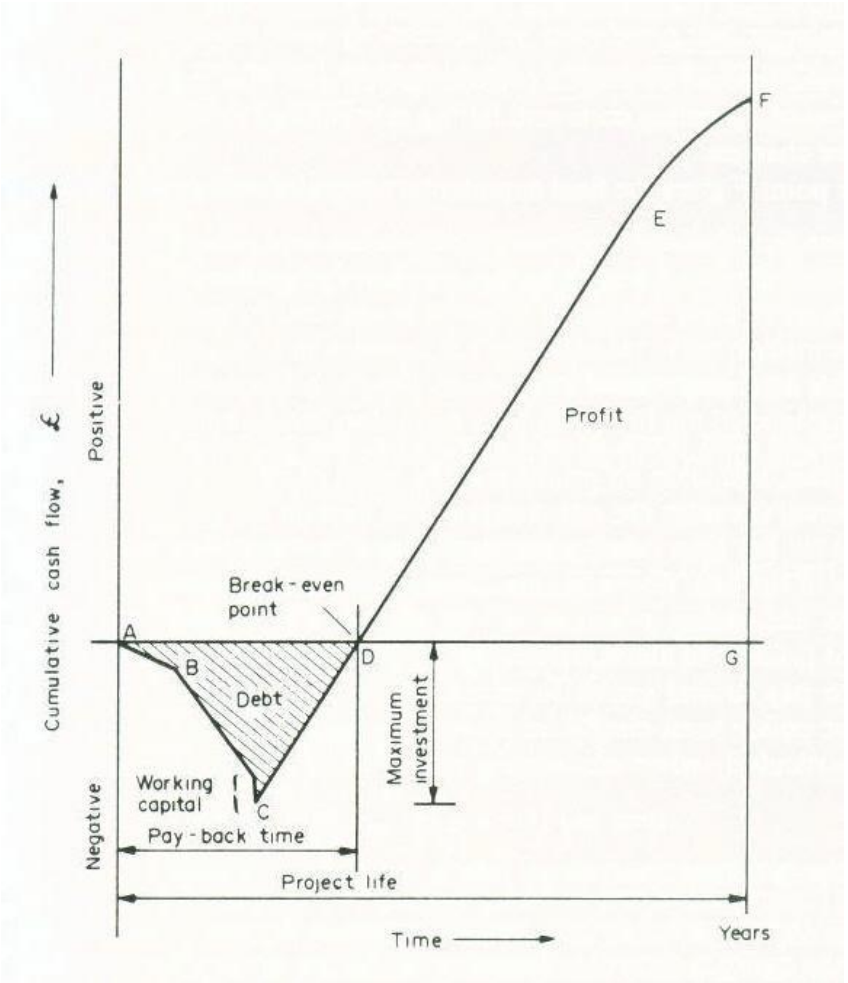
Economic Evaluation

Simple tools for Economic Evaluation

- PAYBACK TIME (Breakeven point)

  - How to get back the original investment.

  = <u>Total Investment</u>
  Yearly cash flow (Before Depreciation)



Economic Evaluation

(Payback time example 1)

A company is considering buying a new plant, capital cost £11M. The cost of production is £1M/y. The plant will have a 10 year life with no end of service (scrap) value.

The revenue from sales (after tax) = £ 4 M /year.

Project capital investment = £ 11M

Cost of production = £ 1M/year.

Payback time = 11/(4-1)* = 11/3 = 3.6 years

* Cash flow = revenue (after tax) – cost of production

Economic Evaluation

Is this a good payback time ?.

Depends on the company and the type of business enterprises that it is involved with.

-Government Infrastructure: 25 to 50 years.

- Petroleum Refinery: 20 years.
- Consumer products: 1 to 5 years.
- Biotech: 3 to 5 years.

Economic Evaluation

Simple tools for Economic Evaluation

- RETURN ON INVESTMENT (ROI)

  - What is the average return on investment

  = $\frac{\text{Average net yearly cash flow (includes plant depreciation)}}{\text{Total Investment}}$

Economic Evaluation

What's depreciation ?

- Expenditure upon resources such as biotech plant, biotech plant equipment etc. that will be recovered over its anticipated lifetime.

Depreciation example) Purchase price of a machine = £4,000, expected to last 3 years. End of service value (scrap) = £500. Use fixed instalment depreciation method.

Depreciation value = 4,000 – scrap value/Life of equipment = (4,000 – 500)/3 = £1,167

Cost = £4,000
Year 1 Depreciation =£1,167
Value end of year 1 = £2,833

Year 2 Depreciation = £1,167
Value at the end of year 2 = £1,666

Year 3 Depreciation = £1,666
Value at end of year 3 = £500

Economic Evaluation

In payback example 1)

Depreciation = (capital – scrap value)/life of the plant = (11-1) / 10 = £1m

- RETURN ON INVESTMENT (ROI

$$= \frac{\text{Average net yearly cash flow } (4 - 1 - 1) = 2\text{ m}}{10} \times 100$$

= 20%

Economic Evaluation

Complex Method

The methods described fail to recognise the true value of money ?

-One pound today is worth more than one pound in some future data.

DISCOUNTED CASH FLOW /NET PRESENT VALUE (DCF/NPV)

- DISCOUNTED CASH FLOW

$$V = \frac{C}{(1+r)^i}$$

where:

V= Present Value

r = rate of discount

i = a given year or time period

Economic Evaluation

Complex Method continued)

Example £1, discount value = 10% over 5 years

$V = 1/ (1+0.1)^{5} = 1/1.6105 = 0.621$

Alternative use Discount tables

EXHIBIT 12B-1 Present Value of $1; $\frac{1}{(1+r)^n}$

Periods	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%
1	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	0.826	0.820	0.813	0.806	0.800
2	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694	0.683	0.672	0.661	0.650	0.640
3	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579	0.564	0.551	0.537	0.524	0.512
4	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482	0.467	0.451	0.437	0.423	0.410
5	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402	0.386	0.370	0.355	0.341	0.328
6	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335	0.319	0.303	0.289	0.275	0.262
7	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279	0.263	0.249	0.235	0.222	0.210
8	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233	0.218	0.204	0.191	0.179	0.168
9	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194	0.180	0.167	0.155	0.144	0.134
10	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162	0.149	0.137	0.126	0.116	0.107
11	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135	0.123	0.112	0.103	0.094	0.086
12	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112	0.102	0.092	0.083	0.076	0.069
13	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093	0.084	0.075	0.068	0.061	0.055
14	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078	0.069	0.062	0.055	0.049	0.044
15	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065	0.057	0.051	0.045	0.040	0.035
16	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054	0.047	0.042	0.036	0.032	0.028
17	0.513	0.436	0.371	0.317	0.270	0.231	0.198	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045	0.039	0.034	0.030	0.026	0.023
18	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038	0.032	0.028	0.024	0.021	0.018
19	0.475	0.396	0.331	0.277	0.232	0.194	0.164	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031	0.027	0.023	0.020	0.017	0.014
20	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026	0.022	0.019	0.016	0.014	0.012
21	0.439	0.359	0.294	0.242	0.199	0.164	0.135	0.112	0.093	0.077	0.064	0.053	0.044	0.037	0.031	0.026	0.022	0.018	0.015	0.013	0.011	0.009
22	0.422	0.342	0.278	0.226	0.184	0.150	0.123	0.101	0.083	0.068	0.056	0.046	0.038	0.032	0.026	0.022	0.018	0.015	0.013	0.011	0.009	0.007
23	0.406	0.326	0.262	0.211	0.170	0.138	0.112	0.091	0.074	0.060	0.049	0.040	0.033	0.027	0.022	0.018	0.015	0.012	0.010	0.009	0.007	0.006
24	0.390	0.310	0.247	0.197	0.158	0.126	0.102	0.082	0.066	0.053	0.043	0.035	0.028	0.023	0.019	0.015	0.013	0.010	0.008	0.007	0.006	0.005
25	0.375	0.295	0.233	0.184	0.146	0.116	0.092	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016	0.013	0.010	0.009	0.007	0.006	0.005	0.004
26	0.361	0.281	0.220	0.172	0.135	0.106	0.084	0.066	0.053	0.042	0.033	0.026	0.021	0.017	0.014	0.011	0.009	0.007	0.006	0.005	0.004	0.003
27	0.347	0.268	0.207	0.161	0.125	0.098	0.076	0.060	0.047	0.037	0.029	0.023	0.018	0.014	0.011	0.009	0.007	0.006	0.005	0.004	0.003	0.002
28	0.333	0.255	0.196	0.150	0.116	0.090	0.069	0.054	0.042	0.033	0.026	0.020	0.016	0.012	0.010	0.008	0.006	0.005	0.004	0.003	0.002	0.002
29	0.321	0.243	0.185	0.141	0.107	0.082	0.063	0.048	0.037	0.029	0.022	0.017	0.014	0.011	0.008	0.006	0.005	0.004	0.003	0.002	0.002	0.002
30	0.308	0.231	0.174	0.131	0.099	0.075	0.057	0.044	0.033	0.026	0.020	0.015	0.012	0.009	0.007	0.005	0.004	0.003	0.003	0.002	0.002	0.001
40	0.208	0.142	0.097	0.067	0.046	0.032	0.022	0.015	0.011	0.008	0.005	0.004	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000

Economic Evaluation

DCF/NPV Calculation example for a £3,000 investment at 10% discount value over 5 years with the following average net yearly cash flow. Year 1 £500, Year 2 1,000, Year 3 1,500, Year 4 1,000 & Year 5, £1,000.

Rate (Cost of Year)	10% Discount Value	Cash Inflow (outflow) £	Discounted Cash Inflow (outflow) £
0	1.000	(3,000)	(3,000)
1	0.909	500	454.5
2	0.826	1,000	826.0
3	0.751	1,500	1126.5
4	0.683	1,000	683.0
5	0.621	1,000	621.0
		£ 2,000	NPV = £ 711.0

Economic Evaluation

Significance of the discount value.

- Company Internal Rate of Return IRR.

- Value is a combination of discount value (value of money with time)

- Plus company return on investment requirement.

- Basically, if you use the IRR in a cash flow projection, then as long as the NPV output is positive then it meets the criteria for company financial approval.

- NPV > 0 is a worth wile investment for that company.

- Internal Rate of Return (IRR).

    - What discount factor gives a NPV of zero.

Economic Evaluation

For previous example with IRR = 15%)

Rate year	15% Discount Value	Cash Inflow (outflow) £M	Disc.Cash Inflow (outflow) £M
0	1.000	(11)	(11)
1	0.870	2	1.740
2	0.756	2	1.512
3	0.658	2	1.316
4	0.572	2	1.144
5	0.497	2	0.994
6	0.432	2	0.864
7	0.376	2	0.752
8	0.327	2	0.654
9	0.284	2	0.568
10	0.247	2	0.494
		£ 9M	NPV = £ 0.962

Economic Evaluation

- For your project, calculate the payback time. Biobucks Ltd has an IRR target on all capital projects of 10%

- Set up the appropriate cash flow and see if the project will be acceptable on an economic basis to Biobucks Ltd.

THANK YOU