Financial Appraisal

Chapter 3



Financial appraisal

A financial analysis must be undertaken if it is necessary to determine the financial profitability of a project to the project implementer. The financial analysis of a project helps determine the financial viability and sustainability of the project.

It will be worthwhile carrying out a financial analysis if the output of the project can be sold to the market or otherwise valued in market prices, e.g., private projects, public projects.

Commercially oriented government authorities selling output, e.g., railway, electricity, telecommunications, freeway authorities will usually undertake financial and economic analysis of a new project.

Need to assess-

- Project's potential impact on their budget
- Project's impact on country's welfare
- If project is financially viable without Subsidy or other assistance

Financial appraisal

Non-commercial government institutions wish to choose between alternative facilities on the basis of essential financial objectives.

For example- hospital service: the management of the hospital could well be required to select the cheapest method of providing a given standard of accommodation and care.

For example- a national defence: will choose between available alternative methods of achieving a physical goal (airborne troop movement capacity) on the basis of the cheapest financial option.

Located in Shyamnagar in the southern region of Bangladesh, Friendship Hospital. **It is a demonstration of how beautiful architecture can be achieved through good design when working with a relatively modest budget and with difficult contextual constraints. The 80-bed hospital in the cyclone-prone area has been constructed using locally-made bricks.**

Financial appraisal: objectives

- **to ensure the availability of funds to finance the project** through its investment and operating phases. A project with a high expected economic return may fail if there are not enough funds to finance the operations of the project. **Water supply projects** are typical examples of projects that generate substantial economic benefits due to the large economic value attached to water, but receive little financial revenue because of the low water tariffs. If the project is undertaken solely on the basis of the favourable economic analysis with no consideration to the financial sustainability, the project may fail due to lack of funds to maintain the system and service its debt. **Other examples: irrigation, public transport.**
- **to establish the financial sustainability of the project** by identifying financing shortfalls that are likely to occur over the life of the project, thereby being able to devise the necessary means for meeting these shortfalls.
- **to determine the profitability of a project and to estimate the value that a private investor would be willing to pay** for the opportunity to participate. Ascertaining the financial profitability is also necessary when government policies are designed to encourage small investors or certain groups in society to undertake projects by providing them with grants or loans.
- **to understand the distributional impacts of the project.** For example, the difference between the financial price an individual pays for a litre of water (in the financial cash flow statement) and the gross economic benefit they derive from consuming the water (in the economic resource flow statement) reflects a net gain to the consumer.

Financial cash flow

The financial cash flow of a project is the stream of financial costs and benefits, or expenditures and receipts that will be generated by the project over its economic life and will not be produced in its absence. The financial cash flow of an investment project is a central piece of the financial appraisal. A project profile is given by cash flows in the financial appraisal.

Analysts must-

- Find out if there will be a market for the project's output and what it can be sold for.
- Assess the sources, quantities, and costs of required capital assets, raw materials and labour.
- Estimate the likely costs of the project.
- Determine anticipated inflation rates, and exchange rate movements

Project life

The project's life is set equal to the technical life of the equipment used. The length of project's economic life is the optimal period over which the project should be run to maximize its return to the project implementation.

Technological obsolescence of equipment, changing tastes, international competitiveness, the extent of a natural resource or mineral deposit may result in shorter economic life than the technical life.

If the project has long term environmental impacts, it may be necessary to extend the length of the cash flow so that costs & benefits are measured.

Growing demand for crops, rice, and palm oil during the COVID-19 pandemic have increased the threats for agricultural fields in Agusan where water and natural peatlands are being drained and converted to farmlands.

Project life

The project's cash flow is separated into Start-up and Operational phases.

The cash flow of the project is likely to be negative during the start-up period.

The implementation phase covers the initial construction of the project as well as the period at the beginning of the project's operation. During the period, operating costs will often be higher and capacity utilization lower than later in the project's life.

Financial cash flow of a water supply project ($million)

	Years				
Costs	**1**	**2**	**3**	**4**	**20**
Capital costs					
Fixed assets					
pipes	400	500	300	0	-70
pumps	50	100	90	0	-30
storage tanks	140	230	160	0	-100
jack hammers	20	10	0	0	-5
constructions	200	250	190	0	0
Total fixed assets	810	1090	740	0	-205
working capital	20	30	40	0	-90
Total capital costs	830	1120	780	0	-295
Operating costs					
project management	80	100	120	90	90
fuel	5	7	8	10	10
maintenance	30	40	50	50	50
Total costs	945	1267	958	150	-145
Benefits					
Water sales revenue	0	200	250	500	500
Net benefits	-945	-1067	-708	350	645
	Start-up phase			**Operational phase**	

Project life: costs

Capital costs: to acquire fixed capital and working capital

Fixed capital: land, buildings, civil works, capital equipment, vehicles, in-plant infrastructure facilities, any specialized needs, training of workforce, wasted material for trial production, and replacement of plant, equipment and vehicles during the project life. **Depreciation is irrelevant in financial appraisal, because it notionally allocates the capital cost of using an asset over its economic life to determine the taxation liability of an enterprise. Adding an additional depreciation cost every year after the full capital costs (already in the cash flow), will result in double counting.**

Working capital: bank deposits, stocks of raw materials, goods in the production process (semi-finished goods), finished goods, and equipment spare parts for future functioning, spare parts of finished goods, are all working capital. **The more remote the location of a plant and the less reliable its transport links, the more likely it is to experience delays in receiving inputs and spare parts and hence the larger the working capital. Firms with longer production period have a larger working capital. Working capital costs are not incurred every year depending on inflation and plant's full production level.**

Project life: costs

Operating costs: recurrent outlays on labour services (wages, salaries), raw materials, energy, utilities (water, waste removal), marketing, transport, insurance, taxes, and debt services over the project life. **Each operating cost is entered in the cash flow (monthly or quarterly) in which it is incurred. Total operating cost is calculated as costs per unit of output. Operating costs may be higher in the start-up phase, only steady state operating costs are included as true operating costs.**

Project life: benefits

The project benefits equal the cash receipts actually received by the project from the sale of goods or services it produces or the market value equivalent of home consumed output in case of non-marketed output.

Benefits: revenue from sales, rent or royalties (license to use a plant equipment), bank deposits, sale of fixed assets, insurance claims, net of sales taxes and other imposts that must be paid to the government by the project, imputed income from non-marketed output (firefighting service, company amenities, e.g., car, housing, gym).

Financial appraisal: Decision rules

Investment in a project is normally done with the expectation that any cash outlay now will result in extra cash (or benefits) in the future. Financial evaluation methods try to estimate whether the cash returns from the investment will be enough to justify the initial investment.

Commonly used methods:

- **Payback period;**
- **Return on investment (ROI);**
- **Net present value (NPV);**
- **Internal rate of return (IRR);**
- **Cost/benefit analysis (CBA).**

Financial appraisal: Decision rules

Time value of money (TVM) is the concept that money has potential earning capacity (i.e., certain 'interest'), and therefore, money available at the present time (present value) is worth more than the same amount in a future time (future value). Future values of money are computed by using the concept of compound interest. Thus, if $10 is invested at 10% per annum and is left to accumulate interest, the following Table shows how the capital grows in 3 years.

Future Value of $10 at Compound Interest of 10%

Year	Future value ($)
0	10.00
1	11.00
2	12.10
3	13.31

Decision rules: payback period

Payback period is generally used as an initial yardstick for reviewing and screening of any project option in terms of period of time that it takes to pay back an initial cash investment.

Cash flows are accumulated annually and payback period is considered to have been reached when the cumulative cash flow reaches zero. It should be noted that **payback period uses cash flows only and not the net income. Also, it does not take care of the profitability of the project. It simply computes how fast the investment is recovered.** Other parameters being equal, shorter payback periods are preferable to longer payback periods. Payback period is normally expressed in years.

In this example, the payback period is between 3 and 4 years, and the cumulative cash flow becomes positive in the 4th year.

Computation of Payback Period

Year	Annual Cash Flow ($)	Cumulative Cash Flow ($)
0	−40,000	−40,000
1	+12,000	−28,000
2	+14,000	−14,000
3	+8,000	−6,000
4	+8,000	+2,000

Decision rules: payback period

Advantages:

- **Payback period is easy to comprehend and calculate.** This is a ‘rule of thumb’ method for appraisal of projects of minor nature that come across frequently for investment decisions. Primary aim is to get the money back as early as possible so that it can be re-invested in other projects.
- **It tries to take care of the risk factor in an investment.** In cases where risk is anticipated from political, economic or any other direction, the shortest payback period should be the best option as the shortest time period reduces the risk of unforeseen happenings.

Disadvantages:

- **Payback period does not take into account the TVM** and consequently does not present the true financial scenario while evaluating the cash flows of different options of a project.
- **Payback period is an arbitrary period without any rationale for selecting a particular project.** It provides primary emphasis on the shortest period of time for returning the investment and **ignores cash inflows after the payback period**.

Decision rules: payback period

Project A takes lesser period for recouping the initial investment and should be accepted. However, **this would mean rejection of a more profitable option, viz., Project B, which continues to give revenues for more years after the payback period of the alternative option (Project A).**

Comparison of Investment Options

	Project A		Project B	
Year	Annual Cash Flow ($)	Cumulative Cash Flow ($)	Annual Cash Flow ($)	Cumulative Cash Flow ($)
0	−40,000	−40,000	−40,000	−40,000
1	+12,000	−28,000	+4,000	−36,000
2	+14,000	−14,000	+6,000	−30,000
3	+8,000	−6,000	+10,000	−20,000
4	+8,000	+2,000	+12,000	−8,000
5	+2,000	+4,000	+12,000	+4,000
6			+10,000	+14,000
7			+10,000	+24,000

Decision rules: payback period

Two identical investment proposals, both having the same payback period, are compared. **Cash inflow in case of Project C is more in the first two years compared to that in the case of Project D, and consequently, Project C has an advantage over Project D. But at the same time, it has to be considered that cash inflows after the payback period are much higher in the case of Project D.** This aspect is required to be considered during selection process.

Comparison of Investment Options

	Project C		Project D	
Year	Annual Cash Flow ($)	Cumulative Cash Flow ($)	Annual Cash Flow ($)	Cumulative Cash Flow ($)
0	−60,000	−60,000	−60,000	−60,000
1	+20,000	−40,000	+10,000	−50,000
2	+20,000	−20,000	+10,000	−40,000
3	+10,000	−10,000	+20,000	−20,000
4	+10,000	NIL	+20,000	NIL
5 (Onwards)	+10,000	+10,000	+20,000	+20,000

Decision rules: return on investment

This method is also known in a number of titles, of which accounting rate of return (ARR) and return on capital employed (ROCE) are some of the most commonly used titles. In this method, an average rate of return is calculated by expressing average annual profit as a percentage of average capital investment in the project. Thus,

$$\text{ROI} = \frac{\text{Estimated average annual profit}}{\text{Average capital invested}} \times 100$$

This can be illustrated by an example. Rs. 1,70,000/- is invested in a project in two years, and the estimated annual profits are as follows:

Year 1: Rs. 10,000/-
Year 2: Rs. 20,000/-
Year 3: Rs. 20,000/-
Year 4: Rs. 10,000/-
Total profit = Rs. 60,000/-

$$\text{Average annual profit} = \frac{\text{Rs.}60{,}000}{4} = \text{Rs.}15{,}000$$

$$\text{Average capital invested} = \frac{\text{Rs.}1{,}70{,}000}{2} = \text{Rs.}85{,}000$$

$$\text{Therefore, ROI} = \frac{\text{Rs.}15{,}000}{\text{Rs.}85{,}000} \times 100$$

$$= 17.65\%$$

Decision rules: net present value (NPV)

All future costs and benefits related to a project are brought together into a single value by applying the traditional 'present-value' concept on a base date corresponding to the initial costs. The inflows (benefits) are treated as positive and outflows costs as negative, and the summation gives the NPV. This method considers TVM. Thus,

$$NPV = \sum_{t=1 \text{ to } n} \frac{(b-c)}{(1+r)^t}$$

Where, b = Benefits
c = Costs
r = Selected discount rate per annum expressed in decimal
t= Time in years when the future cost is incurred
n= Number of years considered in the analysis (life of the project)

A discount rate of 10% is assumed for a project with an initial outlay of $10,000 in year 'one'. In year 'two', the net income is $7,000 and again $6,000 in year 'three'.
The NPV will be calculated as follows:

$$NPV = -10{,}000 + \frac{7{,}000}{1.10} + \frac{6{,}000}{(1.10)^2}$$
$$= +1{,}322$$

A positive NPV implies that estimated total benefits exceed total costs. While comparing alternative proposals, the project with higher NPV is to be preferred, other factors being equal.

Decision rules: internal rate of return (IRR)

The IRR of a project is the rate of return (discount rate) which equates the discounted net benefits to discounted capital costs, and can be obtained by solving for r in the following equation:,

$$C_0 = \sum_{t=1\,\text{to}\,n} \frac{(b-c)}{(1+r)^t}$$

where
C0 = Initial outlay
b = Benefits
c = Costs
r (IRR)= Selected discount rate per annum expressed in decimal
t = Time in years when the future cost is incurred
n = Number of years considered in the analysis (life of the project)

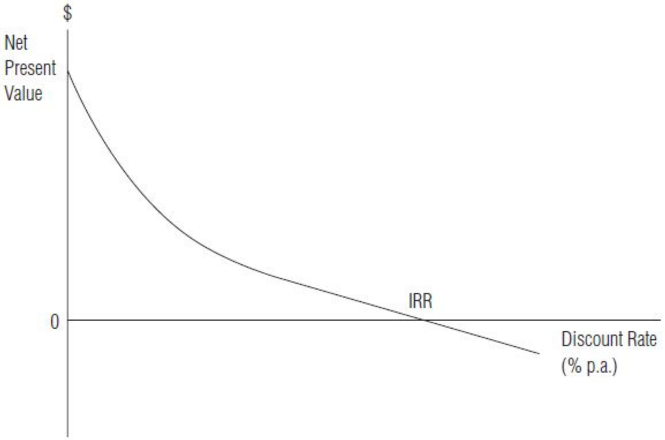
Consider that the initial outlay for a project is $10,000 and the subsequent annual returns are $3,000, $4,000 and $6,000 in years one, two and three at a return rate of r. This can be represented by the following equation:

$$10{,}000 = \frac{3{,}000}{(1+r)^1} + \frac{4{,}000}{(1+r)^2} + \frac{6{,}000}{(1+r)^3}$$

If the IRR calculated from the above formula exceeds the rate of interest obtained by investing capital in the open market, the scheme may be considered acceptable.

Decision rules: compare NPV & IRR

	NPV	IRR
Definition	The net present value of future cash inflows minus the present value of the investment's cash outflows	The discount rate at which the project's NPV is equal to zero (hurdle rate)
Time value of money concept	✓	✓
Criterion to accept/reject	NPV > 0	IRR > r (%)
Result expressed in	Monetary value	Rate (percentage)
Different discount rates can be applied to a single project	✓	✗
Appropriate for ranking mutually exclusive projects	✓	✗



The purpose of an NPV calculation is to compare the performance of a proposed project with the alternative use of the scarce resources involved.

The alternative use is taken to be a project yielding an IRR equal to the market rate of interest – in other words, a project with an NPV=0 at the market rate of interest. The market rate of interest is generally taken to be the rate of return on a riskless asset such as government bonds.

Decision rules: benefit-cost ratio (BCR)

All benefits and costs are discounted to their present value, and the ratio of the benefits to costs is calculated. As in the previous cases, benefits and costs are considered as positive and negative values, respectively.

$$\text{BCR} = \frac{\text{Discounted benefits}}{\text{Discounted costs}} = \frac{\text{NPV}}{C_0}$$

A project with a BCR greater than one is worth undertaking. Also, for comparing purpose, higher the value of BCR for an alternative, the higher will be its ranking.

The major drawback is that the discount rate needs to be assumed. This rate is related to the opportunity cost of capital, which is not easy to ascertain. The ratio itself does not indicate the project’s size or provide a specific value on what the asset/project will generate. For example, both projects show equal BCR, but present value cash flows can be significantly different:

Decision rules: benefit-cost ratio (BCR)

Time	t = 0	t = 1	t = 2	t = 3
Costs	-$5,000	-$10,000	-$10,000	-$15,000
Benefits	–	–	$50,000	$75,000
Net Cash Flow	-$5,000	-$10,000	$40,000	$60,000

Time	Discounted Costs	Discounted Benefits
t = 0	$5,000.00	0
t = 1	-$10,000 / $(1+10\%)^1$ = $9,090.91	0
t = 2	-$10,000 / $(1+10\%)^2$ = $8,264.46	$50,000 / $(1+10\%)^2$ = $41,322.31
t = 3	-$15,000 / $(1+10\%)^3$ = $11,269.72	$75,000 / $(1+10\%)^3$ = $56,348.61
Total:	-$33,625.09	$97,670.92

The benefit-cost ratio would be calculated as,
$97,670.72 / $33,625.09 = **2.90**.

Decision rules: benefit-cost ratio (BCR)

Value Range of the BCR	General Interpretation
BCR < 1	The project is destroying value and should not be undertaken: • The net present value of the project is negative, and • The internal rate of return (IRR) of the project is below the discount rate.
BCR = 1	The project will neither create nor destroy value: • The net present value of the project is zero, and • The internal rate of return (IRR) of the project is the same as the discount rate.
BCR > 1	The project will generate incremental value: • The net present value of the project exceeds zero, and • The internal rate of return (IRR) of the project is greater than the discount rate.

Decision rules: dealing with inflation

Inflation is a process which results in the nominal prices of goods and services rising over time. The existence of inflation raises the question of whether project inputs and outputs should be measured at the prices in force at the time of the appraisal – constant prices – or at the prices in force when the project input or output occurs – current prices.

The government bond interest rate, m (money rate), includes two components – the real rate of interest, r, and the anticipated rate of inflation, i: $m = r + i$. In other words, the anticipated rate of inflation is built into the money rate of interest.

There are two ways of calculating the value of a project at time t: **we could use constant prices, which do not include the inflation which will occur between now and time t, or we could use the anticipated price at time t, incorporating inflation.**

Similarly, there are two ways of discounting the value of the project back to a present value: **we could use the real rate of interest – the money rate less the rate of inflation – or we could use the money rate. If inflation is included in the value of a project at time t the money rate of interest (which incorporates inflation) must be used as the discount rate; if inflation is not included, the real rate of interest must be used.**

Decision rules: dealing with inflation

Methods:

At today's price, P0, the value of a quantity of coal at time t, Qt, is given by P0 Qt.

The present value of the coal, using the real rate of interest (without inflation), r, is given by, $\frac{P_0 Q_t}{(1+r)^t}$

The present value, at the money rate of interest, m (including inflation), is given by, $\frac{P_0 Q_t (1+i)^t}{(1+m)^t}$

Exercise:

Given the following information, use two different methods (**money rate of interest and real rate of interest**) to calculate the present value of a tonne of coal to be received one year from now, when money rate of interest (m): 8% per annum, expected rate of general price inflation (r): 6% per annum, expected rate of increase in the price of coal (i): 2% per annum, and current price of coal: $25 per tonne.

Exemplar questions

- The University of Rajshahi and Rajshahi City Corporation have decided on a new roadway construction and transport facilities connecting the university and the city centre. As a financial analyst of this project, what type of assessments will you undertake and why do you need to undertake such assessments?

- Tabulate cash flow components of start-up and operational phases of a hypothetical mobile network tower project. Also, explain i) why you do not include depreciation in the flow; ii) timing of costs (fixed/working/operational); and iii) market and non-market benefits of this project.

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