INVESTMENT ANALYSIS

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Capital Investment Decisions are the most important decisions that affect the profitability of an organisation. These decisions involve large capital outlays and are difficult to reverse. Consequently it is important that the relevant information is collected and analysed before taking these decisions. The purpose of this note is to describe the analytical techniques for developing and evaluating capital investment proposals. Although the technique is generally applied to long-term investments it can apply to any expenditure from which future benefits are expected. The future benefits do not have to extend over a long period of time for these techniques to be applicable. In practice, however, it is usual to limit the use of capital investment analysis techniques to proposed investments with a life of more than one year.

ESTIMATING CASH FLOWS

Once the alternatives have been determined, the next step is to calculate the cash flows from each alternative. The usual technique is to calculate the cash flows that result from doing nothing versus under-taking each of the alternatives. For example, in considering the purchase of a new machine to replace an existing one, the incremental cash flows that result from the purchase of this machine would have to be considered. Any cash flow that would not be affected by the acquisition of the new equipment should be ignored.

If there are several alternatives, a separate study for each should be made. That is, calculate the differential cash flow of each alternative and, then compare these cash flows to determine the best alternative.

TECHNIQUES FOR EVALUATING CAPITAL INVESTMENT PROPOSALS

There are four commonly used techniques for evaluating capital investment proposals. These techniques are:

- Payback period
- Unadjusted rate of return methods
- Internal rate of return (IRR), and the
- Net Present Value (NPV).

Each of the above techniques are described below along with the their advantages and disadvantages. The following information is needed to apply the above techniques:

1. the amount of the investment i.e cash outflows;
2. the timing of the investment;
3. the amount of savings i.e. cash inflows;
4. the timing of the savings;
5. the life of the investment;
6. the criteria for acceptability

PAYBACK PERIOD

The simplest and one of the most commonly used techniques for evaluating capital investment proposals is the payback. This is calculated as the investment divided by the annual saving

$$\text{Payback Period} = \frac{\text{investment}}{\text{annual savings}}$$

This payback period gives the number of years it takes to get back the investment.

This method has the advantages of simplicity and easy to calculate.

The payback method suffers from a disadvantage of not distinguishing accurately between the desirability of alternative investments. In fact, it can lead to erroneous decisions. For instance, in the following example:

Example	**Investment I**	**Investment II**
Investment	Rs10,000	Rs 10,000
Annual Savings	5,000	3,000
Life	2 years	10 years
Payback	2 years	3 1/3 years

In this example, investment I has the shortest payback in spite of the fact that there is no profit on the investment. Further, the payback methoid does not consider the cash flows beyond the payback period. Since the entire purpose of these techniques is to select among alternative investments, the payback method has very limited value. It

should be used only where a quick return of capital is of crucial importance and, even then, only in conjunction with other methods.

The Unadjusted Rate of Return Method

The Unadjusted Rate of Return Method (also called the accounting method) is calculated as follows:

$$\frac{\text{average annual savings - average annual depreciation}}{\text{Investment}} \quad \text{or}$$

The advantages of the unadjusted rate of return method are as follows:

1. It is easy to understand (although not as simple as the payback method);
2. It considers all the cash flows

The principal disadvantage of the unadjusted rate of return method is that it treats a rupee received in future as equal in value of a rupee received today. (This is not a valid assumption as demonstrated in the following example:

	Investment I	**Investment II**
Account of investment	Rs 10,000	10,000
Savings	3,000 per year for 10 years	30,000 at the end of 10 years
Life	10 years	10 years
Rate of Return - Equation	$\frac{3.000 - 1.000}{10,000}$	$\frac{3.000 - 1.000}{10,000}$
Rate of Return	20%	20%

Both of these investments earn the same average rate of return, yet clearly it is ‘better to have the savings returned evenly during the life of the investment than at the end of the period”.

To summarize, the unadjusted rate of return method is more accurate than the payback. However, the method does not consider the time value of money.

The time-adjusted rate of return method

The time-adjusted rate of return method corrects the basic fallacy of the unadjusted rate of return method; the time-adjusted rate of return method does not treat a rupee to be received in the future as worth the same as a rupee received today. In other words, it takes into account the "present value" of money.

The Concept of Present Value

The method for calculating present value is based on principles of compound interest. This method is e where you receive interest on the interest that you have earned, as well as on the principal. For example, suppose that you invest $ 1,000 in a bank that pay 6% interest, compounded annually. (This means that interest is calculated annually and added to your account.) If you leave both principal and interest in the bank, the growth will be like this:

End of:	Amount in Bank	Amount of Interest Earned
Year 1	Rs 1,060.00	Rs 60.00
2	1,123.00	63.00
3	1,191.02	68.02

The equation for calculating compound interest on Re 1 is as follows:

$(1 + i)^n$, where:

i = the interest rate; and

n = the number of periods the money is in the bank.

In the example above Rs 1,000 today is worth Rs 1,191,02 at the end of 3 years. Consequently, if 6% is the return earned, Rs1,000 today or Rs1,191 three years from now would be equivalent in value. This is the concept of present value. Thus, the present value of Rs 1,191 in three years is Rs1,000 if money is worth 6%. {Present value requires a time period and an interest rate.}.

The equation for the present value of Re 1 is $1/(1+i)^n$,or the reciprocal of the compound interest equation.

Present value is important in capital investment analysis because an investment always involves a payment now in return for cash flows in the future. The evaluation of a capital investment proposal involves determining the present value of these future cash flows.

Internal Rate of Return (IRR)

Suppose that the proposed investment is Rs 3,000 and the anticipated savings, are Rs1,000 a year for five years. (In this instance, assume that the savings are received at the end of the year). The rate of return is calculated by discounting the savings (find their present value) at various rates until a rate was found that would equate the present value of the savings to the amount of the investment. For example:

	10%	20%	30%
Year 1	Rs 909	Rs 833	Rs 769
2	826	694	592
3	751	579	455
4	683	482	350
5	621	402	269
	Rs 3,790	Rs 2,990	Rs 2,435

This shows that a saving of Rs1,000 a year for 5 years on an investment of Rs 3,000 will earn slightly less than 20%. The process of discounting (i.e. finding present value) means that the amount of cash flows are being reduced by the interest; the remainder, therefore, is the return of the principal. If the discounted cash flow adds up to the principal, it means the project is earning the interest rate that is being to calculate the discounted cash flow. In the above example, at the 10% rate the return of principal was Rs 3,790. This means that the return earned is 10% + Rs3790; this is obviously more than 10%. But at a discount rate of 30%, the return of principal was only Rs 2,435 or Rs 5651ess than the Rs 3,000 investment. This means that the project earned 30% minus Rs 565.

Advantages and Disadvantages of IRR

The advantage of the time adjusted rate of return method is that it does take into account the fact that money in the future is worth less than an equal amount today.

The disadvantage is that it may not distinguish between alternative investments with complete accuracy because, implicit in the calculations, is the assumption that the savings can be invested at the indicated rate of return. For example, a 30% return on a one-year investment may not be better than a 25% on a two-year investment. It all depends upon the investment opportunities that will be available in the next two years.

The Net Present Value (NPV) Method

The NPV method is a present value calculation that is designed to overcome the last two disadvantages attributable to the time adjusted rate of return method. Under this method, all cash flows are discounted at a desired rate of return. The present value of the cash inflows minus the present value of the cash outflows gives the net present value. If the net present value is positive, the investment will earn the desired rate in addition to the amount of the net present value. If the NPV is negative, the investment cannot earn the desired rate by the amount of the negative NPV.