

There are five main techniques which most companies today use to appraise investment projects. They are the projects Payback Periods, Accounting Rate of Return (ARR), Net Present Value (NPV), Internal Rate of Return (IRR) and Profitability Index. These techniques all have their own strengths as well as weaknesses. This essay is focusing upon reviewing these techniques and evaluating their strengths and weaknesses.

## ***Payback Periods***

It is one of the simplest and most frequently used methods of capital investment appraisal. A method of capital budgeting in which the time is required before the projected cash inflows for a project equal the investment expenditure is calculated; this time is compared to a required payback period to determine whether or not the project should be considered for approval. The faster capital is returned from an investment, the more rapidly it can be invested in other project. There have obvious deficiencies, payback computations ignore the important fact that future cash receipts can not be validly compared with an initial outlay until they are discounted to their present value.

$$\text{Payback Period} = \frac{\text{Initial Investment Cost}}{\text{Annual Operating Savings}}$$

Example using payback method, Facts: A company is considering the purchase of one of the machines below:

Table 1.1

	Machine A	Machine B
Cost of new machine	£240,000	£240,000
Annual net cash inflow	£60,000	£80,000

From the table 1.1, the payback period for A would be 4years, for B would be 3years.

Now consider the estimated useful lives of the two alternatives. Suppose that the useful life of B is only 3 years. Its use will merely cover its cost and provide no profits. But A has useful life of 6 years. It will generate net cash inflows for two years beyond its payback period, which will give the company an additional net cash inflow of £120,000 (£60,000 at 2 years). Unlike B, A will be profitable. In light of the assets useful lives, A appears to be the better investment.

### ***Accounting Rate of Return (ARR)***

It is an accounting ratio that expresses the profit of an organization before interest and taxation, usually for a year, as percentage of the capital employed at the end of the period. Variants of the measure include using profit after interest and taxation, equity capital employed, and the average of opening and closing capital employed for the period. Its limitation is that it does not consider cash flows and time value of money.

The formula to compute the accounting rate of return is:

$$\text{Accounting Rate of Return} = \frac{\text{Average annual profit}}{\text{Average Investment}}$$

Example using Accounting Rate of Return Method, Facts: A company wants to purchase a machine with following characteristics:

Table 2.1

Cost	£200,000
Expected Annual cash inflow	£80,000
Useful life	4 Years
Residual value	£30,000

Table 3.1

Depreciation	$(200,000 - 30,000)/4 = 42,500$
Average annual profit	$80,000 - 42,500 = 37,500$
Average Investment	$(200,000 + 30,000)/2 = 115,000$
Accounting Rate of Return	$37,500/115,000 = 32.6\%$

Using ARR can give you a quick estimate of the project's net profits, and can provide a basis for comparing several different projects and we always prefer to choose the projects with greater rate of return. Under this method of analysis, returns for the project's entire useful life are considered. However, the ARR method uses income data rather than cash flow and it completely ignores the time value of money. To get around this problem, you should also consider the net present value of the project, as well as its internal rate of return.

### ***Net Present Value (NPV)***

In discounted cash flow, the difference between the present values of the cash outflows and the present value of the cash inflow. The NPV is the application of discount factors, based on a required rate of return to each year's projected cash flow, both in and out. So that the cash flow are discounted to present values. If the NPV is positive, the required rate of return is likely to be earned and the project should be accepted; if it is negative, the project should be rejected. For Strengths of NPV by considering the time value of money, it also takes factors, such as cost of capital, interest rates and investment opportunity costs, into account. It is especially appropriate for long-term projects.

Ranking investments by NPV does not compare absolute levels of investment. NPV looks at cash flows, not at profits and losses the way accounting systems do. NPV is highly sensitive to the discount percentage, and that can be tricky to determine.

We should be having an intuitive understand of the NPV rule and use the formula to calculate NPV:

$$NPV = \frac{FV_1}{1+K} + \frac{FV_2}{(1+K)^2} + \frac{FV_3}{(1+K)^3} + \dots + \frac{FV_n}{(1+K)^n} - I_0$$

Where  $I_0$  represents the initial investment outlay and FV represents the future values received in year 1 to n. the rate of return k used is the return available on an equivalent risk security in the financial market.

Example using Net Present Value Method, The example below illustrates the calculation of Net Present Value. Consider Capital Budgeting projects **A** and **B** which yield the following cash flows over their five year lives. The cost of capital for the project is 10%.

Table 4.1

Year	Project A Cash flow	Project B Cash flow
0	-1,000	-1,000
1	700	100
2	500	300
3	300	300
4	300	500
5	100	800

Net Present Value for Project A is £541.98 and Project B is £402.48. Thus, if Projects A and B are independent projects then both projects should be accepted. On the other hand, if they are mutually exclusive projects then Project A should be chosen since it has the larger NPV.

## ***Internal Rate of Return***

IRR is an interest rate that gives a net present value of zero when applied to a projected cash flow. This interest rate, where the present values of the cash inflows and outflows are equal, is the internal rate of return for a project under consideration, and the decision to adopt the project would depend on its size compared with the cost of capital. It provides a simple hurdle rate for investment decision-making. It is the method favored by many accountants and finance people, possibly the ones at your company. It is not as easy to understand as some measures and not as easy to compute. Computational anomalies can produce misleading results, particularly with regard to reinvestments.

The formula below using the interpolation method is as follows:

$$NPV = C_0 + \frac{C_1}{1 + IRR} + \frac{C_2}{(1 + IRR)^2} + \dots + \frac{C_T}{(1 + IRR)^T} = 0$$

The example below illustrates the determination of IRR. Consider Capital Budgeting projects **A** and **B** which yield the following cash flows over their five year lives. The cost of capital for both projects is 10%.

Table 5.1

Year	Project A Cash flow	Project B Cash flow
0	-1,000	-1,000
1	500	100
2	400	200
3	200	200
4	200	400
5	100	700

Internal rate of return for project A is 16.82% and project B is 13.28%. Thus, if Projects A and B are independent projects then both projects should be accepted since their IRR are greater than the cost of capital. On the other hand, if they are mutually exclusive projects then Project A should be chosen since it has the higher IRR.

### ***Profitability Index***

An index used to evaluate proposals for which net present values have been determined. The profitability index is determined by dividing the present value of each proposal by its initial investment. An investment with index value greater than 1.0 is acceptable. The greater the number, the more financially attractive the proposal. If, on the other hand, the index value is less than the initial investment, the investment project should be rejected. The decision rule is to choose all the projects that have a profitability index greater than one. Or when there are conflicting projects, choose the project with the highest profitability index. Conceptually, PI is very similar to NPV, and in practice, it is much easier to calculate than IRR. Also it considers all cash flows and the time value of money.

## ***Conclusion***

In conclusion, Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return and Profitability Index not only have their own strengths but also weaknesses. Payback Period ignores all cash flows beyond the period and it can be relatively subjective since companies set the desired payback period by themselves. However, Payback Period is very easy to compute and understand. Accounting Rate of Return ignores all cash flows as well as the time value of money. Net Present Value is popular with many companies as it considers the time value of money and some other relevant factors such as cost of capital, interest rates and investment opportunity costs. However, it does not compare the absolute levels of investment. Internal Rate of Return can give investors value-maximizing decision as it considers the time value of money. Profitability Index can be difficult for investors to calculate, as it needs the estimation of the cost of capital. However, it considers all cash flows and the time value of money. Maximizing profit is one of the most important objectives for most companies and organizations; what is better brought to the management board's attention is that a company has to consider both financial and non-financial factors. All investors should make use of these investment appraisals techniques more sophisticatedly and consider all relevant factors which can affect the investment.

