

Chapter 2: Capital Budgeting Techniques

Introduction



2.1 Introduction

In order to assess the feasibility of any investment project, some capital budgeting techniques should be used to evaluate that project. This part illustrates the most common techniques and the advantages and disadvantages of each one of them.

The Net Present Value Method



2.2 The Net Present Value Method

The primary capital budgeting method that uses discounted cash flow techniques is called the Net Present Value (NPV). Under the NPV net cash flows are discounted to their present value and then compared with the capital outlay required by the investment. The difference between these two amounts is referred to as the NPV. The interest rate used to discount the future cash flows is the required rate of return (will be discussed later). A project is accepted when the net present value is zero or positive.

The Net Present Value (NPV) Rule

Net Present Value (NPV) = Total PV of future CF's - Initial Investment



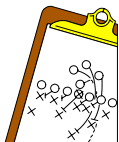
2.2.1 Why To Use Net Present Value?

Accepting positive NPV projects benefits shareholders, for the following reasons:

NPV uses cash flows
 NPV uses all the cash flows of the project
 NPV discounts the cash flows properly, and

2.2.2 Estimating NPV

Estimating NPV



Three variables should be considered:

1. Estimate future cash flows: how much? and when?
2. Estimate discount rate
3. Estimate initial costs

Minimum Acceptance Criteria: Accept if $NPV > 0$

Ranking Criteria: Choose the highest NPV

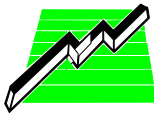
Good Attributes
of the NPV Rule

2.2.3 Good Attributes of the NPV Rule

1. Uses cash flows
2. Uses ALL cash flows of the project
3. Discounts ALL cash flows properly

Reinvestment assumption: the NPV rule assumes that all cash flows can be reinvested at the discount rate.

The Payback
Period Rule



2.3 The Payback Period Rule

The payback period answers the question of; how long does it take the project to “pay back” its initial investment?

Payback Period = number of years to recover initial costs

The shorter the payback period the more attractive the investment. The reasons are that:

The earlier the investment is recovered, the sooner the cash funds can be used for other purpose.

The risk of loss from obsolesces and changed economic conditions is less in a shorter payback-period

Minimum Acceptance Criteria: set by management

Ranking Criteria: set by management



Disadvantages:

Ignores the time value of money

Ignores cash flows after the payback period

Biased against long-term projects

Requires an arbitrary acceptance criteria

An accepted project based on the payback criteria may not have a positive NPV



Advantages:

Easy to understand

Biased toward liquidity

The Discounted
Payback Period
Rule

2.4 The Discounted Payback Period Rule

How long does it take the project to “pay back” its initial investment taking *the time value of money* into account?

However, by the time you have discounted the cash flows, you might as well calculate the NPV.

The Average
Accounting
Return Rule



2.5 The Average Accounting Return Rule

Another attractive but fatally flawed approach.

$$\text{AAR} = \frac{\text{Average Net Income}}{\text{Average Book Value of Investent}}$$

Ranking Criteria and Minimum Acceptance Criteria set by management



Disadvantages:

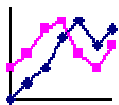
Ignores the time value of money
Uses an arbitrary benchmark cutoff rate
Based on book values, not cash flows and market values



Advantages:

Accounting information is usually available
Easy to calculate

The Internal Rate
of Return



2.6 The Internal Rate of Return (IRR) Rule

IRR is the discount rate that sets NPV to zero. The IRR differs from the NPV in that it results in finding the internal yield of the potential investment. The IRR is calculated by discounting the net cash flows using different discount rates till it gives a net present value of zero (Trial and Error). However, it may be easily calculated using financial calculators or Excel Program.

Minimum
Acceptance
Criteria

2.6.1 Minimum Acceptance Criteria

Accept if the IRR exceeds the required return.

Ranking Criteria

Ranking Criteria

Select alternative with the highest IRR.
Reinvestment assumption: All future cash flows assumed reinvested at the IRR.



Disadvantages

Does not distinguish between investing and borrowing?
IRR may not exist or there may be multiple IRR
Problems with mutually exclusive investments



Advantages

Easy to understand and communicate

The Profitability Index



2.7 The Profitability Index (PI) Rule

$$PI = \frac{\text{Total PV of Future Cash Flows}}{\text{Initial Investment}}$$

Minimum Acceptance Criteria: Accept if $PI > 1$

Ranking Criteria: Select alternative with highest PI

Disadvantages:

Problems with mutually exclusive investments

Advantages:

May be useful when available investment funds are limited

Easy to understand and communicate

Correct decision when evaluating independent projects

Mutually Exclusive

2.7.1 Mutually Exclusive vs. Independent Project

Mutually Exclusive Projects: Only ONE of several potential projects can be chosen, e.g. acquiring an accounting system. The meaning is that if the company accepts one project, it would be impossible to adopt the other proposal even if generates a positive net present value.

RANK all alternatives and select the best one.

Independent Projects

Independent Projects: accepting or rejecting one project does not affect the decision of the other projects.

Must exceed the MINIMUM acceptance criteria.

The Practice of Capital Budgeting



2.8 The Practice of Capital Budgeting

Capital budgeting techniques varies by industry, Some firms use payback, others use accounting rate of return. However, the most frequently used technique for large corporations is IRR or NPV.

Selection of Techniques



2.8.1 Selection of Techniques

Net Present Value is the technique of choice; it satisfies the requirements of: the firm's goal, the time value of money, and the absolute measure of investment.

Internal Rate of Return is useful in a single asset case, where the cash flow pattern is an outflow followed by all positive inflows. In other situations the IRR may not rank mutually exclusive assets properly, or may have zero or many solutions.

Accounting Rate of Return allows many valuations of the asset base, does not account for the time value of money, and does not relate to the firm's goal. It is not a recommended method.

Payback Period does not allow for the time value of money, and does not relate to the firm's goal. It is not a recommended method.

The Notion of Certainty



2.8.2 The Notion of Certainty

A simplified assumption made by many financial analysts is that projected results are known with certainty. The reasons are:

Certainty allows demonstration and evaluation of the capital budgeting techniques, whilst avoiding the complexities involved with risk.

Certainty requires forecasting, but forecasts, which are certain. Certainty is useful for calculation practice.

Risk is added as an adoption of an evaluation model developed under certainty.

The next unit will illustrate how to account for the risk effect in the capital budgeting decisions.

Summary



2.8.3 Summary

This unit evaluates the most popular alternatives to NPV:

- ◆ Payback period
- ◆ Accounting rate of return
- ◆ Internal rate of return
- ◆ Profitability index

When it is all said and done, they are not the NPV rule; for those of us in finance, it makes them decidedly second-rate.

Case



Case 1: (Independent Projects)

The management of the Egyptian investors Plc is evaluating a capital budget decision. The available alternatives are as follows:

Years	NCF (project A)	NCF (Project B)	NCF (Project c)
0	- 500	- 600	- 400
1	150	200	300
2	150	200	100
3	650	100	000
4	0	1200	0000

Required:

Rank these investment alternatives using the payback period, and the NPV. The required rate of return is 18%

The payback period:

To calculate the payback period, the net cash flows for each alternative should be accumulated till it gives a positive value (i.e. till it pays back its initial investment). The one that pays back faster is the best alternative.

Years	NCF (project A)	NCF (Project B)	NCF (Project c)
0	- 500	- 600	- 400
1	150	200	300
2	150	200	100
3	650	100	000
4	0	1200	0000

According to the payback method, project C which pays back after 2 years is No. 1, followed by project A which pays back after 3 years, while project B is No. 3 because it pays back during the fourth year.

Do you agree with this ranking? Why?

The NPV:

According to the net present value method, the net cash flows should be discounted and accumulated to get the NPV, by the end of the useful life. The project that generates the highest NPV is the most feasible one.

	(1)	(2)	(3) = (1) * (2)
Years	NCF (project A)	PV factor @ 18% B)	PV of NCF
0	- 500	1	-500
1	150	0.847458	127.1186
2	150	0.718184	107.7277
3	650	0.608631	395.6101
NPV (total)			130.4564

	(1)	(2)	(3) = (1) * (2)
Years	NCF (project B)	PV factor @ 18% B)	PV of NCF
0	- 600	1	-600
1	200	0.847458	169.4915
2	200	0.718184	143.6369
3	100	0.608631	60.86309
4	1200	0.515789	618.9467
NPV (total)			392.9381

	(1)	(2)	(3) = (1) * (2)
Years	NCF (project B)	PV factor @ 18% B)	PV of NCF
0	- 400	1	-400
1	300	0.847458	254.2373
2	100	0.718184	71.81844
NPV (total)			-73.9443

Project B generates the highest positive NPV, thus it is ranked as No. 1, followed by project A. While project C should be rejected as it gives a negative NPV.

Case



Case 2: (Mutually Exclusive Projects)

The management of Goldi is evaluating an investment proposal to acquire one of two mutually exclusive production lines to produce motherboards. The following data is available:

Years	NCF (project A)	NCF (Project B)
0	-3000	-2000
1	660	440
2	660	440
3	660	440
4	660	440
5	3660	2440

The company's cost of capital is 12%.

Required: select the best alternative

Answer:

The best method to use in selecting between mutually exclusive projects is the NPV, thus the net cash flows for each project is discounted @ the cost of capital rate (12%) and the project that yield the highest NPV is selected.

Years	NCF (project A)	PV factor @ 12%	NCF (Project B)
0	-3000	1	-3000
1	660	0.8929	589.2857
2	660	0.7972	526.148
3	660	0.7118	469.775
4	660	0.6355	419.4419
5	3660	0.5674	2076.782
NPV			1081.433

Years	NCF (project B)	PV factor @ 12%	NCF (Project B)
0	-2000	1	-2000
1	600	0.8929	392.8571
2	600	0.7972	350.7653
3	600	0.7118	313.1833
4	600	0.6355	279.628
5	2600	0.5674	1384.522
NPV			720.9552

Project A

Project A gives net present value that is higher than project B, thus it is more feasible (i.e. project A maximizes the shareholders wealth).

Note: The IRR in this case may give a conflicting result, both projects will give an IRR of 22%.