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# RISK ANALYSIS IN CAPITAL BUDGETING

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## OBJECTIVES

After studying this lesson you should be able to

- Explain the meaning of risk and sources of risk
- Explain the conventional techniques to handle risk

## STRUCTURE

- 5.1 Introduction
- 5.2 Meaning of risk
- 5.3 Sources of risk
- 5.4 Conventional techniques to handle risk
- 5.5 Summary
- 5.6 Self examination questions
- 5.7 Key words
- 5.8 Books for further reading

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## 5.1 INTRODUCTION

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In the preceding lessons you have studied the meaning and process of capital budgeting. You have also examined the various techniques for evaluating capital budgeting proposal. In the process of evaluating and selecting, the basic assumption was that these proposals did not involve any kind of risk. This assumption was made simply to facilitate the understanding of the capital budgeting techniques. In real world situation, however, the firm, in general and its investment project in particular, are exposed to different degrees of risk. The risk arises in capital budgeting proposals because we cannot estimate the future cash flows with certainty and consequently cannot make any correct prediction about the cash flow sequence. The purpose of this lesson is to explain the meaning and sources of risk and conventional techniques to handle risk. However, statistical techniques to handle risk will be explained in the next lesson.

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## 5.2 MEANING OF RISK

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In order to understand the meaning of risk it is better to understand the meaning of certainty uncertainty

- a) **Certainty** : It is a situation where the returns are assured and no variability likely to occur in future returns. For example, fixed deposit in a bank or investment in fixed rate government bonds.
- b) **Uncertainty** : It is a situation where the probable events are not known. In an uncertain situation probable cash flows cannot be predicted. For example, investment in corporate securities where no returns are assured.
- c) **Risk** : The risk associated with an investment may be defined as “the variability that is likely to occur in future returns from the investment”. In other words, risk is a situation in which the probabilities of future cash flows accruing are known. For example investing Rs. 20,000 in a project and expecting returns of Rs. 5,000/- each in five years life. These returns may vary due to various reasons which are explained in the following paragraphs.

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## 5.3 SOURCES OF RISK

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As explained above, risk is associated with the variability of future returns of a project. The factors which will influence the future returns of the projects may be explained as follows:

- a) **size of the investment** : The size of the investment in terms of amount required will determine the risk. Large size project involves more risk and vice versa. For example, a project involves Rs. One Crore investment involves more risk than a project involves Rs. 10,000/-
- b) **Life of the Project** : The life of the project will determine the risk involved. More the projects life is more risk involves, less the life less risk involved. For example a project with a life of 5 years involves less risk than a project with 20 years life.
- c) **General Economic Conditions** : There are the conditions which will influence the general level of business activity. For example, economic and political situation in the country. Governments monetary and fiscal policies etc.
- d) **Industry Factors** : These factors effect all the companies in the industry. For example, industrial relations in the industry , innovation, material cost etc.
- e) **Company Factors** : These are internal to the company which will affect only a company. For example, change in the management, strike in the company, fire in the company etc.

As seen above, various factors are responsible for variations in the returns of a proposed project. The greater the variability of the expected returns the riskier the project. However, risk can be reduced (cannot be avoided) by using certain techniques in evaluating and selecting the projects. These techniques include a) Conventional Techniques b) statistical techniques. Conventional techniques are explained in the following paragraphs. However, Statistical, Techniques are explained in the next lesson.

## **5.4 CONVENTIONAL TECHNIQUESE TO HANDLE RISK**

A number of techniques to handle risk are used by managers in selecting capital budgeting projects. The following are the popular techniques to handle risk.

### **5.4.1 PAY BACK PERIOD**

Pay back period is one of the oldest and commonly used methods for selecting capital budgeting projects. It is the period required to recover initial investment of the project. Firms using this method prefer short pay back period to longer pay back periods. Short period involves less risk to longer period. For example, there are two projects A and B. Project A pay back period is 3 years and Project B pay back period is 4 years. If the pay back criteria is applied project A should be selected as its pay back period is less than project B. Thus, the project A involves less risk than project B.

### **5.4.2 RISK ADJUSTED DISCOUNT RATE.**

This method is based on the presumption that investors expect more rate of return on risky projects as compared to less risky projects. The required rate of return will be equal to risk free rate plus risk premium. This method is similar to net present value method except adding some percentage of risk premium to risk free rate of return. Net Present value may be computed by using the following formula

$$NPV = \sum_{T=0}^N \frac{At}{(1 + K^*)^t}$$

$At$  = cash inflows for period (t)

$N$  = No. of years

$K^*$  = Risk free rate + Risk premium

The risk adjusted discount rate accounts for risk by varying the discount rate, depending on the degree of risk of investment projects. A higher rate will be used for riskier project and lower rate for less risky projects. The net present value will decrease with increasing  $K$  indicating that the riskier a project is perceived the less risky it will

be accepted. For example, consider an investment project costing Rs. 50,000 initially and is expected to generate cash flows of Rs. 25,000 Rs. 20,000 Rs. 20,000 Rs. 10,000. What is the NPV if it is discounted at 15% rate of return (10% risk free rate + 5 % risk premium)

$$\begin{aligned} \text{NPV} &= \frac{25000}{(1+15)^1} + \frac{20000}{(1+15)^2} + \frac{10000}{(1+15)^3} + \frac{10000}{(1+15)^4} - 50,000 \\ &= -845 \end{aligned}$$

Since the projects NPV is negative the project should be rejected.

## ADVANTAGES

- It is easy to understand and simple to calculate
- It recognise the risk involved in projects.

## DISADVANTAGES

- There is no easy way to determine risk adjusted discount rate.
- IT does not make any adjustment in the numerator for the cash flows that are forecast over the future years.
- It is based on the assumption that investors are risk averse.

### 5.4.3 CERTAINTY EQUIVALENT METHOD

According to this method the estimated cash flows are reduced to conservative level by applying a correction factor called a certainty equivalent coefficient. The correction factor is the ratio of riskless cash flow to risky cash flow .

$$\text{Certainty Equivalent Coefficient} = \frac{\text{Riskless cash flow}}{\text{Risky Cash flow}}$$

Under this method certainty equivalent coefficients are calculated for cash flows of each year. They are then multiplied with the cash flows to ascertain cash flows which may be used for the purpose of determining NPV or IRR.

$$\text{NPV} = \sum_{t=1}^n \frac{\alpha_t A_t}{(1+K)^t} - C$$

If the IRR is to be calculated, we will calculate that rate of discount which equates the present value of certainty equivalent cash inflows with present value of certainty equivalent cash out flows.

#### Evaluation of certainty equivalent method

This approach explicitly recognizes risk but procedure for reducing cash flows is implicit and likely to be inconsistent from one investment to another investment.

#### **5.4.4 SENSITIVITY ANALYSIS:**

It is a technique of analysing change in Projects NPV or IRR for a given change in one of the variables. It indicates how sensitive a projects NPV or IRR is to change in a particular variable. The more sensitive the NPV the more critical the variable. The following three steps are involved in the use of sensitivity analysis.

- a) Identification of all the variables which have an influence on the projects NPV or IRR.
- b) Establish the relationship between the variables.
- c) Analyse the impact of change in each of the variables on the projects NPV or IRR

#### **ADVANTAGES**

- 1) It compels the decision maker to identify the variables which will influence projects NPV or IRR. This helps him in understanding the project in totality.
- 2) It indicates the critical variables, which have negative impact on the project NPV or IRR.
- 3) It helps to expose in appropriate forecasts.

#### **LIMITATIONS**

1. It does not provide clear cut results.
2. It fails to focus on the interrelationships between variables.

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#### **5.5 SUMMARY**

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Risk may be defined as the variability that is likely to occur in future returns from the investment. It arises due to various factors like lize and life of the investment, economic condition, industry factors and company factors. The techniques includes (a) pay back period (b) Risk adjusted discount rate c) certainty equivalent coefficient method and sensitivity analysis.

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#### **5.6 SELF EXAMINATION QUESTIONS**

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1. Define an distinguish risk and uncertainty
2. What are the sources of risk?
3. What are the conventional techniques to handle risk?
4. Explain the concept sensitivity analysis

5. A company is examining two mutually exclusive investment proposals. The management of the company uses certainty equivalents (CE) to evaluate investment proposals. From the following information pertaining to their projects advise the company which project should be taken up by the company.

YEAR	Proposal A CFAT (Rs)	Proposal B CE	CFAT (Rs)	CE
0	25000	1.00	25000	1.00
1	15000	0.80	9000	0.90
2	15000	0.70	18000	0.80
3	15000	0.60	12000	0.70
4	15000	0.50	16000	0.40

The firms cost of capital is 12 percent and risk free borrowing rate is 6 percent.

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## 5.7 KEY WORDS

- Risk** : Variability that is likely to occur in future returns from the investment
- Uncertainty** : It is the situation where the probable events are not known
- Certainly Equivalent Coefficient** : It is the ratio between riskless cash flows and risky cash flows
- Sensitivity Analysis** : It is a technique of analysing changing in projects NPV or IRR for a given change in one of the variables.

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## 5.8 BOOKS FOR FURTHER READING

- Vanhorne J : Financial Management and policy Prentice Hall of India, 10<sup>th</sup> ed, 2001
- Hampton : Financial Decision Making, Prentice hall of India., 5<sup>th</sup> ed, 2000
- Pandey I.M. : Financial Management, Vikas Publishers, New Delhi, 8<sup>th</sup> ed 2000.
- Maheshwari S.N. : Financial Management, Sultan Chand and Sons New Delhi.
- Khan & Jain : Financial Management, Tata Macgraw Hill Co. New Delhi. 3<sup>rd</sup> 2001.