Sensitivity Analysis (1) Unit-III

Sensitivity analysis is an approach for assessing risk that uses several possible returns estimates to obtain a sense of the variability among outcomes. It provides information as to how sensitive the estimated project parameters (Input variables) namely, economic life, discount rate, selling price, units sold expected cash flows are to estimates errors. Since the future is uncertain, the decision-maker may like to know what will happen to the attractability of the project when project parameters deviate from their expected values.

→ Sensitivity analysis is also known as 'what if' analysis.

→ Sensitivity Analysis provides different Cash flow estimates by considering three assumptions.

A) The pessimistic (the worst)
B) The most likely (the expected)
C) The optimistic (the best)

→ The project risk can be measured by the range of net present values (NPV). The range is found by substituting the pessimistic outcomes from the optimistic outcomes. The greater the range, the more variability or risky the project and vice-versa.

Advantages of sensitivity Analysis

Sensitivity analysis has the following advantages.

(1) It helps the decision-maker in understanding the project in totality by identifying variables that affect the cash flow forecast (estimates).

(2) It helps to decision in appropriate forecasts, and thus guide the decision-maker to calculate as relevant variables.

Limitations of Sensitivity Analysis

(1) It provides ambiguous results :- The assumed possible outcomes, pessimistic or optimistic could mean different things to different persons (Marketing department, production ..etc)

(2) It fails to focus on inter-relationship between variables :- For example, sales volume may be related to price and operating cost.

→ A price cut may increase sales, thereby reduce operating cost.

(3)

Probability Approach

Probability approach explains the relationship between probability and the associated outcomes.

→ ~~Set~~ probability is the percentage change of occurrence of each possible event (cashflows). probability of occurrence of any event lies between 0 and 1

Determination of variability's of returns includes two steps :- (1) Probability Assignment :- Assignment of probability may be objective or subjective. objective probability assignment is based on a large number of observations under independent identical situations that have been observed over a period of time. on the other hand subjective probability assignment is based on personal judgement, because it is not based on a large number of observations under independent and identified situations.

(2) Estimation of Expected Returns :- once assignment of probability to different possible cash flows is completed then the next step is estimation of expected value.

→ possible cash flows are multiplied by individual assigned probabilities to get the ~~expect~~ expected monetary value.

(4)

The total of all the possible cash flow expected valu
the projects expected return.

Problem (4) The following information is available with regard to a project, whose economic life is three years and cost in Rs. 1,00,000.

Possible Out Situation	Year 1		Year 2		Year 3	
	Cash inflow	Probability	Cash inflow	Probability	Cash inflow	Prob
Pessimistic	2000	0.20	2000	0.40	2000	0.2
Most of Likely	5000	0.60	5000	0.50	5000	0.55
Optimistic	7000	0.20	7000	0.10	7000	0.25

You are required to calculate (i) EMV (ii) Total present Value of project assuming 10% cost of Capital

Solution Expected Monetary Value

Year-1			Year-2			Year-3		
CFs	Pro	MVs	CFs	Pro	MVs	CFs	PV	MVs
2000	0.20	400	2000	0.40	800	2000	0.25	500
5000	0.60	3000	5000	0.50	2500	5000	0.35	1750
7000	0.20	1400	7000	0.10	700	7000	0.40	2800
		4800			4000			4050

Total expected Monetary value = 1 year MV + 2nd year MV + 3rd MV.
Rs. 4800 + 4000 + 4050 = Rs. 12,850

Calculation of present value & EMV

Year	EMV	DF@10%	Total PVs
1	4800	0.909	4363.20
2	4000	0.826	3304
3	4050	0.25	3041
Total present value =			10,708.

Decision Tree Analysis

Decision tree is a pictorial representation in lying tree form. It shows the relationship between a present decision and future events mapped out over time in a format resembling branches of a tree.

In other words, it is a tree form which indicates the magnitude, probability and inter-relationship of all possible outcomes. It is helpful to handle the sequential decision by showing sequential cashflows and NPV of the proposed project under different circumstances.

Steps in Decision Tree Analysis

The following are the steps involved in decision tree analyses.

1) Identifying the (problem) Investment:- It is the first step at which the investment is identified. Investment may be on a new project, new product, entering a new market, replacement of Machines, expansion programmes etc.

2) Identification of decision alternatives:- The identified investment will have two or more alternatives. For example, Company is planning to construct a building for starting a new business it may buy water for constructing building or dig a borewell.

(3) Drawing the Decision Tree :- The decision tree should be drawn indicating the decision points, chances points and other data.

(4) Specification of Data :- once drawing the decision tree is over, then the evaluator has to specify probabilities and monitor values for each alternative.

(5) Evaluate the Alternatives :- Having drawn a decision tree and specified the data, then the next step is to evaluate alternatives.

(6) Selection of best Alternatives :- This is the last step in decision tree analysis in which the evaluator selects a profitable (more) alternative, thereby rejecting other alternatives.

Merits of Decision Tree Analysis

1. Easy to understand
2. Clearly brings out the implicit assumptions and Calculations for all to see, question and revise

Limitations or Demerits Tree Analysis

(1) Decision tree becomes more complex when the alternatives increase,
(2) Involves cumbersome Calculations
(3) It is time consuming
(4) It needs enormous Information.

~~Incorporate Risk~~ (1)

Unit - III

Incorporation of Risk into Capital Budgeting

There are two methods available to incorporate Risks into capital Budgeting. They are:

1) Risk adjusted discounted rate approach (RADR) and
2) Certainty Equivalent approach (CE)

1) Risk Adjusted Discount Rate (RADR) Approach

RADR is the discount Rate that is used to convert future Cash Inflow into present values. It is equal the risk free rate of return plus risk premium for Investing in a project which is characterised by risk. It indicates that RADR allows for both time prefe rable and risk preference. Risk free rate is the rate of Government securities, treasury bills, fixed deposits.

RADR :- The rate of return that must be earned on a given project to compensate the firm's owners adequately.

RADR = Risk free Interest rate + Risk premium.

Firms use different RADRs (Risk premiums) for different types of Capital Budgeting decisions.

For example, high RADR for new projects, medium for expansion projects, and low for replacement investments. It indicates that more the riskiness of the project higher the discount rate and vice-versa.

Decision Rule:- RADR is the discount rate, Since it can be used in two DCF techniques. They are NPV and IPR.

If NPV Method is used.

Accept NPV > 0, Reject NPV < 0.

Consider, NPV = 0.

If IRR Method is used

Accept : IRR > RADR ; Reject : IRR ≤ RADR

Consider : IRR = RADR.

Advantages of RADR:- ① There is no meaning for advantages if there are no disadvantages. The same is the case for RADR it has the following

① It is simple to calculate and easy to understand

② It gives psychological satisfaction to the decision-maker since it adds some premium for risk.

Limitation of RADR:- ① There is no meaning for advantages if there are no disadvantages. The same is the case for RADR it has the following disadvantages

① It is difficult to arrive at RADR - Since there is no tailor-made method to arrive at it [based on arbitrary method]

② It assumes that risk increases with time at a constant rate which is not valid.

3) It assumes that risk increases with time at a constant rate which is not valid.

4) It does not make use of the information from probability distribution of expected future cash.

2. Certainty Equivalent Approach (CEA)

CEA overcomes some of the limitations of RADR approach. It incorporates risk of a project by adjusting the expected cash flows, instead of adjusting discount rate. The eliminates the problem of calculating RADR by assigning arbitrary premium for a given level of risk.

Steps involved in CEA

Step 1: Determination of Risk Adjustment factor. (Certainty equivalent coefficient)

It represents the relationship between a riskless (certain) cash flows and risky (uncertain) cash flow.

Symbolically

Certainty Equivalent Coefficient = $\frac{\text{Riskless CF}}{\text{Risky CF}}$

(4)

Certainty equivalent coefficient assumes a value between 0 and 1, and varies inversely with risk. A higher CE coefficient will be used if lower risk is forecasted and vice-versa.

Step: 2 Determination of present value

Next step is to calculate present values with use of risk free rate (May be assumed). Here there is no risk premium, because, uncertain cash flows are converted into equivalent cash flow.

Here either NPV technique or IRR technique can be applied:

Decision Rule :-

Accept If NPV of Certainty equivalent Cash flow > 0

Reject: If NPV of Certainty equivalent Cash flow < 0

Consider: If NPV of certainty equivalent Cash flow = 0

→ If IRR technique is used

Accept : If IRR > Risk free rate

Reject = If IRR < Risk free rate

Consider = If IRR = Risk free rate

(1) Topic-III Topic-III

unit-III

Unit-3 (1) Advanced Financial Management

Meaning of cash flow :- cash flow is the movement of cash either from the firm to outside (cash outflow) or from outsiders to firm (Cash inflow). Cash inflow of a firm comprises operating cash inflows and terminal cash inflows.

→ There are three basic elements of cash flows :

1) Initial cash outflow (An initial investment)
2) operating cash flow (Cash inflow)
3) Terminal cash flow.

(1) Initial investment :- It comprises original cost and installation cost. (transportation cost, insurance, freight, loading and unloading).

→ purchase of an asset for expansion (programme) operation requires an additional investment in working capital.

Proforma for determination of Initial investment

Particulars	Amount	Amount
Cost of Asset (land, plant, Building)	XXX	
(+) Transportation charges	XXX	
Insurance Freight	XXX	
Net working capital	XXX	
		XXX
(-) Sale proceeds of old Asset	XXX	
Investment allowance	XXX	
Cash outflow.		XXX

2. operating cash flows / Net Cash flows (or) Cash Inflows

operating cash associated with operation of a business

→ Annual Cash Inflows are net earnings before depreciation and after taxes. Depreciation is added back to earnings after tax (EAT) or PAT, because it is non-cash expenses and all cash expenses have to be deducted from Sales revenue.

Determination of Net Cash Inflows (CFAT)

Sales Revenue (unit × price)	xxx
(-) operating expenses (VC)	xxx
EBDT	xxx
(-) Depreciation	xxx
EBT	xxx
(-) Taxes	xxx
EAT	xxx
Add Depreciation	xxx
Cash flow after Tax (CFAT)	

Terminal Cash flow

Terminal value : It is the Cash Inflow resulting from termination and liquidation of an asset. In case of replacement decision in which the old asset is replaced with a new asset, Sale of old and new assets has impact on Cash flows.

(3)

Format for Calculation of terminal Cash Inflow

Particulars	Amount
After tax proceeds from Sale of New Assets :-	
Cash from Sale of new asset	xxx
Less Tax on profit	xxx
Add Tax benefit on loss	xxx
	xxx
After tax Proceeds from Sale of Old Assets	
After tax proceeds from proceeds from Sale of old asset	xxx
	xxx
Less Tax on profit	xxx
Add Tax benefit on loss	xxx
	xxx
Add working Capital	xxx
Terminal cash outflow	xxx

Risk Analysis in Capital Budgeting

Risk :- Risk refers to the variations in the forecasts on the variations in the expected inflows.

Types & Decision Situation in Capital Budgeting

1) Certainty
2) uncertainty and
3) Risk.

(2)

2. operating cash flows / Net Cash flows (or) Cash Inflows

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Sales Revenue (unit × price)	xxx
(-) operating expenses (VC)	xxx
EBDT	xxx
(-) Depreciation	xxx
EBT	xxx
(-) Taxes	xxx
EAT	xxx
Add Depreciation	xxx
Cash flow after Tax (CFAT)	xxx

Terminal Cash Flow

Terminal value : It is the cash inflow resulting from termination and liquidation of an asset. In case of replacement decision in which the old asset is replaced with a new asset, sale of old and new assets has impact on cash flows.

Certainty :- means no risk. that estimated returns are equal to the actual returns.

Uncertainty :- Decision Situation in which the probabilities are known.

Risk :- Deviation of expected returns from actual return.

Source of Risk

The risk in a project arises due to the following reason/source

(1) Project specific Risk :- It is the risk that arises due to estimation of errors in earnings and cash flows or some factors that are specific to the project like Quality of Management etc.

(2) Competitive Risk :- This type of risk arises out of actions of competitors, that affect company's estimated earnings and Cash flow of the project.

(3) Industry specific risk :- Here the firms earnings and Cash flows are affected due to the industry specific factors like unexpected changes in Government regulations, Consumer behaviour and technological development.

(4) Market Risk :- The risk that arises due to unexpected changes in Macro-economic factors and affects all companies in the industry.

(5) International Risk :- This type of risks exists only in international (Foreign) projects, Whose earnings and Cash flows are affected due to the unexpected exchange rate risk or political risk.