

# Feasibility Study of Residential Project – Special Emphases on Sensitivity Analysis

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**Abstract:** — Residential apartment scheme is being adopted in India by project promoters. It is essential to perform feasibility study of any project before commencement of it. During the construction period many factors may affect of project cash flow, those factors can be identified by risk assessment and known as ‘Critical factors’. Considering these critical factors and their combinations will show a possible situations, which may occur during the construction. After analyzing the Internal Rate of Return (IRR) of each possible situation, we can compare this value of IRR with cost of capital of company; and able to determine the practical feasibility of residential project for each situation. For the feasibility of project, each possible situation must have greater value of IRR as compare to Cost of capital of company. Only feasible projects are beneficial for a company. The literature shows how sensitivity analysis can contribute to improve decision-making, but little can be found about the advantages of exploring model sensitivity visually to aid the decision maker. Ultimately, the goal of this work is to develop effective interactive visualization techniques to assist people who are using models for decision making but who need to explore the often complex relationships between the values of model variables and the model output. Hence, feasibility study is essential before commencement of it. After preparing a sensitivity model of residential project, this model can be implementing to other residential projects.

**Keyword:** --- Feasibility study; Residential project ; Sensitivity analysis;

## I. INTRODUCTION

Every construction project gives benefit to the investors. These benefits are in the form of profit, business development, resource utilization etc. Profits are achieved in long period and should have accurate investment forecast so the investors still have willingness to invest their money. In every construction project financial risk is involved. So the Feasibility study analysis gives information about the value of investment and benefits that investors will get. To check the project is feasible or not the commonly used criteria are Net present value (NPV), internal rate of return (IRR) and payback period. For successful implementation of residential project, it is necessary to study financial feasibility of the project. Considering change in variables and combinations of those variables will form a possible situation which may arise during project; those variables are booking, loan period, and delay in construction period. The aim of this project is to perform the financial sensitivity analysis of residential project to predict whether the project is feasible or not.

### 1.1. Acceptance Criteria for projects

A project may be considered as financially viable, when the following three conditions are simultaneously satisfied:

1. The Net Present Value (NPV) for the project should be positive. The discount rate for financial analysis

may include a risk premium over the current commercial lending rate.

2. The financial Internal Rate of Return (IRR) should have a value greater than the discount rate.
3. The cash flow situation in each year of the concession period should be satisfactory. In other words, the cash balance at the end of every year should be positive.

## II. STUDY AREA

Maitreya Realtors and Constructions Pvt. Ltd., a construction company in Maharashtra has provided following data to perform the financial sensitivity analysis of Residential project:

Maitrey Greens residential project is a IGBC project in Nashik. There are total four phases ( eight towers) and 14 storeyed building each.

**Area:** 8.5 acre

**Estimated cost of Phase I:** Rs.31.84 cr.

**Estimated cost of Phase II:** Rs.31.84 cr.

**Estimated cost of Phase III:** Rs.43.27 cr.

**Estimated cost of Phase IV:** Rs.43.27 cr.

**Construction period:** 2.5 years for each phase

**Debt-Equity ratio:** 65:35

**Maintenance cost:**Rs.145 per sq.ft.(one time maintenance )

**Loan period:** 4 years for each phase

**Cost of debt:** 12.5%

**Cost of Equity:** 9%

**Tc:** Effective tax rate applied to interest: 12.5%

Commencement and completion of each phase:

Phase- I: July 2013 to December 2015 (30 months)

Phase- II: July 2015 to December 2017 (30 months)

Phase- III: July 2017 to December 2019 (30 months)

Phase- IV: July 2019 to December 2021 (30 months)

From these above data of a Residential project, discount rate is able to determine by using the technique Weighted Average Cost of Capital (WACC)

The formulae for the calculation of WACC are given below:

$$WACC = \frac{E}{V} * R_e + \frac{D}{V} * R_d * (1 - T_c)$$

Where,

$R_e$  = cost of equity (9%)

$R_d$  = cost of debt (12.5%)

$E/V$  = % of equity financing (35%)

$D/V$  = % of debt financing (65%)

$T_c$  = corporate tax rate (12.5%)

Thus, for this project the weighted average cost of capital is calculated below:

$$\text{Thus, } WACC = \frac{E}{V} * R_e + \frac{D}{V} * R_d * (1 - T_c)$$

$$WACC = (0.35) * (0.09) + (0.65) * (0.125) * (1 - 0.125)$$

$$= 0.1025$$

$$= 10.25\%$$

Thus, WACC for the project is 10.25%

### 2.1. Estimation of cash flows

The cash inflows for the project are generated from the selling flats and payment slab depending upon completion of project in terms of percentage. Typically, cash outflows are in the form of construction cost during the years depending upon construction activity in that year. Performance indicators, namely, Net Present Value (NPV), Internal Rate of Return (IRR) and Pay Back Period (PBP) are calculated using standard procedure based on yearly net cash flows.

### 2.2. Sensitivity Analysis

In a project, there are some variables which are not in the control of the project promoters and thus to overcome this problem, assume following variable and let's perform sensitivity analysis. Sensitivity analysis is used to determine how sensitive a model is to changes in the value of the parameter of the model and to changes in the structure of the model. In this paper we focused on parameter sensitivity. Parameter sensitivity is usually performed as a series of test in which the modeler sets different parameter values to see how a change in the parameter causes a change in the dynamic behavior of the

stocks. By showing how to model behavior responds to changes in parameter values, sensitivity analysis is a useful technique in model building as well as in model evaluation.

## III. METHODOLOGY

*The critical variables, which will affect the cash inflows of a project, are given below:*

1. Booking of flat by consumers
2. Loan period
3. Delay in construction

The above factors are not in the control of the project promoters and by taking their optimum value the cash flow statements are prepared and IRR is calculated which help company to take the investment decision.

### 3.1. Different situations for the cash flow and Sensitivity analysis

1. Normal situation (Booking 100%, Loan Period-4years, Construction Period-2.5years)
2. Only change in booking (50% booking)
3. Only change in loan period (Loan period increase by one year)
4. Only change in construction period (Construction period increase by 1 year)
5. Change in loan period and booking (Loan period increase by 1 year & booking is 50%)
6. Change in construction period and booking (Construction period increase by 1 year and 50% booking)
7. Change in construction period and loan period (Construction period increase by 1 years and loan period increase by 1 year.)
8. Change in all parameter (Loan period increase by 1 year, construction period increase by 1 year and booking is 50%)

## IV. RESULT & DISCUSSIONS

Results are obtained after analyzing and preparing cash flow statement for each situation. Keeping, Discount rate 10.25%

### 1. Normal Situation:

- ♣ Booking Of Flat: 100% For Each Phase
- ♣ Loan period: 4 years for each phase

- ♣ Construction period: 30 months for each phase At the end, net present value is rs.165, 96, 68,899; hence irr is 154% and pbp is 21.71 months

**2. Only change in booking:**

- ♣ Booking of flat: 50% for each phase
- ♣ Loan period: 4 years for each phase
- ♣ Construction period: 30 months for each phase At the end, net present value is rs.29, 87, 78,390; hence irr is 29.40% and pbp is 58.93 months

**3. Only change in loan period:**

- ♣ Booking of flat: 100% for each phase
- ♣ Loan period: 5 years for each phase
- ♣ Construction period: 30 months for each phase At the end, net present value is rs.162, 17, 67,490; hence irr is 152% and pbp is 21.80 months

**4. Only change in construction period:**

- ♣ Booking of flat: 100% for each phase
- ♣ Loan period: 4 years for each phase
- ♣ Construction period: 42 months for each phase At the end, net present value is rs.149, 65, 05,198; hence irr is 97.80% and pbp is 29.58 months

**5. Change in booking and loan period:**

- ♣ Booking of flat: 50% for each phase
- ♣ Loan period: 5 years for each phase
- ♣ Construction period: 30 months for each phase At the end, net present value is rs.26, 08, 76,981; hence irr is 27.50% and pbp is 60.72 months

**6. Change in booking and construction period:**

- ♣ Booking of flat: 50% for each phase
- ♣ Loan period: 4 years for each phase
- ♣ Construction period: 42 months for each phase At the end, net present value is rs.19, 21, 53,578; hence irr is 20.75% and pbp is 75.09 months

**7. Change in loan period and construction period:**

- ♣ Booking of flat: 100% for each phase
- ♣ Loan period: 5 years for each phase
- ♣ Construction period: 42 months for each phase At the end, net present value is rs.145, 86, 03,790; hence irr is 96.35% and pbp is 29.73 months

**8. Change in all parameter:**

- ♣ Booking of flat: 50% for each phase
- ♣ Loan period: 5 years for each phase
- ♣ Construction period: 42 months for each phase At The End, Net Present Value Is Rs.15, 42, 52,169; Hence Irr Is 18.94% And Pbp Is 77.59 Months

From the obtained result, each situation has positive Net present value and hence, IRR is more than cost of capital of company; therefore, this project is acceptable

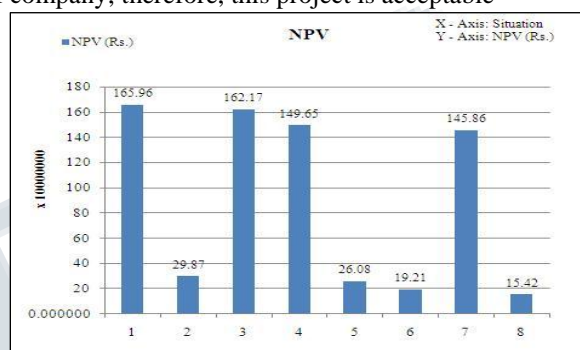


Figure 1: net present value

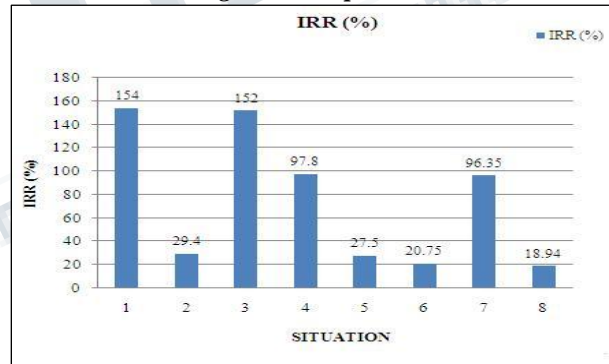


Figure 2: internal rate of return

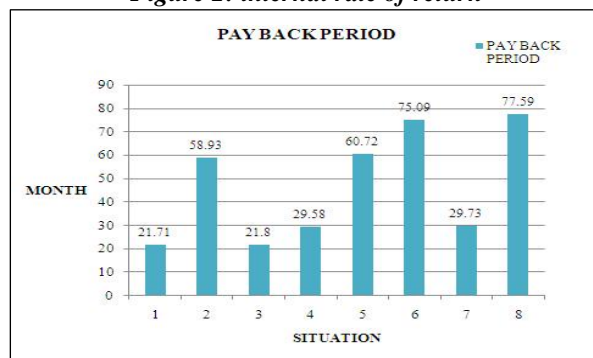


Figure 3: Pay back period

**V. CONCLUSION**

- ♣ Study of Residential project suggest that, it is not that much easy to predict the feasibility of project. To check the feasibility of such project, there is need to list out those factors which cannot be control by project promoters, but such factors greatly affect on the project cash flows. And after determining those factors, we would able to perform sensitivity analysis of such project.
  - ♣ In every project investment proposal, there should be at least 10% profit over the total expenditure in worst possible case also. 'Situation 8' is the worst possible case among all, as in this case there is change in all critical factors. Still, 'Situation 8' has positive NPV with minimum IRR as compared to other 'Situation'.
  - ♣ After performing sensitivity analysis of project, there is positive NPV for all eight 'Situation' which indicate, this Residential project is feasible in every 'Situation', and IRR is more than Cost of capital of company i.e. 10.25%
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