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ECONOMIC SENSITIVITY ANALYSIS OF 'WALAYAR - VADAKKANCHERRY' B.O.T. CONTRACT ROAD PROJECT A CASE STUDY

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ABSTRACT

The Build Operate Transfer (B.O.T.) scheme is being used by government of India for implementing transport infrastructure projects, such as construction of road. It is essential to perform feasibility study of any road project before commencement of it. Various critical factors such as traffic growth rate, loan period and delay in construction affects on cash flows of a B.O.T. contract road project greatly. Financial sensitivity analysis of a B.O.T. road project reveals that, considering all eight combinations of critical factor, not a single situation gives positive net present value. Hence, after performing sensitivity analysis, it is essential to grant 39% subsidy from government to this B.O.T. road project.

Keywords: B.O.T., Economic Sensitivity analysis

I. INTRODUCTION

Government is interested in B.O.T. contract project, they always wants to involve private sector in such type of B.O.T. contract. In such B.O.T. contract government doesn't have to invest finance to a private sector. Private sectors have to undertake such project, invest finance for construction, operate and hand over this project to the government after concession period is over. This contractual arrangements provides a mechanism for using private finance, thus it allows governments to construct more infrastructure facilities without the use of additional public finance. Typical infrastructure projects using B.O.T. contract includes highways, power plants, railways, tunnels, ports, bridges, hydraulic structure and reservoirs. For the successful implementation of B.O.T. project, it is necessary to study the financial feasibility of the project. Considering change in variables and combination of that variable will do such feasibility study; those variables are construction period, traffic density and loan period. The aim of this project is to perform the financial sensitivity analysis of a B.O.T. road project to predict the feasibility and viability of the project

A. B.O.T. Scheme

In the B.O.T. scheme, the government allows private entrepreneurs (project promoters) to design, finance and build an infrastructure. In return, project promoter is permitted to collect tolls and operate the facility throughout

a concession period, during which it is expected to recover all of his project cost and earn a maximum profit. At the end of the concession period, the ownership of the facility is transferred to the government. This facilitates the implementation of capital-intensive infrastructure project by government with funds from outside the budget allocation, while transferring the risks involved to the private sector. For successful implementation, it is necessary for both the government and the private project promoters to be fully aware of the prospects and pitfalls of these projects. The conventional financial analysis with deterministic or 'point' estimates of the important parameters is unrealistic, as it involves the implicit assumption of certainty. In reality, many critical variables of a transport infrastructure project such as the construction, operation and maintenance costs, the traffic volume and the toll revenue are not amenable to precise prediction and financial performance cannot be assessed accurately. For a realistic and meaningful analysis of the financial viability of B.O.T. projects, the consideration of risk and uncertainty should be explicitly incorporated. **[7]**

B. Acceptance Criteria for BOT projects

A B.O.T. contract 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. **[7]**

II. STUDY AREA

A construction company in Karnataka (K.N.R. construction) got the tender of following project. This project is also studied by Ashoka Buildcon Ltd, Nashik; and has provided me following data to perform the financial sensitivity of B.O.T. contract road project:

• Name of work: Four laning of 'WALAYAR – VADAKKANCHERY' from Km 182.250 to Km 240.00 on section of NH - 47 in State of Kerala (total length is 57.750 Km). Including construction of medium bridge, culverts junctions and rotaries, projection works, toll tax barriers and booth, truck parking, plantation, lay-bye and longitudinal drains.

• Estimated cost of project: Rs.682 Cr

• Earnest money deposit: Rs.6.82Cr

• Construction period: From 12th March 2010 to 30th August 2012 (30 months)

• Concession period: 20 years

• Debt-Equity ratio: 70:30

• Maintenance cost: Rs.2 Cr per year for concession period

• Loan period: 15 years

• Cost of debt: 12.5%

• Cost of Equity: 12%

• Corporate tax rate: 12.5%

• NPV rate: 10%

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Total cost of project is Rs.689 Cr

The formulae for the calculation of WACC are given below:

WACC = (E/V)*Re + (D/V)*Rd*(1-Tc) **[4]**

Where,

Re = cost of equity (12%)

Rd = cost of debt (12.5%)

E/V = % of financing i.e. equity (30%)

D/V = % of financing i.e. debt (70%)

Tc = corporate tax rate (12.5%)

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

Thus, WACC = (E/V)*Re + (D/V)*Rd*(1-Tc)

WACC = (0.30)*(0.12) + (0.70)*(0.125)*(1 - 0.125)

= 0.1125625

= 11.25625% ≈ 12%

Thus, WACC for the project is 12%

Also for the cash flow analysis we required the maintenance expenses, which are considered as Rs.2 Cr per year and operating maintenance expenses are considered as Rs.1.5 Cr per year and increases by 5% per year.

TABLE I: Estimation of traffic volume and proposed toll rates

Type of vehicle	**Traffic density (Nos./Day)**	**Toll rate (Rs.)**
LMV	5100	40
LCV	1110	60
Buses	818	130
Trucks	1350	130
Multi axel	1750	200

TABLE II: Estimation of proposed normal traffic growth rate per year in %

Period	**LMV**	**LCV**	**Buses**	**Trucks**	**Multi axel**
1 – 5 yr	8	7	5	5	8
6 – 10 yr	8	6	5	5	7
11 – 15 yr	7	5	5	5	5
16 – 20 yr	7	5	5	5	5

A. Estimation of cash flows

The cash inflows for the project are collected from the toll revenue and it is calculated based on the values of the toll rates and the number of vehicles in each mode for every operating year. Typically, cash outflows are in the form of construction cost and operation and maintenance expenses during the years of operation of the facility. 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 for entire concession period.

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B. Sensitivity Analysis

In B.O.T. road 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 earth 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. **[1]**

III. METHODOLOGY

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

1. Traffic growth rate
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.

A. Different situations for the cash flow and Sensitivity analysis

1. Normal Situation (No change in any critical factor)
2. Considering delay (Generally, project cost increases by 13% in 1 year delay)
3. Only change in loan period (Loan period increases by 2 years)
4. Only change in traffic growth rate per year (Reduced by 0.5%)
5. Considering both, change in loan period and delay
6. Considering both, change in traffic growth rate per year and delay
7. Considering both, change in traffic growth rate per year and loan period
8. Change in all variables

IV. RESULT & DISCUSSIONS

Results are obtained after analyzing and preparing cash flow statement for each situation. Rate of interest=12.5%, Loan amount=Rs.482,30,00,000 and concession period=20 years.

1. Normal situation:
   - Construction period: 30 months
   - Loan period: 15 years
   - Traffic growth rate: Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

2. Considering delay (Generally, project cost increases by 13% in 1 year delay)

- Construction period: 42 months
- Loan period: 15 years

• Traffic growth rate: Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

3. Only change in loan period (Loan period increases by 2 years)

• Construction period: 30 months

• Loan period: 17 years

•Traffic growth rate: Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

4. Only change in traffic growth rate per year (Reduced by 0.5%)

• Construction period: 30 months

• Loan period: 15 years

• Traffic growth rate: Reduced by 0.5% as compare to Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

5. Considering both, change in loan period and delay

• Construction period: 42 months

• Loan period: 17 years

•Traffic growth rate: Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

6. Considering both, change in traffic growth rate per year and delay

• Construction period: 42 months

• Loan period: 15 years

• Traffic growth rate: Reduced by 0.5% as compare to Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

7. Considering both, change in traffic growth rate per year and loan period

• Construction period: 30 months

• Loan period: 17 years

•Traffic growth rate: Reduced by 0.5% as compare to Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

8. Change in all variables

• Construction period: 42 months

• Loan period: 17 years

• Traffic growth rate: Reduced by 0.5% as compare to Normal

At the end of concession period, Net present value is negative; hence IRR is less than cost of capital of company i.e. 12%

From the obtained result, no one situation has positive Net present value and hence, IRR is less than cost of capital of company; therefore, this project is not acceptable. If government grant subsidy on this project, then this project will be acceptable.

A. Subsidy calculation

In situation no.8, NPV is (Rs. -214,73,97,590) which is the worst possible case. But, project must be feasible in worst case also with at least 8% profit over the total expenditure.

- Total Project Cost = Rs.689,00,00,000
- Minimum 8% Profit = Rs.55,12,00.000
- Expected Additional NPV = Rs.269,85,97,590
- 39% Subsidy Amount = Rs.268,71,00,000

Therefore, 39% subsidy should be provided to make this project feasible.

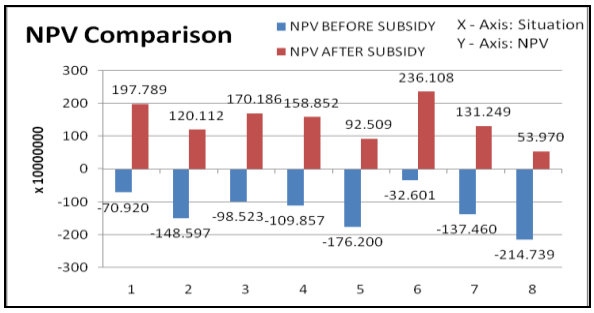

Fig. I. NPV comparison in with-subsidy and without-subsidy

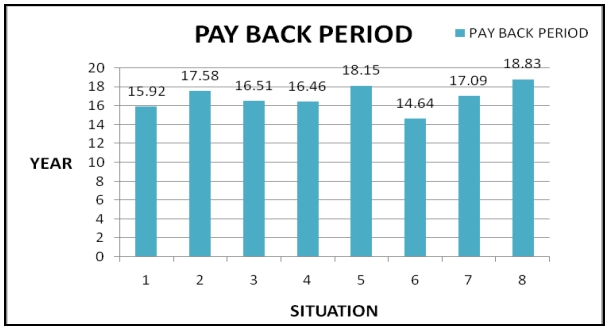

Fig. II. PBP for each situation after subsidy provision

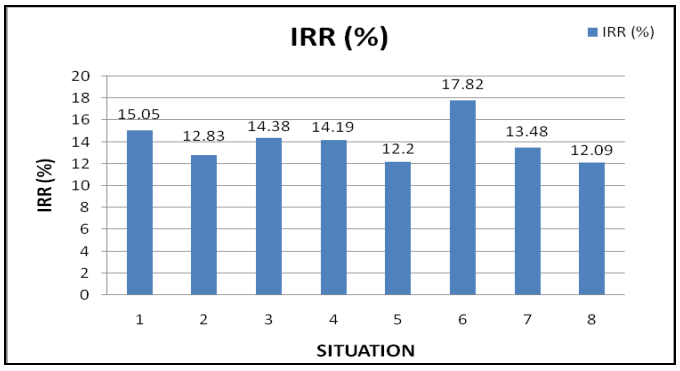

Fig. III. IRR for each situation after subsidy provision

V. CONCLUSION

- Study of BOT contract road project suggest that, it is not that much easy to predict the feasibility of BOT contract road 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.
- After performing sensitivity analysis of project, initially there is negative NPV for all eight 'Situation' which indicate, this BOT contract project is not feasible in any 'Situation', and IRR is less than Cost of capital of company i.e. 12%

- In every project investment proposal, there should be at least 8% 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.

If, Government provide 39% subsidy to this BOT project then it will be a feasible BOT project investment proposal, and results will be as follows:

1) Situation 1: NPV is Rs. 197,78,92,125; IRR is 15.05%
2) Situation 2: NPV is Rs. 120,11,20,225; IRR is 12.83%
3) Situation 3: NPV is Rs. 170,18,62,331; IRR is 14.38%
4) Situation 4: NPV is Rs. 158,85,23,189; IRR is 14.19%
5) Situation 5: NPV is Rs. 92,50,90,431; IRR is 12.20%
6) Situation 6: NPV is Rs. 236,10,89,865; IRR is 17.82%
7) Situation 7: NPV is Rs. 131,24,93,395; IRR is 13.48%
8) Situation 8: NPV is Rs. 53,97,02,410; IRR is 12.09%

VI. ACKNOWLEDGMENT

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