

Comparative Analysis of Concessionaire Models in Indian Highway Sector

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ABSTRACT: Investment in government infrastructure projects plays a significant role in progressive advancement and development of the country. However highway project puts a lot of financial constraints on the government. As a consequence Public private Partnership (PPP) was implemented which gives private entity an opportunity to make an investment in government infrastructure projects. Private entity willing to participate in investment schemes of infrastructure projects depends upon economic and financial viability of that project. This study focuses on various parameters such as Internal Rate of Return (IRR), Net present value (NPV), VGF (Viability Gap Funding) and Payback Period, which are required to perform financial analysis & feasibility analysis of the project. Observing these four parameters BOT annuity + VGF showed highest internal rate of return 14.89% for period of 30 years.

KEYWORDS: Public Private Partnership (PPP), Internal Rate of Return (IRR), Net Present Value (NPV).

I. INTRODUCTION:

Investment in highway sector, in India, has increased tremendously in last 5 years. The total investment in year 2014-15 was Rs. 51,914 Cr and now it has increased 3 times i.e. Rs. 1,58,839 Cr in year 2018-19. The rate of road construction has also increased from 12 km/day in year 2014-15 to 30 km/day in year 2018-19. A requirement of 50 trillion is needed for various infrastructure projects and role of private entity has gained a lot of importance. There is a tremendous interest on public infrastructure and administrations worldwide while the administration spending plan of any nation is constantly restricted[1].

In India, the road projects are awarded by suitable selection of concessionaire models viz. BOT (Built Operate & Transfer) Toll Model, BOT Annuity Model and EPC (Engineering, procurement & construction) Model. Also the new advanced rendition of model concession understanding is introduced which is HAM (Hybrid Annuity Model). Previously, the budgetary and organizational assets of public authorities assumed a crucial job in financing expressway framework ventures [2]. In this research, study of these concessionaire models that are present in India is done. The appropriate selection of concessionaire model is very important for completion of the project successfully. Concessionaire modeling plays a significant role in assessment of

projects for making project financing decisions by both the lenders and equity investors. In project finance, the funding agencies look into the assumed future returns in relation to the amount of the initial investment while making the investment decision. Equity investors used financial model to evaluate the returns from the project in order to ascertain their adequacy. On the other hand, financial model is used by lenders to know the level of cover for their loans and the timeliness of project debt service payments.

The Net Present Value (NPV) method of investment analysis is utilized for selection of concessionaire model. NPV method uses the concept of discounted cash flow analysis for the evaluation. The NPV strategy as a speculation evaluation or capital planning system demonstrates how a project undertaking influences organization investor's wealth in present value terms [3].

The typical steps in discounted cash flow analysis involve:

- (1) Computing future cash flows based on toll revenue.
- (2) Determining the IRR for discounting the cash flows.
- (3) Computing the present value of the expected future returns.
- (4) Compare whether the project is worth more than its cost.

The numerous parameter required in NPV method were identified, which are required for decision making of concessionaire. The comparative analysis for different concessionaire model was performed based on results obtained with NPV model. The simulation of parameters was developed over the concession period. The model was selected with maximum returns on investment over concession period. The model selected based on its feasibility analysis for a new highway project that will be undertaken.

II. ROAD INVESTMENT DECISION MAKING PARAMETER:

Types of decision making parameters:

- A. Net Present Value (NPV)
- B. Internal Rate of Return (IRR)
- C. Viability Gap Funding (VGF)
- D. Payback Period

A. Net Present Value (NPV):

NPV is used for capital financing and planning for the investment to evaluate the efficiency of the project. NPV of a task is the aggregate of the present estimations of all money streams positive as well as negative that is required to happen over the time of the undertaking.

$$NPV = \left[\sum_{t=1}^n \frac{C_t}{(1+r)^t} - \text{Initial Investment} \right]$$

Where

' C_t ' is the cash flow at the end of year 't',

'n' is the life of the project and

'r' is the discount rate.

The NPV speaks to the advantage above and over the remuneration for time and risk. Henceforth choice guideline related with the NPV foundation is acknowledge the project which is having positive NPV and reject the undertaking which is having negative NPV.

B. Internal Rate of Return (IRR):

IRR of an undertaking is the discount rate which makes its NPV equivalent to zero. Put in an unexpected way, it is the markdown rate which compares the present estimation of future money streams with the underlying project. It is the estimation of 'r' in the accompanying condition.

$$\text{Investment} = \left[\sum_{t=1}^n \frac{C_t}{(1+r)^t} \right]$$

Where

' C_t ' is the cash flow at the end of the year 't',

'r' is the internal rate of return (IRR) and

'n' is the life of the project.

In the NPV calculation we assume that the discount rate (cost of capital) is known to determine the NPV. In the IRR calculation we set the NPV equal to zero and determine the discount rate that satisfies this condition.

As a rule, the higher a project IRR, the more attractive is to attempt the undertaking. IRR speaks to the time balanced income over task life. It is that rate that likens the present estimation of money inflows to the present estimation of money outpourings of the project. Or on the other hand at the end of the day, the discount rate that sets NPV of money streams to zero. Direct expense of undertaking and advantages are determined by financial specialist's perspective in IRR.

C. Viability Gap Funding (VGF):

Viability gap funding implies one time award or grant, gave to help infrastructure projects which are economically suitable but yet miss the mark of financial viability. The lack of financial viability for most part emerges on account of long construction periods and the inability to increase user charges into commercial levels. Infrastructure project likewise include different externalities which are not sufficiently shrouded in direct financial returns to the project sponsor.

Legislature of India has informed a plan for suitability whole subsidizing to infrastructure extends that are to be attempted through open private organization. The quantum of VGF gave under this plan is as capital award at the phase of undertaking development.

Designation of Cess Revenues for Viability Gap Funding (VGF):

The normal VGF has been accepted as 30% of the project cost. The most extreme in chose cases can go up to 40% of the project cost.

Portion of cess incomes by the Government for subsidizing the yearly arrangement expenses of NHAI might be part into two sections viz. (a) PPP segment, and (b) EPC, O&M and Misc. part.

D. Payback period:

The payback period is the period of time required to recoup the underlying money cost on the project. If the annual cash inflow is a constant sum, the payback period is simply the initial outlay divided by annual cash inflow. As per compensation paradigm, the shorter the payback time frame, the more attractive is the undertaking. Firms utilizing this standard for the most part indicate the greatest worthy acceptable time frame. On the off chance that this is n of years, projects with payback period n or less are regarded advantageous and projects with compensation period surpassing n years are viewed as unworthy.

III. FINANCIAL PLAN FOR NATIONAL HIGHWAY PROJECT – A CASE STUDY:

Modes of delivery for highway projects:

In this research, following modes of delivery of project are identified in order of priority:

- A. BOT (Toll) without VGF
- B. BOT (Toll) With VGF
- C. BOT (Annuity)
- D. Hybrid annuity model (BOT Annuity plus VGF)
- E. EPC

All highways which are to be tolled ought to stick to the BOT (Toll) mode as per the surviving structure affirmed by CoI/Cabinet, particularly a top of 40% on the grant component.

Data and Assumptions:

The case study of national highway of project was considered for financial analysis of project. The construction of highway takes number of years and similarly maintenance and operation is carried out over period of time. Phase cost of project is calculated to be Rs.330 Cr. Construction cost in first year is 40% of phase cost and 60% of phase cost in second years. It is assumed that annual maintenance is 1% of phase cost of project and periodic maintenance is assumed to 6 % of phase cost of project. The routine operation and maintenance cost is Rs.3.40 Cr and periodic maintenance is Rs.19.80 Cr, which is calculated over period of 5 years.

The costs of construction, annual maintenance and periodic maintenance are added with inflation of 5% over the concession period for each year. It is also assumed that 5% of yearly toll revenue will be spent on operations of toll plaza. In regard of annuity projects, IRR has been considered at 15% per annum with the end goal of computation of annuity installments according to rules given "Money related arrangement for national expressway improvement program".

Net cash flow is calculated with difference of outflow minus inflow. Then Internal rate of return was calculated which was tabulated below.

TABLE I
IRR FOR DIFFERENT MODES OF DELIVERY

	MODES OF DELIVERY			
	A. BOT (Toll) without VGF	B. BOT (Toll) With VGF	C. BOT (Annuity)	D. Hybrid annuity model (BOT Annuity plus VGF)
IRR (%)	3.75	5.80	13.70	14.89

IV. RESULTS:

The results of four models are summarized as below:

TABLE II
SUMMARY SHEET OF IRR AND NPV FOR DIFFERENT CASES OF FINANCIAL MODEL

S.N.	Option	Project cost (Cr)	Grant 40% (Cr)	Annuity in Cr for period of 5 years	IRR	NPV	Concession period
1	BOT-Toll(without VGF)						
		Rs. 330 Cr			3.75	-0.19	30 years
2	BOT-Toll(With VGF)						
		Rs. 330 Cr	Rs. 132 Cr		5.80	-0.22	30 years
3	BOT-(Annuity)						
		Rs. 330 Cr		Rs. 98.10 Cr	13.70	-0.07	30 years
4	BOT-(Annuity + VGF)						
		Rs. 330 Cr	Rs. 132 Cr	Rs. 58.90 Cr	14.89	0.01	30 years

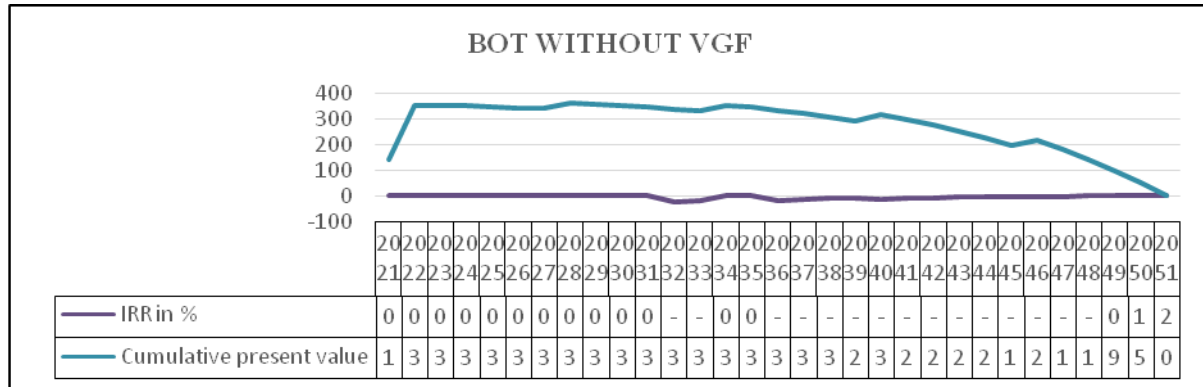


FIG. 1 GRAPH - BOT WITHOUT VGF

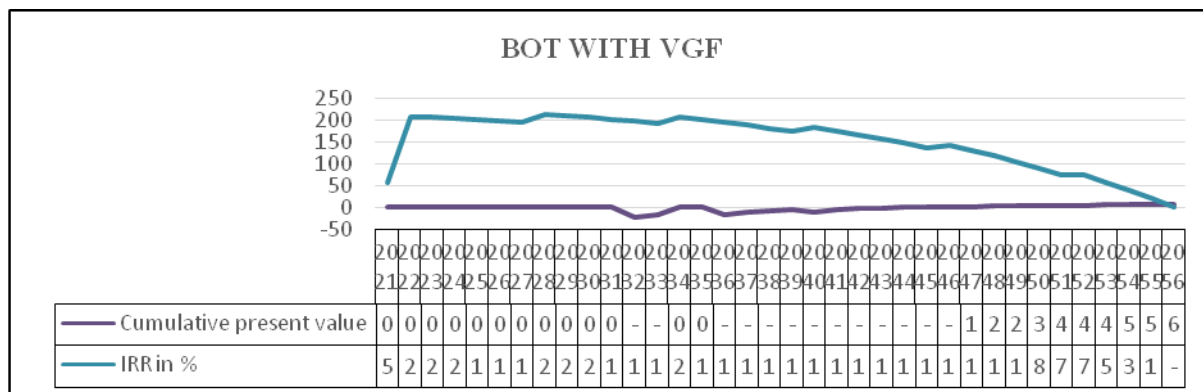


FIG. 2 GRAPH - BOT WITH VGF

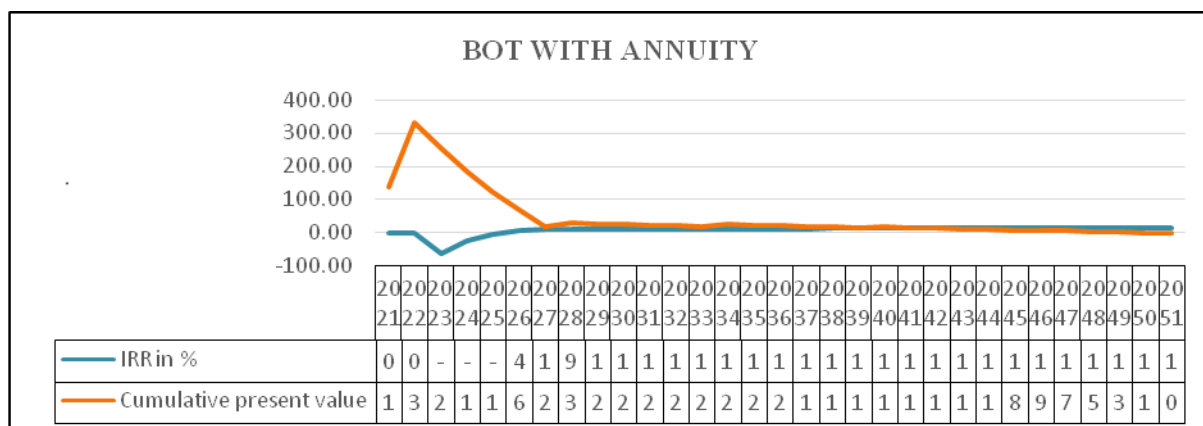


FIG. 3 GRAPH - BOT WITH ANNUITY

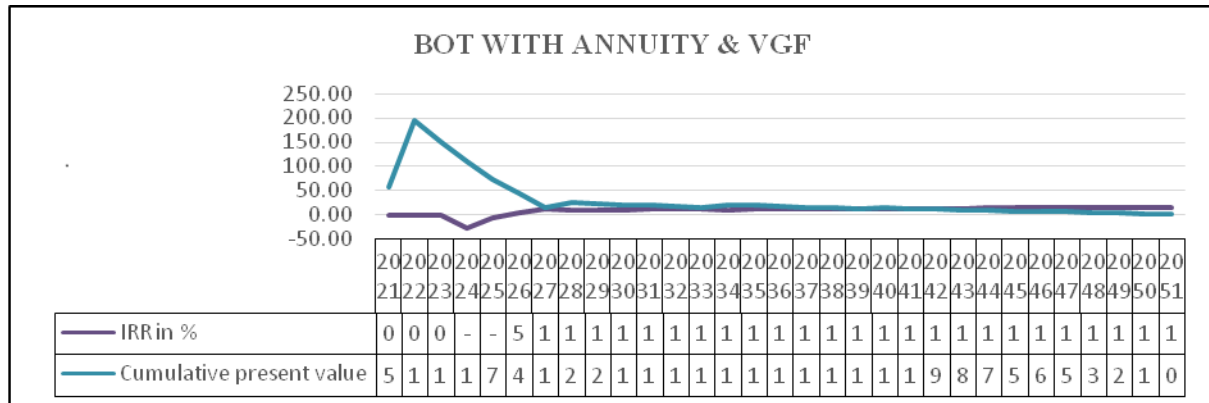


FIG. 4 GRAPH - BOT WITH ANNUITY & VGF

V. CONCLUSION:

The contribution of paper is a graph that is proposed for selection of concessionaire model for financing highway project. The graph is plotted for IRR, NPV and concession period of project. The graph clearly depicts the payback period and corresponding IRR. The graph can also be used to identify most feasible option in case if multiple projects are found feasible within the concession period.

VII. REFERENCES:

- [1] Xueqing Zhang, Shu Chen, A systematic framework for infrastructure development through public private partnerships, *IATSSR 00046*.
- [2] Tanaphat Jeerangsuwan, Hisham Said, Amr Kandil, SatishUkkusuri, Financial Evaluation for Toll Road Projects Considering Traffic Volume and Serviceability Interactions, *ASCE, Vol. 20*.
- [3] Surendranath Rakesh Jory, Abdelhafid Benamraoui, Dev kumar Roshan Boojihawon, Nnamdi O. Madichie, Net Present Value Analysis and the Wealth Creation Process: A Case Illustration, *The Accounting Educators' Journal, Volume XXVI*.