Support Loan Concept for the Viability of a BOT Road Project

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ABSTRACT

This paper presents the viability of a Build Operate Transfer (BOT) road project based on support loan concept. Interest of debt is one of the most important parameters for the viability of a project. In India, interest rate is in the range of 13 -18 % annually for infrastructure project. The road project with low traffic and high project cost may be infeasible. In order to make the project viable, support loan concept has been proposed in this paper. This paper presents the changes in values of various financial viable parameters with the use of support loan with a real case study. This paper presents the results of normal debt and support loan with different interest rates and different payback periods and develops a methodology for support loan for the viability of a project. It has been found that longer payback period is also more beneficial. Financial return is more with low rate of interest of debt. The real case study has been compared with support loan and subsidy provision and found out the best option after projecting both values at the end of payback period. It has been found that support loan provision is more beneficial for the government instead of subsidy option for the viability of a project. Support loan concept is recommended for the viability of the project.

KEYWORDS: Support loan concept, Viability, Road projects, BOT.

INTRODUCTION

Inadequate transport infrastructure has been recognized as an impediment to the industrial and economic progress of any country. Governments worldwide must invariably cope with the widening gap between needed investments and available budgetary resources. They increasingly attempt to involve the private sector in the financing, design, construction and operation of major infrastructure projects with a view to exploit the private initiatives to implement public projects. In this context, BOT concept is becoming a popular mode of privatization of transport infrastructure development (Tiong, 1995).

In recent years, governments in many countries have begun privatizing transportation infrastructure sectors. Some of the forces driving this movement include a scarcity of public resources, an increase in the demand for better service and a political trend toward the deregulation of infrastructures from public monopoly.

The BOT project is essentially a form of leasing, where the government (project sponsor) allows a private entrepreneur (project promoter) to design, finance and build an infrastructure facility. In return, the project promoter is permitted to collect tolls (user fee) and operate the facility for a specified period (called the concession period), during which he is expected to recover all of his costs and earn a reasonable profit. At the end of the concession period, the ownership of the facility is transferred to the

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government. This arrangement facilitates the implementation of capital intensive infrastructure projects by the government with funds from outside the budget allocation, while transferring the risks involved to the private sector.

Prior experience in BOT projects is limited in India, though varied levels of success with such projects have been reported in other countries such as Malaysia, Thailand, Mexico and China. However, for successful implementation, it is essential 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 as variables of a transport infrastructure project such as construction, operation and maintenance costs, traffic volume and the toll revenue are not amenable to precise prediction, and the financial performance can not be accurately assessed. For a realistic and meaningful analysis of the financial viability of BOT projects, the consideration of risk and uncertainty should be explicitly incorporated.

Quite often, private investment in public infrastructure occurs within BOT model where a public entity, the Government, and a private entity, the Sponsor, enter into an agreement, where the Sponsor is bound to design, build, finance and operate an infrastructure project on behalf of the Government for a predetermined period of time, the concession period. At the end of the concession period, the Sponsor transfers its ownership rights back to the Government. Typically, the Sponsor finances the BOT investment through project finance rather than corporate loans .This introduces another active party, the Lender. Thus, the BOT model becomes a trilateral negotiation game with complex interrelationships. The critical success factor for a BOT project is the profit margin of the Concessionaire.

Financing is one of the most significant issues in the BOT project. Only with sufficient capital can a BOT project be successfully carried out (Tiong, 1995). However, in the process of financial planning, there are so many details included that appropriate financial planning procedures and financial assessment methods should be developed in order to evaluate the viability of a project and come up with the best scenario.

Four financial assessment methods are generally available for the viability of a BOT project; namely, Net Present Value (NPV), Financial Internal Rate of Return (FIRR), the payback period method and the discount payback period method. These can be defined as follows (Brigham et al., 1997):

- NPV method: This method is to discount all the cash flows back to the present year (or a specific year). A zero value of NPV represents the breakeven point of a project. If the value of NPV is zero or positive, the project is worth investing. Conversely, if the value of NPV is negative, it is better to decline the project.
- FIRR method: FIRR uses the rate of return that assumes the NPV value of a project to be zero. To evaluate a project with IRR, just compare it to the estimated cost of capital. If the IRR is positive, the project is acceptable, depending on need/ importance of the project.
- Payback period method: This method involves adding the discounting. When the sum of zero is reached, the payback period is found. Payback period should be less than concession period.
- Discount payback period method: This is almost the same as the payback period method, but discounting all cash flows back to a specified year.

A BOT transport infrastructure project may be considered as financially viable, when the following conditions are simultaneously satisfied (Malini, 1998):

The NPV for the project should be positive. The discount rate for financial analysis may include a risk premium over the current commercial lending rate.

The financial IRR should have a value greater than the discount rate.

The cash flow (liquidity) 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.

Payback period/Breakdown year should be less than the concession period.

The four conditions mentioned above may not be satisfied in real project case study and the project may not be financially viable. To make it viable, some modifications may be required.

To make the project viable, the following modifications can be considered:

- Increasing the payback period;
- Recommending for subsidy ;
- Modification of the percentage of equity;
- Provision of rigid pavement option with:
- 0% Fly ash
- 20% Fly ash
- 30% Fly ash
- 40% Fly ash
- 50% Fly ash
- 60% Fly ash.

It has been found from the case study that these parameters improve the NPV/FIRR. Variation of interest rate of debt is the only single parameter that may improve financial parameters.

From past studies, it is found that research work on support loan carried out by previous researchers is very limited. So, support loan concept may be introduced in road BOT projects and detailed financial analysis with a real case study should be carried out.

Objective and Scope

Based on previous work, it is felt that support loan concept can be introduced for the viability of a project. Present research work is planed to carry out a real case study which was originally infeasible for the base case. After modifying the interest rate, the same project is found financially viable. Based on present needs, the following scope is identified:

1. Analyzing financial parameters varying equity from 10% to 90%.
2. Analyzing the base case assuming interest rate of debt and return on equity to be 15% and 20%.
3. Carrying out financial analysis, varying the interest rate from 0% to 15%.
4. Comparing subsidy *vs.* support loan to find out the best option for the Government.

CASE STUSY

A case study has been considered for the selected sections of National Highway (NH) No. 4.The project road has been divided into three homogeneous sections based on traffic homogenity. The homogeneous sections are presented in Table 1.

Table 1. Identification of Homogeneous Sections

Section	Length(km)
HS-01	23
HS-02	67
HS-03	33

Seven day traffic count data has been captured from field traffic data. The Annual Average Daily Traffic (AADT) values are used for future projection of traffic for a 30 year analysis period. Growth rate factors are taken as 5% as recommended by Model Concession Agreement, NHAI, 2000. Tollable traffic at base year (2000) is shown in Table 2.

Toll Rate

Toll rate is selected using guidelines prepared by the Government of India. Inflation rate has been determined based on: Reserve Bank of India Bulletin, 2000.Whole price index for all commodities is found out to be 8.3%.

Using this value, future toll rate has been projected for future year, and toll rate for the opening year, 2004 is mentioned in Table 3.Toll rate increasing factor for the year 2004 is 1.083^7=1.74.Toll rate for the opening year is reported in Table 3.

Project Cost

Project cost is worked out for flexible pavement option. This cost includes the cost of clearing and grubbing, earth work ,subgrade construction, sub base, base course, binder and surface courses including cost of antiglare screen barrier. The average project cost per kilometer is found to be Rs 42.2 million (USD 1 million).

Table 2. Annual Average Daily Tollable Traffic

Vehicle Type	HS 1	HS 2	HS 3
Car/Van/Jeep	2736	3675	4741
Mini Bus	74	111	194
Bus	1076	864	1205
Light Goods Vehicles (LGV)	443	983	1335
2 Axle	2180	2179	3298
3 Axle	855	1168	1367
Multi-Axle Vehicle	108	179	315

Table 3. Toll Rate per km Vehicle-Wise

Year	Car	Full Bus	Multi-Axle	LGV	2A,3A Truck
Toll Rate Rs (1997)	0.40	1.40	3.00	0.70	1.40
Toll Rate Rs (2004)	0.69	2.40	5.20	1.20	240
Toll Rate Rs (2008)	0.96	3.36	7.2	1.68	3.36

USD1=Rs 42.2

Financial Analysis

Financial analysis for base case has been carried out taking the following major maintenance and operation costs into account:

Annual Routine Maintenance (repair of pot hole, clearing cross drainage structure… etc) Cost (Rs 0.2 million per km) (USD 0.00474 per km).

Periodic Maintenance (overlay every 5th year) Cost (Rs 2.8 million per km) (USD 0.0664 per km).

Toll Operation (toll administrative cost) Cost (Rs 6 million for toll plaza per year) (USD 0.1422 per km).

Financial analysis is carried out varying equity from 10% to 90 %. Concession period is taken 20 years and payback period is taken 10 years for normal debt and 10 years for support loan for link 1. Interest on normal debt and return on equity are assumed 15% and 20%.Interest rate of support loan is varied. Project road is divided into three contract packages.

FORMULATION OF FINANCIAL MODEL

A financial model is developed using Excel sheet. It is used to support decision making in project evaluation. The project viability is analyzed from the equity holders' perspective in the project. The first step in any investment evaluation is to gather the appropriate information on the project costs and calculate the cash.

Assumptions and Theoretical Framework

The following are the assumptions for the model:

1. Financing of a project is raised by a combination of equity and debt. The net cash flow during the construction period is negative, while it is positive during the operation period.
2. A loan is available from one source or from multiple sources with the same term of annual equal installments.
3. Land acquisition cost is borne by the Government of India.
4. The cash flows during construction are predestinated.
5. The toll rate vehicle mode wise shall be the rate fixed by the Government of India
6. Complete depreciation of the Total Project Cost (TPC) is allowed during the operation period.

Theoretical Framework

Ranasinghe (1996) has developed a simplified model to calculate TPC for infrastructure projects in developing countries, which is the starting point of the financial analysis as defined below:

$$TPC=BC+EDC+IDC \quad (1)$$

where:

BC= base cost or constant value cost of the project estimated at market prices of a predetermined year;

EDC = the cost escalation during construction; and

IDC = the interest during construction.

After the completion of construction, revenue is generated from toll from vehicles during the operation period, which is fixed based on technical viability of the project. The net annual cash available in current value is given by :

$$NCAi = PBITi - TAXi + DEPi - Di \text{ for } I = 1,2,\ldots,m \quad (2)$$

where:

PBITi = profit before interest and tax;

TAXi = tax;

DEPi = depreciation;

Di = annual debt installment for ith year.

Corporate tax @ 35 % to be paid as decided by the Government of India.

$$TAXi = (PBITi\text{-}INTi) \text{ for } I = 1,2,\ldots,\ m \quad (3)$$

where:

INTi = interest to be paid in the ith year.

Depreciation

Depreciation is a non-cash expense. It only reduces taxable income and provides an annual tax advantage equal to the product of depreciation and the (marginal) tax rate, but it does not lead to a cash outflow from the company. The most common method for depreciation is straight-line depreciation. Under this method, annual depreciation equals a constant proportion of the initial investment. In this model, it is assumed that TPC can be depreciable in its entirety. Thus,

$$DEPi = \frac{TPC}{m} \qquad \text{for i =1, 2, 3 …} \quad (4)$$

Operation and Maintenance (O M) cost includes O M of road cost, personnel salaries, indirect costs and insurance cost. These costs are separately calculated and used in the financial model.

Results of Financial Analysis

Financial analysis has been carried out and test results are reported herein.

The viewpoint of equity holders is focused on the main project metrics, NPV, FIRR and these are the most common and fundamental economic decision criteria employed in practice (Lohmann, 1988). Results of financial analysis for base case with 30 % equity are shown in Table 4.

From Table 4, it is found that the entire project is not financially viable.

In order to make the project viable, support loan concept has been introduced with the following variables:

- Base case; i.e., debt interest is 15%;

- Debt interest of 7.5% to be availed by the Government;
- Debt interest of 5% to be availed by the Government;
- 100% debt with interest of 0% to be availed by the Government;
- 75% debt with interest of 0% to be availed by the Government;
- 50% debt with interest of 0% to be availed by the Government;
- 25% debt with interest of 0% to be availed by the Government.
- Varying payback periods of 10 and 15 years.

Table 4. Financial Results for Base Case

FIRR(%)	NPV(Rs million)
6.79	-455

Results are shown in Tables 5 and 6 for 10 and 15 year payback periods.

Changing payback period from 10 years to 15 years, NPV and FIRR values are shown in Tables 5 and 6. From these tables, it is found that NPV and FIRR are more for a payback period of 15 years than for a 10 year payback period. Therefore, longer payback period is more beneficial for a BOT project.

Average Debt Coverage Ratio (ADCR), Time Interest Earned (TIE) and Ź for risk analysis are shown in Table 7 for various support loans for a payback period of 10 years. Average debt coverage ratio increases with increasing value of equity and the same applies for interest coverage ratio, TIE. Ź also has normal tendency to be of the same value with irregularity of some values. Brigham et al. (1997) reported that debt coverage ratio shows the Concessionaire's ability to pay debt. The higher the debt coverage ratio, the better the Concessionaire's debt paying ability. The debt coverage ratio influences the willingness of banks to loan money to the Concessionaire. Generally speaking, a debt coverage ratio at least equal to or larger than 1.0 is acceptable. Considering this aspect and looking at Table 8, support loan with 5% and 0% interest rate of debt is the only viable option for the project.

Table 5. FIRR and NPV for Various Debt Interest Rates for a Payback Period of 10 Years

Equity(%)	Base Case @ 15 % Interest		Base Case @ 7.5 % Interest		Base Case @ 5 % Interest		Base Case @ 0 % Interest	
	NPV(Rs million)	FIRR(%)	NPV(Rs million)	FIRR(%)	NPV(Rs million)	FIRR(%)	NPV(Rs million)	FIRR(%)
10	-267.2	8.57	323.3	14.14	701.6	16.26	2064.5	20.88
20	-364.2	7.56	122.7	11.95	402	13.5	1317.1	16.7
30	-455	6.79	-52.44	10.43	156.4	11.67	776.9	14.14
40	-539.8	6.17	-205.3	9.27	-48.4	10.31	377	12.33
50	-618.7	5.68	-340.2	8.35	-221.6	9.23	73.4	10.92
60	-692	5.27	-406.3	7.59	-370.2	8.34	-163.4	9.78
70	-759.3	4.92	-568	6.94	-499.5	7.99	-353.1	8.81
80	-821.2	4.62	-665.2	6.34	-613	6.94	-509.3	7.98
90	-877.6	4.4	-753.3	5.9	-714	6.37	-641.2	7.25

Financial analysis is also calculated for various combinations of support loan and normal debt, and results are shown in Table 5 for a payback period of 10 years.

From Tables 5 and 6, it is found that NPV and FIRR vary linearly with equity of negative slope. Both are increased with decreasing interest of loan/debt. With decreasing rate of interest, the project has been found viable with equity values between 20 % and 50%. Return is maximized for debt with 0% interest rate of debt.

Table 6. FIRR and NPV for a Payback Period of 15 Years

Equity(%)	Base Case @ 0 % Interest	
	NPV(Rs million)	FIRR(%)
10	2105.9	27.7
20	1383.9	20.31
30	924.85	17.2
40	465.8	14.12
50	196.775	12.5
60	-72.25	10.91
70	-248.125	9.8
80	-424	8.8
90	-551.35	7.9

USD 1= Rs 42.2

Financial results are reported in Tables 5 and 6 for payback periods of 10 and 15 years. Return for a payback period of 15 years is more than that for a payback period of 10 years. This is due to more positive cash flow (first 15 years) for 15 year payback period than for 10 year payback period. This is shown in Fig.1.

SUPPORT LOAN *VS.* SUBSIDY

To make the project viable at an equity proportion of 20%, support loan and subsidy options are studied. It has been found that the Government provided 41% subsidy for the viability of the project. Subsidy amount is Rs 397.8 million (USD 9.43 Million). It is assumed that this cost is to be alloted to the Concessionaire in the three years of construction periods @30%,30% and 40%; i.e., Rs 119.4,119.4 and 159.2 million. The same project has been found viable for support loan @ 41.2 % of total debt amount @ rate of interest of 0%. Support loan can be phased out @ Rs 95.97,95.97 and 127.97 million at 1st, 2nd and 3rd year, respectively. Assuming that the Government will provide support loan from any financial institue @ 15% interest, total future values for both cases are calculated at the end of the payback period as shown below.

Table 7. Values of ADCR, TIE and Ź for Various Support Loans

Equity (%)	Interest @15%			Interest @ 7.5%			Interest @ 5%			Interest @ 0%		
	ADCR	TIE	Ź	ADCR	TIE	Ź	ADCR	TIE	Ź	ADCR	TIE	Ź
10	0.59	1.42	0.20	0.91	4.45	-.64	1.05	7.5	-.7	1.49	∞	-.87
20	0.61	1.47	0.28	0.92	4.53	-.49	1.06	7.6	-.5	1.49	∞	-.81
30	0.62	1.52	0.33	0.93	4.62	-.30	1.07	7.7	-.3	1.49	∞	-.66
40	0.64	1.57	0.34	0.95	4.69	-.12	1.08	7.8	-.1	1.49	∞	-.43
50	0.65	1.63	0.35	0.96	4.77	0.03	1.09	7.9	.03	1.50	∞	-.19
60	0.67	1.85	0.36	0.97	4.86	0.13	1.10	8.0	.14	1.50	∞	-.01
70	0.69	1.91	0.36	0.99	4.95	0.02	1.11	8.1	.21	1.50	∞	0.12
80	0.71	1.98	0.35	1.00	5.04	0.25	1.13	8.2	.25	1.50	∞	0.20
90	0.73	2.06	0.35	1.02	5.13	0.26	1.14	8.3	.28	1.50	∞	0.25

Future value of subsidy = $119.4*(1.15^{13}) + 119.4*(1.15^{12}) + 159.2*(1.15^{11}) = 2114.1$.

Future value of support loan $=95.97*(1.15^{13})+ 95.97*(1.15^{12})+ 127.97*(1.15^{11}) = 1699.3$.

Total support laon at the start of construction= Rs 320 million. Assuming a construction period of 3 years, it will be repaid at the10 equal installments. Installment amounts to Rs 40 million.

Future reduction value = 32* ($1.15^1 + 1.15^2 + 1.15^3 + 1.15^4 \ldots + 1.15^{10}$) = 934.

Table 8. Financial Return and NPV for Various Proportions of Support Loan and Normal Debt for a Payback Period of 10 Years

Equity(%)	Support Loan 75%		Support Loan 50%		Support Loan 25%	
	NPV	FIRR	NPV	FIRR	NPV	FIRR
10	932	16.94	302	13.68	-57.5	10.9
20	562	14	102.3	11.6	-183.1	9.47
30	267	12.1	-70.7	10.15	-298.7	8.47
40	28.4	10.6	-222	9.05	-395	7.8
50	-168.3	9.5	-355.6	8.2	-495	7.06
60	-332.2	8.9	-474.3	7.4	-585	6.5
70	-473.9	8.57	-580.6	6.8	-668	6.0
80	-595.9	7.1	-676.4	6.3	-745	5.6
90	-703.1	6.5	-763	5.8	-816	5.23

Note: NPV in million Rs, FIRR in percentage,USD 1=Rs 42.2.

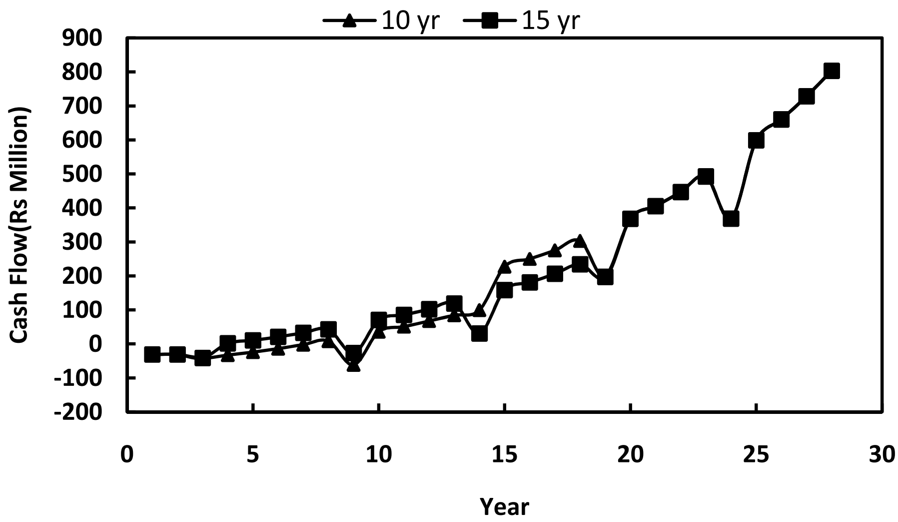

Figure 1: Cash Flow for 10 and 15 Year Payback Periods (USD1 = Rs 42.2)

Net reduction/future value = 1699.3 - 747.3 = Rs 952 million (USD 22.6 million). Hence, support loan is the best option.

Comparing the above future values of support loan and subsidy, it is clearly found that support loan is the better option for the project. Future net expense may be lower considering that loan is to be repaid in 10 equal installments.

CONCLUSIONS

Based on the present research work, the following conclusions can be drawn:

- Financial viability of a project should be checked based on support loan concept varying equity proportion (10 to 90 %), rate of interest of debt(0 to 15%) and payback period (10 and 15 years).
- If a project is not financially viable, modification should be carried out by modifying rate of interest of debt/introducing support loan concept and payback period.
- Net present value and financial internal rate of return vary with negative slope with varying equity proportion.
- Average debt coverage ratio varies with positive slope with equity.
- Net present value and financial internal rate of return vary with payback period. Higher payback period yields better return. For 10 equity funding, returns are found 27.7% and 20.88% for 10 and 15 year payback periods. This supports that support loan concept is the better option compared to subsidy for the present case study. This may vary from case to case depending on the actual case study.
- Interest coverage ratio varies with positive slope with varying equity for a given interest rate of support loan. This varies with negative slope with varying interest rate (it varies from 1.42 to infinite).
- Support loan and subsidy options are studied. It is found that support loan is the best option and should be considered for viability of a BOT project. Future value of subsidy and support loan are Rs 2114.1 and 1699.3 million (USD 50.1 and 40.3 million).

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