

ANALYSIS OF INFRASTRUCTURE PROJECT IN INDIA FOR ASSESSING FEASIBILITY –A COMPARATIVE CASE STUDY ON BUILT- OPERATE –TRANSFER PROJECT

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ABSTRACT

The construction industry is one of the largest industries in all developing nations while other industries have greatly increased their levels of quality and performance the majority of construction work is based on traditional techniques in wasted time. Therefore to be competitive in goal economy there is need to focus on research and development to promote new culture like B.O.T. Built operate transfer (BOT) is a public private partnership (PPP) project delivery system for financing, the world. Feasibility study is the base for success of project and the part of this success lies in proper technical, financial economical and financial analysis feasibility report is prepared during the initial phase or definition phase of the project updating and validation of the feasibility report is required for implementation of the project, the project can be implemented as per techno-economic stipulation made in the feasibility report. Feasibility report is prepared to present an in depth techno- economic analysis carried out on project and contain result of finical as well as economic evaluation of project so that the owner can take investment decision and project can be properly planned and implanted.

Keywords: BOT Infrastructure Projects, Profitability Statement, Cash Flow Statement, Payback Period.

I. INTRODUCTION

There has been a growing trend in recent years for government in many countries to place major public investment, particularly for infrastructure projects, in to the private sector. Many have adopted the built-operate transfer, or BOT approach, so that the private sector has to finance, construct, operate the project facility, and then transfer the ownership to the government after a specified concession period. Therefore, the BOT scheme is a limited-recourse financing technique for implementing infrastructure projects by using private funding. Examples of such projects are power station, toll road, toll bridge, tunnels, and pipeline system for oil and gas.

1.1 FEASIBILITY STUDY:

Feasibility report is prepared during the initial phase or definition phase of the project updating and validation of the feasibility report is required for implementation of the project. The project can be implemented as per techno economic stipulation made in the feasibility report. A feasibility report is prepared to present an in depth techno economic analysis carried out on the project and contain result of technical as well as economic evaluation of the project so that the owner can take investment decision and project can be properly planned and implemented.

The viability of any project mainly depends on the following analysis:

1. Technical analysis
2. Financial analysis
3. Economic analysis

Hence it can very well understood that feasibility study is the base for success of a project and major part of this success lies inproper technical economical and financial analysis. Main purpose of this research is to study and investigate the feasibility associated with B.O.T. project. The result of this analysis compares the financial results of 2 samples of BOT projects which shows the preferred solution which financially feasible and viable and economically justified.

II. METHODOLOGY

- a. Literature Review
- b. Data Collection & Analysis.
- c. Study Of Technical Analysis, Economical Analysis, Financial Analysis And Risk Analysis.
- d. Case Study Part: The details of the project shall be noted and the technical, economical, financial and risk analyze is to be carried out.
- e. Case Study Comparative Analysis & Conclusion
- f. Recommendations

III. FINANCIAL ANALYSIS

A. PROJECT COST

Srnr	Samples	Cost of Project (Cr.)
1	(Sample 1)- For NH-6 Road section.	880.00
2	(Sample 2)- For NH-8 Road Section.	1355.00

As the first annuity payment would be made 6 months after the scheduled project completion date, a provision for funding the first six months of interest cost has been made as part of the Project Cost.

B. MEANS OF FINANCE

The project will be funded through a combination of promoter contributions, government grants, and term loans. It is proposed that the project be financed using debt. The debt-to-equity ratio (DER) is 3:1. The sources of funding for The following is the list of the project's components:

Table 1.

MEANS OF FINANCE	Sample-1	Sample-2
	AMOUNT(RS.CR)	AMOUNT(RS.CR)
Government Grant	141.55	217.96
Equity/Quasi equity	78.45	120.80
Debt	660.00	1016.24
Total Project Cost	880.00	1355.00

NHAI will part finance the project by way of a Grant, which would be 20% of the bid project cost. To facilitate early commencement of work, first installment of 35% of the Grant shall be paid upfront on the Commencement Date against Bank Guarantee. NHAI shall pay the other installments of Grant to the Concessionaire linking up with the satisfactory achievement of project milestones.

C. FINANCIAL DATA FROM CONCESSION AGREEMENTS Sample- 1 -

- Net project cost = 738.45 crores Discounting factor – 12%
- Debt-Equity Ratio – 3:1
- Subsidy – 20% of the bid project cost
- Annuity Payments – 69.30 crores, semi annually
- Total Project cost includes construction cost, Operation and maintenance costs of roads and bridges/structures with all components.
- Construction period – 30 months (2009-2012)
- Concession period – 22 years
- First annuity payment would be made 6 months after scheduled project completion date
- Assumptions:

Interest on debt – 11% per annum Cost of equity – 14%

Depreciation – 5%

Income tax – 33%

Sample- 2 –

- Net project cost = 1355 crores
- Discounting factor – 12%
- Debt-Equity Ratio – 3:1
- Subsidy – 20% of the bid project cost
- Total Project cost includes construction cost, Operation and maintenance costs of roads and bridges/structures with all components.
- Total Project cost includes construction cost, Operation and maintenance costs of roads and bridges/structures with all components.
- Construction period – 24 months
- Concession period – 20 years
- First annuity payment would be made 6 months after scheduled project completion date.

D. Economic evaluation

Economic evolution of sample 1 & sample 2 is done using following methods:

i) Economic evolution of Sample-1 (NH-6)

a. Payback Period (PBP)

Payback period = Cost of the project/ Cash inflows in one year

$$= 880.00/139$$

$$= 6.33 \text{ years}$$

Conclusive Statement:- PBP in case of sample 1 is between 6 to 7 year

b. ARR (Average rate of Return)

Table 2. ARR for Sample 1

Year	Net Inflow	Net Outflow
2009	29.61	30
2010	32.91	30
2011	36.23	30
2012	39.16	30
2013	42.09	30
2014	45.02	30
2015	47.95	30
2016	50.88	30
2017	53.81	30
2018	56.74	30
2019	51.02	30
2020	52.86	30
2021	54.7	30
2022	56.54	30
2023	58.38	30
2024	60.22	30
2025	62.06	30
2026	63.9	30
2027	65.74	30
2028	67.58	30
2029	69.42	30
2030	71.26	30
2031	73.1	30
TOTAL	1241.15	690

ARR= Average profit /Total investment*100%

$$= 53.96/690*100$$

$$= 7.82\%$$

Conclusive Statement:- ARR in case of sample 1 is around 7.82% which shows good return from the investment in the project.

c. NPV (Net Present Value)

Table 3. NPV for Sample 1

Year	PAT	Depr	Total Cash Inflow	Disc factor @ 12%	PV Of Cash Inflow	Total Cash Outflow	WACC @ 11.32%	PV of Cash Outflow	NPV
2009	-6.8	36.39	29.6	0.89	26.42	30	0.9	26.95	-0.52
2010	-3.5	36.39	32.9	0.8	26.22	30	0.81	24.21	2.02
2011	-0.2	36.39	36.2	0.71	25.76	30	0.72	21.75	4.02
2012	2.75	36.39	39.15	0.64	24.88	30	0.65	19.54	5.34
2013	5.68	36.39	42.08	0.57	23.88	30	0.58	17.55	6.33
2014	8.61	36.39	45.01	0.51	22.8	30	0.53	15.76	7.04
2015	11.54	36.39	47.94	0.45	21.68	30	0.47	14.16	7.52
2016	14.47	36.39	50.87	0.4	20.54	30	0.42	12.72	7.82
2017	17.4	36.39	53.8	0.36	19.4	30	0.38	11.43	7.97
2018	20.33	36.39	56.73	0.32	18.26	30	0.34	10.27	8
2019	14.62	36.39	51.01	0.29	14.66	30	0.31	9.22	5.44
2020	16.46	36.39	52.85	0.26	13.57	30	0.28	8.28	5.28
2021	18.3	36.39	54.69	0.23	12.53	30	0.25	7.44	5.09
2022	20.14	36.39	56.53	0.2	11.57	30	0.22	6.68	4.88
2023	21.98	36.39	58.37	0.18	10.66	30	0.2	6.01	4.66
2024	23.82	36.39	60.21	0.16	9.82	30	0.18	5.39	4.43
2025	25.66	36.39	62.05	0.15	9.04	30	0.16	4.85	4.19
2026	27.5	36.39	63.89	0.13	8.31	30	0.15	4.35	3.96
2027	29.34	36.39	65.73	0.12	7.63	30	0.13	3.91	3.72
2028	31.18	36.39	67.58	0.1	7.01	30	0.12	3.51	3.49
2029	33.02	36.39	69.42	0.09	6.43	30	0.11	3.16	3.27
2030	34.86	36.39	71.26	0.08	5.89	30	0.09	2.83	3.05
2031	36.7	36.39	73.1	0.07	5.39	30	0.08	2.55	2.85
Total PV					352.37	NPV		242.52	109.85

Net Present Value = Rs. 109.85

Conclusive Statement:- As NPV in case of sample 1 is positive, hence project is acceptable.

d. IRR (Internal Rate of Return)

Table 4. IRR for Sample 1

Year	Net Inflow	Rate @ 15%		Rate @ 20%	
		Disc factor @ 15%	PV Of Cash Inflow	PV Of Cash Inflow	PV Of Cash Inflow
2008	-660	1	-660	1	-660
2009	29.61	0.87	25.75	0.83	24.67
2010	32.91	0.76	24.88	0.69	22.85
2011	36.23	0.66	23.82	0.58	20.97
2012	39.16	0.57	22.39	0.48	18.88
2013	42.09	0.5	20.92	0.4	16.91
2014	45.02	0.43	19.46	0.33	15.08
2015	47.95	0.38	18.03	0.28	13.38
2016	50.88	0.33	16.63	0.23	11.83
2017	53.81	0.28	15.3	0.19	10.43

2018	56.74	0.25	14.02	0.16	9.16
2019	51.02	0.21	10.97	0.13	6.87
2020	52.86	0.19	9.88	0.11	5.93
2021	54.7	0.16	8.89	0.09	5.11
2022	56.54	0.14	7.99	0.08	4.4
2023	58.38	0.12	7.17	0.06	3.79
2024	60.22	0.11	6.44	0.05	3.26
2025	62.06	0.09	5.77	0.05	2.8
2026	63.9	0.08	5.16	0.04	2.4
2027	65.74	0.07	4.62	0.03	2.06
2028	67.58	0.06	4.13	0.03	1.76
2029	69.42	0.05	3.69	0.02	1.51
2030	71.26	0.05	3.29	0.02	1.29
2031	73.1	0.04	2.94	0.02	1.1
TOTAL			-377.87		-453.55

IRR = Starting Rate + (Surplus at Starting rate / Surplus at Starting rate - Surplus at Ending Rate) * (Ending rate - Starting rate)
 $IRR = 15 + (377.87 / (377.87 + 453.55)) * (20 - 15)$
= 17.27%

Conclusive Statement:- IRR in case of sample 1 is around 17.27% i.e. "annualized effective compounded return rate" or "rate of return" that makes the net present value of all cash flows (both positive and negative) from a particular investment equal to zero.

e. PI (Profitability Index)

Table 5. PI for Sample 1

Year	Net Inflow	Disc factor @ 12%	PV Of Cash Inflow	Net Outflow	Disc factor @12%	PV Of Cash Outflow	Net PV
2009	29.61	0.89	26.44	30	0.89	26.79	-0.35
2010	32.91	0.8	26.23	30	0.8	23.92	2.32
2011	36.23	0.71	25.79	30	0.71	21.35	4.43
2012	39.16	0.64	24.89	30	0.64	19.07	5.82
2013	42.09	0.57	23.88	30	0.57	17.02	6.86
2014	45.02	0.51	22.81	30	0.51	15.2	7.61
2015	47.95	0.45	21.69	30	0.45	13.57	8.12
2016	50.88	0.4	20.55	30	0.4	12.12	8.43
2017	53.81	0.36	19.4	30	0.36	10.82	8.58
2018	56.74	0.32	18.27	30	0.32	9.66	8.61
2019	51.02	0.29	14.67	30	0.29	8.62	6.04
2020	52.86	0.26	13.57	30	0.26	7.7	5.87
2021	54.7	0.23	12.54	30	0.23	6.88	5.66
2022	56.54	0.2	11.57	30	0.2	6.14	5.43

2023	58.38	0.18	10.67	30	0.18	5.48	5.18
2024	60.22	0.16	9.82	30	0.16	4.89	4.93
2025	62.06	0.15	9.04	30	0.15	4.37	4.67
2026	63.9	0.13	8.31	30	0.13	3.9	4.41
2027	65.74	0.12	7.63	30	0.12	3.48	4.15
2028	67.58	0.1	7.01	30	0.1	3.11	3.9
2029	69.42	0.09	6.43	30	0.09	2.78	3.65
2030	71.26	0.08	5.89	30	0.08	2.48	3.41
2031	73.1	0.07	5.39	30	0.07	2.21	3.18
TOTAL			352.46			231.55	120.91

Profitability Index = Discounted Benefits / Discounted Costs

= 352.46 / 231.55

= **1.52**

Conclusive Statement:- As PI in case of sample 1 is more than 1, hence project is financially more feasible.

ii) Economic evolution of Sample-2 NH 8.

a. Payback Period (PBP)

Conclusive Statement:- PBP in case of sample 1 is between 19 to 20 yea

Payback period = Cost of the project/ Average Cash inflows = 1355.00/71.21 = **19 years**

b. ARR (Average rate of Return)

Table 6. ARR for Sample 2

Year	Net Inflow	Net Outflow
2008	65.64	50.81
2009	65.64	50.81
2010	65.64	50.81
2011	65.64	50.81
2012	65.64	50.81
2013	69.3	50.81
2014	69.3	50.81
2015	69.3	50.81
2016	69.3	50.81
2017	69.3	50.81
2018	73.03	50.81
2019	73.03	50.81
2020	73.03	50.81
2021	73.03	50.81
2022	73.03	50.81
2023	76.91	50.81
2024	76.91	50.81
2025	76.91	50.81

2026	76.91	50.81
2027	76.91	50.81
TOTAL	1424.33	1016.2

ARR= Average profit /Total investment*100%
 = 71.21/1016.20*100
 = 7.00%

Conclusive Statement:- ARR in case of sample 1 is around 7.00% which shows average return from the investment in the project.

c. NPV (Net Present Value)

Table 7. NPV for Sample 2

Year	Cash Inflow	Disc factor @ 12%	PV Of Cash Inflow	Total Cash Outflow	WACC @ 11.32%	PV of Cash Outflow	NPV
2008	65.64	0.89	58.6	50.81	0.9	45.64	12.96
2009	65.64	0.8	52.32	50.81	0.81	41	11.32
2010	65.64	0.71	46.72	50.81	0.72	36.83	9.89
2011	65.64	0.64	41.71	50.81	0.65	33.09	8.63
2012	65.64	0.57	37.24	50.81	0.58	29.72	7.52
2013	69.3	0.51	35.11	50.81	0.53	26.7	8.41
2014	69.3	0.45	31.35	50.81	0.47	23.98	7.36
2015	69.3	0.4	27.99	50.81	0.42	21.55	6.44
2016	69.3	0.36	24.99	50.81	0.38	19.35	5.63
2017	69.3	0.32	22.31	50.81	0.34	17.39	4.92
2018	73.03	0.29	20.99	50.81	0.31	15.62	5.38
2019	73.03	0.26	18.74	50.81	0.28	14.03	4.71
2020	73.03	0.23	16.74	50.81	0.25	12.6	4.13
2021	73.03	0.2	14.94	50.81	0.22	11.32	3.62
2022	73.03	0.18	13.34	50.81	0.2	10.17	3.17
2023	76.91	0.16	12.54	50.81	0.18	9.14	3.41
2024	76.91	0.15	11.2	50.81	0.16	8.21	2.99
2025	76.91	0.13	10	50.81	0.15	7.37	2.63
2026	76.91	0.12	8.93	50.81	0.13	6.62	2.31
2027	76.91	0.1	7.97	50.81	0.12	5.95	2.02
Total PV			513.75	NPV		396.29	117.46

Net Present Value = Rs. 117.46

Conclusive Statement:- As NPV in case of sample 1 is positive, hence project is acceptable

d. IRR (Internal Rate of Return)

Table 8. IRR for Sample 2

Year	Net Inflow	Rate @ 15%		Rate @ 20%	
		Disc factor @ 15%	PV Of Cash Inflow	PV Of Cash Inflow	PV Of Cash Inflow
2007	-1016	1	-1016	1	-1016
2008	65.64	0.87	57.07	0.83	54.7
2009	65.64	0.76	57.07	0.69	45.58
2010	65.64	0.66	49.63	0.58	37.98
2011	65.64	0.57	43.16	0.48	31.65
2012	65.64	0.5	37.53	0.4	26.38
2013	69.3	0.43	34.45	0.33	23.21

2014	69.3	0.38	29.96	0.28	19.34
2015	69.3	0.33	26.05	0.23	16.12
2016	69.3	0.28	22.65	0.19	13.43
2017	69.3	0.25	19.7	0.16	11.19
2018	73.03	0.21	18.05	0.13	9.83
2019	73.03	0.19	15.7	0.11	8.19
2020	73.03	0.16	13.65	0.09	6.83
2021	73.03	0.14	11.87	0.08	5.69
2022	73.03	0.12	10.32	0.06	4.74
2023	76.91	0.11	9.45	0.05	4.16
2024	76.91	0.09	8.22	0.05	3.47
2025	76.91	0.08	7.15	0.04	2.89
2026	76.91	0.07	6.21	0.03	2.41
2027	76.91	0.06	5.4	0.03	2.01
TOTAL			-532.7		-686.22

IRR = Starting Rate + (Surplus at Starting rate / Surplus at Starting rate - Surplus at Ending Rate) * (Ending rate - Starting rate)

$$IRR = 15 + (532.70/532.70 + 686.22) * (20-15)$$

$$= 17.19\%$$

Conclusive Statement:- IRR in case of sample 1 is around 17.19% i.e. "annualized effective compounded return rate" or "rate of return" that makes the net present value of all cash flows (both positive and negative) from a particular investment equal to zero.

e. PI (Profitability Index)

Table 9. PI for Sample 2

Year	Net Inflow	Disc factor @12%	PV Of Cash Inflow	Net Outflow	Disc factor @12%	PV Of Cash Outflow	Net PV
2008	65.64	0.89	58.6	50.81	0.89	45.37	13.24
2009	65.64	0.8	52.32	50.81	0.8	40.51	11.82
2010	65.64	0.71	46.72	50.81	0.71	36.17	10.55
2011	65.64	0.64	41.71	50.81	0.64	32.29	9.42
2012	65.64	0.57	37.24	50.81	0.57	28.83	8.41
2013	69.3	0.51	35.11	50.81	0.51	25.74	9.37
2014	69.3	0.45	31.35	50.81	0.45	22.98	8.36
2015	69.3	0.4	27.99	50.81	0.4	20.52	7.47
2016	69.3	0.36	24.99	50.81	0.36	18.32	6.67
2017	69.3	0.32	22.31	50.81	0.32	16.36	5.95
2018	73.03	0.29	20.99	50.81	0.29	14.61	6.39
2019	73.03	0.26	18.74	50.81	0.26	13.04	5.7
2020	73.03	0.23	16.74	50.81	0.23	11.64	5.09
2021	73.03	0.2	14.94	50.81	0.2	10.4	4.55
2022	73.03	0.18	13.34	50.81	0.18	9.28	4.06
2023	76.91	0.16	12.54	50.81	0.16	8.29	4.26
2024	76.91	0.15	11.2	50.81	0.15	7.4	3.8
2025	76.91	0.13	10	50.81	0.13	6.61	3.39
2026	76.91	0.12	8.93	50.81	0.12	5.9	3.03
2027	76.91	0.1	7.97	50.81	0.1	5.27	2.71

TOTAL	513.75		379.52	134.23
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Profitability Index = Discounted Benefits / Discounted Costs

= 513.75 / 379.52

= **1.35**

Conclusive Statement:- As PI in case of sample 1 is more than 1, hence project is financially more feasible

IV. RESULTS

Table 10. Comparison of all 2 samples.

Description	Sample 1	Sample 2
Payback Period (PBP)	6.3 years	19 years
Average Rate of Return (ARR)	7.82%	7%
Net Present value (NPV)	+ ve	+ ve
Internal Rate of Return (IRR)	17.27%	17.19%
Profitability Index (PI)	1.52	1.35

V. CONCLUSION

As payback period of sample 1 is less than sample 2 & also ARR & IRR is higher in sample 1 as compare to that of sample 2. So after considering the above analysis of collected data and its detailed evaluation of the different factors such as IRR, NPV, ARR, PI and payback period, it is concluded that sample 1 i.e. Talegaon - Amravati section on NH 6 is more feasible than sample 2. Hence after considering above terms and comparative conclusion of Sample 1(Talegaon – Amravati Section on NH 6) is more financially feasible.

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