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A revenue risk sharing approach for Public Private Partnership model used for construction of Sion-Panvel highway, Mumbai

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Abstract

Roadways are the major source of transportation and are of vital importance in the economic development of the country. The construction of roads involves bulk investment of resources. Hence the government bodies in various countries prefer models of Public Private Partnership (PPP) for infrastructure development. Because of additional capital and greater techno-managerial efficiency, PPP models has been widely used across the globe. In India, almost 50% of the total PPP infrastructure projects deals with roadway construction. Among the PPP models, Build Operate Transfer (BOT) is the more popularly used approach. Traffic revenue is the major concern in BOT projects which have considerable economical risk impacts on private sector. To date various risk sharing approaches have been proposed by researchers. However, under Indian scenario BOT (Toll) and Annuity models are adopted for risk sharing. These approaches are incapable of sharing the risk with both the partners as it deals with only one. Hence there is a need to identify appropriate risk sharing approach for Indian conditions. The Minimum Revenue Guarantee (MRG) have been the widely used and most reliable risk sharing approach. Therefore, in this study an innovative attempt is made to analyze the performance of MRG under Indian scenario. Sion-Panvel highway is one of the recent PPP projects constructed in Mumbai. Based on full revenue risk method, Internal Rate of Rate (IRR) of this project was mutually decided as 13.94% and was estimated to be achieved in 17 years and 5 months. Whereas the MRG analysis shows that, the decided IRR will be achieved 2 years prior to the estimated along with efficient risk mitigation. The MRG can be used for effective and efficient implementation of BOT models under Indian scenario with minimum economical risk.

Keywords: Roadways; Revenue Risk; Public Private Partnership; Build Operate Transfer; Minimum Revenue Guarantee.

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1. Introduction

Infrastructure is the basic requirement of economic development. Power source, transportation (roads, railways, airports, ports), irrigation are major important elements of infrastructure. The economic growth of country directly depends on the development of infrastructure. Intense growth in infrastructure can be observed worldwide. Infrastructure projects involves a huge amount of investments both in capital and construction resources. Rapid growing infrastructure development requires continuous supply of resources which is quite a task to handle solely. Simultaneous operation of many projects and shortage of capital and resources forced public entity to involve partners, hence the Public Private Partnership (PPP) models were introduced. For, improving the efficiency of the projects and mutual financial investments and resources, Public-Private Partnership (PPP) models are popularly used worldwide.

Roadways are the major source of transportation. They contribute greatly to the economic development of the country. India has second largest road network around 5.6 million km. According to the Ministry of Finance (Indian Brand Equity Foundation, 2018), there were 1,529 PPP projects in India, of which 740 were road projects. Project awarded under BOT is 17.92 per cent of the total awarded projects.
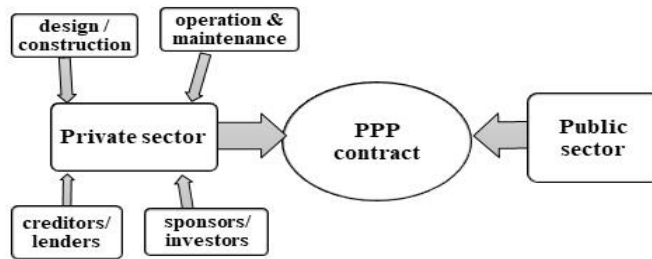

Fig. 1 Public Private Partnership Model (Source: Rouhani et al., 2018)

PPP is an agreement in which private sector is responsible for the execution of the project under the ownership of public sector. PPP helps optimizing resources and availing necessary investments through private sector and ensures long term reliability. PPP contracts are of three types namely- management/ lease contract, design build maintain contract, BOT/ joint venture contract.
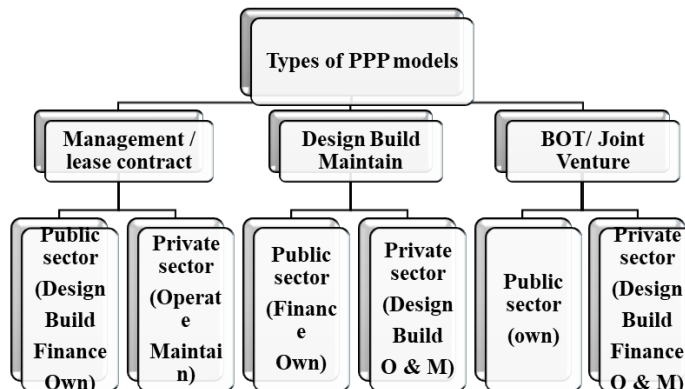

Fig. 2 Types of PPP contracts

Under BOT contract, public entity grants a concession to private company for financing, designing, building and operating the project for a certain period of time till the recouping of its investment is achieved. In BOT as private partner finances, they are more liable to be at risk. Design failure, cost and time overrun, construction risk, changes in cost of repair and renovation, force majeure risk, revenue risk are some risks associated to infrastructure projects (Rouhani et al., 2018). Different risk comes at different phases of project. Risk can be minimized and prevented by mitigation but cannot be ignored. Risk can also be lowered by sharing the risk. Commercial success of the road projects under PPP model are most critically affected by the traffic revenue risk (Thomas, 2003). Revenue risk is

dependent on factors like traffic density, population and economic growth, toll collection cost, and population behavior. Disinclination in the assumption of traffic revenue by private sector and user's unwillingness in toll payments lowers traffic revenue and needs transfer of risk. Forecasting traffic demand is key in PPPs projects on transportation as the traffic is responsible for both project cost in terms of expenditure and capital and project revenue in terms of returns and profits. Estimating future level and composition of traffic is difficult as traffic forecast may get overestimated than actual traffic. Thomas et al. (2003) surveyed and classified the risks associated with the different phases of Indian BOT road projects and identified the traffic revenue risk as one of the critical risks and concluded that traffic revenue risk has the widest disagreement amongst the stakeholders on who is best able to manage this risk. Transferring the risks to the party capable of absorbing and managing the risk, are key for the success of any project under PPP (Singh and Kalidindi, 2006). Delays due to the approval risks should be taken into account and planned properly to mitigate (Vilventhan And Kalidindi, 2012). Risk can be shared using various risk sharing approaches viz. MRG, variable availability payment, least present value of revenue (LPVR), dynamic revenue insurance, shadow tolls (Rouhani et al., 2018). Annuity-based BOT model could be a better arrangement to manage the traffic revenue risk in Indian road projects (Singh and Kalidindi, 2006). MRGs are most applicable to projects with significant revenue volatility and Availability Payments (AP) are more appropriate in projects with lower revenue volatility (Liu et al., 2017). Rouhani et al. (2018) surveyed through various road projects across the world under BOT, compared all risk sharing approaches and concluded that Collar option of MRG, performs the best since this option can preserve the private partner's incentive to increase its revenue/performance under both lower and higher than threshold conditions.

In India, private sector plays an important role in road infrastructure development. For the road infrastructure projects, the full revenue derived from toll is collected by the private sector as the payments for the investments till the whole expenditures along with value for money (VFM) and profit margins re compensated. Many external tangential factors affect the toll revenue like unwillingness of people for paying tolls, exemption on government vehicles and also the availability of alternative non-toll road. Therefore, in most of the roadway PPP projects private sector is exposed to full traffic revenue risk. 18% of the PPP projects are BOT projects which are more prone to risk (Indian Brand Equity Foundation, 2018). There are two models of PPP adopted in India for the development of National highways viz. BOT (Toll) and BOT (Annuity) (Haldea, 2012). In both the cases only one party suffer the revenue risk. Hence there is a need to explore alternative risk sharing approaches under Indian scenario. MRG approach have been widely used by various researchers (Shan et al., 2010; Ashuri et al., 2012; Liu et al., 2017; Rouhani et al., 2018). The MRG approach offers one of the most attractive solutions for risky P3 toll roads (Shan et al., 2010). Hence the objective of this paper is to demonstrate the suitability of MRG under Indian scenario using a case study on Sion-Panvel highway, Mumbai.

2. Materials and Methods

2.1. Minimum Revenue Guarantee (MRG) Approach

In order to make PPP projects both attractive and feasible, governments can grant a subsidy or other incentives to private partners. In MRG the public sector ensures to grant the private sector a minimum level of revenue throughout the concession period. Public sector payment is determined by the difference between predetermined threshold and the actual toll collection. The minimum threshold is predetermined with mutual concern. The annual or periodic payment will be the difference between the predetermined and the actual toll income. Three main MRG modification are-

2.1.1. Put Option

The public entity grants the private partner the difference between the predetermined minimum threshold and the actual toll income whenever the toll income falls below the minimum threshold.

2.1.2. Put and Call option

The public sector grants the difference between the predetermined minimum threshold and the actual toll income as put and in reverse the private sector grants to pay the difference exceeding the predetermined maximum threshold and the actual toll revenue as call.

2.1.3. Collar Option

The public sector grants the difference between the predetermined minimum threshold and the actual toll income as put and in reverse the private sector grants to pay the difference exceeding the predetermined maximum threshold and the actual toll revenue whereby both can grant only some percentage of the determined lack or determined surplus (Rouhani et al., 2018).

2.2. Study Area

Sion-Panvel highway have been considered for the area of study which lengths about 25 km and is located in Mumbai. The estimated cost of the project was Rs. 1220 crores which by including the inflation factor was increased by 10%. The Internal Rate of Return (IRR) was mutually decided to be 13.94%. IRR is usually used to calculate the profitability of investments made in a financial project. Higher the IRR more profitable it is to invest. As per the predetermined estimates toll revenue started from 2013-2014 which was Rs.148.59 crores which was calculated considering the traffic density and tolls per vehicle based on type of vehicle. Maintenance cost of Rs.12 crores was fixed and after every 6 years i.e. 7th year the maintenance cost was 3 times the decided for major repairs, structural repairs and renovations.
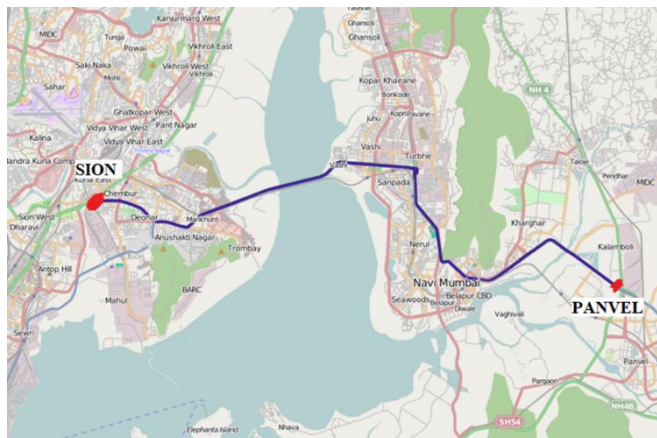

Fig. 3 Sion-Panvel highway route (Source: Google Maps)

2.3. Application of MRG

MRG approach was used for risk sharing among the partners of PPP. The estimation using MRG was calculated by referring the minimum and maximum threshold for the net toll revenue. Minimum threshold and maximum threshold were so decided that there will be a balance between the grants and the call. Minimum threshold used was

Rs. 225 crores and maximum threshold was Rs. 375 crores. The toll revenue was so considered that it will fall between Rs. 225 crores and Rs. 375 crores even if it exceeds or falls short.

3. Results and Discussion

When the Private sector was allowed to collect whole toll revenue generated during the concession period, it arises full revenue risk to be beared by private sector. Risk associated with toll revenue is due to fluctuations in the revenue generation. It may not always happen that the estimated revenue is generated from actual tolls, due to unwillingness of payment of tolls by the users, toll free alternative roads and volume of traffic using the road. By toll revenue method, along with all those risk factors, the decided IRR of 13.94% was being fulfilled in 17 years and 5 months as estimated. As shown in Fig. 4, the actual toll revenue generation was around 50% of the toll revenue estimated. Low actual toll generation than the estimated toll revenue makes the private sector suffer more losses and financial risk.
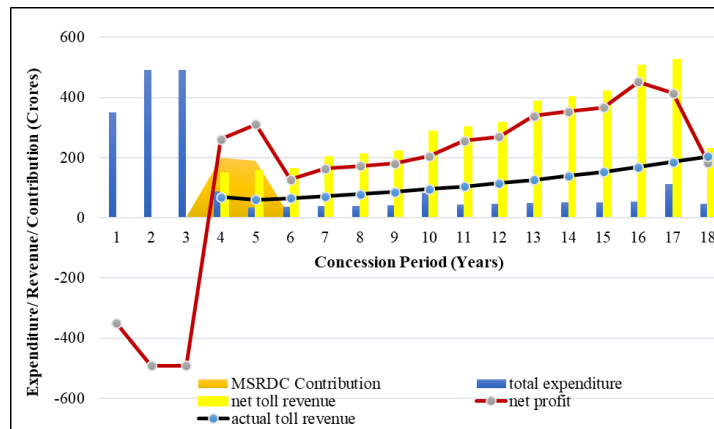

Fig.4 Estimated Vs Actual Toll Revenue

Whereas application of MRG on the other hand effectively reduces the risk factors as the minimum revenue decided will be acquired. Following results were obtained.
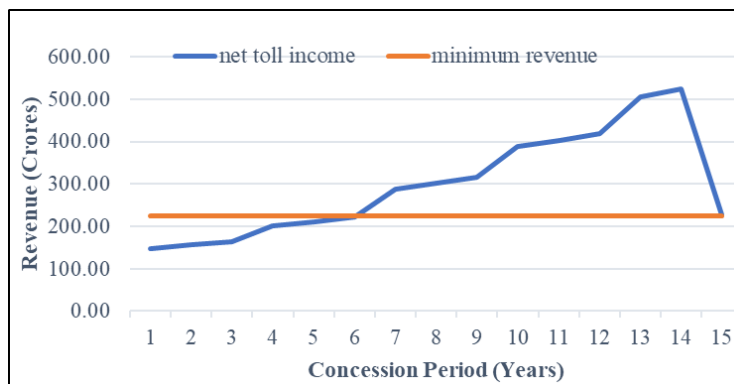
3.1. Put option-

Fig.5 MRG (Put Option)

When the minimum threshold of 225 crores was considered as shown in Fig. 5, it was observed that the IRR was achieved one year prior to the estimated period and the concession period was thus been lowered. Risk can be lowered to some extent as the shortfalls in revenue are been granted by the public sector.
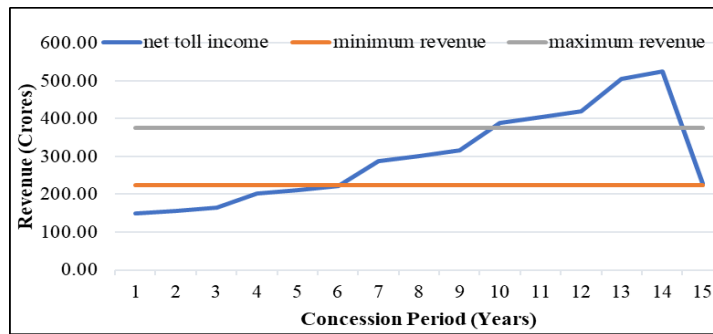
3.2. Put and Call option-

Fig.6 MRG (Put and Call Option)

When the minimum threshold of Rs.225 crores and maximum threshold of Rs. 375 crores were decided as shown in Fig. 6, it was found that the tenure of concession period was reduced by around 2 years. IRR that required 17 years and 5 months by full revenue method will be requiring 15 years and 3 months approximately. Minimum and maximum threshold where so decided as to compensate the grants and the generation of revenue and it can also depend on the availability of funds with the public sector (more the availability higher can be the minimum threshold and it can further reduce the tenure of concession period). As the fluctuations are compensated by granting the difference between actual and predetermined minimum threshold, the risk caused due to those fluctuations are minimized.

3.3. Collar option-

Collar methods results similar to the Put and Call option, but the grants or the call are based on percentage so that the concessionaire gets motivated for improving the revenue and thus increasing the profits. This method overcomes the risk under performance of private sector as the minimum revenue is acquired.

4. Conclusions

In India, 18% of the PPP projects are BOT projects which are more prone to risk. Toll collection being the source of revenue generation in roadways gives rise to revenue risk. Majority infrastructure projects on roadways adopt a Toll revenue method for revenue generation in which private partner collects whole tolls and bears the risk. However, some adopt Annuity model in which the concessionaire is assured a minimum return on his investment in the form of annuity payments, thus the government bears the entire risk with respect to toll income. In this study a comparative analysis for the suitability of MRG over Toll revenue method under Indian scenario have been carried out. Toll revenue method upholds revenue risks as analyzed from the study of Sion-Panvel highway. In Sion-Panvel highway it was observed that there was major downward deviation in the actual toll income, almost 50% drop in toll revenue generation than the estimated revenue. Major causes for this drop in the toll were demonetization, strikes against tolls, removal of toll on cars and jeeps and unwillingness of people for paying tolls. Dropping of revenue gave rise to the risk and losses through the project. By application of MRG, these risks can be minimized by sharing the risk factors. MRG can be suitable to any conditions and also compatible with Indian scenario where population behavior plays a vital role. MRG may not only prove effective in the implementation of the projects by proper value for money and fiscal stability but might also increase the involvement of stakeholders and other partners for the PPP infrastructure development projects.

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