A Model for PPP Contracts to Mitigate Risk

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Abstract

This paper attempts to develop a model to maintain a healthy relationship between the public and private parties involved in a PPP (Public Private Partnership) contract under various risk. This is to ensure right environment for PPPs in India. First, this paper categorizes various risks incurred during the PPP contract and their impact on parties engaged in the contract. Then, it focuses to setup a model considering recent observations of unsuccessful PPPs in India due to incorrect assessment of risks.

Keywords: Contracts, Public Private Partnership, Risk, Win-win contract, Sustainable partnership, Asymmetric Information, Optimization, Infrastructure project

1. Introduction

Contracts are common and used by every individual in their day to day activity: buying an apartment, selling a car, or offering money in return of some specific act. Every-time if an individual makes a promise to pay later, it is a contract. Contracts are defined as a written or verbal promise between two or more parties (people, organizations) to perform certain things. Many time contracts do not have a written or well documented legal form but still works well. Arthur Melvin Okun called them "invisible handshake" in place of "invisible hand" (Okun, 1981). While organizations can use verbal contracts, it is crucial to use a formal written contract when engaging with complex and large projects. It helps to ensure a healthy relationship between contracting parties, mitigate the risks, and prevent them from astray from their objectives. Private Sector does not have the incentive to provide public goods in Pareto-efficient quantities, and therefore the government needs to intervene (Rosen and Gayer, 2008, p. 79). Also, there can be issues of equity with the use of Pareto efficiency principal in the case of goods and services provided by the public sector. There are various goods and services such as road, rail, bus, hospital, and infrastructure, provided by the public sector to the people, but it is also essential to involve the private sector to construct these huge infrastructures. The advantages of involving the private sector are increased efficiency and distributed risk. Hence, contracts play an important role in these kinds of projects between the public and private sector. But such contracts cannot specify every possible contingency which is a major concern (Hart, Shleifer, and Vishny, 1997). But the benefit is that contracts can identify the basic requirements with ease. For example, an agreement is generally made on the quantity to be supplied.

Consider a case of a contract between buyer and supplier. If current supplier gives unsatisfactory services to its buyer and if other suppliers exist that can provide good quality services to the same buyer then the buyer will prefer to end the contract with the current supplier and approach other suppliers. Therefore, the current supplier would always try not to give poor services by "inefficient" cost reductions in present work to get contracts in the future. Nevertheless, neither the buyer of service would want to create a loss for suppliers. A similar situation holds for PPP contract. The PPPs are long term and capital intensive projects which include two or more private and public sector. In case the parties involved in the contract observe any indication or intention that may create losses for any of them then they will not prefer to take participation in the future bid.

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In any of the PPP contract, risk management plays a vital role apart from efficiency gains as parties negotiate and allocate risks based on their ability to manage them better than others (Roumboutsos and Anagnostopoulos, 2008).

India being a developing country needs rapid economic growth. Good quality infrastructure is necessary for economic development, but it requires a huge amount of investment to develop new infrastructures such as power generation, ports, roads, metros, and airports. Since governments in India have pressure to cut deficits thereby have limited money to invest in such project, it becomes necessary to involve private sector by assuring returns of their investments in terms of incentivizing them economically and financially. In the past, various large infrastructure projects have been the result of PPPs which were constructed with speed and minimum cost. In India, BOT was the model of public-private partnership contract adopted early. BOT is a kind of contract in which private party gets the grants from public party to build a large project, operate it and transfer it back to the public party as per the written concession contract. But these infrastructure projects developed under PPP contract suffered due to poor quality, a poor projection of risk, lack of coordination among parties associated with projects, shut-down projects, etc.

A few notations used in this paper are as follows:

GB- the government or the government body

IB- intermediaries providing finance

PC- private parties

GB, IB and PC are three parties involved in the PPP contract.

In this paper, we have created objective functions for the public and private parties involved in a PPP such that a healthy environment for PPP is maintained. We first identify an equitable way to distribute resources between them and then provide a way to identify an efficient private party.

2. Theory

There are various challenges in a public-private partnership at every phase of the project. We divide a PPP project in the delivery phase and the operations and management (OnM) phase. Some risks are common to each phase while others are particular to a phase.

The optimization includes efficient allocation of risks to the party who can best manage it. Iyer and Sagheer (2010) identified a structured list of priority-wise 17 risks. In this paper, all the risks have been categorized based on the treatment they will receive in the analysis. They are as follows:

R1- GB is exposed to a pre-investment risk associated with the cancellation, negotiation redesign the bid before finalizing the contract. This risk includes the losses occurred due to various reasons such as cancellation of tender, incorrect bids or litigation, dropping of projects etc. The losses in terms of cost include tender preparation cost for GB, bid preparation cost for PC and feasibility study for both GB and PC.

Sometimes risk exists due to issues in design or latent defect leads to rebidding or renegotiation. Hence all these risks are put them under the category of pre-investment error. With DBFOT most risk is transferred to PC and IB.

R2. This happens due to PC not being able to acquire necessary finance after getting the work. This risk is higher in BOT as the government doesn't pay for the build process after completion but has to be recovered through operations which have its set of uncertainty. Road projects in India require upfront payments to state petroleum monopolies. Further, financing is generally of non-recourse type and so have very high risks for PC.

R3. This risk arises due to resettlement, rehabilitation, and delays in acquiring land. All three entities considered suffer due to this.

R4. This happens in the middle of a project where delays happen due to corruption, transfer of officials, etc. Also, environmental issues can interrupt during the construction phase.

R5. It is a cost overrun risk where PC suffers more cost than estimated in the construction phase. Generally, corrigendum is required to update prices, and then the role of arbitrator or sometimes judiciary becomes important.

R6. This is the risk of not completing projects or parts of it in the agreed time. Generally, GB has the agreement of levying fines on PC in such cases. Thus most of the risk lies toward PC.

R7. This risk is due to significant changes in law affecting PC's capability to do business, such as appropriating project assets, revocation of rights, license, or approval. Further, there is also an indirect political risk due to war, embargo, riot, agitation, etc. (World Bank 2008). Such risks are low but can affect entities remarkably. Also, the risks of Non-political force majeure such as epidemics, natural disasters can be clubbed here, but their chances are higher.

R8. This is the risk of getting stuck in legal cases. As the judiciary generally takes longer to settle such disputes it can affect adversely each of the entities.

R9. This is the external financial risk such as that from exchange rates, interest rates and prices of materials and equipment. PCs are at exposed to these risks to a large extent followed by IBs.

R10. This risk arises due to issues among the individuals, teams, or organizations involved in the project affecting smooth execution.

R11. This is a risk of physical damages to structures or equipment and to labour that are involved in different phases of the project. This should receive separate treatment as BOT has a long duration for which PC is vulnerable to this risk.

The dependence ranking of whether one risk leads to another was given by Iyer and Sagheer (2010). Based on their work, the top five ranks with decreasing dependence is R5, R6, R2, R11 and R7. Van Ham and Koppenjan (2001) pointed out substantive risks in PPPs. In our view, there should be consideration of permanent damage to the PPP environment in the country thereby increasing the cost of capital for doing the work. There are also risks of not assessing risks properly, and we handle this part separately in our model.

3. Model

In our view, a complete design of a PPP would include a mechanism to share risk as well as reward optimally. The WACC reaches 18-19% in India. We use MIRR for analysis of return on investment.

PPPs in India have not done well. Most SEZs have failed in their purpose. The designs have also faced criticism and R1 has been high. This calls for a newer approach where PC produces designs as well and bears most of the R1 in the

form of Design Build Finance Operate and Transfer (DBFOT).

The problem in India has been the incorrect assessment of risk. The projects are based on detailed project reports created by government which overestimated traffic. PCs became overconfident and took on new projects based on existing ones and created debt cyclically. IBs suffered the brunt of traffic risk and have amassed huge NPAs. But stagnation of projects and lack of new capital due to wary investors are losses for GB as well.

Moreover, a lot of bundling of projects with real-estate related aspects are happening such as commercial set-ups near metro station along with the metro to increase revenue. IBs have raised interest rates for such infrastructure projects due to higher uncertainty level of the real estate sector. Ideally, the GB would want that minimum return on investment for PC to be the WACC.

Or, ideally, r_{min} = WACC.

But if PC comes to know that GB is using WACC, it can incentivise them to coalesce with IB and indulge in corrupt practices by increasing interest rates. Also, this has to be decided before inviting the bids. So, $r_{min, G}$ is what government keeps in its mind based on probabilities of the risks discussed above and their interdependence, while actual WACC might be something else and equal to what minimum return PC would want when risks were properly assessed. We call it $r_{min, P}$.

The GB would create incentive for PC up to a limit, that we call $r_{max, G}$. This doesn't include the actual benefit assessed by the project because of the presence of positive externalities of the public nature of the project. GB would not make the potential social gains of a project to go to PC itself and also avoid lucrative condition. So, even with $r_{max, G}$ the GB finds positive returns for itself.

Let total marginal probability of a risk i (Ri) as given above be w_i. Let w be the vector of marginal probabilities of all the risks. The total marginal risk of i is due to sum of effects of direct factors and other risks leading to adverse situations as discussed above. Based on this $r_{min, G}$ = h(w) where the function h considers only those part of risk that affects PC.

Let $E_{t, P}$ be expected return by PC and $E_{t, G}$ be expected return by GB. Since PC interacts with IB for finances, any

information asymmetry between PC and IB is being ignored here. We determine what risks an entity bears or to what extent.

The WACC incorporates interest rates and the risks involved in a project. We use a term for under assessment of risk, where the negative events overshoot expectations and create losses for PC. We denote it as 'e', an error term not included in the WACC. If there is an under assessment (that we only identify ex-post), e > 0. This is relevant to both the delivery and OnM phases.

In the OnM phase, the return is denoted by 's'. There could be a lower return due to various factors, as can be seen in the case of Indian road PPPs, the estimated traffic didn't materialise and by 80 to 90%. It is not included in the under-assessed risk.

There could be two types of PC. The private sector company can be "good" with enough assets, reliability, and efficient structure. Otherwise, it could be "bad". The PC generally is a consortium of companies that take parts of the project they are good at. It is difficult to know beforehand whether a PC is good or bad, except for the finance part based on the balance sheets of consortium companies.

Let's denote the case of a good PC with inputs α and for bad PC α. The effect of the different inputs affects return on investment before any deductions for the PC which is a Modified Internal Rate of Return (MIRR) (Lin, 1976) from the cash-flows in the OnM phase and outflows for construction and OnM based on expected risk for the project. We use diminishing returns for effort and assign it as a concave increasing function of α, $f(\alpha)$.

Now, the net rate of return, which a PC sees at the end is $f(\alpha) + s - WACC - e$.

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The WACC is a constant for a sector and will be known to each party at the beginning. The variable s is unknown to all entities but is estimated using the evolution of usage of the project by the public, generally based on the Geometric Brownian Motion (Garvin and Cheah, 2004).

The variable α is known to PC (or becomes known in a reasonable amount of time) but is unknown to IB and GB.

The variable e is stochastic. But we see from the recent experience that e has been high in Indian PPPs, so it should have non-zero mean for PC. There have been errors in traffic estimation in the road sector and was due to incorrect assessments in the DPRs or tendencies of the GB to appeal more for the project. But with time other entities will realize what it practically is and adjust their s beforehand.

3.1. Objective function of PC

Maximise $E_{t,P}$ ≍ (equivalent to) Maximise $f(\alpha) + s - WACC - e$

In the above equation, the calculation is done at the beginning where time is t. s is estimated from the theory and the past experience, and any change in Et, P is due to e only.

$r_{min,P} = WACC + E_t(e)$

3.2. Objective function of GB

Maximise net social gain from the project over an infinite time frame, and possibly get it completed within the tenure of people in office:

Maximise $E_{t,G}$ ≍ Minimise $(r_{max,G} - r_{min,G})$, such that $r_{max,G} - r_{min,G} \geq 0$

GB will assume $E_t(e)$ to be 0 as it has tried to include all contingencies in its DPR and created the project. Thus, looking at DPR, the IB is expected to charge similar rates for lending. GB wants PC to meet WACC so that repayment of loans is possible and IB is not affected. Moreover, any return due to efficiency gain or extra traffic is acceptable to GB as its main objective is the social gain that is still left after excluding gain of PC: $f(\alpha) + s - WACC$. So, $r_{max,G}$ = Maximum value estimated of $(f(\alpha) + s - WACC)$

And,

$r_{min,G} = h(w)$

Thus, initial objective of GB: Minimise $(f(\alpha) + s - WACC + h(w))$ such that $f(\alpha) + s - WACC + h(w) > 0$.

By solving the equations, a probability distribution can be found for expected gains for PC and GB. Then, GB would like that a PC of type "good" be selected and they apply inputs of the type $\tilde{\alpha}$ as well. This can be done by creating

and negotiating a contract where the design is changed that would require high efficiency from PC to be able to profit in the concession period or change the contracted concession period for this.

Thus, we have categorised risks and included their interdependence that GB should consider for calculating minimum returns for PC. We recognise that PCs have suffered due to underassessment of risks due to missed and unexpected outcomes, and included it in PC's objective function as a factor.

4. Discussion

We assumed that Et, P is the same as Et, I. If payment of loan is achieved, IB gets both its purpose served and profit made. Whereas, if PC is not able to return the debt, there will be NPAs for lenders and in the case of equity, there will be losses. Both situations will make IB unwilling to involve in the PPPs of India.

Since not everything concerning the future uncertainty of a project can be written down, it is reasonable for parties to interact frequently during a project. Koppenjan (2005) discovered that a lack of early interaction creates increasing dis-alignments of ambitions and understanding, and lead to the failure of PPP. There should be scope for renegotiation and correct expected values at t+1, the time for the next future negotiation on design or concession period.

Most of the assessed countries and territories in 2016 corruption index measured by Transparency International fell below the midpoint indicating endemic corruption in a country's public sector. Citizens face the tangible impact of corruption on a daily basis. The point is very clear with the current mechanism of administration that people, even after attaining executive and political leadership roles, are less motivated by social welfare and righteousness but by personal ambitions and value-maximization (North and North, 1992). The idea of horizontal accountability has been there to check this and includes among others the Judiciary. If the judiciary is not functioning, it creates incentives or diminishes disincentives for corruption, theft, and cheating. The public-private partnerships in India have many cases of being stuck in court cases (R8) mainly due to the intentions of parties not to proceed on agreed lines. The intention for political gains and corruption in

both GB and PC have created the present distrust situation in PPP projects.

5. Conclusion

The objective of PPP is to maintain healthy competition among private parties as well as provide scope for profitability because the PPPs are crucial for Indian infrastructure development and required in large numbers. Moreover, the government should also create a justifiable agreement to avoid charges of bias and create a provision for public money to go to private parties optimally. With corruption, misguided political will, and inefficient judiciary the environment for PPP will deteriorate and hurt the economy on the whole.

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