

# Managing Traffic Demand Risk in Road Sector Public-Private Partnerships (PPPs) through the Use of Put and Call Option Agreements

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## Abstract

One of the major problems facing road sector PPPs is the management of traffic demand risk. The reasons for this are that traffic studies are notoriously unreliable and also the possibility that an alternative route or intermodal competition might affect demand. Therefore, it is usual for private sector investors to seek additional assurances from the government that they would recover their investments through the use of guarantees or other forms of protective contractual clauses that either enable the term of the concession or the revenue accruable to the concessionaire to adjust with demand realizations. However, these protective clauses not only increase the contingent liability of the government but may also stall the infrastructural development of the country, increasing the likelihood of political risk eventuating. This article argues that the best way to resolve this issue is for parties to consider the use of put and call option agreements, which allow either party to exit the contract where economic or social realities demands it.

**Key words:** Public-Private Partnerships, Traffic Demand Risks, Road Sector, Put and Call Options

## 1. Introduction: The Relationship between Volume of Demand and Viability of a Project

The volume of effective demand for a service or product is one of the principal determinants of its commercial viability. Consequently, the quantity and quality of demand that a project is able to attract is one of the most significant factors taken into consideration in determining the project's cash flow and therefore the features of debt service repayments (Alasad et al 2011). Indeed the probability that the user public would not patronize a service or pay cost reflective tariffs, which is referred to as the project's demand risk, is the most critical risk facing project partners in PPPs regardless of the country or the sector (Norton Rose 2006).

The level of demand for a facility or service is usually very difficult to predict.<sup>1</sup> It is even more testing under long-term contracts like road sector PPPs, as the long-term modeling assumptions employed in such cases increases the likelihood that unrealistic or incorrect assumptions might be used in making traffic forecasts. Also, due to the competitive procurement process typically employed in selecting a concessionaire, there is a tendency for bidders to be overly optimistic or reckless or even predatory in making traffic estimations. This has led to renegotiations (Viegas 2010) and failure of a number of PPP projects (Choi 2010).

Due to this unpredictability of demand, the private sector parties and their financiers are usually wary of participating in projects unless the government pledges guarantees against demand risks.<sup>2</sup> The disadvantage of these guarantees is that concessionaires are able to renegotiate and shift losses to taxpayers whenever they get into financial trouble.<sup>3</sup> This also increases the contingent liabilities of governments sometimes to unmanageable

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<sup>1</sup> For example, so many factors may affect the continued use of a tolled road like shift in the use of mass transit, increase in the cost of fuel and the relocation of people from a particular area. This is also true in periods after air mishaps, where people abandon air transportation in preference to other competing means of transport.

<sup>2</sup> For instance, in Chile, in 9 out of 10 highways franchised, the government provided a guarantee that the revenue will equal 70 % of the construction and maintenance costs. (See Engel, 2001)

<sup>3</sup> For instance, in Spain, where 3 firms went bankrupt as a result of traffic projections being less than one-third of original projections, government permitted toll increases and term extensions. Also in Mexico, most of the concessions were renegotiated after cost overruns and low revenues at the cost of USD 6 million to the government. See Engel, E. et al ibid,

proportions, especially in periods of economic downturns. Where liabilities crystalize and the government is unable to meet its financial commitments, the private sector party usually walks away from deals to the detriment of the public. This might not necessarily lead to a loss to the private sector as the private sector may be paid reasonable compensation for transferring the asset back to the public sector.

## **2. What are PPPs? What are the Characteristics of Road Sector PPPs?**

Public Private Partnership (PPP) refers to a long term contractual relationship between public sector agencies and private sector entities under which the responsibility for any or all of the combination of designing, financing, construction, management and operation of public infrastructure and utilities that were traditionally undertaken by the public sector are contractually shared and jointly undertaken by both the public and private sector, usually in proportion to the kind of risks each party can best carry (Nwangwu 2012). PPPs therefore ensure that private sector finance is deployed for the development of infrastructure and that private sector managerial expertise and dynamism may be employed in ensuring the maintenance of the infrastructure. PPPs come in different forms usually depicted with different acronyms. However, a number of these so-called different PPP arrangements are merely slight variants of one another. Some of the popular variants are:

### *2.1 Build Operate and Transfer (BOT)*

This is the most popular PPP arrangement. In these types of projects, the private sector entity finances the construction of the road and is allowed to own and maintain it for a number of years, usually long term, ranging from 25 to 30yrs, before transferring control and ownership back to the public sector. Normally, the infrastructure is transferred back to the public sector at zero cost or at least a cost less than the asset's residual value. This type of arrangement is common with greenfield projects. The idea of a BOT is to benefit from the private sector's detailed knowledge of project design and the materials used in the construction phase can result in the development of a tailored maintenance plan over the project lifespan (Tvarno 2010).

### *2.2 Design, Build, Finance Operate (DBFO)*

Under this scheme, the public partner specifies the services it wants the private sector to deliver and then the private partner designs and builds an asset specifically for that purpose, finances its construction, and subsequently operates the asset by providing services that derive from it.

### *2.3 Lease*

Leases (*affermage*) as a form of PPP is usually used where the assets are already in existence and therefore it is no longer necessary to make upfront investments in infrastructure or where the risk premium for transferring the responsibility for building of the asset to the private sector is very high. Thus under this arrangement, investment and financing of the infrastructure is done under the responsibility of the public sector as opposed to the private sector however the commercial risk *apriori*, continues to be allocated to the private sector. The length of contract in leases is usually shorter than in typical concessions. It is noteworthy that even though the arrangements in a lease and *affermage* are similar there is a slight distinction in the sense that the private sector operator usually retains revenue collected from the users of the facility and makes specified lease fees to the public authority. Under an *affermage* however, the private sector contractor and the public authority share revenues from the users.

### *2.4 Operations and Management Contracts*

Under this arrangement, the public sector basically outsources the provision of services, which were hitherto provided by it to the private sector. The payment for services is made directly to the private partner by the public partner, rather than revenue collected directly from the end users.

### *2.5 Concessions*

Under a typical concession, the public sector grants (concessions) the private sector (concessionaire) a right to deliver certain services in certain areas for a fee paid by the concessionaire for those rights. The private sector operator is responsible for operation, maintenance and even rehabilitation of the asset including any capital required for upgrade and expansion even though ownership of the asset remains with the government throughout

the duration of the concession period. The public sector sets performance standards and ensures that they are met thereby being in effect regulators of the price and the quality of services delivered.

Note that there are certain baseline characteristics that tie these PPP projects together. Some of these characteristics are listed by the Malaysian PPP Guidelines as:

- i. The relationship between the public and private sectors is based on a partnership, which means that risk is shared between both partners optimally as it is allocated to the party who is best able to manage it.
- ii. The public sector procures specified outputs and outcomes of a service for the contract period whilst the private sector determines the required inputs to achieve the specified output. The private sector is given the freedom to introduce innovation into their design and development to reduce cost; there is thus an integration of design, construction, finance and maintenance and operation.
- iii. Payment for services is based on predetermined standards and performances.
- iv. PPP promotes a 'maintenance culture' where the private sector will be responsible for the long term maintenance of the assets throughout the operational period agreed upon by the parties.
- v. In some instances, there is an option for the transfer of the infrastructure asset back to the public sector at the end of the contract period.
- vi. PPP involves a Whole Life Cycle Costing ("WLCC") whereby PPP projects are usually awarded based on lowest total cost over the contract period compared to lowest construction cost under traditional procurement (Malaysian Public Private Partnership Guidelines 2009).

Majority of projects that are classified as PPPs will have a number of these characteristics. Importantly however, the partnership structure must allocate risks and rewards optimally amongst the public and private parties in accordance with the strengths and abilities of each of the parties. It is only this optimal allocation of risks and benefits that ensures that each party contributes in an effective manner to the project.

### **3. Allocation of Traffic Demand Risk**

The principal means through which demand risk is allocated is the payment mechanism used in compensating the private sector. There are two main contract types for delegating public services to private operators. These are contracts where the private sector bears no demand risk, known as availability contracts and those where the private sector bears all or some of the demand risk, known as user charge or concession contracts.<sup>1</sup>

In availability contracts, services are paid for directly by the public sector procuring agency based on the provision of the services according to contract specifications.<sup>2</sup> The private sector's remuneration is in this case directly related to the quality and quantity of services it provides. This, it has been argued, provides less incentive to the private sector to pursue user satisfaction (Brux and Desrieux 2012). Conversely, in user charge contracts, the private sector provider of the services sells its services directly to the user public and receives remuneration through charges to the end-users. Thus the private sector's remuneration in this instance is dependent on the demand by the public for the services (Athias 2007).

There are also mixed forms of both types of contracts, where for example end users pay charges to the private sector contractor in an availability contract; in this case the private sector collects such user fees on behalf of the Government, and secondly the use of shadow tolls which are in reality concession contracts. This is because despite the fact that users do not pay fees in shadow toll contracts, demand is borne by the concessionaire as payments to it by the Government is dependent on the frequency of the use of the facility. In concrete terms, these mixed contractual arrangements either fall into one of the two broad classifications of concession or user charge contracts where the demand risk is borne by the private sector or availability contracts where demand risk is borne by the public sector.

### **4. Management of Demand Risk in Road sector PPPs**

There are advantages to be gained from the use of concession contracts over availability contracts. In concession

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<sup>1</sup> Iossa and Martimot (2008) identifies three payment mechanisms in PPPs, these are user charges, usage payments and availability payments. The usage payments are technically variants of the user charge and availability payments.

<sup>2</sup> This is common in PFI Contracts in the United Kingdom and Contrats de partenariat in France. Several other countries have started to use this contract type exclusively, irrespective of the sector.

contracts, the private sector has more incentive to take users' satisfaction into account, as this will influence the number of people using its service and therefore leads to increase in its revenue. It is also argued that it will motivate the public sector to respond more to the public demands as the consumers are better empowered (Athias 2007). The consumers have the power to oust the private sector provider by refusing to use the service depending on the availability of alternative options. It is believed that this will compel the private sector to better innovate and therefore increase the quality of service provided (Brux and Desrierux 2012).

However, the consequences of the use of concession contracts is that the private sector will always try to protect its investment and ensure that the actions of the public sector do not negatively affect the demand for its services and therefore its revenue. For instance, in a road project, it might be disastrous to the private sector's projected revenue in situations where the government decides to build an alternative road close to a private sector operated tolled road as this will certainly drive demand away from the tolled road. For these reasons, the private sector concessionaire will ensure the insertion of safety clauses in the contract like "non-compete", "demand guarantee" and "compensation events" clauses. These clauses have potentially serious consequences for the Government.

It has been suggested in some quarters that these clauses have the effect of making the government the insurer and guarantor of the earnings of the private sector and destroys competition and consumer choice (Dannin, 2011). More disturbing however is the likelihood that these clauses may stunt economic growth and even lead to stagnation in the development of infrastructure in a country. For instance, the net effect of the use of these clauses might be to forbid the government from building competing infrastructure near the location of the private sector managed facility in order to guarantee the revenue streams of the private sector.

It is obvious that both the availability contracts and the concession contracts have their advantages and disadvantages. It is therefore the submission of this thesis that the nature of the project should ultimately determine the choice of the demand contract that is entered into by both parties and therefore, who bears the demand risk. There is a consensus that availability contracts should be used when there cannot be revenue receipts from the users of a facility or where the government is in control of the demand for the facility like a prison or school for instance. It is the government that determines the number of inmates that are sent to prison and the specific prison that particular inmates would be sent to. However, this thesis argues that availability contracts should also be used in certain instances where the use of concession contracts will whittle down the powers of the government to continue to provide for its citizens due to the insistence by the private sector on the insertion of certain risk mitigation clauses into the contracts.

If we follow the basic rule that the party in control of an event should bear the risk arising from that event because that party is likely to make more effort to prevent the risk from eventuating, then in determining who should bear the demand risk, it follows that the party responsible for control of the demand for the service should shoulder the risk. For instance, it will be ineffectual to ask the private party to bear demand risk in a prison or school PPP where usage mainly reflects government policy in the sector. Also certain types of transactions, especially where the welfare of the citizens is paramount, should be done through availability contracts while other contracts where there are credible user alternatives can be done through concession contracts. Where however the public authority is insistent on using concession contracts, then it must ensure that its use does not stunt the economic development of the country or fetter its right to provide adequately for its citizens.

Where concession contracts are preferred to availability contracts especially in the transport sector, the most common strategies used to mitigate traffic demand risk is to either allow the term of the concession or the revenue accruable to the concessionaire to adjust with demand realizations. The three most common mechanisms are: "modification of the economic balance" of contracts; traffic guarantee contracts; and duration adjusted contracts.

#### *4.1 Modification of the Economic Balance of Contracts*

Under this approach, if the Internal Rate of Return (IRR) of the project falls below a minimum threshold stipulated in the contract, then the "economic balance" of the concession is re-established. In most cases, a minimum IRR is accompanied by a maximum IRR. This ensures that the concessionaire's profits are limited if traffic is much higher than expected, with the excess creamed off by the state. This method is thought to have originated in France and subsequently applied in Spain with some differences (Vasello and Gallego 2005).

Generally, the compensation measures to be adopted for re-establishing the economic balance of the contract are not pre-determined but rather negotiated when the IRR falls above or below the target levels (Vasello and Gallego 2005). The nature of the compensation may take the form of change in toll levels, adjusting the contract

length or the provision of other public subsidies. These subsidies may take the form of capital expenditure contributions (capex), which can either be in the form of loans or equity as capital grants to the private sector (Iossa 2007). The problem with this approach is that it involves a long and tiresome renegotiation process between the concessionaire and the government since the method for re-establishing the economic balance of the contract is not fully specified. Also, the concessionaire has no incentive to reduce operating costs when the project IRR is close to the lower limit since falling below the limit allows a renegotiation of the contract.

#### 4.2 Traffic Guarantee Contracts

This approach involves guaranteeing either the traffic or revenue levels in the contract. The failure to reach this minimum levels triggers compensation from the public sector. Many countries such as Korea, Colombia, Chile, Dominican Republic, Malaysia and Spain have used this method (Irwin 2003). In many contracts, the lower limit is often complemented with an upper limit above which the revenues are “clawed back” and shared between the government and the concessionaire. The main problem of the guarantee approach is that it cannot ignore the strong correlation between the volume of traffic and economic growth; thus the guarantee can have very negative consequences for the public budget if a recession occurs (Transport Research Centre 2007). Nevertheless, it has been shown that the method has worked quite well in some countries such as Chile where, even during an economic recession, only 4 out of 29 transport concessions in operation at the end of 2004 performed below the minimum income guarantee band. This meant a subsidy from the government of only 6.24 US\$ million compared to the USD 350 Million invested. Surprisingly however, it did not reduce pressure from the concessionaires for contract renegotiations (Vassallo and Solino 2006). This mechanism has not worked so well in more unstable countries such as Colombia where traffic volume turned out to be lower than guaranteed levels for many of the concessions in that country (Transport Research Centre 2007). In situations like this, this mitigation method is capable of becoming a large burden on the government’s fiscal position.

#### 4.3 Duration Adjusted Contracts

This method, which has been adopted in several countries, involves matching the term of the concession to predefined and verifiable target traffic or revenue levels. This approach was first applied in 1990 in the concession of the Second Severn Crossing in the United Kingdom (Vasello and Gallego 2005). In this case, even though the government initially decided that the maximum period for the concession should be no longer than 30 years, the concessionaire -Severn River Crossing Plc. – proposed that the basis of the length of the concession be pegged to a fixed target of “Required Cumulative Real Revenue” (Foice 1998). This way, total project revenue was established at 1989 prices (NPV), which, once collected from tolls income, would end the concession. Based on traffic levels during the early years of the concession, it was expected that the concession duration would be ultimately 22 years, considerably less than initially predicted (Transport Research Center). Another similar concession was awarded in Lusoponte Portugal at the end of the 1990’s. The concession agreement was designed in order for the concession to expire no later than March 2028 or at a total cumulative traffic flow of 2,250 million vehicles, and that if the traffic is higher than expected, the concession will finish earlier than 2028 (Lemos 2004).

A good enunciation of this mechanism is called “Least Present Value of the Revenues (LPVR)” and has been extensively espoused by Engel, Fischer and Galetovic. The authors were of the opinion that fixed term contracts do not allocate demand risks optimally. They therefore advocated for a least present value of revenue auction instead of the bidding process being based on the length of the toll period (Engel *etal* 1997). Under this model, the lowest bid wins i.e. the bidder who offers the least present value of accumulated revenues, discounted according to the discount rate fixed in the contract, and the concession comes to an end when that lowest bided amount is recovered by the concessionaire. Therefore, the concession comes to an end earlier if the demand is high and lasts longer when the demand is low. They also claim that significant welfare gains can be achieved from using LPVR auctions (Engel *etal* 1997).

Another major advantage of LPVR auctions is that since it allows the concession term adjust to demand realizations, the concessions are less sensitive to demand information and thus more cost-oriented than fixed term concessions. However, this mechanism has been implemented with minimal success in Chile.<sup>1</sup> The major reason for this is said to be the lukewarm reception of the method by concessionaires. An advantage of this option is that apart from being a demand risk mitigation method, LPVRs provides the public sector authority

<sup>1</sup> It was used in the Santiago-Valparaiso Vina del Mar Concession in Chile

with a price with which to buy out the concession. A fair compensation for the concessionaire is the difference between the winning bid and the revenue collected thus far, unlike in fixed term contracts where compensation is based on estimates of expected profits during the remainder of the concession period, which calculation is always subject to disputes (Engel *et al* 2001). It is presumed that this will act as a disincentive to a private sector party seeking to renegotiate a concession since the public authority can opt to buy out the concession. This as we shall see below is useful in exercising the put-call option where that exists in the contract.

The major criticism of the LPVR method is that it does not provide sufficient incentive for the concessionaire to exert effort in enhancing the quality of service (Engel *et al* 2001). It has been suggested that this could be overcome by complementing the method with other regulatory inventions, such as the appointment of third parties who verify the minimum quality standards and appropriate fines for non-compliance with those standards (Tirole 1997).

## 5. The Solution: Put and Call Option Agreements

As evidenced from above, the attempt at managing demand risk, especially when demand risks are allocated using the concession contract models, creates major challenges for the public sector. The use of traffic or revenue guarantee instruments and non-compete clauses not only distort the intended risk allocation structure of the toll road concession, but may also increase the likelihood of the advent political risk. This is because majority of the factors that influence traffic demand risk are macroeconomic in nature and usually out of the control of either party. When these risk mitigating instruments transfer the traffic demand risk unwittingly back to the government, it may leave the government with little or no option but to default on its obligations. The solution might be to allow the government “call” the contract in those instances instead of breaching the contract.

This suggestion was also put forward by Quiggins, who claims that PPPs will be improved by the inclusion of “put and call” options in contracts which allow either of the contracting party to terminate after a predetermined period which he proposed should be every 7 years with the public sector having an option of buying off the remainder of the unamortised period by the private sector (Quiggins 2005). In a similar vein, Veigas argues that concessions are better designed in successive shorter term contractual cycles of a maximum of 15years each; each cycle will involve a revision of objectives, policies, technological standards and demand forecasts. This is aimed at the partial amortisation of the private sector party’s investment. At the end of the concession period the concessionaire would collect a payment equivalent to the value of the unamortised payments (Viegas 2010). The Government does not need to have recourse to funds from the budget to make these payments; it may raise the money by organising a subsequent concession for another period of similar duration without the cost of a new construction. It can be done in a manner that allows the new rent cover the exit payment of the first concessionaire.

The concept of real options theory is not new. It is a natural extension of financial options theory used in pricing underlying assets or instruments at pre-agreed prices on a stipulated date. An option itself is the right but not the obligation to take some actions in future. In this instance, a put option is the option (but not the obligation) of the private sector partner to sell the remainder of the term of the concession back to the government at a certain price, date and under stipulated conditions. The case of a call option would be the reverse, giving the government a right to buy back the concession under certain conditions. The concept of put and call options are not new to PPPs, practitioners have always attempted to value the implicit options available to parties when they enter into long-term PPP contracts. This allows the parties price-in the value of the options into project, thereby improving the commercial values of projects (Vijdic and Damjanovic 2011). However, there has been limited attempt at analysing the use of put and call options as a risk mitigating technique in PPP contracts.

In conclusion, it is certain that put and call option agreements make PPP contracts less prescriptive and therefore more flexible, leading to better outcomes for both parties. However, in using them, care must be taken to ensure that the conditions under which the options become exercisable are pre-determined and that the formula for determining the exercise price of the option is agreed by the parties before-hand. It makes sense that exercising the option does not unwittingly reward either party; otherwise it will only encourage opportunistic behaviors.

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