

## PRIVATE FINANCE FOR ROAD PROJECTS IN DEVELOPING COUNTRIES: IMPROVING TRANSPARENCY THROUGH VFM RISK ASSESSMENT

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**Abstract:** Private financing of road projects in developing countries has considerably declined in recent years. Currency crisis have led several projects to fail and increase risk levels of potential projects. For attracting private investments in risky projects, governments have offered incentives and support measures. Government must assure themselves and convince the general public that support measures given are not excessive. This could be possible by using a transparent, open and quantitative method for evaluating/assessing the risks. This paper reviews methods and techniques used for assessing the risk in private finance projects. A value-for-money (VFM) methodology used in the UK is presented. It was identified that the main shortcoming of the VFM method is surprisingly the lack of transparency towards the general public. This paper indicates some considerations before taking into account the application of the VFM method in developing countries, and proposes a VFM risk assessment methodological approach for developing countries.

**Key Words:** VFM, Risk assessment, Road projects, Developing countries, Transparency

### 1. INTRODUCTION

Evaluation of projects in developing countries from the government's funding point of view has usually been done from an economic analysis perspective (Talvitie, 2000). However, in the case of private sector financing of infrastructure projects it becomes necessary for governments to assure that projects provide not only an important socio-economic value but also that they are financially feasible. Road infrastructure projects are characterized by requiring high investments in the initial years, and are generally exposed to many revenue uncertainties which might reduce their financial viability (Lam and Tam, 1998). In order to attract needed private investment in potentially risky or financially unviable projects, governments have opted for offering the private sector incentives and support measures such as grants, subsidies, tax-exemptions, revenue and foreign exchange guarantees, and sovereign guarantees against force majeure and political risk, among others.

In recent years, worsening economic conditions brought by the collapse of financial markets in some developing countries have provoked the failure of several transport infrastructure projects (especially toll roads) and drastically changed the private interest for them. As mentioned by Estache and Strong (2000), the effects of financial crisis in Asia, Russia and Brazil have resulted in dramatic increases in political and currency/exchange risk premiums. Government incentives and support mechanisms have then become more indispensable now than ever. But when giving these support mechanisms, governments have the responsibility of assuring themselves as well as convincing the general public that the private sector is rewarded accordingly to the risk taken and not done excessively. This task of assuring transparency not only at the bidding and awarding process but also at later stages could be achievable through an explicit and quantitative risk assessment method that is thought to be lacking in many of the present projects. As indicated by Akintoye *et al.* (2001), the public sector has generally preferred a qualitative approach for evaluating the risk. The reasons given for not undertaking a full and detailed quantitative approach are: inexperience, lack of knowledge, insufficiency of data, and difficulties in defining the risk in terms of likelihood and impact. In cases where risks have been assessed using quantitative methods, the drawback of these approaches has been related either to shortcomings of the techniques used, or to the lack of openness to the public domain about the details of the risk assessment process due to commercial confidentiality reasons.

Within this context, this paper aims at various issues. It firstly analyzes the present situation of private finance road projects in developing countries, and then describes the main risk factors and their allocation to the different parties in a road project. The paper then reviews the commonly used methods for evaluating and assessing the risk, and identifies the deficiencies and limitations of the existing techniques. Next, it presents a VFM methodology used by the UK government for evaluating their private finance projects, and reveals the shortcomings of this method. And finally, it suggests some considerations before taking into account the application the UK method in developing countries, and proposes a methodological approach for assessing the risk of private financing road projects that could help the governments in developing countries showing the transparency of their decision making.

## **2. PRIVATE FINANCING ROAD PROJECTS IN DEVELOPING COUNTRIES**

### **2.1 Need of Private Financing by Government**

The availability of an efficient transport system is essential to foster economic development (Fujii, 1999). In developing countries, road transport is the dominant mode and represents the biggest share in terms of freight and passenger traffic. Roads are important for their contribution to economic growth by facilitating trade and increasing productivity in agriculture/industrial activities, and also for improving living standards (Bhandari, 2002). Developing nations should not only build road infrastructure projects but also operate and maintain them successfully. However, as experience has shown, general absence of a periodic/routine maintenance policy due to inadequate resource allocations has resulted in the continuous deterioration of projects and the need of rehabilitation and reconstruction at much higher costs (Quartey Jnr., 1996).

Road infrastructure in developing countries has been traditionally funded by governments through a general budget allocation or by using dedicated taxes, access fees or tolls linked to

road use (PIARC, 1999). However, fiscal stringencies and budgetary constraints faced by many governments in the developing world have forced them to limit their spending on the provision of new road projects and the maintenance and rehabilitation of existing facilities. In order to keep pace with increasing population and rising demand for road infrastructure projects, governments have advocated the private sector for fulfilling the required highways needs. Project financing has emerged as a main financial instrument for bringing private capitals into the provision of road projects. Project financing is not a new tool and has been used for hundreds of years in the mineral resource sector, but it began to spread widely in the seventies with the development of an oil field project in the North Sea by the British Petroleum-BP (De Lemos *et al.*, 2000). Under this financing technique project lenders primarily look at the cash flows and earnings of the project for the repayment of the debt service. In contrast with corporate finance, project financing is done on a non-recourse or limited recourse basis, where lenders have normally little or no financial recourse against the project sponsor/promoter for the repayment of their loans.

## 2.2 Types of Private Financing Schemes

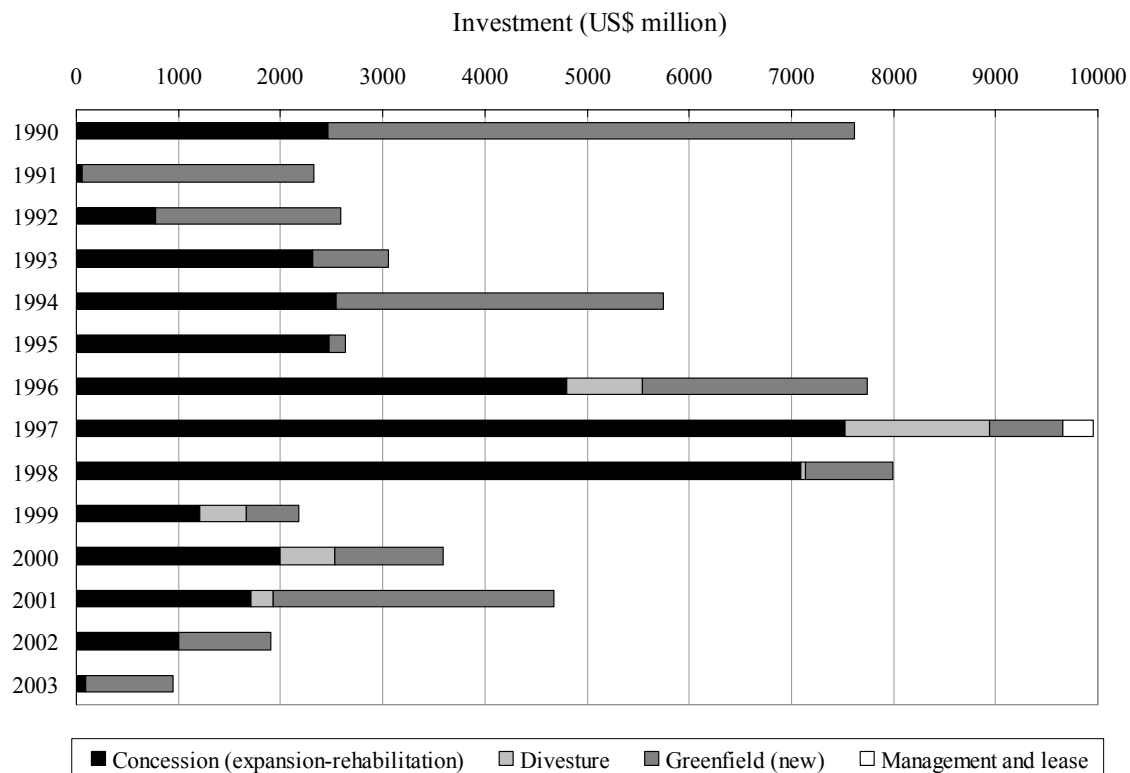
Several types of Public-Private Partnerships (PPP) structures have been introduced worldwide and they differentiate upon the responsibilities and risk allocation between the public and the private sectors. The PPP spectrum ranges from a simple commercialization of assets that remains under public ownership on one side, right through a full privatization of facilities on the other side, with several schemes in between that might involve jointly public-private financing for the project.

In this study, private involvement in road infrastructure provision follows a classification given by the World Bank (2004), which classifies contract structures in four types:

- 1) Concessions: Occurs when a private entity takes over the management of a state-owned road for a given period during which it also assumes significant investment risk. Concession schemes can be further classified in the following categories: a) Rehabilitate-Operate-Transfer (ROT); b) Rehabilitate-Lease-Transfer (RLT) or Rehabilitate-Rent-Transfer (RRT); and c) Build-Rehabilitate-Operate-Transfer (BROT)
- 2) Greenfield Projects: Take place when a private entity or a public-private joint venture builds and operates a new road project for the period specified in the contract. The road project usually returns to the public sector at the end of the concession period. Greenfield projects can be further classified in the next categories: a) Build-Lease-Own (BLO); b) Build-Operate-Transfer (BOT) or Build-Own-Operate-Transfer (BOOT); and c) Build-Own-Operate (BOO)
- 3) Divestitures: Occurs when a private entity buys an equity stake in a state-owned toll road company through an asset sale, public offering, or mass privatization program. Divestitures can be further classified into two categories: a) Full; and b) Partial.
- 4) Management and Lease Contracts: In this type of contracts a private entity takes over the management of a state-owned road project for a given period. The road project is owned by the public sector, and investment decisions and financial responsibilities also remain with that sector.

## 2.3 Recent Private Sector Participation in Toll Road Projects (1990-2003)

An analysis on the Private Participation in Infrastructure (PPI) project database (World Bank, 2004) for the period between 1990 and 2003 revealed that the private sector was involved in 359 toll road projects in the low- and middle-income developing countries. Figure 1 shows the private investment by type of contract schemes for the given period.



Source: Data for the analysis extracted from PPI Project Database - World Bank (2004)

Figure 1. Private Investment in Toll Road Projects by Type of Contract between 1990-2003

In 1990, private investment in toll road infrastructure was largely pulled by the Argentinean and Mexican wide-ranging toll road programs. The following years were characterized by a general decrease in investment commitments. Between 1996 and 1998, private investments rose again and reached a peak in 1997 with about 10 billion dollars in 61 awarded contracts. Financial crisis that affected many developing countries in the late nineties significantly reduced the private interest for roads in the following years. In year 2003, investments by the private sector in toll roads projects were just US\$945 million (the lowest level since 1990).

## 2.4 Cancelled Toll Road Projects

For the period from 1990 to 2003, 31 out of the 359 toll road projects that involved private participation in developing countries were cancelled and taken over by the government. From the 31 failed projects, nineteen were greenfields, eleven were concessions, and the remaining was a divesture project. The value of cancelled projects by region, type of contract, and its country distribution is shown in Figure 2.

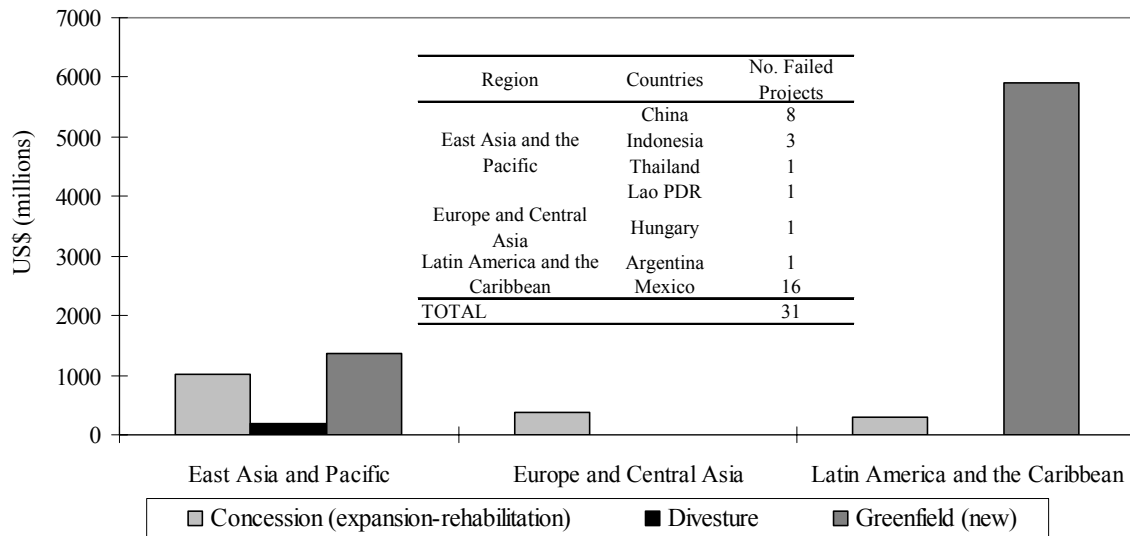


Figure 2. Value of Cancelled Projects by Region, Type of Contract, and Country Distribution during 1990-2003

In Mexico, main reasons for the failure of road concession projects were attributed to: lower than expected revenues due to traffic shortfalls; excessively high toll rates; and the currency crisis of 1994. In the East Asia region, the currency crisis of 1997 seems to be the most influencing factor for the failure of toll road projects. Currency devaluation and rising interest rates have seriously affected many projects in the whole region.

### 3. RISK CHARACTERISTICS OF PPP ROAD PROJECTS

#### 3.1 Risk Management

Risk and uncertainty with potential damaging consequences are inherent in all projects regardless of their nature. Due to the high degree of risk nature of construction business activities, risk management has been used by the construction industry and its clients to address and control the risks which they are, or might be, exposed to (Akintoye and MacLeod, 1997). From a little more general perspective, risk management has been defined as a structured approach to identify, assess and control the risks that emerge during the course of the policy, program or project lifecycle (HM Treasury, 2003). Risk management is a continuous and interactive cycle which could be comprised of the following three main stages: risk identification, risk assessment, and risk response (Figure 3).

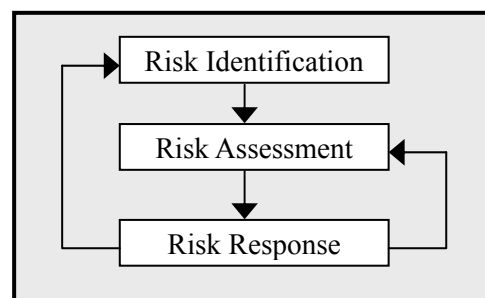


Figure 3. Risk Management Interactive Process

The purpose of the risk identification stage is to define as extensively as possible, a list with all types and sources of risks and uncertainties that might have an impact on the project. It is a crucial stage for the risk management process, because if a risk cannot be identified, it cannot consequently be evaluated and managed. According to Merna and Njiru (2002), risk identification techniques fall into three categories: intuitive, inductive (e.g. 'What if?' techniques) and deductive (e.g. 'So how?' techniques). Some of the most common methods used for the identification of risk include: brainstorming, prompt lists, checklists, interviews and risk registers.

The risk evaluation/assessment stage which is the main focus of this study is aimed at determining the likely financial impact of all the risks that were identified in the previous stage. Risks are generally assessed by using two types of approaches: qualitative methods or quantitative methods. However, in many occasions the combination of both methods has been suggested as the approach to be followed. The amount of effort committed for the assessment of risk varies a lot, but the general rule has been to use as little as is necessary to arrive at reliable planning decisions (Grey, 1995). A more detail description on the methods used for risk assessment is covered in Section 4 of this paper.

The objective of the risk response stage is to reduce the potential impact of risks and also to increase the control over them. Risk response has been often referred to as risk control, which involves handling risks in a manner that achieves project and business goals efficiently and effectively (Merna and Njiru, 2002). Risk response strategies have been generally classified into four categories: risk reduction, risk avoidance/elimination, risk transfer and risk retention/absorption (Akintoye *et al.* 2001). Alternative designs, contingency allowances, contractual risk allocation arrangements, and insurance are among the preferred tools used for risk response. If new risks arise as a result of introducing the risk response strategies, the risk management process continues interactively passing again through the identification-assessment-response stages.

### **3.2 PPP Road Projects Main Risks and their Allocation in Developing Countries**

Several studies and research papers have documented the identification of risks in transport infrastructure projects and related road schemes (Lam, 1999; Estache and Strong, 2000; World Bank and Ministry of Construction of Japan-MOCJ, 1999; Asian Development Bank, 2000). Although risk factors differ from project to project, there are some common factors that could affect projects in general. A list with of some of the most typical risks that could appear in a PPP road project in a developing country is shown in Table 1.

Project risks should be assigned to the public or private entity that is best at controlling and managing them. Figure 4 shows the allocation of risk between the government and the private sector proposed or adopted for some PPP road schemes in selected developing countries. In most of the cases, the private sector has taken on risk associated with the design, financing, construction, operation and maintenance of facilities, general regulatory risks as well as cover for insurable force majeure events. On the other hand, the public sector has been responsible for environmental license approvals and other planning permits, right-of-way land acquisition, discriminatory regulatory risk, and uninsurable force majeure events and political risks.

Table 1. Main Factors of Risks Encountered by PPP Road Projects

Risk Factor	Cause
Land Acquisition, ROW	Due to the possibility that: 1. Land costs are higher than expected; 2. Acquisition of land is not timely carried out
Licenses approvals, permits, consents	Due to the failure to obtain all necessary permits (e.g. environmental licenses, building consents, etc.) for the execution of the project
Design	Due to the possibility of the project design not achieving the required output specifications
Construction/Rehabilitation	Arising because of an increase in the estimated project costs; or a time schedule delay for the construction/rehabilitation works
Operation & Maintenance	Due to higher than anticipated operation or maintenance cost; or the un-compliance with the contract specified performance measures
Traffic/Revenue	When the actual revenue is lower than the expected one because of: 1. Traffic shortfalls; 2. Impossibility to charge user at the projected rates
Financial	Arising when the construction/rehabilitation cost or the project financing cost increases due to higher than forecasted rates for: 1. Interest rates; 2. Inflation; 3. Devaluation
Force Majeure	Due to the possible occurrence of unexpected events non-controllable by the parties. Risk of force majeure can be: 1. Insurable (e.g. against natural disasters, employer/public liability, etc.); 2. Non-insurable (war, terrorist acts, archeological discoveries, expropriation, etc.)
Regulatory	Because of changes in legislation or unsupportive government policies that have a negative impact in the project. Regulatory risk can be of two types: 1. Discriminatory (e.g. changes contractual toll rates); 2. General (e.g. changes in tax rate policy)

Risk Factor	Asian Countries	Hungary	Colombia	South Africa
Land Acquisition, ROW	□	□	△	□
Licenses approvals, permits, consents	□	□	□	□
Design	○	○	○	○
Construction/Rehabilitation	○	○	△	○
Operation & Maintenance	○	○	○	○
Traffic/Revenue	△	○	○	○
Financial (Devaluation)	□	○	△	○
Financial (Inflation)	□	○	○	○
Financial (Interest rates)	○	○	○	○
Force Majeure (Insurable)	○	○	○	○
Force Majeure (Political/Non-insurable)	□	□	□	□
Regulatory (General)	○	○	○	○
Regulatory (Toll rates)	□	□	□	□

○ Private      △ Shared      □ Government

Sources: Asian Countries: Asian Development Bank (2000); Hungary: Szavo (1999); Colombia: Ministry of Transport - National Institute of Concessions (2003); South Africa: National Treasury (2004)

Figure 4. Risk Allocation in PPP Road Projects in Selected Developing Countries.

#### **4. REVIEW OF RISK ASSESSMENT METHODS IN PPP PROJECTS**

Evaluation of the financial viability of private financing projects requires the development of an investment model in which financial indicators (e.g. payback, internal rate of return, net present value) are used for measuring the value of the investment (The Institution of Civil Engineers *et al.*, 2002). In order for the financial model to be accurate and complete, it should not only analyze the key parameters (like revenues, capital costs, operation costs, etc.) cash flows but also assess the potential impact that risks could have on these individual parameters.

##### **4.1 Lack of Research on Risk Assessment from Government Viewpoint**

Although several studies have analyzed the point of view of the private sector from a risk evaluation/assessment perspective, the authors identified that there is very limited research that document the way in which governments have evaluated and assess the risk of private financing projects. Ranasinghe (1999) mentioned that quite a few quantitative approaches can be used to analyze the financing and conduct risk analysis of BOT projects, and therefore his study was aimed at proposing a model that could be used by governments for analyzing the viability of private sector participation in infrastructure projects. Kumaraswamy and Zhang (2001) have also pointed out that specific literature discussing governmental practices in managing BOT projects is really scarce. The National Audit Office (NAO) in the UK have examined the government experience in some of the privately financed road projects (National Audit Office, 1998), but their report have been found to be lacking of detailed information about the methodology and assumptions (such as likelihood of occurrence and consequence impact cost) used for assessing the risk in the projects.

##### **4.2 Risk Assessment Approaches**

From a review on the existing methodologies used for the evaluation and assessment of risk in the financial appraisal of projects, two main categories of approaches were identified: qualitative techniques and quantitative techniques.

###### **4.2.1 Qualitative Techniques**

Qualitative techniques have been used for compiling a list of the main risk sources and describing their likely consequences, without entering in details about the quantification of their probability of occurrence. (Merna and Njiru, 2002). The next step after all sources of risk are identified is to define some kind of order of priority. Due to the limited time and resources generally available for this prioritization task, risk assessment may be biased towards the use of relatively simple procedures such as qualitative and semi-quantitative techniques (Ward, 1999).

Risk registers are one of the most common examples of qualitative approaches. A risk register is usually a tabular form document or database which list all risk relevant to the project, together with some information useful for the management of those risks (Simon *et al.*, 1997). According to Ward (1999), risk registers has the attraction of simplicity and convenience, but also has a number of shortcomings including: 1.Unsufficient description of individual risks drivers which might create ambiguity and misunderstanding; 2.Risk inter-dependencies are ignored; and 3.Limited guidance on the relative importance of individual risk drivers.



Semi-quantitative approaches have also been applied for ranking the risk by means of probability-impact (P-I) tables. In such tables, probability and impact of risks are subjectively assessed by using qualitative scaling factors (e.g. a five category scale might include: very high, high, medium, low and very low). Following, a range of values/weights are assigned to the qualitative scaling factors and P-I scores for each of the risks can then be derived by multiplying the values of their probability and impact. Finally, the most important risks (e.g. those with the highest P-I scores) are classified in order of severity (high, medium, low). Vose (2000) mentioned that the key drawback to the semi-quantitative approach is the high dependency of the process on the scale (e.g. linear, logarithmic) of values/weights that are assigned for the qualitative scaling factors.

#### **4.2.2 Quantitative Techniques**

Quantitative techniques aim to represent the likelihood and impact of risks in terms of the usual planning measures, such as time and money (Grey, 1995). Two of the most widely used quantitative risk analysis techniques in the financial appraisal of projects are: deterministic analysis techniques and probabilistic analysis techniques (Merna and Njiru, 2002).

##### Deterministic Techniques

Sensitivity analysis is probably the most representative approach among the deterministic techniques. Sensitivity analysis examines the effect of changes in the value of the model's dependent variable resulting from the changes in the value of one or more of the input variables to the model. The most popular form of sensitivity analysis is the one-factor-at-the-time approach, wherein the main advantage is that it allows interpretation of the results in an easily understandable way. Another form of sensitivity analysis is the "scenario analysis", which recalculates the model for a combination of simultaneous changes in the input variables (Van Groenendaal and Kleijnen, 1997). Frequently, three types of scenarios are distinguished: an optimistic case, a base case, and a pessimistic case. Some of the major shortcomings of using sensitivity analysis are: 1. Equal probability of occurrence is given to all scenarios (despite the likelihood of getting some scenarios with extreme values is lower); 2. Possible inter-dependencies between the variables are ignored; 3. In big projects with many items/activities, a combination of all variables can create a too large set of scenarios.

##### Probabilistic Techniques

There are two major probabilistic approaches to quantitative risk assessment: analytical approaches and simulation approaches. Analytical approaches require for each of the uncertain variables in a model to be associated with a probability distribution function (PDF) that mathematically describes its shape. Then, the PDF's of variables are mathematically combined to derive another PDF that describes the exact model distribution outcome. If the risk model would be described by the sum of two simple and independent distributions, then the analytical approach may be considered as a suitable option. However, risk models of real life projects are generally much complex and usually formed by several distributions that do not allow such simple mathematical manipulation, which makes this approach not practical for implementation (Vose, 2000).

Probabilistic simulation approaches overcome the main deficiencies of deterministic methods by assigning each of the uncertain variables with a PDF rather than single-value estimate. The

objective of a Monte Carlo simulation is to calculate the combined impact in the variability of the model's input parameters to determine a probability distribution of the possible model outcomes. The simulation technique involves a random sampling of values for each probability distribution within the model to produce hundreds or even thousands of scenarios (also called iterations or trials) which are used to create the probability distribution of the model outcome (Simon *et al.*, 1997; Vose, 2000).

## 5. THE UK VALUE FOR MONEY (VFM) APPROACH

Public finance constraints for maintaining and providing transport infrastructure have resulted in successive UK governments seeking to encourage the private sector participation in the development of road projects. Three potential types of projects (financially-free standing, joint ventures, and service sold) were identified to be implemented under the Private Finance Initiative (PFI) in the UK. Out of the three, the Design, Build, Financing and Operate (DBFO) scheme has been the preferred strategy for road financing. Just in England alone during the last decade, the Highways Agency have secured the private sector participation in ten DBFO road projects, from which eight have at present an operational status and the remaining two are still under construction.

### 5.1 Basis of the VFM Approach

The two fundamental requirements that every PFI projects must fulfill are: 1. Appropriate transfer of risk to the private sector; and 2. Achievement of VFM by the taxpayers. It is important to bear in mind that an optimum, rather than a maximum risk transfer is the objective of the PFI (Treasury Taskforce, 1999). Allocation of project risk to the private sector should only be sought if they are in a position to best control and manage the risks, or otherwise will result in a deterioration of VFM. But, what is VFM? According to Grout (1997), VFM for the public sector can be defined as realizing the lowest out-turn cost over the whole life of the contract. In order to demonstrate VFM, it is first necessary to develop a Public Sector Comparator (PSC) which is generally based on a similar historic publicly funded project that would serve as a benchmark for the PFI bid. The PSC must be expressed in present value amounts and should include the full cost of providing the required output as well as fully accounting for the risk that would be encountered by that style of procurement (Treasury Taskforce, 1998). A VFM conceptual framework for a PFI project is shown in Figure 5.

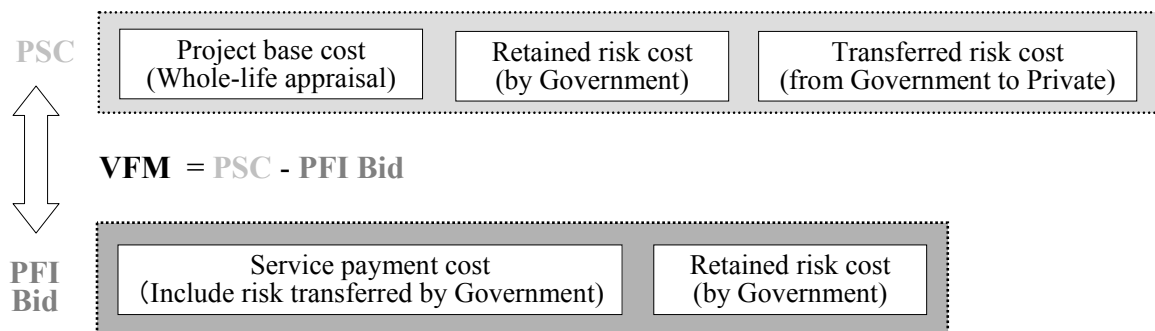


Figure 5. VFM Conceptual Framework in a PFI Project.

Considering the importance that risk allocation have in a concession project, the DBFO approach to highway projects in the UK as implemented under the PFI, may present the best

practice in the treatment of these risks (World Bank and MOCJ, 1999). The Highways Agency (1997) reported that VFM has been delivered in the first eight DBFO road contracts in England with average cost savings of about 15%. These VFM savings were obtained by comparing the net present value of the PSC with the net present value of the projected payment under the DBFO contract.

## 5.2 Shortcomings of the Current UK VFM Approach

Despite of the relatively successful experience of the UK government in introducing the PFI (with better results in roads and prison projects than in other sectors), the authors have identified some deficiencies and shortcomings in relation with the VFM approach that are worth to mention.

First of all, although the great importance that risk transfer has on evaluating the VFM, the guidance given by the central government on the construction of the PSC and the methodology for assessing the risk has been in many cases neither clear and transparent nor detailed enough. Illustrations on the working of the PSC methodology has been generalized too much because of preserving confidentiality, and just some pointers, instructions and clues had been given, rather than actual details on the procurement (Treasury Taskforce, 1999). Pollock (2002) have claimed that the whole methodology underpinning calculation of risks it is not clear at all, even though the whole of government policy is hanging on these claims of risk transfer that presumably give good VFM.

Following, a study by Akintoye *et al.* (2001) about the methodology used by governments for evaluating the risk in PFI projects identified that in the few cases where a full quantitative approach took place, the deterministic techniques were predominantly used. The Treasury Taskforce (1999) have also recognized that despite more sophisticated techniques (e.g. probabilistic simulation) could be employed as an alternative to the deterministic approach, it is recommended not to use them in every project due to the high cost usually required. A review on the limited publicly available information about risk analysis in PFI projects revealed that in the case of DBFO road projects, some risk simulation analysis was undertaken but solely for the construction cost variable. It seems that other important uncertain variables were not included in the risk analysis which put at stake the credibility of the obtained results.

At last but perhaps the most important issue is that the veracity of the cost savings brought by the VFM approach has been under growing skepticism by the general public due to the government refusal to disclose information on the valuation place on the risks, and on the fundamentals of the risk assessment methodology because of confidentiality reasons. The model contract and other tender documentation have included confidentiality clauses intended to preserve confidentiality for the duration of the road contracts (National Audit Office, 1998). The Wales Watch (2001) noted that any attempt to gain some insight as to whether the taxpayers have got a good deal always hits the brick wall of commercial confidentiality and therefore it is very difficult to see how any assessment can be made on the VFM if information related to the valuation of risk and discounting is kept secret. The details of risk assessment which underpins the VFM calculations should be available for the public in general and not exclusively to a few selected public bodies, that according to Heald (2003) are the only ones that can have access to PFI documentation on the conditions necessary for a comprehensive analysis on the VFM.

## **6. TOWARDS A MORE TRANSPARENT VFM RISK ASSESSMENT FOR DEVELOPING COUNTRIES**

The VFM approach is expected to bring, among other benefits, transparency about the government decision making process. However as this paper shows, despite of the better way for accounting the risks in PFI/PPP projects that the VFM methodology could bring, the approach taken by the UK government is lacking of transparency with the general public due to the decision of not revealing details about the risk assessment process undertaken in the projects and which makes part of the contractual documents. One of the reasons for the government and the private sector to agree in preserving confidentiality in their contracts is the possible advantages that other competitor parties could take from this experience in future governmental bidding projects. But by keeping contract information in secret, the presumable good VFM results claimed by the government were consequently at doubt, and some transparency organizations have argued that the public sector's reason for not releasing contract information is to avoid a possible public embarrassment (Wales Watch, 2001).

The "negotiation based" type of contract procurement used in the UK is probably at the core of the transparency problem. Allowing for negotiations at the bidding and awarding stages might let the private sector to propose innovative arrangement for designs, risk sharing, toll pricing and other elements of the bidding process (Fisher and Babbar, 1996). Its main deficiencies are the high public/private resources (time, effort, and cost) required, the complexity of evaluating alternative proposals, and the lack of a full transparent process (usually the details of the negotiations are not open to the public domain even years after the contracts had been signed). Other types of bidding procurement in which terms of contracts are clearly predefined, equal for all participants and where as little as possible is left for future negotiations (such as those used in Colombia, Chile and Argentina) are considered to be more competitive and transparent (World Bank and Ministry of Construction of Japan, 1999).

### **6.1 Considerations Before Applying the VFM Approach in Developing Countries**

Before considering the applicability of the VFM risk assessment approach in developing countries it is first necessary to understand the major differences that the approach will face in the context of developing countries given the sometimes contrasting environment (economic/social/political) in which it was originally implemented in the UK. Some of these differences are:

Contract type: The DBFO road procurement scheme as implemented under the PFI in the UK has not been tried in developing countries (Silva, 2000). Data analysis on the PPI project database (World Bank, 2004), demonstrate that the majority of private financing in road projects undertaken by developing countries has been of the concession type (for expansion or rehabilitation schemes), or of the greenfield type (for completely new schemes).

Payment mechanism: The shadow tolling mechanism (where payment to the concessionaires is not made by the direct road users but by the government itself through public taxes) used in the UK DBFO/PFI road schemes is probably not very attractive to governments of developing countries because it does not help to solve their budgetary limitation problem and privately financed projects would have anyway to be annually repaid by using public sector scarce funds. Instead, it is more appealing for them to newly implement or continue using the real tolling mechanism (where users are directly charged at tollbooths - users pay principle).

Procurement process: Being aware of the transparency shortcomings of the negotiation based type of procuring contracts used in the UK, it is recommended that developing countries implement simple, transparent and competitive bidding procedures. For fighting corruption and giving more transparency to the procurement process, recent steps taken by the government of Colombia are worth to mention (El Tiempo, 2002): 1. Creation of anticorruption watching bodies; 2. Awarding of contracts only at public hearings; 3. All bidding documentation (e.g. terms of reference of contracts, specifications) must be open and available to the general public view previous to the contract award.

Concession length: DBFO road contracts in the UK were bidden for fixed term concession periods (average of 30 years). In developing countries the concession period have varied from fixed terms in the early contracts to variable terms in lately concession agreements. The Least-Present-Value-of-Revenues (LPVR) approach suggested by Engel *et al.* (1998) is considered of best practice in dealing with variable term concessions in PPP road projects. The LPVR method is also helpful in reducing the traffic/revenue risk by allowing contracts to be lengthened whenever demand is lower than expected, or shortened when demand is higher than expected.

It seems from above that some developing countries have created effective mechanisms for procuring PPP projects, and this bring the question of why governments of those countries should consider applying the VFM approach? The main reason governments may have for considering applying the VFM approach is to not relying only on competition for achieving the best deal at the bidding process. Normally the winning bidder is the one that proposes the lowest cost for a predefined bidding criteria (e.g. LPVR, toll charges, etc.), even if this cost is greatly exceeding the estimate value that the government have anticipated for the project. While competition between the bidders might bring some tension into the tender stage, it cannot provide the compelling evidence that the government is getting the best value for the price it is paying (particularly when some incentives and support measures are given). The advantage of estimating a PSC adjusted for risk transferred could serve not only to provide a comparison benchmark for the proponent bids, but also to demonstrate that the risk transferred to the private sector are rewarded accordingly to the risk taken and not excessively. However, as previously mentioned, in order to achieve transparency using the VFM approach, it is necessary for the whole analysis and its risk quantification assumptions to be open to the general public and not just to the government authorities.

## **6.2 VFM Risk Assessment Methodological Approach for Developing Countries**

The VFM risk assessment proposed approach is based on a probabilistic Monte Carlo simulation model that aims at determining the probability distribution of the model outcomes (PSC, PFI bid revenue from toll collection) from which it would be possible to assess the VFM of the road project in a developing country. The proposed approach assumes that main risks which affect the project have been obtained at a preliminary risk identification stage, and also that needed risk response measures are already in place. The process for estimating the VFM in the proposed approach can be comprised of the following four main steps:

- 1) The first step is to set up the structure of the financial model in which a VFM risk assessment can be performed. For this purpose, the use of spreadsheets is advisable due to their enormous flexibility for representing the cost and revenue structures in a model. Moreover, spreadsheets allow direct interactions with several specialized risk analysis software packages in which risk modeling can be run.

- 2) The second step assigns a PDF for each of the uncertain variables in the spreadsheet model. In determining the PDF that best represent the variables, two different approaches are usually used: A) If there is available data on the variable, several techniques exist for fitting this data to empirical (non-parametric) or mathematical (parametric) distributions; and B) If data on the variable is not available, the parameters that define the distribution can be found through expert opinion (Vose, 2000).
- 3) The third step is to account for any correlation effect between the uncertain variables that will lead to build realistic models. The quantification of the correlation effect between the variables can be found in two alternative ways: A) If data is available, then it can be used for modeling the correlation between the uncertain variables; and B) If data is not available, correlations coefficients must be estimated from the subjective opinion of experts (Vose, 2000).
- 4) The fourth step consists of running the Monte Carlo simulation model and estimating the probability distribution of the outcome variable (PSC/PFI bid revenue from tolls). For the model to be correct, the effect of correlation between variables must be included.

In the process of building a VFM risk assessment model by governments of developing countries, several difficulties are likely to appear. First of all, the kind of data required for undertaking a formal assessment of risk in projects may be not available in most these countries. Therefore, input data for the risk model such as the PDF's and correlations must be obtained from the subjective assessment of experts or specialists. Following, governments of developing countries might also suffer from the in-house scarcity of skilled and experienced manpower for conducting proper risk assessment/management in their PPP projects, which forced them to rely on external consultants. Finally, carrying out probabilistic simulation approaches usually involve high costs which may act as a deterrent factor against the use of sophisticated risk assessment techniques.

## 7. CONCLUSIONS

Our review on the methodologies for assessing risk in projects shows that qualitative techniques are mostly preferred by governments due to their simplicity of use. In cases where quantitative analysis is needed, the tendency for governments has been to rely on external consultants. Probabilistic simulation techniques overcome the deficiencies of other approaches, but using these techniques is generally more complex and costly.

This study reveals that the VFM approach introduced by the UK government lacks transparency in dealing with general public. The government in the UK has refused to disclose information on the risk assessment methodology and the valuation of risk included in the contractual documents, due to commercial confidentiality reasons. However, by keeping contract information in secret, the presumably good VFM savings claimed by the government has been under growing skepticism by the general public. It was found that the transparency shortcomings of the negotiation based type contract procurement employed in the UK, can be overcome by using simpler, clearer competitive bidding procedures in which contract terms are specified in advance and the contracting parties barely rely on backdoor negotiations.

The study also identified that despite the effective procurement methods that some developing countries employ, the main reason for considering the application of the VFM method is not to rely solely on competition for getting the best deal at the bidding stage. While competition for a bidding criteria allows the government to choose the lowest cost proposal among bidders, it does not guarantee that this cost will not exceed the value the government have estimated for the project. The construction of a PSC can provide not only a benchmark for the private bid but also assures governments and the general public that the transferred risks are rewarded according to the risks taken. In order for the government to achieve transparency in their decision making, the proposed VFM risk assessment approach should be opened to the general public and not just for the public authorities.

## REFERENCES

- Akintoye, A. S. and MacLeod, M.J. (1997). Risk analysis and management in construction. **International Journal of Project Management**, Vol. 15, No. 1, 31-38.
- Akintoye, A., Beck, M., Hardcastle, C., Chinyio, E., and Assenova, D. (2001). **Framework for Risk Assessment and Management of Private Finance Initiative Projects**. School of the Built and Natural Environment, Glasgow Caledonian University, Glasgow.
- Asian Development Bank (2000). Developing best practices for promoting private sector investment in infrastructure: Roads. ADB, Manila
- Bhandari, A.S. (2002). Private sector participation in roads. **Workshop on Promoting Private Participation in Roads and Highways, Keynote Presentation**, Addis Ababa, Ethiopia, 26-28 June, 2002
- De Lemos, T., Betts, M., Eaton, D., and DeAlmeida, L.T. (2000). From concessions to project finance and the private finance initiative. **The Journal of Project Finance**, Fall, 19-37
- El Tiempo (2002). Biddings of institutions of the state will be awarded at public hearings. Bogota, 1 Oct., 2002 [in Spanish]
- Engel, E., Fisher, R. and Galetovic, A. (1998). Least-Present-Value-of-Revenue auctions and highway franchising. Working Paper 6689, National Bureau of Economic Research, Cambridge, Aug. 1998
- Estache, A. and Strong, J. (2000) The rise, the fall, and ... the emerging recovery of project finance in transport. World Bank Institute.
- Fisher, G. and Babbar, S. (1996). Private financing of toll roads. **RMC Discussion Paper Series No. 117**, The World Bank, December 1996.
- Fujii, Y. (1999). Economic development stages and toll road systems. **Proceedings Seminar on Asian Toll Road Development in an Era of Financial Crisis, Vol. 1, Session 1-2**, Tokyo, Japan, 9-11 March, 1999
- Grey, S. (1995). **Practical Risk assessment for Project Management**. John Wiley and Sons, Chichester.
- Grout, P. (1997). The economics of the private finance initiative. **Oxford Review of Economic Policy**, Vol. 13, No. 4, 53-66
- HM Treasury (2003). **The Green Book – Appraisal and Evaluation in Central Government**. The Stationery Office, London.
- Heald, D. (2003). Value for money tests and accounting treatment in PFI schemes. **Accounting, Auditing and Accountability Journal**, Vol. 16, No. 3, 342-371
- Highways Agency (1997). DBFO – Value in Roads: A case study on the first eight DBFO road contracts and their development. March, 1997
- Institution of Civil Engineers and Faculty and Institute of Actuaries (2002). **Risk Analysis and Management for Projects (PRAM)**. Thomas Telford, London

- Kumaraswamy, M. and Zhang, X.Q. (2001). Governmental role in BOT-led infrastructure development. **International Journal of Project Management**, Vol. 19, No. 4, 195-205
- Lam, P.T.I. (1999). A Sectoral review of risks associated with major infrastructure projects. **International Journal of Project Management**, Vol. 17, No. 2, 77-87
- Lam, W.H.K. and Tam, M.L. (1998). Risk analysis or traffic and revenue forecasts for road investment projects. **Journal of Infrastructure Systems**, Vol. 4, No. 1, 19-27
- Merna, T. and Njiru, C. (2002). **Financing Infrastructure Projects** Thomas Telford, London
- Ministry of Transport - National Institute of Concessions (2003). Terms of reference for the design, construction, operation, rehabilitation and operation of project "Bosa-Granada-Girardot" by the concession system - Concession contract, Bogota, Colombia, Oct. 2003
- National Audit Office (1998). **The Private Finance Initiative: The First Four Design, Build, Finance and Operate Roads Contracts**. HC 476, The Stationery Office, London.
- National Treasury (2004). Public private partnerships manual. National Treasury PPP Unit, South Africa
- PIARC (1999). Financing and economic evaluation: Introductory report. **21<sup>st</sup> World Road Congress, C9 Session**, Kuala Lumpur, Malaysia, 3-9 October, 1999
- Pollock, A. (2002). Experts tell Romanow Commission that public private partnerships are not the answer. Canadian Health Coalition. May, 2002
- Quartey Jnr., E.L. (1996). Development projects through build-operate schemes: Their role and place in developing countries. **International Journal of Project Management**, Vol. 14, No. 1, 47-52
- Ranasinghe, M. (1997). Private sector participation in infrastructure projects: A methodology to analyze viability of BOT. **Construction Management and Economics**, Vol. 17, No. 5, 613-623
- Silva, G.F. (2000). Toll roads: Recent trends in private participation. **Public Policy for the Private Sector, Note No. 224**, The World Bank Group, December 2000.
- Simon, P., Hillson, D., and Newland, K. (1997). **Project Risk Analysis and Management (PRAM) Guide**. The Association for Project Management, The APM Group Ltd., Norwich
- Szabo, F. (1999). Public-Private partnerships in Hungarian motorways construction. **Seminar on Public-Private Partnerships in Transport Infrastructure Financing**, ECMT, Paris, France, 12 January, 1999.
- Talvitie, A. (2000). Evaluation of road projects and programs in developing countries. **Transport Policy**, Vol. 7, No. 1, 61-72
- Treasury Taskforce (1998). **Public Sector Comparators and Value for Money**. Policy Statement No. 2, HM Treasury, London.
- Treasury Taskforce (1999). **How to Construct a Public Sector Comparator**. Technical Note No. 5, HM Treasury, London
- Van Groenendaal, W.J.H and Kleijnen, J.P.C. (1997). On the assessment of economic risk: Factorial design versus Monte Carlo methods. **Reliability Engineering and System Safety**, Vol. 57, 91-102
- Vose, D. (2000). **Risk Analysis: A Quantitative Guide**. John Wiley & Sons Ltd., Chichester
- Wales Watch (2001). A55? Ask me Another-That is Commercial in Confidence. 9 Jul., 2001
- Ward, S.C. (1999). Assessing and managing important risks. **International Journal of Project Management**, Vol. 17, No. 6, 331-336
- World Bank (2004). Private participation in infrastructure database. <http://ppi.worldbank.org/>
- World Bank and Ministry of Construction of Japan (1999). **Asian Toll Road Development Program - Review of Recent Toll Road Experience in Selected Countries and Preliminary Tool Kit for Toll Road Development**. Draft Final Report. May, 1999.