

Risk Management Framework

Typical Risks in Highway PPPs and Usual Arrangements for Sharing Them

Major risks in a highway PPP project usually include the acquisition of right-of way, construction, environmental, Operation and Maintenance (O&M), traffic, collection of tolls, competing roads, political intervention (policy reversals), inflation, forex (in cases involving foreign currency financing) and force majeure.

Of these, risks related to time and cost overruns during the construction phase as well as traffic volume and user fees (tolls) are of particular significance from the standpoint of private operators, as they are normally expected to absorb these risks.

In cases where private operators are not undertaking the construction on their own, this risk is mitigated through selecting an Engineering, Procurement and Construction (EPC) contractor through a bidding process, and entering into an agreement with suitable incentives and penalty clauses.

Traffic risk, on the other hand, is usually handled in two ways. Under the toll-based Build-Operate-Transfer (BOT) projects it is borne by the private operators (and investors financing them). An important variant of this approach is shadow tolling, wherein private partners do not collect tolls from the road users but nevertheless bear traffic risks, as they are paid on the basis of the volume of actual traffic.

In contrast, in the second approach, the government or its agency absorbs the traffic risk and the private partner is paid for making the specified level of road service available regardless of the extent of traffic, e.g. BOT-Annuity projects; these are also known as availability-based projects.

The Infrastructure and Law website of the World Bank presents typical risk matrices for toll roads (a shorter and a longer version) as well as a number of sample annotated concession agreements and links to other concession agreements and DBOs.



Infrastructure and Law website (UserID and password required; refer “Create account” for free access)

Risk analysis

It is important to address risk in the economic evaluation in order to assess the robustness of the conclusions and evaluate the likelihood of not achieving the intended economic objectives (as reflected by the NPV or EIRR).

In many cases this takes the form of showing the sensitivity of the rate of return to a number of separate eventualities (changes in assumptions about cost, construction

period, traffic growth rate, etc), and of demonstrating the switching point with respect to these variables, either singly or cumulatively.

More recently, however, it has become increasingly common to employ simulation methods (Monte Carlo type) to estimate a distribution of rates of return based on what are considered to be reasonable assumptions about the range and distribution of specific risks. The appraisal process requires evidence of the actions taken within the project design to mitigate major risks.



Transport Project Appraisal at the World Bank, Gwilliam, The World Bank, (2000), page 10



Recent trends in risk mitigation instruments for infrastructure finance; Innovations by providers opening new possibilities. Tomoko Matsukawa and Odo Habeck. PPIAF GRIDLINES 2007

Example: Colombia - Toll road concession project

A risk analysis was performed to test the effect on the economic feasibility of the project of probabilistic changes in the assumptions related to traffic growth, construction and maintenance costs, and generated traffic. Traffic was varied according to major deviations in economic growth during the analysis period, assuming a beta distribution of economic (and, consequently, traffic) growth rates between -0.2 and 1.5, with a median of 0.75. Generated traffic also is varied assuming a beta distribution with changes in the percentage of generated traffic from 0 to 1.2 of the estimated values and a median of about 0.9. Construction and maintenance costs were varied following a triangular distribution with a maximum of 1.7 and a minimum of 0.95 of the estimated costs. A Monte-Carlo simulation of these risks yields a distribution of economic rates of return with a probability of 25 percent of being lower than 12 percent in the case of not considering the passenger-time benefits and of about 11 percent in the case of including those benefits.



Colombia - Toll road concession project, The World Bank, project appraisal document, (1998)

Infrastructure Risk Modeling through INFRISK

Increased exposure to risk has been an inevitable consequence of recent economic, technological, and project finance transactions.

In the face of such developments, the viability of long-term capital investments—particularly in the core infrastructure sectors of power, transport, and telecommunications,

hinges critically on how the risks associated with such investments are evaluated and managed.

The World Bank Institute (WBI) has developed INFRISK. This is a powerful tool for quantitatively measuring and analyzing project risks, and also can serve as training for raising awareness and building expertise in the application of modern risk management techniques.

INFRISK is a flexible computer risk analysis approach to infrastructure project finance transactions.

With a user-friendly interface, INFRISK can analyze the exposure to a variety of market, credit, and performance risks from the perspective of key contracting parties (project promoter, creditor, and government) for both the construction and the operation phases of a capital investment project.

The output includes deterministic scenario analysis, probabilistic simulation, and multi-period Value-at-Risk analysis for key decision variables, such as net present value, internal rate return, debt service coverage ratio, and government tax revenues.

Drawing on recent developments in the literature on project evaluation under uncertainty, the program enables the use of a broader set of probability distribution (uniform, normal, beta, lognormal, student (t), and Bernoulli) in conducting Monte Carlo simulations rather than relying only on the commonly used normal distribution.

INFRISK works in conjunction with Microsoft Excel. A Getting Started booklet is provided for instruction on the use of the software.

A Global PPPI Portal has been developed in order to accommodate the demand for a more organized and systematic PPP network. The portal's virtual library of documents, e-discussion forum, calendar of events, and other functions is proposed by the WBI to improve the connection of remote PPP professionals around the world and enhance the global PPP knowledge economy.



<http://info.worldbank.org/etools/PPPI-Portal/>

Two factors distinguish the financing of infrastructure projects from corporate and traditional limited-recourse project finance:

- a high concentration of project risk early in the project life cycle (pre-completion),
- a risk profile that changes as the project comes to fruition, with a relatively stable cash flow subject to market and regulatory risk once the project is completed.

In the reference below, Dailami, Lipkovich, and Van Dyck describe INFRISK, a computer-based risk-management approach to infrastructure project finance transactions that involve the private sector.

Developed in-house by the World Bank Institute, INFRISK is a guide to practitioners in the field and a training tool for raising awareness and improving expertise in the

application of modern risk management techniques. INFRISK can analyze a project's exposure to a variety of market, credit, and performance risks from the perspective of key contracting parties (project promoter, creditor, and government). Their model is driven by the concept of the project's economic and financial viability.



A Computer Simulation Approach to Risk Management in Infrastructure Project Finance Transactions. Designed and developed by Mansoor Dailami, Ilya Lipkovich, and John Van Dyck. The World Bank Institute.