RISK MITIGATION IN INFRASTRUCTURE PROJECTS

BY

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A recent study by a global think tank estimates that India needs about $ 2.7 trillion in infrastructure investment over the next 10 years. Clearly the government does not have that kind of money. The involvement of the private sector and capital markets is therefore essential for India to meet its infrastructure needs. Unfortunately, the experience of the private sector in infrastructure projects in India has been less than favorable. Infrastructure projects generally require huge outlays of irreversible capital upfront in exchange for an uncertain stream of future cash that comes from user charges regulated by government fiat. The risk for the private player, both demand and regulatory, is substantial. Creative ways have been successfully employed in other countries to mitigate, transfer and share this risk. It is time for India to explore new structures to finance infrastructure projects.

The private sector in India typically shies away from BOT projects. In a BOT project, the private partner has the responsibility to finance, design, build and operate a facility for a specific period of time under a concession contract. The concessionaire typically gets a return on investment through user charges. Toll roads are an example of these types of privately financed infrastructure projects. Due to limited interest from private contractors, many of whom have been badly burnt from past BOT projects, The Ministry of Roads & Highways has had to resort to EPC type projects where all the funding, and hence all the risk, is borne by the government. This clearly is unsustainable, and policy makers have to think of innovative models to get private capital involved.

One of the problems is the way projects are evaluated. Most infrastructure projects in India are evaluated using standard discounted cash flow (DCF) and net present value (NPV) models--often called Life Cycle Cost models. These models are inherently flawed because they ignore the value of flexibility and learning that invariable occurs in projects with a long life. These traditional models work under the assumption that uncertainties and risks across the lifespan of an investment remain relatively stable. In reality, however, both demand uncertainty and regulatory uncertainty make future cash flows non-deterministic. In the face of project uncertainties these models cannot accurately predict project feasibility. These traditional models also lack flexibility. The project is seen as a now-or-never decision; if the NPV is positive the project is considered feasible, if NPV is negative the project is not viable. There is no room to model alterations to the project during its lifetime. This is a very restrictive given that it is virtually impossible to have infrastructure designed perfectly today and still be perfect 25 years later. In the real business world, implementation and strategy are constantly adapted through learning and new information. For example, traditional NPV analysis assumes that the project will operate in each year of its lifetime: abandonment is never an option built into the analysis. In reality, the right to sell the remaining cash flows from a project's life for a salvage value is a valuable option that can affect the NPV of a project. Research has shown that the NPV or life cycle cost methodology systematically undervalues every infrastructure project because of its failure to incorporate options and flexibility into projects.

Infrastructure projects are dynamic, and all contracts must be designed with 'options' to influence the project and alter the investment outcomes. Real Option Analysis (ROA) developed in Finance Theory as a variant of Financial Options provides a more flexible approach to valuing infrastructure investments. A Financial Option is defined as the right, but not the obligation, to buy or sell an asset for a predefined price during or at the end of an agreed period. A call option gives the option holder the right to buy, and a put option the right to sell, an asset at an agreed upon price X (called the strike price). The owner of the option will exercise the option only if it is advantageous for him to do so i.e., when the value of the asset (S) is greater than (in the case of a call option) or less than (in case of a put) the strike price X. The payoff for the option holder is the absolute value of S-X if the option is exercised, or 0 (zero) if it is not. It is this beneficial asymmetry with a zero or positive payoff that makes options valuable. This value in turn demands that owners of the option pay a price (called the premium) to the writer of the option.

ROA can be applied to all infrastructure projects especially those involving user charges; toll roads, water treatment plants, sewage treatment plants, power projects etc. The government, could provide incentives or subsidies in the form of ‘ guarantees ‘ to entice private investment and to improve the creditworthiness of a PPP project. A revenue guarantee, for example, promises to pay the private party a revenue shortfall, that is the difference between a minimum guaranteed revenue X and the actual revenue S at some point in time. If the revenue (S) falls below X then the payment to the private party is X-S, if not it is zero. This type of guarantee is akin to a financial put option owned by the private party which has a payoff of Max(X-S, 0) (read as the higher of X-S or 0).

The reverse of a minimum revenue guarantee is a mechanism known as Revenue Cap in which the government is entitled to a share of revenue if it is beyond a specified threshold. In this case if revenue S exceeds the threshold X, then the private party pays the government S-X, and if it doesn’t then it is zero. This type of contract is akin to a call option owned by the government which has a payoff of Max (S-X, 0).

The combination of the Minimum Revenue Guarantee and Revenue Cap provisions create a risk and revenue sharing mechanism between the government and the contractor. Like Financial Options these Real Options have value and can be quantified using numerical techniques. The price the owner of the options would pay to acquire the option can be calculated using Binomial Lattices, Monte Carlo algorithms and in some cases closed form solutions like the Black-Scholes options pricing model. Studies have shown that projects which were previously unfeasible based on NPV become feasible when ‘optionality’ is added to the project. ROA captures the true value of the project, i.e., its NPV plus flexibility value – effectively, the expected value of the change of NPV over the option’s life. Since options have “value” the true Project Value = NPV + Option Value. A series of options can be built into each project with contractors having the option to bid on their value.

The value of an option is a function of the uncertainty regarding future costs and revenues. As with Financial Options, the value of a Real Option increases as uncertainty increases. This characteristic makes the inclusion of options in infrastructure projects even more relevant because in this context project uncertainty becomes a driver of value and can be viewed as a positive element. This is important because infrastructure decisions are rarely one-time events, and typically involve several stages with lots of uncertainties (both technical and political).

ROA is a useful analytical tool when the following conditions apply to an infrastructure project:

a) there are real options embedded in the project: expansion, abandonment, temporary suspension, deferral, alternative use, technology upgrade, options to switch, options to contract.
b) there is uncertainty about future revenues and costs
c) there is flexibility in the implementation of the project where an initial decision made at the start of the project can be altered and extra decisions can be made during the later stages of the project.
Flexibility in implementation includes the following:
1) Scale up and down options; abandonment for salvage value (toll roads)
2) Options to switch to allow the flexibility of new technologies to be introduced during the process (sewage treatment, water treatment projects)
3) scope up and down options which allow management to offer additional / or reduced products (telecom)

Including Real Options in infrastructure projects also opens up the possibility of designing financial instruments where these options can be traded in capital markets either as standalone instruments or in conjunction with the underlying assets through a special purpose vehicle (SPV). Project risk can be transferred from the contractor and the government to the capital markets. These instruments broadly known as "asset backed securities" (ABS) are commonly used to fund infrastructure projects in many developed countries. All 'utility-type' infrastructure projects which have a regular (and contractual) stream of cash flows from user charges like toll roads , water and sewage treatment plants, can be financed through a bank backed SPV using debt or equity type instruments which allow sharing of risk (and return) among thousands of market participants as opposed to direct government financing and/or PPP models where the entire risk is borne either by the government or the private vendor. These types of capital-market created instruments bring transparency and discipline to the process and enable the proper pricing of all projects. It is hard to imagine that a government bureaucrat would do a better job of pricing project risk than the collective wisdom of thousands of capital market participants. In India capital market funding of infrastructure projects is negligible. Almost 60% of the infrastructure projects are funded with public funds and another 35% from commercial banks and non-bank financial companies. This is a crying shame for a country with a $ 2 trillion capital market.

Another problem with infrastructure projects in India is that the concession term is usually fixed. In such auctions, demand risk is never optimally assigned due to the stochastic nature of the revenues collected by the private contractor. A better way to allot the project would be on a "Least-Present-Value-of-Revenue" (LVPR) basis where the project is auctioned to the private contractor that bids the lowest present value from user charges. The bidding variable is no longer the toll rate or the concession length but the present value of toll revenue. The concession term is not fixed—instead what is fixed is the present value of revenues the contractor desires from the project, with the concession term being over as soon as that present value of revenues is obtained. LVPR provides flexibility to contracts by allowing the concession period to be automatically prolonged (shortened) if user charges are less (more) than estimated. The abandonment option also gets automatically built into it since any salvage value from an abandoned project gets factored into the present value of revenues. And since the concession term is not fixed it eliminates the need for frequent renegotiations that normally accompany fixed term concessions.

Finally, to make infrastructure projects more sustainable the government has to do abandon the L1 (lowest bidder) method for awarding contracts. The principal of “winner’s curse” in economics deals specifically with this problem and why choosing the lowest bidder is a suboptimal solution both for the bidder and the project owner. Since all bidders have equal information on project value, the ‘true’ cost of the project should be the average value of all bids. Why then did the L1 bidder bid less that the true project cost? Since the bidding process is highly competitive, the L1 contractor is forced to bid low. But he also understands that while the low bid will not return an adequate profit as such, once the contract is awarded he becomes a monopolist and can use his superior information and monopolistic power to make the project profitable either through cost escalations or shoddy performance. Awarding contracts on the L1 basis is therefore no panacea because it fails to determine the final cost or quality of the job. Instead, the government should do what is commonly done in countries like the USA and Israel where the lowest bidder and the highest bidder are thrown out and the remaining bidders are brought in for negotiations. It is no wonder that the average sewage treatment plant lasts 19 years in the USA and 5 years in India. You get what you pay for with L1--the winner’s curse.