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A Review of Tools for Project Financial Assessments

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Abstract

Governments not always have the funds to build transport and other infrastructure projects that are economically justified and environmentally and socially sound. Under certain circumstances, projects meeting such conditions can be implemented by involving private financing, through public-private partnerships (PPP), which is a means to get projects completed by leveraging scarce public resources. In a PPP project, the sources of revenue to the private partner (or concessionaire) may include (i) the users of the facility (e.g., road tolling), (ii) the government (e.g. through availability payments, capital grants and shadow tolls), and (iii) both users and government, which is usually called a hybrid concession. As a key step in considering attracting private investors for such projects, decision makers and practitioners need to assess their financial viability, an endeavor that can be greatly facilitated by relatively simple tools now available. This paper reviews and provides case studies of two existing tools for assessing the financial viability of: (i) hybrid road PPP projects, which involve both tolls and availability payments; and (ii) output- and performance-based road contracts (OPBRC), which involves payments by the government. The main output generated by both models include the project's internal rate of return, equity internal rate of return, annual debt service coverage ratio and the present value of the government's cash flow.

Keywords: PPP; PBC; OPBRC; transport infrastructure; tolling; availability payments; financial assessment

1. Introduction

There has been a substantial contribution of the private sector to finance roads and other forms of transport infrastructure across the world. In 2017, private investment commitments in energy, transport, ICT and water

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infrastructure in developing countries (i.e., low- and middle-income countries) totaled US$93.3 billion (World Bank, 2017a). Private investment commitments in developed countries have also been substantial.

Driving policy makers' continued interest in attracting private financing to transportation projects is the need for greater investments to keep transport infrastructure in acceptable condition and carry out required expansions in a context of public budget constraints. When arrangements for private participation or, more generally, public-private partnerships (PPP) are designed well, they can lead to (Mladenovic and Queiroz, 2014):

(1) Greater financial efficiency, by leveraging public money through the mobilization of private capital, reducing the impact of investments in infrastructure on the fiscal budget, and creating fiscal space to expand public service delivery in other sectors;

(2) Better distribution of risks, by transferring design, construction, and performance risks to the private sector, which is best able to manage such risks; and

(3) Better governance, by increasing the accountability of the service provider through competitive bidding, disclosure policies, and public reporting.

Government support to potential PPP projects is justified when an economically feasible project does not offer, without such support, the financial benefits required to attract private concessionaires. The mixing of public and private funding to get projects completed is a way to leverage scarce public resources, not just replace them. Because transport infrastructure is so essential to a well-functioning, growing economy, it is vital that subsidy funding is well spent and helps to deliver infrastructure services people really need at the least possible cost (World Bank, 2012).

In a PPP project, the sources of revenue to the private partner (or concessionaire) may include (i) the users of the facility (e.g., road tolling), (ii) the government (e.g. through availability payments, capital grants and shadow tolls), and (iii) both users and government, which is usually called a hybrid concession.

As a key step in considering attracting private investors for such projects, decision makers and practitioners need to assess their financial viability, an endeavor that can be greatly facilitated by relatively simple tools now available.

This paper reviews and provides case studies of two existing tools for assessing the financial viability of: (i) hybrid road PPP projects, which involve both tolls and availability payments (AP); and (ii) output- and performance-based road contracts (OPBRC), which involves payments by the government. The main output generated by both models include the project's internal rate of return, equity internal rate of return, annual debt service coverage ratio and the present value of the government's cash flow.

2. Financial Tools Available

There are several toolkits available for the analysis and ex-ante assessment of highway PPP projects. These toolkits provide a wide range of tools and manuals that may assist stakeholders involved in PPP projects from early phases of project development to financial closure and implementation, as summarized below.

The Government of India (2010) released a web-based toolkit for the improvement of the decision-making process in PPP arrangements for the delivery of infrastructure projects. The toolkit can be used for the assessment of highway projects, which is one of five sectors covered. It is suitable for detailed analysis of greenfield and brownfield projects. The primary resources of revenues considered are user charges, shadow tolls, and annuities. Results consist of a set of accounting ratios such as debt service coverage ratio, loan life cover ratio, return on assets, net profit margin, and return on equity. Also, results cover a set of output parameters related to the project such as the project's internal rate of return and net present value, and shareholder accounts, such as the equity internal rate of return and the equity net present value.

Beaty and Lieu (2012) developed an Early-Stage Toll Revenue Estimation Model. The model is standalone, spreadsheet-based, and prepares early stage traffic and toll revenue estimates, and allows a user to simultaneously examine the interaction of multiple tolling variables and traffic scenarios, so the agencies can make an informed decision about future toll road projects.

In 2013, the Federal Highway Administration's (FHWA) Office of Innovative Program Delivery launched a new toolkit, P3-Value, Public-Private Partnership Value-for-Money Analysis for Learning and Understanding Evaluation (FHWA, 2013). Although the main purpose of the toolkit is to help decision makers in the "value-for-money" analysis, it covers other important aspects of PPPs such as risk evaluation and financial feasibility. This toolkit consists of four tools, namely a risk analysis tool, a public sector comparator (PSC) tool, a shadow bid tool, and a financial assessment tool, all Microsoft Excel based and supported by associated manuals. Subsequently, the US Department of Transportation (2016) published a related Guidebook on Financing of Highway Public-Private Partnership Projects.

The World Bank, supported by the Public-Private Infrastructure Advisory Facility (PPIAF), developed a Toolkit for Public-Private Partnership in Roads and Highways (PPIAF, 2009) - the Toolkit - to assist policy makers in implementing procedures to promote private sector participation and financing in roads. The Toolkit includes financial models (in graphical and numerical formats) that can be used for the financial assessment of PPP toll roads.

Based on the Toolkit toll road graphical financial model, two models were developed to assess the financial feasibility of (a) hybrid PPP projects, that is, projects involving both tolling and availability payments (Mladenovic and Queiroz, 2018a), and (b) Output- and Performance Based Road Contracts (Mladenovic and Queiroz, 2018b), a form of performance-based contract as standardized by the World Bank (2017b). Both models are discussed in the next sections.

3. Financial model for tolling and availability payment PPP projects

As in the original Toolkit model (PPIAF, 2009), the hybrid (i.e., toll plus availability payment) financial model includes five worksheets (Mladenovic and Queiroz, 2018a): Data Sheet, Cash Flow Graph, Debt Graph, Dividend Graph, and Summary of Assumptions and Results. The main results produced by the model include five key project financial indicators (PPIAF, 2009):

- Project IRR – the project financial Internal Rate of Return for the concession period (in real terms)
- ROE - the Return on Equity for the concession period (in real terms)
- Minimum ADSCR - the minimum Annual Debt Service Coverage Ratio
- Minimum LLCR - the minimum Loan Life Coverage Ratio
- PV – present value of the net financial contribution from the government.

Under a hybrid project, in addition to tolls collected from road users, the concessionaire receives annual payments (usually called availability payments or annuities) from the government. The government pays the required annual availability payment to the concessionaire and may also pay subsidies during the construction period, and recovers corporate tax and value-added tax (VAT) during the operation and maintenance (O&M) phase of the project. PV, as calculated by the model, shows the present value of the financial balance for the government throughout the concession period. The tax amounts (corporate tax and VAT) are considered positive (for this purpose), while government payments to the concessionaire are considered negative. When PV is zero, the project is fiscally neutral for the government. If PV is negative, it means that the taxes received by the government during the project life are less than the government financial contribution to the project, in terms of availability payments and subsidies. In this case, PV is shown in red in the graph sheets of the financial model.

In practice, the hybrid financial model has several applications, such as: (a) Given the existing (or forecast) traffic volume and maximum acceptable toll rate for a particular road project, the model can be used to estimate the minimum availability payment required for the project to attract private sector interest, that is, potential bidders in a competitive bidding scenario; and (b) Carrying out sensitivity analyses of the impact of key input parameters (e.g. capital cost, concession life, loan terms) on outputs such as the (i) investor's return on equity (ROE), and (ii) annual debt service cover ratio (ADSCR).

Applications of the model include estimating, for the project prevailing conditions, what levels of ROE and ADSCR will be required for the project to attract investors and lenders. If such parameters are lower than a certain threshold, it is likely that there will not be a good degree of competition in the competitive bidding process to select the concessionaire. In an extreme case of low ROE and ADSCR, there may be no bidders at all. The minimum required ROE and ADSCR tend to be higher in developing countries compared with developed countries.

Return on equity (ROE) is a measure of profitability of the concessionaire (or project company, or special purpose vehicle - SPV). Assessing the required ROE in a project is a difficult exercise. If a prospective bidder can find lower risk options (e.g., bond market or a bank savings account) that yields the same ROE as the project, it is likely that such company would not bid for the project, opting instead to invest in the other options available.

The most commonly used approach to estimate ROE is the Capital Asset Pricing Model (CAPM), which uses the following formula (PPIAF, 2009):

$$ROE = Rf + (\beta \cdot MRP) \quad (1)$$

where:
Rf = risk free return;
β = a measure of systematic risks (the higher the risk the higher β); and
MRP = Market Risk Premium (typically between 3% and 9%).

Typical ROE values for developing countries are around 12% to 16%, in real terms. Substantially lower values (say 6% to 8%) would apply to developed economies.

ADSCR represents, for any operating year, the ability of the project company (i.e., the concessionaire) to cover the debt service considering the assumptions made in the model. This ratio is determined as follows:

$$ADSCR_i = \frac{CBDS_i}{DS_i} \quad (2)$$

where:
ADSCRi = the annual debt service cover ratio in year i;
CBDSi = the net cash flow before debt service in year i (i.e., the amount of cash remaining in the project company after operating costs and taxes have been paid); and
DSi = the debt service to be paid in year i (principal plus interest).

A project is considered viable for the lenders when the ADSCR is greater than 1. If a margin of say 10% is deemed appropriate, then the ADSCR should be at least 1.10, for every year of the loan life. Generally, the minimum ADSCR should be greater than 1.2 (in the case of low risks) and greater than 1.4 where risk is assessed to be higher, which is usually the case in developing countries. More details are provided in Module 2 of the Toolkit for PPP in Roads and Highways (PPIAF, 2009), which may be accessed at:

https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/highwaystoolkit/2/2-34.html

While launching a concession project that requires availability payments (AP), in combination with tolls or not, a country should be aware that AP creates future liability for the government, and hence limits its future resources to invest in other needed projects. Nevertheless, when a "users pay" type of project is not feasible (due, for example, to user inability or unwillingness to pay the minimum required toll rate, or because of low traffic volumes), AP may be used to complement the limited toll revenue (Mladenovic and Queiroz, 2014).

4. Hybrid PPP case study: Minimum availability payment to keep tolls at an affordable level

This case study focuses on estimating availability payments (also called annuities, as in South Asia), as a complement to toll revenues, where such revenues are not enough for the project to attract private partners. We will use publicly available data from a proposed road concession in the states of Minas Gerais and Goiás in Brazil, the BR-364/365 Concession, with a total length of 437 km. The selected concessionaire will be responsible for upgrading and rehabilitating sections of the road and operating and maintaining the entire road during a 30-year concession life, including an initial 2-year investment phase and a 28-year operation and maintenance (O&M) phase. The following preliminary data, obtained or inferred from the website of the Brazilian National Agency for Land Transportation (ANTT, 2019), were used as input to the hybrid financial model (authors' assumptions were used to complement the required input data):

Concession life: 30 years
Upgrade/rehabilitation cost during the 2-year investment phase of the contract: \$700 million
Annual maintenance cost in subsequent years of the contract: \$23 million per year (at opening year)
Annual average daily traffic (AADT): 4,500 vpd
Annual traffic growth: 2.5%
Capital structure: Equity, 25%; Loans, 75%
Nominal interest rate: 7% per year
Loan grace period: 2 years
Loan repayment period: 13 years
State discount rate (in nominal terms): 10%
Inflation: 4% per year
Tax rates: (a) equivalent value added tax (VAT): 8%; (b) Corporate tax: 18%
Amortization period: 28 years

Let us also assume that the following targets (or constraints) will have to be met for the project to be able to attract private investors (typical developing country parameters, deemed applicable to Brazil):

Equity Internal Rate of Return (or Return on Equity): ROE $\geqslant$ 14% (in real terms)
Annual Debt Service Cover Ratio: ADSCR $\geqslant$ 1.4

Using the information above, the hybrid model can be used to estimate the minimum required availability payment to attract private investors, and at the same time keeping the toll rate at an affordable level. As a first step, we will assume an availability payment equal to zero and estimate the required toll rate. Application of the model shows that a weighted average toll rate (WATR) of \$73.30/vehicle would be required.

Toll affordability levels are usually expressed in terms of the maximum toll rate that car drivers are willing and able to pay, expressed in \$/car-km. Based on prevailing toll rates on Brazilian federal roads (ANTT, 2019), it seems fair to assume, in the absence of specific studies and surveys for BR-364/365, that a maximum affordable rate of \$0.04/car-km would apply.

The relationship between the weighted average toll rate and the toll rate for cars, trucks, buses and motorcycles can be written as:

$$WATR = (PC \cdot TRc + PB \cdot TRb + PT \cdot TRt + PM \cdot TRm)/100 \tag{3}$$

where:
WATR is the weighted average toll rate per vehicle;
PC, PB, PT and PM are the percentages of cars, buses and light trucks, heavy trucks, and motorcycles in the traffic flow; and
TRc, TRb, TRt and TRm are the toll rates for cars, buses and light trucks, heavy trucks, and motorcycles.

In Brazil (and several other countries), the toll rate for a commercial vehicle is equal to the toll rate for cars times the vehicle's number of axles, and the toll rate for motorcycles is equal to half the toll rate for cars. Based on the above and the estimated traffic composition, the following relationships between toll rates for different types of vehicles were assumed as representative of BR-364/365:

- Average bus and light truck toll rate = 2.5 x car toll rate
- Average heavy truck toll rate = 5 x car toll rate

Average traffic flow composition will be assumed as: PC, 58.4%; PB, 15.7%; PT, 22.9%; and PM, 3.0%.

Based on the above, the equation for WATR can be re-written as:

$$WATR = (58.4 \cdot TRc + 15.7 \cdot 2.5 \cdot TRb + 22.9 \cdot 5 \cdot PT \cdot TRt + 30 \cdot 0.5 \cdot TRm)/100 \quad (4)$$

or

$$TRc = WATR/2.136 \quad (5)$$

WATR was computed by the model as $73.30/vehicle. Consequently, for the proposed road concession, a car toll rate of $73.30/2.136 or $34.32/car would be required. As the total road length is 437 km, the unit toll rate will be 34.32/437 or $0.079/car-km. If such rate is considered affordable, there would be no need for availability payment.

However, if we assume that a maximum affordable toll rate of $0.04/car-km would apply, we can use the hybrid model to estimate how much availability payment would be required to meet the financial constraints adopted, i.e., ROE and ADSCR. Accordingly, Table 1 shows the WATR and the related car toll rate, which would be required for availability payments varying from zero to $60 million/year. By interpolation, it can be found that an availability payment of $59 million/year would be required to keep the toll rate at $0.04/car-km. In case it is shown that a higher toll rate, say $0.05/car-km, would be affordable, the availability payment could be reduced to $44 million/year, also obtained by interpolation of the data in Table 1.

In a scenario of competitive bidding to select the concessionaire, the road agency could, for example, fix the toll rate to be charged to the users (say $0.04/car-km), and let the bidders offer the minimum availability payment they would require. Based on the data used and the calculations made, the road agency could expect bids demanding availability payment of around $59 million/year.

Table 1. Estimated relationship between required availability payment and affordable toll rate for BR-364/365 proposed road concession in Brazil.

Availability Payment ($ million/year)	Weighted Average Toll Rate, WATR ($/vehicle)	Toll Rate per Car ($/car)	Unit Toll Rate per Car ($/car-km)
0	73.3	34.32	0.079
10	67.3	31.51	0.072
20	61.2	28.65	0.066
30	55.1	25.80	0.059
40	49.0	22.94	0.052
50	42.9	20.08	0.046
60	36.8	17.23	0.039

5. Estimating annual payments under an output- and performance-based road contract (OPBRC)

Road agencies across the world have shown an increased interest in adopting performance-based contracts (PBC) for road maintenance as a means to increase the efficiency of maintenance operations. PBC differ substantially from method-based contracts that have been traditionally used to maintain transport infrastructure. PBC is a type of contract in which payments for the management and maintenance of an asset are explicitly linked to the contractor successfully meeting or exceeding certain clearly defined minimum performance indicators (Stankevich et al., 2005).

Performance based contacts may have different forms and include activities like routine and/or periodic maintenance. Routine maintenance occurs every year and comprise works on cleaning and maintenance of pavements, structures, signalization, drainage, vegetation control, as well as winter maintenance. Periodic maintenance includes road resurfacing, road and bridge rehabilitation and reconstruction.

A specific type of PBC has been standardized by the World Bank, namely the Output- and Performance Based Road Contracts-OPBRC (World Bank, 2017b). A user-friendly tool has been developed for estimating the annual payments by the government that will be required by potential contractors to undertake an OPBRC project. The model is particularly helpful to a road agency planning to launch an OPBRC program to make an estimate of the annual payments that the agency will have to make to the private contractors (Mladenovic and Queiroz, 2018b).

The model can also be applied to other types of transport infrastructure, such as a container terminal or a waterway. The model can be used to carry out sensitivity analyses. For example, the user can change the value of an input parameter (e.g., construction/rehabilitation cost) and obtain the resulting impact on the equity internal rate of return, or another key model output.

6. OPBRC case study: Estimating required annual payments under a potential contract

This case study demonstrates an application of the OPBRC financial tool to estimate the amount of the annual payments the government can expect to make under a proposed contract.

Let us assume that a road agency wants to award a 7-year performance-based contract (OPBRC) for rehabilitating a given road section in year 1 and maintain the road to comply to specified performance indicators in the subsequent years of the contract. The unknown is the minimum Annual Payment that a potential OPBRC contractor will require from the road agency to undertake the proposed contract. The following data is available for the contract:

Contract life: 7 years
Rehabilitation cost in the first year of the contract: US$20 million
Annual maintenance cost in subsequent years of the contract: $1 million per year (at opening year)
Capital structure: Equity, 25%; Loans, 75%
Nominal interest rate: 7% per year
Loan grace period: 1 year
Debt maturity: 5 years
Discount rate (real terms): 6%
Inflation: 4% per year
Tax rates: (a) VAT: 15%; (b) Corporate tax: 20%
Amortization period: 6 years

Let us also assume that the following targets (or constraints) will have to be met for the project to be able to attract private investors:

Equity Internal Rate of Return (or Return on Equity): ROE $\geqslant$ 14%
Annual Debt Service Cover Ratio: ADSCR $\geqslant$ 1.2

As a first step, the user should enter the data provided using both the Data and the Cash Flow Graph worksheets of the model. Assuming there are no revenues to the contractor other than the Annual Payment, the “Initial Payment” in the Cash Flow Graph will be the Annual Payment required by the contractor.

The user can now go to the Cash Flow Graph and obtain the minimum Annual Payment ($ million) by trial and error, by varying the Initial Revenue so that the financial indicators calculated by the model are equal to, or just above the minimum required threshold given above for the two indicators considered critical for the project: ROE and ADSCR. By doing this, the user should find that an Initial Annual Payment of $7.3 million is the minimum amount that would satisfy both indicators.

In a scenario of competitive bidding to select the OPBRC contractor, the road agency could expect bids demanding annual payments of about $7.3 million/year.

7. Summary and conclusions

Two PPP financial models were discussed in the paper: a hybrid financial model and a model to estimate annual payments required under Output- and Performance-Based Road Contracts (OPBRC). Use of the former was illustrated by a case study focused on preliminary data available for a proposed toll road concession in Brazil, the BR-364/365 Concession. Following an assumption of the maximum affordable toll rate on the road, the model was used to estimate the minimum annual availability payment that the road agency can expect to make for the project to attract private investors (or bidders). A practical example was also shown to compute required annual payments under OPBRC contracts.

It seems fair to conclude that the two models shown will facilitate public and private entities to estimate financial requirements under hybrid and OPBRC PPP projects in the road sector. While the models have been developed specifically for roads, their application to other types of infrastructure (e.g., waterways, port terminals, water and sanitation) can be explored through relatively simple adaptation.

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