Financial Assessment of PPP Projects: a Modeling Exercise

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Objectives of the Exercise

- This practical session will provide participants with an opportunity to learn how to use the graphical and numerical financial simulation models of the Toolkit for PPP in Roads and Highways.

- Following completion of the exercise, the participants should be able to work on several PPP issues, such as the main factors defining the minimum tariff (e.g., toll rate), or minimum availability payment required for a PPP project to attract private investors.
Toolkit for PPP in Roads & Highways

• Funded by the Public-Private Infrastructure Advisory Facility (PPIAF); implemented by the World Bank

• Assists policy makers to implement procedures to promote private sector participation in the financing of roads

• Includes a financial model in two versions, graphical and numerical

• Available in English and Russian at: http://go.worldbank.org/P2XMGNYLD0
Graphical and numerical financial models of the Toolkit for PPP in Roads and Highways

- User friendly, simplified tools for scrutinizing PPP projects, including possible toll rates and subsidy levels

- Highlights the key parameters which affect the financial viability of a PPP

Key financial indicators that can be calculated with the financial models of the Toolkit

- Project Financial Internal Rate of Return (FIRR or IRR)
- Return on Equity (ROE)
- Annual Debt Service Cover Ratio (ADSCR)
Main financial analysis indicators

- **Project Internal Rate of Return (or Project IRR)**
  - Financial return or yield of the project regardless of the financing structure
  - Project is considered to be financially viable when Project IRR is above a benchmark rate of return with respect to the country, sector and project characteristics (8% or more in real terms, depending upon countries and financial markets)

\[
\text{OCFBF} = \text{Operating Cash-Flows Before Financing}
\]

\[
\sum_{i=\text{first year of construction}}^{\text{end of concession}} \frac{(OCFBF)_i}{(1 + \text{PROJECT . IRR})^i} = 0
\]
Equity Internal Rate of Return (or Equity IRR)

- Yield of the project for the shareholders through the remuneration of their investment with dividends
- The project is profitable for the shareholders when Equity IRR is high. Generally, a minimum expected return rate (real return) is 10% (Shadow Toll) or 17% (Toll Roads). This Equity IRR minimum is called **Hurdle Rate**.

\[
\sum_{i=\text{first year of construction}}^{\text{end of the concession}} \frac{-\text{Equity injected}_i + \text{dividends}_i}{(1 + \text{Equity.IRR})^i} = 0
\]
**Annual Debt Service Cover Ratio (ADSCR)**

- Represents the ability for the project company to cover/repay the debt
- Project estimated viable for the lenders when the ADSCR is greater than 1 for every year of the project life. Generally, the minimum ADSCR should be greater than 1.2.

\[
\text{CAFDS} = \text{Cash Available For Debt Service}
\]

\[
(\text{Debt Service})_{i,n} = \text{Principal}_{i,n} + \text{Interest}_{i,n}
\]

\[
\text{ADSCR}_n = \frac{(\text{CAFDS})_n}{3 \sum_{i=1}^{n} \text{Debt Service}_{i,n}}
\]
Instructions to Participants

• Please form teams with one or two members each

• Each team will be given basic data (or assumptions) for a proposed PPP project and will be asked questions on the financial assessment of the project

• Please choose the team member who will make a brief presentation of your team’s results, after deliberations

• Please assume that previous studies have shown that the proposed project is economically justified, and socially and environmentally sound
Basic data to be used by each team

- Concession term: 30 years
- Construction Cost: US$60 million
- Road length: 100 km
- Three-year construction, with progress rates:
  - Year 1: 20%; Year 2: 50%; Year 3: 30%
- Operating expenses: $6 million per year (at opening year); no variable operating expenses
- Capital structure: Equity, 30%; Subsidies, 0%
- Nominal interest rate: 12% per year
- Loan grace period: 3 years
- Loan repayment period: 13 years
- Discount rate (real terms): 10%
Basic data to be used (cont’d)

- **Initial daily traffic (opening year), vehicles/day:**
  - AADT = 3,800 vpd

- **Traffic composition:** cars, 50%; trucks, 45%; buses, 5%

- **Traffic growth:** 5% per year

- **Inflation:** 6% per year

- **Tax rate, VAT:** 10%; **Corporate tax:** 24%

- **Link to the Financial Model**  [Link]
Financial Indicator Targets

The following targets (or constraints) are assumed to be required for the project to attract private sponsors:

- Project Financial Internal Rate of Return: FIRR ≥ 12%
- Equity Internal Rate of Return (or Return on Equity): ROE ≥ 16%
- Annual Debt Service Cover Ratio: ADSCR ≥ 1.2
Questions to each team

1. Please estimate the minimum toll rate per average vehicle, in (a) $/veh, and (b) $/veh-km, for the project to be able to attract private investors.

Note: The minimum toll rate ($/veh) can be obtained by trial and error using the “Cash Flow” sheet of the graphical financial simulation model (or the “Assumptions” sheet of the numerical model) of the Toolkit. After you have entered all the data applicable to your specific project, you can vary the toll rate so the financial indicators calculated by the model are just above the minimum required threshold.
Questions to each team (cont’d)

2. Please estimate the minimum car, truck, and bus toll rates, in (a) $/veh, and (b) $/veh-km, for the project to be able to attract private sponsors. Please assume the following relationships between toll rates for different type of vehicles:

- Average truck toll rate = 3 x car toll rate
- Average bus toll rate = 2 x car toll rate
Note regarding the solution to Question 2

The toll rate in the graphical model (WATR) is:

$$WATR = \frac{(%C \times TRc + %T \times TRt + %B \times TRb)}{100}$$

where WATR is the weighted average toll rate per vehicle; %C, %T, and %B are the percentages of cars, trucks, and buses in the traffic flow; TRc, TRt, and TRb are the toll rates for cars, trucks, and buses, respectively.
Toll rates for trucks and buses

The example of Brazil:

\[ TRt = \text{Number of axles} \times TRc; \quad TRb = \text{Number of axles} \times TRc \]
Questions to each team (cont’d)

3. *Closing the affordability gap with government subsidies.* If the toll rates estimated under Question 2 are above road users’ affordability (or willingness to pay), you may want to consider using government subsidies to reduce the toll rate required to attract private investors. If the maximum feasible (or affordable) toll rate is US$0.06/car-km, how much should be the Government’s contribution to the construction cost (i.e., subsidies)?
Notes regarding the solution to Question 3

(a) Changing the amount of Subsidies does not change the project’s financial Internal Rate of Return (IRR), which is independent of the project’s capital structure. Please disregard the minimum IRR requirement in this case.

(b) Please keep the loan-equity ratio at 70:30

(c) A minimum amount of equity is usually specified to make sure the private sponsors have “their skin in the game.” Let us assume that equity, in this example, is required to be not less than 20%. The sum of Equity, Loans and Subsidies is 100 percent. Consequently, the maximum amount of Subsidies that could be considered in this case would be 80%.
Questions to each team (cont’d)

4. Using the toll rate computed under Question 1, *ceteris paribus*, what would be the amount of subsidy that the government could provide for the project to be fiscally neutral to the government (i.e., NPV of taxes and subsidies equal to zero)?

5. How does the project financial internal rate of return (IRR) vary with the amount of subsidies? Is IRR independent from the capital structure (i.e., proportion of subsidies, equity, and credit)?
Questions to each team (cont’d)

6. In case there is no political support to charge actual tolls to road users, alternative approaches could include shadow tolls or availability fees. Assuming that there will be no capital grants (i.e., no subsidies during construction), please estimate the minimum annual required payment by the government (availability fee, or availability payment, or annuity) during the first year of operation. Please use the result from Question 1a in your calculations.

Note: Availability payment = 365 * AADT * WATR

7. What financial criterion (or criteria) would you include in the bidding documents, so as to allow for an objective evaluation of financial proposals under a competitive selection of concessionaires?
8. Bridging the affordability gap with shadow tolls. In case the toll rates estimated under Question 2 are higher than the affordable toll rates in your country, the Government may want to consider providing a shadow toll payment to the concessionaire (to complement actual toll revenue), so the actual toll rates can be kept within the road users’ affordability. Assuming that the maximum affordable toll rate is $0.04/car-km, and that there will be no capital grants (i.e., zero subsidies), please estimate the shadow toll payment by the government during the first year of operation, so as to complement the affordable toll rates.
Notes regarding Question 8

(a) Please use the information and results from Questions 1 and 2, as appropriate.

(b) Affordable weighted average toll rate per vehicle (WATRa):

\[
WATRa = (\%C \times TRca + \%T \times TRta + \%B \times TRba) / 100
\]

where \(\%C\), \(\%T\), and \(\%B\) are the percentages of cars, trucks, and buses in the traffic flow; \(TRca\), \(TRta\), and \(TRba\) are the affordable toll rates for cars, trucks, and buses, respectively.

Note: \(TRca = 100 \times 0.04 = \$4.00/\text{car}\)

(c) Annual shadow toll payment (ASTP):

\[
ASTP = 365 \times AADT \times (WATRr - WATRa)
\]

where \(WATRr\) is the required weighted average toll rate per vehicle as computed under Question 1a. The units of \(WATRr\) and \(WATRa\) should be \$/veh.

(d) Payment of an ASTP by the government is somewhat similar to a minimum revenue guarantee.
Questions to each team (cont’d)

9. Time permitting, please work with the numerical financial simulation model to answer the above questions. In your view, what are the pros and cons of the two models?

10. Module 5 of the Toolkit for PPP in Roads and Highways describes the five key stages to launch a PPP project. In which one (or ones) of these stages do you think it may be necessary to carry out a financial assessment of the project?
Questions to each team (cont’d)

11. Several assumptions have been made to run this numerical application of the Toolkit financial simulation models. Please describe the changes in assumptions that you would suggest to make this exercise more realistic for Mozambique.

12. Toll rates (or availability fees) are a complex issue. The toll rate that will actually be charged to road users depends on many factors, such as the degree of competition, expected and actual traffic volume and composition, loan terms, government support (if any). Please discuss.
Elasticity – Toll rates and traffic volumes

Inelastic

Elastic

[e.g., some types of commuting]

[e.g., leisure travel]
13. You have estimated in Question 3 the amount of construction subsidies required to lower the toll rate to an affordable value. Some governments, however, prefer to pay annuities, instead of construction subsidies. How can you estimate the “annuities” that are equivalent to a given construction subsidy?

14. Please make a brief presentation summarizing your team’s results and discussions. Please focus your presentation on the non-numerical questions.

Good luck!
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**Concession life: 30 years, Construction period: 3 years**
Main Stages to Launch a PPP Project

• Stage 1: Identification, Prioritization and Selection of the PPP Project

• Stage 2: Due Diligence and Feasibility Studies: includes activities and studies to ensure the selected project is well designed and can be successfully tendered and implemented

• Stage 3: Procurement: includes prequalification of bidders and the bidding and bid evaluation process

• Stage 4: Contract Award: includes dealing with the preferred bidder(s), financial close

• Stage 5: Contract Management: deals with the construction and operation periods of a project including transfer back if relevant
Making Predictions

“It's hard to make predictions - especially about the future.”
Attributed to many people, including Yogi Berra, Niels Bohr, Samuel Goldwyn, Robert Storm Petersen, and Mark Twain

“Heavier-than-air flying machines are impossible.”
Lord Kelvin, British mathematician and physicist, president of the British Royal Society, 1895
References

• Toolkit for PPP in Roads and Highways
  http://ppiaf.org/documents/toolkits/highwaystoolkit/

• Workshops on the Toolkit for PPP in Roads and Highways, New Delhi, India, June 2009; Brasilia, Brazil, June 2010; Moscow, Russia, June 2011
  http://go.worldbank.org/P2XMGNYLD0

• Worldwide Trends in Private Participation in Roads

  http://go.worldbank.org/FIIOBYIDP0
Cesar Queiroz, former World Bank Highways Adviser, is an international consultant on roads and transport infrastructure. His main expertise is in public-private partnerships, road management and development, performance-based contracts, port reform and rehabilitation, improving governance, quality assurance and evaluation, research, teaching and training. Between 1986 and 2006, he held several positions with the World Bank, including Lead Highway Engineer and Principal Highway Engineer. Prior to joining the World Bank, Cesar was the deputy director of the Brazilian Road Research Institute in Rio de Janeiro. He holds a Ph.D. in civil engineering from the University of Texas at Austin, a M.Sc. in production engineering from the Federal University of Rio de Janeiro, and a B.Sc. in civil engineering from the Federal University of Juiz de Fora, Brazil. Cesar has published two books and more than 130 papers and articles. His recent assignments include infrastructure advisory services to Russia, Brazil, Latvia, Lithuania, Poland, Ukraine, Philippines, Uganda, Sri Lanka, India, Egypt, Colombia, Laos, Mozambique, Saudi Arabia, Tunisia, Sweden and Norway. He is currently a visiting professor at the University of Belgrade, Serbia, and has lectured on PPP at George Washington University since 1996, and at the International Law Institute since 2007.