

Graphical Model for Financial Simulation of Highway PPP Projects

User guide

Worksheets

The graphical model comprises four worksheets, for which the main functions and outputs of each worksheet are described hereafter.

Data sheet

This sheet summarizes the main characteristics (assumptions) of the PPP project. A few easily identified assumptions can be determined and changed using this sheet. The other key characteristics can be changed directly from the graph sheets.

Graphical Model for Financial Simulation of Highway PPP Projects

Summary of project assumptions

<p>Source of funds</p> <table border="0" style="width: 100%;"> <tr><td>Subsidies</td><td>30%</td></tr> <tr><td>Equity</td><td>30%</td></tr> <tr><td>Credit</td><td>40%</td></tr> <tr><td>Nominal interest rate</td><td>6.0%</td></tr> <tr><td>Repayment period</td><td>20 years</td></tr> <tr><td>Grace period</td><td>4 years</td></tr> <tr><td>Capitalization</td><td>4 years</td></tr> <tr><td>Repayment of loan</td><td><input type="text" value="P+I constant"/></td></tr> </table>		Subsidies	30%	Equity	30%	Credit	40%	Nominal interest rate	6.0%	Repayment period	20 years	Grace period	4 years	Capitalization	4 years	Repayment of loan	<input type="text" value="P+I constant"/>	<p>Construction costs (VAT excluded, indexed on inflation)</p> <table border="0" style="width: 100%;"> <tr> <td>Duration of works (years)</td> <td>4 years</td> <td><input type="text"/></td> </tr> <tr> <td></td> <td>Year</td> <td>%</td> </tr> <tr> <td></td> <td>1</td> <td>10%</td> </tr> <tr> <td></td> <td>2</td> <td>30%</td> </tr> <tr> <td></td> <td>3</td> <td>50%</td> </tr> <tr> <td></td> <td>4</td> <td>10%</td> </tr> <tr> <td></td> <td></td> <td>0%</td> </tr> <tr> <td colspan="2" style="text-align: right;">Total in MUSD</td> <td>170.00</td> </tr> <tr> <td colspan="2" style="text-align: right;">Amortization</td> <td>46 years</td> </tr> </table>		Duration of works (years)	4 years	<input type="text"/>		Year	%		1	10%		2	30%		3	50%		4	10%			0%	Total in MUSD		170.00	Amortization		46 years
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<p>Traffic and Tariff</p> <table border="0" style="width: 100%;"> <tr><td>Initial traffic</td><td>20.6 ×1000 vehicles/day</td></tr> <tr><td>Traffic growth</td><td>5% per year</td></tr> <tr><td>Toll rate (VAT included)</td><td>3.4 USD per vehicle</td></tr> <tr><td>(VAT excluded)</td><td>2.8 USD per vehicle</td></tr> <tr><td>(indexed on inflation)</td><td></td></tr> <tr><td>Initial daily revenue</td><td>58.6 kUSD / day</td></tr> <tr><td>(VAT excluded)</td><td></td></tr> </table>		Initial traffic	20.6 ×1000 vehicles/day	Traffic growth	5% per year	Toll rate (VAT included)	3.4 USD per vehicle	(VAT excluded)	2.8 USD per vehicle	(indexed on inflation)		Initial daily revenue	58.6 kUSD / day	(VAT excluded)		<p>Operation costs (indexed on inflation)</p> <table border="0" style="width: 100%;"> <tr><td>Fixed part</td><td>1,000 kUSD per year</td></tr> <tr><td>Variable part</td><td>0.1 USD per veh.</td></tr> </table> <p>Economic</p> <table border="0" style="width: 100%;"> <tr><td>Inflation rate</td><td>4.0%</td></tr> <tr><td>Corporate tax rate</td><td>30%</td></tr> <tr><td>VAT rate</td><td>19.6%</td></tr> <tr><td>State discount rate (real terms)</td><td>4.0%</td></tr> <tr><td>(nominal terms)</td><td>8.16%</td></tr> </table>		Fixed part	1,000 kUSD per year	Variable part	0.1 USD per veh.	Inflation rate	4.0%	Corporate tax rate	30%	VAT rate	19.6%	State discount rate (real terms)	4.0%	(nominal terms)	8.16%															
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Repayment of loan corresponds to the type of reimbursement of loan. Two types are proposed:

- **P+I constant:** A constant amount (including Reimbursement of Capital and Interest) is paid at each term
- **Linear:** The same amount of capital is reimbursed at each term. The interest is calculated from the non reimbursed capital.

Duration of works can vary from 1 to 5 years. The user enters the duration of works and default values for distribution of works are displayed. The user can modify the default values by using the scrolling bars. The percentage of the first year is calculated: 100% - sum (% year 2 to % year 5). If the % of year 1 equals to 0%, it is not possible to increase the % of the other years.

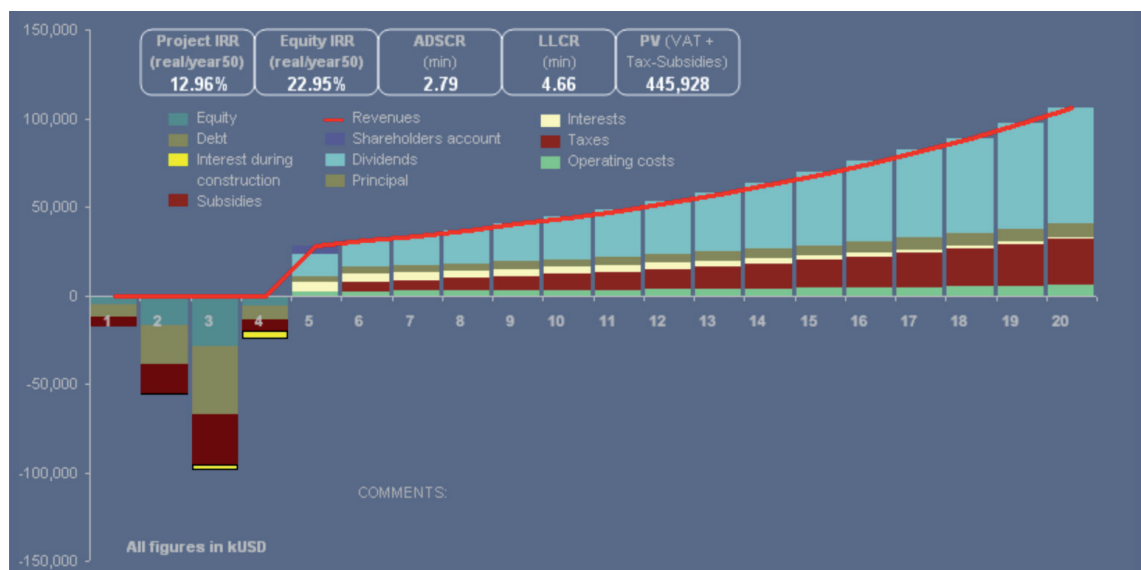
*The capitalized items are assumed to be depreciated on a straight line basis throughout the operating period. The datasheet reports the corresponding number of years of **depreciation**.*

The **operation costs** are paid during the operation period (after the construction period). They are indexed on inflation.

- The **fixed part** of operation costs covers personnel costs, administration costs, safety and security costs, annual routine maintenance costs of highway and equipment, periodic maintenance costs.
- The **variable part** of operation costs is linked to the traffic. It corresponds to additional costs due to the growth of traffic (operation personnel, maintenance of tolling station, etc). It may vary in the range from 0.1 to 5 USD per vehicle.

State discount rate is the rate used to calculate the NPV of government cash flows.

Cash Flow Graph

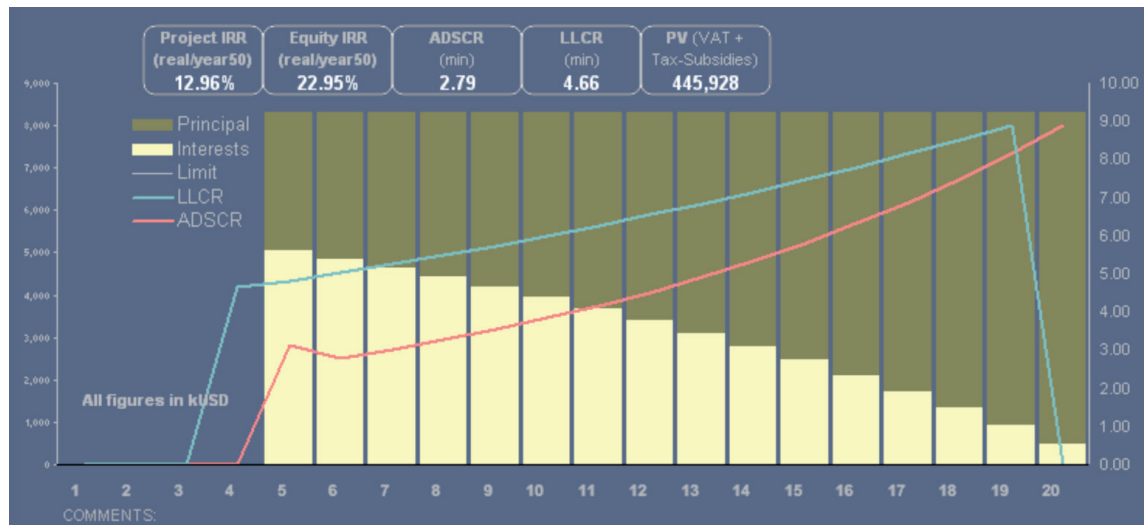


The graph represents all concession company cash flows during the concession period. They are classified by order of repayment priority: Operation costs > Taxes > Debt service > Dividends > Shareholders account.

The **shareholder account** represents a bank account controlled by the company shareholders (fiscal restrictions generally limit the authorized distribution of dividends to the project net income) to which the cash balance is transferred (or drawn from if negative) until it can be distributed as dividends.

When the shareholders' account is insufficient to service the debt, shareholders have to fill the gap and this appears on the graph in the form of negative dividends.

Debt graph

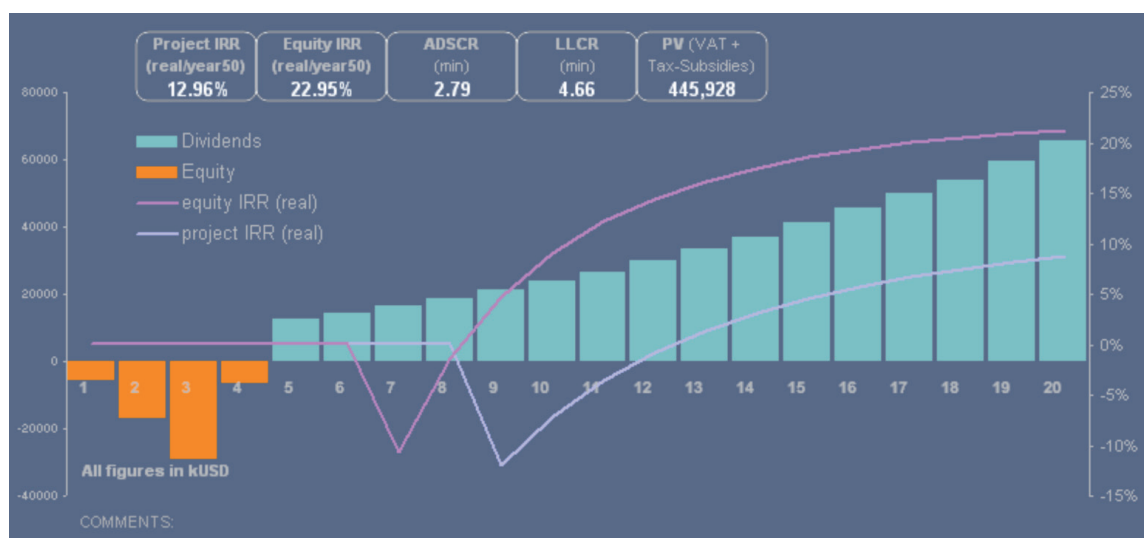


This graph represents, for the first twenty years of the concession period, separately on the LH and RH axes:

- 1 Yearly payment of principal and interest during the debt servicing period (grace period + repayment period)
- 2 Changes in the two main bank ratios over the repayment period: Annual Debt Service Coverage Ratio (ADSCR) and Loan Life Coverage Ratio (LLCR). A definition of both ratios is provided in the Toolkit (Module 2 - Financial Evaluation)

Nominal interest rate is used to calculate the annual interest paid.

Dividend Graph



This Graph displays, for the first twenty years of the concession period, on two different axes:

- ① The equity mobilized by company shareholders during the construction period and the dividends received by them during the operation period.
- ② Changes in the two main investment ratios over the concession: the financial Internal Rate of Return of the project (Project IRR) and the Equity IRR.

The graphical model allows a rapid verification that Project IRR is independent from financial structure (subsidies, equity, credit conditions) whilst Equity IRR is directly related to it.

Summary of assumptions and results

SUMMARY OF THE MAIN ASSUMPTIONS	
GENERAL	
Concession life	50 years
Construction Period	4 years
Construction costs	170,000 kUSD
Amortization	46 years
FINANCIAL STRUCTURE	
Subsidy	30% of the construction costs
Equity	30% of the construction costs
Debt	
Maturity	20 years
Interest rate	6.0%
Grace period	4 years
Repayment of loan	P+I constant
TOLL AND TRAFFIC	
Toll, VAT included	3.7 USD per vehicle
Initial traffic	20,600 vehicles / day
Traffic growth	5.0%
OPERATING COSTS	
Fixed part	1,000 kUSD per year
Variable part	0.1 USD per vehicle
OTHER KEY PARAMETERS	
Inflation rate	4.0%
Corporate tax	30.0%
VAT rate	19.6%

SUMMARY OF THE RESULTS	
FINANCING PLAN	
Uses (in kUSD)	197,167
Construction costs (nominal terms)	188,343
Capitalised Interests	8,824
Sources (in kUSD)	
Investment subsidy	56,503
Equity	56,503
Debt	84,161
FINANCIAL RATIOS	
Minimum ADSCR (Annual Debt Service Coverage Ratio)	2.79
Minimum LLCR (Loan Life Coverage Ratio)	4.66
Minimum PLCR (Project Life Coverage Ratio)	21.32
SHAREHOLDERS' RETURN	
Project IRR after tax (real terms)	12.96%
Project IRR after tax (nominal terms)	17.48%
Equity IRR (real terms)	22.95%
Equity IRR (nominal terms)	27.86%
PUBLIC AUTHORITIES' FINANCIAL FLOWS	
PV on Subsidy (kUSD)	-46,078
PV on the VAT (kUSD)	215,519
PV on the Corporate Taxes (kUSD)	276,487
PV on the State revenues (kUSD)	445,928

This sheet summarizes the assumptions and results of the project.

Project indicators / ratios

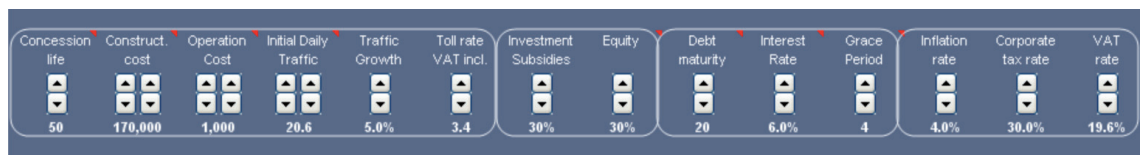
Project IRR (real/year50) 12.96%	Equity IRR (real/year50) 22.95%	ADSCR (min) 2.79	LLCR (min) 4.66	PV (VAT + Tax-Subsidies) 445,928
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On each of the three graphs, five key project indicators / ratios are displayed.

- **Project IRR** for the last year of concession in real terms,
- **ROE** for the last year of concession in real terms,

- **Minimum LLCR,**
- **Minimum ADSCR,**
- **NPV of net financial contribution from government.** The government may pay subsidies during the construction period and recover taxes and VAT during the operation period. The indicator shows the net present value and the financial balance for the government throughout the concession period.

Project data



Fourteen key project characteristics can be modified on any of the three graphs which are then automatically adjusted. Ranges of variations have been limited on purpose to realistic values.

Concession duration

Although **concession duration** can be set at any figure between 7 and 100 years, results are displayed on the graph for the twenty first years only.

Construction cost

The **construction cost** can vary from USD 5 million to USD 5 billion. This amount represents the total cost over the years of construction period (1 to 5). The incremental steps are adjusted accordingly, varying with the Construction cost. The construction cost excludes VAT, but it is indexed to inflation. The nominal construction cost for the year n will be calculated according to the following formula:

$$(\text{nominal construction cost})_{\text{year } n} = (\text{real construction cost})_{\text{year } n} \times (1 + \text{inflation rate})^n$$

Two arrow keys can be used:

- the increment of the RH arrow key is 250,000 kUSD,
- the increment of the LH arrow key is 5,000 kUSD

Operation cost

The fixed part of the **operation is varying** from 1 million USD to 500 million USD per year.

Two scrolling bars can be used:

- the increment of the scroll bar on the right is 10,000 kUSD,
- the increment of the scroll bar on the left is 1,000 kUSD

Initial daily traffic

Initial daily traffic corresponds to the daily traffic of the first year of operation.

Two arrow keys can be used:

- the increment of the arrow key on the right is 2,000 vehicles per day
- the increment of the arrow key on the left is 100 vehicles per day

Traffic growth

Traffic growth is used to estimate the traffic forecasts during the period of the project. It can be increased in increments of 0.5%.

Toll rate

Toll rate corresponds to the average toll paid by vehicles in the first year of operation, including VAT. For subsequent years, the toll rate is adjusted with inflation.

The initial revenue is the amount of revenue generated by the project in the first year of operation. This revenue equals the initial traffic multiplied by the initial toll rate excluding VAT; the operator shall receive the road toll proceeds with VAT and pay the VAT back to the State.

Subsidy rate

Subsidy rates can be adjusted by the user. The amount of debt is calculated by the model to reach 100% of investment cost (Equity + Subsidy + Debt = 100%).

Equity rate

Equity rate can be adjusted by the user. The amount of debt is calculated by the model to reach 100% of investment cost (Equity + Subsidy + Debt = 100%).

Debt maturity

Debt maturity = Grace period + Repayment period of capital. Concession duration must be greater than Debt maturity.

Interest rate

Interest rate is a nominal rate (including inflation). It can vary from 0% to 25%.

Grace period rate

Grace period is the period during which repayment of the principal is deferred. This term does not refer to interest payments. The grace period is adjusted according to the duration of works (construction period): grace period must be above or equal to the duration of works.

Inflation rate

Inflation rate is used to estimate the forecasts of revenues and operating costs, and to calculate the real rates of financial indicators.

Corporate tax rate

Corporate tax corresponds to the corporate tax (profit tax) paid by the concession company. This rate is applied to Earnings before Taxes (Revenues - Operating costs - Amortization - Financial costs).

VAT rate

VAT rate is used to calculate the VAT paid annually to the State by the private partner from project revenues. The Model assumes that no road users can reclaim VAT on tolls.

Summary of project data ranges

The following table describes the lower and upper limits of the 14 project characteristics.

Data	Minimum	Maximum
Concession life	7 years	100 years
Construction cost	5 million USD	5,000 million USD
Fixed operation cost	1 million USD	500 million USD
Initial daily traffic	0 vehicle per day	120,000 vehicles per day
Traffic growth	0%	10%
Toll rate	0.1 USD per vehicle	100 USD per vehicle
Subsidy rate	0%	100%
Equity rate	0%	100%
Debt maturity	Grace period + 1	Concession life
Interest rate	0%	25%
Grace period	Duration of works	8 years
Inflation rate	0%	50%
Tax rate	0%	100%
VAT rate	0%	100%

Comments

Comments are triggered by the model to inform of unrealistic or impossible data entries. For example, if the concession period is set at a value less than the sum of the repayment period and the grace period, a message is displayed to alert the user and the model automatically corrects one of the three parameters to ensure their coherence. Similarly the model would also adjust automatically the financial structure to ensure coherence (Equity + Subsidies + Debt = 100%).