

FINANCIAL MODELING OF PROJECT FINANCING TRANSACTIONS

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Abstract. *The aim of the paper is to provide the audience with the essential features to understand Project Financing as a key point of the development of Romanian infrastructure. Key elements of the dissertation are advantages and opportunities Romania can exploit with the use of a proper financial modeling. Further elements of the dissertation are the experience of the use of financial modeling in Securitisation and how Project Financing could benefit from it.*

Keywords: project financing, project management, financial modeling.

1. Introduction to project financing

The IPFA – International Project Finance Association defines Project Finance (PF) as „the financing of long-term infrastructure, industrial projects and public services based upon a non-recourse or limited recourse financial structure where project debt and equity used to finance the project are paid back from the cash flow generated by the project” (Figure1). Due to the usual large-scale and long-term projects to be financed, this financial technique is usually adopted in a public-private partnership scheme (PPP or P3); further, the Project Finance is emerging worldwide as the governments’ preferred alternative to fund infrastructures.

The lenders in a PF will be primarily looking at the ability of the project, even on conservative assumptions, to generate cash and to serve the debt. The lenders are not generally looking to share in profits. PF essentially deals with the use of financial engineering to allocate risks amongst the various parties of the financing (sponsors, lenders, suppliers, contractors, government bodies, insurers, etc.) in such a way that no party assumes full credit risk.

This allocation of risks mainly is implemented by the means of putting in place long-term contracts, guarantees and agreements between the various parties. The financial engineering helps to place each project risk with the party best able to bear that risk. It is the complexity of these arrangements combined with the unique features of each project that makes PF a challenging area of modern corporate finance. An „infrastructure gap” exists in Europe. From an ECOTER 2001 paper in the 15-member EU the Tagliacarne Index about infrastructural endowments floats between 189,1 of Belgium and 42,4 of Finland (100,0 the EU average, 90,4 the index for Italy).

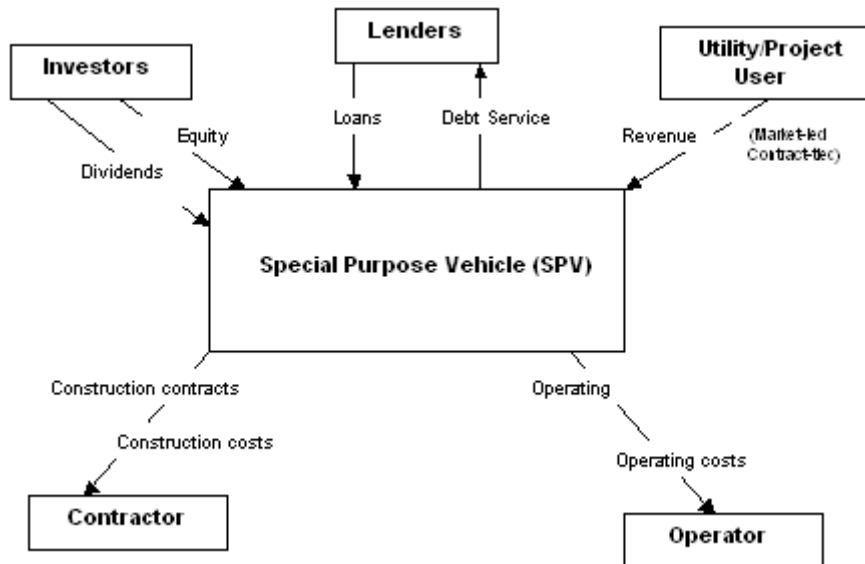


Figure 1. The allocation of risks

2. The need for investment and the role of PF and PPP

This has a negative impact on economic growth and the wealth of the citizens of Europe. It also affects the efforts of the EU governments to reduce the significant social and economic differences both between and within Member States, in particular considering the access to EU of the 10 new comers from May 2004 and the further 2 (Romania and Bulgaria) from January 2007. Governments have limited financial resources to expense increased capital costs, to improve public services and to face Maastricht restrictions on their ability to raise further debt. The development of PF and PPP is the consequence of an approach which some countries have taken to finance public infrastructure and services. The state of PF and PPP development varies widely between the Member States but they are firmly considered as an useful tool at governments' disposal to reach their goals.

After a ten-year process of legislative review, in 2002 the regulatory framework of reference for PPP, and in particular for PF, was completed in Italy to restructure infrastructures which were much older than those of other European countries. Since 2003 public investments financed with PF doubled each year with a higher rate of increase in Southern regions which have less infrastructures. Nowadays investments in public administration financed by the means of PF have been more than 30% of the total national investments, while those of local administration have been more than 50%. A negative counter effect persists however: investments financed by PF have a modest average size and are concentrated in industries of low risk profile: cemeteries, parking lots, sports grounds, small day-hospitals.

This fact leads us to an important consideration: public investments of greater impact on the economic growth are uncertain and they last longer with relevant external benefits, not captured by rateable services. It is very hard that these investments are financed by PF.

3. PF and PPP in the Central and Eastern countries

Practitioners of PF and PPP have been looking to the East with interest after the access to EU of the new countries. Given the increasing popularity of the PF and PPP concept (if not yet the practice!) amongst the first 15 EU members, can we expect new opportunities for an increased capital expenditure funded by PF? In my opinion, the answer is yes but not immediately. In comparison with the former 15 EU members, the 12 new comers are relatively poor, with the exception of Slovenia whose GDP per capita is not far from that of Greece; otherwise, the GDP per capita floats between 25% and 50% of the EU average.

All the new comers have a critical need to develop and modernize their infrastructure more than what experienced by the former 15 members; however, all are critically constrained by the need to adhere to the Maastricht criteria, particularly the requirements that planned government deficit must be no more than 3% of GDP and gross debt must be no more than 60% of GDP. The conditions seem very similar to those which pushed the development of PF in the UK in the 1980s – a political demand for improved infrastructure beyond the means of the government alone to fund. Under these circumstances, there would seem to be a strong point in favor of a rapid development of PF and PPP in the Central and Eastern countries. There are, however, some factors which might limit the number of PPP promoted in the immediate future. They are:

- **Public opinion and political will:** frequently there is a mistrust that the private sector will make excessive profit at the expense of the public one, mistrust that may be based on past privatization programs that have been less than transparent;
- **Understanding of the PFs and PPPs as concepts:** there is a general misconception that the cost of borrowing of a PPP is higher than its host sovereign;
- **Legal environment:** in most of the new EU comers there are structural difficulties with the legal and procedural aspects of implementing PPPs;
- **Ability to implement projects:** most of the new EU comers have a limited ability to implement complex infrastructure projects to EU standards;
- **Ability of the economy to absorb funds and implement projects:** most of the new EU comers have limited public administration resources able to manage several large projects simultaneously.

As a consequence of the above, it would appear that there would still be demand for PPPs but as a second source to fund large projects. It is clear that if the PPP market is to be developed, then it is necessary to assist these countries to overcome the deficit of skills within the public sector.

4. The role of financial models in PF and in securitization

From my brief overview of PF, it will be clear that in order to assess and evaluate a PF it is necessary to develop a financial model („FM”) that forecasts the cash flows of the project and reflects the contractual obligations of the various parties. Given the overriding importance of risk allocation to PF, the underlying FM needs to be flexible enough to allow the impact of changes in the key assumptions to be assessed. The importance of FM to PF cannot be understated. Like in a Securitization deal, it is the primary tool for evaluating and assessing the benefits and is constantly used during the negotiations to quantify the impact of the project’s cash flows given the underlying agreements. Potential lenders in a PF will use the FM as a necessary tool to complete their credit risk analysis, running various scenarios and evaluating the impact on key financial ratios.

As general rule, most FM are built using Microsoft Excel, often with the use of macros and occasionally with Visual Basic code. The significant increase in the computational power of personal computers combined with the flexibility of modern spreadsheets has directly contributed to the increased sophistication and detail of FM. In structured and corporate finance the FMs are frequently used in Securitization and PF transactions: in both of them in fact the role of the FM is to project the cash flows available for debt service. Various factors make the FM tough and challenge the modeler. Some examples are:

- **Regulatory pricing regimes** ---→ complicate the calculation of revenues;
- **Lock-up provisions** ---→ complicate the determination of how the cash is distributed;
- **Ownership structures** ---→ complicate the allocation of cash and tax
- **Risk sharing** ---→ complicate many features such as the provision of debt financing, the use of reserve accounts and cash flow waterfall.

In setting up the FM a large number of assumptions will be made regarding the project. These assumptions will be the responsibility of a number of parties, including various advisors. Regard these assumptions, they can be categorized into four tiers:

- **Reasonably certain** ---→ e.g. interest rates, tax & depreciation rates;
- **Less certain but subject to general agreement** ---→ e.g. construction periods;
- **Uncertain but hedged through contracts** ---→ e.g. off-take agreements for the purchase of electricity from a power station;
- **Uncertain and unhinged** ---→ e.g. market related assumptions such as traffic flow for an airport or airways.

The last tier of assumptions will usually be determined by either a form of best estimation or statistical analysis; the importance of a FM is evident for those assumptions which are uncertain and unhinged.

5. Risks of FM and the role of the advisors

To minimize the risk arising from incorrect, inconsistent or inadequate modeling it is necessary to actively manage this risk.

The way through which this is typically handled in the PF industry, like in the Securitization one, is going for a consultant to be engaged to review the FM; in the Securitization industry the review is requested by the rating agencies, in PF the consultant is engaged by the lenders of the project, due to their strong reliance on the model for their risk assessment. A consultant engaged to review a FM typically perform the following tasks:

- Undertake a detailed examination of the model's logic, including any algorithm, and perform a cell-by-cell check of all calculations within the model;
- Verify that input assumptions have been applied correctly;
- Review the project documentation to ensure that relevant formulas and covenants have been correctly incorporated into the model's logic;
- Advise on the overall design of the model and on how it may be improved;
- Comment on the model's ability to successfully test sensitivities using a set of assumptions;
- Provide written confirmation that the model can be relied upon.

It is necessary to have an independent consultant to review the model. The model developer is too familiar with the model to be expected to find errors. Having an independent party that is not otherwise involved in the project review the logic and the mathematics is the best way of managing the risk of incorrect modeling.

In the Italian Securitization industry, the completion of an independent review of the model is a standard part of the due diligence process since the very beginning of the market in 1999; the „financial model audit” is not yet so familiar in the PF industry due to the limited average size of Italian transactions as said before. The consultant chosen to conduct a „financial model audit” is usually taken from one of the major accounting firms. However, it is pleasing to note that an accounting firm with a structured finance team specialized in Securitization & PF is preferable for this role, since cash flow valuation is entailed into Securitization & PF, and not into plain financial statement audit.

6. Enhancing PF models. Deterministic or stochastic risk modeling?

Risks underlying FMs. There is a number of project specific risks underlying any PF. Many of the risks are dealt by the means of the legal framework; others will be borne by the relevant party. The following table illustrates the main risks:

Table 1

Main risks in FMs

Construction	Operations
Completion risk	Regulatory risk
Cost overrun risk	Off-take risk (eg electricity purchase in a power project)
Performance risk	Market risk (eg traffic flow in an airport project)
Environmental risk	Performance risk
	Environmental risk

Through a systematic review of the risks, it will be reached an understanding of the structuring that can be used and the appropriate contractual agreements. The FM will start to be developed during this risk review and be used to quantify the financial impact of the various risks and cash flow structuring.

Deterministic risk modeling. The FMs developed for PF are generally deterministic, that is, for an assumed set of inputs the model produces a single set of outputs. The outputs are determined by the logic and calculations within the model. Obviously, a great deal of effort is put into determining what values the various input assumptions should take in the model. Accordingly it is usual during the evaluation of a project to run a very large number of scenarios through the FM, varying the key input assumptions through a range of “possible” values.

It is usual to undertake scenario testing, whereby a number of the key input assumptions are changed at the same time. Usually at least three scenarios are constructed: base case (conservative assessment of the risks), worst case (pessimistic one) and best case (optimistic one). Scenario testing is a useful aid to understanding the financial impact of a project’s risks. However it provides no information on the likelihood of a particular scenario.

Stochastic risk modeling. As each PF deal is unique and critical, more advance modeling approaches are sometimes required, including stochastic risk modeling. Stochastic risk modeling can be implemented in both aspects of PF, the financing side and the operational side. Risks factors on the financing side are uncertain future variables such as floating interest rates, inflation rates, exchange rates and credit risks premiums; while on the operational side, a wider range of risk factors may be involved, including variables that impact on the timing and/or the magnitude of a project expected cash flows. Common examples of stochastically modeled variables on the operational side, by type of project, are as follows:

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Table 2

Stochastic variables by types of projects

Type of project	Stochastic variables
Power & Energy	Electricity Pool Price
Transport – Toll Roads	Traffic Flow
Hospitals/Schools/Prisons	Wages inflation
Telecommunication	Volume
Airports	Passenger Number

A plain spreadsheet risk model is deterministic, which means that the inputs are fixed (one value to one cell). It will reveal a single outcome at a time, generally the most likely or average outcome. If alternative outcomes are required in order to analyze the effect of varying inputs on outputs, changes of the inputs in the model have to be run manually, that is scenario testing. Instead, a risk analysis that combines a spreadsheet model and simulation can automatically analyze the effect of varying inputs on outputs by providing a range of outputs with associated probabilities. Suppose that, without the aid of a simulation, the most likely total NPV of a project amounts to €30 million. How is it likely? Is it 75% or 100% certain? A simulation approach can provide the probability of a given outcome. One type of spreadsheet simulation is Monte Carlo simulation. Monte Carlo simulation requires each uncertain variable to be defined as an input distribution, that is a range of possible values with associated probabilities. Many types of input distribution exist: uniform, normal, binomial. A simulation calculates multiple scenarios by sampling values from the input distribution for the uncertain variables. During a single assessment, the model randomly selects a value from the input distribution for each uncertain variable and then recalculates the spreadsheet and saves the outcomes in the memory. If a simulation for 40.000 trials is run, then 40.000 possible outcomes will be created, compared to the single outcome in the deterministic spreadsheet. These outcomes can be analyzed in order to get expected cash flows and they can be sorted to determine how likely it is that the overall outcomes will exceed various thresholds, named “percentiles”.

In conclusion, Monte Carlo simulation adds the dimension of dynamic analysis to PF models by making it possible to build up random scenarios. It enables a PF model to answer questions like, “What is the probability of the NPV exceeding €20 million?” or “What are the chances of losing money on this project?”. As said before, the FM is the agreed approach to assess the structure of any Securitization transaction. The importance of testing if the in/out-cash structure of the deal can be relied on to serve the Notes issued in a Securitization transaction is comparable to the importance of verifying if the cash structure in a PF deal can afford the operative risks, the forecasted costs and debt. Thus, also for PF transactions the FM can be properly used as the base for the evaluation of the transaction. It is worthy to be noticed that the different inputs-outputs required to a PF either in Securitization or PF deals imply a different mathematical/statistical methodology to build the model. Just to mention what we stated

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above, the FM for Securitization will be deterministic while the FM for PP will be preferably stochastic.

The Airport project. Take for example an airport project. Let's say that the purpose of the project is the construction of a new terminal and to finance such investment it has been chosen the PF. Furthermore, let's assume that the repayment of the Lenders is based on the estimate of the potential passenger traffic in the next 5 years. The variability of passenger numbers – and its growth over 5 years - entails uncertainty; the estimate of the traffic growth is the main variable to be considered to verify the ability of the structure to repay in full the financing received by the Lenders. Suppose that the annual number of passenger follows a Poisson input distribution. The cash flow model computes the series of „n” forecasted passenger number stored as the output of each calculation. Analyzing the output distribution it is possible to verify the probability of repayment of the financing.

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