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Project Finance and Projects in the Energy Sector in Developing Countries

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Abstract:

The purpose of this study is to show the importance of using project finance in infrastructure investments in developing countries. The paper will be focused only on one infrastructure sector, which is energy. Structurally, power project finance has involved largely build-own-transfer (BOT) project structures and long-term contracts. The projects largely reflect a rational allocation of risks among public and private participants. Private sponsors and lenders generally assume risks for completion and performance. Governments assume substantial risks in nearly all projects, mostly in areas in which they have control, such as utility performance, currency convertibility, fuel costs, inflation, and political event.

The aim of this research is to empirically examine a financing and governance structure called Project Finance that typically funds large scale, capital intensive, infrastructure investments in risky countries.

The methodology used in this paper is literature review of the main theories for project finance. I will empirically test the propensity of the firms to use project finance, using data of some projects in South – East countries. For this purpose the study compares project financed and corporate financed transactions in the energy sector.

I find that the propensity of firms to use project finance is high and statistically significant when large sunk investments have state owned primary buyer firms in risky countries.

Key words: Project finance, corporate finance, energy sector, developing countries.

Introduction

Project finance[1] is not a phenomenon of modern finance, but its implementation grew up and brought some innovation from the '70s to 1990. There was a contraction of this form in the years 1997 – 1998 due to the Asian crisis, to continue until early 2000. After these years, project finance grew up significantly and it is useful in many infrastructure sectors. One of the most important reasons for the implementation of this financing form is for the necessity to fund major projects of infrastructure, in various sectors and countries.

Project Financing is applied to projects such as those of reserve, exploiting and cash-flow projects, oil and gas pipelines, bridges, highways, tunnels, power plants, hotels and amusement parks. For example, "British Petroleum" funded 945 million dollars to carry out oil and gas plants in the North Sea, while "Freeport Minerals" funded 120 million dollars for the "Ertsberg" mine in Indonesia. With the introduction of PURPA - s[2], the project finance in USA was applied to the industry of energy. PURPA - s set the framework for long-term

[1] Nevitt (1979) defines project finance as "a separate funding entity, in which the lenders have guarantees mainly in the cash-flow form and revenue generated by this unit, as the main source of loan repayment and as collateral for the loan, its assets ". Another definition is given by Shah and Thakor (1987) according to which "Project financing is an arrangement in which a sponsor or a sponsoring group carry out a project to build a separate legal entity, where project cash flows are kept isolated from sponsors balances who are the initiators of the project. These flows are the main guarantee for the payment of debt service. Guaranties of the project are contractual one rather than real guarantees".

[2] Public Utility Regulatory Policy Act - According to this regulation, local energy service companies were obligated to buy the whole quantity of electricity produced by energy companies through the use of long-term contracts. PURPA set the stage for long-term contractual obligations, which were strong enough to finance the construction costs of a power plant, through the use of FP.

contractual obligations too strong to finance the construction costs of an energy park, through the use of project financing. We can mention o lot of examples of these projects like: the "Disneyland" park of Hong-Kong and Paris or the Eurotunnel project.

If you refer to developing countries and especially Eastern European countries, there is an increasing trend of using this form of financing in two main sectors: the energy and telecom. This technique has begun to be widely used in these countries, starting after 2000. In Russia, Turkey, Romania or Bulgaria, it has had a wider use than in other countries in Eastern Europe and the Southeast. We can mention the project of building a power plant in Bulgaria, "Maritza 1", where MIGA issued a guarantee of 99 million euros for building this new plant. Total project costs were estimated around 1.09 billion euros, of which the engineering contract (turnkey - contract), procurement and construction contract went about 723 million euro. Key consultants were BNP Paribas, Ceylon and ING. International lenders were EBRD and BSTDB[3].

Several studies have emphasized the need to develop energy projects that are essential for a competitive Europe, productive, long-term development, modernization and sustainable demand for energy. If we refer to the European Commission, starting in 2020, there will be substantial investment in power generation in Europe, transport, communications and technology information infrastructure, which will require a total of 2 trillion euros. Financing of projects has a large sectorial extension as well as a geographical one. Gatti, S. et al. (2013, 12) emphasize that the geographical distribution of countries that use project finance ranges from developed countries to developing ones. Regarding the developing countries, about 49.4% of the total number of loans granted to projects finance belongs to the Asian borrowers, with projects in Taiwan, Australia, China, and Indonesia, with a value that ranges from 32 to 55.9 billion

[3] EBRD – European Bank of Reconstruction and Development, and BSTDB – Black Sea Trade Development Banks.

dollars. Western European borrowers are the third largest recipient of funding projects, after Asia and North America.

Regarding the number of loans taken, Eastern Europe ranked fourth, with a number of 256 loans and a total of $ 52.5 billion. However, the regions of the Middle East and Turkey occupy the fourth place if we refer to the total value of loans (207 loans, for a value of $ 68.9 billion). This is due to the amount of loan given to two of the three dozen oil projects in each of the countries of Saudi Arabia: the Gulf (for an average of $ 666.0 million), Qatar ($ 483.9 million) and the United Emirates ($ 546.4 million). Widespread use of this financing model, especially after 2000, is seen to be used in developing countries, in Central and Eastern Europe. The sector where these projects are concentrated is that of energy and telecom sector (in both its sub-sectors, the production of energy and gas) as well as in the telecom sector. In the section below we are going to describe literature review and the main theories for project financing, the main characteristic of this form of financing and some definitions.

Literature review

Project finance is used for the realization of infrastructure projects to be built mainly by the governments of developed countries, but also from developing countries, or projects that are considered as public benefit. But this does not mean that this form is used only for projects whose pioneers are the governments of these countries, as this form may be used for projects entirely private (eg. refineries or large industrial plants). In the following paragraphs we will present an overview of the main theories of project finance.

1. Williamson (1975) and Klein, Crawford and Alchian (1978) developed the theory on the role of a special economic structure, as well as financial and organizational governance (with the creation of SPV -). Managers control the performance of the firm and may misuse it especially if these assets are characterized by the generation of large amounts of free cash flows. This theory was supported by Esty (2003) too. He

supported the hypothesis that the unique structure that characterizes the project finance minimizes the costs of hold – up problem between parties of a transaction who have invested in a specific project.

2. Jensen and Meckling (1976) were among the first authors who analyzed and measured agency costs arising from conflicts between firm managers and major shareholders, i.e. the owners of structure. Esty (2003) supported the hypothesis that project finance reduces agency costs arising from the conflict between managers and shareholders as a result of the particular structure characterizing this technique.

3. Shah and Thakor (1987) in their theory showed that the use of project financing reduces the cost of capital, especially for projects that are characterized by high risks. This is due to symmetric information between the participating parties (i.e. according to the authors, there is a symmetry of information, in the case of project financing).

4. Chemmanur and John (1996) analyzed the financing of the project through the role of benefits of managers arising from the advantages that they have over information and control of the projects.

To give an accurate and inclusive definition of this form of financing is not too easy, due to the different types of projects that use this technique. One of the first authors who tried to give a more accurate definition of this form of financing is Nevitt.

Nevitt (1979) defines project finance as "a special purpose entity in which lenders of the project have mainly cash flows guarantees and the income generated by the project, as the main source of repayment of the loan and as collateral for loan, its assets."

We can conclude that project finance, as opposed to corporate finance, consists of some very special elements. Three of these elements are: the establishment of a separate entity, non guaranteed debt (to finance the project) that will be settled only by the cash flows that will be generated only by the project, as well as sharing of the risk between the parties

participating in the project. Use of this debt without guarantees or limited recourses is the essence of Project Finance.

Methodology and hypothesis

Theoretical literature as well as some empirical studies has shown that PF is a special financial and government structure. PF has an ownership structure split from its sponsors. Use of this separate ownership structure has advantages because it integrates the providers/buyers with project owners, high levels of debt and long-term contracts. This is a solution that reduces transaction costs or opportunistic behaviors, after agreements are reached. Therefore, we should expect a high propensity to use project finance, when we have very high investment costs (large sunk cost). This analysis leads to establishing the following hypothesis:

Hypothesis 1: firms have greater propensity to use project finance rather corporate finance for project with high investment size.

Investsize variable measures the total amount of investment in millions of dollars. I expect this variable to have a positive correlation with project finance.

Esty (2004; 2010) in his work has argued that countries in which the projects are localized are a very important party in transactions. They provide the legal infrastructure, regulations and basic infrastructure of the country. These states may be the parties that assure direct purchases of the product/service provided by the project (plant). When a project is completed, countries may exhibit opportunistic behavior (beneficiary) and change the legal infrastructure, regulatory or basic infrastructure, expropriating, or asking for a higher quota rent. Developing countries are characterized precisely by this legal and political instability. This analysis leads us to hypotheses 2 and 3:

Hypothesis 2: Political risk is positively related to project finance

Hypothesis 3: Country risk is positively related to project finance

One particular factor which affects the risk of a particular country is the percentage of exports of oil, gas and chemical processing industry. Countries that depend on exports of oil and gas on a large percentage of GDP are more likely to face political pressures that adversely affect investments in the energy, oil and gas. Database of the World Bank WDI (World Development Indicators) provides annual data for all countries, the share of oil and gas exports over GDP. From here there derives the following hypothesis:

Hypothesis 4: large quantities in the exports of oil and gas as a percentage of GDP may have a positive connection in choosing project finance rather than corporate finance.

Also, country risk can be used to measure the size of the potential beneficiary behavior of a government, a threat that could grow when we have a high concentration of buyers or suppliers, and when one of these parties is state owned. In this case, the party that can influence the investors have an additional advantage over foreign owners, due to its control over the legal (such as, rule of low, expropriations etc.) and physical infrastructure including power, roads, telecommunications etc.

Joint ownership of a particular investment and the structure of PF with high levels of debt solve the problem that arises from the «threat» of opportunistic behavior. This leads us to the next hypothesis:

Hypothesis 5: projects that have state company purchasing the product /service produced will demonstrate a higher propensity to Project Finance.

In order to test this hypothesis, we constructed a binary variable called state-ownership, which takes the value 1 if the product is sold to a largely state-owned company and the value 0, otherwise. We expected to have a positive relationship between this variable and the propensity of project finance.

In this paper, there are also used two other binary variables that will receive the value 0 or 1. One of the variables indicates which of the two sub-sectors of energy use more project finance. Also, it will be created another dummy variable

(binary) for each of the states obtained in the sample. This variable is intended to show the propensity of the developing countries in using project finance.

Methodology

The data required for this study were obtained from the World Bank database for infrastructure projects (PPI database). Information on some of the projects is taken from the EBRD data (a relatively small number). PPI database contains information on infrastructure projects that are not more than a combination of public-private partnerships (i.e. it includes all types of PPP-s). To create the two groups of investments that we needed for the model, we proceeded as follows: initially we have chosen which countries will be part of the study and for these countries we selected infrastructure projects pertaining to the energy sector. To be sure that the projects taken from the database were projects realized by project finance, we selected only those projects that were Greenfield projects. From the Greenfield projects, we filtrated out those projects that were implemented through BOT[4] and BOO models. This database has detailed information on the projects in terms of their implementation costs, the place where it was positioned, names of the firms which acted as the sponsors etc. We have taken into consideration projects that cover the period 2000-2012.

To create a second group of investments, corporate finance ones, we have reechoed Greenfield-type projects and other types that were not implemented through the BOT or BOO model. We can mention here the example of the construction of TEC in Vlora (Albania) to issue a Greenfield-type investment, whose works started in the 2003. This project, which is funded by the World Bank, the EBRD and the IEB, has a cost of approximately $ 141.9 million and an installed power of 100 MW. Even for this group project databases provide detailed information. Projects realized with PF are conducted mainly provided by a consortium of firms (Joint Ventures),

[4] According to the literature BOT model are defined as the applied form of project finance in developing countries. This model was used for the first time in Turkey, in 1984.

while the second group of projects with the traditional form of financing. This emphasizes the fact that the projects implemented through project finance are projects that require higher investment cost (i.e. they are capital intensive) and are characterized by high technological risks, as well as economic and financial conditions. The number of projects taken into consideration for the second typology of financing (after eliminating the projects that did not belong to the chosen sector) was 27. The data used for country and political risk was taken from ICRG). In addition to the information obtained from the ICRG, we used data from the World Bank WDI. For more detailed information we can see the paragraph where the econometric model will be explained.

Description of data

The data for the study includes investments made from 2000 until 2012. It includes projects implemented in 15 Central and Eastern European countries as well as Eastern Europe. Database contains information about 72 projects with a number of observations - 90. Table I (Annex I) summarizes all the data taken into consideration. This table shows the number of projects taken into consideration for the analysis (the projects are taken from the PPI world database[5]). Table II represents the summary of some statistical characteristics of explanatory variables (Annex II).

The econometric model and its results

So far we have described how we collected the data for this paper. Selected sample included investments made through project finance, as well as through corporate finance. The Regression model aims to compare the two groups and to determine which of those variables selected by the theory influence the choice of PF by traditional societies. In this paper we will use an econometric model of logit type, first used by Sawant, J. R. (2007) (oil and gas sector). The aim of the econometric model, considering the selected sample, is to show that there is a propensity in the use of PF by the firms as

[5] http://ppi.worldbank.org

governance and financing structure. For this reason, the dependent variable is a binary variable (y), which takes the value 1 if the investment is structured as PF and will get the value 0 otherwise. Logistic model is as follows:

P (y = 1/xj) = Λ (ß0 + ß1 investsize + ß2countryrisk + ß3polrisk + ß4ekspfuel + ß5stateowned + ß6 energy projects + + ß7Binarvar (countries) + u).

There are seven independent variables taken into consideration in this model. Some of them are binary variables, such as state - owned (that takes value 1 if the buyer of the output produced is a state owned enterprise, and 0 otherwise), energy projects (that show the sector of the project, it takes value 1 if the project is in the energy production subsector or in the gas subsector) and the sum of some binary variables that are represented by countries (these variables take value 1 if projects in one country are realized through project finance, and 0 otherwise).

Results of the model

In the preceding paragraph we focused on the theoretical description of the models used to test the viability of the model. To make a comprehensive analysis to see whether the expected results of the regression would change, we consequently used two models. The first model is that of regression (OLS) and the second model is a logistic-type function because the dependent variable is a binary one. But in this paper we are going to interpret only the logit model. If the dependent variable (but not only) is a binary variable, you can use logit models. Models were built using the Stata program. Analysis of econometric models is shown below. Numbers in parentheses represent standard error. Coefficients, which have a level of confidence interval that ranges from 0 to 0.10 are marked with *. Coefficients which have a confidence interval level to the 0.05 are marked with **, while those with a confidence interval of 0.01 are marked with ***. The logit model takes this form:

P (y = 1/xj) = 16.11201 + 0.0009319investsize-0.0499568countryrisk-0.08324188polrisk +

0.0834872ekspfuel + 0.6570402stateowen +0.5207771 energy projects + u

Y is a binary variable that takes the value 1, for the project realized through project finance, and 0 otherwise. Xj takes value from 1 to 7 because there are 7 independent variables, while u is the error.

The table below shows the results of econometric model:

Table III – results of the regression analysis

Indipendent Variables n = 90	**Logit Model**	**Mean value**
Investsize	.0009319 ** (.0004411)	544.446 Millions $
Countryrisk	-.0499568** (.02436444)	64.296
Polrisk	-.08324188 ** (.03448663)	61.3987
State-owned	0.6570402*** (0.1721618)	0.6829
Ekspfuel	.0834872** (.0376383)	17.439 %
Energjpro	0.5207771** (0.2102147)	0.9146
Other binary variabels (countries)		
Al	0.4415952** (0.1765442)	
Ar	0.4369983** (0.2269861)	
Bg	0.2853786** (0.1454793)	
Tu	.822492*** (0.2437937)	
Constant	16.11201 (10.50803)	
Log – likelihood Value Pseudo R2 R-squared	-21.484861 (0.5865)	

In the table above we represented the results of the binary variable. The presence of project finance in this country shows a good propensity for those in using this form of financing in the future.

Since logistic type models are a little more difficult to interpret, I put them on the side of the model coefficients calculated average values of each of the factors.

a. Investment Size (investsize). In this model the coefficient is positive and statistically significant. When the investment size grew up by 100 million, with an average of 544,446 million dollars, the propensity for project finance increases by 0.93. Therefore, we can say that for high-value investment, the firms prefer to use PF compared with corporate Finance, this happening due to the much longer range risk that they would take over.
b. Country Risk (country risk). Again, this coefficient is negative and statistically significant. As interpreted above, we can say that an increase in country risk grade would lead to increased use of PF. An increase of 10 points of political, economic and financial risk factors will lead to the increased use of PF 0.49. A 10-point increase volatility of a country would mean an increase in average risk rating of 64,296 to 54,296. Countries that have a low risk that goes up to 54,296 are Turkey, Bulgaria, etc.
c. Political Risk (polrisk). Even in this model this coefficient is negative and statistically significant. An increase of the degree of that political risk will lead to the increased use of FP. An increase of 10 points of legal, environment, regulatory and political risks will lead to increased use of FP 0.83. So we can say that the political risk in this model has a greater importance than that of country risk.
d. The presence of state-owned companies as the main buyer of the product / service of state own investment. In this model, the coefficient is positive and statistically

significant, with a confidence level of 99%. This means that when a state-owned company is the main buyer in an investment, the trend for FP choice will increase. In essence, the effect of this factor is to increase the propensity for FP by 0.65, when state-ownership ranges from 0 to 1.

e. Fuel exports as a percentage of GDP (ekspfuel). The ekspfuel coefficient is positive and statistically significant at a confidence level of 95%. A positive sign of the coefficient indicates that the propensity for PF will increase when the quantity of exported fuel as a percentage of GDP will increase. In the logit model, an increase of 10 per cent of ekspfuel from 17,439% to 27,439% would increase the propensity for PF at 0.83. Countries that have a percentage of the fuel that goes from 20 to 30% in the sample are Lithuania in 2003 and 2010, Belarus in 2010, Albania in 2011 etc.
f. The energy production sector compared to oil and gas energy. Even here the energy coefficient is positive and statistically significant. This means that the most important subsector in which a great value would appear for FP is that of energy production. The effect of this factor is to increase the tendency for FP by 0.52, when energy ranges from 0 to 1.

In conclusion we can say that the theory of opportunistic behaviors is very significant. So, the main hypothesis of this paper is verified. Consequently, we can say that the propensity of the firm in choosing PF in the energy sector grows when investment have the presence of state-owned companies as the main purchasing of the product /service produced, when the investment is carried out in a country that is characterized by high political risk and when the size of the investment is very large.

Conclusions

Factors belonging to the theory of transaction costs and opportunistic behavior are supported by these data models. An investment realized through PF can resolve the problem of agency costs. The agency costs increase due to high investment costs facing legal regulatory and political changes. We can say that investments realized through PF need preliminary contracts that are very important for the success of the projects. They are made by the project company and product buyers, just to avoid the opportunistic behavior of one of the parties at the time of project construction. In the energy sector, the PPA contract (Power Purchase Agreement) has a particular importance. It is made by a state-owned company such as KESH in Albania or Bulgaria Energy Corporation (Bulgarian Energy Holding EAD). This eliminates the risk of unsold product. Another important factor is the size of the investment. We can conclude that PF is the best choice for high-cost projects. Another factor that affects the use of PF is the country risk. Countries which are characterized by high political risks show a higher tendency to use PF for the implementation of infrastructure projects.

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Annex I

Table I – project finance vs corporate finance

	Number of projects	**Number of firms**	**Number of observation**	**Number of Joint Ventures**	**Number of a single firm**	**Investment amount (million $)**
Corporate finance	27		29	2	22	**7506.91**
Project finance	45		61	42	16	**37137.68**
Total	**72**	**NA**	**90**	**44**	**38**	**44644. 59**

Annex II

Table II - Summary statistics - explanatory variables

Variables	**Number of observation**	**Mean**	**Standard deviation**	**Min**	**Max**	**Description**
State-owned	90	0.6829	0.4681	0	1	binary variable that represents the presence of state-owned firms as a buyer
Energy-Projects	90	0.9146	0.2811	0	1	binary variable, which is a subsector of energy(electricity and gas production)
Gas-projects	90	0.085	0.2811	0	1	binary variable that represents the energy sub-sectors (energy production and gas)
Investsize	90	544.446	1138.194	2.76	5187	Investment size in million dollar
polrisk	90	61.3987	5.931	48.8	79	Measured on a scale from 0 to 100, where 100 indicates the lowest risk
countryrisk	90	64.296	4.274	54.5	75.5	Measured on a scale from 0 to 100, where 100 indicates the lowest risk
ekspfuel	90	17.439	20.893	1	71	Export fuel as a percentage of GDP