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THE DETERMINANTS OF CAPITAL STRUCTURE
IN INFRASTRUCTURE PROJECTS: AN INVESTIGATION
OF AGENCY PROBLEMS IN PROJECT FINANCE

by

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THESIS

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ABSTRACT

The present thesis investigates one of the most important determinants of capital structure, the agency problems, in the context of project finance/Public-Private-Partnership structures. In an effort to identify potential agency problems, I have followed a qualitative approach based on three fundamental steps that are applied for each relationship in the project finance structure. First I identify the objective of each party, then I account for the ‘information status’ of each party (i.e. which party has an information advantage and what type of advantage) and last, based on (i) the relationship between the parties, (ii) the scope of the relationship, (iii) the motives and (iv) the information status, I identify what type of agency problem(s) is(are) potentially developed in each relationship. With this method I also identify the channels through which agency costs can end up in the final price of the deliverable of the project under consideration, be it either product or service. The predominant agency problems are of the adverse selection type prior to financial close and of the moral hazard type after the financial close.

Keywords: Project Finance, PPP, Public-private partnerships, agency problem, information asymmetry, moral hazard, adverse selection

“Infrastructure plays a critical role in growth, competitiveness, job creation and poverty alleviation. Investment in high-quality, sustainable infrastructure can provide basic services to households; lead to productive gains for industry; provide market access for agriculture; enable sustainable urban development; open corridors of trade for poor and landlocked countries to the global economy; and help progress towards a more climate-smart world.”

From the World Bank Global Infrastructure Facility website

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And a note for the readers. If the reader is familiar with project finance then he/she could potentially skip to chapters five, six and seven. For unfamiliar readers a thorough introduction is provided. Apart from the agency theory related chapters, there are also some more general subjects discussed. Of particular interest is paragraph 3.2 which compiles the history of project finance based on existing literature (the value added is that it collects many references and binds them in one story) and paragraph 4.7 which discusses how banks tried to smooth the impact of Basel II in their project finance operations in the years prior to the crisis using sophisticated financial engineering (also hard to find online).

Table of Contents

Abstract	3
Acknowledgments.....	5
Table of Contents	6
List of Figures	9
List of Tables.....	10
Abbreviations	11
1. Introduction	13
1.1 Public Private Partnerships	14
1.2 Financing of infrastructure	17
1.3 Why study project finance?.....	19
1.4 Motivation of the thesis.....	20
1.4 Overview of the thesis.....	21
2. Financial instruments in Project Finance	24
2.1 Introduction.....	24
2.2 Financial Products used as stores of value	25
Deposits.....	25
Loans	27
Bonds	28
Commercial Papers	30
Certificates of deposit	31
Repurchase agreements	31
Stocks	31
2.3 Instruments used to transfer risk	32

Insurance contracts.....	32
Futures contracts	33
Options	35
Swaps	35
3. Introduction to Project Finance	37
3.1 What is project finance?.....	37
3.2 History of Project Finance: From Ancient Greeks to the Suez Canal and the modern industry	42
3.3 Structure of a project finance scheme	44
Sponsors	45
The host government.....	46
The Lenders.....	47
4. Project Finance Banking	49
4.1 Introduction	49
4.2 Concerns on project finance loans	52
4.3 Project default	56
4.4 Equator Principles	59
4.5 Project Finance Loan Pricing	61
4.6 Hedging	62
4.7 Banking Regulations and their impact in project finance	63
5. Agency problem and information asymmetry.....	69
5.1 Introduction	69
5.2 The importance of management structure	72
5.3 The Syndicated lending Case and its similarities.....	73
5.4 The lead arrangers reputation effect.....	74
6. Analysis of Agency Problems in PF	78

6.1 Banks - SPV	80
Main parties and roles	80
Objectives.....	81
Information Status	81
Agency problem characterization	82
6.2 SPV – Contractors.....	84
Main parties and roles	84
Objectives.....	84
Information Status	84
Agency problem characterization	85
6.3 Government of host country – SPV	86
Main parties and roles	86
Objectives.....	86
Information Status	87
Agency problem characterization	87
6.4 Bond underwriter- credit rating – bond buyers	88
Main parties and roles	88
Objectives.....	89
Information Status.....	89
Agency problem characterization	90
6.5 SPV – Banks – Multilaterals	92
Main parties and roles	92
Objectives.....	93
Information Status.....	93
Agency problem characterization	93
7. Closing remarks.....	96

Bibliography.....102

List of Figures

Figure 1 Author’s compilation of the financial instruments that may be potentially found in a project finance structure.....26

Figure 2 The family of infrastructure related bonds30

Figure 3 Insurance participants in project finance.34

Figure 4 Public Finance for a waste treatment facility.41

Figure 5 Corporate Finance for a waste treatment facility.....41

Figure 6 Project Finance for a waste treatment facility.42

Figure 7 European project finance loans and bonds issuance44

Figure 8 Indicative project finance structure..44

Figure 9 Risk Mitigation Instruments in Project finance.53

Figure 10 Number of defaults by region.57

Figure 11 Number of projects by year of default.57

Figure 12 Comparison of data volume and mean loss-given-default for project finance and large corporate unsecured loans.58

Figure 13 The average spread of Public private partnership loans during the life of the loan.....60

Figure 14 The term structure of public private partnership loans.60

Figure 15 Anatomy of agency problems70

Figure 16 The relationship between implied agency costs of debt and agency costs of equity with the leverage variations.72

Figure 17 The lead bank share and loan spread relationship75

Figure 18 Simplified representation of a project finance structure with highlighted spots of agency problems79

Figure 19 Method of Analysis.....80

Figure 20 Overview of contracts and agreements in project finance of a typical syndicate financing scheme98

Figure 21 Connection of agency costs to the final product/service cost.....100

List of Tables

Table 1 Comparison between corporate and project finance (Comer , 1996)	40
Table 2 Size and composition of project finance bonds and loans	44
Table 3 Sponsor profile in project finance	46
Table 4 Profile of the host government in project finance	47
Table 5 The profile of the Lenders.....	48
Table 6 Average default rates and recovery rates per industry and per region.....	58
Table 7 Agency theory overview.	70
Table 8 Contract types.	85
Table 9 Regulatory and Governance strategies for protecting principals from agency problems.	101

Abbreviations

ABS	Asset Backed Securities
BNEF	Bloomberg New Energy Finance (Financial Publisher)
CDS	Credit Default Swaps
CLO	Collateralized Loan Obligations
CMU	Capital Markets Union (an EU initiative to reinforce capital markets)
CDO	Collateralized Debt Obligations
DSCR	Debt Service Cover Ratio
EPC	Engineering, Procurement & Construction
FX	Foreign Exchange Currency
GDP	Gross Domestic Product
IISD	International Institute for Sustainable Development
IPO	Initial Public Offering
IRB	Internal ratings based
LCR	Liquidity Coverage Ratio
LLC	Limited Liability Company
LLCR	Loan Life Cover Ratio
LLP	Limited Liability Partnership
MLP	Master Limited Partnership
NGO	Non-Governmental Organization
NHS	National Health System (UK)
NSFR	Net Stable Funding Ratio (Basel)
O&M	Operation & Maintenance
PECDC	Pan-European-Credit-Data-Consortium. (renamed to Global-Credit-Data)
PF	Project Finance
PFI	1 private financing Initiative (UK) or 2 Project Finance International : publication of Thomson Reuters
PLCR	Project life cover ratio
PPP	Public Private Partnership
SPV	Special Purpose Vehicle
VAT	Value added tax
YieldCo	Yield Company

1. Introduction

“Good roads, canals and navigable rivers, by diminishing the expense of carriage, put the remote parts of the country more nearly upon a level with those in the neighborhood of the town. They are upon that account the greatest of all improvements.”

Adam Smith, Wealth of Nations

Infrastructure refers to a wide number of industries with different characteristics, though traditionally it encompasses the sectors of transportation, energy, telecommunications, water and sanitations. Transportation refers to land transportation (roads), air transportation (airports, facilities, airplane financing) and naval transportation (shipyards, ports, vessels). Energy refers to oil, gas, nuclear and renewable energy sources, storages and transportation projects. Telecommunication refers to telephone, internet and relevant infrastructure (cables, networks). A peculiar sector is also sometimes encompassed in general infrastructure, that of social infrastructure which includes schools, hospitals and similar projects.

The demand for infrastructure refers to the investments necessary to satisfy retail consumer demands as well as producer’s or industry’s demands (Sawant, 2010). Both the consumers and the industry demand electricity, transportation, telecommunication, energy, commodities and other inputs to keep in pace with growth in its output. Infrastructure can be a solution to the main challenges humanity faces such as social stability, rapid urbanization, climate change adaptation and mitigation and natural disasters. Without

infrastructure countries will not only find it harder to meet basic needs but also they will struggle to improve competitiveness (World Bank Group, 2012). Today, the infrastructure gap in low and middle-income countries is estimated at US\$1 trillion.

The spending forecast over the next decade reflects the impact of several megatrends. In a report by PWC these trends include the widespread global change, demographic shifts, an evolution in global economic power, and growing urbanization. PWC calculated that the worldwide, capital project and infrastructure spending is expected to total more than \$9 trillion by 2025, up from \$4 trillion in 2012. This accelerated infrastructure spending is expected to drive economic growth, create jobs, and deliver vital services, such as a clean water supply (PWC, 2014). The World Economic Forum estimates that every dollar spent on a capital project (in utilities, energy, transport, waste management, flood aversion projects, telecommunications) generates an economic return of between 5% and 25%. That multiplier effect accounts for the rapid economic growth of emerging markets that have made infrastructure spending a priority (PWC, 2014).

1.1 PUBLIC PRIVATE PARTNERSHIPS

The developments in the global economic status has given birth to the public private partnerships (PPP). PPPs can be defined as arrangements whereby private parties participate in or provide support for, the provision of infrastructure. A PPP project results in a contract for a private entity to deliver public infrastructure based services (Grimsey & Lewis, 2004). These arrangements can take many forms such as (from Pierson & McBride, 1996 cited in Grimsey & Lewis, 2004):

- The public sector entity transfers land, property or facilities controlled by it to the private sector entity (with or without payment in return) usually for the term of the arrangement
- The private sector entity builds, extends or renovates a facility
- The public sector entity specifies the operating services for the facility
- Services are provided by the private sector entity using the facility for a defined period of time (usually with restrictions on operations standards and pricing)

- The private sector entity agrees to transfer the facility to the public sector (with or without payment) at the end of the agreement.

It is also helpful to understand what public private partnerships are not. The first misconception concerns financing. PPPs are not always financed by the private sector and their financing is just one element of the structure¹. The essence of PPP is that the public sector does not necessarily buy an asset rather it is purchasing a stream of services under specified terms and conditions (Grimsey & Lewis, 2004).

PPP's have been subject of debates due to the separation between public and private entity and due to the 'fair return' of the private sector question. There is a universal argument that the state has to play a role in the provision of public infrastructure on the grounds that (Yescombe, 2007):

- The private sector cannot take account of externalities – i.e. general economic and social benefits – and therefore public-sector intervention is required
- Without such intervention infrastructure which has to be freely available to all ('public goods') will not be built, especially where this involves networks, such as roads, or services, such as street lighting
- Competitive provision of infrastructure may not be efficient and a monopoly provision requires some form of public control
- Even where competition is possible, the public sector should still provide 'merit goods' i.e. those that would otherwise be underprovided (such as schools, as the rich could pay for private schools but the poor would get no education).
- Infrastructure requires a high initial investment on which only a very long-term return can be expected. It may be difficult to raise private capital for this investment without some public sector support.

Yescombe (2007) concludes that infrastructure should be provided by the public sector where competitive market pricing would distort behaviour or lead to loss of socio-economic benefits. Yescombe (2007) further argues an interesting point, that until recently private sector financing was the norm for infrastructure projects. Only at 19th and 20th centuries the state took over responsibility from religious or private charities for the provision of much

¹ And when this is the case we refer to project finance as one potential method

social infrastructure (schools and hospitals). What has changed is the definition of 'necessary' infrastructure.

Regardless of the debate about the participation of the private sector in the financing, it should be noted that PPP's do not work always favourably. A nice example is presented by Grimsey & Lewis, (2004) about the case of prison (detention) projects. The government of Australia took back a women's prison which was operated by a private operator after the poor performance of the latter. There are nearly 180 such private facilities globally but it has been a traditional controversy of the PPP case. A similar debate has been over the participation of the private sector in the National Health System (NHS) of UK². Mayston (1999) has identified the following potential benefits out of the participation of the private sector:

- Lower levels of expected cost from the private sector (rather than the public sector) managing the design and construction of the key assets, such as hospital buildings
- Lower levels of expected costs from the private sector (rather than the public sector) managing the operation of these assets
- A greater capacity of the private sector to minimise the risks of cost escalation in the costs of constructing and operating the assets
- A superior ability of the private sector to bear the above risks, compared to the public sector
- Greater levels of much needed investment in new capital assets for use by the NHS being available under the PFI rather than from direct capital expenditure in the NHS

That said, Mayston also underlines that given the experience of the Channel Tunnel project (also PPP), that the involvement of the private sector by itself is no guarantee of satisfactory outcomes from major investment expenditures. Equally he identifies that public sector project management skills have often been sadly deficient and mechanisms are therefore required which ensure that maximum value for money and an optimal use of the available skills is obtained for each case.

² A very popular discussion many references of which can be found with keywords the PFI case for UK NHS (PFI stands for 'Project Finance Initiative').

There is a big debate over the participation of the private sector either in the financing or in a simple PPP. However this discussion is not in the scope of this thesis but not addressing the long lasting debates would be like the elephant in the room that no one talks about. This thesis is focused in the participation of the private sector in the financing element though a part of the analysis can be applied to pure PPP structures without private sector financing. The analysis that follows in chapter 6 can be said that is unbiased with regards to the model preference of the author as it is based simply on the identification of the motives of the stakeholders and their status with regards to information. Hence no objective parameter enters in the method.

1.2 FINANCING OF INFRASTRUCTURE

Traditionally, the infrastructure demand was financed via public funds and given the predominance of the public sector, the typical nature of public goods and the positive externalities generated by such investments was associated with the participation of the public sector. Developments in domestic socioeconomics globally has induced a change in this situation as public deficits, increased public debt to GDP ratios and, sometimes, the inability of the public sector to deliver efficient investment spending and misallocations of resources due to political interferences have led to a strong reduction of public capital committed to such investments (OECD, 2014).

As a result of this increasing public capital shortage in combination with the increasing demand for infrastructure, in the past few years, the infrastructure funding was provided by the private sector through its flagship method, **project finance**. Project finance has proved to be the most suitable financial technique able to attract private capital for infrastructure investments based on two pillars; the equity side, the bulk of financing has been provided by corporate sponsors and developers and on the debt side, the prominent role has been played by bank syndicated loans (OECD, 2014).

At this point, the first definition for project finance will be given and it will be discussed extensively in the following chapters. The definition is drawn from Esty and Sesia (2007). It is defined as a transaction that involves the creation of a legally independent project company financed with nonrecourse debt and equity from one or more corporation known

as the sponsoring firms, for the purpose of financing an investment in a single purpose capital asset, usually with a limited life.

The benefits of project finance that have been commonly referred to the literature are summarized in three points by Esty (2003). The first motivation for using project finance is the agency cost motivation. Esty recognised that certain assets such as large tangible assets with high free cash flows are susceptible to costly agency conflicts and as such, the creation of a special project vehicle for their management is ‘an opportunity to create a new, asset-specific governance system to address the conflicts between ownership and control’. These new systems have the potential to reduce the agency conflicts through joint ownership and high leverage to discourage costly agency conflicts. The second motivation is the solution to the underinvestment problem³, as project finance can solve the leverage-induced underinvestment by allocating project returns to new capital providers in a way that it cannot be replicated by corporate debt (Esty, 2003). The third motivation regards the spearhead of project finance, effective risk management. The project finance structure reduces the possibility of risk contamination i.e. ‘the phenomenon whereby a failing asset drags an otherwise healthy sponsoring firm into distress’ (Esty, 2003). By allocating risky work streams to specialized contractors who have the ability to handle such risks, project finance can work as an effective risk shield for finance providers.

It is interesting to highlight that in the 90’s there was no market for infrastructure equity at all. In the debt side, apart from conventional project finance loans, at some point the project bond concept was introduced but it disappeared after 2008 due to a series of downgrades suffered by the monoline insurers⁴ that before the demise of Lehman Brothers provided credit insurance to these capital markets debt instruments (OECD, 2014). The collapse of the Monoline insurers has had the effect to reduce the potential amount of funds that institutional investors could have committed to infrastructure investments (OECD, 2014). Monoline wrapped bonds had risk and credit ratings that improved considerably as a result of being covered by a guarantee which consequently meant that the risk of default was realized only in the event insolvency of the insurer (Hochtief, 2016). These insurers

³ An underinvestment problem is an agency problem where a company refuses to invest in low-risk assets, in order to maximize their wealth at the cost of the debt holders.

⁴ Monoline insurers: Insurance specialist entities that guarantee municipal and project debt.

are called “monoline” because they are legally licensed and organized as insurance companies, but they are permitted by law to offer only financial guarantees. They were largely subsidiaries of major insurance corporations which enjoyed the highest credit ratings before the financial crisis hit but when the ratings of these companies began to crumble as the crisis progressed project bonds almost completely disappeared (Hochtief, 2016). Currently project bonds are slowly making a comeback.

Among the most popular sources of capital for both loans and bonds, was insurance companies, pension funds, mutual funds, petrodollars, hedge funds, private equity funds, endowments and multilateral banks. Pension funds in particular have a strong potential in project financing if certain challenges are met. The private pension funds can be categorized in two types, defined contribution and defined benefit. The first pays its members with contribution with additional returns generated from their contributions, the latter promises to pay its members retirement benefits at a certain level (Sawant, 2010). Given the nature of the pension funds’ liabilities, infrastructure finance has been strongly proposed as a suitable investment. A big obstacle has been the legal nature of the associated credit risk of infrastructure projects which forbids such investments from pension funds.

1.3 WHY STUDY PROJECT FINANCE?

Project finance structures have been on the spotlight of academia in many scientific fields and has been studied by many perspectives. I will distinguish between two main drivers. The first driver of interest is the fact that project finance is the main tool to finance the necessary infrastructure for human development and growth. Infrastructure and construction holds a big share of the global financial system with great effect on all national economies.

From the academia point of view which is the second driver of interest, the shortest answer on why project finance is an interesting study field is given by Esty (2004) as ‘project companies are strategic research sites for people interested in learning more about how structural attributes such as high leverage, separate legal incorporation and concentrated equity ownership affect managerial incentives and asset values’. A starting point on the analysis of project finance is the seminal ‘irrelevance’ proposition of Modigliani and Miller (1958) that corporate financing decisions do not affect the value of

a firm under certain conditions. The proposition is based on the assumption that financing and investment decisions are separable and independent.

Project finance structures directly challenge this proposition as there is an organisational decision to finance assets separately rather than jointly which is the case with corporate financed investments (Esty, 2004). Simply put, in project finance, the financing and the investment decision and structuring are not irrelevant rather they are strongly correlated and as Esty (2004) puts it, it shows 'why structure matters'. A second research interest about project finance is the fact that their peculiar structure allows the researcher to observe the determinants and impacts of various structural decisions in a cleaner and more transparent way than in most corporate settings (Esty, 2004).

1.4 MOTIVATION OF THE THESIS

The interest in the present topic flows from the field of capital structure theory. The context is provided by the work of Modigliani and Miller (1958) who argued that financing and investment decisions are irrelevant if several conditions hold, such as (i) if there are no taxes or transaction costs, (ii) if there are no costs of financial distress, (iii) if there are no agency conflicts and if (iv) there are no information costs. In such an environment, a structure like project finance would add no value at all. However in the real world this is not the case and capital structure does matter as for example through financial engineering the value of an asset can be increased by packaging the debt and equity claims in a way that increases leverage or reduces agency costs (Finnerty, 2007).

Some of the determinants of capital structure could be (Titman & Wessels, 1988) (i) the collateral value of the assets, (ii) the non debt tax shields, (iii) Growth, (iv) Uniqueness, (v) Industry classification, (vi) Size, (vii) Volatility, (viii) Profitability.

Past research had tried to understand the capital structure mechanics with many approaches. Harris and Raviv (1991) performed a survey of the seminal works published at the time categorizing the popular models in four categories, (i) models based on agency costs, (ii) models based on asymmetric information, (iii) models based on the interactions of capital structure with behaviour in the product, with the input market or with characteristics of products or input, (iv) models based on corporate control considerations.

The authors also summarized that all main models considered the following capital structure determinants:

- The desire to ameliorate conflicts of interest among various groups with claims to the firm's resources, including managers (the agency approach)
- The desire to convey private information to capital markets or mitigate adverse selection effects (the asymmetric information approach)
- The desire to influence the nature of products or competition in the product/input market, or
- The desire to affect the outcome of corporate control contests

As will be further discussed, through a complex network of complex financial contracts⁵ between the participants in a project finance structure, both the cost of agency conflicts inside the project company and the opportunity cost of underinvestment due to leverage and incremental distress costs in sponsoring firms **can be reduced**.

It is hence evident that the study of the agency problems developed in project finance will shed light on their nature and allow for an assessment as to what extent the agency conflicts are diminished and what are the new agency problems that emerge from this complex relationship.

1.4 OVERVIEW OF THE THESIS

The present study investigates the agency problems developed in a project finance structure and identifies the paths through which they impose agency costs in the total cost of the project.

The subject, draws insight from the literature, according to which however, project finance is a solution to the agency problem. As will be shown, the agency problem is not missing from the image and its effect is significant but at the same time the contractual nature of project finance does a significant effort to reduce its impact.

⁵ Which significantly limits the room for actions against the common benefit of the participants through detailed and specific covenants that govern the relationships.

Determining the credit spread directly with a numerical approach however was not possible hence the ultimate effect in the credit spread of a project cannot be extrapolated since the information required for the relationships developed between a project is rather extensive and most of the time not publicly available. Relevant studies have worked with project finance loan databases and via regression analysis the main spread determinants have been identified, determinants such as the reputation of the lenders or of the lead arranger, the country's reputation, the size of the loan and other factors which are easy to collect. For the study of agency problems however a direct approach is not so easy.

One method is to study a single project extensively to its details and build up information that is missing and then account for uncertainty. Such studies exist for flagship and notable projects but this approach can't be replicated or repeated for other projects for verification.

Another method would be via regression analysis to indirectly account for agency problems using proxies based on information asymmetry but this method also lacks transparency and direct relationship with the target that is to be modelled.

Last, a less empirical method is the theoretical approach of incentives theory also known as contract theory. With this method, a detailed mathematical model is drawn based on microeconomic models. This method is purely theoretical and not easily verified.

I have followed a qualitative approach of the project finance structure in an effort to identify potential agency problems. My approach is based on three fundamental steps that are applied for each relationship in the project finance structure. First I identify the objective of each party, then I account for the 'information status' of each party (i.e. which party has an information advantage and what type of advantage) and last, based on the relationship between the parties, the scope of the relationship, the motives and the information status I identify what type of agency problem(s) is (are) potentially developed in each relationship. With this method I can also identify the channels through which agency costs can end up in the final price of the deliverable of the project under consideration, be it either product or service.

Similar method is followed by Esty (2003) in his work entitled '*The Economic Motivations for Using Project Finance*' where in some part he discusses the agency conflicts with a similar method. He identified the three general type of conflicts, (i)

conflicts between ownership and control, (ii) conflicts between ownership and related parties – opportunistic behaviour and (iii) conflicts between debtholders and equity holders. This thesis goes one step further by identifying the type of agency conflicts that are met in all relationships developed in a project finance structure.

On another note, similar studies can be found in both law and microeconomics scientific literature emphasizing in the contracts structure and the mechanisms adopted to mitigate agency problems. One such study is Armour, Hansmann and Kraaakman (2009) from Harvard entitled '*Agency Problems, Legal Strategies and Enforcement*'. The study treats agency problems in general and not specified for project finance specifically. In this study the authors also identified three generic agency problems met in business firms (i) conflict between owners and hired managers, (ii) conflict between owners with majority shareholders and minority shareholders and (iii) conflicts between the firm itself i.e. with parties with whom the firm contracts such as creditors, employees and customers. As per the title, this work emphasizes on legal strategies to mitigate such problems.

Last, an example of the investigation of agency problems with a microeconomic approach can be found in Martimort & Poyet (2008) where the authors try to answer the question '*To build or not to build*' i.e. whether the two tasks of building infrastructure and managing these assets should be bundled or not, with microeconomic models applied specifically to public private partnerships. Though these models can be proven to be very useful in project finance and public-private partnership contracting, they will not be presented in this thesis as they belong to a different discussion.

The text starts with the introduction describing the financial instruments used in project finance transactions. It continues with an introduction and an extensive description of project finance structures. Chapter 4 presents the banking concerns for project finance loans and chapter 5 serves as an introduction to agency theory and information asymmetry. Chapter 6 outlines the qualitative analysis followed to identify potential agency problems and chapter 7 summarizes the conclusions of this thesis.

2. Financial instruments in Project Finance

2.1 INTRODUCTION

With the term ‘*Project Finance Structure*’ I will refer to the whole *ecosystem* of stakeholders, financial relationships, agreements, contracts that consist the financing of a project (which will be presented in the next chapter). I use the term ‘structure’ to highlight that the various contracts which serve as the *interconnectors* between stakeholders, govern the development of the project – in a parallelization with biology, it could be the DNA of a project. DNA is a molecule that carries most of the genetic instructions used in the development, functioning and reproduction of a living organism (a similarity with the life of a project is easily seen), combined of two biopolymer strands coiled around each other (financial institutions been the one strand and technology or other institutions providing a service forming the other in our case) to form a double helix. The two biopolymer strands are referred to as polynucleotides composed by nucleotides which are connected through a chain of covalent bonds (i.e. in this case the contracts).

As project finance is based on a complex system of interconnected stakeholders, it makes extensive use of financial instruments which are the building blocks of modern finance. A definition of financial instruments would proceed as follows ‘*A financial instrument is the written legal obligation of one party to transfer something of value, usually money, to another party at some future date, under specified conditions*’ (Cecchetti & Schoenholtz, 2015). As a broad definition, it covers all categories of instruments. The

above cited authors, categorize the financial instruments in two categories⁶, based on the end objective achieved by its use, (i) instruments used as stores of value and (ii) instruments used to transfer risk. The first category encompasses instruments such as Deposits, Bonds, Loans, Stocks and Asset Backed Securities to name but a few. The second category contains more complex instruments such as insurance contracts, futures contracts, options and swaps. The image on the next page illustrates the multitude of instruments that may be met in a project finance structure.

2.2 FINANCIAL PRODUCTS USED AS STORES OF VALUE

Deposits

Basic building blocks of the financial instruments are the deposits. A deposit is simply a sum of money placed within an entity (a bank) different than the originator of the money. Deposits may serve as a credit for the party who placed it and it may be withdrawn to some other party or used for a purchase. There are three main types of deposits, namely the savings account deposit, the current account deposit and the time deposit. Their difference is traced firstly in the timeframe over which the money are bound to the bank and can't be withdrawn and secondly to the degree of flexibility from the originators point of view for payments. Their title (savings, current and time deposit) is drawn from regular banking products but all three are met in project finance structures with different naming – though with essentially similar mechanics. The Savings account is the simplest variation as the depositor has the freedom to withdraw or deposit on their will. The current account deposits also allow the depositor to withdraw money on his own will but also allow for a credit issued for the depositor by offering an option for over-withdrawal (ie withdrawal of a sum bigger than the one in the deposit), issuing hence a loan on the spot. This form of deposit is mainly used by enterprises for their business related transaction and presents great flexibility as it also considers the issuance of a check book allowing the clients to shift payments to the future. The time deposits will commit the deposited sum for a certain period of time over which the bank will pay interest for it. However if the depositor wishes to withdraw the sum earlier, the payable interest will be less than agreed.

⁶ Other categories may also be established.

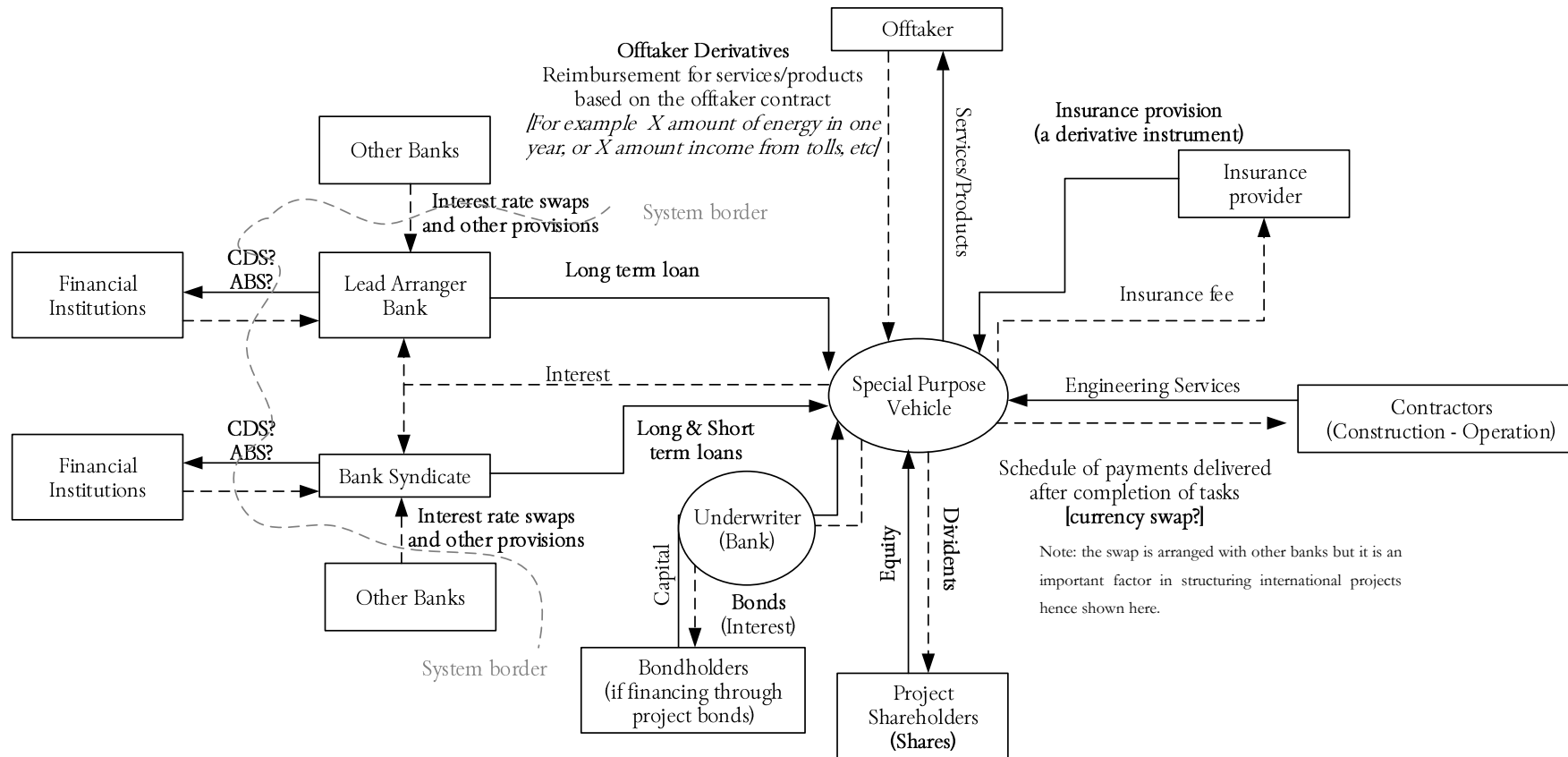


Figure 1 Author's compilation of the financial instruments that may be potentially found in a project finance structure. The list is not exhaustive for brevity. Abbreviations in the figure are explained as, CDS: Credit Default Swaps, ABS: Asset Backed Securities. The grey line indicates the border line after which the bank operates outside of the project context.

Each of the above instruments is priced accordingly. The price refers either to the interest paid by the bank for the deposit or to the interest paid by the account holder if this ends up on a credit status (in the case of the current account deposit). The depositor is benefiting from the provided service and the bank reimburses him with an interest paid on the deposited sum. The bank benefits from increased liquidity both from the deposit amount but also from other auxiliary charges such as the charge on transactions with other banks. In project finance, the mechanics are essentially similar but governed by additional rules and covenants especially during the loan repayment period where restrictions in drawdown may apply. Essentially, deposits may be held for (i) the main debt facility, (ii) the debt service account, (iii) accounts for project costs and payments, (iv) accounts to hold various grants and financing from governments or other multilateral agencies and others.

Loans

In a loan agreement, the borrower obtains resources from a lender in exchange for a promised set of payments in the future. The loan provides the borrower with flexibility and depending on the special characteristic of each loan and the borrowers profile, it may allow the latter to decrease the cost of debt by utilizing assets that he owns. The bank benefits from the interest paid on the borrowed sum and the borrower benefits from flexibility in his transactions. A loan may be characterized from basic parameters such as the interest paid (size and status-fixed or variable), duration of repayment, scope, collateral and others. The price of a loan refers to the cost of debt for the borrower i.e. the interest paid. In project finance there are several types of debt. I will address them as debt. There are two main types of debt, senior and subordinated. The subordinated debt is referred to as Mezzanine debt and is debt provided by third parties rather than investors directly to the project company and may be used in cases where either there is a gap between the amount that senior debt are willing to provide and the total debt requirements of the project (Yescombe, 2007).

The below characterization for senior debt is drawn from Gatti (2008). The senior debt includes the following sub-types, (i) the base facility (ii) the working capital facility, (iii) the stand-by facility and (iv) the vat facility. The base facility is granted to the SPV to finance the construction and will be repaid from cash flows the project generates in the operating phase. The working capital facility serves to finance any cash deficit arising as a result of the cash collection cycle. In PPP for example, the amount of working capital facility will cover the

period necessary for the SPV to receive payments from the host government. The standby facility is an additional debt facility made available to the SPV to cover contingencies arising during the project's life cycle. It is the riskiest part of the debt of the project and presents the greater spread. Last the VAT facility is granted to cover VAT requirements during the construction phase and it will be repaid from VAT receipts during operation (especially when VAT reimbursement takes a long time in the country where the project is developed). The facility in short aims to finance VAT paid on construction and development costs.

Bonds

Another form of a loan is the bond with which, in exchange for obtaining funds today, the issuer promises to make payments in the future. The bond is used by the issuer to fund operations whereas it is used from the buyer as a store of value. Unlike loans, the bonds can be traded in financial markets by the buyers. The relationship between the issuer and the holder is minimal as the issuer may not know who exactly the owner of the bond is at a given time, which is in complete contrast with the loan case. In addition to the characteristics that govern the identity of a loan as mentioned above, the bond also has a face value and a price attached to it which governs its future. Again there is a regular coupon rate and an interest rate along with a maturity period. In contrast with the loans, the bonds may not have collateral attached. Bonds will be discussed in a later part of the text as one of the main project finance options is the project bond which becomes increasingly familiar.

For **financing of a single project** backed by its own cash flows is one category of project bonds and this is of interest here. However for **financing infrastructure** we encounter several types of bonds and some discussion is needed to avoid disambiguation.

First I will talk about the **project bonds** which are an instrument issued to fund a single project and is considered as the evolution of project finance loans in combination with access to capital markets. The below definition is drawn from a presentation from law firm Chadbourne and specifically taught in the university course 'Infrastructure Law' by Despoina Doxaki in University of Piraeus Banking Law Master program. A project bond is a type of

asset-backed⁷ bond where payment of interest and repayment of principal in respect of the bonds are made primarily from the cash flow generated by an infrastructure project and to that extent it is similar to a project finance loan provided by a bank though the funding comes from capital market investors. Note here that the project bond can be issued either before the construction to fund the project totally or issued after the project has entered into operation and is significantly derisked and used as a refinancing option for better terms compared to the bank loan facility. That said, we further distinguish between two types of project bonds, **ex post** project bond and **ex ante** project bond.

Municipal bonds is a special category of bonds issued by public bodies in order to finance projects linked to the mission of local authorities. They are structured in similar ways with project bonds. Gatti (2008) identifies three types of municipal bonds (i) general obligation bonds, (ii) project revenue bonds and (iii) dedicated revenue bonds, and his typology definition follows. **General obligation bonds** are securities for which debt service is guaranteed by full faith and credit by the issuer's creditworthiness which depends on its power to impose taxes on the public. **Project revenue bonds** are securities very similar to project bonds. Here the debt service for the loan also is guaranteed by the cash flows generated by a single project and the essential difference with project bonds is that the issuer is a public body instead of an SPV. Last the **dedicated revenue bonds** are a special category of bonds in which debt service is guaranteed by a specific cash flow generated by revenues collected by the public body concerned but they are not linked to a single project.

When talking for **financing infrastructure** in general and not for a specific project, we can also endorse the thematic bond financing category⁸. I will describe them with the popular Green⁹ Bonds category which is becoming popular as the sustainable character of infrastructure is a governing trend. The typology is from BNEF¹⁰ (2014). Here too we distinguish several types of bonds, (i) corporate self-labelled bonds, (ii) green asset backed securities (ABS), (iii)

⁷ Asset backed securities are effectively shares issued in the returns or payments arising from specific assets. The investor will purchase a share in the potential revenue that arises on the holder of these assets.

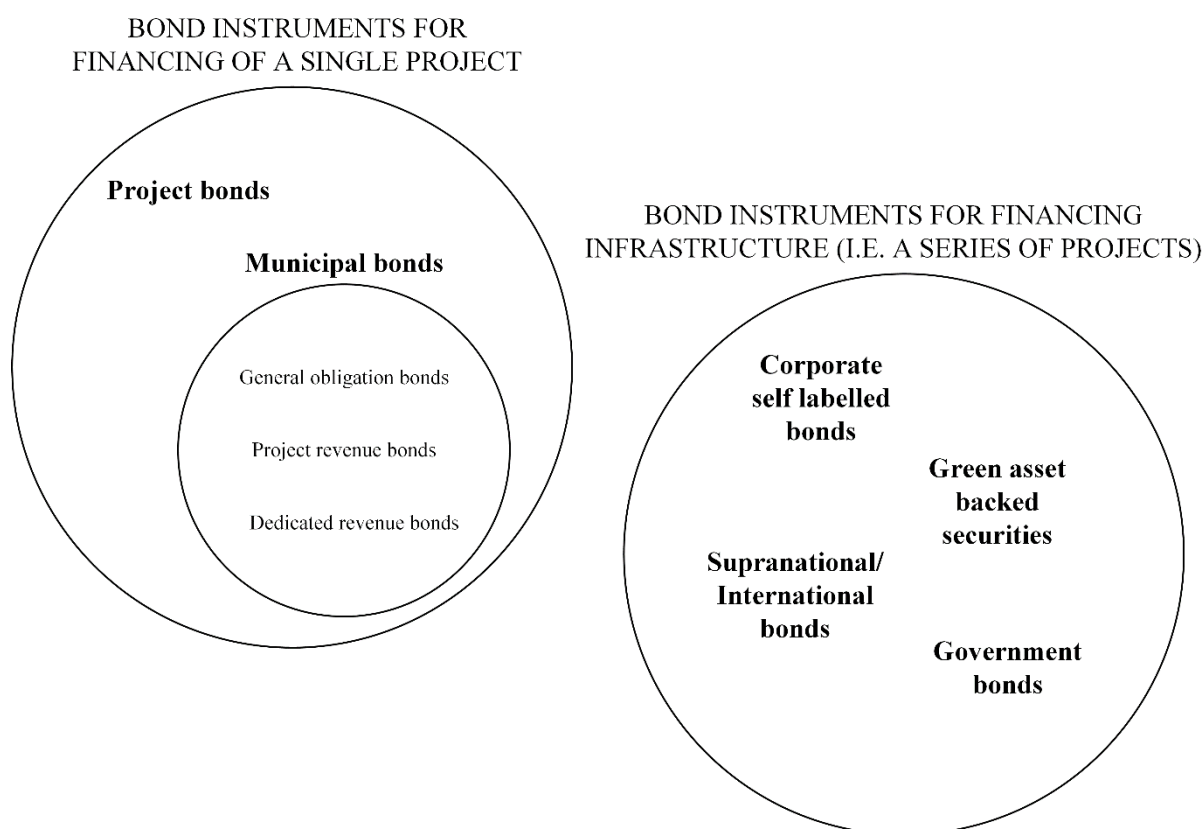
⁸ Definition named by the author to account for other popular infrastructure bond types.

⁹ Green activities refers to energy efficiency, renewable energy and sustainability related activities.

¹⁰ BNEF: Bloomberg New Energy Finance

supranational and international bonds and (iv) government bonds. **Corporate self-labelled bonds** are bonds issued by corporations and explicitly labelled as green that is, to fund general green activities but the repayments are sourced from the general corporate funds. **Green ABS** are asset backed securities whose cashflows are sourced from a portfolio of underlying receivables such as loans, leases and power purchase agreements. The receivables are associated with green projects. The **supranational/international** bonds are bonds issued by organizations like multilateral banks, development banks and export credit agencies to fund green activities. The **Government bonds** are bonds issued by national, regional or local governments to finance green projects, encompassing municipal bonds.

Figure 2 The family of infrastructure related bonds



Commercial Papers

The **commercial paper** is a payment promise and serves as an instrument of short term debt without collateral. The commercial papers may be traded freely and the holder is not obliged to hold it until its maturity. That said, the commercial papers present great liquidity and are very popular since this trait decreases the need for great yields and hence the cost of debt of

the issuer. Such papers are only issued by large corporations and banks. Commercial papers may be encountered in the project finance landscape as a financing tool for the working capital, most likely prior to the financial close of the project, for example to finance development or pre-financing activities.

Certificates of deposit

The **certificates of deposit** are low risk investment products which are sold by banks. In short they are very similar with the time deposits presented previously but they differ in the strict commitment of the deposited sum for a period of time, with exchange for a higher interest. Again the withdrawal of funds prior to its maturity is punished with less interest. This characteristic of the binding duration exposes both the investor and the issuing bank to interest rate risk in times of variability in the rates. In project finance they are extensively used in the development process as a guarantee to establish the agreements of the project and place orders of equipment or raw materials.

Repurchase agreements

Also a form of short term debt, the **repurchase agreements** consist of two transactions, Simply, one entity owns a security such as bonds, which sells them in another entity in exchange for a sum equal to the worth of the bonds, with an agreement to buy them back in the future with a predefined price. Such agreements are met in the equity participation in financing. Investment in a project by way of shares may be coupled with an agreement to allow the equity investor to sell its shares to the project sponsor if the equity investor wishes to exit the project and similarly, the project sponsor may have the option to repurchase the shares.

Stocks

Owning a share of a company's **stock** is equal to owning a small piece of the firm and entitlement to a part of its profits. The owner of a firm, sells stocks in an effort to raise funds to enlarge operations and for transferring risk of ownership. The buyers of the stocks though use them as a store of wealth. The buyer of the stock benefits from its increasing price and potential dividends but also accumulates the potential downside risk. In project finance, a special purpose vehicle company is established, the shares of which are owned by the sponsors and potentially other entities (banks, financial institutions, engineering firms).

At this point it is beneficial to include here the new types of companies for infrastructure projects that have emerged in the last years as they relate to the use of stocks in project finance.

A new type of company that has emerged in US and EU markets, referred as YieldCo (YieldCos as plural). YieldCos are **yield based investment vehicles** used for mainly electrical energy generation projects. Especially for wind and solar projects which provide power under long term contracts and pay out much of their cash flow to shareholders. Stocks of YieldCos are publicly traded. The YieldCo structure originates from the project company contributing cash-generating assets into a limited liability company. The YieldCo then raises cash from the public through an initial public offering (IPO) of its stock, and uses the IPO proceeds to buy an interest in the LLC. The sponsor retains an economic interest in the LLC but typically has no economic interest in YieldCo, only a majority voting interest, which allows the sponsor to control investment and operational decisions (Ernst & Young, 2015). The YieldCo is an evolution of the master limited partnerships (or MLP's). The MLP's have been around for several years and also are a vehicle formed to hold long-lived assets with stable income streams. For MLP's however special conditions may apply for their establishment as the revenues must be originating from specific sectors (such as sustainable technologies, oil & gas) that are specified by laws. In contrast with Yieldcos, MLP's face no corporate level taxation in the cost of the restriction in the origin of revenues as said. The market for Yieldcos is growing fast as in 2014 15 quotes US and EU renewable power ownership vehicles had raised a total of 12bn\$ (with capitalization of 27.6bn\$) which accounts for one third of new public equity funding for all clean energy companies (BNEF, 2015).

2.3 INSTRUMENTS USED TO TRANSFER RISK

Insurance contracts

The objective of an **insurance** product is to assure that a series of payments will be made under particular circumstances. The insurance contracts are the basic tool for risk transfer from one party to the other. The general feature of a typical insurance contract is that embodied in a contract over which the insurer will pay the insured if certain defined events occur. The point of importance is that the event must be uncertain and its uncertainty must hold either to whether the event will occur at all or when it will occur. The uncertainties that can be insured against are numerous and depending on the insured entity there may be separate contracts for each

uncertainty but contracts exist that bundle a number of uncertainties in a single agreement. Though insurance does not remove risk, it does offer some financial security to the project company by providing financial assistance should it suffer the effects of such risk becoming manifest (Dewar, 2011). In return for a known cost called premium, the uncertainty associated with both the frequency and severity of loss is transferred to the insurer, whereas the premium is a contribution to a pool of premiums received by the insurer from all insured parties and it acts for and out of which all losses are paid (Dewar, 2011). Insurance contracts are also attached to Moral Hazard problems. In a moral hazard situation, one party is taking risks because someone else bears the burden of those risks. The topics of moral hazard will be extensively discussed in the next chapters¹¹.

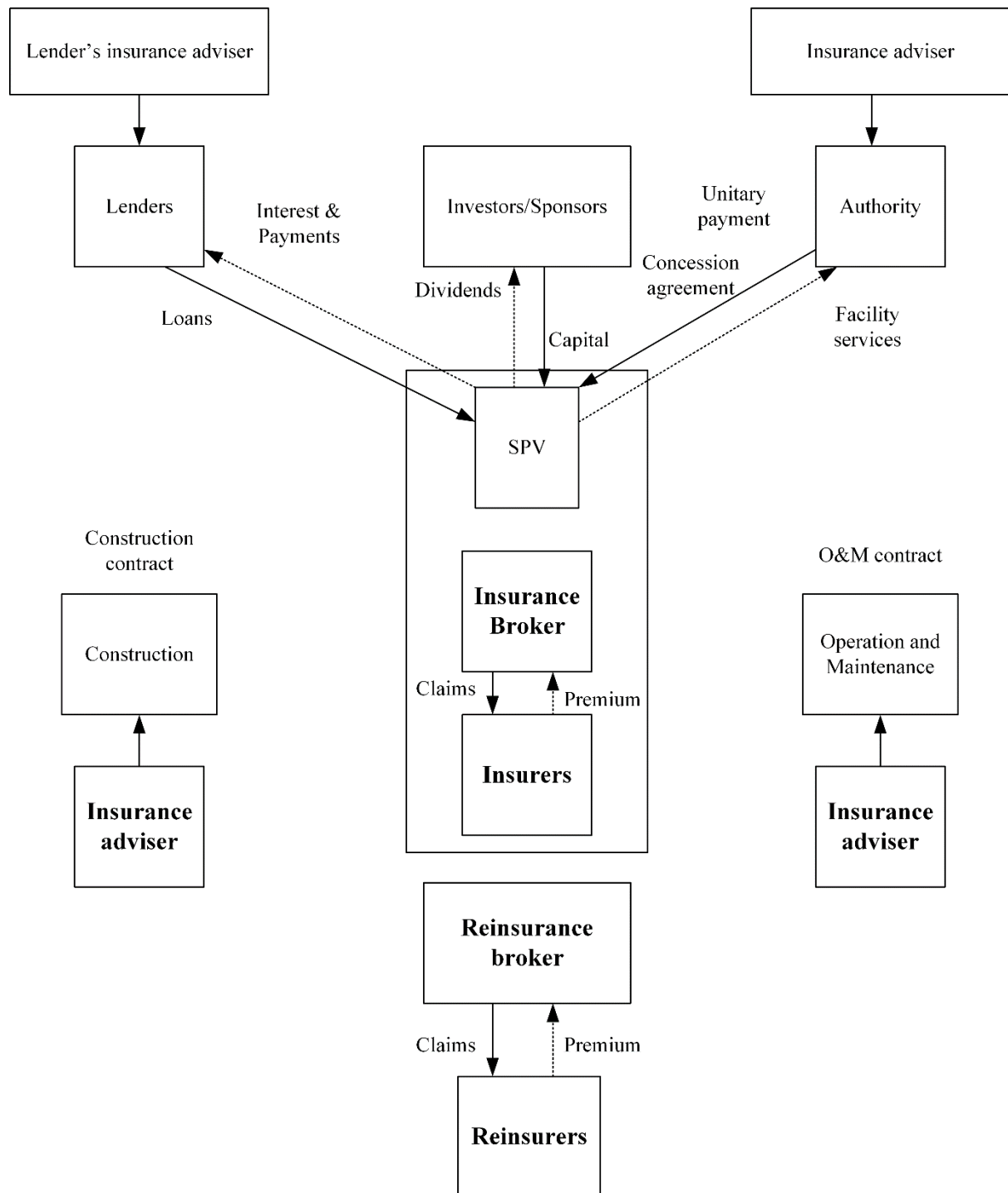
There are three generic types of insurance contracts developed in a project finance structure. The typology is drawn from Dewar (2011). First there are those that protect against the direct costs, and to some extent indirect costs to reinstate, repair or replace assets that have been lost or damaged. Second there are those that protect against a loss of revenue or a loss of anticipated revenue that would have been earned but for the loss or damage that delayed or interrupted the generation of revenue. Last there are those that protect against a claim by a third party for indemnity as a result of occurrence or accident for which the project company is held to be legally liable, whether under applicable law or negligence. Insurance plays a great role in project finance structures and is met in many relationship in the project. Figure 3 shows the insurance participants in a project financing scheme.

Futures contracts

A **future** contract is an agreement made between two entities to exchange a fixed quantity of a commodity or an asset at a fixed price on a set future date (Cecchetti & Schoenholtz, 2015). It is a form of a derivative instrument as its value is based on the value of another instrument. Such contracts are negotiated at futures exchanges.

¹¹ Agency problems related to insurance contracts in project finance are not addressed in this thesis. Insurance related agency problems have been extensively discussed in the greater literature.

Figure 3 Insurance participants in project finance. From Dewar (2011)



Futures contracts are also a great tool for risk management as they can be used to fix prices or rates in advance for future transactions. Futures are also used for speculation based on prediction of the price of an asset or the direction that it will move in the future. In a future contract, a sum of money are deposited in the margin account which serves to mitigate the

credit risk to the exchange (i.e. ensure that the counterparties are secured towards the promised benefit and the obligations that had been undertaken), the balance of which should be kept in certain levels depending on the transaction size and the development of the losses of the contract. Futures contracts can be met in several phases in a project financing scheme. First it can be more frequently met during the operation phase whereby the sponsor-government agreement is effectively a futures contract for the delivery of a service at an agreed price. It can also be met during the financing phase (i.e. for currency hedging) or for commodity supply for the construction.

Options

The **options**, just like the futures contracts are derivative instruments whose prices again are based on the value of another instrument. The basic characteristic of the option is that it gives the holder the right and not the obligation to buy or sell the underlying asset at an agreed price. This facility is available for a predefined period. The two parties have agreed a strike price which along with the premium paid on the option when compared with the underlying asset price governs whether the option is exercised or not. Options can be classified according to the type of the underlying asset in many categories some of which are the equity options, the bond options, the future options, the index options, the commodity options and the currency options. Options can be integrated with either debt or equity instruments in project finance as an upgrade facility, for example in a two-phased project such as the future expansion of a mine or an oil rig.

Swaps

An instrument from the same family is the **swap** contract which is an agreement to exchange two specific cash flows at certain time in the future. The products of the swap family come in great variation first on the asset that is exchanged (interest rate, currency et.al.) and the characteristics of the agreement such as the facility period, the charge and others. Most swaps are traded over the counter i.e. are tailor-made for the counterparties. There are four governing types of swaps, interest rate swaps, currency swaps, commodity swaps and equity swaps but other variations exist as well. The most common form of a swap is the plain vanilla interest rate swap where two parties exchange a fixed rate loan with a floating rate loan. More exotic swaps are also met such as the total return swap (party A pays total return of an asset and party B makes periodic interest payments), the option on a swap (provide the right but not the

obligation to enter in a swap agreement), the variance swap (allows a party to speculate or hedge risk by betting on the magnitude of movement), the amortising swap (an interest rate swap in which the notional principal for the interest payments declines during the life of the swap), the zero coupon swap , the deferred rate swap, the accrediting swap, the forward swap and others. Swaps will be most frequently used in project finance for hedging uses such as hedging of currency or interest rate risks on the loan facilities.

3. Introduction to Project Finance

“It does not seem necessary that the expense of those public works should be defrayed from that public revenue, as it is commonly called, of which the collection and application is in most countries assigned to the executive power. The greater part of such public works may easily be so managed as to afford a particular revenue sufficient for defraying their own expense, without bringing any burden upon the general revenue of the society. “

Adam Smith, ‘*An Inquiry into the Nature and Causes of the Wealth of Nations*’, Book IV ‘*Of Systems of political Economy*’, Part third ‘*Of the Expense of Public Works and Public Institutions*’, Article I ‘*Of the Public Works and Institutions for facilitating the Commerce of the Society*’

3.1 WHAT IS PROJECT FINANCE?

First, it is essential to underline what project finance is not – or more correctly what it should not be- it should not be a mean of raising funds to finance a project that cannot be financed on a conventional basis. The soundness of the project and its economic viability are very important.

Gatti (2008) defines project finance as the structured financing of a specific economic entity which is established by the sponsors using equity or mezzanine debt¹² and for which the lender considers cash flows as being the primary source of loan reimbursement, whereas assets represent only collateral. Gatti also notes that the literature on project finance more or less agrees on defining project finance as a financing facility that as a priority does not depend on the soundness and creditworthiness of the sponsors not even on the value of assets held by the sponsors and are willing to make available to financiers as collateral, instead it is basically a function of the project's ability to repay the debt contracted and remunerate capital invested at a rate consistent with the degree of risk inherent in the venue concerned.

Wynant (1980) defined project finance as "a financing of a major independent capital investment that the sponsoring company has segregated from its assets and general purpose obligations." The World Bank who has traditional engagement in participating in capital intensive projects via project finance, defines it as the "use of nonrecourse or limited-recourse financing" (1994). Comer (1996) further explains that the nonrecourse financing is referred when the lenders are repaid only from the cash flow generated by the project or, in the event of complete failure, from the value of the project's assets. Under a limited recourse scheme, lenders may also have limited access to the assets of the sponsors.

The objective of using project financing is to create a structure that is bankable and to cap the risk of the shareholders by shifting risks to the participating parties, who are experts in the service they are providing and have better capacity to manage relevant risks. The payment of the principal, the interest, the dividends and the operating expenses is originating from the project's revenues and assets. Both equity and debt investors, in order to engage on a project require certain basic legal, regulatory and economic conditions to prevail.

Project finance transactions share the following characteristics. They usually refer to large scale projects that require a great deal of debt and equity capital, such as infrastructure projects. These structures are highly leveraged with debt ratios from 65% to 80% of the total capital and

¹² Mezzanine debt (defined in the previous chapter) is any subordinated debt or preferred equity instrument that represents a claim on a company's assets which is senior only to that of the common shares.

the tenor can be as high as 15 to 20 years. The five distinctive points that characterize project finance are (Gatti, 2008):

- i. The debtor is a project company set up on an ad hoc basis that is financially and legally independent from the sponsors.
- ii. Lenders have only limited recourse (or in some cases no recourse at all) to the sponsors after the project is completed. The sponsors' involvement in the deal is, in fact, limited in terms of time (generally during the setup to start-up period), amount (they can be called on for equity injections if certain economic- financial tests prove unsatisfactory), and quality (managing the system efficiently and ensuring certain performance levels). This means that risks associated with the deal must be assessed in a different way than risks concerning companies already in operation.
- iii. Project risks are allocated proportionally between all parties involved in the transaction, with the objective of assigning risks to the contractual counterparties best able to control and manage them.
- iv. Cash flows generated by the project company (a special purpose vehicle company) must be sufficient to cover payments for operating costs and to service the debt in terms of capital repayment and interest. Because the priority use of cash flow is to fund operating costs and to service the debt, only residual funds after the latter are covered can be used to pay dividends to sponsors.
- v. Collateral is given by the sponsors to lenders as security for receipts and assets tied up in managing the project.

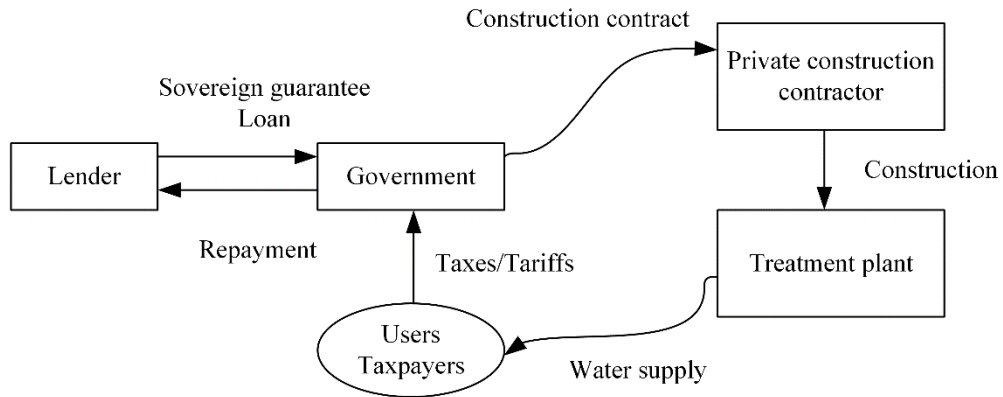
Project funding can be obtained from various sources. For infrastructure projects specifically, funding may be originating from three methods, public finance, corporate finance and project finance. In public financing (see figure 4), governments use existing surplus funds or debt such as government bonds. This option though strains the balance sheet of the governments and has been found to be less attractive as it limits their capacity to build more projects. In corporate finance (see figure 5), a sponsor from the private sector uses its own credit for raising funds due to his capacity and the limited size and nature of the project. Last as said, the project financing (see figure 6) uses the project's asset and future revenues as the basis for raising funds.

In project finance, the sponsor company usually is comprised by more than one sponsors. This occurs for many reasons, most prevailing are: (i) that the project exceeds the financial or technical capabilities of one sponsor, (ii) because the risks of the projects have to be shared, (iii) because a larger project achieves economies of scale, (iv) because the legal conditions may impose maximum equity position and hence indicate additional equity providers. The above three financing types are presented in the figures in the next page for the example of a waste treatment facility. The table below summarizes a comparison between corporate and project finance.

Table 1 Comparison between corporate and project finance (Comer , 1996)

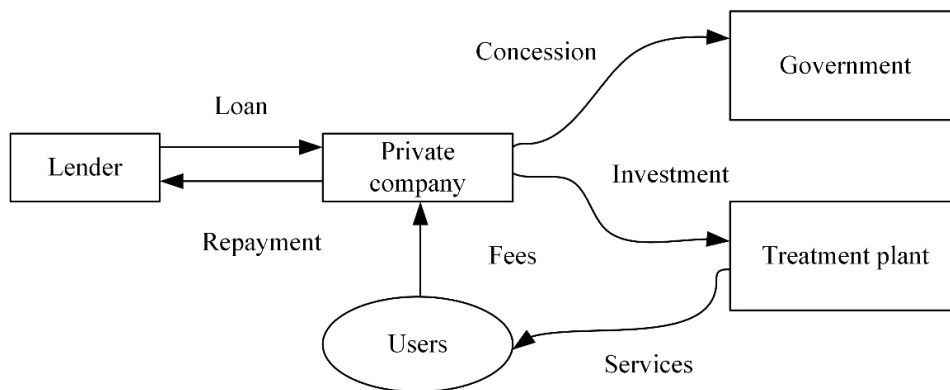
Dimension	Corporate finance	Project finance
Financing vehicle	Multi-purpose organization	Single-purpose entity
Type of capital	Permanent – an indefinite time horizon for equity	Finite – time horizon
Dividend policy and reinvestment decisions	Corporate management makes decisions autonomous from investors and creditors	Fixed dividend policy – immediate pay out; no reinvestment allowed
Capital investment decisions	Opaque to creditors	Highly transparent to creditors
Financial structures	Easily duplicated; common forms	Highly – tailored structures which cannot generally be reused
Transaction costs for financing	Low costs due to competition from providers, routinized mechanisms and short turnaround time	Relatively higher costs due to documentation and longer gestation period
Size of financings	Flexible	Might require critical mass to cover high transaction costs
Basis for credit evaluation	Overall financial health of corporate entity; focus on balance sheet and cash flow	Technical and economic feasibility; focus on project's assets, cash flow and contractual arrangements
Cost of capital	Relatively lower	Relatively higher
Investor/lender base	Typically broader participation; deep secondary markets	Typically smaller group; limited secondary markets

Figure 4 Public Finance for a waste treatment facility. From (Gatti, 2008)



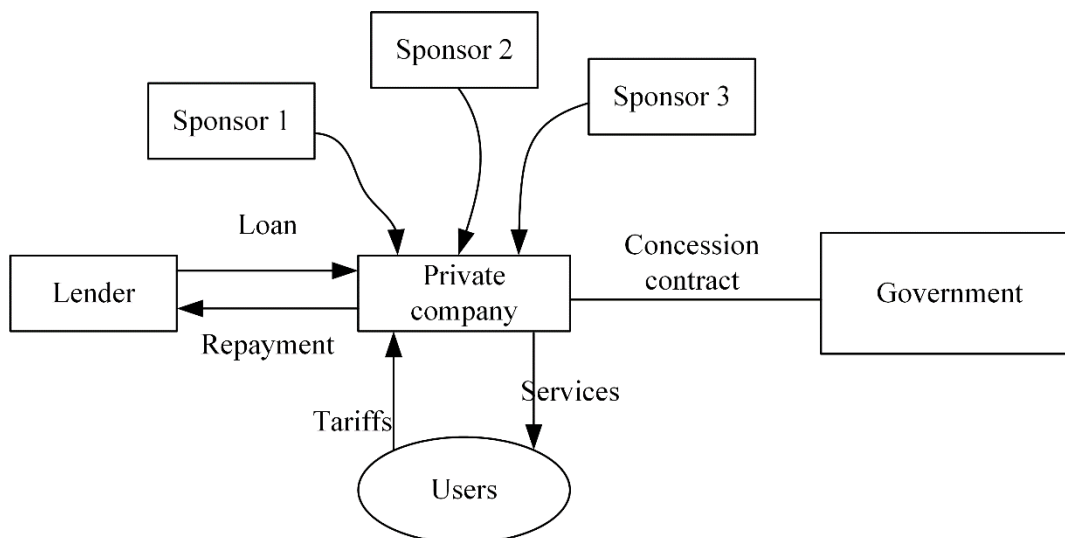
- A government borrows funds to finance an infrastructure project and gives a sovereign guarantee to lenders to repay all funds. Government may contribute its own equity in addition to the borrowed funds
- Lenders analyse Government’s total ability to raise funds through taxation and general public enterprise revenues, including new tariff revenue from the project
- The sovereign guarantee shows up as a liability on Government’s list of financial obligations

Figure 5 Corporate Finance for a waste treatment facility. From (Gatti, 2008)



- A private company borrows funds to construct a new treatment facility and guarantees to repay lenders from its available operating income and its base of assets
- The company may choose to contribute its own equity as well
- In performing credit analysis, lenders look at the company’s total income from operations, its stock of assets, and its existing liabilities
- The loan shows up as a liability on the company’s balance sheet

Figure 6 Project Finance for a waste treatment facility. From (Gatti, 2008)



- A team or consortium of private firms establish a new project company to build, own and operate a specific infrastructure project. The new project company is capitalised with equity contributions from each of the sponsors
- The project company borrows funds from lenders. The lenders look to the projected future revenue stream generated by the project and the project company's assets to repay all loans
- The host country government does not provide a financial guarantee to lenders sponsoring firms provide limited guarantees. 'Off-Balance-Sheet Financing'

3.2 HISTORY OF PROJECT FINANCE: FROM ANCIENT GREEKS TO THE SUEZ CANAL AND THE MODERN INDUSTRY

A few words as to the origin of project finance follow. The views on the first application of project finance differ among the literature. I have collected below all references, sorted with the referred time of appearance.

The first argued appearance of project-finance-like mechanisms was during ancient Greek and Roman times whereby shipping merchants were using similar techniques to share the risk in marine trading via a sea loan known as *Fenus Nauticum* (Kavaleff, 2002-2003). It worked on the basis that a loan was advanced to the merchant for the purpose of purchasing goods on the outward voyage, which loan would only be repayable if the ship arrived safely at the home port with the cargo on board (Bonsor, Cuthbert, & Hall, 1997).

Other references present a much later example, during 1299 A.D. (also differ as to the year – some argue for 1291 A.D.) the English Crown financed the exploration and the development of the silver mines by repaying the Florentine merchant bank Frescobaldi, with output of the mines. The bank held a one-year lease and mining concession, that is, they were entitled to as much silver as they could mine during the year (Bomer & Bodnar, 1996).

Later in the 17th century, a similar form as the *Ferus Nauticum*, was used to fund voyages and expeditions to India. Upon return, the cargo and the ships would be liquidated and the proceeds of the voyage split amongst investors (Bomer & Bodnar, 1996).

One and a half century later we trace the next example of finance per project basis, that of the Suez Canal in 1850. It is referred to as the first infrastructure project financed and operated on a project basis. In 1970 project financing took its modern form and its use was increased. The development of the North Sea oil fields in 1970 was the first example of modern project finance (James, 2008). The story of the project is presented by Kensinger & Martin¹³ (1988) and also by Barclay Edward and James. Due to the fact that their writing is not easily found either online or hardcopy, I will allow also refer to it since it is very interesting as a predecessor of modern project finance. Below follows an extract from James (2008).

In 1972 BP created the project company Norex for the purpose of managing the construction and operation of facilities for oil extraction from the North Sea. Much of the financing came in the form of loans from a syndicate of 66 banks. The terms of the loans dictated that the banks would have recourse only to the assets of the project firm itself in case of project failure and loan default. The banks did not have recourse to BP's other assets in the event that debt service requirements were not repaid. Norex arranged offtake contracts with BP trading company which would purchase the extracted oil. These offtake or purchase contracts helped alleviate bankers' concerns regarding the uncertainty of future demand quantities and prices.

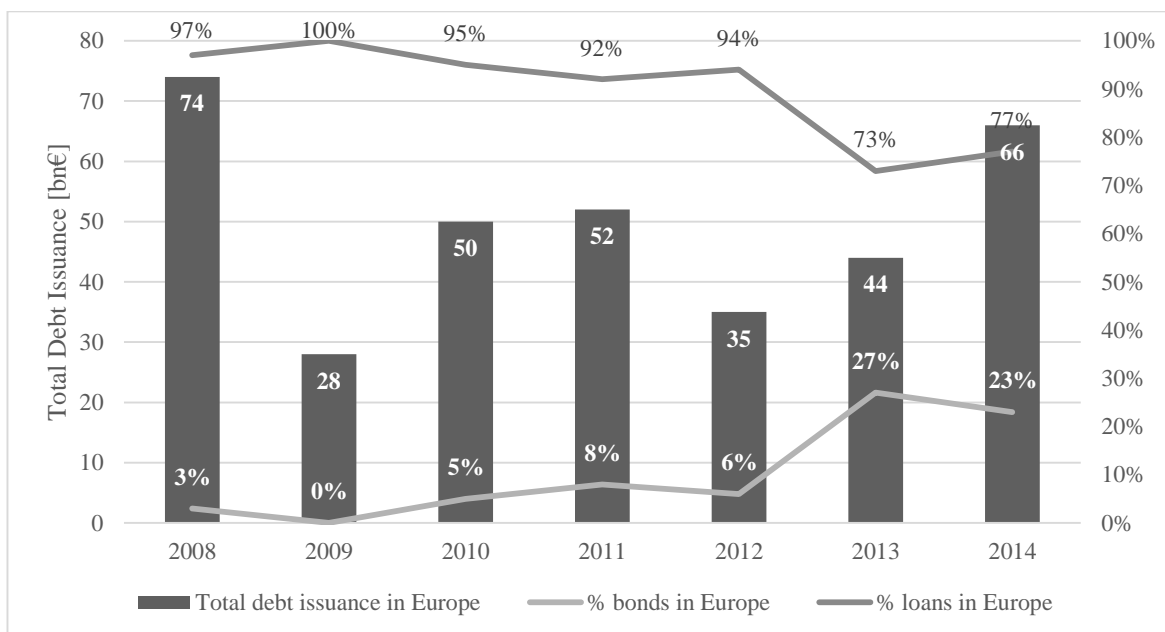
Modern project finance is a widely used tool. The following figures will present the magnitude of modern project finance industry. The figures are from AFME (2015) based on data from PFI Thomson Reuters.

¹³ Interesting fact: the title of the work of Kensinger and Martin (1988) is '*Project Finance: Raising money the old fashioned way*' implying the long story of project finance.

Table 2 Size and composition of project finance bonds and loans

	Global			Europe	
In €m	2014	2013	In €m	2014	2013
Loans	215,019	148,021	Loans	51,064	32,238
Bonds	41,584	35,735	Bonds	15,100	11,842
% Bonds	16%	19%	% Bonds	23%	27%
Total	256,604	183,755	Total	66,164	44,080

Figure 7 European project finance loans and bonds issuance from AFME (2015)

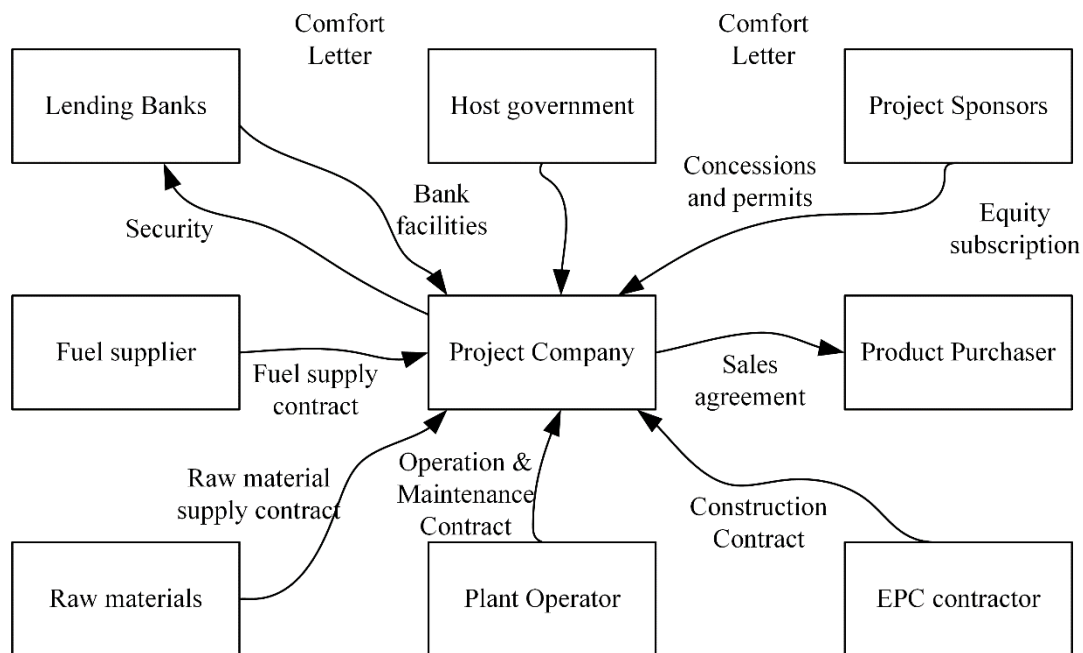


3.3 STRUCTURE OF A PROJECT FINANCE SCHEME

In this paragraph, the role of each party in a project finance structure is presented. The below characteristic structure will be used as a guide for the presentation to follow. As an introduction, for the main parties (host government, lenders, project sponsor), the main terms that will be found in a contract are briefly discussed in the form of two main items, (i) obligations and (ii) risk assumed¹⁴.

Figure 8 Indicative project finance structure. From Gatti (2008).

¹⁴ A more detailed discussion is held in chapter 6 where the motives and incentives of each party as well as the information status is analysed.



Sponsors

The aims of the sponsors are summarized in four points depending on their type, (i) maximizing their return to equity, (ii) strategic expansion, (iii) the sale of goods, (iv) the sale of services (Dewar, 2011).

There may be several types of sponsors. **Industrial sponsors** see the project under consideration as an opportunity which is connected to their core business or an expansion on another field. **Public sponsors** (governments, municipalities) aim at developing a project for social welfare. The **contractor sponsor** is interested in the project as it will provide him a contract to either develop, build or operate a project and in exchange he commits equity or subordinated debt. Last there are other types of sponsors who may just be purely **financial investors**. The summary of risks, benefits and obligations of the two prevailing sponsor types are shown in the next table.

Table 3 Sponsor profile in project finance

Industrial Sponsor	Public Sponsor	Financial Sponsor	Contractor Sponsor
Obligation: All types of sponsor have to adhere to ruling law and regulation in all phases of the project life			
Obligation arises if the project is the result of a tender. Obligation is not arising in a free proposal scheme unless if licenses have been signed which oblige the sponsor to perform work in a predefined timeframe. If so, these are likely to be: <ul style="list-style-type: none"> • the completion of financial close prior to a deadline • the completion of construction works prior to a deadline • the adherence of specific rules • The provision of the granted by the tender service/product for the contract lifetime with the agreed specifications and quality 			
Primary economic benefits: <ul style="list-style-type: none"> • A new project in the pipeline, i.e. revenues from a new stream • Entry to a new field if project not in core business 	Primary economic benefits <ul style="list-style-type: none"> • New product/service • Potentially cheaper supply of product/service (i.e. oil fields) • VAT from construction • Work places 	Primary economic benefits <ul style="list-style-type: none"> • Investment benefits; a financial sponsor may receive a development or advisory fee for services. 	Primary economic benefits <ul style="list-style-type: none"> • Contract assignment and fees • Track record, reputation
Risk assumed: <ul style="list-style-type: none"> • Country risk as explained • Development risk 	Risk assumed: <ul style="list-style-type: none"> • Development risk (i.e. partners credibility) 	Risk assumed: <ul style="list-style-type: none"> • Purely financial sponsors could exit prior to construction if agreed. Hence they assume development risk (i.e. not regulation in place, project not licensed, delays in the development completion and all the sphere of country risk) • Country risk • Development risk 	Risk assumed: <ul style="list-style-type: none"> • Country risk

The host government

The aims of the host government are six, (i) cost minimization, (ii) risk transfer, (iii) a safe and efficient operation of the project, (iv) attract new capital, (v) technology development and training, (vi) competitive advantage.

Not all potential projects are directly related with the host government and in such projects the government just participates through the legislative and licensing framework. However in large scale infrastructure projects but also in other of smaller magnitude with public or municipal companies as the off-taker, the government plays a vital role in the financing of the project. Thus there are two distinctive cases. In the first, the host government must present a solid legal framework for the private sponsors to work on. An uncertain and weak framework will discourage any interest for project financing. The same applies to the second case where a public entity participates as the off-taker. There, from the financing point of view, the host government is treated as a potential borrower in the assessment of a loan. The financiers will

examine the credit risk of the off-taker and in the presence of great country risk, they will either require greater returns and shorter maturities or not finance at all. Thus, to summarize the role of the government for the two distinctive cases is presented in the table below.

Table 4 Profile of the host government in project finance (host government as sponsor is presented in the previous paragraph)

Host Government as an Off-taker	Host Government as legal framework
Obligation: Regardless of the participation, the host government must have in place a solid, clear and fair legislative framework that will encourage such investments but also protect public finances and the interests of the society.	
Obligations: Buy the service/product produced by the project according to the terms of a contract. i.e. adhere to the terms of the contracts, agreements and legal framework.	Legal framework, consents, permits
Economic benefits: <ul style="list-style-type: none"> • VAT from the project transactions, • job creation, • value added in the national industry (if industry is in place), • savings from the project's product/service provision in case it is more expensive to acquire with other means, • security of supply if the product/service is not in great supply, 	Economic Benefits <ul style="list-style-type: none"> • VAT from the project transactions, • job creation, • value added in the national industry (if industry is in place),
Risk assumed: <ul style="list-style-type: none"> • Environmental risk • Social impact risk • Risk of paying more for the service/product if project remuneration is not structured properly 	Risk assumed: <ul style="list-style-type: none"> • Environmental risk • Social impact risk

The Lenders

The aim of the banks is to invest in a profitable project with the lowest risk. The banks benefit from the interest received and the fees paid on services. The banks are approached by the sponsors to evaluate their proposal and if they feel comfortable, they provide with a financing term sheet. The lenders are a variety of commercial banks, export credit agencies, insurance companies, pension funds and other finance entities which may participate in the financing of the project. For the lenders there is no recourse other than the project itself and hence the lenders face the full risk of loss if the project fails and share little or no upside if the project is successful. The lenders may have different objectives according to their type as for example export credit agencies want to boost the export potential of the host country of the technology provider, multilateral banks want to boost investment in the host country of the project and pension funds simply want a safe allocation of funds to match their balance sheet

future development. Despite the different motives behind the lenders, the key objective is to invest and receive a fair return for the risk assumed.

Table 5 The profile of the Lenders

Lenders
Obligation: Provide the agreed funds and services based on financing agreement.
Economic benefits: <ul style="list-style-type: none">• Profit from Interest paid on loan• Profit from fees on provided services
Risk assumed: <ul style="list-style-type: none">• Country risk• Construction risk• Economic risk (risks associated with the country and the market the project operates within)• Financial risk (risks associated with the financial characteristics of the investment)

These were the main parties involved in a project finance transaction. The structure though includes a big number of other participants such as the contractors, the insurer, the development banks and others. A complete analysis of these members is given in chapter 6 where the information status and the agency problems are identified.

4. Project Finance Banking

“...one who sees the beauty of the perfect covenant, the joy of an all-encompassing event of default, or the elegance of a multitier inter-creditor agreement has the capacity to excel in the field [..project finance..]. The inclination to do so comes from never having outgrown the desire to play with big toys, or for that matter machinery and equipment”

John Dewar, Author of ‘International Project Finance Law and Practice’

4.1 INTRODUCTION

As said, project finance deals primarily with infrastructure projects which are capital intensive. When project finance is initiated prior to the project initiation as is traditionally the case¹⁵, the lender is exposed to construction risk as this was discussed previously. Apart from the construction risk, during the construction period the lender is exposed to a variety of financial risks as well. Such risks are (Kolhatkar & Dutta, 2013) (i) the bankruptcy of the project partner on the meantime, (ii) the fluctuation of inflation rate, (iii) the fluctuation of interest rate, (iv) the fluctuation of exchange rate, (v) the rise in fuel prices, (vi) various insurance risks, (vii) currency exchange risk and (viii) liquidity risks.

¹⁵ For smaller projects, as project finance requires time for structuring, some-times sponsors may develop a project with traditional debt, equity or bond financing and refinance later with project finance loans. This is difficult to meet in large project.

Recall that project finance loans are of significant size. Regardless of the size, type or role of a bank in a project finance deal, traditional theories of banking, indicate that a bank manager has four basic concerns in the bank's operation. These are (Ireland, 2012):

- i. Liquidity Management: i.e. to make sure that the bank has enough cash to cover potential depositors requests for withdrawals.
- ii. Asset management: i.e. to acquire assets with the highest return and the lowest risk.
- iii. Liability management: i.e. to acquire funds at the lower cost and
- iv. Capital adequacy management: i.e. to maintain sufficient capital while still providing decent returns to shareholders.

While taking into consideration the above concerns, the bank has a wide number of instruments with which to operate, most of which were presented in chapter 1. As Dermine (Dermine, 2009) notes, although the services provided by the banks are interrelated, it is convenient to distinguish five categories of services with increasing complexity. The first service provided by banks is the underwriting and placement of securities which helps borrowers to meet economic units with a surplus. The second service is portfolio management, the income of which is paid to the shareholders of the bank. A third function is the payment services and the general management of the payment system which includes tasks such as the facilitating and track keeping of transfer of wealth among individuals. A fourth function is the monitoring and information related services. This service is related to the first service of underwriting as information can reduce the costs of screening and monitoring borrowers. While the second service refers to the management of the bank's assets, the fourth service refers to credit management which usually holds significant space in the banks balance sheet. Last, the fifth service is the risk sharing service which is an increasingly important function of banks. By providing some form of insurance against several sources of risk, this service of banks makes the market more complete. I will refer later to the risk management for project finance especially. To summarize, the bank, as a key role in project finance has to move along predefined lines.

Project finance loans have certain characteristics that make them particularly attractive mainly for rating agencies and institutional investors (Grushkin & Bartfeld, 2013). These loans involve a single asset and single credit which is associated with this asset's revenue streams and hence are very focused since they cannot be used for other purposes than the development

of the defined asset. They are secured by all of the borrower's asset including its equity though the most valuable is the asset itself and its associated contracts. The project finance loans amortize over the life of the loan and are supported by a detailed covenant package which literally governs the borrower's transactions. These loans naturally recruit high level of surveillance, monitoring and reporting operations by contracting independent advisors.

That said, it is evident that the lender is exposed to credit risk with very little upside while faces the full risk of loss if the project fails. Especially in more risky projects, different type of lenders may participate who have the capacity and appetite to assume such risks. These may be export credit agencies or multilateral lenders, both of which have different objectives than a commercial bank. Such institutions provide support in the form of loans, political or commercial risk insurances, guarantees and other instruments. Their participation can significantly increase the level of comfort for commercial banks in risky or large scale projects.

The question remains as to why commercial banks should play the primary role? The answer is that commercial banks have substantial experience and appetite for cross border financings, funding flexibility to manage construction drawdown schedules and multi-currency draws, and the capability to be a positive and responsive force in working with the sponsors to respond to unexpected events affecting a project (Dewar, 2011). Commercial banks run in-house specialized teams with experts on various fields of infrastructure that can comprehend the credit risk in such projects.

The roles that can be played by commercial banks are four (Gatti, 2008), namely (i) the lead arranger bank, (ii) participant lender, (iii) documentation bank and (iv) agent bank. The lead arranger is a key role which will be discussed later. The participant lender as implied by the very title is a bank that is not participating with arranging or advisory roles, rather just holds a share in the total debt. The documentation bank is the bank responsible for the correct drafting of the documents of the loan. The agent bank is responsible for managing the cash flows and the payments of the project during its life cycle.

The whole structure is initiated by the initiative of project sponsors and the recruitment of a financial advisor and an arranger. The advisor makes a preliminary valuation of the financial feasibility of the project and outlines an initial assumption as to how the funding mix will be established. The arranger on the other hand is usually a commercial bank and duties include

the mandate from the project sponsors to structure and manage the financing contract. The arranger bank must have the capacity to bring along other banks to fill the financing gap and for especially large projects should be able to form a syndicate¹⁶. If the bank cannot find any additional lenders, the arranger's duties require that the arranger gives an underwriting guarantee of availability of funds.

The two roles of advisory and arranger can be integrated to be provided by the same bank. That is, the project sponsors have three structuring options (Gatti, 2008):

- i. Maintain a clear-cut division between the roles of financial advisor and arranger (i.e. the financial advisor is not allowed to participate in the loan pool)
- ii. The financial advisor will also be the arranger
- iii. And a combination of the above two where the advisor will compete with others for the role of the arranger.

Each option has its own merits (Gatti, 2008). Separating the roles has the merit of reducing potential conflicts of interest between the parties but has the drawback that since the advisor does not invest any money in the deal, the banks that will be called on to the financing will have no credible points of reference as they may think that the advisor wants to shift a risky project. On the other hand, the advisor has to complete all the due diligence before the financial structure and if the roles of the advisor and arranger were combined in a single team, this could avoid extra costs. Hence a great number of banks operate in the dual role of advisor and arranger.

4.2 CONCERNS ON PROJECT FINANCE LOANS

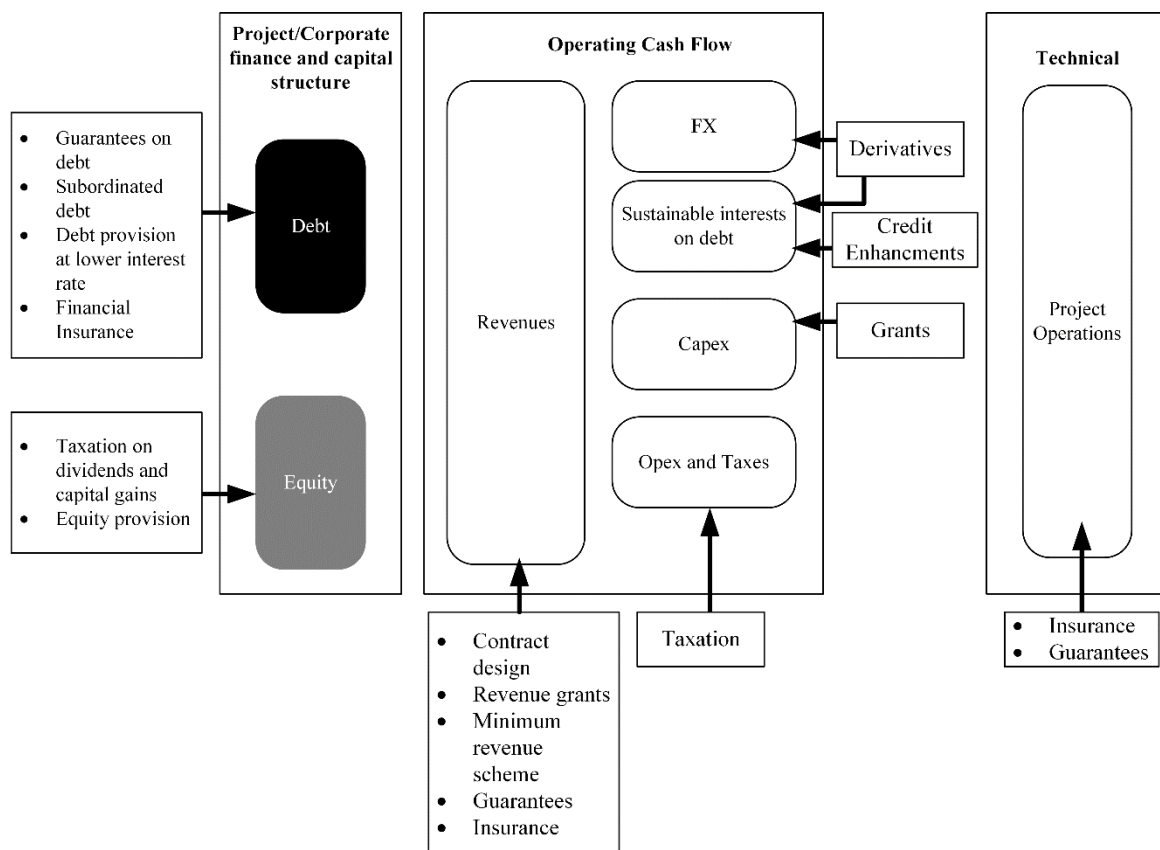
Key point to understand the nature of credit risk in project finance is the question whether longer maturities are a source of risk per se. Sorge (2004) notes that matching the time profile of the debt service and the projected revenue cash flows implies that project finance loans will have much longer maturities than syndicated loans and indeed his search in a database of loans shown that the average maturity of project finance loans is 8.6 years whereas for syndicated loans it was 4.8 years. Long maturities do not necessarily qualify as riskier than short-term

¹⁶ Project finance is a special case of the group of syndicated lending which will be discussed widely in the next chapter.

credits but make the lender particularly exposed to political risk and hence project finance makes often use of political risk guarantees. .

Having discussed already about risks and concerns, in this part the risk management options and instruments will be discussed. To begin with, in the next figure, potential instruments that can reduce the exposure to credit risk or mild the potential downside are presented. The figure shows the forms of public and private supports by showing their effects on the main components of the project cash flow (revenues, capital costs, capital expenditures, operating costs, corporate taxation, interest on debt and foreign exchange currency losses), and financing instruments. The various Risk mitigation instruments may be targeted to specific financial instruments, or to the project SPV in general (operations/cash flow), which can mitigate the excess exposure to commercial risk (OECD, 2015).

Figure 9 Risk Mitigation Instruments in Project finance. From OECD (2015)



The discussion of the nature of credit risk in project finance is drawn by Sorge (2004). Based on the framework for pricing risky debt proposed by Merton (1974), we should expect to

observe a hump shaped term structure of credit spreads as the underlying credit risk is driven by two components, (i) the leverage of the firm and (ii) the uncertainty about the value of the firm asset at maturity. Based on Merton's assumption of decreasing leverage ratios over time, postponing the maturity date reduces the probability that the value of the assets will be below the default boundary is due. On the other hand though a longer maturity will also increase the uncertainty about the future value of firms' assets. Second, despite the extensive securities arrangements, the credit risk of non-recourse debt remains tied to the timing of project cash flows. Obtaining credit risk at longer maturities implies hence smaller amortising debt repayments due in the early stage of the project. This would help to relax the project company's liquidity constraints thus reducing the risk of default and as a consequence, long term project finance loans should be perceived as being less risky than short-term credits. Third, the credit risk of non-recourse debt might be affected not only by the timing but also by the uncertainty of project cash flows and how they evolve over the project stages. Thus successful completion of the project milestones will reduce the uncertainty of the project's financial viability and consequently in the opposite scenario, any potential delays will definitely drive up risk premium required by the lenders. Last, significant impact in the credit spreads will be the political risk and by the availability of corresponding guarantees. Commercial lenders are often willing to commit for longer maturities in emerging economies only in the presence of multilateral development banks or export agencies.

The key to the successful mitigation of the aforementioned risks are the contracts with which the deal is structured, what Corielli et al (2008) define as Non-Financial Contracts. Esty (2003) defines non-financial contracts as an institutional risk management tool and in fact they are both mechanisms that sponsors and lenders use to limit agency problems and tools to manage corporate risk. Gatti adds that contracts are also ways to pre-commit the actions of the management of the sponsor and the obligations of every key counterparty in a detailed way. Gatti et al (2008) investigated the effect of contracts in the interest rate spreads in a project finance deal. They investigated whether the presence of non-financial contracts that shift risks from the project company to its counterparties, reduces the level of interest rate spreads on project finance loans and enables the sponsors to contribute with lesser equity. Their results indicate that lenders are reluctant to price the credit cheaper if sponsors are involved as project counterparties in the relevant contracts and furthermore they do not seem to care about

sponsor's involvement as a contractual counterparty of the SPV when deciding the level of leverage. However they did find that the lack of non-financial contracts causes a cost increase about 19bps, that the use of non-financial contracts signed by counterparties other than project sponsors helps to reduce the loans cost by about 110 bps and that the absence of non-financial contracts is responsible of a drop of 1.1 points of the debt to equity ratio used for the deal.

In the financial contracts on the other hand, one should expect to see covenants that put constraints in the management of the project to protect the lenders interests as have been discussed previously. Especially with regards to the loan, the common risk ratios used are explicitly set in the contracts. There are three risk ratios used (UNCDF, 2014). The first is the debt service cover ratio (or DSCR) which is the ratio of the net project revenue to total debt obligation on the facility for the period. The second risk ratio is the loan life cover ratio (LLCR) which is the ratio of the present value of net cash flow before interest for each future period up to the final repayment date to the amount of the facility outstanding at the end of the period. The third risk ratio is the project life cover ratio (PLCR) which is the ratio of the aggregate of the NPV of the projected cash flows after debt service from the calculation date until the final day of the project term to the total outstanding loan facility at the calculation date.

The covenants governing the project behaviour and consequently for maintaining the above risk ratios in acceptable levels may be (UNCDF, 2014):

- i. To maintain a debt service cover ratio of 1.2x to 1.5x
- ii. To demand a performance guarantee from the engineering, procurement, operation, maintenance contractors
- iii. To insist on a maintenance reserve account
- iv. To fund a debt service reserve account
- v. To require a percentage of contingent equity
- vi. To force purchase currency hedges
- vii. To demand an all asset cession and pledge
- viii. To insist on direct agreements

4.3 PROJECT DEFAULT

That said, even despite the application of all the above tools and strategies, a project may still default. The following discussion about default in project finance is drawn by PECDC which is an institute with credit data pooling initiative primarily designed to assist member banks' completion of Basel II preparations and maintains a large commercial loan loss and recovery dataset. In the discussion for the default cases, the term of 'loss given default' is excessively used and is defined as one minus the recovery rate. The recovery rate is as a rule of thumb the net of all cash flows (discounted) divided by the outstanding amount as the date of default. Hence, since project finance loans depend on a specific asset to generate cash flows for principal and interest payments, the loss given default rate is made more complex given the structure of the non-financial contracts mentioned above. To simplify things, a project is in default if:

- i. Material payment is past due more than 90 days
- ii. The bank takes a charge-off or makes a specific provision
- iii. The banks sells the project at a material credit related loss
- iv. The bank consents to a distressed restructuring likely to result in a loss
- v. The obligor has sought or has been placed in bankruptcy protection

On the other hand, a project is resolved if:

- i. The project has entered return-to-performing status post default or post restructuring
- ii. The bank sells/transfers the defaulted exposure
- iii. There is completion of liquidation/bankruptcy process and repayments distributed to all creditors
- iv. The bank receives final repayment in part or in full from the sale of the project or the loan.

A study performed by PECDC¹⁷ (2014) sheds light to the periodical default cases of project finance loans. The data from their latest report show a correlation of loss given default with project type and highlight that mining and renewable energy projects have higher loss given default when compared to infrastructure, telecoms and non-renewable energy projects. They

¹⁷ PECDC: Pan-European-Credit-Data-Consortium. Today it is renamed to Global-Credit-Data

also found a correlation with whether the project technology is proven or unproven as there is an increase in average loss given default for unproven technology projects that defaulted in the construction phase. Given the default, it is important to correlate with whether the project defaulted in the construction versus operation phase, as the construction phase projects reported a higher than average loss given default compared to defaults in the operation phase. Last compared to large unsecured corporate loans, project finance loans show a lower loss given default.

Figure 10 Number of defaults by region. Sample of 281 defaulted projects under the default definition of Basel II for the period 1997-2009. The large share of projects in the US reflects the 2002-2004 power market crisis led by regulatory changes. From PECDC (2014)

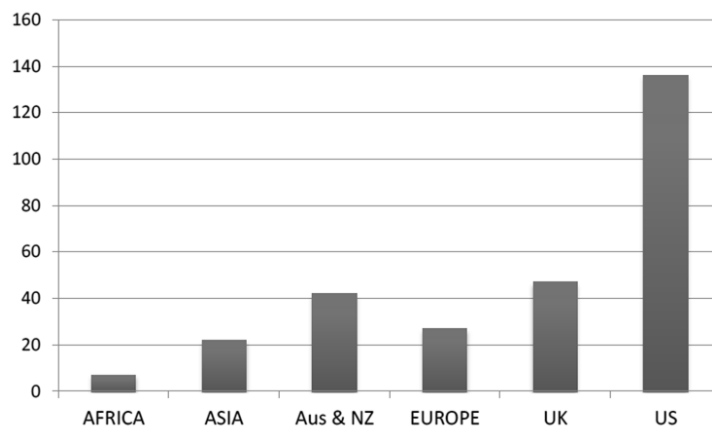


Figure 11 Number of projects by year of default. Authors from the PECDC noted that defaulted cases appear to coincide with global economic performance. From PECDC (2014)

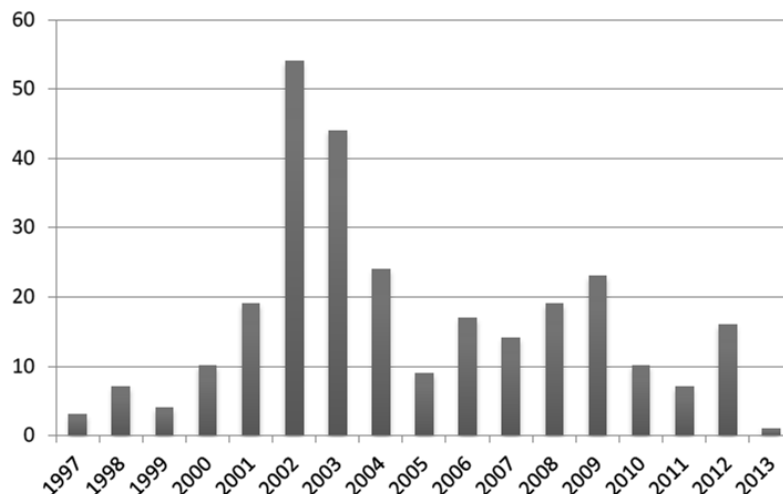


Figure 12 Comparison of data volume and mean loss-given-default for project finance and large corporate unsecured loans. From PECDC (2014)

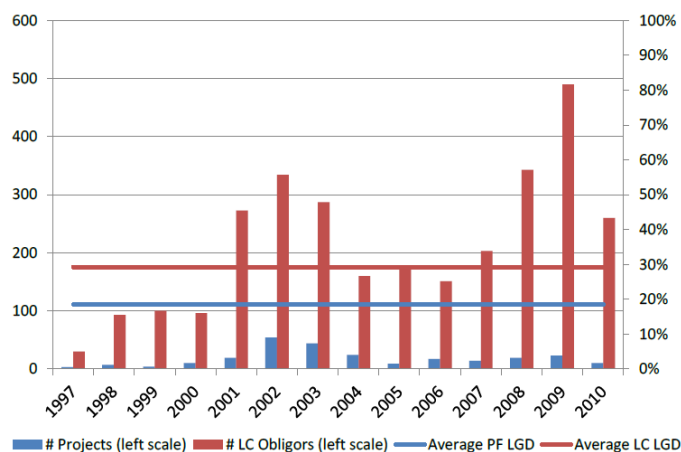


Table 6 Average default rates and recovery rates per industry and per region. From Moody's, collected and processed by Rossi & Stepic (2015)

Industry	Average Default Rate %
Infrastructure	5.2%
Manufacturing	21.4%
Media & Telecom	12.0%
Oil & Gas	6.1%
Power	7.0%
Metals & Mining	13.0%
Average (simple)	10.8%
Average (weighted)	7.2%

Region	Average Default Rate %
Eastern Europe	1.8%
Latin America	14.8%
North America	9.9%
South East Asia	10.0%
Western Europe	5.2%
Average (simple)	8.9%
Average (weighted)	7.2%

Industry	Average Recovery Rate
Infrastructure	72.6%
Manufacturing	49.2%
Media & Telecom	60.2%
Oil & Gas	73.4%
Power	88.5%
Metals & Mining	58.3%
Average (simple)	67.0%
Average (weighted)	76.4%

Region	Average Recovery Rate
Eastern Europe	78.2%
Latin America	80.2%
North America	71.8%
South East Asia	82.2%
Western Europe	73.8%
Average (simple)	77.2%
Average (weighted)	76.4%

4.4 EQUATOR PRINCIPLES

On the due diligence part, the Equator Principles are very interesting. The Equator Principles is a set of guidelines/criteria established by financial institutions in 2003 and they set an environmental and social risk management framework and a minimum due diligence standard for identifying, assessing and managing environmental and social impacts in project finance transactions (Herbert Smith Freehills LLP, 2012). In 2015 it was adopted by 83 financial institutions in 36 countries covering 70% of international project finance debt in emerging markets. The Equator Principles applies globally, to all industry sectors and to four financial products, (i) Project Finance Advisory Services, (ii) Project Finance, (iii) Project-Related Corporate Loans and (iv) Bridge Loans¹⁸.

The Equator Principles consist of 10 principles over the following areas (Equator Principles, 2013), (i) review and categorisation of projects, (ii) social and environmental assessment, (iii) applicable social and environmental standards, (iv) action plan and management system, (v) consultation and disclosure, (vi) grievance mechanisms¹⁹, (vii) independent review, (viii) covenants, (ix) independent monitoring and reporting, (x) reporting. Potential projects are categorized in **category A** for projects with potential significant adverse social or environmental impacts that are diverse, irreversible or unprecedented, **category B** for projects with potential limited adverse social or environmental impacts that are few in number, generally site specific, largely reversible and readily addressed through mitigation measures and **category C** for projects with minimal or no social or environmental impacts.

The financial institutions associated with the Equator Principles Foundation, commit to implementing the Equator Principles in their internal environmental and social policies, procedures and standards for financing projects and will not provide Project Finance or Project-Related Corporate Loans to projects where the client will not, or is unable to, comply with the Principles (Equator Principles, 2011). The Principles are not intended to be applied retroactively, but financial institutions should apply them to the expansion or upgrade of an

¹⁸ Interim or temporary financing from a bank while a borrower obtains medium and long-term financing from the capital markets (from the project finance glossary website of Harvard University available at <http://www.people.hbs.edu/besty/projfinportal/glossary.htm>)

¹⁹ Grievance mechanisms: designed to receive and facilitate resolution of concerns and grievances about the project's environmental and social performance.

existing project where changes in scale or scope may create significant environmental and social risks and impacts, or significantly change the nature or degree of an existing impact (Equator Principles, 2011).

Figure 13 The average spread of Public private partnership loans during the life of the loan. From Blanc-Brude & Strange (2007)

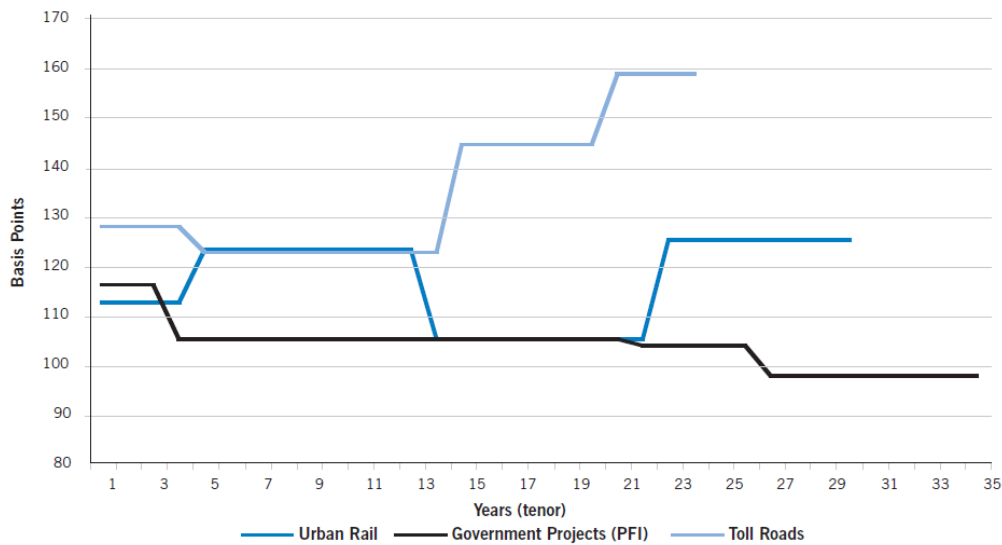
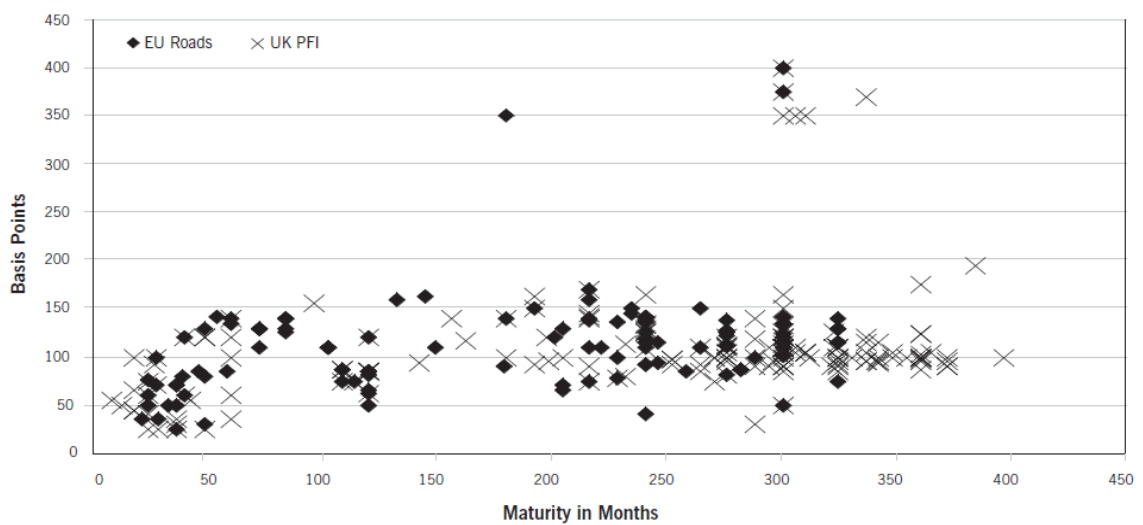


Figure 14 The term structure of public private partnership loans. From Blanc-Brude & Strange (2007)



4.5 PROJECT FINANCE LOAN PRICING

Project finance usually is applied in PPP projects which are ultimately paid by taxpayers as service users. Hence they are politically sensitive as the cost of debt transferred to the taxpayers will be a point of criticism as it will be significantly higher than the cost of public financing. Most critics argue that in such projects, the financing duties when delivered to the sponsors, pose a needless increase in the costs (Palmer, 2000). Practitioners on the other hand simply argue that the cost of debt in project finance is merely the price of the market suggesting that project level risks play a less important role in the state of competition among banks (Blanc-Brude & Strange, 2007). The government argues that it is necessary for private capital to be at risk and take responsibility for the work it carries out especially in the context of project financing. That said, governments frequently find themselves underwriting public projects with the provision of guarantees.

Following the above discussion, it is important to understand that the lender is expected to price any risk that the project structure cannot pass to subcontractors and has the capacity to affect the cost of debt (Blanc-Brude & Strange, 2007). As we will discuss later, project finance loans in the end are deemed as riskier than other type of loans by the Basel Committee and require higher levels of reserve capital from the banks.

A few words of loan pricing will show that classic loan pricing models are not successful in explaining what determines the cost of debt in project finance transactions (Blanc-Brude & Strange, 2007). These models, such as the Merton/Black-Scholes make an important assumption that the creditworthiness of the borrower is given. They predict that the default risk premium is directly related to the borrower's leverage and to the variance of the value of the underlying assets of the borrower. Furthermore they predict that the credit spread is directly related to the risk free rate on the debt. Project finance loans on the other hand seem driven by other factors than those assumed in the Merton/Black-Scholes model. In empirical studies they found that loan spreads are directly related to country risk, covenants in the contract and project leverage plus loan pricing was found that is not a positive function of maturity and loan size (Blanc-Brude & Strange, 2007). There is a nonlinear humped shaped relationship between spreads and maturity in project finance loans because projects tend to have short-term liquidity constraints, and they go through fairly predictable risk phases that are gradually resolved. In a study also cited above, H5 found that debt markets do appear to price project risks that are not

contractually diversified in public private partnerships but not those risks that are contractually allocated, even when they are significant. However they argue that banks are not completely rational in pricing risk as they could still be getting the size of the premiums wrong. That said it is important to remember based on the first chapter of the present text that banks derive value not only from the spreads on the long term senior loans but also from fees and returns on subordinated debt and other transaction fees.

4.6 HEDGING

Due to the characteristics of the financing of the project (long term, size) concerns about various parameters naturally arise. I will talk of two main risks in this part, currency risk and interest rate risk.

Currency risk is created in cases where the project revenues are paid in the local currency whereby the financing is delivered in a different currency. For example a solar plant in India may be financed in Euros but the price per kilowatt-hour is in rupees and this creates an asset liability mismatch (exposure to currency depreciations/appreciations). There are some techniques that can mitigate this risk but these depend on the nature of the project (IISD, 2015).

One method can be the **partial natural hedge**; the sponsor may choose to sell a portion or all of the project's output to a country with the same currency as its liabilities. One characteristic example is the Nam Theun 2 hydropower project in Laos is partially financed by Thai banks through Thai baht-denominated loans and also exports a significant proportion of its energy production to Thailand (IISD, 2015). Another more popular method is the local **currency swap**, under which two parties agree to exchange principal and/or interest payments of a loan in one currency for an equivalent loan in another currency. Solution to exchange risk may also be found in the contracts of the project with an **exchange rate-indexed remuneration** scheme whereby the project's revenues are indexed to the exchange rate with a currency swap been integrated to the contract. As such, the currency risk is transferred to the off-taker. Last, depending on the currency mechanism of the host country, if the currency is pegged to a foreign currency, a developer could consider taking out a loan in the foreign currency, assuming that the peg is maintained but currency risk continues to exist as the peg may be withdrawn.

Exposure to **interest** risk is also critical as the repayment of the debt will last several years, in some projects even for 20-30 years. Project bonds always carry a fixed rate coupon except for those which are inflation indexed, but commercial banks do not generally lend for such a long duration at a fixed rate because they cannot fund the loan with matching deposits (Yescombe, 2007). The most straight forward way to hedge this risk would be that the service fees are adjusted for movements in the floating rate interest on the project company debt – not a very popular solution as it is likely to give the authority a balance sheet problem (Yescombe, 2007). Rather popular are the **interest rate swaps** used to cover floating interest rate risk. With this instrument, one party exchanges an obligation to pay interest on a floating rate basis for an obligation to pay interest on a fixed rate basis, and the other party in the swap does the opposite. A key element of a swap arrangement is that the fixed and floating rates are netted, resulting in only one cash payment payable by the party obligated to pay whichever happens to be the higher of the two rates at the time (Williams, 2014). From a risk mitigation perspective, by entering into an interest rate swap the borrower is trading short-term upside for long-term certainty (Williams, 2014).

It is important to remember that every hedging instrument that is included in the project finance structure adds an extra cost in the final cost of deliverable. Both the currency hedging instrument and the interest rate hedging instrument will come at a significant cost especially for less popular currencies or very volatile economies that may render a project initially infeasible.

4.7 BANKING REGULATIONS AND THEIR IMPACT IN PROJECT FINANCE

Due to the high magnitude and duration, project finance instruments pose a significant asset in the balance sheet of the financial institutions, and as such it is highly susceptible to banking regulations. When a new regulation or a modification in an existing one is put in place, one of the first concerns that arises apart from its prospected effectiveness, is the impact on infrastructure financing. The most common impact is that of regulatory capital i.e. the regulatory imposed capital buffer for the bank's asset which imposes a 'capital cost' to the overall cost of debt for the borrower, simply put it makes infrastructure loans more expensive. As this topic requires an extensive discussion, I will briefly present the milestones in the story of banking regulations and project finance.

Timewise, Basel I was issued in 1988 under the title '*Capital Accord*' which highlighted dangerously low capital levels in the largest banks and proposed the establishment of capital standards. It adopted an 8% rule as the target of the capital ratio defined as net worth to assets but the actual capital requirement was also a function of the asset portfolio held by a bank. Also five asset categories were established with risk weights assignment of 0%, 10%, 20%, 50% and 100%. The category of project finance fell in the highest risk category with 100% risk weight assignment and as such, a bank with 100m\$ project finance loan will need to hold 8m\$ capital (*as $100m\$ \times 100\% \times 8\%$*). Hence, for each project finance loan, the banks needed to hold more capital to comply with regulations, posing hence an extra cost of debt for the borrower.

In 1999 the Basel Committee initiated the works for the expansion of the Basel regulations with the new set entitled '*New Capital Accord*' or Basel II. The new rules consisted of three main pillars, pillar 1 for minimum capital requirements, pillar 2 for increased regulatory oversight and pillar 3 for increased bank disclosure. The rules focused on specific asset classes and allowed two approaches for the estimation of credit risk, the **standardized approach** and the internal ratings based approach. With the standardized approach the rating on borrowers or loans was supplied by credit rating agencies (which were approved by regulators) with the risk weighting established by Basel Committee, in order to determine the capital requirements. However if the borrower was unrated, the banks would have to use 100% risk weighting. The **internal ratings based** approach was based on classification of loans into risk categories using the banks own internal data (if sufficient historical default and recovery data were available). This option implied that there would be different standards at different banks.

With Basel II, the capital charge would add several basis points to the price of the project loan, ignoring though the benefits of using less debt to fund the loan (Esty & Sesia, 2004). Esty & Sessia for example estimated that for a bank using the IRB approach for a 100m\$ project finance loan rated '*fair*', with the new Basel II rules, circa 80 basis points are added to the price of the loan due to capital charges, if the bank requires 20% pre-tax return on equity. The industry response was intense. The implementation of the accord was spanning in several years' time but the financial industry was bracing for its coming. Several exotic methods emerged to counter-balance the effect of the new regulations.

The below discussion summarizes an article published in a legal science forum which describes experiences from the attempts made to mild the impact of Basel II. I should note that the options are very exotic and refer to pre-crisis times (2007) and should only be read from historical interest perspective and not as a current situation description.

In their article, the authors from Freshfields Bruckhaus Deringer LLP Law firm (2007), they describe three potential solutions for offsetting Basel II impact on project finance. They identified that unless a bank is qualified for the advanced internal rating based approach²⁰, the capital reserve requirements for project finance loans are likely to significantly increase beyond the 100% reserve requirement of Basel I. This could serve as an incentive for institutions to develop a risk management system that would allow for the full internal rating based approach. But until then the authors identified three potential methods to mild the impact.

In order to free up regulatory capital, banks could issue collateralised debt obligations (or CDO's) for project finance debt, i.e. by pooling together a portfolio of loans and securitising the repayment obligations, and selling the notes/bonds in investors either publicly or privately. They referred to two experiences at the time, the EPIC 1 (2004) CDO and the Stichting Profile (2005) CDO. EPIC 1 was issued by Depfa Bank in 2004 and was backed by UK PFI loans²¹ and the Stichting Profile was issued by Sumitomo Mitsubishi Banking Corp and Nib Capital bank. Both of them had a similar structure in the synthetic securitisation of a portfolio of UK PFI loans. Depfa Bank closed another CDO backed by project finance loans in 2006 securitising public-private partnership credits from 11 jurisdictions around the world naming the product EPIC2. Both products involved projects in the riskier category with more heavily capital weightings and with projects under construction and projects under operation. The CDO's offered the investors a range of credit exposure from AAA to BB and efficient diversification risk. The insurance mechanism was working as follows. For EPIC 1 of Depfa bank, Depfa remained the lender of record and transferred the credit default risk into a securitisation structure²² by entering into a credit default swap with KfW bank from Germany which was a development bank, not a commercial. KfW guarantees in return for a premium,

²⁰ Certain requirements must be met in order to be allowed to apply the internal rating based approach such as availability of data and others.

²¹ Project Finance Loans issued in the context of the private finance initiative of UK – see footnote 2 in 1.1.

²² Apart from the a specified first-loss portion which was assigned a different risk weighing

the payment of principal and interest in the pooled loans. With this method, Depfa achieved 0% weighting for the portion of the portfolio covered by the credit default swap, which was the result of KfW's governmental status. KfW also protected itself with entering in another credit default swap for the senior tranche of the deal with a monoline insurer with AAA rating to ensure 0% risk weighting for KfW. The monoline insurer was assuming the real credit risk for the senior tranche. There was also a mezzanine piece, the credit risk of which was transferred into a special purpose securitisation vehicle with credit-linked promissory notes²³ which in turn securitised the credit risk by further issuing notes to investors. The investors were left with the real credit risk for the mezzanine tranche and KfW protects itself by using the cash paid by the investors for the notes, as cash collateral against the credit default swap with Depfa.

More details on the above mechanics can be found in the source of the above information, the article of Freshfields bruckhaus Deringer LLP (2007). It is easily seen that it is a complex process and in order for a bank to qualify for the above solution there were several preconditions; (i) given the complex and costly financial engineering the benefit from the freeing of regulatory capital should be worthy against the cost of the rating and other incurred costs, (ii) a sufficient pool of appropriate loans is required for the securitisation to work, (iii) the counterparty in the credit default swap and the risk weighting it attracts was important, (iv) clear definition of default events and others.

The second solution that was identified by Freshfields bruckhaus Deringer LLP (2007), was wrapped bank debt. In this case, a monoline insurer guarantees the lending banks that the loan will be serviced and repaid and as such the wrap will lower the risk weighting of the loan. The use of such tactics was rare as it was uncompetitive in the pricing of the guarantee as an exotic product. The authors had referred to a number of such deals, a toll road in Spain, a road in Norway, a wastewater project in Middle East and a bridge in Canada, all in 2006.

The third solution that they had identified was the potential for mergers between the banks. They cited opinions that the new accord could serve as a motivation for mergers with several potential advantages for the banks such as (i) access to additional information for smaller

²³ Recall here the discussion in chapter 2 for the financial instruments and their use in project financing.

banks, (ii) access to more sophisticated risk management methods for smaller banks, (iii) access to a larger pool of assets for securitisation.

I will stop the discussion about the mechanics of balance sheet management in the light of Basel II knowing that it does not belong in the context of this thesis but hoping that the reader finds it interesting as a history piece. Some authors have cited in the post-crisis period that perhaps such tools may come back. Grushkin and Bartfeld (2013) identified that collateralized loan obligations have risen from the dead. They had been pronounced dead in 2008 in the aftermath of the financial crisis but in years 2011 and 2012 in US several such products were issued and in 2013 the industry witnessed the rebirth of the European collateralized loan obligation (CLO) market. In 2013 during the writing of their article, Grushkin and Bartfeld reported 54bn\$ CLO market in US and 10bn\$ for EU. They concluded that a number of factors argue in favour for the comeback of project finance CLOs, such as the surging demand for infrastructure, the demand for new CLO eligible assets, the recovery of CLOs in general, and the attractive characteristics of project loans.

That was briefly the description of the situation in the aftermath of Basel II publication and implementation. Which brings us to Basel III, also with major impact in the project finance market and the financial system. Basel III was presented in 2014 and involved micro-prudential approaches to reduce the risks of individual banks and address the macro-prudential policy framework with the introduction of a counter-cyclical capital buffer. The key measures of Basel III were (i) the need for higher and better capital with banks required to hold 4.5% of common equity and 6% of tier I capital of risk weighted assets, (ii) the introduction of a capital conservation buffer of 2.5% and a counter-cyclical buffer of which allows the regulator to demand bigger buffer during periods of high growth, (iii) minimum leverage ratio and (iv) liquidity and funding requirements which have drawn much attention in the context of project finance and will be discussed here.

The liquidity and funding requirements were imposed based on two ratios, the liquidity coverage ratio (LCR) which requires banks to hold an important share of high quality liquid assets to cover total net cash outflows over 30 days, and a Net Stable Funding Ratio which is a longer term structural ratio to address liquidity mismatches and provide incentives for banks to use stable sources to finance their activities (Cambridge Economic Policy Associates, 2015).

The Net Stable Funding Ratio requirements mandates that the ratio of available stable funding to required stable funding should be 100% on an ongoing basis and thus the less liquid and longer term a bank's assets and exposures are, the more stable funding will need to have available to it. This stable long term funding is costlier to banks and as such the ratio creates an incentive for banks to avoid illiquid long term assets such as infrastructure loans (McNamara & Metrick, 2015).

To close this part, I will cite the concern that is met in the literature that the ever-growing capital cost that the banks are facing, may have given rise to a growing role of the shadow banking sector in project finance.

Standard & Poors (2013), defines shadow banking as *'the system of finance that exists outside regulated depositories, commercial banks and publicly traded bonds; it consists of participants such as pension funds, insurers, sovereign wealth funds and export credit agencies alongside finance companies, private investment funds, business development corporations, asset managers, hedge funds and sponsored intermediaries such as money-market funds'*. McNamara & Metrick from Yale, in their case study in 2015 cited here as well have highlighted that the shadow banking universe is not subject to the Net Stable Funding Ratio imposed by Basel III as presented previously. The authors identify that up to 25bn\$ project finance debt may had been sourced from the shadow banking industry in 2013 which accounts for almost 12.5% of the total project debt issued in the same year but it has sky-rocketed compared to the years before 2013. The deep concern of the literature is that most shadow banking institutions lack the *'deep institutional knowledge of project finance possessed by many banks that have been involved in the sector'*. They conclude that questions already exist as to whether Basel III has introduced more risk into the system (McNamara & Metrick, 2015).

5. Agency problem and information asymmetry

“Almost all economic relations are affected by risk, and by the problems of insurance and incentives to which this gives rise”

J.E. Stiglitz,

From his article *“Risk, Incentives and Insurance: The pure theory of Moral Hazard”* in the Geneva Papers on Risks & Insurance, 1983.

5.1 INTRODUCTION

Before I discuss the agency problems faced in project finance, we need to establish the proper definitions first. In the below lines, the definitions given in Mishkin (2004) are adopted.

It all begins with the role of information in the market and particularly the asymmetric information case. Under asymmetric information, the knowledge of one party about the other party involved in a transaction is insufficient to support the process of decision making. The presence of asymmetric information can lead to adverse selection and moral hazard problems.

The adverse selection problem occurs before the transaction between the two parties mentioned in the previous example. The essence of the adverse selection problem can be easily understood in a single loan case. It is identified that the ones who most actively seek out loans are bad credit risk takers. In other words, the parties who most likely want to engage in the transactions are the parties who are the most likely to produce an undesirable outcome. Hence, because adverse selection increases the chances that a loan might be offered to a bad credit risk

taker, lenders may decide not to give any loans also in the presence of borrowers with good credit risk profile.

Figure 15 Anatomy of agency problems

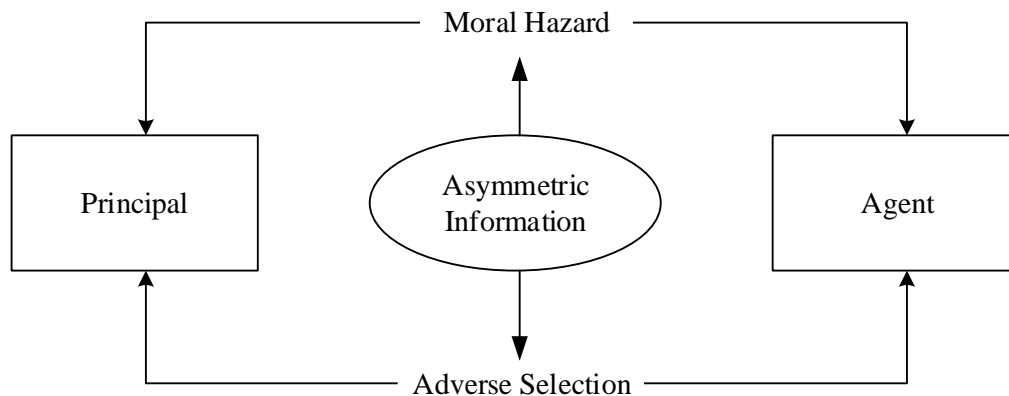


Table 7 Agency theory overview. From (Kathleen, 1989)

Key idea	Principal-agent relationships should reflect efficient organization of information and risk bearing costs
Unit of analysis	Contract between principal and agent
Human assumptions	Self-interest bounded rationality Risk aversion
Organizational assumptions	Partial goal conflict among participants Efficiency as the effectiveness criterion Information asymmetry between principal and agent
Informational assumptions	Information as a purchasable commodity
Contracting problems	Agency (moral hazard and adverse selection)
Problem Domain	Relationships in which the principal and agent have partly differing goals and risk preferences (e.g. compensation, regulation, leadership, impression, management, whistle-blowing, vertical integration, transfer pricing)

An illustrative example of the situation, is given by Akerlof in his seminal work discussing the Market for ‘Lemons’ (Akerlof, 1970). In this situation potential buyers of used cars are unable to access the information for the car they are interested in. Thus they cannot tell if the car is indeed a good one or a bad one. The owner of the car however has this information. So

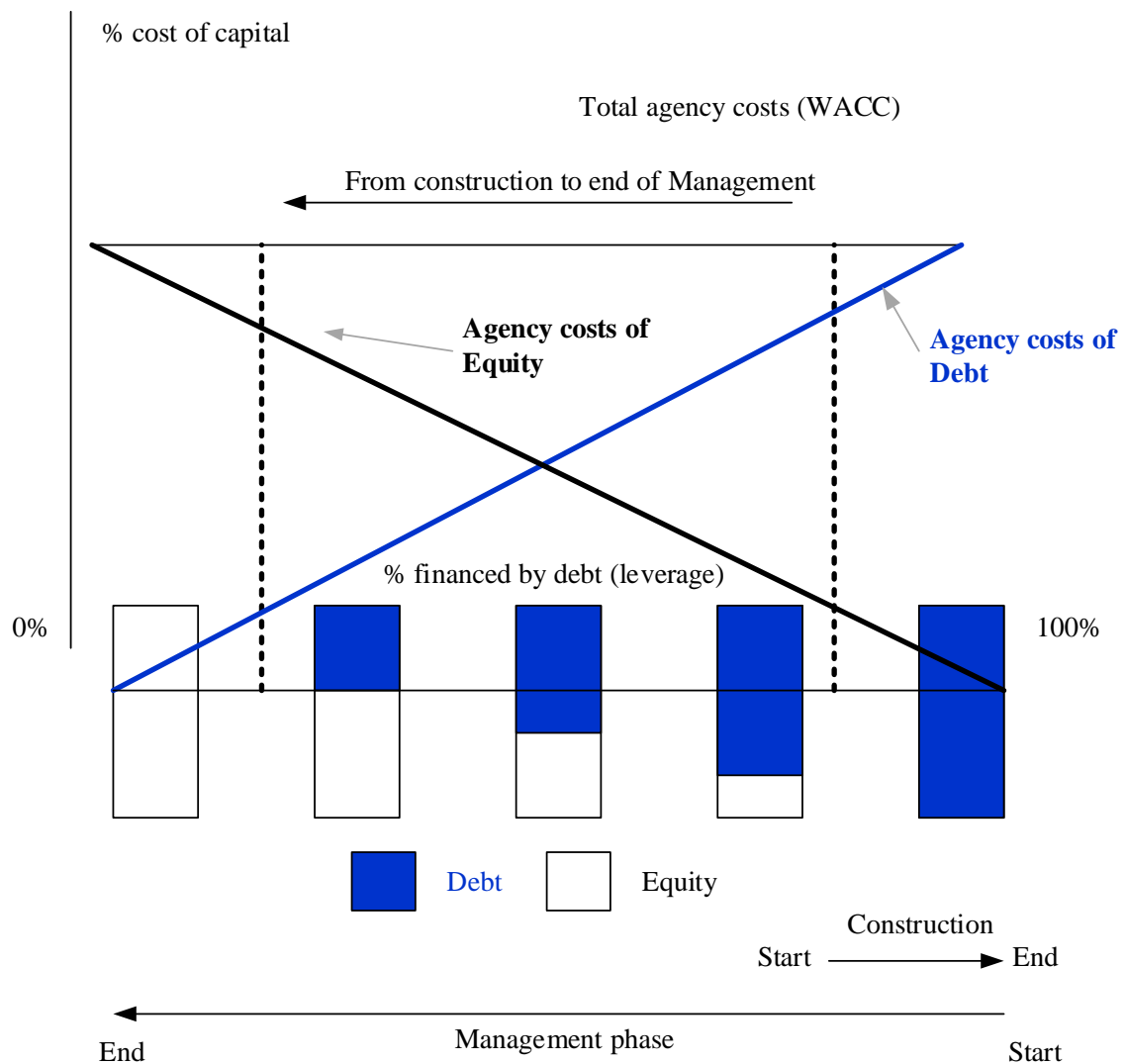
if the car is a bad case, the owner will be eager to sell it at the price the buyer is willing to pay. However if the car is a good case, the owner knowing its real value, may decide not to sell it. This is a pure example of the adverse selection problem as due to the above case, few good cars will enter the market and as no buyer would like to buy a bad car, the market will perform poorly. As I will explain later, the same problem can be transposed in the loan market.

Consequently, moral hazard is the problem arising after the transaction has been signed and deals with the concern of the lender that the borrower will engage in activities that are undesirable from the lenders point of view because they might make it more possible that the loan will not be repaid. Hence, backward looking, potential moral hazard situation may shift the appetite of the lender as it will lower the probability that the loan will be repaid and the lender may decide not to lend at all.

A special case of moral hazard in equity contracts is the principal agent problem. This problem occurs in the cases where ownership and control of a firm is separated. In such structures we distinguish two parties, the managers own only a small fraction of the firm they are work for (called 'agents') and the stockholders who own most of the firm's equity (called 'principals'). The separation of ownership and control involves moral hazard in that the managers in control may act in their own interest rather than the interest of the owners.

Agency theory binds all three cases together. The Agency Theory is the analysis of how asymmetric information problems affect economic behaviour. Sufi (Sufi, 2007) identified that information asymmetry and the need for monitoring are key assumptions in the early theories of banking as these are discussed in the works of Leland and Pyle (1977) and Diamond (Diamond, 1984). We will see later that the key point in the analysis of project finance structures is exactly that.

Figure 16 The relationship between implied agency costs of debt and agency costs of equity with the leverage variations. From (Visconti, 2013)



5.2 THE IMPORTANCE OF MANAGEMENT STRUCTURE

Esty (2003) discusses the economic motivations for project finance with particular focus in the management structure based on the very fundamental principle of Modigliani and Miller (Modigliani & Merton, 1987) of their ‘irrelevance proposition’. They show that in corporate finance, financing decisions do not affect the firm value under certain conditions. Their ‘irrelevance proposition’, highlights the factors that make the value of financing decisions relevant. Their key assumption was that financing and investment decisions were however

separable and independent activities. This implies that some financing decisions such as the firms' organization and ownership structure will not affect investment decisions. Esty spots the obvious contradiction in the case of the special purpose vehicle companies met in project finance, as the financing of these legally independent companies with non-recourse debt provides with a strong prima facia evidence that financing structures do matter (Esty, *The Economic Motivations for Using Project Finance*, 2003).

Esty continues in the proposition that a motivation for using project finance is the agency costs mitigation potential as project finance structures can reduce the agency conflicts between owners and related parties. He notes that the threat of opportunistic behaviour which is severe in other project companies on bilateral deals, is mitigated in project companies that utilize joint ownership. The high leverage discourages costly agency conflicts among participants. However he notes that certain types of agency conflicts may foster and he labels them in three types, namely conflicts developed between ownership and control, conflicts between ownership and related parties, and third conflicts between debtholders and equity holders. Project finance can mitigate to some extent all three categories as the combination of structural features (contracting etc.) which effectively controls managerial discretion at project level. It has been widely accepted that project governance systems are more effective than the corporate equivalents at eliminating wasteful expenditures and discourages sub-optimal investment.

5.3 THE SYNDICATED LENDING CASE AND ITS SIMILARITIES

Though the difference between traditional lending and project finance lending has been repeatedly underlined, in this point I will use the example of syndicated lending to highlight the potential agency problems between lenders and the borrower as these are quite similar with those met in project finance loans where many lenders may be participating following a lead arranger.

To begin with, I will briefly present the loan syndication structure. In loan syndicates, a lead bank (the lead arranger) initiates a loan and then sells shares of that loan to other financial institutions. The lead arranger has multiple roles in such a structure. I will use the formulation of Ivashina²⁴ (2009) to present the case. Before and after the syndication, the lead arranger

²⁴ Ivashina studied the effects of asymmetric information on loan spreads

bank acts as an agent for the lending syndicate by collecting and processing information about the borrower. After the syndication, the lead bank is in charge of monitoring the progress of the loan. Here we note that participant banks depend on information collected by the lead arranger. Also as Chaudry and Kleimeier underline (2015), the participant banks consider not only the borrower but also the lead arranger, his reputation and his prior relationship with the borrower when considering the participation in a syndicate.

Here Ivashina (2009) identifies two problems. There is an adverse selection problem as the lead bank has incentive to syndicate bad or risky loans. There is also a moral hazard problem after the lead bank sells parts of the loan to syndicate participants as the incentive to continue scholastic monitoring of the loan progress is significantly reduced. The contradiction with traditional lending is evident as in traditional lending the spread is determined by the borrower characteristics whereas in syndicate lending, the information collected about the borrower by the lead bank in the due diligence process, allow for an additional premium which is driven by the information asymmetry between the lead and participant banks. This case is frequently met in project finance cases as normally a lead bank brings along other participant banks – but the lead bank most likely will have a certain expertise with the infrastructure to be financed – and this expertise will be far more proficient than that of the participant banks. Hence the information asymmetry described in the previous example arises in project finance not only due to the traditional sources of moral hazard and adverse selection but also due to the nature of the project to be financed.

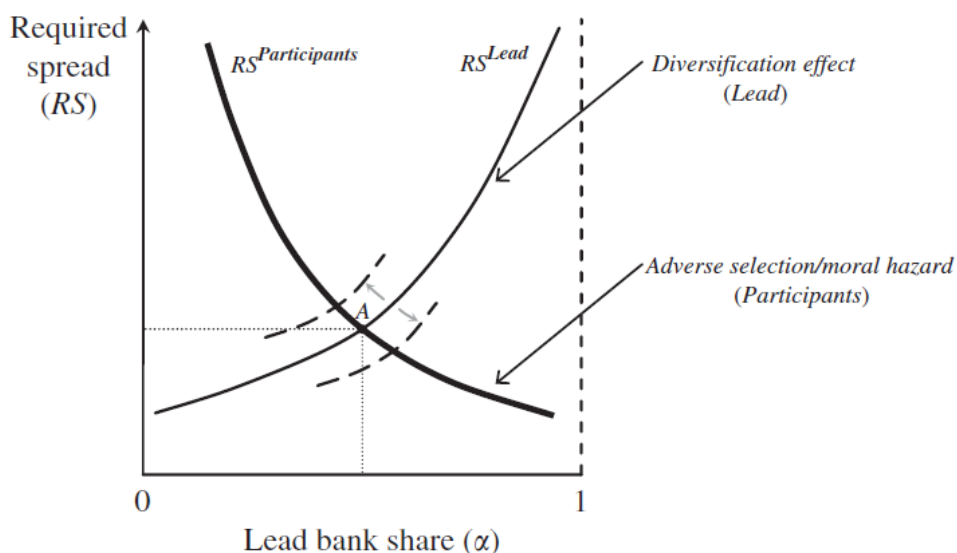
5.4 THE LEAD ARRANGERS REPUTATION EFFECT

The asymmetric information theory suggests that ownership structures can significantly mitigate information asymmetries. Ivashina (2009) citing Leland and Pyle (1977) reminds us that theory predicts that an increase in the informed party share of ownership, would signal a higher quality of the underlying project, thereby reducing the cost of asymmetric information. Similar postulate can be formatted for the project finance case, as the due diligence for a novel infrastructure project with no track record by a specialized lead arranger and consequently an increases share in the debt service by the lead arranger, will signal a good-quality signal to other banks interesting to participate. Ivashina (2009) based on the aforementioned theory suggests that due to this increased share of the lead bank, the information asymmetries will be

reduced and hence the overall loan spread will also be reduced as the premium required by the participant banks will be reduced. She argues though that on the other hand, an increased share by the lead, will cause an increase in the credit risk exposure for this project thus it will call for an increased premium required by the lead. This extra premium will offset the potential decrease of the spread due to the potentially decrease in information asymmetry. Figure 17 shows this offset.

Ivashina used the lead bank's loan portfolio for each loan of her sample and used annual information on industry level default correlations to construct the standard deviation of the probability of default of the lead bank's loan portfolio, which as she argues is a measure which is positively correlated with the credit-risk premium demanded by the lead. In other words, using shifts in the idiosyncratic credit risk of the lead bank's loan portfolio as a proxy, she measured the asymmetric information effect of the lead's share on the loan spread. The result of the econometric model indicated that the asymmetric information costs pose 4% of the total cost of credit.

Figure 17 The lead bank share and loan spread relationship, from Ivashina (2009).



Chaudhry and Kleimeier (2015) expand more in the effect of the lead arranger reputation. They summarize that Moral Hazard considerations are driven by the fact that all lenders have limited information about the borrowers. They break down the lending relationship in three interfaces, (i) between borrowers and lead arrangers, (ii) between borrowers and participants,

and (iii) between lead arrangers and participants. In all three interfaces, the role of the lead arranger is highlighted.

In the first phase of the syndication (pre mandate – discussion between arranger and borrower), borrowers have an information advantage over the arranger and there is a potential adverse selection problem which magnifies if there are no public information about the borrower. This problem can be mitigated with proper screening of the borrower by the lead arranger and past relationship with the lead arranger.

In the second phase (post mandate, during the establishment of the syndication) the information superiority of lead arrangers can lead to an adverse selection problem again since the participant banks are ignorant about the loan or the affairs of the borrower and the lead bank. Also as said, the lead bank may shift bad loans towards participants. The problem at this phase can be increased if the lead arranger retains a small share on the project but is less severe for reputable arrangers.

In the third phase of the syndicate, lead arrangers take up the monitoring duty of the loan but here the borrower retains a significant advantage as there is information asymmetry between him and all lenders which can lead a moral hazard problem. Furthermore there is a moral hazard problem between the lead arranger who monitors the loan and the participant banks in the case the lead arranger does not fulfil the monitoring task as agreed.

In the case where lead arrangers have limited information about the borrowers, they must overcome their resulting moral hazard problem by underperforming from monitoring (as the lead's effort are unobservable). This moral hazard is more severe when lead arrangers retain a small share of the project but less severe for a reputable lead arranger (Chaudhry and Kleimeier, 2015). As most likely the lead arranger will be a strong player in the syndicate loan market, shrinking would lead to a loss of reputation (Chaudhry and Kleimeier ,2015), (Pichler & Wilhelm, 2001).

Findings from the literature indicate that informed lead arrangers cannot exploit the opacity of the borrowers or take advantage of the participants, rather lead arranges retain higher share of the loan and form more concentrated syndicates (Chaudhry & Kleimeier, 2015). Also it has been strongly suggested that lead arranger's reputation is affecting the concentration of the

syndicates as studies showed that syndicates grow larger and more diffuse when arrangers are more reputable.

In other literature studies, the proportion of the loan held by the arranger is shown to be negatively related to the reputation of the lead (Panyagometh & Roberts, 2010). The quantity and quality of information about the borrower also are negatively related to the share retained by the lead lender (Simons, 1993) but positively related to the number of lenders in the syndicate (Dennis & Mullineaux, 2000). In their study, Champagne and Coggins (2012), investigated the information asymmetry in syndicate loans by studying six factors, (i) the quality of the syndicate (ii) the heterogeneity of its members or share concentration, (iii) the characteristics of the lead arranger, (iv) the geography of the syndication and the lead arranger, (v) the relations between the borrower and the syndicate members and (vi) the lender's institution types. They found that higher quality syndicates with stronger cohesion can mitigate the information asymmetry premium. On the other hand, heterogeneous or less concentrated syndicates are related to lower spreads which is consistent with a reduction of the diversification premium. Reputable and more experienced lead arrangers are associated with higher spreads but results show again that the quality of the lead is significant determinant of the spread only for transparent borrowers as for opaque borrowers the benefits of a higher quality lead offset the reputation effect on the spread. With respect to geography, they found that US borrowers pay higher spreads with a foreign lead or a foreign syndication region. Also US borrowers are associated with syndicates and leads of higher quality than European or Asian borrowers. For European borrowers, syndicates are based on weaker lender-borrower relationships and are more heterogeneous and diffuse. Asian syndicates were found to be the most homogeneous and concentrated and with the lower quality syndicates and leads.

6. Analysis of Agency Problems in PF

“I have no faith in human perfectibility”

Edgar Allan Poe, American writer, editor, and literary critic, 1809-1849

In this part, I will discuss the agency problems which are presented in each relationship in the project finance structure. To begin with, we need to identify these relationships that can foster such problems first. Our guide will be the source of agency problem, information asymmetry.

To achieve that, we only need to contemplate on the objectives and the information status of each party. Similar to the law of heat transfer where heat flows from the hot source to the cold source, in a typical bilateral agreement, the party with more valuable/concrete/conclusive information is in more advantageous position and hence there exists the greater moral hazard problem against the other party. Hence though realizing when information asymmetry really exists in a real time negotiation may prove challenging, the identification of where it would foster can be straight forward.

The figure below presents the potential spots where information asymmetry can be identified in a typical project finance structure such as those discussed in the introduction.

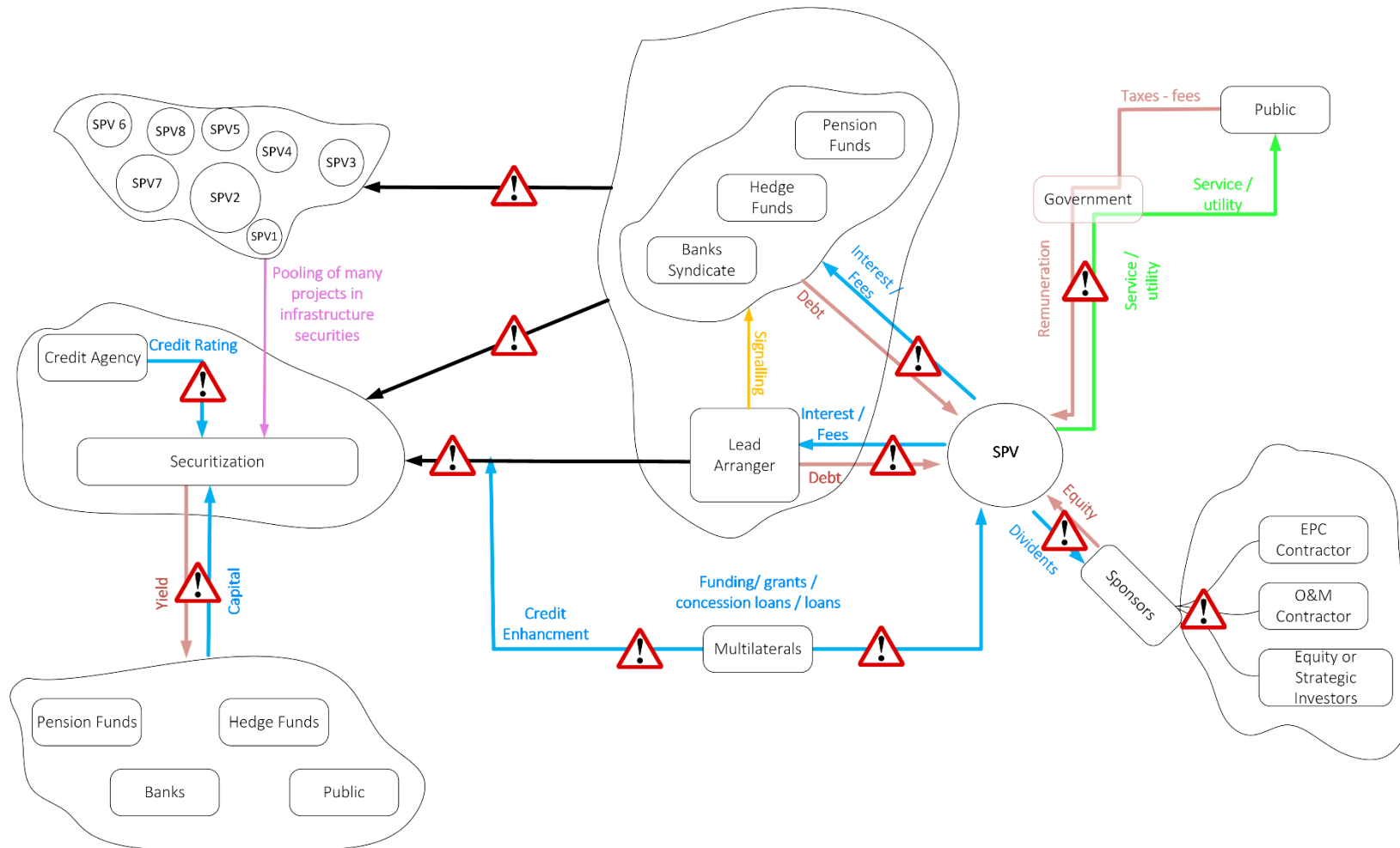
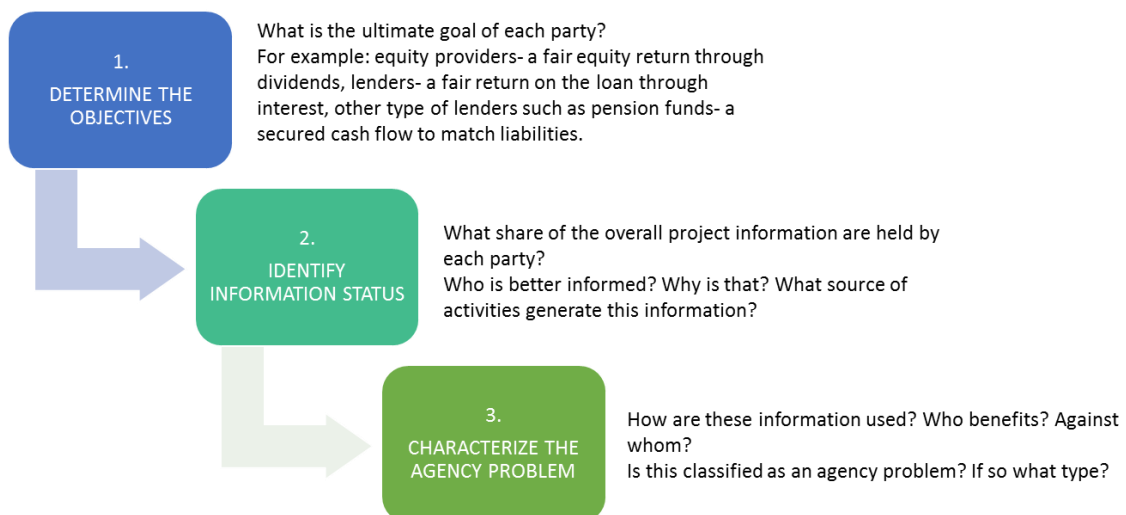


Figure 18 Simplified representation of a project finance structure with highlighted spots of agency problems

Having identified the agency problem spots, I will discuss each case and draw insight from the existing literature. The analysis will be threefold, for each relationship first I will determine the objectives of each party, then I will identify their relationship status and last I will characterize the agency problem presented. The five relationships that will be examined are: (i) Banks - SPV, (ii) SPV – Contractors, (iii) Government of host country – SPV, (iv) Bond underwriter- credit rating – bond buyers, (vi) SPV – Banks – Multilaterals. Some entities appear in more than one relationship but the role description provided is not a duplicate – rather it is a presentation of their role with regards to the counterparty discussed in each case and hence they should not be omitted.

Figure 19 Method of Analysis



6.1 BANKS - SPV

Main parties and roles

This is the heart of the project finance structure as it is the main financing relationship. A simple structure for a small project can have a single lender but for the majority of the projects in the market it will be more likely to have a lead arranger and a syndicate of other Banks. We will discuss both cases.

Hence the parties involved are **the project sponsors (via SPV), the lead arranger bank and participant banks.**

The **project sponsors** are either developer companies, or EPC contractors or a consortium of companies interested in pursuing a project or the winning consortium in a public tender for a project. In either case it is a team of companies who have committed resources and established a special purpose vehicle company upon which all the project assets are registered (contracts, equipment, services). The SPV may also commit equity financing.

The **lead arranger bank** is the bank with the mandate to bring the project debt in the table, find other debt providers, and carry out the financial close process on behalf of the project sponsor. Also retains a share in the debt financing.

The **participant banks** are providing the remaining debt to the project company. They do not have a lead role and they are invited to the project either from the lead arranger or from the sponsors.

Objectives

The **SPV** aims at delivering a successful project satisfying thus the obligation through the contracts with the host country. Hence on the one hand the SPV must comply with the contracts signed and at a cost that will result to a profit for the SPV members in the form of dividends from the operation of the project or from the assigned contracts (depending on the type of the project, i.e. whether it is Built-Transfer, or Built-Own-Operate).

The **lead arranger** aims at structuring a successful financial consortium. The arranger will be paid on a success fee basis (or service fee basis) but also provides debt and hence will collect interest. The objective of the arranger is to ensure the de-risking of the project and the repayment of the loan. The **participant banks** provide debt financing and their profit is from the collected interest. They also need to ensure the loan repayment.

Information Status

The most well informed party with regards to the quality of the project on the above relationship is the **SPV**. The SPV will have done extensive work prior to the time of the financing negotiations and will have reached in a final investment decision based on that work (either through the business development stream or through the work required to win a public tender). Hence the SPV enters the financing negotiations with a headstart regarding the project technology and construction risk, budgeting, staffing needs, prospects of the project, future prospects arising from the project implementation and others. Also the consortium members

may include the EPC contractor or the O&M contractor or the asset manager, who may retain a small equity share. These three parties are very well informed about their line of business.

The second best informed party is the **lead arranger**. As will be shown, the lead arranger is the first non-consortium party to perform the financial due diligence. The lead arranger has to be ensured before he brokers the project to other banks for a debt share and will also have to hold a significant debt share to his balance sheet. He is in direct communication with the project sponsor representing the bank consortium as well. The lead arranger and the other banks hire an engineering company to assist with the due diligence and the monitoring of the project but still this consultant is processing the information provided by the SPV and is not in direct touch with the project and is by definition less informed compared to the direct knowledge the SPV accumulates through the interface with the EPC or the O&M contractors.

The **participant banks**, are the least informed party in this relationship as they are the last party to join the consortium and if their share is less than that of the lead arranger, they will commit less resources in the due diligence and the project monitoring. Also they may not have a close communication with the SPV as this of the lead arranger.

Agency problem characterization

The nature of the agency problem met in this relationship is best described by the generic case of syndicate loans as these were described in the first chapters. The following interfaces have been also examined empirically in Champagne & Coggins (2012), Chaudhry & Kleimeier (2015) and Ivashina (2009).

During the financial negotiations prior to the financial close, the first agency problem encountered is of the **adverse selection** type as the borrower has more information about the project than the lender. Hence a 'lemon' problem arises with the lender not knowing if the project is a 'lemon' or a sound opportunity. The lender could minimize this problem through careful screening but the problem cannot be bypassed totally. The problem intensity is increasing if the borrower is opaque (when very little public information are available for the borrower) and decreasing if there is a prior relationship with the borrower.

After the lead arranger has performed the screening and took the investment decision, he will receive the mandate to form a syndicate in order to gather more debt for the financing of the project, i.e. form a syndicate. In this relationship we meet the second agency problem, also

an **adverse selection** problem. At this time, the other potential lenders have less information about the project opportunity and also rely on the screening of the arranger. Still, the lead arranger is better informed than the other lenders and as a result, the other debt providers cannot realize if the project is a lemon or a sound project. The problem intensity is increasing if the arranger is non reputable and if he retains a small share, whereas it decreases for reputable lenders and intense screening from the other lenders. The mechanics are governed by the fact that the participants are aware of the potential adverse selection problem and are expecting it. Hence in order for the arranger to get favourable terms, he must signal the quality of the project through his share of the total debt. Here we should note that though the increase in the lead's share will decrease the agency cost, it will however increase the lead's exposure to the project and hence the lead will demand bigger risk premium. Thus there are two opposing effects affecting the spread at this stage (Ivashina, 2009).

The above two problems were spotted prior to the financial close of the project. After the financing is complete and the procurement-construction process has initiated, a typical **moral hazard** problem appears. The sponsor or the contractors may choose less optimal equipment for the project in order to save costs, or apply non-optimal construction techniques to shorten the time schedule. Such actions may result in less cost for the SPV but may not be on the benefit for the lifetime of the project. The problem intensifies with new technologies, opaque projects and generally assets with no previous track record. The agency cost of this problem is reduced with reputable contractors, suppliers and optimal contractual structures to ensure the performance of the project. This is achieved with well-specified guarantee clauses in all equipment and services procured for the project.

When the project has finalized its construction and entered operation, a generic **moral hazard** is again spotted in the relationship between the syndicate lenders. The screening intensity is a function of the share held by each bank. It is evident that if significant share is taken by participant banks and not the lead arranger, then the latter will have less incentive to monitor efficiently the project. Also the screening effort of the lead arranger is not observable. The problem is increasing for non-reputable arrangers. However again the arranger may have significant presence in the financing industry and such a shrinking of monitoring duties could hit his reputation and as such we could expect the market discipline to be a guarantee of proper monitoring by the arranger.

6.2 SPV – CONTRACTORS

Main parties and roles

The **SPV** is formed by either a single company or by a consortium of a developer company, an EPC contractor, and O&M contractor and other parties that want to have an ownership share in the project. In any case, the SPV is purchasing services from all these contractors regardless of their participation in the SPV.

The **contractors** are companies that are contracted to perform a service for the SPV. Some important contractors like the EPC or the O&M may also have ownership shares in the SPV but not always.

Objectives

The **SPV** aims at receiving a service with predefined quality criteria, time schedules and remuneration. The **SPV** will try to contract the service at a competitive remuneration, perhaps through a request – for – proposal process. If however the EPC or the O&M has contributed to the equity of the SPV, then there may be a preferential bidder in the shareholder agreement with a competitiveness clause. That is, if the EPC is participating in the equity structure, then he may be entitled a first offer option where he will quote first for the EPC contract with a direct assignment if his proposal is competitive with the market.

The **contractors** will profit from the remuneration of the service delivered and from dividends if they participate in the SPV. They also get the option to advertise the project in their track record which will be a plus for future ventures especially when new technologies are introduced.

Information Status

In this relationship, the most informed party is the **contractors**. The contractors are in close contact on a daily basis with the project, they have in deep knowledge about all its aspects, information which in many cases may not be accessible or understandable from the SPV given the technically complex nature of such projects.

The **SPV** arguably has access to all the information of the contractors in theory. But in practice the SPV depends on the contractors for the access to information. The information gap widens if the SPV members are not originating from the construction industry and hence are not experienced.

Agency problem characterization

In this relationship, there is a potential **principal-agent** problem developed between the project sponsor (the principal) and the various contractors (agents) who are contracted to deliver a service. A simple example is drawn by Farrell (2003). In such a case an agent can take advantage of an unknowledgeable principal and make choices that minimize its own costs and not those of the principal. For example this can occur when the agent may know of a cost reduction technology and method but fails to share this information with the principal. Also before finalizing the contract, the agent may know that the proposed technology is new and untested, but because he wishes to test and improve the technology he fails to raise this potential risk with the principal.

This problem is mitigated with the proper choice of procurement contract. There are two potential contract types, behaviour based contracts (preferable when the principal can prescribe and monitor agent's actions effectively) and outcome based contracts (a solution to incomplete information as the agent's remuneration is based on the final outcome and not behaviour) (Farrell, 2003). The optimal mitigation instrument for a given project will result from a comparison of the costs of monitoring behaviour plus the principal's completion risk premium in the case of a behaviour based contract and the costs of verifying the outcome and the agent's risk premium in the case of an outcome based contract. These costs vary with the degree of goal consistency between principal and agent, principal's expertise, technology uncertainty, the degree of principal risk aversion and the degree of agent risk aversion (Farrell, 2003).

Table 8 Contract types. From Farrell, (2003)

Contract type	Information type	Principal Expertise	Agency costs	Completion risk premium relative costs
Behaviour based	Symmetrical	Expert	Monitoring Process and Final Results	Principal < Agent
Outcome based	Asymmetrical	Non Expert	Verifying final outcome	Principal > Agent

6.3 GOVERNMENT OF HOST COUNTRY – SPV

Main parties and roles

The government adopts laws that allow the participation of private finance in the development of projects and establish the framework of implementation. For example, the projects can be tendered (transportation) or they may allow for a direct access (ie small renewable energy²⁵ projects). The Government will receive the service and remunerate the project company either on an output basis or on a fixed annual fee (other variations exist too).

The SPV has successfully reached financial close on a project and has signed the binding agreement with the state. This, as said, could be the result of a tender or a direct assignment. The SPV has to arrange for the procurement of equipment and appoint the contracts of the project. Then it is responsible for the environmental, financial auditing and must deliver the project on time. Surely these two last tasks are contracted to specialized firms but it is the SPV liable against the government. Upon delivery of the project, the SPV is benefiting from the agreed fees for the service provided.

Objectives

The **Government** must deliver the necessary infrastructure to the public that will ensure growth and development. Many studies have highlighted the importance of infrastructure for development and the impact of effective and economical infrastructure in both the current GDP and its prospects. The Government should procure the required service in an economical way without undermining its quality.

The SPV must meet the requested quality criteria in the agreed timeframe or else will be liable for penalties. Also the SPV wants to design the project and its implementation in a cost

²⁵ This example needs clarification without disturbing the reading flow. Usually large transportation projects are assigned through a tender process (exceptions arise when the contractor also agrees to inject further development finance in the host country and other such special cases). The field of renewable energy until 2015 was open without an auction in many countries (i.e. following a licensing process the sponsor was awarded a guaranteed power purchase agreement). In the last years however many countries have switched this system with an auction based system on which the consortium that offers the lowest energy price wins the project. This is not always the case for small projects that could run on a first come first served basis until a certain power capacity is met.

effective ways that will allow for greater profit margin. This thought is governing the selection of the contractors and the equipment.

Information Status

The most informed party in this relationship is the SPV who has examined the project in deep and has hands on experience from its implementation. The SPV has deep technical knowledge for the project acquired through the relationship with the contractors and is also in direct communication with the lenders.

The Government laisses only with the SPV and not with the other counterparties. The information available in the Government is only drawn from the project documentation delivered from the SPV for licensing/auditing/permitting purposes or from site inspections. The Government also may hire engineering companies as consultants but still the information density is greater in the SPV side.

Agency problem characterization

The government is the entity that initiates the project either by a call for proposal or a tender, and by establishing the necessary legislation. The first sensitive spot is the remuneration of the service provided by the project sponsor (either the EPC fee for construction only, or a fee for operation as well). The remuneration will by definition cover all associated costs including the financing costs. But excluding the absolute and measurable costs (like the O&M, EPC or the financing costs which can be easily measured) the profit margin should be based on a fair return. This is the first exercise that the government needs to solve. Though its not an agency problem per se, it shares some characteristics as (i) there is information asymmetry between the country and the project sponsor as explained above, (ii) the government wants to receive high quality service for the lowest cost and the sponsor wants to get a handsome fee. The study of the misalignment of incentives and the fair project returns is discussed in Martimort & Pouyet (2008), Grimsey & Lewis (2005), more extensively in Grimsey & Lewis (2005) and does not belong here but it should be mentioned.

Having decided the remuneration and procured the project, the government should comply with the contracts that govern the operation of the project. Here we can identify three types of risk for the project: (i) Expropriation, (ii) Creeping Expropriation and (iii) Breach of contract (Sawant, 2010). Each of these is a channel through which the government can bring to life an

agency problem resembling mostly to **moral hazard**, i.e. one party is taking actions that are not favourable to the counterparty.

Expropriation is the act when the government finds political justification for taking over infrastructure assets. These incidents have been reduced in the last 25 years as the governments have realized the potential negative impacts such actions can bear. Creeping expropriation is more easily met, it is the act where the returns on an investment may be adversely affected by sovereign acts of the host country such as changes in the tax law, specific import or export duties or other charges the investor has to pay (Schnitzer, 2002). Last the breach of contract is a non-performance of contractual obligations by host governments. All of these actions are including on the country risk premium demanded by the banks for the financing of the project and hence are part of the overall agency cost, a cost which is transferred to the remuneration of the sponsor and hence to the final offtaker, the users of the infrastructure. The effect of country risk in the credit spread has been studied and verified with empirical evidence in works such as Bonetti, Caselli, & Gatti (2009) or Hainz & Kleimeier (2012).

Creeping expropriation and breach of contracts are the most studied. The first is very difficult to impossible to hedge due to the numerous channels via which the government can affect the payoff of the project and hence it is difficult to draft in an insurance contract. Breach of contract on the other hand is easier to observe and be proactive in a contract. However both cases have the potential to impose an extra cost to the cost of the project which in effect make it more expensive. Hence the best practices to mitigate such a cost is to draft the project agreements optimally and account for potential future developments that affect the project's performance. Such a careful work on the project contracting could also avert principal-agent problems on behalf of the project sponsor.

6.4 BOND UNDERWRITER- CREDIT RATING – BOND BUYERS

Main parties and roles

The bond **underwriter** processes and publishes the bond on behalf of the project company. The underwriter will perform the first due diligence and initiate and take over the issuance process.

The **credit rating agency** will be contracted by the underwriter to publish a first rating for the bond given the project characteristics. Then during the lifetime of the project, the agency will update its opinion for the rating given new developments such as project performance or even based on external factors such as the ability of the host country to follow the remuneration schedule.

The bond **buyers** can be investment funds, pension funds or other. The bond may be open to other type of investors but given the complexity and sophistication of the underlying project such a security has been unpopular for the greater market. These funds will buy a number of project bonds and the proceeds from the sales will be used for either the project construction (when the bond is “pure” project bond) or for the repayment of the project loan (if the bond is issued for refinancing).

Objectives

The **underwriter** having performed the project due diligence and agreed to the underwriting services, will perform all necessary tasks for the issuance of the bond. The underwriter will profit from the services fee that will be paid by the SPV.

The **credit rating agency** is paid from the underwriter to issue a rating for the bond. On that basis, the agency receives the project documentation and assess its technical and economical feasibility. Even though the agency is paid by the issuer, in order to preserve the quality and fame of its ratings cannot allow any distortion in the final rating. This is so since the agency cannot afford a hit in its reputation, also known as market discipline.

The buyers buy the bond in order to benefit from the bond returns (coupon).

Information Status

In the top of information ranking in this relationship is the **underwriter** who has direct access to the project documentation and its sponsor.

The **credit rating agency** has arguably less access to primary information than the underwriter.

The **buyer** is the party with the less access to information as the main source is the bond prospectus which is a summary document with the most important project information – however this document is significantly extensive in size regardless its presentation purpose.

Agency problem characterization

The nature of this relationship is different than the other relationships discussed here. The securitization problems have not been extensively studied for project finance loans, or project bonds due to their small number comparatively with the conventional capital markets (i.e. not big enough sample for safe conclusions). That said, it is important however to emphasize on them as they have a potential for delivering a great impact on the financial markets. Paligorova (2009) has identified four important incentives for the study of securitization:

(i) Due to the increased level of securitized debt over the last year (and the potential for further increase if project financing through bonds becomes more popular²⁶),

(ii) The distortion and structural changes imposed in the capital markets (i.e. traditional bank based relationships are replaced with arms-length contracting with investors having very little knowledge over the original loans or the original borrowers),

(iii) The potential impact of securitization in the monetary policy transmission mechanism, that is the strengthening of monetary policies through the increase of liquidity (transforming and intangible asset to tangible) but on the other hand securitization may dampen the effect of monetary policy by providing alternative sources of funding for the banks,

(iv) Securitization may reduce funding costs by allowing originators to remove the pool of loans from their balance sheet and hence avoid regulatory costs but once the assets are relieved from the balance sheet, the originators can use the proceeds for new loans and hence improve liquidity.

For the mechanics and nature of securitization we can draw much insight from the much discussed subprime mortgage securities who draw the spotlight upon them in the aftermath of the crisis though I will not refer to any non-project-relevant parameters such as the characteristics of mortgages and I will emphasize in the relationships developed during securitization instead. The below analysis is drawn from an essay of the Bank of Canada, by Paligorova (2009).

²⁶ For example after the implementation of the CMU (Capital Markets Union) directive of the European Union which will allow for many types of investors to invest in such securities.

The main mechanism that creates an agency problem is the fact that via securitization, the originators of loans lack the incentive (**moral hazard**) to act in the best interests of investors causing multiple agency conflicts and specifically they are motivated to maintain high volumes of loan issuance but not promote high quality loans as they will no longer have any exposure to this pool of assets (Mishkin (2008) in Paligorova (2008)).

In the first act, during the origination and the structuring, the first agency problem begins to foster, since as said above, the originator lacks the incentive to develop a long term relationship with the borrower, collect information and general screening (**moral hazard**). Several scholars have identified that the growth of subprime mortgages was associated with a decrease in loan quality (Demyank & Van Hemert (2009) in Paligorova (2008)). This agency problem can be mitigated with transparency and standardization measures (i.e. reduce asymmetric information, help originator, arrangers to exercise due diligence and perhaps potentially reveal the investment strategy of the originator to the investors). Also the securities can be designed accordingly to allow for optimal subordination levels i.e. if subordination levels are too low and the equity tranche held by the originator is very low there is less incentive for screening as the senior tranche is the one significantly exposed to the risk instead.

After the form of the securities is finalized, the issuer will have to contract a credit rating agency to provide a rating. The participation of such agencies in the structure is aiming at reducing the information asymmetries between SPV/Issuer and the final investors. However, there is an inherent **conflict of interest** in this relationship because of the different objectives of each party, i.e. the issuer wants a favourable rating, the investor wants an accurate rating and the credit rating agency is paid by the issuer. However there is also the '**ratings shopping**' case, with which the issuer retaining the option to choose the most favourable rating. Also the agencies may attract new customers by selling consulting or advisory services (Paligorova, 2009). Theory suggests that this is a potential problem but practitioners argue that the market efficiency mitigates it, that is, the credit rating agency depends on its reputation to attract customers and cannot afford to manipulate the ratings in favour of the issuer. This problem is also met in typical securities and many proposals have come to light. One solution calls for the investor to be the one who pays for a rating in a potential investment hence cancel out the conflict of interest problem. However this would bounce back as it will increase the information asymmetries between investors who can afford the rating and those who cannot. Another

solution calls for greater transparency with regards to the methodologies and models utilized by the rating agency but this would result to a competition issue between the agencies. In the end, this is still an open discussion since the aftermath of the financial crisis.

Having been granted the credit rating, the issuer will initiate a roadshow or a marketing campaign for the securities. The potential investors may consider the option of an insurance product to protect their investment from a potential default. This product may at first seem to protect the investor from the default risk, but in reality it introduces an additional counterparty risk, that of the insurer who may fail to pay the investor in the case of default. If project financing through capital markets gains popularity then this problem should be resolved, perhaps as a solution to the general securitization case, i.e. the **moral hazard** problem of aggressive expansion of the insurer's balance sheet from the excessive sale of insurances without a collateral pledge.

Depending on the type of security, an additional moral hazard could be considered. If the security is traded as a component of a larger pool of other project securities, then a **moral hazard** issue is developed in the relationship of the investors with the asset manager due to their different goals. The asset managers aims at getting a handsome fee which may result in adverse selection on their behalf (i.e. choosing also lower quality project securities to be included in the pool) in contrast to the aim of the investors who aim at investing in a security with the optimal risk/payoff ratio.

Though a single solution cannot be applied in order to solve all the above agency problems, as a general best practices, transparency, disclosure, better use of credit ratings, effective alignment of incentives and standardization are recommended (Paligorova, 2009).

6.5 SPV – BANKS – MULTILATERALS

Main parties and roles

This is a similar relationship as the first one (Banks-SPV) but differs in the nature of the Multilateral banks. In some projects, additional financing may be provided by multilateral banks either in the form of debt/equity or in the form of guarantees or other instruments.

Here, the SPV has the same role as previously, where the sponsors will provide some equity and the banks will follow the lead arranger in debt. For some very risky or innovative projects,

a multilateral bank may choose to participate. Usually, for projects under the multilateral bank's umbrella of interest, the multilateral may provide up to 75% of debt.

This means that the project has been through a due diligence process and has been approved. The commercial banks will translate this signal towards the project quality and will choose to participate or not in the financing.

Objectives

The SPV wants to reach to financial close and secure debt (or equity) with affordable cost.

The multilateral bank wants to support a sector, a nation, a technology by providing financing. Hence if the project falls within the scope of the bank, it will receive financing in more favourable terms than those that would be provided by commercial banks only. Still depending on the instrument provided, the multilateral will either expect to get its money back (through interest or dividends) or not (in the case of grants).

The commercial bank, knowing that the multilateral bank is participating, will take on the remaining share, either individually or in syndicate (depending on the size) and expect to profit from the loan repayment.

Information Status

Again, the SPV has the direct access to project information through its work/resources committed or through the communication with the contractors.

The multilateral bank and the commercial bank have less access to information as their information comes from either the SPV or their engineering advisor. Still they do not have 'primary' information sourced directly at the project.

Agency problem characterization

The multilateral banks participate in projects as debt providers, as equity or with any other instrument such as concession grants or guarantees. For the relationship between the multilateral and the SPV in the pure debt or equity case, the agency problem is **similar to the problems described in the banks-SPV relationship**.

The difference here lays in the in-house decision making process of the multilateral bank and this will be explained here. The reason why multilateral banks are an important study ground is that they effectively manage funds resulting from the participating countries revenues

as an investment. The investments carried out by such banks are targeting in a well-defined result, such as job creation, support of new technologies and others. A typical multilateral bank consists of both lending and borrowing countries, hence the lending patterns are particularly interesting since it should account for power politics, donor interest and others. The borrowing countries want the bank to supply loans and services at as low cost as possible with a minimum bureaucratic hassles and requirements whereas the non-borrowing countries will seek to impose their own ideas about development on borrowers, implement strict control on how resources are spent and reduce the overall risk (Humphrey & Michaelowa, 2013). That said, the decision making process needs to account for all the potential restrictions, strategies and as such a potential **adverse selection** agency problem could emerge since the investment committee does not compare between projects with regards to their profitability only but with regards to the politics inbound, if they comply with the banks strategy²⁷ and others.

Aside from the decision making process, in the ex post case, of particular interest is the potential impact of the investments taken by the multilaterals in the case of their default. Such cases were highlighted in the recent failure of a project funded by the European Investment Bank called ‘Castor’ which was an underground gas storage project in Spain. The project was known to be problematic due to its complexity and in an area with seismic activity. The project was participating in the ‘Project Bond’ Initiative of EIB and was significantly leveraged. Eventually the construction enhanced the seismic activity in the area and due to cracks in the seabed (which resulted to gas leaks) the project was abandoned. The project’s debt however was not simply cancelled out but was transposed to the Spain’s national debt. The bank did not assume any responsibility as the responsibility for environmental and technical screening was passed on in Spanish national agencies. This is a hands on example on the **adverse selection** problem which was analysed in this text.

Further considerations over the operation of multilaterals is the support to countries, companies and other entities that are engaged in tax shield activities. The EIB in particular has been in the spotlight as some of the investments held were effectively outside the tax umbrella of the EU and as such it was cancelling out the EU’s tax policy.

²⁷ Which is also a result of the friction between borrowing and non-borrowing countries.

Many NGO's and other interested parties have called upon the national representatives in the multilateral banks for transparency and changes in their operation schemes and decision making process. Also several investments have been severely targeted as unnecessary. The agency problems developed in the relationships in the multilateral banks is perhaps the most complex type that can be met and a solution cannot be easily drafted. Perhaps a wise step could be the enhanced transparency in the post construction period of a project and not only in the ex-ante process.

7. Closing remarks

The present thesis identified a series of agency problems that foster in the relationships developed in project finance structures. This work is important since agency costs end up in final cost of debt and in the end in the final cost of the service/product provided. Project finance has built a reputation as a solution on agency problems but as argued, these are not entirely extinguished from the picture.

The general issue of private sector participation in financing has been a long standing debate and is not discussed extensively in this text. However the key highlights of this debate should be read in accordance with the present findings. Grimsey and Lewis (2005) have very neatly summarized the debate in 7 points. They focus on the UK National Health System Private Financing Initiative but the points can be easily generalized:

- i. Frequently decision makers have not been able to choose freely between publicly and privately provided infrastructure and have been drawn into more expensive private financing options because of cuts to direct public funding budgets which are perceived as the ‘only game in town’.
- ii. There can be no presumption that private entities always possess better design capabilities than the accumulated experience of the private sector and no reason to assume that the chosen private contractor will be the most appropriate for the task at hand.

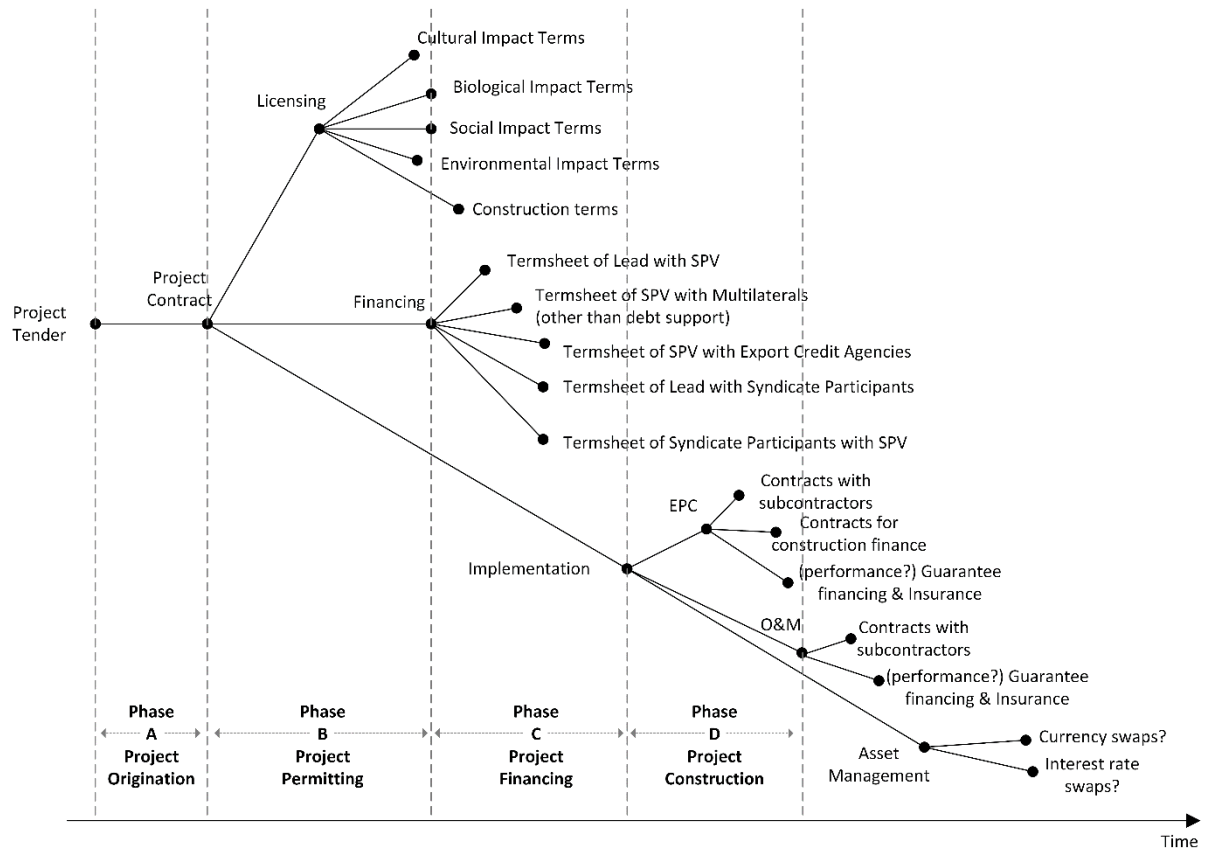
- iii. The high degree of secrecy and commercial confidentiality surrounding many project finance deals has hindered the process of public accountability and accounting for the contracts.
- iv. Involvement of major construction companies in project finance creates a bias toward new building rather than maintenance and refurbishment of existing facilities.
- v. Tendering, negotiation, transactions and monitoring costs are high relative to the value of the service provided as consultancy fees are and charges are increasing the cost of financing.
- vi. Payments under private financing schemas involve significant fixed payments to cover interest charges and capital repayment which limit the future of the public authority by mortgaging the future in return for immediate gains.
- vii. Insolvency of the project company may result in lengthy litigation with no guarantee of financial resolution leaving the public authority to pick up the pieces.

The above points are very interesting and should be kept in mind when talking about project finance.

However as said in the introduction, the present thesis and the findings are not biased by the debate of private sector participation in infrastructure financing as it is a mere accounting of possibilities for agency problems based on the information status of the participants.

Point 1: The reader should remember that the source of agency problems in contractual relationships in project finance is information asymmetry between the participants. It was shown that such a complex structure as project finance allows room for agency problems to emerge. Figure 20 shows an overview of the contractual relationships developed in a typical project finance structure with syndicate lenders. The x-axis represents the time, starting from the project origination and spanning after the project has entered the operation phase. In the figure, each connection represents a contractual relationship. The figure shows also the phases of the project. Note that as said, each relationship is a potential ground for the generation of agency problems.

Figure 20 Overview of contracts and agreements in project finance of a typical syndicate financing scheme



Point 2: The agency problems developed can be categorized according to the time frame to ex ante (prior to financial close) and ex post (after financial close). The majority of the problems developed ex ante are of the adverse selection type whereas the problems developed ex post are of the moral hazard type and its variation principal-agent problem.

Prior to financial close, the main agency problem that was observed in all relationships was that of adverse selection: in the relationship between the SPV and the Lead arranger as the latter cannot know a priori the quality of the project and the SPV is better informed, similarly for the participant lenders against the lead arranger.

After the financial close of the project, the main type of agency problem observed is moral hazard. First, in the relationship between the lead arranger and the SPV since the SPV is managing the project and is better informed than the lead arranger, second between the lead

arranger and the participant banks as the latter may not monitor the project effectively since the monitoring is taken up by the lead arranger.

Moral hazard also fosters in the relationship between the project company and the government authority that is purchasing the produced product or service as the latter can divert from the main project agreement terms with ‘creeping expropriation’ methods such as those presented in paragraph 6.3.

Point 3: The agency costs travel to the cost of the end product and consequently to the price paid by the off-taker.

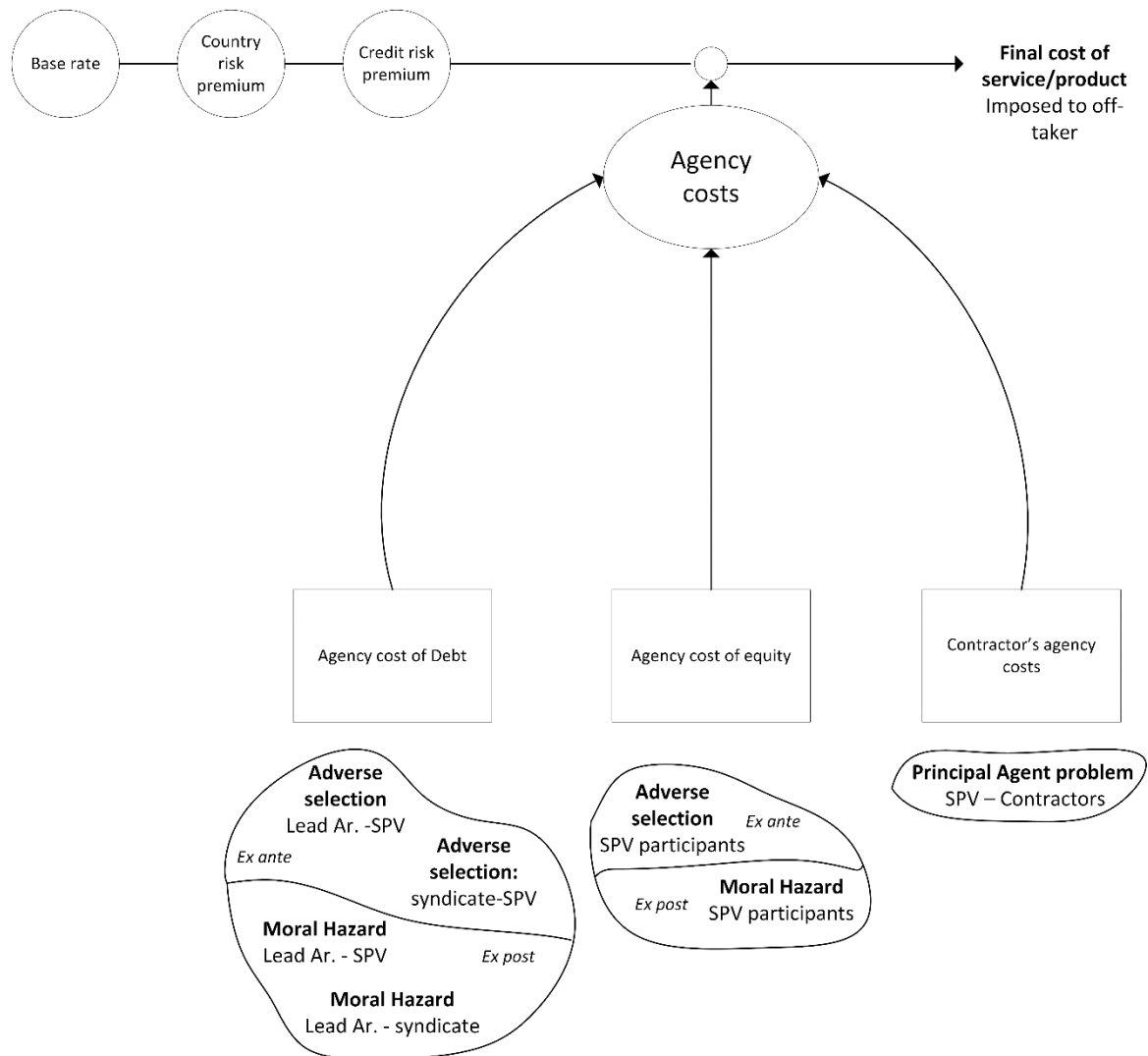
It was shown in paragraph 6.1 that the agency problems are translated to cost that is added up to the cost of debt or the cost of equity or the cost of services provided by contractors.

For example, the presence of agency problems between the lead arranger and the participant banks translates to higher cost of debt for the SPV as the participant lenders identify the problem. Similarly, the cost of services provided by the contractors are transposed to the SPV’s balance sheet. Also, lack of reliability of the host government may ask for instruments such as default insurance and swaps which do not come free. Similarly in the case of international projects, instruments like interest rate swaps and currency swaps also add up to the final cost of the service/product produced by the project.

All the problems presented in chapter 6 aggregate to a single agency cost that is added up on top of the base rate, the country risk premium, the credit risk premium and other costs. The following figure, summarizes point 3 graphically. The top row illustrates the final product/service cost development and the rest of the chart illustrates the connection between problems presented in chapter 6 with the final cost.

Last it is important to remember that the final cost of the service/product provided by the project is transferred to the end user who most of the times is the citizens of the host country, either directly (toll roads) or indirectly (sewage, water infrastructure, energy generation).

Figure 21 Connection of agency costs to the final product/service cost



Solving the agency problems or reducing their impact is not an easy task. It is a complex legal exercise that depends on the skills of the legal and the other advisors. The end objective is to **allocate the risks to the parties that are best able and most motivated** to assume them and reduce the residual risks in the project to a level that the sponsors and the lenders can prudently manage (Dewar, 2011). The discussion of the legal strategies is extensive and does not belong in this text. Note that the strategies are dynamic in nature as they have to solve a different problem as the project/time progresses. The reader interested can turn to Armour, Hansmann and Kraakman (2009) for a brief summary of the legal strategies. The strategies that can be recruited refer to regulatory strategies, governance strategies, compliance and enforcement strategies, disclosure requirements.

Table 9 Regulatory and Governance strategies for protecting principals from agency problems. From Armour, Hansmann & Kraakman (2009)

	Regulatory Strategies		Governance strategies		
	Agent constraints	Affiliation terms	Appointment rights	Decision rights	Agent incentives
Ex ante	Rules	Entry	Selection	Initiation	Trusteeship
Ex post	Standards	Exit	Removal	Veto	Reward

As a final closing remark, I would like to elaborate on additional work that could accommodate the present thesis. As said, a numerical approach to estimate the agency costs is not easily implemented due to the inefficiency of the potential proxies which simulate agency problems indirectly. Several studies cited in the present text have tried similar approaches. However as the supervisor of this thesis Professor Angelos A. Antzoulatos suggested, one could try to extrapolate the agency costs incurred by negation. That is, how the end product/service could potentially cost in the total absence of agency costs. Again such an approach should be based on actual data the breakdown of which is not available. But such an approach could be followed as an analysis of a small number of projects in detail.

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