Risk Shifting Through Nonfinancial Contracts. Effects on Loan Spreads and Capital Structure of Project Finance Deals

Francesco Corielli*, Stefano Gatti** & Alessandro Steffanoni***

In project finance, sponsors and lenders set up a Special Purpose Vehicle (SPV) that receives limited or no-recourse funding for the design, construction and management of a specific project with limited economic life. A network of nonfinancial contracts (NFCs) is set up in order to limit managerial discretion of project sponsors, to make cash flows better verifiable for lenders and to reduce the negative impact of unexpected events on project cash flows. Using a sample of more than 1,000 project finance loans worth about US$ 195 bn closed between 1998 and 2003, we study the negotiation of the financial package between sponsors and lenders and its cost. We use a 2 stage least squares methodology to model the joint determination of spread and leverage. Our results confirm the business practice according to which sponsors tend first to set up the contractual network of the project finance transaction and only later seek for financing and negotiate the level of spread and debt-to-equity ratio with the bank syndicate. In this negotiation process we find that: (1) lenders rely upon the network of contracts as a mechanism to control agency costs and project risks but (2) are reluctant to price the credit cheaper if sponsors are involved as project counterparties in the relevant contracts and finally (3) do not care about sponsors' involvement as a contractual counterparty of the SPV when deciding the level of leverage. Overall, the lack of NFCs causes a cost increase quantified in about 19 bps and the use of NFCs signed by counterparties other than project sponsors helps reducing the loans cost by about 110 bps. Furthermore, the absence of NFCs is responsible of a drop of 1.1 points of the debt-to-equity ratio used for the deal. Further results indicate that – in contrast to what happens for the level of D/E ratio – country risk and industry risk do not influence the level of spread which is instead driven by the negotiated leverage and by the existence of some NFCs. Finally, our findings indicate that sponsors face a trade-off between higher financial leverage and lower interest rate levels during the negotiation of the loan terms with lenders.

Keywords: project finance, contractual arrangements, long-term contracts, loan pricing, capital structure

JEL Classification: G21, G32, F34, K12

1. Introduction

In the last few years, the number and amount of project finance (PF) transactions have increased dramatically. According to Hainz and Kleimeier (2003), the total amount of project finance transactions closed between January 1980 and March 2003 was about US$960 billion, about 5% of the total syndicated loans in the same period.

*Francesco Corielli,Department of Finance,Università Bocconi
**Stefano Gatti,Department of Finance ,Università Bocconi and SDA Bocconi School of Management
***Alessandro Steffanoni ,Head of Structured Finance, Interbanca
Please address all correspondence to:
Stefano Gatti,Dept. of Finance,Università Bocconi,Viale Isonzo, 25
20100 – Milan (Italy),Tel: 0039-02-5836-6106,Fax: 0039-02-5836-5920
e-mail: stefano.gatti@unibocconi.it

Data reported by Esty and Sesia (2007) indicate that in the USA the project finance market is smaller than the amount of corporate bond issues but it is larger than funds raised through Initial Public Offerings (IPOs) or venture capital funds. Considering the global market, project finance bank loans and project finance bonds respectively recorded an impressive 23% and 15% compound annual growth rate (CAGR) between 1994 and 2006. Some of these deals are concentrated in developing countries where project finance is increasingly considered an efficient method of narrowing the infrastructure gap with developed countries (Hammami, Ruhashyankiko and Yehoue,2006). In addition to infrastructure, available statistics indicate a concentration of project finance in the oil and gas, power, telecom, and transportation sectors.

According to Esty and Sesia (2007), project finance is a transaction that "[…] involves the creation of a legally independent project company financed with nonrecourse debt (and equity from one or more corporations known as sponsoring firms) for the purpose of financing investment in a single purpose capital asset, usually with a limited life".

Since project finance is based on the creation of a project company (also known as Special Purpose Vehicle (SPV)) for the design, construction and management of a single project, one of the key features of this transaction is the existence of a network of nonfinancial contracts (NFCs) which we define as contracts that generate cash inflows or outflows that affect the unlevered free cash flows of the SPV. Examples of such contracts are those for the construction of industrial plants and facilities, toll roads, or telephone networks (Engineering, Procurement and Construction (EPC)), agreements for their operation and maintenance (O&M) the purchase of raw materials and long-term sale to third parties (off-taking agreements). Sponsors negotiate all these contracts in a vertical chain from construction and input supply to the output sale and after having set up this network of contracts seek financing for this "contractual bundle" on the syndicated loans market or, less frequently, on the bond market.

In project financed transactions, NFCs are what Esty (2003) define as an "institutional risk management" tool. In fact, contracts are both mechanisms that sponsors and lenders use to limit agency problems like in Jensen and Meckling (1976) and tools to manage corporate risk as discussed by Lessard (1990), Lessard and Miller (2001) and Froot, Sharfstein and Stein (1993). Contracts are also ways to pre-commit the actions of the management of the SPV (the agent) and the obligations of every key counterparty in a very detailed way.

The reduction of cash flows volatility implied in the contractual bundle has two important consequences on the financing policies of project finance deals (1) the risk premium required by lenders should be lower than without the risk management made possible by NFCs and (2) the reduced level of cash flow volatility may be compatible with lower equity contribution (higher debt-to equity ratios) by sponsoring firms.

In this paper, we investigate whether the presence of NFCs that shift risks from the SPV to its counterparties reduces the level of interest rate spreads on project finance loans and enables sponsoring firms to contribute lesser equity (exploit higher debt-to-equity ratios). We are also interested in studying the behavior of loan spreads and debt-to-equity ratios when the sponsoring firms of the SPV also act as contractual counterparties. Think for example to the very frequent case of sponsoring firms that are also the main or sole purchaser of the output or the sole supplier of raw material to the SPV.

We test our assumptions on a sample of almost 1,000 project finance loans worth more than US$ 195 bn signed between January 1998 and May 2003 for which we know information about the loan spread and the debt-to-equity ratio used for the deal financing. The sample is extracted

from the database ProjectWare (Dealogic), which includes more than 9,000 loans closed between January 1994 and May 2003.

Drawing on preceding empirical research, we estimate the influence of NFCs, microeconomic loan variables, location of the transaction and sector on both the debt-to-equity ratio and the loan spread. Since most of the available literature (Yescombe, 2002; Finnerty, 2007; Nevitt and Fabozzi (2000) and Gatti (2007)) clearly indicates that sponsors negotiate *first* the bundle of NFCs and that only at a second stage of the process they seek the debt financing and negotiate the cost of external resources, we use a 2 stage least square methodology to model the joint determination of spread and leverage. Accordingly, in our research design, the NFCs structure is supposed to be exogeneous and debt-to-equity ratio and spread are endogenous and determined simultaneously.

Our results show that lenders rely upon the network of contracts as a mechanism to control agency costs and project risks but that they are reluctant to price the credit cheaper if sponsors are involved as project counterparties in the relevant contracts. Furthermore, lenders do not seem to care about sponsors' involvement as a contractual counterparty of the SPV when deciding the level of leverage.

Data show that (1) the lack of NFCs causes a cost increase quantified in about 19 bps, (2) the use of NFCs signed by counterparties other than project sponsors helps reducing the loans cost by about 110 bps and (3) the absence of NFCs is responsible of a drop of 1.1 points of the debt-to-equity ratio used for the deal. Further results indicate that – in contrast to what happens for the level of D/E ratio – country risk and industry risk do not influence the level of spread which is instead driven by the negotiated leverage and by the existence of some NFCs. Finally, our findings indicate that sponsors face a trade-off between higher financial leverage and lower interest rate levels during the negotiation of the loan terms with lenders.

Our results contribute to the existing literature and economic profession from different perspectives.The first is that, despite the importance of project finance in international financial markets, to the best of our knowledge ours is the only paper that studies the role of contractual arrangements in project finance deals and their effects on cash flow verifiability, loan cost and capital structure (Subramanian et al., 2007). The reason is due to a structural lack of reliable data concerning the structure of the transactions and information about the capital structure selected for their funding. In this study, we overcome this problem by using a database specifically dedicated to project finance, ProjectWare. To the best of our knowledge, the only other paper that used this database is that of Gatti et al. (2007 (b)).

Second, the analysis of risk allocation through NFCs contributes to the increasing interest in the literature about the shift of corporate executives from financial risk management to enterprise-wide risk management (Morgan Stanley, 2005; Nocco and Stulz, 2006) and its links with stock prices performance and corporate valuation.

Third, our paper adds new insights to the banking literature on syndicated loans. In particular, it helps analyze the relationship between investment policies – decided by project sponsors – and capital structure decisions and debt pricing that are based on the negotiation between sponsors and lenders. The use of project finance deals to examine the pricing decisions of banks has some advantages compared to the previous literature because the determinants and impacts of different managerial decisions—particularly extensive contract negotiations with a large set of counterparties—can be more transparently observed through SPVs than in corporate finance/multi-project settings and because PF loans are fully self-contained, one-time financing

events [1]. For these reasons, PF is an optimal context to study the joint determination of capital structure and cost of debt as in Dennis, Nandi and Sharpe (2000) in isolation from other commingling and incomplete effects that in a standard corporate finance setting occur outside the financing event being studied (Gatti et al, 2007 (b)).

Fourth, our paper is one of the few that specifically shed some light on the relationship between risk management, cash flow volatility, firm value and corporate financial policies.

The rest of our article is organized as follows. Section 2 reviews the theoretical and empirical literature and introduces our testable hypotheses. Section 3 provides information about the sample and the data as well as some descriptive statistics. Section 4 reports the model, the illustration of the variables and the results of the two-stage least squares regressions analyzing the determinants of loan pricing and capital structure of PF transactions. Section 5 summarizes the results and discusses the implications for management and further directions for research.

2. Literature review and hypotheses

Literature related to project finance is scarce, from both the theoretical and empirical side.

Theoretical contributions have analyzed the deal from the point of view of the optimal incorporation choice under asymmetric information (Shah and Thakor, 1987 and Leland, 2007) and contamination risk between existing assets and new projects (Chemmanur and John, 1996), of the choice of debt allocation between existing firms and newly created vehicles (John and John, 1991), of the reduction of agency costs of debt and perverse management incentives toward over- and underinvestment (Berkovitch and Kim, 1990). Related theoretical literature has analyzed either the characteristics of the assets that most likely are project-financed (Habib and Johnsen, 1999) or some of the characteristics of the loans used to finance these ventures like the presence of covenants and other contractual clauses designed to improve the quality of monitoring by lenders and to reduce managerial discretion (Rajan and Winton, 1995; Smith and Warner, 1979).

Another stream of literature has examined project finance as one subset of the wider syndicated loans market. Studies have focused on the differences between project finance loans and other syndicated credits (Megginson and Kleimeier, 2000), on the pricing of syndicated loans and the use of syndicates to solve agency problems (Simons, 1993; Pichler and Wilhelm, 2001; Dennis and Mullineaux, 2000; Altunbas and Gadanecz, 2004; Altunbas, Gadanecz, Kara and Lucchetta, 2007; Sorge and Gadanecz, 2007; Sufi, 2007, Ball, Bushman and Vasvari, 2007), on the effect of creditors' right enforcement on the syndicate structure (Esty and Megginson, (2003) and on the role of certification of borrowers' quality played by the arranger bank (Casolaro, Focarelli and Pozzolo, 2003; Gatti et al., 2007 (b)).

To the best of our knowledge, no other paper has addressed the relationship between NFCs use, corporate risk management and financial decisions. Available literature on the topic is represented by a handful of papers, all of them analyzing already existing corporations but not project finance (Leland, 1998; Smithson and Simkins, 2005; Minton and Schrand, 1999; Shin and Stulz, 2000; Allayannis and Weston, 2001; Pagach and Warr, 2007). The main results from these papers are that cash flow volatility is negatively related to the level of capital expenditure and positively correlated to the cost of debt and equity financing.

Given the lack of previous literature, we had to develop our own testable hypotheses starting from the view of the firm as a contract web originally formulated by Alchian and Demsetz

[1] This is a characteristic that has been highlighted also for the LBO market by Ljungqvist et Al. (2007)

(1972) and Jensen and Meckling (1976) and later applied to the case of project finance by Brealey, Cooper and Habib (1996) and Esty (2002).

The first hypothesis – **CSH, or cost saving hypothesis** – posits that if sponsors make use of risk-shifting NFCs to reduce the volatility of project cash flows, creditors will charge a lower loan spread.[2]

In order to understand our assumption, it is useful to refer to Esty and Sesia (2007) and Blanc-Brude and Strange (2007) for the case of Public Private Partnerships (PPPs) to briefly illustrate the institutional structure of a project finance deal.

The SPV organizes a network of contracts with third parties (among which sponsoring firms can well be present). Of the numerous NFCs that are signed, four are particularly important for the soundness of the venture. Construction contracts and engineering, procurement, and construction (EPC) contracts are closed on a turnkey basis to make plant and equipment available to the SPV, usually at predefined prices, times of delivery, and standards of performance (construction risk shifting). Purchasing agreements guarantee raw material to the SPV at predefined quantities, quality, and prices (raw materials cost and availability risk shifting). The selling agreements, often defined as take-or-pay or off-taking agreements, enable the SPV to sell part or all of its output to a third party that commits itself to buy unconditionally, again at predefined prices and for a given period of time (market risk shifting)[3]. Operation and Maintenance (O&M) agreements are designed to provide the SPV with efficient and effective plant maintenance, compliant with predefined service-level agreements (operational risk shifting). The entire set of contracts is managed and coordinated by the board of directors of the

[2] Obviously, lower spreads do not mean that sponsors do not bear any cost. Project finance contracting takes longer and is more expensive than a standard corporate finance loan agreement: Esty (2004) indicates a closing interval of 6 to 18 months and transaction costs between 5% and 10% of the total project. Furthermore, Blanc-Brude et al. (2006) quantify a 25% higher construction cost in project financed Public-Private-Partnerships (PPPs) compared to traditional public procurement. The authors argue that this additional cost is the price the sponsoring public administration pays in order to avoid the emergence of construction risks that are shifted to the private partner.

[3] These contracts are particularly common in the oil/gas and power sectors, but are absent in sectors such as transportation and hotel/leisure, where it is not possible to pre-commit the behavior of a large group of buyers (such as car drivers or travelers and tourists). Cameron's (2000) empirical study of the awarding of power purchase agreements (PPAs) to independent power producers in the United States between 1986 and 1989 finds that without at least one large buyer for large-scale capital investments—an implicit form of insurance against market risk—many developers would not have started production in the 1980s. Considering the nature of "dedicated assets" of such plants throughout the 1980s, an off-take agreement was also critical.

SPV that are appointed by the sponsoring firms and are actually "grey directors" of the shareholders.

Once designed with the help of sponsors' legal, technical and financial advisors, this bundle of contracts is then presented to creditors to seek debt financing and to negotiate the cost of external resources (Yescombe, ch. 5, 2002; Finnerty, ch. 4 and 12, 2007).

This cost is clearly influenced by the risk management that sponsoring firms have put in place through the set of NFCs. In fact, Williamson (1988) considers these contracts as essential methods to avoid the emergence of opportunistic behavior by upstream or downstream counterparties. Berkovitch and Kim (1990) and Leland (1998) demonstrate that project finance can reduce agency costs between sponsors and creditors, as the contractual design of the deal strongly limit managerial discretion as well as the problems of asset substitution and of over- and underinvestment (Myers, 1977). In addition, the loan agreement signed by the SPV with the bank syndicate includes rigid covenants limiting the possibility of ex post investment risk choice by management by forcing it to pre-commit to the future strategy.

Empirical evidence of the relationship between risk shifting contracts and credit spread is provided by Dailami and Hauswald (2001) in their study of the Ras Gas Liquified Natural Gas Company project, where they find that the movements of the spread paid by the project bond issued by a SPV are strongly correlated with the rating of one key counterparty (the off-taker). They conclude that this correlation shows the relevance of one NFC – the offtaking agreement – on the characteristics of the financial ones, as Fama (1990) argues.

Our second hypothesis – **SIH, or sponsors' involvement hypothesis** – is a corollary of the first one. We posit that risk management is even more effective in reducing cash flow volatility and agency problems if sponsoring firms are also contractual counterparties to an SPV. Lenders should react to the reduction of agency costs by lowering loan spreads even more.

The hypothesis can be explained considering that although contracts can prevent ex post opportunistic behavior, it is impossible to write a complete state-contingent agreement. Jensen and Meckling (1976) and Grossman and Hart (1986) argue that allocating residual cash flow and asset control rights to key counterparties of an SPV can be a further incentives to align the interests of lenders, sponsors and contractual counterparties. In other words, an entity that is both an SPV sponsor and counterparty should have sufficient incentive to honor the agreements. If so, the project will perform properly and the dividend paid to the shareholder will be less volatile because the project's cash flows will be exposed to less opportunistic behavior.[4]

[4] Suppose to consider an SPV entitled to design, build and manage a power generation facility whose input is represented by tar, a by-product of the oil refining business. If one of the sponsoring firm is an oil refinery, the shareholder will have a strong incentive to fulfil the obligations included in the raw material supply agreement (RMSA) signed with the SPV. Since this contract stipulates for the unconditional supply of fixed quantities of tar at a predefined price, the refinery can turn a by-product into a source of revenue in addition to dividends paid by the SPV and will not be incentivized to behave opportunistically. See Finnerty (2007) and Gatti (2007).

On the other hand, our second hypothesis implies that if sponsoring firms are also key contractual counterparties of the SPV, they will control many of the variables affecting the cash flows of the project. If the SIH is rejected , this means that lenders are unwilling to surrender decision rights to sponsors and that they demand higher spreads and/or larger equity contribution as a compensation for a higher sponsors' control over project cash flows.

The presence of sponsors in the double role of SPV shareholder and SPV counterparty has been empirically studied by Dailami and Hauswald (2003) who find that in 19% of the deals in their sample of emerging markets project bonds, investors impose minimum ownership requirements for key counterparties of the SPV (operators, suppliers, contractors, and off-takers) . The authors argue that such provisions can solve agency problems by aligning the interests of lenders with those of key stakeholders.

Our final hypothesis – **LIH, or leverage increase hypothesis** – is that the stipulation of risk-shifting NFCs reduces cash flow volatility and enable lenders to allow sponsors to increase debt-to-equity ratios.

This argument has been discussed in detail by Fama (1990), who affirms that capital structures are likely to involve a larger fraction of equity in projects whose revenues are much more volatile than fixed payoffs promised to labor and suppliers. John and John (1991) similarly demonstrate that project finance is more likely to be used in deals with high tangible-capital, proven and experienced technologies, and a low level of managerial discretion. Contracts in project finance attempt to reduce managerial discretion, and consequently, the volatility of revenues and costs, stabilizing the amounts of free cash flow. Limiting volatility, associated with a predefined amount of capital expenditures made possible for example by fixed-price EPC agreements allows for higher leverage.

Unfortunately, little empirical evidence is available to test our LIH and with mixed results. Esty (2002) compares the leverage ratios of 121 combined-cycle gas turbine (CCGT) generating plants operating under PPAs with those of 14 merchant power plants with no shelter against market risk. The results show that the average leverage ratios for plants with PPAs and merchant plants are 95% and 85%, respectively. However, Esty is unable to test whether there are differences in the leverage ratios of plants with PPAs when the agreements are signed by one of the sponsors. Pagach and Warr (2007) find that firms implementing corporate Enterprise Risk Management are more levered but Carter, Rogers and Simkins (2006) find opposite evidence for the US airline industry where hedgers of fuel costs are the larger, less leveraged and best rated airlines.

3. Data and descriptive statistics

Our sample of project financed ventures and project finance loans comes from the ProjectWare database which includes information on more than 9,000 project finance loans closed between January 1994 and May 2003. Previous empirical literature has often been based on a similar database called LoanWare, also maintained by Dealogic. But, while LoanWare provides precise details about the structure and pricing of syndicated loans, ProjectWare is almost completely focused on loans awarded to project finance transactions, and thus is more relevant to our inquiry. ProjectWare also includes rather detailed descriptions of the most important characteristics of each project, together with details about key SPV counterparties and sponsors. This information is crucial to analyze the contractual structure of a given transaction.

Studying the features of project finance deals is, however, a very tricky affair. Esty (2004) argues that projects have idiosyncratic features, so that lessons learned are of limited utility for other projects. On the other hand, to the best of our knowledge, no study has investigated how

the nexus of NFCs shapes capital structure choices and the cost of debt funding. We think that our sample, with its complete coverage of sectors and geographical areas, can shed some light on contract issues for long-lived assets in the presence of agency conflicts and extensive transaction costs.[5]

ProjectWare certainly suffers from some remarkable drawbacks. The first is that its descriptions of the main characteristics of projects are in text format; hence, the content of the field is never standardized, and the relevant information for our analysis must be extracted manually by reading the descriptions one project at a time. Second, a complete description of the projects and its "nonbank roles" – that is the information about counterparties other than banks participating to the bank syndicate – is available systematically only from 1998. Third, although ProjectWare includes some fields dedicated to the fee structures of the deal—gross fees, participation fees, and commitment fees—data are missed for the majority of projects. A knowledge of the all-in cost of a loan would be much more informative than spread because borrowers can trade-off spread for fees as Gatti et al. (2007 (b)) demonstrate. These limitations force us to restrict our analysis of project finance loans to those closed after January 1, 1998—clearly reducing the sample size. Also, many project loans do not have information about either the contractual network or the SPV sponsors.

Initially, we extracted all of the project finance loans included in ProjectWare using the financial close date as the reference year for each loan. The flag used to identify the loans has been "project finance" regardless of the number of financing banks. In other words, we accepted both syndicated loans and bilateral loans, that is, loans awarded by a single lender. We then applied a series of filters to select samples by information regarding the dependent variables, spread over various base interest rates and debt-to-equity ratios. Information about debt-to-equity ratios is contained in the "D/E ratio" field in the database, although for many projects, this field was blank. To overcome this, we checked the calculation rules of the database and manually computed debt-to-equity ratios from the data on loan amount, bond amount, and equity amount.

Unfortunately, even with these measures, not all the projects included in ProjectWare had the information needed for our regressions. In many cases, information about spread was available while the value of the debt-to-equity ratio was missing. The final number of usable project loans – those for which information on spread and leverage is available – is 1,093. The total amount of the loans is around US$ 195 bn..

The sample use a single loan tranche as a unit of observation. Since many projects are financed with more than one loan tranche, multiple tranches appear as separate observations in our sample. Information about project size—that is, total SPV assets—was often missing.

[5] The argument is similar to the standard case in credit risk analysis. While specific aspects of debt issuers should be taken into account when assessing credit risk, the analysis must also be based on system- and sector-wide screenings, which are useful in identifying the system-level drivers of credit deterioration. This idea underpins all the field of credit scoring methods, as well as most credit derivative pricing models. It could be argued that driving factors identified by a screening analysis such as ours would still be relevant at the single-deal level; however, it is quite possible that other, more idiosyncratic factors may be relevant at a single-deal level, but not at a screening level.

For the project finance loans included in the sample, we collected information about project location and industrial sector, country risk rating, and microeconomic loan characteristics. Country risk rating is based on Standard and Poor's rating. Microeconomic loan characteristics include financial close date, tranche amount, maturity, whether the loan is subject to currency risk, and whether it is part of a refinancing of an already-financed project.

Next, we collected information about the sponsors[6] and key contracts of each project. ProjectWare allows the analysis of six contracts that are widely used in project financing. The six key contract categories are (1) O&M agreements, (2) construction agreements, (3) EPC agreements, (4) take-or-pay/off-taking agreements, (5) supply agreements, and (6) equipment supply agreements. We tracked down the loans for projects where one or more of the six contracts were signed, then sorted out the projects in which one or more key contracts were signed by one or more sponsors.

Table 1 presents some descriptive statistics for our sample of project finance loans closed between January 1998 and may 2003.

Panel A shows the industrial breakdown using the classification proposed by Megginson and Kleimeier (2000). Data indicate that the largest share of loans was awarded to electricity/power and other energy utility industries (about 52% of the total amount and 56% of the total number of loans), followed by telecommunications (28% and 18%) and transportation (14% and 14.5%). Our findings are in line with Megginson's and Kleimeier's (2000). Although they use a longer time horizon and a different sample, they find that electricity and other energy, oil/gas and transportation receive the most funds for project finance.

Panel B shows the geographic breakdown of project finance loans. Project finance has a worldwide diffusion despite strong concentration in some areas. The sample indicates four relevant geographic areas for project finance transactions—Western Europe, North America, Eastern Europe and Southeast Asia—which account for about 30%, 16%, 15% and 11%, respectively, of the total amount of project finance loans (25%, 15%, 17% and 13%, respectively, of the total number of loans). Our data confirm the results presented in Hainz and Kleimeier's work (2003).

Finally, Panel C presents the distribution of project finance loans according to the rating of the borrower's country. Following a slightly modified rating scale as the one proposed by Altunbas and Gadanecz (2003), we have reclassified the Standard and Poor's country ratings into five groups ranging from best to default, unrated, or undisclosed.[7] Although other measures of political risk are available and have been used in other studies—such as the monthly data

[6] The information available in ProjectWare simply reports sponsors' names and numbers. However, we lack an important piece of information, namely, the percentage composition of the SPV's equity capital.

[7] Our rating system is as follows: 5 = best (from AAA to A+); 4 = investment grade (from A to BBB-); 3 = speculative (from BB+ to BB); 2 = poor (from BB- to CC); and 1 = default, unrated, or undisclosed. The only difference we introduce in our paper compared to Altunbas and Gadanecz's is the inclusion of BBB- countries in the investment grade instead of the speculative grade category in accordance to the standard practice proposed by Standard and Poor's.

compiled by the International Country Risk Guide (ICRG) or Institutional Investor (II)—the use of the Standard and Poor's country ratings is justified by their strong correlation with the other measures. Erb, Harvey, and Viskanta (1996) find that the Standard and Poor's and Moody's ratings have a 95% rank-order correlation with the II credit-risk measure, and 90% with the ICRG financial rating.

The sample shows a polarization toward the first class, which accounts for more than 66% of the value of project finance loans and 57% of the total number of loans signed. Poor or speculative rating countries, arguably the developing ones, receive a lower amount of project finance loans.[8] The Asian crisis of the second part of the 1990s and data referred to 1991-1998 (non shown) reasonably explain the shift toward high-rated countries. Again, our results are consistent with the evidence reported by Hainz and Kleimeier (2003).

Turning now to summary statistics Table 2 contains two groups of data: project variables (group A) and loan variables (group B).

Data about the project variables are included in Group A. Project size are available for 518 operations, with an average amount of US$513 million (median value US$200 million). The values are lower than the ones reported in Esty and Megginson (2003), very likely because their study focuses on syndicated loans, implying a different sample structure that excludes smaller bilateral loans. The average value of the debt-to-equity ratio is 4.23, with a median value of 2.75, consistent with the median values found by Gatti et Al.(2007(b)) The average number of sponsors is 3.1 (median value 2). Again, the data are similar to those found by Esty (2003), who reports that more than 65% of the projects studied have three sponsors or less.

Group B contains information about the characteristics of the project loans included in the sample. The loan tranches have an average value of US$178.1 million (median value US$83 million). Our results are consistent with the findings of Megginson and Kleimeier (2000) and Gatti et A. (2007(b)) for both the average and median value.

The ratio of the single loan to total loan size (eventually, bonds included) is 45% on average (39% median). This means that, on average, the sample shows 2.22 tranches for a single project, each accounting for almost one-half of total borrowed funds (not shown in the table). The business practice of funding a project with multiple loans is clearly supported by the data, as already documented by Esty and Megginson (2003) who, in fact, report higher values (69.4% average and 70.0% median).

For the spread level, the average value is 172 basis points (137.5 basis points median), a higher value than those of Megginson and Kleimeier (2000), likely due to the longer time span analyzed by the authors but completely in line with the results reported by Gatti et A., (2007(b)).

[8] This, however, does not necessarily mean that developing countries are receiving less money in the form of project finance loans. As Hainz and Kleimeier (2003) show, the absolute number of project finance loans in their sample decreases monotonically from the low-risk country quartile to the high-risk country quartile, but the relative volume of project finance loans as a percentage of total syndicated loan volume does not. This indicates that developing countries make more use of this technique for their funding.

The average maturity of loans varies between a mean of 10.5 years (median value 9.0). This is slightly higher than data reported by Megginson and Kleimeier (2000) but in line with findings included in Esty and Megginson (2003), Gatti et Al. (2007(b)) and Dailami and Hauswald (2003) for the project bond market.

A final result, not found in previous empirical research, pertains to the tranches of refinanced projects. Although the mean value of refinancing loans is lower than the mean value of all the loans, their median value is higher. This reflects the business practice of accompanying the refinancing of troubled projects with a renegotiation of the contractual terms of the loan agreement, a higher spread, increased debt but a more than proportional additional equity from sponsors (reduced debt-to-equity ratio). Our findings on refinanced loan spreads and debt-to-equity ratios, discussed in the next section, also seem to confirm this market practice.

4. The determinants of loan pricing and capital structure in project finance transactions

In order to analyze the determinants of the spread and the debt-to-equity ratio of project finance loans we follow Esty (2004). Project finance is, by its nature, characterized by endogeneity problems. In fact, in the initial stage of the deal structuring, the SPV directors manage a large set of variables simultaneously. They have to design, build and manage a new venture for which they must find counterparties – being them sponsoring firms or third parties – and negotiate NFCs delineating respective rights and obligations with them. Then, they must decide how much equity to ask to sponsoring firms and how much external funding is needed, including the cost for such financing. Apparently, at the beginning of the deal structuring all these variables, including the network of NFCs, are endogenous. Following this argument NFCs, together with the debt-to-equity ratio, would be designed to minimize overall cost of funding (spread) and sponsors of ex ante riskier project could choose to have more risk-shifting contracts but still face loan terms that look relatively expensive.

Albeit interesting from a theoretical point of view, available empirical literature does not seem to confirm the endogeneity of the contractual network of NFCs. In particular, Megginson and Kleimeier (2000) surprisingly do not find big differences in the loan spreads paid for project finance deals compared to other types of syndicated loans. Their conclusion is that ex ante risks have been allocated (or managed) *before* sponsoring firms resort to financial intermediaries to get funding for the projects. Implicitly, the authors recognise that the "contractual bundle" is defined at an earlier stage – and this decision is managed essentially by project sponsors – in order to set the level of project business risk to be sold to the arranging banks. Only at this later stage banks start negotiate the terms of the financing with the SPV sponsors and the negotiation revolves around two variables (1) how much equity is required to sponsors (debt-to-equity ratio) and (2) how much is the cost for the external funding provided to the SPV.

The belief that NFCs are negotiated and structured before the request of external funding is confirmed by Esty and Sesia (2007, page 5) when they argue that "To develop an IPP (Independent Power Producing Plant) a developer typically needed to sign four primary contracts […] *After* signing these and numerous other contracts, sponsors could finance the "contractual bundle" on a project basis. Because project finance makes extensive use of contracts, some people refer to it as "contractual finance". In the same way, Blanc-Brude and Strange (2007, p.3) and Blanc-Brude et al. (2006, p.7) come to similar conclusions in their studies on Public Private Partnerships (PPPs).

Further evidence of our argument for considering the contractual bundle as exogenous come from Yescombe (2002), chapter 5 and Finnerty (2007), chapter 4. In particular Yescombe argues that the contractual bundle is taken by banks as an exogenous variable particularly when

sponsors have a long experience in negotiating project contracts and show high bargaining power.

Finally, confirmation for our assumption comes from many interviews with arranging banks who confirms that their role is basically focused on the organization of the financial package and on a thorough due diligence of contracts negotiated by sponsoring firms with the other counterparties.

Consequently, it seems natural, from the econometric point of view, to consider the contractual bundle as an exogenous variable and instead to assume that both spread and debt-to-equity ratio are determined simultaneously once negotiations for the financial package begins as in Dennis, Nandi and Sharpe (2000). For this reason, we estimate the two regressions simultaneously by using 2 stages least square methodology and introduce suitable identification restrictions.

4.1 The model

The model we use is the following：

Tranche margin（spread in bps）= intercept + ß1Country Rating Dummies + ß2Sector Dummies + ß3Refinancing Dummy + ß4Currency Risk Dummy + ß5Debt-to-equity ratio + ß6Tranche Final Maturity + ß7 O&M Contract Dummy + ß8O&M Sponsor Dummy + ß9Construction Contract Dummy + ß10Construction Sponsor Dummy + ß11R EPC Contract Dummy + ß12EPC Sponsor Dummy + ß13Offtaking Contract Dummy + ß14Offtaking Sponsor Dummy + ß15Supply Contract Dummy + ß16RSupply Sponsor Dummy + ß17Equipment Supply Contract Dummy + ß18Equipment Supply Sponsor Dummy（equation 1）

Debt-to-equity ratio = intercept + ß1Country Rating Dummies + ß2Sector Dummies + ß3Refinancing Dummy + ß4Currency Risk Dummy + ß5Tranche Amount + ß6Tranche margin（spread in bps）+ ß7 O&M Contract Dummy + ß8O&M Sponsor Dummy + ß9Construction Contract Dummy + ß10Construction Sponsor Dummy + ß11R EPC Contract Dummy + ß12EPC Sponsor Dummy + ß13Offtaking Contract Dummy + ß14Offtaking Sponsor Dummy + ß15Supply Contract Dummy + ß16RSupply Sponsor Dummy + ß17Equipment Supply Contract Dummy + ß18Equipment Supply Sponsor Dummy（equation 2）

In the first regression, the spread is the dependent variable, explained by a series of variables related to both the loan characteristics and the contractual structure of the project. The second set uses the same independent variables to explain the value in the debt-to-equity ratio calculated as explained in Section 3. In both models, the dependent variable of the other equation is used, and this creates a simultaneity problem.

The identification restrictions of these equations are based on the reasonable hypothesis that the tranche amount variable can be an instrument for the debt-to-equity ratio in the tranche margin equation and that the tranche maturity can be an instrument for the tranche margin variable in the debt equity ratio equation. The identification of the variables that could be used as

instruments for the spread and debt-to-equity ratio is first of all based on opinions collected during our interviews with project finance top arrangers and are also confirmed by previous literature. In particular, Megginson and Kleimeier (2000), Altunbas and Gadanecz (2003) and Dailami and Hauswald (2003) find statistically significant coefficients for the relation between tranche margin and tranche maturity for, respectively, project finance loans and project bonds. On the other hand, Gatti et al (2007 (b)) find a correlation between larger loans *and* more leveraged projects when they are syndicated by prestigious Mandated Lead Arrangers.

For both of the dependent variables, we first test a complete model using all of the independent variables discussed below and six reduced models, each including one key contract at a time to test its influence on the dependent variable.

The first group of independent variables considers the risk of the country where the project is located and the effect of the project sector. Country Rating is a dummy linked to the Standard and Poor's country rating, reclassified in five groups following a slight variation of the methodology proposed by Altunbas and Gadanecz (2003); Sector is a dummy variable divided into eight categories as proposed by Megginson and Kleimeier (2000).

The second group of independent variables controls for tranche characteristics, already partly examined in previous empirical studies. Refinancing is a dummy variable indicating the status of the loan in question. It takes a value of 1 if the tranche is refinancing an existing project and zero otherwise. Currency Risk is a dummy variable equal to 1 if the loan currency is different than the currency of the borrower's country and zero otherwise. Tranche Amount is the value of the loan expressed in millions of US dollars. Tranche Final Maturity gives the duration of the loan in number of years.

The third group of independent variables controls for and tries to depict the contractual structure of a deal by tracking the existence of key contracts and identifying the parties that sign them. The party can be either one of the sponsoring firms or a third party that is not an SPV shareholder. ProjectWare allowed us to track six contracts. O&M Agreement is a dummy with value 1 when the contract exists and zero otherwise. A second dummy, O&M Sponsor, verifies whether the contract is signed by one or more sponsors. If it is, the dummy takes a value of 1; if not, its value is zero. Construction agreements and EPC agreements are treated the same way.[9] Construction Agreement and Construction Agreement Sponsor are dummies with value 1 when, respectively, the contract exists and is signed by one or more sponsors. The value of the first dummy is zero if the contract is not present. The second is zero if the contract is not signed by one of the sponsors.

Dummies are also used for the other four key contracts,[10] and as above, in all these cases, the agreement dummies assume a value of 1 if the contracts exist, while the sponsor variables take a value of 1 if the agreements are signed by one or more sponsors.

[9] ProjectWare assumes that "construction contract" indicates a general agreement obliging a contractor to build a plant or a tangible asset, while "EPC contract" more precisely indicates an agreement between the SPV and a general contractor in which the latter engages itself in designing, providing parts and materials, and building up the asset, usually on a turnkey basis.

[10] The dummy variables corresponding to the remaining four types of contracts are Put or Pay Agreement and Put or Pay Agreement Sponsor, Off-taking Agreement and Off-taking Agreement Sponsor, Supply

Before presenting the results of the regressions, a remarks is necessary. The most relevant point concerns the structure of our dataset. The dataset is not to be considered as a sample of the project financing deals, but as a full record of those events (with the arguable exception of the smallest deals, for which participant banks do not signal the data to ProjectWare). This helps to understand some characteristic of the data set. For instance, if our analysis were based on a sample, one possibility could be a balanced sample with respect to the contractual variable with, maybe, a weighing for the actual frequencies of each contractual mode in the full population. As we are considering the full population, this procedure is unnecessary and the empirical unbalance between contract combinations is automatically satisfied. In fact, the data are polarized on combinations of 0-0 (the contract does not exist and, perhaps obviously, is unsigned by sponsors) or 1-1 (the contract exists and is signed by sponsors). A smaller number of cases have the combination 1-0 (the contract exists but is signed by a party other than one of the sponsors). Clearly no case can have the combination 0-1—a nonexistent NFC cannot be signed by anyone. This situation is shown in the correlation matrices of Table 3, which indicates that some of the highest correlation coefficients, all statistically significant at the 1% level, correspond to the combinations between the contract and the sponsor dummy for the same contract.[11]

We point out that the joint model estimated with two-stage least squares and simple OLS regressions return very similar results, confirming that the simultaneity problem is not a big issue in our dataset. It also confirms, in the logic of the standard Durbin-Wu-Hausman test (Davidson MacKinnon (1993) Ch.8.7), the arrangers' opinion about the exogeneity of the spread variable.[12]

4.2. Determinants of loan spread

Table 4 shows the relation between loan spread and the three groups of independent variables discussed in the Section 4.1. We first present the results of the complete model (regression 1), and then continue to the findings for the six reduced models (regressions 2 to 7).

Agreement and Supply Agreement Sponsor, Equipment Supply Agreement, and Equipment Supply Agreement Sponsor.

[11] While quick and easy to read, a correlation index can sometimes be misleading for an asymmetric case, such as the one that we consider in Table 3. In our analysis, the second dummy of each pair can take a value of 1 only if the first dummy does. This asymmetry creates dependence in itself. The problem can be avoided by simply remembering that a correlation coefficient, in our case, is a measure of the frequency with which the second dummy variable has a value of 1 given that the first does. However, it is very easy to split the dependence into two parts by first assessing how many cases take a value of 1 for the first variable and, second, how many among these cases take a value of 1 for the second variable. Results of this analysis are available upon request.

[12] The regressions obtained with simple OLS are not included in the text but are available upon request.

The complete model confirms the importance of country risk in defining the loan spread, as the relationship is statistically significant at the 1% level. The positive signs of the Country Rating dummy indicate for example that a project located in a speculative grade country pays 65 basis points more that a country qualified as "best rated". This difference is of 105 b.p. when the project is built and managed in countries with poor rating. Curiously, countries defaulted or unrated pays lower spread compared to the other rating classes, perhaps reflecting the attempts of banks to restructure the loans with the purpose to avoid project bankruptcy (Gatti et al., 2007 (a)).

In contrast and surprisingly, the complete model indicates also the irrelevance of industry in influencing the level of spread. All the coefficient are in fact statistically unsignificant.

Regression #1 also shows a lower cost if sponsors accept currency risk (the Currency Risk dummy is positive, which means that a project without currency risk is about 11 basis points more expensive than a project exposed to currency fluctuations). This relation is statistically significant at the 10% level.

The leverage of the project shows a positive, statistically significant relation with the loan spread in the complete and reduced models. An increase of 1 point in the debt-to-equity ratio of the project leads to an increase in the spread level, which varies from a minimum of 46 basis points in regression #5 to a maximum of 75 basis points in regression #2. This is an evident signal of the existence of a trade-off for sponsors between cheaper credit and lower equity contribution.

The relation between loan spread and NFCs and between loan spread and sponsor involvement as SPV counterparties is useful to test our **CSH - cost saving hypothesis** and **SIH, - sponsors' involvement hypothesis.** Looking at the data of Table 4, regression #1, the coefficients of three NFCs – EPC, offtaking and equipment supply – are negative and statistically significant for the EPC agreement, indicating that loans are priced 17 b.p. cheaper when the EPC is not in place. On the other hand, O&M, construction and supply agreements coefficients tell us a different story. Lenders price higher loans where projects are financed without these contracts in place and the effect is statistically significant for the absence of the construction agreement (+36 bps) . Overall, the net effect of the NFCs coefficients indicates that the absence of crucial NFCs causes an increase in cost of 19 bps giving support to our CSH.

Let's now turn to the analysis of the effect of sponsors' involvement as key counterparties of the SPV. The negative signs of the dummies of sponsors' involvement for construction and supply agreements – statistically significant, 107 b.p. and 52 b.p respectively – indicate that the presence of NFCs contributes to the reduction of the cost of funding but that lenders do not seem to appreciate sponsors' involvement in these contracts. On the other hand, the coefficient of sponsors' involvement for the EPC, offtaking and equipment supply contracts are positive and statistically significant for the EPC (+25 b.p.) and offtaking contracts (+24 b.p.). The net effect is that the use of NFCs by SPVs decreases the cost of funding by 110 bps. However, lenders seems to prefer these contracts to be signed by parties other than project sponsoring firms. For this reason, our SIH is rejected.

Our findings suggest that construction and supply contracts are those where the conflict of interests between sponsors and lenders is maximum. In the case of supply agreements, the reason can be a possible opportunistic renegotiation by the supplier. Instead, for construction contracts, contractors sponsoring projects could be tempted to ask the SPV a higher compensation for construction because their return on the deal is dependent more on the price of the construction than on dividends generated during the operating phase of the project. If this is

true, a contractor-sponsor would extract value from creditors and other shareholders**.** This interpretation is an indirect explaination of the higher cost of construction of toll roads studies by Blanc Brude et al (2006).

To confirm the findings about the effect of NFCs and sponsors' involvement on loan spreads, we run six further regressions (see again Table 4, regressions #2 to #7) with the same independent variables, but including one contract at a time. The intuition behind this methodology is to test the effect that a given agreement can have on the project finance loan spread, whether the agreement is signed or not.[13]

The results of the complete model are confirmed for construction (regression #3) and supply contracts (regression #6). The coefficients of the contract dummy are positive (and statistically significant for the construction contract) and the coefficients of the sponsors' involvement are negative and significant.

Although results are in line with the business practice of project finance confirmed by several interviews done with Mandated Lead Arrangers, we anyway suggest prudence in interpreting the results. The first and most trivial reason is that, without more information about the rights and obligations included in each contract in the sample, we cannot assume that two contracts with the same name have equivalent effects on the spread of two different project loans. In power generation plants, for example, there is a profound difference if a sponsor signs an off-taking agreement for 100% of the output produced by the plant or only 50% of the output, with the remainder sold on the market (as with a merchant plant). In a toll road construction contract, it is one thing if the sponsor guarantees up to 20% of the value of the works by letter of credit and up to 25% for liquidated damages in cases of construction defects; it is another if there is a guarantee of 100% of the value of the works (as happens for projects awarded in some Middle Eastern countries) and up to 40% for liquidated damages. The contracts have the same name, but they are valued very differently by bank lenders. The second reason that can explain the rejection of our Sponsors' Involvement Hypothesis is that what lenders really care about is not the presence of a sponsor, but its financial soundness. This follows the findings of Dailami and Hauswald (2001), but unfortunately, it cannot be tested with our sample, since ProjectWare

[13] We run further robustness checks (not reported but available upon request) for the analysis of subsamples of loans granted to projects in the two most represented industries (electricity/energy and telecom). The CSH is confirmed for the electricity/energy sector where the absence of key NFCs determines a cost increase of 49 bps but is rejected for the telecom sector (- 55bps). Instead, the SIH is rejected in both cases (the net effect of the coefficients is -425 bps for electricity/energy and -384 bps for telecom projects).

does not provide data on sponsor ratings.[14] Finally, an unclear effect of sponsor involvement on the loan spread could be related to the variable enforceability of different contracts. This important institutional feature goes beyond the scope of this paper, but a great deal of literature has addressed the problem, although from different standpoints than ours (La Porta, Lopez de Silanes, Shleifer, and Vishny, 1998 and 2002 and more recently Subramaniam et Al., 2007).

4.4. Determinants of the debt-to-equity ratio

The same methodology used to analyze the determinants of loan spreads is employed to value the determinants of capital structure in project finance transactions. The results are summarized in Table 5.

Again, we begin with a complete regression model (regression #1) including all the dependent variables, and then add six more regressions (regressions #2 to #7) to test the influence of each contract on the debt-to-equity ratio of each transaction. The first important difference with the spread regression is the effect of country ratings and project sectors on the debt-to-equity ratio since both are highly significant in defining the capital structure when instead they were unsignificant for spreads.[15]

Table 5 shows that lower ratings determine lower debt-to-equity ratios, as the negative sign of the dummy variable indicates but the regression indicate that countries rated as poor show higher leverage. For example, a project located in an investment-grade country has a 1.4-points lower debt-to-equity ratio than a best-grade country; this difference becomes 1 point lower for a speculative-grade country and only 0.6 points for countries with poor ratings. Overall, this seems to indicate the preference for sponsors to use higher debt in highly risky countries or, alternatively, that projects located in countries with the highest rating can be financed only with less aggressive capital structures. The results are in line with the literature that considers project finance as a substitute for poor institutional standards of corporate governance and weak creditors rights (Subramaniam et Al, 2007)

[14] One could argue that the lack of data about sponsor rating could be easily overcome by collecting the missing data from sources other than ProjectWare. This is certainly true for some of the projects of our sample, but not for all. In project finance deals, firms commonly create joint ventures, often under fantasy names, to start an initiative as a single sponsor together with other sponsors. The newly created joint venture-sponsor can then play other roles in the same deal. In these cases, information about the joint venture-sponsor can be tracked down using ProjectWare, but it is impossible to assign it a rating unless the database cites the shareholders of the joint venture.

[15] This confirms the findings of authors-conducted interviews where international bank officials argued that leverage and spreads are often defined by comparing projects in similar locations and sectors. Once these two variables have been set, a project arranger check whether the free cash flow generated by the venture allows lenders to rely on adequate levels of cover ratios. If not, leverage and spread are adjusted iteratively to reach satisfactory levels of these ratios.

Higher leverage ratios—in decreasing order—are found in power, telecom and commercial projects reflecting the higher market risk implied in the last two sectors.[16] Table 5 indicates that a power sector project has a 1.4-points higher debt-to-equity ratio than a commercial project and 0.6 points higher than a telecom project.

The second relevant difference from the results obtained in the spread regressions is the role played by the microeconomic features of the loans. Only the refinancing coefficient is negative and statistically significant meaning that a project that has not been refinanced has a 1 point lower leverage than a refinanced one. Apparently, data indicate that refinancing is required either (1) to overcome problems that arose during the life of the project or (2) to avoid bankruptcy of a deal that retains economic value only as a going concern (Gatti et al. 2007 (a)). However (3) a higher debt-to-equity ratio for refinanced projects could well be compatible with sponsoring firms asking a renegotiation of the financial package for projects that have successfully passed the construction phase and are now less risky than originally expected. In cases (1) and (2), as a compensation for restructuring, lenders require a higher spread remuneration while in case (3) the Mandated Lead Arranger receives further fees in exchange for the improved financial conditions offered to the sponsoring firms.

The sign of the spread (tranche margin) coefficient is negative and statistically significant for all the model specifications and the result is coherent with what seen in the spread regression. If leverage is exogenously determined a higher debt-to-equity ratio increases the risk for lenders which react with a higher spread (see the positive sign of the coefficient for leverage in all regressions in Table 4). On the other hand, if spread is exogenously determined, a higher tranche margin is compatible only with lower leverage and vice-versa. Put differently, data indicate that sponsors cannot finance a deal with expensive funds *and* high leverage. This confirms once more the existence of a trade off for sponsors between these two variables.

Finally, the coefficients of the NFCs dummies and of the sponsors' involvement allow us to test our final hypothesis – **LIH, or leverage increase hypothesis** – which states that the stipulation of risk-shifting NFCs reduces cash flow volatility and enable lenders to allow sponsors to increase debt-to-equity ratios.

Table 5 shows negative and statistically significant coefficients for EPC and supply contracts. Projects without these two key contracts are financed with a 0.5 and 0.6 respectively lower debt-to-equity ratios than deals where these two NFCs are in place. In other words, the absence of these two contracts forces SPVs to decrease the debt-to-equity ratios by 1.1 points and this evidence supports our LIH hypothesis. On the other hand, the absence of sponsors as key SPV counterparties is statistically unsignificant for all contracts but the O&M where the absence of sponsors shows a positive coefficient (1.57). Overall, compared to what happens for spreads, the low statistical significance of most NFCs and sponsors' involvement coefficients indicates that lenders do not seem to take care of sponsors' involvement when deciding the leverage, which is driven mainly by variables like country risk or industry risk.

The reduced models generally support these findings: the absence of EPC, off-taking and supply agreements is negatively and significantly correlated with debt-to-equity ratios. This comfortably confirms our LIH hypothesis and is in line with the theoretical conclusions of John

[16] Remember that while in the power industry sponsors can sometimes resort to offtaking agreements to reduce market risk, this is only partially doable in telecom (through IRU = indefeasible rights of use) and not feasible for merchant and commercial plants.

and John (1991). Our results also bolster Fama's (1990) argument that a higher fraction of debt in the capital structure is compatible with firms with low revenue volatility.

5. Summary and conclusions

Contracts are the basis on which firms work. They set rights and obligations between the firm and its financial and nonfinancial counterparties, from banks and bondholders to suppliers, purchasers, and workers. The nature of the firm as a nexus of contracts (Jensen and Meckling, 1976) is even more transparent in project finance transactions than in standard corporate finance settings. In project finance a specially incorporated new firm, an SPV, is created to manage all the contracts referred to a single purpose venture and to make cash flows better veriable for lenders (Subramaniam et Al, 2007). In these cases, it is crucial that financial and nonfinancial contracts are designed with the objective to pre-commit, when possible, the future behavior of SPV management and its numerous counterparties, to avoid agency problems between SPV sponsoring firms and lenders and to set up an effective risk management package. Pre-committing future obligations is also a risk management policy that has the further advantage of reducing the volatility of the cash flows available for debt service and dividend payments, allowing sponsors to negotiate higher debt-to-equity ratios for the deal. Past empirical studies have pointed out the differences between project finance loans and regular (corporate) loans, particularly regarding spread levels and capital structure ratios, but none of them has focused on how NFCs influence loan pricing and debt-to-equity ratios.

Using a sample of more than 1,000 project finance loans closed between January 1998 and May 2003, taken from the ProjectWare database, we found that: (1) lenders rely upon the existence of NFCs when setting the cost of the loans (our CSH is verified); (2) they are willing to price more favourably loans for projects where sponsors are *not* key counterparties of the SPV in the relevant NFCs (our SIH is rejected); (3) lenders care about the existence of NFCs when setting the level of leverage for the deal (our LIH is confirmed). Sponsors' involvement is not relevant in influencing the level of leverage.

Our findings confirm some theoretical conclusions drawn outside the project finance environment. As suggested by Leland (1998), agency costs that reduce firm value can be lowered when management makes investment risk choices that can be credibly pre-committed in debt covenants or reinforced by a set of predefined obligations included in long-term contracts. Another interesting finding is that the contractual structure of the deal is important *per se* for lenders. They matter in the definition of the financial package only if sponsors are *not* involved in the deal as project counterparties and their involvement influences the price but not the quantity of funds provided by banks (sponsors as counterparties influence spread but not leverage).

Our study opens up further avenues for research. The effect of the financial soundness of sponsors on project finance loan spreads and debt-to-equity ratios could be investigated. While it is certainly true that lenders evaluate a project based on its cash flows and not on sponsor soundness given the non or limited recourse clause, sponsors can also be SPV counterparties, and we were not able to verify whether lenders favor this situation. Further research could also explore the microeconomic features of contracts. We simply tracked down the existence of a contract, but the available data are not particularly detailed. With a smaller sample of project finance loans in a definite sector, and with data taken directly from information memoranda like in Blanc-Brude et Al (2006), one might better understand how NFCs are linked to spread levels and debt-to-equity ratios—assuming confidentiality problems can be overcome.

Finally, future studies could include regressions of the differences in the legal and institutional settings of a country to examine the level of protection that the law guarantees to creditors. Subramaniam et Al. (2007) have demonstrated that project finance is a good substitute for weak legal and institutional protection for lenders while Esty and Megginson (2003) have studied the effect of contract enforceability on the structure of syndicated loans for project finance transactions. Some of their research hypothesis could be included in the study of the effect of NFCs on spreads and leverage.

References

Alchian, A.A., Demsetz, H., 1972. Production, information costs, and economic organization. American Economic Review 62, 777-795.

Allayannis, G., Weston, J., 2003. The use of foreign currency derivatives and firm market value. Review of Financial Studies 14, 243-276

Altunbas, Y., Gadanecz, B., 2004. Developing country economic structure and the pricing of syndicated credits. Journal of Development Studies 40, 143-173

Altunbas, Y, Gadanecz, B. Kara A., Lucchetta M., 2007., Borrower certification versus opportunistic behavior by lenders: Evidence from loan syndications. Working Paper, University of Wales

Ball, R., Bushman, R., Vasvari, F., 2007, The debt-contracting value of accounting information and loan syndicate structure, working paper, University of North Carolina.

Basel Committee on Banking Supervision, 2001a. Consultative document—the internal ratings-based approach. Bank of International Settlements, Basel.

Basel Committee on Banking Supervision, 2001b. Working paper on the internal ratings-based approach to specialised lending exposures. Bank for International Settlements, Basel.

Basel Committee on Banking Supervision, 2004. International convergence of capital measurement and capital standards—a revised framework. Bank for International Settlements, Basel.

Berkovitch, E., Kim, E.H., 1990. Financial contracting and leverage induced over- and under-investment incentives. Journal of Finance 45, 765-794.

Blanc Brude, F., Strange R., 2007, How banks price loans to Public-Private-Partnerships: Evidence from the European Market, Journal of applied corporate finance 4, 94-106.

Blanc-Brude, F., Goldsmith, H., Valila, T., 2006. Ex ante construction costs in the european road sector: a comparison of public-private partnerships and traditional public procurement, Economic and Financial Report 2006/01, EIB, Luxembourg.

Brealey, R.A., Cooper, I.A., Habib, M.A., 1996. Using project finance to fund infrastructure investments. Journal of Applied Corporate Finance 9, 25-38.

Cameron, L.J., 2000. Limiting buyer discretion: effects on performance and price in long-term contracts. American Economic Review 90(1), 265-281.

Carter, D., Rogers, D., Simkins, B., 2006. Hedging and Value in the US Airline Industry, Journal of Applied Corporate Finance 18, 21-33

Casolaro, L., Focarelli, D., Pozzolo, A.F., 2003, The pricing effect of certification on bank loans: Evidence from the syndicated credit market, Working Paper Banca D'Italia, Rome

Chemmanur, T.J., John, K., 1996. Optimal incorporation, structure of debt contracts and limited recourse project finance. Journal of Financial Intermediation 5, 372-408.

Dailami, M., Hauswald, R., 2001. Contract risks and credit spreads determinants in the international project bonds markets. Working paper. World Bank Institute, Washington D.C.

Dailami, M., Hauswald, R., 2003. The emerging project bond market: covenant provisions and credit spreads. Working paper 3095. World Bank Policy Research, Washington D.C.

Davidson, R., MacKinnon, J.G., 1993. Estimation and Inference in Econometrics, Oxford University Press, New York.

Dennis, S., Mullineaux D. J., 2000. Syndicated loans, Journal of Financial Intermediation 9, 404-426

Dennis, S., Nandi D., Sharpe, I.G., 2000. The determinants of contract terms in bank revolving credit agreements. Journal of Financial and Quantitative Analysis, 38, 87-110.

Erb, C.B., Harvey, C.R., Viskanta, T.E., 1996. Political risk, economic risk and financial risk. Financial Analysts Journal 52, 28-46.

Esty, B.C., 2002. Returns on project-financed investments: evolution and managerial implications. Journal of Applied Corporate Finance 15, 71-86.

Esty, B.C., 2003. The economic motivations for using project finance. Working paper. Harvard Business School, Boston.

Esty, B.C., 2004. Why study large projects? An introduction to research in project finance. European Financial Management 10, 213-224.

Esty, B.C., Megginson, W.L., 2003. Creditors' rights, enforcement, and debt ownership structure: evidence from the global syndicated loans market. Journal of Financial and Quantitative Analysis 38, 37-59.

Esty, B.C., Sesia, A., 2007. An overview of project finance & Infrastructure Finance —2006 update. Case study 9-207-107 (rev. April 12, 2007). Harvard Business School, Boston.

Fama, E.F., 1990. Contract costs and financing decisions. Journal of Business 63, 71-91.

Finnerty, J.D., (2007). Project Financing: Asset-Based Financial Engineering, 2nd Edition, John Wiley, New York.

Froot, K.A., Scharfstein D.S., Stein, J.C. (1993)., Risk Management: Coordinating Corporate Investment and Financing Policies, Journal of Finance 48, 1629-1658

Gatti, S. (2007 (a)). Project Finance in Theory and Practice, Academic Press, Burlington.

Gatti, S., Rigamonti, A., Saita, F., Senati, M.. (2007 (a)), Measuring Value-at-Risk in project finance transactions, European Financial Management 13, 135-158

Gatti, S., Megginson, W.L., S., Kleimeier S., Steffanoni, A. (2007 (b)) Arranger Certification in Project Finance, University of Oklahoma, Norman, Working Paper

Grossman, S., Hart, O., 1986. The costs and benefits of ownership: a theory of vertical and lateral integration. Journal of Political Economy 94, 691-719.

Hainz, C., Kleimeier, S., 2003. Political risk in syndicated lending: theory and empirical evidence regarding the use of project finance. Maastricht, LIFE working paper 03-014.

Habib, M.A., Johnsen, D.B., 1999. The financing and redeployment of specific assets. Journal of Finance 54, 693-720.

Hammami, M., J.-F. Ruhashyankiko and E.B. Yehoue, 2006, Determinants of Public-Private Partnerships in Infrastructure, Washington, International Monetary Fund, Working Paper 06/99.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3, 305-360.

John, T., John, K., 1991. Optimality of project financing: theory and empirical implication in finance and accounting. Review of Quantitative Finance and Accounting 1, 51-74.

La Porta, R., Lopez De Silanes, F., Shleifer, A., Vishny, R., 1998. Law and finance. Journal of Political Economy 106, 1113-1150.

La Porta, R., Lopez De Silanes, F., Shleifer, A., Vishny, R., 2002. Investor protection and corporate valuation. Journal of Finance 57, 1147-1170.

Leland, H.E., 1998. Agency costs, risk management and capital structure. Journal of Finance 53, 1213-1243.

Leland, H.E.,, 2007. Financial synergies and the optimal scope of the firm: implications for mergers, spinoffs, and structured Finance, Journal of Finance 62, 765-808.

Lessard, D., Global Competition and corporate finance in the 1990s, Journal of Applied Corporate Finance 1, 59-72

Lessard, D., Miller, R., 2001. Understanding and managing risks in large engineering projects. Sloan working paper 4214-01. MIT Sloan School of Management, Boston.

Ljungqvist, A., Richardson, M., Wolfenzon, D. (2007) The investment Behavior of Buyout Funds: Theory and Evidence, Stern School of Business – New York University, Working Paper

Megginson, W.L., Kleimeier, S., 2000. Are project finance loans different from other syndicated credits? Journal of Applied Corporate Finance 13, 75-87.

Minton, B., Schrand, C., 1999, The Impact of cash flow volatility on discretionary investment and the cost of debt and equity financing. Journal of Financial Economics 54, 423-460

Moody's, 2000. Project finance recognizes benefits of bank loan ratings. Moody's Investors' Service Special Comments, April.

Modigliani, F., Miller, M., The cost of capital, corporation finance and the theory of investment, American Economic Review 53, 261-297.

Moody's, 2001a. Weaker credit trends ahead for project companies lacking third party surety for construction obligations. Moody's Investors' Service Special Comments, February.

Moody's, 2001b. Moody's response to the Basel Committee proposal on an internal rating-based capital adequacy approach for project finance. Moody's Investors' Service Special Comments, May.

Morgan Stanley, 2005, Roundtable on Enterprise Risk Management and Corporate Strategy, Journal of Applied Corporate Finance 17, 32-61

Myers, S., 1977. Determinants of corporate borrowing. Journal of Financial Economics 5, 147-175.

Nevitt, P.K., Fabozzi, F., 2000. Project Financing. Euromoney, London.

Nocco, B.W., Stulz, 2006. E.R.M., Enterprise Risk Management: Theory and Practice, Journal of Applied Corporate Finance 18, 8-20

Pagach, D., Warr R., An Empirical Investigation of the Characteristics of Firms Hiring Chief Risk Officers, Working Paper, North Carolina State University

Pichler, P., Wilhelm, W., 2001. A theory of the syndicate: Forms follows function, Journal of Finance 56, 2237-2264

Rajan, R., Winton, A., 1995. Covenants and collateral as incentives to monitor. Journal of Finance 50, 1113-1146.

Shah, S., Thakor, A.V., 1987. Optimal capital structure and project financing. Journal of Economic Theory 42, 207-243.

Shin, H., Stulz, R., 2000, Shareholder Wealth and Firm Risk, Working Paper

Simons, K., 1993. Why do banks syndicate loans? New England Economic Review (January), 45-52

Smith, C.W., Warner, J.B., 1979. On financial contracting: an analysis of bond covenants. Journal of Financial Economics 7, 117-161.

Smithson, C., Simkins, B., 2005. Does Risk Management add value? A survey of the evidence. Journal of Applied Corporate Finance 17, 8-17

Sorge, M., Gadanecz, B., 2007, The term structure of credit spreads in project finance, International Journal of Finance and Economics (forthcoming)

Standard and Poor's, 2002a. Project and infrastructure finance 2002: beyond the crises. Project and Infrastructure Finance Review.

Standard and Poor's, 2002b. Project collateralized loans and bonds: rating considerations. Project and Infrastructure Finance Review.

Standard and Poor's, 2002c. Credit implications of traffic risk in start-up toll facilities. Project and Infrastructure Finance Review, 85-92.

Stulz, R.M., Johnson, H., 1985. An analysis of secured debt. Journal of Financial Economics 14, 501-521.

Subramanian K., Tung F., Wang X., 2007, Law, Agency Costs and Project Finance: An Empirical Analysis, Working Paper, Goizueta Business School, Emory University

Sufi, A., 2007, Information asymmetry and financial arrangements: Evidence from syndicated loans, Journal of Finance 62, 629-668

Yescombe, E.R. (2002). Principles of Project Finance, Academic Press, San Diego. E.

Williamson, O.E., 1988. Corporate finance and corporate governance. Journal of Finance 43, 567-591

Table 1

Descriptive statistics of the project finance loans sample

This table presents the sample descriptive statistics for the period january 1998 - may 2003. Panel A shows the breakdown by industry according to the classification of Megginson and Kleimeier (2000). Panel B shows the breakdown by region using the classification of Megginson and Kleimeier (2000). Panel C presents the breakdown by country rating; we used a slightly modified Standard and Poor's scale as the one proposed by Altunbas and Gadanecz (2003): 5 - Best (from AAA to A+), 4 - Investment Grade (from A to BBB-), 3 - Speculative (from BB+ to BB), 2 - Poor (from BB- to CC), 1 -Default, unrated or undisclosed . The number of loans refers to the number of tranches for which information about spread and debt/equity ratios is available.

Panel A - Industrial category of borrower	**Loan tranches with spread and debt/equity ratios available (number of projects 518)**			
	Value (US$/000)	**Percent**	**Number**	**Percent**
1 Commercial	1,356,030.0	0.7%	11	1.0%
2 Industrial	4,550,540.0	2.3%	35	3.2%
3 Utilities (Electricity/energy excluded)	5,322,860.0	2.7%	82	7.5%
4 Electricity/energy utility	101,057,380.0	51.9%	607	55.5%
5 Transportation	27,376,895.0	14.1%	158	14.5%
6 Telecommunication	54,631,440.0	28.1%	194	17.7%
7 Others	427,165.0	0.2%	6	0.5%
0 Undisclosed				
Totals:	**194,722,310.0**	**100.0%**	**1,093**	**100.0%**
Panel B - Geographic location of the borrower	**Loan tranches with spread and debt/equity ratios available (number of projects 518)**			
	Value (US$/000)	**Percent**	**Number**	**Percent**
1 North America	31,991,560.0	16.4%	160	14.6%
2 Carribean	7,170,130.0	3.7%	49	4.5%
3 South America	15,934,240.0	8.2%	100	9.1%
4 Western Europe	57,882,250.0	29.7%	270	24.7%
5 Eastern Europe	29,247,730.0	15.0%	181	16.6%
6 Africa	7,990,320.0	4.1%	60	5.5%
7 Australia & Pacific	15,385,340.0	7.9%	85	7.8%
8 South East Asia	21,071,300.0	10.8%	141	12.9%
9 Indian Sub Continent	920,520.0	0.5%	15	1.4%
10 Middle East	7,128,920.0	3.7%	32	2.9%
11 Other	-	0.0%	-	0.0%
0 Undisclosed				
Totals:	**194,722,310.0**	**100.0%**	**1,093**	**100.0%**
Panel C - Rating of the borrowers' country	**Loan tranches with spread and debt/equity ratios available (number of projects 518)**			
	Value (US$/000)	**Percent**	**Number**	**Percent**
5 - Best	128,373,780.0	65.9%	622	56.9%
4 - Investment Grade	19,323,120.0	9.9%	110	10.1%
3 - Speculative	19,393,610.0	10.0%	183	16.7%
2 - Poor	18,762,590.0	9.6%	97	8.9%
1 - Default, Unrated, Undisclosed	8,869,210.0	4.6%	81	7.4%
Totals:	**194,722,310.0**	**100.0%**	**1,093**	**100.0%**

Source: Dealogic Projectware

Table 2
Univariate Analysis of project finance loans

This table presents an univariate analysis of the main variables used in the study. The variables are classified in 2 groups: project variables (Group A) and Loan variables (Group B)

January 1998 - may 2003)	**Sample 1: loan tranches with spread and debt/equity ratios available (number of projects 518)**			
	Number	**Mean**	**Median**	**Std. Dev.**
Group A: project variables				
Project size (US$ thousands)	518	512,605.0	200,000.0	590,788.8
Leverage: Debt/Equity ratio	518	4.23	2.75	3.68
Number of sponsors	518	3.14	2.00	3.11
Group B: loan variables				
Tranche size (US$ thousands)	1,093	178,176.0	82,848.0	308,553.8
Tranche/Total loan size (%)	1,079	44.9%	38.5%	34.9%
Spread (basis points)	1,093	171.8	137.5	106.9
Maturity (years)	1,093	10.5	9.0	6.8
Tranche size with currency risk	286	185,862.7	76,697.5	419,435.9
Refinancing	55	154,060.4	129,232.0	138,712.0

Source: Dealogic Projectware

Table 3
Correlations among contracts and contracts signed by sponsors

This table shows the correlation coefficients among contracts and contracts signed by sponsors.
It is worthwhile noticing that given the structure of the dummies used in the paper the most part of the six key contracts will fall in the combination 0-0 (contract absent, hence cannot be signed by sponsors) or 1-1 (contract is present and signed by sponsors). A limited number of combinations will be 1-0 (contract exists but it is signed by a party different than the sponsors); the combination 0-1 is empty by definition. The statistically significant correlation coefficients shown in the table demonstrate the situation.

		Correlation Matrix											
		OP_DUM Operator Dummie Variable	**OP_SP Operator-Sponsor**	**CON_DUM Contractor Dummies**	**CON_SP Contractor-Sponsor**	**EPC_DUM EPC Dummies**	**EPC_SP EPC-Sponsor**	**OFF_DUM Offtaking Dummies variable**	**OFF_SP Offtaker-Sponsor**	**SUP_DUM Supplying Dummies**	**SUP_SP Supplier-Sponsor**	**EQ_DUM Equipment supplier dummies variable**	**EQ_SP Equipment supplier-sponsor**
OP_DUM Operator Dummie Variable	Corr. Coeff.	1	**.790(**)**	**.067(*)**	**.084(**)**	**.182(**)**	**.103(**)**	**.129(**)**	0.047	**.140(**)**	**.082(**)**	**.107(**)**	0.037
	N	1093	1091	1093	1093	1093	1093	1093	1093	1093	1093	1093	1093
OP_SP Operator-Sponsor	Corr. Coeff.		1	**.120(**)**	**.121(**)**	**.137(**)**	**.164(**)**	**.139(**)**	**.094(**)**	**.169(**)**	**.114(**)**	**.068(*)**	**.061(*)**
	N		1091	1091	1091	1091	1091	1091	1091	1091	1091	1091	1091
CON_DUM Contractor Dummies	Corr. Coeff.			1	**.395(**)**	**.068(*)**	0.045	**.094(**)**	**.236(**)**	**.129(**)**	0.001	0.04	**.078(**)**
	N			1093	1093	1093	1093	1093	1093	1093	1093	1093	1093
CON_SP Contractor-Sponsor	Corr. Coeff.				1	0.046	0.027	**-.072(*)**	-0.031	-0.022	-0.012	0.015	**.185(**)**
	N				1093	1093	1093	1093	1093	1093	1093	1093	1093
EPC_DUM EPC Dummies	Corr. Coeff.					1	**.406(**)**	**.310(**)**	**.074(*)**	**.364(**)**	**.089(**)**	**.260(**)**	**.081(**)**
	N					1093	1093	1093	1093	1093	1093	1093	1093
EPC_SP EPC-Sponsor	Corr. Coeff.						1	**.136(**)**	0.023	**.135(**)**	-0.025	**.232(**)**	**.253(**)**
	N						1093	1093	1093	1093	1093	1093	1093
OFF_DUM Offtaking Dummies variable	Corr. Coeff.							1	**.315(**)**	**.595(**)**	0.037	**.236(**)**	0.019
	N							1093	1093	1093	1093	1093	1093
OFF_SP Offtaker-Sponsor	Corr. Coeff.								1	**.256(**)**	**.147(**)**	0.017	**.086(**)**
	N								1093	1093	1093	1093	1093
SUP_DUM Supplying Dummies	Corr. Coeff.									1	**.149(**)**	**.279(**)**	0.018
	N									1093	1093	1093	1093
SUP_SP Supplier-Sponsor	Corr. Coeff.										1	-0.008	-0.011
	N										1093	1093	1093
EQ_DUM Equipment supplier dummies variable	Corr. Coeff.											1	**.285(**)**
	N											1093	1093
EQ_SP Equipment supplier-sponsor	Corr. Coeff.												1
	N												1093

** and * denote significance at the 1% and 5% (2-tailed) level respectively

Table 4

Determinants of Spread - Contractual structure of the deal and loan microeconomic variables

This table shows the results of 2SLS regressions on tranche Spread. The independent variables are different features of the loan contract, country rating, project sector and relevant contracts used in the project finance deals. Besides regression # 1 that includes all the contract available in ProjectWare, we include 6 other regression models (regression from #2 to #7) in order to account for the relevance of the inclusion of each contract in influencing the Tranche Margin. T-tests are shown in parenthesis under each independent variable

	All contracts	**O&M contract**	**Construction Contract**	**EPC Contract**	**Offtaking Contract**	**Supply Contract**	**Equipment Supply Contract**
	Reg. #1	Reg. #2	Reg. #3	Reg. #4	Reg. #5	Reg. #6	Reg. #7
Constant	-17.231	-148.422	-60.516	-98.976	-65.643	-87.224	-109.394
	(-0.148)	(-1.322)	(-0.567)	(-0.912)	(-0.604)	(-0.806)	(-1.018)
Country rating dummy: Default, not rated, undisclosed	**61.783** ***	**63.918** ***	**64.393** ***	**62.048** ***	**63.647** ***	**65.673** ***	**66.566** ***
	(-5.155)	**(5.463)**	**(5.572)**	**(5.297)**	**(5.414)**	**(5.643)**	**(5.691)**
Country rating dummy: Poor	**105.456** ***	**104.338** ***	**104.035** ***	**105.693** ***	**105.315** ***	**103.808** ***	**102.075** ***
	(-9.396)	**(9.524)**	**(9.629)**	**(9.475)**	**(9.643)**	**(9.495)**	**(9.240)**
Country rating dummy: Speculative grade	**65.001** ***	**59.465** ***	**61.763** ***	**61.338** ***	**62.524** ***	**60.800** ***	**61.228** ***
	(7.483)	(-6.989)	(7.340)	(7.275)	(7.351)	(7.098)	(7.225)
Country rating dummy: Investment grade	-2.490	0.147	0.321	0.851	0.251	1.358	1.451
	(-0.243)	(0.014)	(0.032)	(0.084)	(0.025)	(0.134)	(0.143)
Country rating dummy: Best	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)
Sector dummy: Commercial	-45.660	-57.873	-49.579	-52.248	-58.033	-58.184	-58.336
	(-0.947)	(-1.187)	(-1.028)	(-1.075)	(-1.194)	(-1.195)	(-1.198)
Sector dummy: Industrial	-22.639	-25.898	-25.397	-22.959	-26.692	-26.100	-26.328
	(-0.534)	(-0.603)	(-0.599)	(-0.537)	(-0.624)	(-0.609)	(-0.614)
Sector dummy: Utilities (power/energy not included)	-37.755	-39.056	-41.089	-33.775	-39.174	-38.364	-38.767
	(-0.942)	(-0.963)	(-1.025)	(-0.836)	(-0.970)	(-0.948)	(-0.957)
Sector dummy: Power/energy	-46.591	-49.549	-45.001	-49.039	-49.581	-50.878	-51.489
	(-1.182)	(-1.248)	(-1.147)	(-1.240)	(-1.248)	(-1.280)	(-1.297)
Sector dummy: Transportation	-11.138	-16.383	-14.455	-11.008	-16.956	-15.388	-16.144
	(-0.279)	(-0.409)	(-0.365)	(-0.276)	(-0.425)	(-0.385)	(-0.403)
Sector dummy: Telecom	36.851	36.611	37.731	36.167	34.035	35.445	33.175
	(-0.924)	(0.908)	(0.947)	(0.901)	(0.847)	(0.881)	(0.823)
Sector dummy: others	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)
Refinancing dummy: not-refinanced loan	11.298	14.932	14.800	10.928	14.465	14.069	13.315
	(0.852)	(1.125)	(1.130)	(0.821)	(1.091)	(1.059)	(1.003)
Currency risk dummy: no currency risk	**11.231** *	**11.411** *	**13.652** *	**10.373** *	**11.406** *	**10.683** *	**10.499** *
	(1.590)	(1.620)	(1.957)	(1.477)	(1.615)	(1.512)	(1.483)
Debt-to-equity ratio	**63.105** **	**75.749** ***	**68.122** ***	**59.326** ***	**46.111** **	**71.769** ***	**63.016** ***
	(2.254)	(3.050)	(2.993)	(2.497)	(1.941)	(3.123)	(2.707)
Tranche final maturity (years)	-0.643	-0.668	-0.554	-0.737	-0.614	-0.690	-0.686
	(-1.287)	(-1.356)	(-1.138)	(-1.498)	(-1.226)	(-1.393)	(-1.393)
O&M agreement dummy: absent	9.723	-0.043					
	(0.661)	(-0.003)					
O&M sponsor dummy: contract not signed by sponsors	-17.244	-13.497					
	(-0.922)	(-0.720)					
Construction agreement dummy: absent	**36.183** ***		**40.524** ***				
	(3.228)		(3.711)				
Construction agreement sponsor dummy: contract not signed by sponsors	**-107.986** ***		**-112.559** ***				
	(-4.190)		(-4.514)				
EPC Construction agreement: absent	**-17.129** **			**-19.575** ***			
	(-2.213)			(-2.683)			
EPC Construction sponsor dummy: contract not signed by sponsors	**25.554** *			**26.591** *			
	(1.726)			(1.869)			
Offtaking agreement dummy: absent	-5.403				-5.94		
	(-0.576)				(-0.712)		
Offtaking agreement sponsor dummy: Contract not signed by sponsors	**24.449** *				**36.514** ***		
	(1.635)				(2.543)		
Supply agreement dummy: absent	2.908					-2.056	
	(0.310)					(-0.253)	
Supply agreement sponsor: Contract not signed by sponsors	**-52.751** *					**-53.834** *	
	(-1.674)					(-1.720)	
Equipment supply agreement dummy: absent	-9.784						-11.381
	(-0.981)						(-1.198)
Equipment supply sponsor: Contract not signed by sponsors	18.691						16.086
	(0.628)						(0.556)
Number of observations	1,091	1,091	1,093	1,093	1,093	1,093	1,093
Adjusted R-squared	0.226	0.205	0.222	0.210	0.209	0.206	0.205

Note: (a) the parameter is set to zero since it is redudant. ***, ** and * denote significance at the 1%, 5% and 10% level respectively

Table 5

Determinants of Debt-to-equity ratio - Contractual structure of the deal and loan microeconomic variables

This table shows the results of 2SLS regressions on the value of debt-to-equity ratio. The independent variables are different features of the loan contract, country rating, project sector and relevant contracts used in the project finance deals. Besides regression #1 that includes all the contracts available in ProjectWare, we include 6 other regression models (regression from #2 to #7) in order to account for the relevance of the inclusion of each contract in influencing the debt-to-equity ratio. T-tests are shown in parenthesis under each independent variable

	All contracts	**O&M contract**	**Construction Contract**	**EPC Contract**	**Offtaking Contract**	**Supply Contract**	**Equipment Supply Contract**
	Reg. #1	Reg. #2	Reg. #3	Reg. #4	Reg. #5	Reg. #6	Reg. #7
Constant	**11.376** ***	**11.758** ***	**11.996** ***	**11.868** ***	**12.504** ***	**11.122** ***	**12.585** ***
	('4.796)	(6.049)	(5.808)	(6.085)	(6.407)	(5.144)	(6.061)
Country rating dummy: Default, not rated, undisclosed	**-1.547** ***	**-1.338** ***	**-1.479** ***	**-1.569** ***	**-1.543** ***	**-1.516** ***	**-1.441** ***
	(-3.724)	(-3.454)	(-3.658)	(-3.869)	(-3.787)	(-3.767)	(-3.550)
Country rating dummy: Poor	**-0.661** *	**-0.667** *	**-0.650** *	-0.606	**-0.711** *	**-0.700** *	**-0.669** *
	(-1.701)	(-1.778)	(-1.724)	(-1.574)	(-1.886)	(-1.860)	(-1.756)
Country rating dummy: Speculative grade	**-1.019** ***	**-0.855** ***	**-0.938** ***	**-0.891** ***	**-0.983** ***	**-1.042** ***	**-0.908** ***
	(-3.384)	(-2.908)	(-3.166)	(-3.031)	(-3.322)	(-3.502)	(-3.073)
Country rating dummy: Investment grade	**-1.384** ***	**-1.287** ***	**-1.462** ***	**-1.472** ***	**-1.453** ***	**-1.515** ***	**-1.456** ***
	(-3.902)	(-3.663)	(-4.142)	(-4.207)	(-4.150)	(-4.326)	(-4.154)
Country rating dummy: Best	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)
Sector dummy: Commercial	**-3.930** **	**-3.931** **	**-4.091** **	**-3.819** **	**-4.092** **	**-4.055** **	**-4.024** **
	(-2.352)	(-2.351)	(-2.431)	(-2.275)	(-2.439)	(-2.419)	(-2.393)
Sector dummy: Industrial	-2.022	-2.049	-2.151	-2.034	-2.207	-2.184	-2.170
	(-1.375)	(-1.391)	(-1.454)	(-1.378)	(-1.494)	(-1.480)	(-1.466)
Sector dummy: Utilities (power/energy not included)	1.371	1.248	1.161	1.314	1.164	1.164	1.166
	(0.987)	(0.898)	(0.830)	(0.942)	(0.834)	(0.835)	(0.834)
Sector dummy: Power/energy	**-2.551** *	**-2.167** *	**-2.378** *	**-2.300** *	**-2.623** *	**-2.600** *	**-2.378** *
	(-1.867)	(-1.594)	(-1.740)	(-1.687)	(-1.914)	(-1.901)	(-1.738)
Sector dummy: Transportation	-1.299	-1.447	-1.635	-1.474	-1.670	-1.636	-1.642
	(-0.947)	(-1.053)	(-1.185)	(-1.069)	(-1.212)	(-1.188)	(-1.189)
Sector dummy: Telecom	**-3.159** **	**-3.058** **	**-3.153** **	**-3.077** **	**-3.241** **	**-3.185** **	**-3.183** **
	(-2.287)	(-2.213)	(-2.270)	(0.027)	(-2.337)	(-2.299)	(-2.287)
Sector dummy: others	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)	0(a)
Refinancing dummy: not-refinanced loan	**-1.041** **	**-0.823** *	**-0.798** *	**-0.904** **	**-0.877** *	**-0.893** *	**-0.808** *
	(-2.265)	(-1.808)	(-1.748)	(-1.968)	(-1.915)	(0.051)	(-1.764)
Currency risk dummy: no currency risk	0.079	0.171	0.128	0.118	0.087	0.101	0.142
	(0.322)	(0.709)	-0.525	(0.485)	(0.356)	(0.416)	(0.583)
Tranche amount (US$ mil.)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.316)	(0.315)	-0.083	(0.118)	(0.068)	(0.218)	(0.129)
Tranche margin (b.p.)	**-0.026** ***	**-0.034** ***	**-0.027** ***	**-0.027** ***	**-0.022** ***	**-0.025** ***	**-0.027** ***
	(-2.938)	(-4.029)	(-3.266)	(-3.227)	(-2.580)	(-2.987)	(-3.211)
O&M agreement dummy: absent	-0.056	-0.252					
	(-0.110)	(-0.502)					
O&M sponsor dummy: contract not signed by sponsors	**1.570** ***	1.650					
	(2.487)	(2.660)					
Construction agreement dummy: absent	-0.321		-0.383				
	(-0.827)		(-1.008)				
Construction agreement sponsor dummy: contract not signed by sponsors	0.106		0.506				
	(0.119)		(0.584)				
EPC Construction agreement: absent	**-0.515** **			**-0.608** **			
	(-1.919)			(-2.413)			
EPC Construction sponsor dummy: contract not signed by sponsors	0.767			0.783			
	(1.538)			(1.643)			
Offtaking agreement dummy: absent	-0.183				**-0.435** *		
	(-0.565)				(-1.506)		
Offtaking agreement sponsor dummy: Contract not signed by sponsors	-0.591				-0.625		
	(-1.184)				(-1.306)		
Supply agreement dummy: absent	**-0.565** *					**-0.694** ***	
	(-1.738)					(-2.475)	
Supply agreement sponsor: Contract not signed by sponsors	1.346					1.464	
	(1.243)					(1.373)	
Equipment supply agreement dummy: absent	0.053						-0.127
	(0.153)						(-0.387)
Equipment supply sponsor: Contract not signed by sponsors	-0.912						-0.382
	(-0.891)						(-0.390)
Number of observations	1,091	1,091	1,093	1,093	1,093	1,093	1,093
Adjusted R-squared	0.167	0.161	0.152	0.156	0.155	0.156	0.151

Note: (a) the parameter is set to zero since it is redudant. ***, ** and * denote significance at the 1%, 5% and 10% level respectively