

# How Banks Price Loans to Public-Private Partnerships? Evidence from the European Markets

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**P**ublic-private partnerships, or PPPs,<sup>1</sup> are an increasingly popular method of procurement for public infrastructure projects—one in which a public authority commissions the design, construction, operation, maintenance, and financing of a public infrastructure project from a private consortium within a single contractual framework. In the past 15 years, PPPs have come of age in the United Kingdom (UK), with over 800 projects signed since 1992. They have also experienced rapid growth in many other European countries and, indeed, throughout the world. In the EU, more than 1,000 PPPs had reached financial close by mid-2007, representing a capital investment of about €200 billion.<sup>2</sup> Meanwhile, in the U.S., PPPs are also starting to become a mainstream method of procurement, especially in the road sector.<sup>3</sup>

The vast majority of PPPs are developed using a method called “project finance,” which can be defined as “the raising of funds to finance a single indivisible large-scale capital investment project, whose cash flows are the [main or] sole source to meet financial obligations and provide returns to investors.”<sup>4</sup> Many different types of large, capital-intensive projects have been developed using project finance (PF), including toll roads, power plants, airports, casinos, oil and gas facilities, and real estate. PF deals have highly leveraged, limited- or non-recourse capital structures<sup>5</sup> that aim to shield equity investors from most of the financing risk and significantly decrease the cost of finance for the project. But if much of the appeal of project finance derives from its ability to minimize funding costs by achieving high leverage, such high leverage is also its main point of vulnerability. According to Standard & Poor’s,<sup>6</sup> PF structures can be endangered by overly ambitious borrowing programs that eliminate room to maneuver around other problems or structural

deficiencies. Thus, one of the most important characteristics of PF deals is the predictability of the long-term cash flows. For this reason, lenders are heavily involved, alongside equity investors, in the developing and monitoring of such projects.<sup>7</sup>

PPPs, as suggested, are a subset of the PF market. The fundamental difference between PPPs and other PF deals is their “public” dimension; that is, project output in PPPs is a function of government policy (health, transport, education etc.), and a government department or local authority is typically the client and *de facto* regulator of the contract. In a PPP, the public client transfers a number of risks traditionally carried by the state or local authority to the project company. These risks typically include the construction of a new asset as well as its operation for several decades, and may include factors that can radically affect a project’s revenues (such as demand risk e.g. traffic risk for a transport project). Indeed, risk transfer is the fundamental theoretical justification of PPPs: the benefits of efficient risk management by private investors (keeping down construction and operating costs and delays) are expected to more than offset the cost of risk-pricing by private financiers.<sup>8</sup>

Nevertheless, the financial economics of such projects remain ill-understood, especially the role played by debt markets. In policy and procurement circles, the debate around PPPs focuses on the extent of the actual risk transfer from the public to the private sector, but there is little rigorous analysis of what capital and debt markets do with project risks once they have been contractually passed on to a project company.

In this context, the cost of debt in PPPs is an important issue. Since PPPs are ultimately paid for by taxpayers and service users, they have been politically sensitive almost everywhere they have been undertaken. The pivotal point of concern and criticism of PPPs is their cost of funds, which is

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1. They are also sometimes called “DBFOs,” which is short for Design-Build-Finance-Operate.

2. See Frederic Blanc-Brude, Hugh Goldsmith, et al. (2007). *Public-Private Partnerships in Europe: An Update. Economic and Financial Report 2007/03*. Luxembourg, European Investment Bank.

3. Ivan Mattei (2006). “PPPs in the US, Evolving Financing Structures.” *Infrastructure Journal* January. Recent examples include the Port of Miami Tunnel (US\$1bn) or the I-595 toll road (US\$1.5bn) in Florida.

4. Mansoor Dailami and Robert Hauswald (2000). *Risk shifting and long-term contracts: evidence from the Ras Gas Project*. Washington, DC, World Bank Institute Governance Regulation and Finance Division. Policy Working Paper.

5. Typically, a project company (or special purpose vehicle) is incorporated and financed partly by equity investors and partly by lenders. The debt is “non-recourse” in the sense that lenders have little or no claim on the equity investors’ balance sheet in the event of default by the SPV.

6. S&P and Peter Rigby (2005). *Global Project Finance Yearbook*. London, Standard & Poor’s.

7. For a review of the economic and finance issues found in project finance, See Richard A. Brealey, Ian A. Cooper, et al. (1996). “Using Project Finance to Fund Infrastructure Investments.” *Journal of Applied Corporate Finance* 9(3): 25-38. and Benjamin C. Esty (2002). “Returns on Project-Financed Investments: Evolution and Managerial Implications.” *Journal of Applied Corporate Finance* 15(1).

8. Paul A. Grout (1997). “The Economics of the Private Finance Initiative.” *Oxford Review of Economic Policy* 13(4): 53-66.

typically higher than the cost of public funds. Most critics of PPPs argue that all the efficiency gains of a DBFO could be achieved through a DBO (design, build, operate) and that private financing results in a needless increase in costs.<sup>9</sup> And because PPPs are typically so highly leveraged (sometimes up to 100%), the cost of debt is the main driver of the cost of funds in such projects. Understanding how PPP debt is priced is thus as important for policymakers as it is for originators.

### A Pricing Puzzle?

The conventional wisdom about how project finance and PPP loans are priced can sometimes seem puzzling. Practitioners often argue that the cost of debt for a project is simply “the price of the market,” with the suggestion that project-level risks play a less important role than the state of competition among banks and the pressure they face to score high in the league tables. Practitioners in recent years have also routinely described the project debt market as a “buyer’s” market and sponsors’ presentations as events where “anybody who cannot do 80bp can leave the room.” At the same time, the role of “credit cycles” in determining (or distorting) the cost of debt in projects is also often emphasized.<sup>10</sup>

Moreover, in PF transactions that are also PPPs, there may be other, more compelling reasons for lenders to ignore risk. Government agencies typically claim that in PPPs it is “*necessary for private capital to be at risk* [and] to take responsibility for the works it carries out. (...) It is also important that the private sector funders do not infer from any government involvement...that it is in any way underwriting the finance raised.”<sup>11</sup> However, the fact that PPPs remain “public projects” might suggest that governments ultimately underwrite them. For example, in the context of the bond issue to fund the London Underground PPP in 2004, the British government agreed to underwrite 95-100% of the total principal of £4.5 billion.<sup>12</sup> In most PPPs, lenders receive implicit or explicit repayment guarantees from the sovereign in the event of termination by the public client.

So how risky are PF loans? Even if significant project risks are contractually passed on to third parties (e.g. construction risk through a fixed-price, turnkey contract), lenders should “price” any risk that the project company cannot pass on to subcontractors and that can affect the project’s revenues and its ability to service debt. The Basel Committee, among others, has argued that PF loans are riskier than other types of

loans and require higher levels of reserve capital for banks.

Casting doubt on such arguments, however, existing research indicates that PF lending has proven extremely resilient to adverse economic conditions, with low default rates and very high recovery rates<sup>13</sup> that have enabled it consistently to outperform pools of equivalent corporate loans. Using historical data for a sample of 759 loans, Standard & Poor’s conducted an analysis of project finance loans’ expected losses (or EL, which is the “probability of default,” or PD, multiplied by “loss given default,” or LGD). S&P found that the LGD of PF loans is quite low—25% on average—and that, thanks to restructurings, 100% of loan values were maintained in their sample. The study also reported that PF loans have better LGD rates than secured, senior, and senior unsecured corporate debt. According to these findings, static pools of PF loans would have a ten-year cumulative average probability of default of about 7.5%, and a one-year average probability of default of approximately 1.5%.<sup>14</sup>

As discussed in previous articles in this journal, high levels of leverage are reliable indicators of generally low asset risk<sup>15</sup> and PF debt tends to carry lower interest rates than equivalent corporate debt.<sup>16</sup> In another study of the credit performance of 217 infrastructure projects over a decade, Standard & Poor’s confirmed that instances of default, defined as missing of at least one payment by the borrower, have been rare (8.8%) and recovery rates very high.<sup>17</sup>

That PF and PPP debt almost never defaults can, of course, be seen as a good thing. For critics of PPPs, however, the combination of such low default rates and the cost of debt incurred in these projects suggests that banks are capturing undeserved “rents” and taxpayers are not getting “value for money.” Such criticism reflects the common perception that banks are not taking much risks in PPPs and that most debt service and fees accrue to them as “pure profit.”

In effect, to appreciate the role of private capital, and of lenders in particular, in project finance and PPPs, two questions really need answering:

**Do banks price risks and, if so, how accurately?** Assuming a competitive syndication market, do banks walk into PF deals with their eyes closed, with the idea of just “doing deals?” Do they care about risk since the public services financed through PPPs are ultimately underwritten by the public sector? If project finance loans almost never default, why do PPP term loans cost 120bp?

9. Keith Palmer (2001). Contract issues and financing in PPP/PFI (Do We Need the ‘F’ in ‘DBFO’ Projects?). IPPR. London.; Committee on Public Accounts (2003). Report by the Comptroller and Auditor General: Ministry of Defence: Redevelopment of MOD Main Building. HC 748, Minutes of Evidence, Appendix 1. London, House of Commons.

10. Nevertheless, for recent empirical research suggesting the credit cycles may not play a pivotal role in driving spreads, see Max Bruche and Carols Gonzales-Aguado (2007). Recovery Rates, Default Probabilities and the Credit Cycle. Working Paper. Madrid, CEMFI.

11. HMT (2003). PFI: Meeting the Investment Challenge. London, Her Majesty’s Treasury.:105-6

12. Fitch Ratings (2004). Transport for London (TfL). International Public Finance. N. Painvin and F. Mayorga. London, Fitch Ratings.

13. S&P (2004). When Projects Fail: Ten Years of Project Finance Ratings. *Global Project Finance Yearbook*. London, Standard & Poor’s.

14. James Berner (2002). “Do Project Finance Loans Outperform Corporate Loans?” *Infrastructure Journal* 2002 Review.

15. Esty. *Ibid*

16. Stefanie Kleimeier and William L. Megginson (2000). “Are Project Finance Different From Other Forms of Syndicated Credit.” *Ibid*. 13: 75-87.

17. Competitive weakness is the major reason for sub-standard credit performance, with most of the downgrades in the S&P sample corresponding to merchant power plants. S&P and Rigby *Global Project Finance Yearbook*. *Ibid*.

**How do banks add value to PF/PPP transactions?** Which is equally important given the argument that the benefits of a DBFO could be achieved through a DBO—that is, without private financing.

These questions, as noted earlier, are as important for arrangers as they are for policymakers. Thanks to a new dataset of spreads from hundreds of loans extended to PPP projects across Europe and robust statistical results, this paper provides new ways of answering them.

## Project Finance Loan Pricing

Before analyzing our data, a review of the key theoretical and empirical literature on project finance and loan pricing provides some answers and raises more questions.

## Classic Loan Pricing Models

The Merton/Black-Scholes option pricing framework for the pricing of default risk on corporate debt is the basis for most loan pricing models.<sup>18</sup> It predicts that the default risk premium is directly related to the borrower's leverage, and to the variance of the value of the underlying assets of the borrower. The MBS pricing model also predicts that the credit spread is directly related to the risk-free rate on the debt (typically LIBOR<sup>19</sup>). In this framework, the risk premium is also influenced by debt maturity, but the sign of the relationship depends on the other parameters in the model. More recently, other researchers have proposed an extended version of the MBS framework of risky debt pricing that produces more realistic results in line with empirical observations.<sup>20</sup> In particular, they show that credit spreads can vary significantly when companies with similar default rates have assets with different correlations with interest rates, which helps explain why debt with similar ratings has different spreads in different industries. Empirically, they find that spreads are strongly negatively correlated with corporate assets with significant exposures to interest rates. The interest rate risk of the borrower's assets must be taken into account along with default risk in valuing risky debt.

Project finance loan pricing, however, seems driven by other forces than those predicated by MBS. One study of a sample of over 5,000 PF loans within a control group of 90,000 syndicated loans found that PF loans differed significantly from other loans, with longer maturities, more frequent

third-party guarantees, and more frequent use by non-U.S. and riskier-country borrowers. The same study also reported that PF loan spreads are directly related to variables such as country risk, covenants in the loan contract, and project leverage. Finally, the study concluded that, in contrast to standard corporate debt, PF loan pricing is not a positive function of maturity and loan size.<sup>21</sup>

The term structure of project finance loans seemed a particular puzzle. The apparent absence of a clear relationship between spreads and maturity was thus addressed by a later study.<sup>22</sup> The authors argued that whereas spreads for both investment- and speculative-grade loans other than project finance are a positive linear function of maturity, PF loans have a “hump-shaped” or non-linear term structure. The authors attributed this non-linear relationship between spreads and maturity in project finance to two characteristics of these loans: (1) because projects tend to have short-term liquidity constraints, lenders grant longer maturities to avoid increasing the projects' probability of default; and (2) projects go through fairly predictable risk phases that are gradually resolved (i.e., risks either materialize or not), with spreads first rising and then falling over time in a “sequential resolution of uncertainty.”<sup>23</sup>

Syndication is also viewed as playing a potential role in driving the cost of debt. When the existence of a relationship between syndicate size (number of arranging banks) and risk pricing was tested empirically, loan pricing was shown to be a positive function of syndicate size and concentration, suggesting that sponsors may indeed have been paying a premium to have a syndicate protect them against expropriation.<sup>24</sup> On the other hand, other studies have reported finding that the presence of larger syndicates reduces credit spreads.<sup>25</sup>

In sum, the “classic” loan pricing models are not completely successful in explaining what determines the cost of debt in project finance transactions, let alone in PPPs. The role of syndication is also unclear. Importantly, a key assumption in most classic credit risk pricing models is that the creditworthiness of the borrower is given. Banks may either seek compensation for risk through spreads and fees or use the non-price characteristics of loans<sup>26</sup> to facilitate monitoring (e.g. shorter maturities) and limit losses (e.g. loan size, collaterals) when lending to risky borrowers. In other words, credit risk is viewed as “exogenous” and hence largely unaffected by the lenders' actions.

18. Robert C. Merton (1974). “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates.” *Journal of Finance* 29(2): 449-470.

19. LIBOR: London Interbank Offered Rate

20. Francis A. Longstaff and Eduardo S. Swartz (1995). “A Simple Approach to Valuing Risky Fixed and Floating Rate Debt.” *Journal of Finance* 50(3): 789-819.

21. Stefanie Kleimeier and William L. Megginson (2000). “Are Project Finance Different From Other Forms of Syndicated Credit.” *Journal of Applied Corporate Finance* 13(1): 75-87.

22. Marco Sorge and Blaise Gadanecz (2004). The term structure of credit spreads in project finance. Monetary and Economic Department, Geneva, Bank of International Settlements: Working Paper.

23. R. Wilson and Kreps (1980). “Temporal resolution of uncertainty.” *Econometrica* 48.

24. Benjamin C. Esty and William L. Megginson (2000). Syndicate Structure as a Response to Political Risk in the Project Finance Loan Market, Harvard Business Scholl; Yener Altunba and Blaise Gadanecz (2003). Developing country economic structure and the pricing of syndicated credits. Monetary and Economic Department, Geneva, Bank of International Settlements: Working Paper; Benjamin C Esty and William L Megginson (2003). “Creditor Rights, Enforcement, and Debt Ownership Structure: Evidence from the Global Syndicated Loan Market.” *Journal of Financial and Quantitative Analysis* 38(1): 37-60.

25. Philip E. Strahan (1999). Borrower Risk and the Price and Nonprice Terms of Bank Loans New York, New York Federal Reserve; Kleimeier and Megginson; Sorge and Gadanecz. *Ibid.*

26. Strahan. *Ibid.*

## The Network of Contracts and Endogenous Credit Risk

Our view is that it makes little sense to assume that credit risk remains an exogenous variable when lenders generate between 70% and 100% of a project's capital costs. Lenders are heavily involved in the contractual structuring of project finance transactions and require the use of certain types of contracts, including fixed-price construction contracts.<sup>27</sup> Indeed, the view of the corporation as a "nexus of contracts" that is popular in financial economics<sup>28</sup> is especially useful in thinking about project finance.

To begin with, in project finance, the project's debt holders bear most of the cost of unforeseen contingencies and potential opportunistic behavior by the project's client. Consequently, one should expect lenders to use the contractual structure of the project to minimize credit risk. Having done so, lenders should then price any risk that is not explicitly managed through contracts. In other words, unmanaged risk factors only should drive the credit spread of a project's risky debt (e.g. revenue risk).

In a case study of the RasGas natural gas project, two authors do a nice job of showing how the project's structure divides risks into those that are managed through contractual allocations among different stakeholders, and those that remain unmanaged and are thus priced.<sup>29</sup> This case study is one of the few analyses of project-level drivers of credit spreads in a project finance transaction using actual pricing data and rigorous statistical methods. It shows that the demand risk that arises from possible breach of contracts by off-takers (clients) of the projects is directly passed on to debt holders. In other words, the credit spread of the RasGas bond issue was clearly driven by unallocated risk factors.

Because the RasGas deal is an oil and gas project, financed with bonds and operating in an emerging market, one might question whether such findings would also apply to PPP projects, which belong to much more "public" sectors, tend to be financed with bank debt, and have mostly been developed in Europe. The key recognition, though, is that in project finance transactions, banks are the architects of the project's contractual structure, and that structure in turn determines the risk pricing of the project's debt. Banks agree to lend only when they have a sufficient level of "comfort," which is often achieved by assuming "step-in" rights with extensive powers over the project's management and use of

cash flows. In other words, project finance transactions can be structured to represent the desired level of credit risk lenders and sponsors are willing to take, usually those corresponding to a BBB or BBB- rating.

## Monitoring and the Cost of Debt

Banking theory also emphasizes the special nature of banks as delegated monitors and liquidity providers, and how the characteristics of the lender/borrower relationship affect the risk and cost of debt. The distinctive role of banks is to overcome information problems and minimize adverse selection in the lending market. In so doing, banks work to expand the supply and reduce the cost of capital available to fund businesses.<sup>30</sup> In practice, banks address the borrower/lender information asymmetry problem by through a more intensive evaluation of borrower risk. And particularly in project finance, lenders have especially demanding information requirements from sponsors that are designed to reduce their perceived risk and increase their comfort in making the loan.

Financial intermediation, information revelation and monitoring are the channels through which banks reduce the costs of funds.<sup>31</sup> For complex projects, auditing and monitoring can alleviate some of the problems posed by the potentially opportunistic behavior of contractors. Indeed, one of the main rationales for project finance is to enable lenders to distinguish project performance from firm performance, monitor project management behavior, and determine the cash flow available for interest and principal repayment.<sup>32</sup> Monitoring is improved by including a very detailed set of debt covenants that force lenders to commit to continuous control of the behavior of management.<sup>33</sup>

Auditing and monitoring are also more effective when the auditors and monitors are experts in the area they control and have clear incentives to spend the resources needed to discover useful information.<sup>34</sup> Project finance ensures that lenders have a sufficiently large stake to incur monitoring costs and, if they specialize in financing infrastructure projects, the expertise and reputation for being credible monitors. Finally, the separate incorporation of a new venture also allows lenders to better assess the value of collateral. The low redeployment value of most project-financed assets explains why lenders spend more time and effort valuing revenues from the asset's current use than estimating the resale value of the collateral.<sup>35</sup>

This at least partial resolution of the lender/borrower

27. Without the commitment to deliver on time and budget from contractors, lenders cannot reasonably take on overall project risk. A fixed-price, date-certain construction contract is thus an important factor of lender comfort. Peter Rigby and S&P (1999). *Project Finance Rating Criteria* New York, Standard & Poor's.

28. Armen A. Alchian and Harold Demsetz (1974). "Production, Information Costs, and Economic Organization." *American Economic Review* 62(5): 777-795; Michael Jensen and William H. Meckling (1976). "Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure." *Journal of Financial Economics* 3(4): 305-360.

29. Dailami and Hauswald. *Ibid.*

30. Joseph E. Stiglitz and A. Weiss (1981). "Credit Rationing in Markets with Incomplete Information." *American Economic Review* 71: 393-409.

31. Douglass W. Diamond (1984). "Financial Intermediation and Delegated Monitoring." *Review of Economic Studies* 51(3): 393-414.

32. S. Shah and A.V. Thakor (1987). "Optimal capital structure and project financing." *Journal of Economic Theory* 42: 207-243.

33. C.W. Smith and J.B. Warner (1979). "On financial contracting: an analysis of bond covenants." *Journal of Financial Economics* 7: 117-161; R. Rajan and A. Winton (1995). "Covenants and collateral as incentives to monitor." *Journal of Finance* 50: 1113-1146.

34. Matthias Dewatripont and Patrick Legros (2005). "Public-Private Partnerships: Contract Design and Risk Transfer." *EIB Papers* 10: 120-145.

35. M.A. Habib and D.B. Johnsen (1999). "The financing and redeployment of specific assets." *Journal of Finance* 54: 693-720.

information problem in project finance has two potentially important effects. First, as we have already seen, by diminishing adverse selection and moral hazard, the structure of project finance lowers the cost of debt. At the same time, however, it gives the most informed banks considerable bargaining power with the project's sponsors, putting the bank in a position to extract higher rents from the project. Eventually, banks with superior monitoring ability may be in a position to charge higher loan "all-in" rates (including fees, revenues from subordinated debt etc.) and also to lend for longer maturities.<sup>36</sup> For instance, recent research suggest that certification by prestigious lead arranging banks can create economic value by reducing overall loan spreads compared to loans arranged by less prestigious arrangers, and by allowing larger and more highly leveraged PF deals to be funded. Banks participating in such syndicates pay for certification, thus allowing top-tier arrangers to keep large fractions of the up-front fees.<sup>37</sup>

Because of this effect, economists have argued that corporate borrowers should diversify their portfolio of borrowing sources to balance the price advantage and the disadvantage of having informed lenders.<sup>38</sup> However, project finance transactions are structured in such a way that diversifying borrowing sources is rarely an option for the project company: once the deal has closed, loan covenants typically prohibit further borrowing by the project company, especially from a different group of lenders. Thus, in a PF transaction, the lender's information advantage is greater than average (because the project is highly leveraged) and their bargaining power over the project's profits is also greater.

### Spreads and Fees in European PPP Debt

To assess the cost of debt in PPPs, we developed two overlapping datasets: one is a sector-specific sample of EU motorway projects (EU Roads), and the other is a country-specific multi-sector sample of PFI projects in the United Kingdom<sup>39</sup> (UK PFI). The use of two samples allowed us to address some of the shortcomings of past PF studies, and to isolate detailed project-level risk factors that could drive the cost of debt in PPPs.

We cross-referenced the Thomson Banker and ProjectWare databases to build both datasets. Each PPP financing typically involves multiple "tranches" or individual loans, and each tranche constitutes a single observation in our analysis.

These databases report thousands of project finance deals, with several tranches related to each project. However, the spreads are not reported for many loans. For many more loans, only the initial spread (at launch) is reported. We used only those tranches for which we believed we knew what the spread was supposed to be for the duration of the life of the tranche. We also avoided mixing floating and fixed rate debt (bonds), which we believe to have structurally different determinants, by using only the floating-rate loans, which constitute the great majority of available observations.<sup>40</sup> Our EU Roads sample consists of 125 observations, and the UK PFI sample of 177 observations. Both samples included PPPs that closed over the 12-year period from 1994 to 2005. For the purpose of statistical analysis, these are relatively "large" samples.

### The Spread Variable

The dependent variable in our analysis—that is, the variable whose behavior we are trying to explain—was the *ex ante* (at closing) tranche spread over the risk-free benchmark rate of interest. Previous studies of project finance loans have used either the all-in-spread (AIS)<sup>41</sup> or the initial spread,<sup>42</sup> as their proxy for the risk premium. Although reasonable when comparing corporate loans, this practice ignores the fact that project finance loans often have multiple pricing structures or step-pricing. For example, a project may draw on credit lines that are priced at 100 basis points (bp) over a risk-free benchmark initially but, depending on the revenue risk of the project and the type of lending instrument, the spread may stay the same, decrease to 80bp after three years, and/or gradually increase to 200bp over a 25-year period.<sup>43</sup> Such steps are agreed between lenders and borrower *ex ante* i.e. at financial close.

This point is illustrated by Figure 1, which depicts the average *ex ante* spread during the life of a term loan in our sample for three different types of projects: roads, urban rail, and government (hospitals, prisons, schools etc.). Among other things, Figure 1 shows that "government" projects raise term loans that, on average, have longer maturities than those funding road or rail projects.

More descriptive statistics for the projects in both samples are summarized in tables 1 and 2. Most of the EU motorway projects are located in one of three countries—Spain, the U.K., and Portugal—and most of the U.K. PFI projects are in

36. Because they are better able to reduce the moral hazard problems of asset substitution and underinvestment ADF Coleman, N Esho, et al. (2004). Do Bank Characteristics Influence Loan Contract Terms?, Australian Prudential Regulation Authority Working Paper.

37. S. Gatti, S. Kleimeier, et al. (2007). Arranger Certification in Project Finance. Working Paper.

38. Raghuram G. Rajan (1992). "Insiders and Outsiders: The Choice Between Informed and Arm's Length Debt." *Journal of Finance* 47(4): 1367-1400.

39. The Private Finance Initiative (PFI) is the name of the British PPP procurement programme. It covers most public services including transport, defense, government, hospital and school buildings and associated services, social and student housing, and municipal services such as street lighting, fire brigade headquarters, etc.

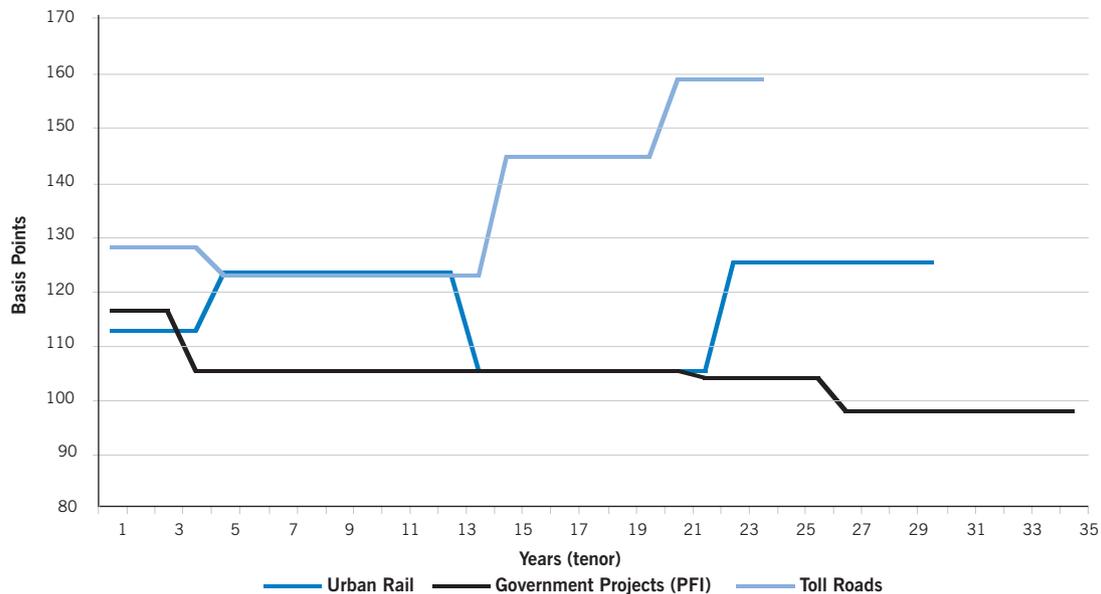
40. At present some 70% of PPP projects are financed with bank loans (commercial and multilaterals) according to Standard's and Poor's and 30% via the bond market. In our initial sample, bonds represented only 13% of observations. S&P and Rigby Global Project Finance Yearbook. *Ibid.*

41. AIS: Initial spread over LIBOR plus annual fees, also called the "drawn" spread

42. The spread at the beginning of the life of the loan

43. In a Merton debt pricing framework, this is equivalent to saying that the variance of non-fixed assets is not constant. In effect, such variance never is constant but project finance allows lenders to anticipate such changes in asset variance.

Figure 1 The Average Spread of PPP Term Loans during the life a the loan



one of three sectors—hospitals, education, and roads. There is a mean (median) spread of 113.15 (112.50) bp for the EU motorway sample and a mean (median) of 109.52 (100) bp for the UK PFI sample. The ranges and standard deviations for both samples are also comparable.

### Step Margins

As shown in Figure 1, in the case of both motorway and government projects, *ex ante* spreads step down after the initial construction period, when the project is at risk of being late or over budget, which could affect future revenues and increase the probability of default. However, motorway spreads subsequently increase, possibly due to the exposure of most road projects to some degree of market risk.

Conversely, government PPPs only have ‘revenue risk’ in terms of their delivery performance (the British sovereign is AAA-rated). The unitary payments made by government departments for the delivery of infrastructure services are otherwise pre-agreed and tied to inflation. But since the performance of operators is managed through contracts, this risk is apparently not reflected in debt spreads. Thus, for government projects, the average step-margins typically decrease as the loan matures.

Finally, urban rail projects first experience, on average, a step-up of loan spreads during the first period of operation, probably because such projects are exposed to significant

competition or market risk.<sup>44</sup> The spread steps down during the second period of operations, presumably after the reputation of the link has been established, and it goes up again beyond 22 years of operation, denoting a more radical form of uncertainty at the time of lending about future transportation user choices and traffic.

These findings show that the “initial spreads” used in previous empirical studies of PF loan pricing can be a very partial representation of lenders’ perception and pricing of risk. Our dataset allows us to observe such multiple pricing structures and to calculate the weighted credit spread of loans to PPPs: the weighted average of the different spreads applicable during the life of each loan, with the weights given by the number of months during which each price is charged to the borrower on this particular loan. This weighted average spread was used as our dependent variable in the regression analysis described below.

From casual observation of these findings, then, spreads and the use of step margins appear to reflect different levels of revenue risks associated with different types of projects. Nevertheless, there is an alternative explanation of such pricing structures—one that suggests “strategic” behavior on the part of lenders. According to this view, which is often expressed by practitioners about all PPPs, if not all PF transactions, loan rates are scheduled to increase over time not to reflect revenue risk, but to force a refinancing of the project’s

44. As opposed to many motorways, which enjoy a strong comparative advantage to alternative means of transportation and sometimes a quasi-monopoly on a certain route

Table 1 **Descriptive Statistics on Credit Spreads in the EU Motorways Sample**

Country	N	Mean	Median	Minimum	Maximum	Std. Deviation
Netherlands	3	55.00	70.00	25.00	70.00	25.98
Norway	3	82.60	87.05	73.70	87.05	7.70
United Kingdom	34	117.76	105.00	50.00	400.00	74.12
Spain	39	104.24	110.00	50.00	150.00	30.27
France	2	112.50	112.50	65.00	160.00	67.18
Hungary	7	91.29	118.67	35.00	137.50	51.52
Germany	2	124.80	124.80	124.38	125.23	0.60
Portugal	26	132.25	126.50	91.50	350.00	47.82
Greece	3	138.33	130.00	125.00	160.00	18.93
Ireland	6	115.83	132.50	30.00	135.00	42.12
<b>Total</b>	<b>125</b>	<b>113.15</b>	<b>112.50</b>	<b>25.00</b>	<b>400.00</b>	<b>52.10</b>

Table 2 **Descriptive Statistics on Credit Spreads in the UK PFI Sample**

Sector	N	Mean	Median	Minimum	Maximum	Std. Deviation
Bridge	5	82.75	75.00	70.00	100.00	13.24
Defense	19	94.16	100.00	25.00	125.00	28.89
Education	37	94.87	100.00	30.00	195.65	28.49
Hospital	48	100.66	100.00	25.00	175.00	28.44
Prison	5	107.59	100.00	80.00	165.00	33.93
Police	16	140.82	105.00	25.00	350.00	107.47
Government Buildings	3	192.50	110.00	97.50	370.00	153.85
Road	29	122.89	110.00	50.00	400.00	78.89
Urban Rail LRT/MRT	15	127.19	120.00	91.18	164.17	21.87
<b>Total</b>	<b>177</b>	<b>109.52</b>	<b>100.00</b>	<b>25.00</b>	<b>400.00</b>	<b>56.16</b>

debt. Such practices are said to reflect banks' incentives to "keep their money moving" to increase fee revenues.

Contradicting such claims, however, inspection of our sample clearly shows that upward step margins are used, on average, only in transport financing, but not in government' projects like PFI schools or hospitals. This difference in practice in turn suggests that the opportunity for a refinancing arises primarily from the change in risk profile as a project progresses from its construction and development phase into its operating phase. Once the operating phase has been reached, a number of the risks that dictated the funding structure at the outset may have been resolved. And to the extent this happens, the project company would be the main beneficiary of such refinancing. That is, in a more stable operating environment and with more predictable cash flows, the project company would have the opportunity to adjust

its funding structure to reflect the lower inherent risks that characterize the project after a few years.

Although PPP re-financings have been criticized as representing a direct and unjustified transfer from the public to the private sector,<sup>45</sup> the benefits from refinancing a PPP Road for lenders (in the form of breakage fees) are unlikely to compensate for the loss of revenues from another 15 years of debt service at Libor+170bp. It seems more likely that lenders' anticipation of refinancings is a function of the opportunity cost of lending to a PPP project i.e. the same funds could be lent to corporations at higher rates.

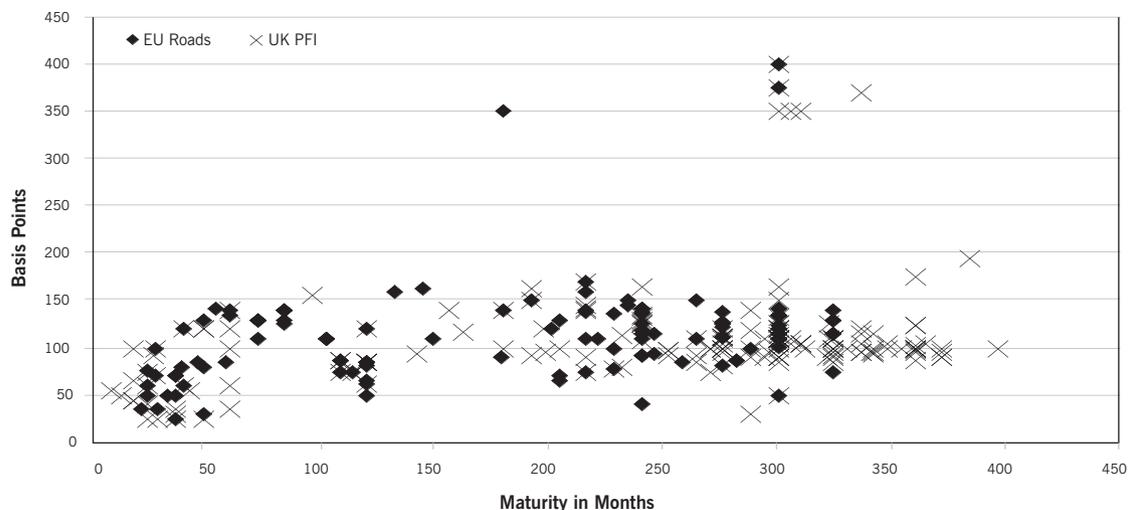
### Fees

Credit spreads are not an ideal measure of the risk premium, because loans also carry fees that can be related to creditworthiness and performance. Two types of fees are charged by

45. NAO (2000). The refinancing of the Fazakerley PFI. HC 584 Session 1999-2000. London, National Audit Office; Nicholas Timmins (2000). *A Sensible Strategy for Spectacular Returns*. *Financial Times*. London. 3 July; Oliver Morgan and Nick Mathia-

son (2001). "PFI's bounty hunters: Firms developing schools and prisons pocket millions as the 'risk' factor dwindles." *The Observer*. London. 8 July.

Figure 2 The Term Structure of PPP Loans



lenders in the syndication market: commitment fees, which are paid annually on the balance of the undrawn portion of a loan; and participation fees, which are paid upfront to banks participating in a syndicate. Commitment fees are higher for riskier borrowers because they are more likely to borrow and more likely to default.

Unfortunately, data on fees were not available for all the observations in our two samples: data on commitment fees were available for 66 tranches in the EU Road sample, and data on participation fees for 57 tranches. The corresponding figures for the UK PFI sample were 81 and 41 tranches, respectively. For the more limited samples for which we know the fees, we calculated the AIS for the first year of the loan by adding the commitment and participation fees to the initial spread. The mean (median) AIS for the EU motorway sample was 225.62 (235.17) bp for term loans. The corresponding figure for the UK PFI sample was 212.95 (215.39) bp. Again, these figures were consistent with the view that the motorway sector, which tends to carry some traffic risk, is riskier than the PPP sector in general, where fixed fees or unitary charges are often paid by the public sector on the basis of availability of service. By comparison, previous research has reported a mean AIS 238bp for classic corporate term loans extended to large U.S. companies.<sup>46</sup>

It is also noteworthy that, in our samples, both commitment and participation fees are very significantly and positively correlated with spreads. Commitment fees are also significantly and positively correlated with longer maturi-

ties. This supports the hypothesis that risk is priced jointly through spreads and fees, but also that longer loans generate higher upfront revenues for lenders.

### Term Structure

The term structure of PF loans was one of the empirical puzzles explored by previous research, with some suggesting that there might be a “hump-shaped” relationship between spread and loan maturity.<sup>47</sup> Figure 2 plots the term structure of the loans in both samples. A first look suggests that there may have been some substance to this hypothesis. However, closer examination of the data revealed that there were strong “year” and “country” effects driving the spreads of PPP loans rather than any specific term structure. For most countries in the EU Road sample, for example, longer and cheaper loans were extended towards the end of the sample period. (Spain was an exception, with spreads increasing with maturities.)<sup>48</sup> In the U.K. PFI sample, we also observed strong year effects. As noted above, this is due to the fact that perceived risk decreased for lenders as the PPP debt market became more developed, and, as shown in Figure 3, lenders gradually extended loans with lower spreads and longer maturities. Thus longer maturities appear to be associated with lower spreads on a cross-section basis, but the likely explanation is that it is simply a time effect and not evidence of a non-linear term structure. Unfortunately, our samples were too small to attempt panel data analysis. Note that this time effect could also be interpreted as the effect of the ‘credit cycle’ over the considered period.

46. Strahan. *Ibid.*

47. Sorge and Gadanecz. *Ibid.*

48. One close examination, Spain's increasing spreads for motorway projects may be

closely related to a marginally decreasing rate of traffic growth in that country during the 1990s/early 2000s.

## The Determinants of PPP Debt Spreads

Using a simple ordinary least-squared (OLS) regression, we tested the relationship between the weighted-average spread described above and a number of control variables expected to have an impact on spreads. The OLS regression results for the EU Road sample are statistically very robust.<sup>49</sup> The UK PFI results are also statistically robust, albeit slightly less so<sup>50</sup> but they provide a useful cross-sector robustness check of the road sample results. The results of the regression are reported in Table 3. The different drivers and their effect on spreads in our samples are described below. It must also be stressed that the degree of overlap between the EU Roads and the UK PFI samples is very limited since the majority of observations in the UK PFI sample are schools and hospitals.

## Classic Spread Determinants

The first group consists of the “classic” variables that are expected to drive loan spreads. The first control variable is the size of each tranche. Previous research in PF loan pricing reported either no relationship or a negative relationship between tranche size and debt pricing, which was interpreted as “economies of scale” in the relationship between loan and spreads.<sup>51</sup> With our samples however, size was not a significant driver of the cost of PPP debt, neither in the EU road sector nor in the UK PFI sector.

The second variable is the maturity of each tranche. In our EU Roads sample, maturity had a significant ( $p < 0.05$ ) positive but small impact on spreads, while in the UK PFI sample, maturity also had a significant ( $p < 0.01$ ) and very small positive impact on spreads. The remaining classic variables that we tested were the size of the banking syndicate, the risk-free rate (Libor or Euribor depending on the tranche) and project leverage (the proportion of the project’s capital expenditure financed with debt). These variables proved to have no statistically significant effect on the pricing of the tranches in our sample.

## Instrument Types

One weakness of existing studies of project finance loan pricing is their lack of control for differences in “instrument” types between tranches. For each project, a number of facilities are arranged, from term loans (lump-sum, long-term loans), to revolving credit facilities and letters of credit, as well as mezzanine debt (often called quasi-equity). Each of these instruments has its own risk profile, corresponding to

specific project risks, and features specific covenants and adequate pricing (for example, a senior term loan tends to be priced significantly below a subordinated debt facility). Because term loans are the most common type of instrument in our samples, it could be important to capture the differential effects of mezzanine or subordinated debt and short-term bridge/revolver-type facilities.

Our introduction of dummy variables for instrument types added significantly to the explanatory power of our model. In the EU Roads sample, mezzanine or subordinated debt increased average spreads by about 250bp, reflecting the higher degree of risk taken by lenders with such instruments. Short-term bridge or revolver financing was about 28bp below average spreads, reflecting the lower level of risk of bridge financing which, even in project finance deals, tends to carry corporate guarantees from the project developers. The same effects were observed in our UK PFI sample.

## Refinancings

As discussed, we would expect refinancings to carry lower credit spreads. Refinancings in project finance tend to occur several years into the operating phase, after the asset has been built, the project has acquired a track record, and substantial cash flow risk has been eliminated. In both samples, refinancings proved significantly cheaper, by 50bp in the EU Roads sample and by 20bp in the UK PFI sample.<sup>52</sup>

## Macro-Effects

Another group of variables in our regression model was intended to reflect host-country macro effects. We felt that possible macro determinants had to be taken into account in the estimation of the model using the data in the EU Road sample because this sample includes motorway projects from ten different EU countries. We began by using a set of nine dummy variables (one each for France, Germany, Greece, Hungary, Ireland, Netherlands, Norway, Portugal, and Spain) to capture systematic differential effects relative to the U.K. We also included a measure of inflation<sup>53</sup> to reflect lenders’ perceptions of inflation risk. And yet another variable was used to capture the development of the PPP market, as measured by the cumulative number of PPP projects financed in each country.

However, the addition of the nine country dummy variables did not add significantly to the explanatory power of the model for the EU Roads sample. Hence these were

49. All the specifications estimated using the EU Motorways sample satisfied conditions of homoskedasticity (White and Cook-Weisberg tests, which test the null hypothesis of homoskedasticity or constant variance) and of residuals normality (Jarque-Bera and Shapiro-Wilk tests, which test the null hypothesis of residuals normality). The coefficient of determination for the final specification was high indicating that the model explained almost 86% of the observed variation in credit spreads. Multicollinearity was diagnosed as low.

50. All the specifications estimated using the sample of UK PFI projects satisfied conditions of homoskedasticity (White and Cook-Weisberg tests), but failed to establish

residuals normality (Jarque-Bera and Shapiro-Wilk tests). The coefficient of determination for the final specification was high indicating that the model explained almost 85% of the observed variation in credit spreads. Multicollinearity was low.

51. Sorge and Gadanez. *Ibid.*

52. John C. Dell, Laurence Monnier, et al. (2004). “Refinancing Risk - Permutations of Project Finance Structures.” Fitch Ratings (Project Finance Special Report).

53. The (natural logarithm of the) inflation rate: A past-four-year average at the time of financial close is calculated to reflect lenders’ perception of inflation risk. Data: Euro-monitor International from International Monetary Fund (IMF), International Financial Statistics and World Economic Outlook/UN/ national statistics.

Table 3 **Regression Results**

EU Motorways Sample		UK PFI Sample	
Variable	Estimated coefficient	Variable	Estimated coefficient
Constant	78.32*** (14.642)	Constant	103.78*** (22.218)
<b>Control variables</b>		<b>Control variables</b>	
Tranche Size	0.00672 (0.0123)	Tranche Size	- 0.0143 (0.0245)
Maturity	0.0544* (0.0241)	Maturity	0.0582*** (0.023)
Syndicate Size	- 0.102 (1.260)	Syndicate Size	0.023 (0.401)
Project Leverage	- 15.92 (14.59)	Project Leverage	- 0.496 (7.667)
Risk-Free Rate	1.496 (1.357)	Risk-Free Rate	- 1.705 (1.827)
Mezzanine	250.68*** (12.81)	Mezzanine	247.23*** (9.79)
Short term/Revolver	- 27.69*** (6.57)	Short term/Revolver	- 38.23*** (7.00)
Refinancing	- 49.92*** (7.58)	Refinancing	- 19.87*** (5.32)
<b>Host Country factors</b>		<b>Host country factors</b>	
Not significant		Inflation	- 7.04 (21.73)
		Market Development	- 0.235*** (0.089)
<b>Construction Risk</b>		<b>Construction Risk</b>	
CAPEX	0.0154*** (0.0060)	CAPEX	4.168* (2.585)
Bridge	4.10 (8.92)	<b>Sector Dummies</b>	
Tunnel	- 18.01 (13.84)	Not significant	
<b>Revenue Risk</b>		<b>Revenue Risk</b>	
Real Toll	41.19*** (7.53)	Real Toll	12.66* (7.26)
Shadow Toll	33.65*** (7.20)	Shadow Toll	9.28* (5.53)
Traffic Growth	- 5.44*** (1.30)		
Transport Price Index			0.0498 (0.0715)
<b>Sample size</b>		<b>Sample size</b>	
	<b>125</b>		<b>177</b>
Adjusted R <sup>2</sup>	0.8596	Adjusted R <sup>2</sup>	0.8495
White Test†	109.957 (0.1563)	White Test†	103.9191 (0.1674)
Cook-Weisberg Test†	0.00 (0.9813)	Cook-Weisberg Test†	2.32 (.1278)
Jarque-Bera Test†	1.20 (0.5477)	Jarque-Bera Test†	18.13 (0.001)
Shapiro-Wilk Test†	0.721 (0.23536)	Shapiro-Wilk Test†	4.769 (0.000)

Notes: (1) The dependent variable in each regression is the weighted average spread (SPREAD).

(2) Standard errors are given in brackets.

(3) \*\*\* denotes that the coefficient is significant at the 1% level; \*\* at the 5% level; and \* at the 10% level.

(4) † p-value in parenthesis.

excluded from the final specification. So too the perception of inflation risk, likely due to the fact that tolls tend to be inflation-indexed and the future costs of road maintenance to be passed on contractually. Finally the PPP market development variable was not found to be significant, possibly due to the small numbers of PPP roads in each individual country.

By contrast, this variable was highly significant in the U.K. PFI sample, where hundreds of PPP projects have been financed, confirming the expectation that lenders' perceived risk decreased as the PPP debt market matured in the U.K.

At the same time, inflation risk did not affect the cost of debt in the U.K. sample, a result consistent with the practice of inflation-indexing unitary charges, the fixed fees paid by the public sector to the project company.

To control for the potential effect of the credit cycle, we also introduced year dummies in the model (excluding the PPP Market development variable to avoid multicollinearity problems). Year dummies proved to be insignificant, suggesting that the credit cycle is not an important driver of the cost of debt in our samples.

## Construction Risk

The third group of variables was related to construction risk. As noted earlier, debt markets should not demand additional compensation for risks that are credibly managed through the project company's contractual structure. Regarding the EU Roads sample, two undertakings that introduce major risk into road projects are the construction of bridges and tunnels. Previous research has reported that projects are essentially bridges or tunnels have historically experienced much greater cost overruns and delay problems than other road projects.<sup>54</sup> Such risks, if not mitigated, could affect the financial viability of projects and increase the probability of default. We included two dummy variables to capture the potentially higher construction risk of such projects. We also added a variable to control for the overall size of the project (capex), based on the premise that larger projects are more complex and may exhibit a marginally increasing degree of construction risk.

In the EU Roads sample, the overall size of the project did have a small significant impact on spreads. But, as predicted, the tunnel and bridge dummy variables were not significant. Thus, although projects involving bridges and tunnels feature higher construction risk than other roads, they do not face a higher cost of debt *ceteris paribus* because the construction risk is supposed to be managed contractually by the project company.

To test for construction risk in the U.K. PFI sample, we included a set of seven sector dummies in the estimation of the model. But the addition of these sector dummy variables did not add significantly to the explanatory power of the model, which is also consistent with the hypothesis that construction risks are mitigated by project companies. And these variables were accordingly excluded from the final specification shown in Table 3.

## Revenue Risk

The fourth group of variables was related to project revenue risk. As discussed above, one of the pivotal characteristics of project finance deals is the predictability of long-term cash flows, which drives the probability of default. For the EU Road sample, we included two macroeconomic and two project-specific variables. The first macro variable relates to the rate of traffic growth.<sup>55</sup> Failure to meet traffic projections has been a major risk and the main source of financial distress in

European toll road projects.<sup>56</sup> The second variable was a transport price index,<sup>57</sup> which reflects each country's willingness to pay for the use of toll roads and bridges. The two project-specific variables are two dummies capturing differences in toll types. Revenues collected by actual tolls are the riskiest, those by "shadow" tolls are less risky, and those by "availability payments" are the least risky.<sup>58</sup>

The addition of these four variables added very significantly to the power of the model. Higher compounded rates of past traffic growth, reflecting higher confidence by lenders that traffic projections will be met, decreased spreads by 5bp for each percentage point of past annualized traffic growth. Motorway projects that involved collection of tolls from users tended to have spreads that were 41bp above average, while projects that collected shadow tolls (paid by the government on the basis of traffic) had spreads that were 34bp above average. However, higher transport price index scores, which reflect a country's ability/willingness to pay for toll roads or bridges, did not seem to affect lenders' risk perception. Likewise, in the U.K. PFI sample, projects collecting real tolls (mainly urban rail projects) and shadow tolls (mainly road projects) had significantly higher spreads than those where revenues were collected through availability payments.

## Do Banks Price Risks in PPPs?

To interpret these results, it is useful to recall what an OLS regression actually shows. The regression results provided us with a model that predicts the *average* spread in a representative sample given a number of control variables. Thus, while loans to individual projects might exhibit very different characteristics for reasons inherent in the project, the average effect, at the portfolio level, is that described by the model.

Our main finding is that debt markets *do* appear to price project risks that are not contractually diversified in PPPs, but not those risks that are contractually allocated, even when they are significant. We also found the risk premiums to be consistent with our perception of the size of the risks faced. For example, our results show that toll roads have a higher cost of debt than shadow toll roads, and toll road projects in general are cheaper to finance in countries with historically high rates of traffic. In the U.K., where the largest number of PPP projects has been signed, increased lender confidence in PPPs has also driven down the cost of debt.

Does this mean that banks are *completely* rational in

54. Bent Flyvbjerg, Nils Bruzelius, et al. (2003). *MegaProjects & Risk: An Anatomy of Ambition*. Cambridge, Cambridge University Press.

55. Traffic Growth: A past-three-year compounded growth rate is calculated at the time of financial close to reflect lenders' perception of traffic risk. Data: Car traffic volume: Euromonitor International from International Road Federation/national statistics (The volume of car traffic in any one year, measured in number of kilometres driven by the total number of cars.)

56. Flyvbjerg, Bruzelius, et al. *Ibid.* See also Robert Bain (2004). *Traffic Forecasting Risk: Study Update 2004*. London, Standard & Poor's.

57. Transport Price Index: The index is based on 1995=100 and is meant to reflect lenders' perception of ability and willingness to pay for transport services in the host country. Data: Index of transport prices from National statistical offices/ OECD/ Eurostat/ Euromonitor International.

58. "Real Tolls" involve direct collection of tolls from users. "Shadow Tolls" are paid by the public sector on the basis of actual traffic and priced by "traffic band"; such bands are structured to cover different types of expenditures, from maintenance to debt service and dividends. "Availability Payment" schemes are not linked to traffic levels but solely to operator performance. Each case represents a different degree of control of future revenues by the private investor-operator, and thus a different degree of revenue risk.

pricing risk in PPPs? Not necessarily: The banks could still be getting the size of the premiums wrong by an order of magnitude (and we cannot determine this without access to *ex post* data). What we can say, however, is that the current pricing of PPP debt appears to make sense. Our results provide credible statistical evidence that the pricing of a representative portfolio of loans to PPP projects appears to provide lenders with compensation for systematic risks (e.g. traffic), which can be eliminated through diversification, but none for idiosyncratic risk however significant (e.g. construction). Our findings also show that the returns to lenders in PPP and PF transactions derive not only from the spreads on long-term senior loans, but also from fees and returns on subordinated debt (including mezzanine).

Finally, our results and analysis of risk help explain why maturity, which is a major systematic driver of the cost of debt in standard corporate finance, has only a marginal linear effect on spreads in PPPs.<sup>59</sup> As discussed earlier, the information advantage of banks in PF lending means that the difference between systematic and idiosyncratic risks can be attributed in significant part to lender's risk minimization and management efforts when working to close a transaction.

In a portfolio of standard corporate debt, the risk associated with longer maturities can never be fully diversified since, to some extent, future market conditions are uncertain for all borrowers. The greater uncertainty that attends a portfolio of corporate debt with longer maturities contains at least some systematic risk that in turn makes maturity a positive driver of the average spread. By contrast, a portfolio of project finance loans effectively eliminates most of this source of systematic risk by virtue of credit enhancement and other structuring devices that reduce lender exposure by altering borrowers' risk profiles over time. By so doing, PPP financing may well achieve what amounts to a complete diversification of longer maturities.

To the extent it proves to be true, this hypothesis would help understand the value that lenders bring to PF transactions and why project finance seems less risky than lending to corporates. In other words, in project finance transactions, what is usually systematic risk becomes idiosyncratic. This is why maturities do not drive average spreads in PPP and PF lending. The same reasoning can be applied to the tranche size variable: tranche size typically is a driver of the cost of debt for corporate loans<sup>60</sup> but not in project finance. Lending larger amounts for longer periods of time does not,

on average, increase the cost of debt in a portfolio of project finance/PPP loans.

It is sometimes suggested that banks lend to projects on a project-by-project basis without necessarily taking a portfolio-wide view and that many banks take the classic position of "originate and hold."<sup>61</sup> Our results clearly show that this does not have to be the case. As our findings suggest, a bank holding the significant and balanced portfolio of PPP debt in either of our samples would be exposed to systematic risk only and would price according to our model.

### Conclusion: Project Finance as Corporate Governance

The design of project finance and PPP deals reflects, and in turn can be used to shed light on, much of what we know about corporate finance. In conventional corporate lending, the borrower typically specifies the amount of debt it is seeking, and its creditworthiness becomes the main determinant of loan spreads. By contrast, when a project finance package is arranged by lenders, all dimensions of a loan contract, including leverage, are "variables" subject to negotiation between borrower and lender. In project finance, the goal is to come up with the most efficient mix of maturities, spreads, leverage, and other contractual provisions to manage what lenders perceive to be the project's revenue risk and the probability of default on the debt.

Thus a potentially interesting way of answering the question "what value do banks bring to project finance/PPP's?" is to think of project finance as a specific form of corporate governance and risk management. In a PPP, leverage is typically high enough that banks effectively "own" (or have claims on) the majority of the firm (or SPV) for most of the project's life. The debt providers in such deals thus exert considerable control and share significant responsibility alongside equity investors for making the project work: the cost of senior and subordinated debt *plus* fees is their reward for lending and actively managing risk.

Consistent with this argument—and contrary to the conventional wisdom—we present new research that shows that, at the portfolio level, PPP lenders appear to price only "systematic" risks while managing other risks at the project level through contracts and project design. The cost of PPP debt is thus determined only by systematic risks, such as future market demand for a service, while PF structures effectively shift or diversify most project-level, idiosyncratic risks,

59. We introduced the variable log (spread) in the regression to test for a non-linear but it failed to reach statistical significance. The term structure of PPP loans is not non-linear because a) we control for instrument types: the relationship between spread and maturity is different for bridge loans, standby facilities and term loans or mezzanine loans. Each of these instruments has different average maturities with term loans and mezzanine (quasi-equity) exhibiting the longest average maturities. The "hump" that previous authors reported may be the product of this discrepancy between instrument types i.e. the long term cheaper loans are different kinds of tranches than the shorter term more expensive ones; b) time is driving spreads down and maturities up: While all

current analyses of project finance credit spreads are cross-sectional, the present one included, there are strong time effects affecting loan spreads. This time effect may be mistaken for a non-linear relationship between maturities and spreads if examined on a cross-sectional basis.

60. Strahan, *Ibid.*

61. Rahim Inoussa and Peter Stockman (2004). "An Active or 'Structured' Approach to Managing Energy Project Finance Loan Portfolios." *Journal of Structured Finance* 75 (Summer).

such as the risk of construction cost overruns or delays.

Based on these findings, we suggest that project finance should be viewed as a highly developed and customized form of corporate governance—one in which the main investors are regulated financial institutions with control rights that are akin to those of equity investors, but with a fixed upside and perhaps greater aversion for systematic or “unspecified” risks.

Finally, our findings are also inconsistent with the popular perception that the public sector effectively guarantees risky PPP debt. While the public sector may arguably

remain the *ultimate* underwriter of public services, there is effective transfer and pricing of unallocated project risks in PPPs.

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