The paper was finally published in the Journal of Applied Corporate Finance 13(1), Spring 2000, p. 75-87.

ARE PROJECT FINANCE LOANS DIFFERENT FROM OTHER SYNDICATED CREDITS?

*by Stefanie Kleimeier, Maastricht University, and William L. Megginson, University of Oklahoma**

During the past two decades, an important new method of financing large-scale, high-risk domestic and international business ventures has emerged. This technology, called project finance, is usually defined as limited or non-recourse financing of a newly to be developed project through the establishment of a (separately incorporated) vehicle company. Thus the distinguishing features of project finance (PF) are, first, that creditors share much of the venture's business risk and, second, that funding is obtained strictly for the project itself without the expectation that the corporate or government sponsor will co-insure the project's debt—or at least not fully.

Project finance was first used on a large scale to develop the North Sea oil fields during the 1970s, where the scale and risk of the investment required far exceeded the capabilities of any single petroleum company, or even any single consortium of companies.[1] Following the success of the North Sea developments, PF has been used extensively to develop natural resource, electric power, transportation, and

*This paper draws heavily on a manuscript presented at the 1999 Harvard Business School/Journal of Financial Economics Conference on Field-Based Research, and we appreciate the comments received from conference participants—especially Steve Kaplan and Paul Gompers. We also thank Ben Esty, Chris Cornwell, Michel Habib, Jimmy Hilliard, Larry Lang, Carlos Maquieira, John Martin, Ashoka Mody, Mitch Petersen, Annette Poulsen, David Schirm, Bill Schwert, Joe Sinkey, and Art Snow for helpful comments and suggestions. Finally, we are especially grateful for the financial support of the University of Oklahoma's Michael F. Price College of Business, which allowed us to purchase the *Loanware* database used in this study.

1. If project finance is defined more generally as limited recourse financing of stand-alone projects, Kensinger and Martin quite rightly point out that this financing technique predates stocks or bonds by several centuries. The "modern" form of PF—using a separately-incorporated vehicle company (governed by British or U.S. commercial law), syndicated loan financing, and sophisticated contractual allocation of project risks and responsibilities—is, however, a much more recent invention. See J. Kensinger and J.D. Martin, "Project finance: Raising Money the Old-Fashioned Way," *Journal of Applied Corporate Finance,* Vol. 1 (1988), 69-81. The Petrozuata project is described in B. Esty and M.M. Millett, *Petrolera Zuata, Petrozuata C.A.*, Harvard case number 299012 (Harvard Business School Press, 1998).

numerous other ventures around the world. PF has been associated with many financial and operating success stories. These include the Teeside Power project in the UK, the Ras Laffan LNG project in Qatar, the Hopewell Partners Guangzhou Highway in southern China, and the Petrozuata heavy oil project in Venezuela, as well as numerous independent power generation projects in the United States. However, PF is most closely associated in the public mind with three spectacular recent financial failures—the Channel Tunnel (Eurotunnel), the EuroDisney theme park outside of Paris, and the Dabhol power project in India. In spite of these failures, total PF lending worldwide has exceeded $36 billion every year since 1989, and reached a peak of $85 billion in 1997 before dropping back to $54 billion during 1998's global economic turmoil.

Three excellent studies of project finance have been published in recent years.[2] The authors of these studies assert that PF will most commonly be used for capital-intensive projects with relatively transparent cash flows, in riskier-than-average countries, using relatively long-term financing, and employing far more detailed loan covenants than conventionally-financed projects. One of the three studies—by Brealey, Cooper, and Habib—also stresses that one of the key comparative advantages of project finance is that it allows the allocation of specific project risks (such as completion and operating risk, revenue and price risk, and the risk of political interference or expropriation) to those parties best able to manage them. To our knowledge, however, no full-scale empirical study of project finance has yet been published.[3] This paper seeks to remedy this empirical gap, and has two principal objectives. The first is *descriptive*. Using a comprehensive sample of over 90,000 syndicated loans (worth over $13 trillion) booked on international capital markets since 1980, we compare the financial characteristics and geographic and industrial distributions of 4,956 PF loans with various non-PF loan sub-samples and with the full sample of all syndicated loans. Second, we perform statistical (OLS regression) analyses of the determinants of loan pricing (spreads) for PF and non-PF loans to determine how borrower and loan-specific factors influence credit spreads.

THE LOANWARE DATABASE

The principal data source used in this study is the *Loanware* database provided by Capital DATA, a London-based joint venture company between Euromoney plc and Computasoft Ltd. This database contains detailed historical information on virtually the entire population of syndicated loans and related banking instruments booked on national and international capital markets from January 1, 1980 through March 23, 1999. While the file contains information on both signed and unsigned loans, we examine only loans that are actually agreed to by the contracting parties (signed loans), though we do include the roughly one-eighth of all loans that are subsequently canceled. We also require that the loan size (in $US millions) be available. After applying these two screens, we are able to examine a total of 90,784 loans (worth $13.2 trillion), of which 4,956 loans (worth $634.4 billion) have a loan purpose code of Project Finance. We verify with Capital DATA that this screen refers to loans made to a vehicle company, so we refer to this as our "full project finance loan sample," while we call the larger dataset our "all syndicated loan sample."

The Industrial and Geographic Distribution of Project Finance Loans

The full project finance and all syndicated loan samples are described in Tables 1 and 2. Table 1 presents the industrial distribution of the full sample of all loans and the project finance sample, while Table 2 presents the geographic distribution of both loan samples. Both tables reveal striking differences between project finance lending and more traditional syndicated lending, and these differences largely verify the standard picture of project finance. Table 1 shows that PF loans are highly concentrated in five key industries, whereas the general population of syndicated loans reveals a far less concentrated industrial pattern. No less than 60.2 percent of all project lending (by value) and 46.3 percent of all PF loans are made to borrowers in the communications, mining and natural resources, oil and gas, electricity and energy utility, and transportation

2. See R.A. Brealey, I.A. Cooper, and M.A. Habib, "Using Project Finance to Fund Infrastructure Investments," *Journal of Applied Corporate Finance,* Vol. 9 (1996), 25-38, R.C. Smith and I. Walter, *Global Financial Services*, (Harper Business, New York, 1990), 191-281, and the Kensinger and Martin article cited above.

3. Apart from our own previous study comparing PF in Asia with that in the West See S. Kleimeier and W.L. Megginson, "A Comparison of Project Finance in Asia and the West" in *Project Finance in Asia: A Redefining of Premises*, L.H.G. Lang, ed. (North Holland Publishing, Amsterdam, 1998) 57-90.

TABLE 1 ■ INDUSTRIAL DISTRIBUTION OF PROJECT FINANCE AND ALL SYNDICATED LOANS

Industrial Category of Borrower	Project Finance Loans			All Syndicated Loans		
	Number of Loans	Total Value of Loans US$ Million	Percent of Total Value	Number of Loans	Total Value of Loans US$ Million	Percent of Total Value
Commercial & Industrial	3,136	$386,862	61.0	59,612	$8,391,648	63.1
Chemicals, Plastic & Rubber	105	8,891	1.4	2,340	321,100	2.4
Communications	241	51,126	8.1	2,237	510,242	3.8
Construction/Heavy Engineer	222	15,477	2.4	1,434	75,751	0.6
Forest Products/Packaging	135	15,219	2.4	1,988	299,979	2.3
Hotels & Leisure	298	20,628	3.3	1,992	255,184	1.9
Mining & Natural Resources	300	28,030	4.4	1,452	191,219	1.4
Motorway Operator	117	14,642	2.3	342	28,636	0.2
Oil & Gas	631	119,513	18.8	6,061	1,165,320	8.8
Petrochemicals	147	24,975	3.9	470	89,359	0.7
Steel & Aluminum	215	23,488	3.7	2,098	199,275	1.5
Utilities	1,063	$140,609	22.2	4,644	$808,306	6.1
Electricity/Energy Utility	1,009	136,520	21.5	3,942	714,073	5.4
Financial Institutions	167	$21,828	3.4	14,051	$2,461,411	18.5
Transportation	143	$48,677	7.7	5,781	711,028	5.4
Transport (ex. Airlines, Ship)	112	46,788	7.4	1,870	319,180	2.4
Government/Agencies	399	$30,602	4.8	3,979	674,869	5.1
Government/Authority	302	23,333	3.7	2,463	488,359	3.7
Other	48	$5,844	0.9	2,716	251,211	1.9
Total, All Items	4,956	$634,422	100.0	90,783	$13,298,457	100.0

(excluding airlines and shipping) industries. These industries account for only 21.8 percent of all syndicated lending (value) and a mere 17.1 percent of all syndicated loans. This finding is consistent with the received wisdom that project finance is used primarily to fund tangible-asset-rich and capital intensive projects with relatively transparent (often hard-currency) cash flows. This conclusion is reinforced by the observation that all of the other "over-represented" industries for PF lending (i.e., construction/heavy engineering, hotels and leisure, petrochemicals) can be described similarly.

Table 2 also presents a revealing difference between the countries which attract PF lending and those where other types of syndicated credits are directed. Whereas the vast bulk of general syndicated lending is concentrated in the United States (61.4 percent by value and 56.6 percent of all loans), only 16.8 percent of PF lending and only 14.7 percent of PF loans go to U.S. borrowers. The biggest recipient of PF lending is southeast Asia. This region accounts for 23.8 percent of the total value—and no less than 30.3 percent of the total number—of project finance loans, whereas it accounts for a mere 5.2 percent of the value (and 10.8 percent of the number) of all syndicated lending. Closer analysis reveals that PF lending to southeast Asia peaked in 1996, and has fallen dramatically since then, but this region was the heart and soul of PF lending for almost a decade prior to that date—with Indonesia and China being the two favorite target countries. Intriguingly, U.K. borrowers are more heavily represented in the PF sample than in the full syndicated loan sample (14.5 percent by value versus 9.3 percent), although the rest of western Europe accounts for an almost identical fraction (10.3 versus 10.4 percent) of both types of lending. This preference of project finance lenders for British borrowers is not merely an artifact of the disproportionately large Eurotunnel loans (discussed below). It also reflects the emphasis placed by the Conservative Thatcher and Major governments (and now the Labor government of Tony Blair) on the private rather than public financing of large infrastructure

TABLE 2 ■ GEOGRAPHIC DISTRIBUTION OF PROJECT FINANCE AND ALL SYNDICATED LOANS

Geographic Location of Borrower	Project Finance Loans			All Syndicated Loans		
	Number of Loans	Total Value of Loans US$ Million	Percent of Total Value	Number of Loans	Total Value of Loans US$ Million	Percent of Total Value
Supranational	5	$848	0.1	313	$31,896	0.2
North America	850	$126,155	19.9	53,694	$8,623,762	64.9
United States	727	106,561	16.8	51,401	8,169,735	61.4
Western Europe	673	$157,223	24.8	15,173	$2,613,371	19.7
United Kingdom	306	91,751	14.5	6,109	1,230,149	9.3
Eastern Europe	276	$22,046	3.5	1,623	$156,291	1.2
Middle East	501	$59,286	9.3	2,094	$217,619	1.6
Turkey	198	14,468	2.3	813	54,808	0.4
Africa	196	$12,563	2.0	930	$60,549	0.5
Indian Sub Continent	157	$11,729	1.9	967	$58,459	0.4
South East Asia	1,503	$151,004	23.8	9,780	$688,046	5.2
China	450	29,810	4.7	1,467	89,719	0.7
Hong Kong	134	21,689	3.4	1,553	147,766	1.1
Indonesia	260	33,210	5.2	1,392	91,912	0.7
South Korea	120	8,015	1.3	1,662	85,332	0.6
Malaysia	139	17,477	2.8	841	64,965	0.5
Thailand	154	17,748	2.8	1,128	64,867	0.5
Australia & Pacific	246	$37,500	5.9	2,266	$395,197	3.0
Australia	227	36,221	5.7	1,853	349,251	2.6
Latin America	496	$52,342	8.3	3,303	$370,542	2.8
Caribbean	52	$3,646	0.6	596	$78,816	0.6
Other	1	$79	0.01	44	$3,920	0.03
Total, All Items	4,956	$634,422	100.0	90,783	$13,298,457	100.0

projects—many of which have proven to be remarkably successful, both financially and operationally. As a whole, these geographic lending patterns are consistent with the widely held belief that project finance is a particularly appropriate method of funding projects in relatively risky (non-OECD) countries.

Characteristics of the Largest Project Finance Deals

Table 3 presents key details of the 15 largest project finance loan packages arranged since 1980. These are listed by the total value of the project, since some packages have as many as four separate loan tranches—which are listed separately, with their corresponding financial information, within each project's cell in the table. There are a total of 34 loans associated with these 15 project finance packages. The infamous Eurotunnel project has the distinction of being both the largest and second largest project financing in history, though the $13.2 billion loan in June 1990 was only a refinancing of the original $7.9 billion loan package arranged in August 1987. These 15 deals reveal many of the key features commonly associated with project finance. Project sponsors are usually well known international operating companies, state-owned enterprises, and/or governmental bodies that are joined together through ownership of the vehicle company and by the supplemental project financing contractual agreements. Further, the loans themselves tend to be relatively long-term credits, and are priced at a fixed spread above a benchmark interest rate, typically the London Inter-Bank Offered Rate (LIBOR). Another distinctive feature of these loans is that they frequently include a loan tranche that is fully or partially guaranteed by a creditworthy third party, usually a developed country's export credit agency (though the World

TABLE 3 ■ FINANCIAL DETAILS OF THE TWENTY-FIVE LARGEST PROJECT FINANCE DEALS SINCE 1980

Loan(s) Launch Date	Loan(s) Size/$US M	Borrower Name(s)	Project Location	Loan Term (Years)	Spread over LIBOR, Basis Points	Third Party Guarantee
Sponsor Names			**Loan Purpose**			
Jun 90	$13,204	Eurotunnel plc/SA; Eurotunnel Ltd; Eurotunnel Finance SA	UK/France	20 yrs	175.0 bp	None
——			Refinancing & increased funding for cross-channel tunnel link			
Aug 87	$6,319	Eurotunnel plc/SA	UK/France	18 yrs	108.3 bp	None
(canc 90)	$1,580			18 yrs	141.7 bp	
——			Original Eurotunnel financing			
Mar 93	$5,530	Formosa Plastics Corp. USA; Nan Ya Plastics Cor.p; Formosa Chemicals & Fibre; Formosa Pharmaceuticals	Taiwan	15 yrs	75.0 bp	——
——			Construct petro-chemical project and port complex in Yunlin province. Largest Taiwanese syndicated loan.			
Feb 93	$1,995	Qatar Liquified Gas Co. Ltd.	Qatar	12 yrs.	——	MITI
	$1,600			——	——	——
	$300			9 yrs.	70.0 bp	COFACE
	$170			9 yrs	165.0 bp	——
	$100			9 yrs.	——	——
Qatar General Petroleum; Marubeni; Mitsui; Mobil Corp.; TOTAL		LNG project in Qatar.	Develop $6 bn North Field Ras Laffan.			
Nov 95	$2,598	Railtrack plc	UK	5.5 yrs	27.5 bp	
	$1,102			5.5 yrs	27.5 bp	——
——			General corporate purposes and construct Thameslink 2000 project.			
Jan 98	$1,500	NEXTEL Communications	USA	8 yrs	200.0 bp	——
	$1,195			——	——	
	$500			8 yrs	200.0 bp	
——			To build firm's nationwide digital mobile radio network and working capital.			
Sep 97	$2,168	Hutchison Telecommunication;	UK	8 yrs	100.0 bp	——
	$642	Orange plc		8 yrs	100.0 bp	
——			Refinancing of earlier project financing.			
Jan 97	$2,734	Bouygues Telecom	France	10 yrs	130.0 bp	——
Bouygues Decaux Telecom; Bouygues SA; Cable & Wireless; US West; Faber; BNP-Banexi			Nationwide rollout of borrower's mobile phone franchise.			
Jul 96	$1,281	Athens International Airport	Greece	——	——	HERMES
	$1,036			——	——	
	$403			——	——	
——			Construction of new Athens airport.			
Aug 97	$1,363	Alliance Pipeline LP	Canada	10 yrs	120.0 bp	——
	$1,223			10 yrs	120.0 bp	
IPL Energy Inc; Westcoast Energy Inc.			Construct pipeline to carry natural gas from British Columbia to Chicago hub.			
Jan 97	$2,500	Rossijkoje A/O Gazprom	Russia	8 yrs	200.0 bp	——
——			Construct pipeline linking Yamal gas fields with Europe.			
Mar 92	$770	Castle Peak Power Co. Ltd.	Hong Kong	20 yrs	62.5 bp	ECGD
	$690			13.1 yrs	53.9 bp	——
	$500			20 yrs	75.0 bp	COFACE
	$482			20 yrs	——	US EXIM
China Light & Power (CLP Power); Exxon Corp.			Construct Black Point Power Station at Castle Peak in Hong Kong.			
Nov 93	$1,700	Republic of Korea; Seoul-Pusan	Korea	17.5 yrs	75.0 bp	COFACE
	$720	High-Speed Rail		15 yrs	56.0 bp	——
——			Purchase TGV trains for Seoul-Pusan rail link.			
May 97	$1,200	Loy Yang Power Projects Pty Ltd	Australia	15 yrs	——	——
	$581			10 yrs	——	
	$387			6 yrs	——	
	$232			——	——	
CMS Generation Co; NRG Energy Inc			Purchase of Loy Yang Power Station, coal mine & other assets from Loy Yang, wholly-owned by state of Victoria.			
Jun 90	$2,324	Midland Cogeneration Venture LP	USA	25 yrs	——	——
CMS Energy; Dow Chem.; Fluor; Panhandle Eastrn.; Coastal Corp.			Construct 1,370 MW cogeneration facility in Midland, MI.			

Bank is a frequent guarantor of smaller PF loans in this database).

Perhaps the most telling difference between the large PF loans detailed in Table 3 and more traditional syndicated credits is the use to which they are put. Whereas most non-PF loans are arranged to finance acquisitions or LBOs, to refinance existing financing facilities, or for general corporate purposes, all of the large PF loan packages are associated with specific construction projects—though two are refinancing of earlier credits. Among the 15 PF loans, we find—parallel to Table 1—that the main applications of PF is in communication, transportation, and power. Once again, the received wisdom regarding project finance rings true: at least the largest such loan packages are complex, international financial deals involving a vehicle company owned by multiple sponsors, and are arranged to fund development of large, tangible-asset-based projects. The loans are often guaranteed by third parties (though the entire package rarely is—only individual loan tranches), and the projects are often located in relatively risky countries. We now turn to a direct comparison of PF loans with various subsamples of non-PF loans, categorized by their intended use.

CHARACTERISTICS OF PROJECT FINANCE VERSUS NON-PROJECT FINANCE LOANS

Panel A of **Table 4** presents basic financial characteristics for the full sample of all syndicated loans, the full sample of PF loans, and four additional, non-overlapping samples of syndicated loans classified by loan purpose. The category of *corporate control (CC) loans* are arranged to fund acquisitions, leveraged buyouts, or employee stock option plans. *Capital structure (CS) loans* are those booked in order to repay maturing lines of credit or for recapitalizations, share repurchases, debtor in possession financing, standby commercial paper support, or other (unspecified) refinancing. *Fixed asset based (FAB) loans* are intended for mortgage lending or to fund purchases of aircraft, property, or shipping. The *general corporate purpose (GCP) loans* category includes loans with that as their stated purpose, as well as credits with an empty loan purpose code. Loans with other purposes are not grouped here into a separate category, though they are included in the full sample of syndicated loans.[4] This categorization strategy, though admittedly ad hoc, effectively groups together loans having similar corporate purposes and provides a manageable set of loan type samples that can be directly compared to each other.

Panel A of Table 4 reveals striking—and highly significant—differences both between PF and non-PF loans, as well as between the various categories of non-PF loans. One of the most dramatic findings is how much larger are CC and CS loans than other loan types. These credits have mean (median) values of $212 million ($59 million) and $209 million ($65 million), respectively, as compared to $146 million ($50 million) for the full population of all syndicated loans and a "mere" $88 million ($50 million) for FAB loans. The converse of this result is the surprising finding that PF loans are, on average, $18 million *smaller* than the general population of syndicated loans ($128 million versus $146 million), though the median PF loan size is $2 million greater ($52 million versus $50 million). These relative size differences remain even when size is expressed as the total value of all loan tranches rather than as individual loans. While the size difference between PF and CC loans can *perhaps* be explained away by stressing that the latter involves purchasing an entire company, the fact remains that PF loans are not abnormally large financing vehicles—but rather fall well within the mainstream of syndicated lending.

According to all four of the remaining variables in Table 4's Panel A, however, PF loans are substantially different financial instruments. The average maturity of PF loans, 8.6 years, is almost twice that of the full population of syndicated loans, and is comparable only to the 8.1 year average of FAB loans. Additionally, compared to the overall sample of syndicated loans and most of the sub-samples, PF loans are more than twice as likely to be fixed rate credits (13.9 percent versus 5.9 percent). Further, those PF loans that are priced as a floating rate use LIBOR as a pricing base far less frequently (38.8 percent) than the full syndicated loan sample (69.5 percent).[5] Perhaps the single most

4. We also grouped these credits into an "Other loans" sample, and subjected these to the same basic tests as the five principal categories. This sample was very similar to our GCP loans sample in general characteristics, so we do not report these tests here in the interests of space. These results are available upon request.

5. After LIBOR, the next most common bases for pricing project finance loans are the Singapore and Hong Kong Inter-Bank Offered Rates (SIBOR and HIBOR), with 118 and 82 loans, respectively. A surprisingly large number of 1,830 PF loans list a spread, in basis points (thus confirming they are floating rate credits), but do not specify the base against which the loan is priced. Running our main analyses with these classified as LIBOR-based loans yields qualitatively similar results.

TABLE 4 ■ CHARACTERISTICS OF PROJECT FINANCE VERSUS OTHER SYNDICATED LOAN SAMPLES*

Variable of Interest	All Syndicated Loans	Project Finance Loans	Corporate Control Loans	General Corporate Purpose Loans	Capital Structure Loans	Fixed Asset Based Loans
PANEL A: ALL LOANS WITH $US AMOUNT AVAILABLE						
Number of Loans	90,784	4,956	10,795	39,653	25,313	4,680
Total Volume, $USm	13,229,278	634,422	2,292,431	4,275,803	5,289,793	410,175
Loan Size, $USm: avg	146	128	212	108	209	88
Median	50	52	59	39	65	50
Minimum	0.003	0.011	0.067	0.003	0.012	0.050
Maximum	15,000	13,204	14,000	7,737	15,000	4,330
Average Maturity, Years	4.8	8.6	5.1	4.5	3.9	8.1
Loans with Fixed Price (%)	5.9	13.9	2.7	4.9	3.9	6.2
Loans Priced vs LIBOR (%)	69.5	38.8	84.6	66.2	70.8	72.5
Loans to US Borrowers (%)	55.8	13.9	68.8	50.3	74.0	20.4
PANEL B: HIGH-INFORMATION LOANS WITH SPREADS VERSUS LIBOR						
Number of Loans*	40,073	1,824	6,266	15,617	13,464	1,468
Total Volume, $USm *	8,120,791	322,870	1,709,683	2,038,268	3,759,693	130,824
Loan Size, $USm: avg	203	177	273	131	279	109
Median*	70	70	85	50	100	60
Average Number of Tranches	1.7	2.0	2.4	1.4	1.7	1.5
Avg Spread over LIBOR, bp	134	130	195	113	135	86
Average Maturity, Years	4.8	8.6	5.2	4.6	4.1	7.7
Avg No. of Syndicate Banks	10.7	14.5	11.9	9.4	11.5	9.6
Average Fee Levels, bp						
Initial Commitment Fee	30.8	36.9	39.5	28.0	30.8	20.2
Max Participation Fee	36.9	56.3	56.1#	30.7	31.6	37.2
Loans in US Dollars (%)	86.8	77.7	84.5	85.6	90.6	78.9#
Loans to US Borrowers (%)	56.9	11.6	76.8	44.3	74.3	13.4#
Loans with Currency Risk (%)	33.1	72.9	10.5	45.3	18.2	71.0#
Loans with Covenants (%)	30.5	3.4	41.6	21.3	42.4	7.1
Average Country Risk Score*	90.0	74.6	95.4	87.3	94.1	82.7
Average Country Risk Rank	12.8	31.8	5.2	16.3	7.4	21.3
Loans with Guarantees (%)	13.3	34.1	6.8	14.3	9.9	34.5#
Loans to Collateralizeable Asset-rich Borrowers (%)	14.2	27.7	8.5	12.4	11.9	69.5

*Panels A and B present financial details for the full sample of all syndicated loans, plus five sub-samples categorized by loan purpose code. In panel B, # indicates that based on a two-sample t-test assuming unequal variances, the difference between the value for this loan type and the value for project finance loans is *not* significant at the 5% significance level. All other values are statistically significant at the 5% level or higher. * indicates that the t-test has not been applied to these variables.

remarkable difference between PF and all non-PF loans is how *infrequently* PF loans are extended to U.S. borrowers. Whereas American corporations (and occasionally governmental units) arrange 55.8 percent of all syndicated loans, by value, and account for fully 74.0 percent of CS lending, U.S. borrowers account for a mere 13.9 percent of PF lending. The only other category of loans with a similar non-U.S. flavor are the FAB credits, which we will find share many important characteristics with PF loans.

Loan Pricing Samples

One of the most important objectives of this study is to determine whether PF loans are more or less expensive for borrowers than other types of

loans. To address this issue, we select from the sample of all syndicated loans those credits which are both priced as floating rate loans and which use LIBOR as a base interest rate. We also screen for complete data on borrower nationality and loan currency denomination. These screens yield a set of "high-information" loan samples with comparable pricing data expressed, in basis points, as spreads above LIBOR. These are presented in Panel B of Table 4, beginning with the full sample of 40,073 high-information syndicated loans. The various loan purpose sub-samples are presented next, beginning with the 1,824 project finance loans priced as a spread over LIBOR.[6]

In addition to the variables discussed earlier, Table 4's Panel B presents several new loan structure variables as well as greater detail about borrowers and the use for which a loan is arranged. Most of these are self-explanatory (i.e., fee levels, number of banks in a syndicate, loans with guarantees), but a few require definition. We define a loan as having *currency risk* if the denomination of the loan (and its currency of repayment) differs from the currency of the borrower's home country. Thus a Japanese borrower arranging a dollar loan would be subject to currency risk, whereas that same borrower arranging a yen-denominated loan would not be. *Country risk rank* and *country risk score* are taken directly from the semi-annual country risk tabulation in *Euromoney* magazine. A low-risk country will have a very low rank but a very high score. While we report both risk rank and risk scores in Panel B, in the interest of space we later report only empirical results using country risk rank data, since this is the only risk measure reported by *Euromoney* during the 1980-1982 period.

The variable *loans with covenants* indicates whether the loan agreement legally imposes any of the standard positive or negative covenants on the borrower. Since this variable suffers from a missing value problem (that is, an empty cell may mean either that the loan has no covenants or that the data is unavailable), we report it simply as the fraction of each loan type with covenants included. Finally, the variable *loans to collateralizeable asset-rich borrowers* is a dummy variable coded as 1 if the borrower is operating in an industry generally believed to be rich in non-specialized, tangible (and thus collateralizeable) assets. Specifically, this means that the loan recipient has a business borrower code of airlines, apartment management, electricity utility, hotels and leisure, property, REIT, or shipping. Both the theoretical and empirical capital structure literature suggests that companies with many such assets should be able to tolerate heavier debt levels than other companies.[7] Panel B of Table 4 also shows—based on t-tests comparing the values of each variable in the high-information PF loan sample with the corresponding values in the (high-information) all syndicated loan sample and in the other four loan purpose sub-samples—that almost all differences between the PF sample values and the corresponding values for other loan categories are statistically significant.[8]

Most of the non-price variables detailed in Panel B clearly suggest that PF loans are often similar to fixed asset based loans (FAB), but are otherwise fundamentally different financial instruments from other loan types. As before, a far lower fraction of both PF and FAB loans are arranged for U.S. borrowers (11.6 and 13.4 percent) than is true for the overall sample of all syndicated loans (56.9 percent), and these loans also have much longer average maturity (8.6 and 7.7 years versus 4.8 years). Additionally, PF and FAB loans are much more likely to be subject to currency risk than are other loan types (72.9 and 71.0 percent for PF and FAB loans, respectively, versus 33.1 percent for all syndicated loans). Given the non-U.S. nature of typical PF and FAB borrowers, coupled with the fact that syndicated loans are overwhelmingly dollar-denominated, this high level of currency risk is not surprising. Furthermore, a significantly larger fraction of PF and FAB loans carry third-party guarantees (34.1 and 34.5 percent, respectively) than of the full sample of all syndicated loans (13.3 percent) or any other sub-sample.

PF and FAB loans share one other intriguing (and surprising) common feature—they are far less

6. This number will be further reduced depending on the availability of the country risk rank and score data. The relatively low "survival rate" of PF loans from the full sample to the high-information sub-sample (36.8 percent of the original 4,956 loans) is due to their pricing characteristics. PF loans are more commonly fixed price credits than are other types of loans and fewer of the floating rate PF loans are priced versus LIBOR. Nonetheless, a comparison of the variables common to the loan samples in Panels A and B reveals that the high-information PF loans in Panel B are not dissimilar to their counterparts in Panel A in terms of average loan size, maturity, and frequency of U.S. borrowers. The same is true for the other loan type sub-samples, so we will assume that any empirical results derived from the high-information sub-samples are generalizeable to the larger population of all loans.

7. See especially Bradley, Jarrell, and Kim, 1984, On the existence of an optimal capital structure: Theory and evidence. *Journal of Finance* 39, 857-878.

8. The actual values of the t-test are available from the authors upon request.

likely to contain loan covenants than are all other loan types. Only 3.4 percent of PF loans, and 7.1 percent of FAB loans, have at least one positive or negative loan covenant versus 30.5 percent of all syndicated credits and 42.4 percent of capital structure loans. We are frankly at a loss to explain why FAB loans have so few covenants—unless these are primarily mortgages, specifically tied to individual assets, which give creditors senior enough positions not to require separate loan covenants. We can, however, offer two possible explanations for the absence of covenants for PF loans—which received wisdom suggests should be loaded with exquisitely detailed contractual provisions. First, since this database details PF *loans*, rather than the full financial deals themselves, it is likely that the explicit debt covenants for PF packages are covered by a separate contract (the project financing package), so the PF loans themselves are simply one part of a much larger deal. No such separate contract governs a takeover loan or a debt refinancing credit extended to an operating company, however, so in those cases the covenants are included in the loans themselves. The second hypothesis really has greater implications for general corporate finance than for a PF study, though the separate incorporation feature of PF is central to its logic. Since loan covenants are designed in part to protect the creditor from asset substitution and other methods of wealth expropriation by the borrower, it follows that these clauses are far less necessary for loans to a special-purpose vehicle company than they are for loans made to a complex, multi-divisional corporation.

For three of the characteristics detailed in Panel B, PF and FAB loans differ significantly from each other—though they remain more similar than in comparison to other loan categories. The first two such features are the country risk measures. PF loan borrowers are, on average, located in far riskier countries than is the case for any other loan category. The average country risk rank for PF borrowers (31.8) is significantly higher than the corresponding value for FAB loans (21.3), and is dramatically higher than the average risk rank for all syndicated loans (12.8). Using late-1998 *Euromoney* scores, this suggests that the typical syndicated loan is arranged for a borrower in, say, Sweden, while a typical FAB loan would go to a borrower in Singapore, and a typical PF credit would be arranged for a company in Bahrain. Average country risk scores for PF, FAB, and all syndicated loan borrowers (74.6, 82.7, and 90.0, respectively) tell a similar story, corresponding as they do to arranging loans for borrowers in Qatar, Cyprus, and Australia. Clearly, project finance loans involve significantly greater political and economic risk than any other major category of syndicated credit.

Perhaps one reason PF loans can be made to relatively risky borrowers is because they are much more likely to be arranged for collateralizeable asset-rich projects than is the case for the average syndicated loan. Over one-quarter (27.7 percent) of PF loans are extended for such projects, versus only 14.2 percent of all syndicated loans. On the other hand, the fraction of FAB loans arranged for this type of borrower, 69.5 percent, is the highest of any loan category—but this is not surprising since this category is defined as rich in tangible assets.

Finally, the relative pricing of PF versus non-PF loans is one of the most important, and surprising, findings detailed in Panel B of Table 4. Average loan spreads are statistically and economically significantly *lower* for PF loans (130 bp) than they are for CC loans (195 bp), CS loans (135 bp) and the full sample of all syndicated loans (134 bp). Many observers might have predicted that PF loans have higher spreads than non-PF loans, since loan repayment is not guaranteed by the project's sponsor (limited or non-recourse lending) and because of most projects' higher perceived risk levels.

Furthermore, the observed level of loan fees and the number of participating banks do provide indirect evidence that PF lending may well be considered relatively more risky than other types of lending—or at least more difficult to arrange. The average levels of commitment and participation fees for PF loans (36.9 and 56.3 bp, respectively) are significantly higher than the levels for the full sample of syndicated loans (30.8 and 36.9 bp), as well as for every sub-sample except corporate control loans. Additionally, the average number of banks participating in PF loans (14.5 banks) is significantly larger than the average for all loans (10.7 banks) and the average for every other loan sub-sample. These findings suggest that banks must be compensated with relatively high up-front fee payments to entice them to participate in project finance lending, and they are apparently unwilling to take as large a stake in PF loans as they would in other credits. Either that or they wish to increase the number of banks participating in a PF credit of a given size in order to spread risks over a larger number of banks for some

other reason, such as to build political support. We will examine loan pricing more fully in the next section, when we employ OLS regression to determine what factors influence loan spreads.

Before proceeding, we should briefly summarize the results of our univariate comparisons between PF loans and other loan types. Project finance loans fall, on average, in the middle range of all syndicated lending in terms of size and loan spread (price). On the other hand, PF loans have much longer average maturity and are more likely to be fixed rather than floating rate credits (and are less likely to be priced relative to LIBOR if they are floating rate). American companies use project finance sparingly; whereas over half of all syndicated loans are arranged for U.S. borrowers, only one-eighth of PF loans are booked for American vehicle companies. In fact, the average PF loan borrower resides in a much riskier country than is true for syndicated lending in general, and PF lending is significantly more likely to be arranged for a tangible asset rich project. Finally, PF loans share many similarities with FAB credits—such as borrower nationality, average loan size and maturity, frequent use of third-party guarantees, and infrequent use of loan covenants. On the other hand, they also differ in being more expensive than FAB loans and in being extended to relatively riskier and less tangible-asset rich borrowers.

LOAN PRICING REGRESSIONS

In this section, we subject the various high-information loan samples detailed in Table 4, Panel B to OLS regression analysis. Our purposes in doing this are two-fold. First, we wish to determine which of the variables detailed in Table 4 have significant, independent influences on loan spreads once the effects of other variables are accounted for. Second, we wish to determine whether PF loans are more or less expensive than other types of loans—again, after accounting for other factors. The academic literature contains numerous examples of loan pricing studies using both bank loans and publicly-traded debt. The loan pricing tests we perform are most similar to those presented in a study by J. R. Booth, both in the actual model estimated and in the average size of loans under examination.[9] Our sample size, however, is many times larger than that used in Booth's or almost any other study.

We estimate the determinants of loan pricing using the model described in equation 1. The dependent variable is the loan spread above LIBOR, in basis points, and the independent variables are those presented and discussed in Table 4. We employ standard OLS regression estimation.[10] The model estimated is:

$$\text{Spread} = \alpha + \beta_1 \text{ Size} + \beta_2 \text{ Maturity} + \beta_3 \text{ Guarantee} + \beta_4 \text{ Currency Risk} + \beta_5 \text{ Country Risk Rank} + \beta_6 \text{ Collateralizeable Assets} \quad (1)$$

where:

- *Size* = Loan size, in US$ millions;
- *Maturity* = Loan maturity, in years;
- *Guarantee* = Dummy variable taking the value of 1 if a loan has a third-party repayment guarantee and 0 otherwise;
- *Currency Risk* = Dummy variable taking the value of 1 if a loan is exposed to currency risk (the currency of the loan repayment cash flows differs from the borrower's home country currency), and 0 otherwise;
- *Country Risk Rank* = Country risk rank, an integer ranking of country risk provided by *Euromoney* every year, where low risk countries have low ranks and high risk countries have high ranks;
- *Collateralizeable Assets* = Dummy variable taking the value of 1 if the borrower is in an industry generally considered to be rich in collateralizeable (tangible, non-specialized) assets, and 0 otherwise.

We employ country risk rank , rather than risk score, as our measure of country risk both because this yields two additional years of data, and because this measure increases with country risk—which lends itself to a more logical interpretation of the coefficient on the risk variable coefficient. For example, if rank's coefficient value is 1.50, this implies that a loan booked to a borrower in a country with a risk ranking of 40 will on average have a spread 15 basis points higher than a loan to a borrower in a country with a rank of 30.

9. See J.R. Booth, "Contract Costs, Bank Loans, and the Cross Monitoring Hypothesis," *Journal of Financial Economics,* Vol. 31 (1992), 25-41.

10. Our model adjusts for heteroskedasticity using the methodology proposed by White. See H. White, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica,* Vol. 48 (1980), 817-838.

TABLE 5 ■ LOAN PRICING REGRESSIONS FOR DIFFERENT LOAN SAMPLES

Loan Type	All Syndicated Loans	Corporate Control	Capital Structure	Fixed Asset Based	General Corporate Purpose	Project Finance
Number of Observations	39798	6258	13428	1449	15429	1803
Adjusted R^2	0.17	0.16	0.17	0.14	0.17	0.17
INDEPENDENT VARIABLES:						
Intercept	150.93	160.28	148.32	104.07	140.13	131.37
	(142.39)	(36.63)	(77.66)	(20.54)	(85.20)	(20.94)
Loan Size (US$m)	–0.04	–0.04	–0.05	–0.02	–0.06	–0.01
	(–19.27)	(–9.24)	(–15.36)	(–4.07)	(–12.62)	(–1.33)
Maturity (Years)	2.82	9.11	3.12	0.11	0.68	–0.89
	(16.88)	(12.82)	(8.85)	(0.21)	(2.47)	(–2.00)
Guarantee (0/1)	–9.26	–19.54	–3.70	–5.44	–3.98	–42.67
	(–7.22)	(–4.16)	(–1.41)	(–1.68)	(–2.22)	(–11.27)
Currency Risk (0/1)	–103.88	–62.11	–94.54	–57.99	–98.87	–42.16
	(–74.61)	(–13.55)	(–37.36)	(–11.52)	(–47.59)	(–6.95)
Country Risk Rank	1.24	1.23	0.76	0.59	1.51	1.50
	(25.80)	(4.63)	(7.23)	(4.09)	(21.77)	(10.87)
Collateralizable Assets (0/1)	–14.45	–17.42	–11.91	20.50	–6.59	15.99
	(–11.36)	(–4.09)	(–4.63)	(5.05)	(–3.33)	(3.75)

We should also explicitly state that this model does not have a variable measuring credit risk in any direct way—such as borrower solvency, liquidity, or leverage ratios—despite the likelihood that such a proxy would prove very useful. There are two reasons for this. First, the *Loanware* database does not provide a machine readable identification code (i.e., CUSIP or *Datastream* identification number) for borrowers, so there is no feasible method of matching borrowers to their corresponding accounting or stock price data. Second, it is not at all clear that debt or liquidity ratios for PF borrowers would be comparable to similar ratios for borrowers of other syndicated loans. Whereas the borrower of all other types of syndicated credits is usually an operating company, which promises its entire faith and credit to repayment of the loan, the PF borrower is, by definition, a vehicle company without external assets or sources of repayment. Thus the implied corporate backing for a syndicated loan to, say, Enron is fundamentally stronger than the backing for a loan to a vehicle company being sponsored by Enron—even if Enron is the sole project sponsor. Other things equal, this lack of corporate guarantee of loan repayment should make these loans riskier and thus more expensive than other types of loans. The key question we hope to answer is whether the project financing structure is sufficiently good at overcoming agency problems, and/or at reducing contract monitoring and enforcement costs, to overcome this lack of corporate backing. If so, PF loans will not be more expensive than other loan categories—and may even have lower spreads.

Table 5 presents the results of estimating equation 1 for all syndicated loans followed by separate regressions for each loan type. The regression intercepts for each loan sample are comfortingly close to the univariate loan price (spread) averages presented in Panel B of Table 4, and also show similar relative patterns (highest for CC, lowest for FAB loans). The intercept for PF loans, 131.4 basis points, is in fact less than two basis points different from the average spread presented in Table 4's Panel B (130 bp). The PF intercept is also the second lowest of any loan sample. This finding, coupled with the univariate test results showing that PF loans have significantly lower spreads than other loan groups, clearly suggests that project finance lending has competitive advantages over other loan forms—at least for funding certain projects.

The second line of Table 5 details the influence of loan size on spreads, which is insignificant for project finance but negative and significant for all other loan samples. The coefficient values for size on non-PF loans ranges from –0.02 to –0.06, with an average of –0.04 for all syndicated loans. This suggests that increasing the size of a non-PF syndicated loan by $100 million **actually reduces[ok?]**

the required loan spread by an average of 4 basis points. This negative size/spread relationship could be due to economies of scale in arranging non-PF syndicated credits, or it could be due to better known and more creditworthy borrowers being able to arrange larger loans. Since size is not a significant influence on PF loan prices, we do not attempt a further analysis here. Clearly, however, this finding merits further study.

Loan term is a second variable that behaves differently for project finance than for any other loan type. Whereas spread and maturity are significantly positively related for all other loan categories, they have a significant negative relationship for PF loans. The coefficient value for term indicates that booking a loan with an original maturity one year longer than the median *reduces* the average project finance loan spread by 0.89 basis points. A one-year increase in maturity would increase spreads for other loan categories—by up to 9.1 basis points for corporate control loans. Since PF loans have an average (and median) maturity that is more than twice that of most other loan types, this result is readily explainable (without a negative spread/term relationship, long tenor loans would be prohibitively expensive), though still surprising.

While finding a consistently significant negative relationship between spread and guarantee across all loan samples is not surprising, the dispersion in coefficient values definitely is. Whereas the presence of a third-party guarantee reduces the spread on a typical capital structure loan by only 3.7 basis points, a similar guarantee reduces the spread on project finance loans by almost 43 basis points. No other loan category has nearly this sensitivity to third-party guarantees; the next highest value, -19.6 basis points for corporate control, is less than half as large. This result also shows why PF borrowers are so much more willing than most other borrowers to incur the cost (in time, effort, and cash) required to arrange guarantees. The payoff, in terms of a reduced loan price, is much larger.

In yet another surprise, the currency risk dummy has a significantly n*egative* relationship with loan spreads for every loan category. This finding suggests that a mismatch in the currency of the borrower's home country and the currency of loan repayment significantly reduces the rate charged on an average loan—by 42 basis points for PF credits and by up to 99 basis points for general corporate purpose loans. One obvious interpretation of this finding is that banks offer lower rates to international borrowers who are willing to accept the risk of borrowing in dollars or another hard currency, though it is not clear why this would not be offset by increasing borrower default risk.

The final variable in Table 5, collateralizeable assets, is always significant—though it has a negative relationship with spread for CC, GCP, and CS loans, and a positive relationship with spreads for PF and FAB credits. This means that, for most loans, a borrower in a collateralizeable asset-rich industry will be charged a lower interest rate than will borrowers in other industries, but the reverse is true (with roughly equal force) for PF and FAB lending. The negative coefficient for most loans is what we expected—tangible assets should generally support debt better than other types of assets. The positive relationship for PF and FAB could have two explanations. First, it could result from the fact that these types of loans are already concentrated upon funding tangible-asset-rich projects, and that the specific industries chosen as "collateralizeable" happen to be relatively riskier than average. Alternatively, it may simply be that riskier projects can be funded using PF or FAB loans than could otherwise be arranged. This is consistent with other loan pricing studies, which document that the use of collateral is positively related to loan spreads.

SUMMARY AND CONCLUSIONS

This study compares the financial characteristics of a large sample of limited recourse PF loans to a comparison sample of syndicated loans, as well as to various sub-samples of non-PF credits classified by loan purpose. Collectively, these samples represent almost the entire population of large syndicated bank loans booked on international capital markets since 1980—over 90,000 loans in total, with an aggregate value in excess of $13 trillion. We find that PF loans differ significantly from non-PF credits in that PF loans have a longer average maturity, are more likely to have third-party guarantees, and are far more likely to be extended to non-US borrowers and to borrowers in riskier countries. PF credits also involve more participating banks, have fewer loan covenants, are more likely to use fixed-rate rather than floating-rate loan pricing, and are more likely to be extended to borrowers in tangible-asset-rich industries such as oil and gas, real estate, and electric utilities.

Despite being non-recourse finance, floating-rate PF loans have *lower* credit spreads (over LIBOR) than do most comparable non-PF loans. This result, surprising in some respects, is striking evidence that the project financing structure solves important agency costs that are inherent in the creditor/borrower relationship, and that PF is a very effective method of providing monitoring for large projects with relatively transparent cash flows. Also contrary to expectations, we find that PF loans are not larger than non-PF loans, but are in fact significantly smaller than CC or CS loans (two of the four non-PF loan samples examined). Though PF and (most) non-PF loans are all syndicated bank credits, our univariate comparisons suggest that project finance loans differ rather fundamentally from non-PF credits in almost every important aspect.

■ STEFANIE KLEIMEIER

is ___Professor of Finance at Maastricht University's School of Management in Maastricht, The Netherlands.

■ WILLIAM MEGGINSON

is Professor & holder of the Rainbolt Chair in Finance at the The University of Oklahoma's Michael F. Price College of Business.