

# **Pricing Global Project Bonds: Legal, Financial and Economic Factors**

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## **Outline**

1. Motivation, Question, Findings
2. From Project Finance to Corporate Finance and back: What Can We Learn?
3. Contractual Structure, Risk Shifting and Conflicts of Interest: Economic Questions
4. Data and Methodology
5. The Proof is in the Pudding: Empirical Results
6. Lessons and Future Research

# Motivation

- Study credit risk dynamics arising from interlocking contracts: project finance
  - who bears what risk?
  - how do markets price contractual risks?
  - relate risk dynamics to the nexus of contracts view of the firm: look at all, not only financial contracts
- Data set: exhaustive sample of project bonds
  - projects in emerging markets (OECD sample to follow)
  - cross-sectional determinants of at-issue credit spreads

# Objective

- Study the contractual dynamics arising from the typical set of contracts making up a project
  - debt (bond) covenant, contingent on
  - off-take agreement
  - completion, performance, or debt-service guarantee
- Statistical analysis of credit spreads
  - relate to contractual risk factors in linear framework
  - market price of contract risk and provisions
  - relevance gauged in terms of statistical significance

# Results

- Bondholders share in residual risks
  - contractual incompleteness responsible,
  - not necessarily deliberate attempt by firm to enhance value at expense of debtholders
- Pricing factors: depends on the variables
  - credit rating
  - amount outstanding: secondary liquidity
  - seniority
  - country rating and industry factors
  - corruption and regulatory concerns

# Project Finance

- Financial technique to fund a single indivisible large-scale capital investment
  - cash flows are the sole source to meet financial obligations and to provide returns to investors
  - stand-alone projects: no recourse
  - no cross-subsidization, diversification of cash flows
- Projects are a web of contracts
  - particularly well documented, few sources of risks
  - each contract separately documented
- Typical projects: large infrastructure projects

# Economics of Project Finance

- Nexus of contracts allocating risks and returns
- Fundamental problem: property rights
  - incomplete contracts, weak enforcements
  - hold-up problems: investors locked into project, unilateral redefinition of property rights
- Two legal systems interact: think of a debtholder
  - debt covenant: US (NY) or UK law
  - importance of local legal system: enforcing property rights
- Institutional development affects bond pricing
  - legal institutions directly
  - political and economic (e.g., regulatory) institutions indirectly

# From Corporate to Project Finance

- Corporate finance textbook models
  - large up-front investment
  - 3 phases: contracting, investment, operating (with corresponding resolution of uncertainty)
  - small number of actions, players and claims
  - bilateral monopoly: one seller, one buyer
- Rarely found in practice except
  - project finance: exactly fits this paradigm
  - use project finance data and evidence to analyze and test fundamental questions in corporate finance

# The Firm as a Nexus of Contracts

- Alchian and Demsetz (1972), Jensen and Meckling (1976): financial contracts
  - focus on organization and financial structure
  - foundation for capital structure and corporate governance theories, i.e.,
  - allocation of control and return rights
- Fama (1990): neglects other contracts
  - labor, input and output contracts
  - interact with the financial structure of the firm

## Project Finance Literature

- Some theoretical literature on project finance, but....
  - Shah and Thakor (1987), Berkovitch and Kim (1990), Chemanur and John (1995)
- ...next to no empirical work
  - Esty (1999): Petrozuata, spot market preempts problems
  - Esty and Megginson (2000): syndicated project bond market
  - Dailami and Hauswald (2001): Ras Gas clinical study
- Other related literature: covenants, hedging
  - Smith and Warner (1979): analysis of bond covenants
  - Mello and Parsons (2000): paired financing and hedging

# Data Description: Bonds

- Start with Moody's and S&P rating lists
  - project bonds issued and rated between 1994 and 2002
- Match with issue data from Bloomberg and IDC
  - 134 bona fide emerging market project bonds: 103 obs with full data from 23 different countries
  - match with about 45 project bonds from OECD countries
- Collect issue documentation: rating studies, analyses, bond prospectus and covenants - work in progress
  - extract standard contractual provisions
  - match with financial information on off-taker
  - code variables

## Bond Characteristics

Characteristic	N	Mean	Std. Dev.	Min	Max
Spread over US Treasuries	103	297.95	175.38	10	802.172
Amount	103	270.82	199.63	23	1000
Maturity	103	11.9	10.6	2.85	100
Rating in terms of Moody's classification	101	Baa1	4 notches	Aaa	B2

Type	N	Spread	Amount	Maturity	Rating
Emerging economies	103	297.95	270.82	11.9	Baa1
Latin America	46	329.08	235.66	11.27	Baa1
Asia	37	266.51	170.56	11.06	Baa2
Europe	3	208.34	200	7.33	A2
Middle-East and North Africa	2	161.25	600	13.76	A3
Africa	1	802.17	396.825	30	Baa1

# The World Business Environment Survey (WBES): Institutional Development



A standard core enterprise survey using a uniform methodology

An effort to unify fragmented work to assess conditions for private investment

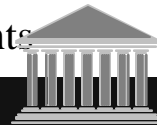
- Covers perceptions of the investment climate as shaped by local economic policy; governance; regulatory, infrastructural and financial impediments and public service quality
- Generates indicators that allow comparisons across countries and over time
- To date, 80 countries have been surveyed
- Extract battery of relevant measures for projects

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## Example: Courts Role in Property Rights



A majority see judiciary as “sometimes”, “seldom”, “never” fair or impartial in CEE, Latin America, CIS and East Asia Developing. A majority see it as “sometimes”, “seldom”, or “never” honest in CEE, LAC, E. Asia Developing, CIS, and Africa. Frequency of enforcement of decisions low for majority in CEE, LAC, E. Asia Developing, and CIS. Justice is rarely quick or affordable...

	<i>Fair &amp; Impartial</i>	<i>Courts - Enforceability</i>	<i>Honest</i>	<i>Courts - Affordable</i>	<i>Courts - Consistent</i>	<i>Quick</i>	<i>Lack Confidence</i>
CEE	74.2%	68.2%	79.4%	57.4%	77.5%	79.8%	59.4%
Africa	46.7%	50.3%	51.6%	57.6%	58.7%	85.8%	42.1%
Latin America	69.9%	67.0%	69.5%	70.6%	78.6%	94.4%	38.4%
CIS	55.9%	55.6%	56.7%	65.5%	64.6%	90.2%	37.1%
East Asia Developing	55.2%	58.7%	58.7%	74.0%	50.8%	80.8%	32.1%
OECD	48.1%	48.6%	38.0%	77.5%	58.8%	86.5%	28.9%
South Asia	31.0%	46.9%	37.1%	60.5%	48.0%	80.6%	23.0%
MENA	23.2%	28.6%	22.9%	22.8%	26.5%	47.0%	16.2%
East Asia NIC/ China	23.0%	24.5%	26.9%	37.4%	28.6%	42.4%	11.0%

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# Key Variables: Summary Statistics

Variable	Label	N	Mean	Std. Dev.	Min	Max
Spread over US Treasuries	SPREAD	103	297.94	175.38	10	802.17
Amount issued	AMOUNT	103	270.82	199.63	23	1000
Maturity	MAT	103	11.9	10.6	2.85	100
Credit rating index	CRI	101	7.30	3.98	0	14
Inflation	INF	103	11.98	11.45	.60	49.40
GDP per capita	GDPCAP	103	4689.32	4921.48	0	22600
GDP (million \$)	GDP	103	236.1	222.1	0	833.2
Economic growth	GROWTH	103	1.80	2.01	-1.2	7.6
Infrastructure development	INFRA	103	2.17	0.36	1.68	2.84
Financing	FINANCE	103	2.74	0.34	2.10	3.35
Exchange rate	FXRATE	103	2.63	0.63	1.38	3.63
Legal	LEGAL	103	2.19	0.42	1.56	2.84
Corruption	CORRUPT	103	2.51	0.62	1.44	3.47
Taxes & regulation	TREG	103	2.78	0.56	1.86	3.61
Political instability	POLINST	103	2.84	0.54	1.95	3.64
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## Basic Model

$$\begin{aligned}
 SPREAD_i = & \mathbf{b}_0 + \sum_{1 \leq k \leq K_1} \mathbf{b}_k ISSUE_k + \sum_{K_1 < k \leq K_2} \mathbf{b}_k BCOV_k + \sum_{K_2 < k \leq K_3} \mathbf{b}_k 1_{IND_k} + \\
 & + \sum_{K_4 < k \leq K_5} \mathbf{b}_k x_k + \sum_{K_5 < k \leq K_6} \mathbf{b}_k INST_{kj} + \sum_{K_5 < k \leq K_6} \mathbf{b}_k BCOV_K * INST_{kj} + v_{ij}
 \end{aligned}$$

$$v_{ij} = e_{ij} + u_i$$

- Estimated by OLS or random effects where
  - *SPREAD*: at-issue spread of bond yield over UST
  - *ISSUE*: issue information (amount, maturity, rating)
  - *BCOV*: covenant provisions (seniority, collateral, etc.)
  - *IND*: industry indicator (energy, power, water, etc.)
  - *x*: host country economic indicators (GDP, growth, etc.)
  - *INST*: financial, legal and political institutions index



# Economic and Institutional Factors

Specification	1	2	3	4
Constant	171.6364 (0.0049)	-437.6966 (0.0659)	281.3138 (0.5531)	288.3255 (0.0122)
<b>Economic indicators:</b>				
Country credit rating	19.0393 (0.0017)		20.1268 (0.0556)	21.6974 (0.0078)
GDP in USD millions	0.2171 (0.0046)		0.3317 (0.0463)	0.2572 (0.0003)
GDP per capita	-0.0015 (0.7085)		0.0039 (0.1981)	
Inflation	-3.9555 (0.0455)		-2.0634 (0.5323)	
Growth	-16.8877 (0.0007)		-15.0828 (0.0000)	-18.7537 (0.0005)
<b>Institutional obstacles:</b>				
Infrastructure		153.2801 (0.1868)	32.7415 (0.8510)	
Financing		88.5061 (0.1646)	-101.2956 (0.4528)	
High FX rate		-11.7367 (0.8065)	20.6311 (0.7924)	
Legal		123.7272 (0.2861)	170.6664 (0.3910)	
Corruption		-101.3433 (0.3093)	71.2188 (0.6570)	76.8214 (0.0480)
Political instability		-94.5398 (0.2560)	-323.0367 (0.0919)	-249.0727 (0.0006)
Taxes and regulation		157.1911 (0.0123)	120.4833 (0.3445)	118.0559 (0.0414)
Adjusted R <sup>2</sup>	0.31	0.20	0.42	0.36

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# Covenant, Terms and Project Type

Specification	1	2	4
Constant	206.5749 (0.0000)	156.8670 (0.1951)	21.8025 (0.7402)
<b>Bond characteristics:</b>			
Amount	-0.1327 (0.0874)	-0.1301 (0.2154)	
Maturity	-0.9282 (0.5200)	5.9242 (0.1056)	1.2693 (0.2113)
Credit rating	18.3336 (0.0000)	37.6766 (0.0000)	33.0817 (0.0000)
<b>Terms:</b>			
Senior		-221.8065 (0.0659)	
Secured		32.4201 (0.5155)	-40.2313 (0.2778)
Asset-backed		-50.2000 (0.3817)	-74.7438 (0.0323)
Guarantee		-21.8135 (0.7648)	
<b>Project type:</b>			
Energy			46.6740 (0.1288)
Telecom			70.3778 (0.0733)
Transport			162.7932 (0.0016)
Water			147.0045 (0.0334)
Transmission			-185.8533 (0.0356)
Adjusted R <sup>2</sup>	0.20	0.34	0.45

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# Legal Institutions and Courts

# Financial and Political Institutions

# Summary of Results

- Contractual structure as substitutes for shortcomings legal environment
  - use covenant and off-take agreements to contract around local legal provisions
  - less evidence for legal risks than often claimed
- Residual risk sharing or shifting?
  - bondholders' exposed to institutional risks that could potentially exacerbate contractual risks
  - open question: how does financial structure mitigate risk?
- Importance of the economic environment
  - credit assessments, growth, wealth

# Lessons

- Theory of the firm
  - non-financial contracts matter for financial ones
  - optimal self-enforcing contracts rather than courts
- Corporate finance
  - institutional factors affect pricing of financial claims
- Project design
  - contractual structure as substitutes for courts
- Methodology
  - large, cross-sectional sample

# Future Work

- Covenant pricing
  - more detailed covenant information
  - risk-distribution between parties
- The price of institutions
  - control sample from developed economies
  - capital structure as self-insurance
- True panel study: time-series effects
  - panel of liquid project bonds from bilateral monopoly to test cross-sectional implications

# Questions?