



# Corporate Environmental Management & Credit Risk

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Stockholm seminars, March 28-29, 2011

# Research Overview

- Context
  - Climate change debate, environmental scandals
  - Environmental risk exposure of firms, value implications for investors
  - Focus so far on return performance, but what about risk?
  - Lack of empirical research on credit markets
- Objective

“Does the environmental management of borrowing firms affect bond investors?”
- Findings
  - Environmental practices are related to significant differences in credit risk
  - Robust results, which also hold for banks
  - Implications for bond pricing, risk management, and governance

# Conceptual Framework

- Environmental practices and their implications for credit risk:
  - Litigation risk
    - *Clean-up costs, fines, damage awards*
  - Reputation risk
    - *Nonfinancial stakeholders (e.g., sales, transaction costs)*
    - *Financial stakeholders (e.g., funding, liquidity)*
  - Regulatory risk
    - *Increases legal risks and scrutiny*
    - *Higher compliance costs*
  - Proactive environmental engagement
    - *Reduces risk exposure, enhances cash flows*

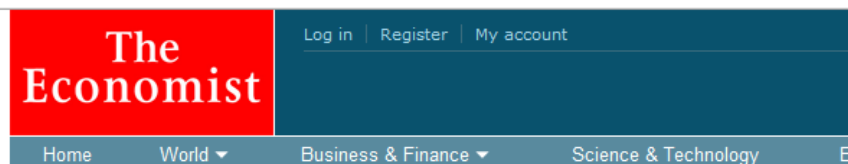


# Litigation & Regulatory Risks



June 25, 2010

BP Plc faces at least 243 U.S. lawsuits so far arising from its role in the Gulf of Mexico oil spill, in what is considered by some the biggest environmental disaster in U.S. history.



American politics and business

## Obama v BP

America's justifiable fury with BP is degenerating into a broader attack on business

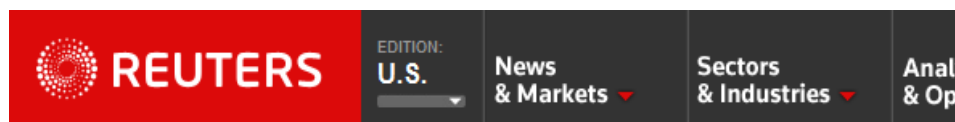
Jun 17th 2010

**Bloomberg  
Businessweek**

Tuesday July 6, 2010

"Oil producers around the world are bracing for stricter regulation."

"BP's spill was initially overseen by the U.S. Minerals Management Service. The agency, faulted for lax regulation, was broken into three by President Barack Obama on May 19, creating bodies to oversee leases, drilling safety and fee collection."



## Factbox: BP lawsuits in the United States

Fri Jun 25, 2010 8:34am EDT

**REUTERS** - Shareholders have sued the board of BP Plc for failing to monitor safety and exposing the company to potentially enormous liability related to the Deepwater spill disaster in the Gulf of Mexico, according to court documents.



24 Jun 2010 14:15

## New York State pension fund sues BP over losses

"BP misled investors about its safety procedures and its ability to respond to events like the ongoing oil spill, and we're going to hold it accountable."

"BP could now face class-action suits from many other pension funds, even those outside the US."

# Financial Impact

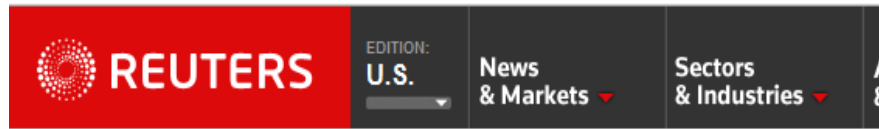


## BP and the oil spill

### The oil well and the damage done

BP counts the political and financial cost of Deepwater Horizon

Jun 17th 2010



### UPDATE 3-Fitch downgrades BP by six notches, bonds plummet

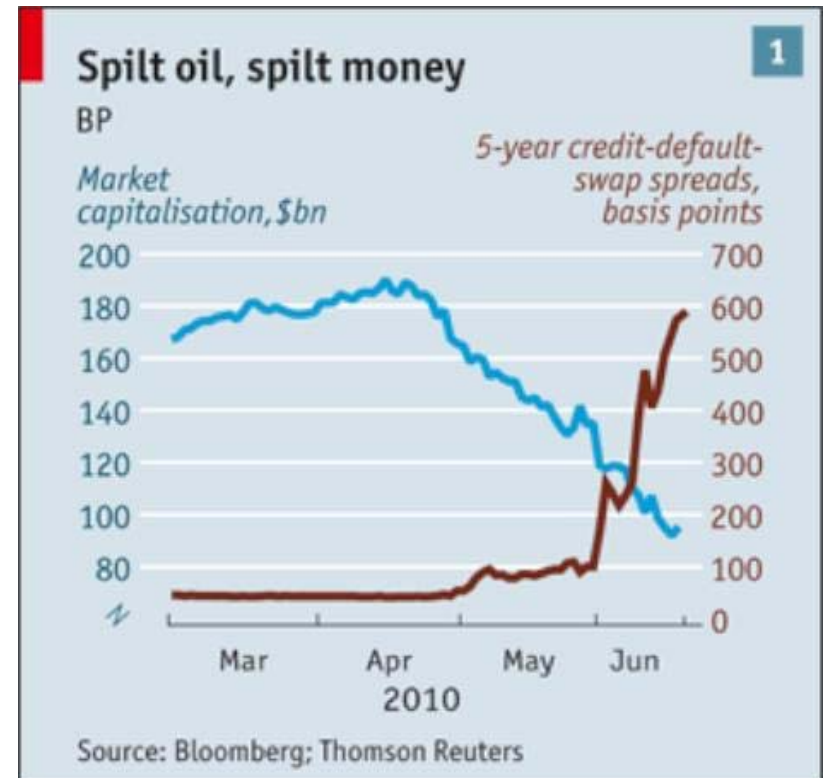
Tue Jun 15, 2010 1:48pm EDT

\* First multi-notch rating fall for BP, and first below AA

\* Rating still higher than implied by level in CDS market

\* BP bonds plummet in secondary markets

**The Economist** - "Investors ... have driven down its (BP plc's) value by \$89 billion since the well erupted (after adjusting for declines in the wider stock market), far in excess of all but the most dire forecasts of the ultimate costs of the spill."



# Hypotheses

Does the credit market anticipate potential environmental risks?

1. *“Firms with more environmental concerns have a higher cost of debt financing and lower credit ratings.”*
2. *“Firms with more proactive environmental management have a lower cost of debt financing and higher credit ratings.”*
3. *“The link between environmental performance and credit risk is stronger for firms that operate in environmentally risky industries.”*
4. *“The impact of environmental performance on credit risk has increased over the recent decade.”*



# Assessing Environmental Profiles

## Corporate environmental performance

- Independent rating agency (KLD)
- Coverage:
  - U.S. credit market
  - 1991-2010
  - +3,000 largest public companies

# KLD Performance Ratings (Strengths)

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## Panel A: Performance Strength Indicators, *ENV Strengths*

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<i>Beneficial Products and Services</i>	The company derives substantial revenues from innovative remediation products, environmental services, or products with environmental benefits. (The term “environmental service” excludes services with questionable environmental effects, such as landfills, incinerators, waste-to-energy plants, and deep injection wells.)
<i>Pollution Prevention</i>	The company has notably strong pollution prevention programs including both emissions reductions and toxic-use reduction programs.
<i>Recycling</i>	The company either is a substantial user of recycled materials as raw materials in its manufacturing processes, or a major factor in the recycling industry.
<i>Clean Energy</i>	The company has taken significant measures to reduce its impact on climate change and air pollution through use of renewable energy and clean fuels or through energy efficiency. The company has demonstrated a commitment to promoting climate-friendly policies and practices outside its own operations.
<i>Other Strength</i>	The company has demonstrated a superior commitment to management systems, voluntary programs, or other environmentally proactive activities.

# KLD Performance Ratings (Concerns)

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**Panel B: Performance Concern Indicators, *ENV* Concerns**

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<i>Hazardous Waste</i>	The company's liabilities for hazardous waste sites exceed \$50 million, or the company has recently paid substantial fines or civil penalties for waste management violations.
<i>Regulatory Problems</i>	The company has recently paid substantial fines or civil penalties for violations of air, water, or other environmental regulations, or it has a pattern of regulatory controversies under the Clean Air Act, Clean Water Act or other major environmental regulations.
<i>Substantial Emissions</i>	The company's legal emissions of toxic chemicals (as defined by and reported to the EPA) from individual plants into the air and water are among the highest of the companies followed by KLD.
<i>Agricultural Chemicals</i>	The company is a substantial producer of agricultural chemicals, i.e., pesticides or chemical fertilizers.
<i>Climate Change</i>	The company derives substantial revenues from the sale of coal or oil and its derivative fuel products, or the company derives substantial revenues indirectly from the combustion of coal or oil and its derivative fuel products. Such companies include electric utilities, transportation companies with fleets of vehicles, auto and truck manufacturers, and other transportation equipment companies. In 1999, KLD added the climate Change Concern.
<i>Other Concern</i>	The company has been involved in an environmental controversy that is not covered by other KLD ratings.

# Data

## Environmental performance measures

- $ENV_{Strengths}$  = Sum of all strengths
- $ENV_{Concerns}$  = Sum of all concerns
- 582 U.S. public companies, 1995-2006 period

## Credit risk measures

- 2,242 bond issues (yield spreads & bond ratings)
- 6,420 long-term issuer ratings

## Control variables

- Bond characteristics
  - *Seniority, time-to-maturity, issue size, credit grade, exclude non-standard components*
- Company characteristics
  - *Leverage, size, capital intensity, interest coverage, ROA, operating loss*

# Industry Distribution

<i>SIC Division</i>	<i>Cost of Debt</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
Agriculture, Forestry, Fishing	0.05 %	0.04 %	0.21 %
Mining	3.88 %	4.06 %	5.14 %
Construction	2.34 %	2.25 %	1.44 %
Manufacturing	41.66 %	40.84 %	45.01 %
Transportation, Communication, Electric, Gas, Sanitary services	19.34 %	19.56 %	17.94 %
Wholesale Trade	2.34 %	2.25 %	2.58 %
Retail Trade	7.61 %	7.95 %	7.79 %
Finance, Insurance, Real estate Services	13.03 %	13.86 %	9.74 %
Nonclassifiable establishment	0.19 %	0.22 %	0.48 %
<i># Observations</i>	<i>2,119</i>	<i>2,242</i>	<i>6,447</i>

# Cost of Debt Regressions

$$\ln(\text{Spread}) = f(\text{ENV}, \text{Issuer Characteristics}, \text{Issue Characteristics})$$

	(1b)	(1c)
ENV <sub>Strengths</sub>	-0.0387** (-2.06)	-0.0839*** (-4.79)
ENV <sub>Concerns</sub>	0.0491*** (2.91)	0.0388*** (3.04)
BRmod		-0.3259*** (-14.15)
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup>	0.70	0.74
# Observations	2,119	2,068

\* p≤0.1, \*\* p≤0.05, \*\*\* p≤0.01

# Economic Significance

Bond characteristics	Median	Mean
Issue size	\$300 mio.	\$440 mio.
Annual yield spread	120 bps (\$3.6 mio.)	150 bps (\$6.6 mio.)
Time-to-maturity	10 years	12.5 years

Estimated impact on the cost of debt	Based on median yield spread	Based on mean yield spread
$\Delta \text{ENV}_{\text{Strengths}}$ (Std.Dev.)	- 6 bps	- 7 bps
$\Delta \text{ENV}_{\text{Concerns}}$ (Std.Dev.)	+ 5 bps	+ 6 bps
Maximal difference (best vs. worst)	64 bps	80 bps

# Credit Rating Regressions

*Bond ratings* =  $f(\text{ENV}, \text{Issuer characteristics}, \text{Issue characteristics})$

*Issuer ratings* =  $f(\text{ENV}, \text{Issuer characteristics})$

	<i>Bond Ratings</i>	<i>Issuer Ratings</i>
ENV <sub>Strengths</sub>	0.1622* (1.93)	0.0745 (1.48)
ENV <sub>Concerns</sub>	-0.1925** (-2.18)	-0.1458** (-2.09)
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>
Pseudo R <sup>2</sup>	0.34	0.23
# Observations	2,242	6,420

\* p=0.1, \*\* p=0.05, \*\*\* p=0.01

## Breaking down the Credit Risk Effect:

### *Environmental Performance Categories*

	<i>ln(Spread)</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
ENV <sub>Strengths</sub>			
Beneficial Products	-0.1900*** (-3.47)	0.0393 (0.15)	0.3550*** (4.08)
Pollution Prevention	0.0023 (0.03)	0.2461 (0.68)	0.1898 (0.85)
Recycling	-0.1257 (-1.45)	-0.0118 (-0.04)	-0.3450* (-1.72)
Clean Energy	-0.0704*** (-2.62)	0.2721** (2.08)	0.1207 (0.42)
Other Strength	-0.1856** (-2.00)	0.2888* (1.88)	-0.1082 (-0.72)
ENV <sub>Concerns</sub>			
Hazardous Waste	0.0197 (0.43)	-0.4161 (-1.37)	-0.3515* (-1.90)
Regulatory Problems	0.1339** (2.15)	-0.5917* (-1.95)	-0.6784*** (-3.11)
Substantial Emissions	0.1478** (2.46)	-0.5933 (-1.59)	-0.4252** (-2.33)
Agricultural Chemicals	0.0794** (2.21)	-0.4475 (-1.34)	0.0022 (0.01)
Climate Change	0.1395*** (2.86)	-0.6838* (-1.73)	-0.5341** (-2.02)
Other Concern	0.1697*** (4.05)	-0.1842 (-0.74)	0.1668 (0.59)
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.72	0.35	0.26
# Observations	1,545	1,674	5,291

# High-Risk Industries

	<i>ln(Spread)</i>	<i>ln(Spread)</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
ENV <sub>Strengths</sub>	-0.0811*** (-4.24)	-0.0297 (-1.11)	0.1289 (1.21)	0.0017 (0.03)
ENV <sub>Concerns</sub>	0.0474*** (3.02)	0.0578*** (2.58)	-0.2026* (-1.72)	-0.1341 (-1.19)
ENV <sub>Strengths</sub> * HighRisk	-0.0144 (-0.38)	-0.0278 (-0.55)	0.1348 (0.96)	0.2074** (2.44)
ENV <sub>Concerns</sub> * HighRisk	-0.0208 (-1.18)	-0.0285 (-0.88)	0.0060 (0.03)	-0.0170 (-0.12)
HighRisk	-0.1971*** (-2.81)	-0.1912* (-1.88)	0.1792 (0.30)	-0.7395 (-1.50)
BRmod	-0.3255*** (-14.04)			
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.74	0.64	0.34	0.23
# Observations	2,068	2,119	2,242	6,420

\* p≤0.1, \*\* p≤0.05, \*\*\* p≤0.01

# Paper & Allied Products Industry

	<i>ln(Spread)</i>	<i>ln(Spread)</i>	<b>Bond Rating</b>	<b>Issuer Rating</b>
ENV <sub>Strengths</sub>	-0.0761*** (-4.64)	-0.0285 (-1.24)	0.1616* (1.76)	0.0709 (1.28)
ENV <sub>Concerns</sub>	0.0421*** (3.31)	0.0437** (2.31)	-0.1522* (-1.70)	-0.1334* (-1.81)
ENV <sub>Strengths</sub> *P&A	-0.1330*** (-7.37)	-0.1464*** (-5.41)	0.0692 (0.72)	0.1210* (1.82)
ENV <sub>Concerns</sub> *P&A	-0.0291* (-1.91)	0.0557*** (2.57)	-0.6163*** (-4.74)	-0.2354*** (-2.72)
P&A	-1.0938*** (-15.62)	-1.2937*** (-25.55)	1.0499*** (5.51)	-0.4527** (-2.14)
BRmod	-0.3273*** (-13.96)			
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.74	0.64	0.34	0.23
# Observations	2,068	2,119	2,242	6,420

\* p≤0.1, \*\* p≤0.05, \*\*\* p≤0.01

# Environmental management effect over time

1995 – 2001				
	<i>ln(Spread)</i>	<i>Spread</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
ENV <sub>Strengths</sub>	-0.1266*** (-2.87)	-19.17*** (-3.26)	0.2105 (1.28)	0.0571 (0.71)
ENV <sub>Concerns</sub>	-0.0084 (-0.29)	-1.78 (-0.44)	-0.1479 (-1.42)	-0.0794 (-0.87)
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.52	0.43	0.33	0.17
#Observations	1,114	1,117	1,195	2,323

2002 – 2006				
	<i>ln(Spread)</i>	<i>Spread</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
ENV <sub>Strengths</sub>	-0.0251* (-1.70)	-4.82* (-1.75)	0.1480 (0.98)	0.0651 (0.77)
ENV <sub>Concerns</sub>	0.0852*** (3.99)	13.63*** (3.19)	-0.2285** (-2.34)	-0.2147*** (-3.86)
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.68	0.53	0.35	0.26
#Observations	954	975	1,047	4,097

# Robustness Checks

- Control for industry membership
  - Effect of aggregate environmental performance
  - Ordinary yield spread regressions
  - Marginal effects analysis for credit rating regressions
  - Clustering of standard errors at different levels
- *Findings robust to all of the abovelisted tests*
- *Measures do not capture an omitted default risk (Chava, 2010)*

# Implications for Banks

- Theoretical arguments and findings also apply to banks:
  - Additional risk through lender liability (e.g., CERCLA in the U.S.)
  - Bank initiatives and their effect on cost of capital (Equator Principles, CERES)
  - Impact of environmental management on bank loans very similar to the findings in our study (Chava, 2010)
- Credit screening:
  - An understanding of country-specific environmental regulations is crucial
  - Identifying current and future environmental liabilities
    - Accounting opacity, M&A activities, strategic default, ...

# Conclusions

- Environmental management has value implications for lenders:
  - Significant effect on spread of newly issued bonds (64 bps, p.a.)
  - Effect holds for regulated and non-regulated environmental activities
  - Climate change and regulatory issues appear to matter the most
  - Effect has increased significantly over the last decade
  - Effect not restricted to high-risk industries
  - Proactive engagement associated with lower yields
- Incorporating environmental performance into the credit assessment of firms offers potential for more accurate bond pricing and enhanced risk management

# Caveats and Challenges

- Crude measures of environmental performance
  - *Limits accuracy of our estimates*
  - *Complicates environmental risk assessment in practice*
  - *Offers profit opportunities through information advantage*
- Study limited to large public corporations and new bond issues
  - *Small companies more prone to environmental risks?*
  - *Ignores risk exposure to supply channels & foreign operations*
- Can the relation be exploited in portfolio strategies?
  - *Lack of bond return data, liquidity issues in credit markets*

# Robustness Tests

## *(Tables)*

# Ordinary Yield Spread Regressions

	<i>Spread</i>			
	<i>(I.b)</i>	<i>(I.c)</i>	<i>(II.b)</i>	<i>(II.c)</i>
ENV <sub>Strengths</sub>	-5.0513 (-1.29)	-11.8094*** (-3.50)		
ENV <sub>Concerns</sub>	8.0024*** (3.03)	5.9395*** (3.04)		
ENV <sub>Total</sub>			-7.0636*** (-3.79)	-6.6796*** (-4.23)
BRmod		-50.8564*** (-10.33)		-50.8462*** (-10.25)
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup>	0.62	0.61	0.62	0.61
# Observations	2,148	2,093	2,148	2,093

\* p≤0.1, \*\* p≤0.05, \*\*\* p≤0.01

## Marginal Effects Analysis:

### *Bond Ratings*

	CCC-D	B	BB	BBB	A	AA	AAA
ENV <sub>Strengths</sub>	0.0000 (-0.54)	-0.0004 (-1.18)	-0.0106* (-1.87)	-0.0526* (-1.92)	0.0585* (1.94)	0.0050 (1.63)	0.0001 (0.79)
ENV <sub>Concerns</sub>	0.0000 (0.54)	0.0004 (1.12)	0.0126** (2.00)	0.0625** (2.18)	-0.0695** (-2.20)	-0.0060* (-1.72)	-0.0001 (-0.86)
Leverage	0.0000 (0.63)	0.0000* (1.67)	0.0011*** (3.51)	0.0053*** (3.73)	-0.0059*** (-3.77)	-0.000***5 (-3.22)	0.0000 (-0.94)
Size	0.0000 (-0.66)	-0.0013* (-1.66)	-0.0403*** (-5.40)	-0.2001*** (-5.29)	0.2224*** (5.47)	0.0191*** (4.50)	0.0002 (0.96)
Capital Intensity	0.0000 (-0.60)	0.0000 (-1.43)	-0.0005*** (-3.47)	-0.0023*** (-3.02)	0.0025*** (3.15)	0.0002** (2.57)	0.0000 (1.05)
Interest Coverage	0.0000 (-0.63)	-0.0001* (-1.71)	-0.0021** (-2.47)	-0.0105** (-2.22)	0.0116** (2.25)	0.0010** (2.56)	0.0000 (0.92)
ROA	0.0000 (-0.63)	-0.0002 (-1.37)	-0.0049*** (-3.47)	-0.0242*** (-4.11)	0.0269*** (4.17)	0.0023*** (2.83)	0.0000 (0.91)
Loss <sup>+</sup>	0.0001 (0.52)	0.0107 (1.12)	0.1366** (2.43)	0.1633*** (7.98)	-0.2983*** (-5.98)	-0.0123*** (-2.97)	-0.0001 (-0.86)
Subordinated <sup>+</sup>	0.0003 (0.64)	0.0239 (1.17)	0.2151** (2.53)	0.1253** (2.03)	-0.3517*** (-8.06)	-0.0127*** (-3.12)	-0.0001 (-0.85)
Time-to-maturity	0.0000 (-0.55)	0.0000 (-1.15)	-0.0004** (-1.97)	-0.0022** (-2.34)	0.0025** (2.35)	0.0002* (1.65)	0.0000 (0.89)
Issue size	0.0000 (0.00)	0.0000 (0.00)	0.0000 (0.00)	-0.0001 (0.00)	0.0001 (0.00)	0.0000 (0.00)	0.0000 (0.00)

\*\*\* p≤0.01, \*\* p≤0.05, \* p≤0.1

<sup>+</sup> dy/dx is for a discrete change of dummy variable from 0 to 1

## Marginal Effects Analysis:

### Issuer Ratings

	CCC-D	B	BB	BBB	A	AA	AAA
ENV <sub>Strengths</sub>	0.0000 (-1.31)	-0.0105 (-1.50)	-0.0180 (-1.45)	0.0089 (1.38)	0.0183 (1.52)	0.0013 (1.31)	0.0001 (1.23)
ENV <sub>Concerns</sub>	0.0001 (1.06)	0.0206* (1.89)	0.0353** (2.18)	-0.0175** (-2.15)	-0.0358** (-2.04)	-0.0025 (-1.63)	-0.0002 (-1.09)
Leverage	0.0000 (1.29)	0.0015*** (3.69)	0.0025*** (3.47)	-0.0012*** (-3.18)	-0.0025*** (-3.75)	-0.0002*** (-2.64)	0.0000 (-1.52)
Size	-0.0004 (-1.31)	-0.0789*** (-8.71)	-0.1352*** (-7.36)	0.0670*** (5.31)	0.1369*** (11.83)	0.0096*** (3.24)	0.0009 (1.45)
Capital Intensity	0.0000 (-1.10)	-0.0006*** (-3.45)	-0.0011*** (-3.31)	0.0005*** (3.19)	0.0011*** (3.43)	0.0001** (2.56)	0.0000 (1.26)
Interest Coverage	0.0000 (-0.53)	-0.0001 (-0.50)	-0.0002 (-0.51)	0.0001 (0.51)	0.0002 (0.51)	0.0000 (0.49)	0.0000 (0.44)
ROA	0.0000 (-1.30)	-0.0080*** (-6.26)	-0.0137*** (-9.93)	0.0068*** (6.60)	0.0139*** (9.82)	0.0010*** (2.94)	0.0001 (1.40)
Loss <sup>+</sup>	0.0005 (1.13)	0.0697*** (4.85)	0.0841*** (5.06)	-0.0669*** (-3.93)	-0.0824*** (-5.97)	-0.0046*** (-3.31)	-0.0004 (-1.34)
Subordinated <sup>+</sup>	0.0004 (1.22)	0.0584*** (3.79)	0.0799*** (4.17)	-0.0545*** (-3.42)	-0.0790*** (-4.39)	-0.0048*** (-3.13)	-0.0004 (-1.47)

\*\*\* p≤0.01, \*\* p≤0.05, \* p≤0.1

<sup>+</sup> dy/dx is for a discrete change of dummy variable from 0 to 1

# Aggregate Environmental Performance Score

	<i>ln(Spread)</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
ENV <sub>Total</sub>	-0.0459*** (-5.39)	0.1826** (2.55)	0.1239*** (2.85)
BRmod	-0.3257*** (-14.13)		
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.74	0.34	0.23
# Observations	2,068	2,242	6,420

\*\*\* p≤0.01, \*\* p≤0.05, \* p≤0.1



# Breaking down the Credit Risk Effect (2002-2006):

*Environmental  
Performance Categories  
Most Recent Time Period*

	<i>ln(Spread)</i>	<i>Spread</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
ENV <sub>Strengths</sub>				
Beneficial Products	-0.0980** (-2.23)	-6.5204 (-0.47)	0.2182 (0.55)	0.4114*** (3.82)
Pollution Prevention	0.0279 (0.32)	10.2347 (0.64)	0.3726 (0.66)	0.2844 (1.12)
Recycling	-0.0485 (-0.47)	-3.0209 (-0.15)	-0.0831 (-0.23)	-0.2507 (-1.13)
Clean Energy	-0.0886** (-2.35)	-18.9682*** (-2.74)	0.1408 (0.67)	0.1358 (0.46)
Other Strength	-0.2292*** (-2.97)	-29.0479** (-2.01)	0.4299 (1.47)	-0.0985 (-0.51)
ENV <sub>Concerns</sub>				
Hazardous Waste	0.0671 (0.99)	9.0009 (0.76)	-0.3009 (-0.83)	-0.4675*** (-2.72)
Regulatory Problems	0.2009*** (2.73)	41.7625*** (3.51)	-0.4808 (-1.09)	-0.8118*** (-3.85)
Substantial Emissions	0.2274*** (2.85)	38.9302*** (2.73)	-0.9263** (-2.07)	-0.5972*** (-3.16)
Agricultural Chemicals	0.0466 (0.80)	-10.5366 (-0.79)	-0.1232 (-0.67)	-0.1982 (-1.05)
Climate Change	0.2332*** (3.09)	56.2877*** (5.99)	-0.7896** (-1.99)	-0.5860** (-2.36)
Other Concern	0.1291*** (2.47)	9.9276 (1.01)	-0.1122 (-0.29)	0.0687 (0.23)
<i>Year Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Industry Fixed Effects</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Adj. R <sup>2</sup> / Pseudo R <sup>2</sup>	0.74	0.53	0.37	0.28
# Observations	963	984	1,674	5,291

\* p≤0.1, \*\* p≤0.05, \*\*\* p≤0.01



# Appendix

# Summary Statistics

Variable	# Obs.	Mean	Std. Dev.	Median	Min	Max
<i>Environmental Performance</i>						
ENV <sub>Strengths</sub>	2,242	0.30	0.59	0	0	4
ENV <sub>Concerns</sub>	2,242	0.67	1.06	0	0	5
ENV <sub>Total</sub>	2,242	-0.37	1.07	0	-4	4
<i>Credit Risk Measures</i>						
Spread (in bp)	2,119	149.85	104.59	120	3	945
Bond Rating	2,242	4.41	0.93	4	1	7
Issuer Rating	6,420	3.73	1.18	4	1	7
<i>Issuer Specific Controls</i>						
Leverage (%)	2,242	69.38	15.18	68.62	36.08	123.09
Size (in BM\$)	2,242	39.21	93.63	12.54	0.28	979.41
Capital Intensity (%)	2,242	57.64	40.28	53.82	0.06	174.85
Interest Coverage	2,242	9.17	8.99	6.21	-1.51	45.96
ROA (%)	2,242	4.23	4.59	3.64	-21.73	15.76
Loss	2,242	0.03	0.18	0	0	1
<i>Issue Specific Controls</i>						
Subordinated	2,242	0.02	0.15	0	0	1
TTM (in years)	2,242	12.50	11.85	10	0.25	100
Issue Size (in MM\$)	2,242	438.66	399.14	300	10	2,500
Speculative	2,242	0.13	0.34	0	0	1

# Credit Rating Classification Schedule

**Panel A: Recoding Schedule for Rating Classifications**

<i>Moody's Rating</i>	<i>S&amp;P Rating</i>	<i>Compustat (data280)</i>	<i>Assigned Rating Code</i>	<i>Rating Grade</i>
Aaa	AAA	2	7	Investment
Aa1	AA+	4	6	Investment
Aa2	AA	5	6	Investment
Aa3	AA-	6	6	Investment
A1	A+	7	5	Investment
A2	A	8	5	Investment
A3	A-	9	5	Investment
Baa1	BBB+	10	4	Investment
Baa2	BBB	11	4	Investment
Baa3	BBB-	12	4	Investment
B1	BB+	13	3	Speculative
B2	BB	14	3	Speculative
B3	BB-	15	3	Speculative
B	B+	16	2	Speculative
B2	B	17	2	Speculative
B3	B-	18	2	Speculative
Caa1	CCC+	19	1	Speculative
Caa2	CCC	20	1	Speculative
Caa3	CCC-	21	1	Speculative
Ca	CC	23	1	Speculative
C	D, SD	27, 29	1	Speculative

# Credit Rating Distribution

## Panel B: Distributions of Bond and Issuer Ratings

<i>Assigned Rating Code</i>	<i>Bond Rating</i>	<i>Issuer Rating</i>
7 (AAA)	1.41 %	0.75 %
6 (AA <sup>+</sup> to AA <sup>-</sup> )	8.34 %	16.94 %
5 (A <sup>+</sup> to A <sup>-</sup> )	36.47 %	26.85 %
4 (BBB <sup>+</sup> to BBB <sup>-</sup> )	40.44 %	29.17 %
3 (BB <sup>+</sup> to BB <sup>-</sup> )	10.11 %	21.96 %
2 (B <sup>+</sup> to B <sup>-</sup> )	2.78 %	3.25 %
1 (CCC <sup>+</sup> to D)	0.44 %	1.08 %
# <i>Observations</i>	2,256	5,568