Environmental Externalities and Cost of Capital

Sudheer Chava
Associate Professor of Finance
College of Management
Georgia Institute of Technology
How can environmental externalities be internalized by a firm?

- **Regulation**
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- Taxes
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- Socially Responsible Investing
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- Regulation
- Taxes
- Socially Responsible Investing
- Environmentally Responsible Lending
Motivation: Socially Responsible Investing

Socially Responsible Investing (SRI)

- **$3.07 trillion** in assets tied to SRI in the U.S. as of 2010.
- **12.2%** of total assets under management in the U.S.

**SRI Strategies**

- Incorporation of **environmental**, social and governance (ESG) factors into investment analysis and portfolio construction
- The filing or co-filing of shareholder resolutions on ESG issues and,
- Deposits or investments in banks, credit unions, venture capital funds that have a specific mission of community investing

Source: Social Investment Forum’s 2010 Trends in Socially Responsible Investing Trends
...Faced with mounting pressure from protest groups, ten of the world’s leading banks have agreed to adhere to international environmental and social-impact standards when financing dams, power plants, pipelines and other infrastructure projects... (Wall Street Journal, June 4, 2003)
Motivation: Environmentally Responsible Lending

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- Citigroup Inc., JPMorgan Chase & Co. and Morgan Stanley say they’ve produced The Carbon Principles together with several large power companies, Environmental Defense and the Natural Resources Defense Council, that will make it more difficult for new U.S. coal-fired power plants to secure financing. The focus of the principles will be to steer power companies away from plants that emit high levels of carbon dioxide (a greenhouse gas) and to focus on new, cleaner and renewable technologies. ... (Associated Press, Feb 4, 2008).
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- After years of legal entanglements arising from environmental messes and increased scrutiny of banks that finance the dirtiest industries, several large commercial lenders are taking a stand on industry practices that they regard as risky to their reputations and bottom lines... (Banks Grow Wary of Environmental Risks, New York Times, Aug 31, 2010)
Equator Principles

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- Signatories include Bank of America, Citibank, J.P. Morgan Chase
CERES and RiskMetrics Survey

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- Several U.S. and European banks have made multibillion dollar investments or financing commitments in the clean energy sector.
Exclusionary ethical investing can lead to polluting firms being held by fewer investors, a lower stock price for polluting firms and, an increase in their cost of capital (Heinkel, Kraus, Zechner (2001)). Similarly, socially responsible lending can lead to an increase in the cost of capital for the affected firms if a significant number of lenders adopt environmentally sensitive lending policies and firms can't easily substitute between various sources of capital.
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- Potential to impact the environmental policies of firms through the cost of capital channel
Research Questions

Does the environmental profile of a firm affect
- the firm’s cost of equity capital?
- the firm’s cost of debt capital?
Firm Level Environmental Data

Source: KLD Stats

- information on environmental concerns and environmental strengths for a large sample of firms
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Firm’s Environmental Profile

- Environmental Concerns
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  - Substantial Emission Concerns
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- Environmental Strengths
  - Environmentally Beneficial Product Strength
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  - Clean Energy Strength
  - Environmental Communication Strength
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number of strengths is the total number of environmental strengths for the firm recorded in the KLD database.

net concerns is a net measure of environmental concerns and is constructed as number of concerns - number of strengths.

climate score is constructed as the difference of climate change concerns and clean energy strength.
Expected Stock Returns

- Implied Cost of Capital (ICC) as a proxy for exante expected stock returns

- ICC is computed using discounted cash flow model of equity valuation following Lee, Gebhardt and Swaminathan (2001), Pastor, Sinha and Swaminthan (2007), and Chava and Purnanandam (2009)

- ICC is the internal rate of return that equates the present value of free cash flows to equity to current stock price.

- ICC as a proxy for expected returns
  - Advantages: a forward looking measure, doesn’t explicitly rely on any asset pricing model, and doesn’t need long sample periods.
  - Disadvantages: requires assumptions on model inputs such as forecasting horizon and dividend payouts. Important to perform several sensitivity analyses.
### Panel C: Desc. Stats for the Firm Level Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev.</th>
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<td><strong>Inputs for expected return computation</strong></td>
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<td>0.0856</td>
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Source for Bank Loan Data: Dealscan

- distributed by the Loan Pricing Corporation (Reuters)
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- approximately 50,000 facilities can be linked firm level balance sheet information in Compustat (using Chava and Roberts (2008) link file)
- merging with the KLD database results in 5879 bank loans to non-financial firms during 1992 – 2007
key dependent variable: log of loan spread aisd (all-in-spread-drawn).
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- adds the spread of the loan with any annual fees (or facility fee) paid to the bank
### Panel C: Desc. Stats for Loan and Firm Level Variables

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<th>median</th>
<th>std. dev.</th>
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<td>loanmat (months)</td>
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<td>perfprice</td>
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<td>termloan</td>
<td>0.19</td>
<td>0.00</td>
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<tr>
<td><strong>Firm-Level Characteristics</strong></td>
<td></td>
<td></td>
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<tr>
<td>assets (billions $US)</td>
<td>7.83</td>
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<td>0.00</td>
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<td>invgrade</td>
<td>0.50</td>
<td>1.00</td>
<td>0.50</td>
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<tr>
<td><strong>Macro Variables</strong></td>
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<tr>
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All regressions include (based on Chava and Purnanandam (2010))

- log(total assets)
- leverage
- market to book ratio
- past one month stock return
- standard deviation of firm's daily stock returns over the past year
- year fixed effects

Separate specifications with and without industry fixed effects (2-digit SIC)

Standard errors are clustered at the firm level
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- **Standard errors are clustered at the firm level**
## Impact of Environmental Concerns and Strength Indices on ICC

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Sudheer Chava
Environmental Externalities
Nov 2011 21 / 35
### Impact of Individual Environmental Concerns on Bank Loan Spreads

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Sudheer Chava
Environmental Externalities
Nov 2011
## Impact of Individual Environmental Strengths on ICC

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| **R²**              | 0.218        | 0.363        | 0.218        | 0.363        | 0.218        | 0.363        | 0.222        | 0.360        |
| **N**               | 13114        | 13114        | 13114        | 13114        | 13114        | 13114        | 10783        | 10783        |

| control variables   | yes          | yes          | yes          | yes          | yes          | yes          | yes          | yes          |
| industry fixed effects | no          | yes          | no           | yes          | no           | yes          | no           | yes          |
| year fixed effects  | yes          | yes          | yes          | yes          | yes          | yes          | yes          | yes          |
| std err clustering  | firm         | firm         | firm         | firm         | firm         | firm         | firm         | firm         |
### Impact of Individual Environmental Strengths on Bank Loan Spreads

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|                  |        |        |        |        |        |        |        |        |
| \text{R}^2       | 0.631  | 0.717  | 0.630  | 0.717  | 0.630  | 0.717  | 0.625  | 0.706  |
| \text{N}         | 5879   | 5879   | 5879   | 5879   | 5879   | 5879   | 5186   | 5186   |

- Control variables: yes, yes, yes, yes, yes, yes, yes, yes
- Loan level controls: yes, yes, yes, yes, yes, yes, yes, yes
- Macro variables: yes, yes, yes, yes, yes, yes, yes, yes
- Industry fixed effects: no, yes, no, yes, no, yes, yes, yes
- Year fixed effects: yes, yes, yes, yes, yes, yes, yes, yes
- Std err clustering: firm, firm, firm, firm, firm, firm, firm, firm

Sudheer Chava

Environmental Externalities

Nov 2011
ICC Results: Possible Explanations

Why do investors demand higher expected returns on stocks with environmental concerns?

- Risk
Why do investors demand higher expected returns on stocks with environmental concerns?

- Risk
  - Regulatory Risk
Why do investors demand higher expected returns on stocks with environmental concerns?

- Risk
  - Regulatory Risk
  - Litigation and Compliance Costs for Borrower
Why do investors demand higher expected returns on stocks with environmental concerns?

- Risk
  - Regulatory Risk
  - Litigation and Compliance Costs for Borrower
  - Credit Risk
Why do investors demand higher expected returns on stocks with environmental concerns?

- Risk
  - Regulatory Risk
  - Litigation and Compliance Costs for Borrower
  - Credit Risk

- Exclusionary Socially Responsible Investing
Why would lenders consider the environmental profile of the firm in pricing loans?

- Credit Risk
Why would lenders consider the environmental profile of the firm in pricing loans?

- Credit Risk
  - Regulatory Risk
Why would lenders consider the environmental profile of the firm in pricing loans?

- Credit Risk
  - Regulatory Risk
- Litigation and Compliance Costs for Borrower
Why would lenders consider the environmental profile of the firm in pricing loans?

- Credit Risk
  - Regulatory Risk
  - Litigation and Compliance Costs for Borrower

- Lender Liability Laws
Why would lenders consider the environmental profile of the firm in pricing loans?

- Credit Risk
  - Regulatory Risk
  - Litigation and Compliance Costs for Borrower
- Lender Liability Laws
- Reputation Risk for the lender
All the original signatories of Equator Principles had been the targets of NGO campaigns beforehand.
Reputation Risk for the lender

- All the original signatories of Equator Principles had been the targets of NGO campaigns beforehand.
- Environmental action groups have...
Reputation Risk for the lender

- All the original signatories of Equator Principles had been the targets of NGO campaigns beforehand.
- Environmental action groups have persuaded supporters to cut up their credit cards and mail them back to the company.
Reputation Risk for the lender

- All the original signatories of Equator Principles had been the targets of NGO campaigns beforehand.

- Environmental action groups have
  - persuaded supporters to cut up their credit cards and mail them back to the company,
  - introduced shareholder proposals related to environmental policies.
Reputation Risk for the lender

- All the original signatories of Equator Principles had been the targets of NGO campaigns beforehand.

- Environmental action groups have:
  - persuaded supporters to cut up their credit cards and mail them back to the company,
  - introduced shareholder proposals related to environmental policies,
  - kept the pressure on banks financing mountain top removal coal mining and tar sand exploration.
Reputation Risk for the lender

- All the original signatories of Equator Principles had been the targets of NGO campaigns beforehand
- Environmental action groups have
  - persuaded supporters to cut up their credit cards and mail them back to the company,
  - introduced shareholder proposals related to environmental policies
  - kept the pressure on banks financing mountain top removal coal mining and tar sand exploration.
  - For example, Bank of America announced its withdrawal from mountain top removal, with other banks being reluctant to step into financing tar sands.
Are Environmental Concerns and Strengths Proxying for an Omitted Component of Firm’s Default Risk?

Bankruptcy Model

- Bankruptcy data from Chava and Jarrow (2004) and Chava, Stefanescu and Turnbull (2008)
- Sample period is 1990-2008
- Cox proportional hazards model
- Dependent variable is bankruptcy set to one if the firm has filed for bankruptcy that year and zero otherwise
- Shumway (2001) variables: net income to total assets, total liabilities to total assets, volatility of stock returns, excess return and relative size
Are Environmental Concerns and Strengths Proxying for an Omitted Component of Firm’s Default Risk?

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## Impact of Environmental Concerns and Strengths on Institutional Ownership

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### Impact of Environmental Concerns and Strengths on # of Institutional Owners

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Sudheer Chava  Environmental Externalities  Nov 2011  31 / 35
### Impact of Environmental Profile on the Loan Syndicate Size

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Yes. The environmental profile of a firm affects the expected stock returns.
Yes. The environmental profile of a firm affects the expected stock returns

- Environmental Concerns: increases the ICC

But it is a challenging task to conclusively rule out the risk story

Why do investors expect higher returns on stocks with environmental concerns?

- Stocks with environmental concerns have a lower institutional ownership and are held by fewer institutional investors

Consistent with exclusionary socially responsible investing having an impact on the expected returns
Yes. The environmental profile of a firm affects the expected stock returns

- Environmental Concerns: increases the ICC
- Environmental Strengths: no meaningful relation with ICC
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Environmental profile is not simply proxying for an omitted component of default risk of the firm.
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Yes. The environmental profile of a firm affects the price and non-price terms of its bank loans.
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- Environmental Concerns: increases loan spreads
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Why would lenders consider the environmental profile of the firm in pricing loans?
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- Lower syndicate size for firms with environmental concerns
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Consistent with reputation risk channel.
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Consistent with reputation risk channel.

But it is a challenging task to conclusively rule out the risk story.
Socially responsible investing / lending

- can increase the cost of capital of firms with environmental concerns
Socially responsible investing / lending

- can increase the cost of capital of firms with environmental concerns

- has a potential to impact the environmental policies of the firm through the cost of capital channel