« Assessing corporate and sovereign intangible capital »
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Measuring the effect of government ESG performance on sovereign borrowing cost

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Research overview

- **Motivation**
- **Literature**
- **Research question & findings**
- **Data**
- **Methodology & Results**
- **Conclusion**

Motivation

Sovereign bonds: a safe asset?

- Sovereign bonds issued by developed countries had long been considered a safe haven for institutional investors' assets.

- The euro crisis has reminded us that the debt of the highest-rated countries can be volatile

  Fiscal deficits in the G-7 countries widened to 5 - 15 % of GDP in 2009.
  The net general government debt of these countries is projected to rise to their highest levels in many decades (Gruber, 2013)

- "Risk-free sovereign bonds are no longer considered something that exists" (PRI, 2013)

- "If yield differentials reflect different default risks across states, they would be useful indicators for an efficient allocation of funds and a deterrent for irresponsible fiscal policies" (Codogno et al, 2003)

Literature

Sovereign bonds and country credit risk

- **The traditional determinants of a country's yield spread:**

  - ✓ Fiscal and macroeconomic conditions => credit risk
  - ✓ Size and depth of government's bond market => liquidity risk
  - ✓ International factors and risk aversion

⇒ Increasing importance of country specific factors and country credit risk since 2007 (Barrios et al 2009, Mody 2009)

- **Country credit risk explained by macroeconomic variables:**
  - ✓ Debt burden and Fiscal variables (Bernoth et al 2012, Gruber et al 2012)
  - ✓ Openness and terms of trade (Maltritz, 2012)
  - ✓ Financial health (Mody, 2009)

⇒ The debate on the stable and significant determinants of sovereign bond spreads is far from settled

Literature

Sovereign bonds and country credit risk

⇒ Even before the eruption of the sovereign debt crisis in Greece, policymakers and market participants had begun to focus on the potential effects of deteriorating (irresponsible) fiscal positions on government bond yields and, by extension, private capital formation and economic growth

- Other determinants of a country credit and public finance risk/responsibility:
  - ✓ **Governance factors**:
    - Political instability (Matei et al 2012, Hatchondo & Martinez, 2010)
    - Tax evasion (Artavanis et al, 2012)
    - Corruption (Connolly, 2007)
  - ✓ **Environmental performance**:
    Scholtens (2010), Margaretic and Pouget (2014)
  - ✓ **Social performance**:
    Mapplecroft (2014)

⇒ Recent research on “qualitative” ESG, factors to explain sovereign bond spreads

Literature

ESG and bonds markets

Several papers on **corporate** bonds and ESG factors:

Bauer et al.(2010): Firms with good employee relations have a lower cost of capital,

Bauer and Hann (2011): Green firms have a lower cost of capital

Oikonomou et al. (2013): higher CSR means lower spreads, esp. for long-term bonds

Few academic papers on **sovereign** bonds and ESG factors:

Margaretic Pouget (2014): focus on emerging markets, show that government bond spreads do depend on extrafinancial information

Drut (2010) : on OECD countries, SR sovereign bond portfolio without significant diversification cost

- Professional research: AXA IM (2013) , Union Investment (2012) MSCI (2012) :

ESG factors are hardly integrated into country credit rating because :

- **they are often considered qualitative (soft) as opposed to quantitative (hard) information**
- **and the link between ESG and default probability is difficult to establish (rare events)**

Research question & findings

- Central question: Does the ESG performance of developed countries affect their borrowing cost?

- Main finding: Country ESG scores appear to be a significant predictor of sovereign bond spreads

Data

Panel data of 23 OECD countries, from 2007 to 2012

- Country's borrowing cost : Yield spread

- The difference between the interest rate the government pays on its external US dollar denominated debt and the rate offered by US Treasury on debt of comparable maturity

- Country's performance on ESG criteria : Vigeo sustainability country ratings (SCR)

- Control variables: Macroeconomic fundamentals

Vigeo sustainability country rating

Themes taken into account by dimension

Environmental responsibility	
Participation in environmental	Air Biodiversity Water Land Information systems
Air emissions	climate change Ozone layer protection Local and regional air quality
Water	Measure of water withdrawal
Biodiversity	Percentage of threatened species Percentage of protected areas
Land use	Proportion of land covered by forest Evolution of the proportion of forest
Environmental pressure	Nuclear waste Energy consumption measures

Institutional responsibility	
Respect protection and human	Respect, protection and promotion of human rights Respect, protection and promotion of labor rights
Democratic institution	Political freedom and stability measure Control of corruption measure Independence of justice measure Market regulation measure Press freedom measure

Vigeo sustainability country rating

Themes taken into account by dimension

Social responsibility and solidarity	
Social protection	Inequality measure Total unemployment Youth unemployment
Education	Public education expenditure Primary school education enrollment Secondary school education enrollment
Health	Public health expenditure Mortality (Infant mortality, life expectancy) HIV/Aids prevalence rate Tuberculosis prevalence and death rates
Gender Equality	Gender equality Gender empowerment index
Development aid	Development aid measures
Safety and quality of policy	Participation in international conventions

- *For each rating, Vigeo selects several criteria representing either commitments or quantitative realizations.*
- *For each criterion, countries are rated on a scale ranging from 0 to 100 (the best grade).*
- *For the commitment criteria, i.e. the signature and ratification of treaties and conventions, the grade is: 0 if the country did not sign, 50 if the country signed but did not ratify, and 100 if the country signed and ratified.*
- *For the quantitative criteria, a score is computed such that: the 10 percent of worst-performing countries obtain a score of 10, and so on*

ESG variables

Which quantitative indicators weigh more in the SCR ratings ?

Dimension	Indicator	Description	Code
Environmen-	Electricity generation	Ability to generate electrical power by Terawatt hours	ELECT
tal	CO2 emissions	Estimates of CO2 emissions in millions oftonnes	CO2EM
	Forest rents per GDP	Represents the total natural resources rents per GDP	RENTS
	Protected areas	Terrestrial and marine protected areas as a total of territorial area	PROTE
Social	Social expenditure	Represents the provision by public (and private) institutions of benefits to individuals in order to provide support during circumstances which adversely affect their welfare	SOEXP
	Female to male labor rate	Closer the ratio is to 1, the more gender equal the economy	FEMAL
	Health expenditure	Reflecting the relative priority assigned to health	HLEXP
	RD Expenditure	Indicator of government and private sector efforts to obtain competitive advantage in science and technology	RDEXP
	Human development index	Composite statistic of life expectancy, education, and income indices used to assess country's human development	IDH
Governance	Rule of law	Measuring the quality of contract enforcement, police, and courts, and incidence of crime	RULES
	Regulatory quality	Represents the incidence of market-unfriendly policies	REGUL
	Government effectiveness	Measure of the competence of bureaucracy and the quality of public service delivery	EFFEC
	Corruption	Reflecting the abuse of public power for private gain	CORRU
	Voice and accountability	Captures political, civil and human rights	VOICE
	Political stability	Reflecting the likelihood of violent threats to, or changes in, government, including terrorism	POLTI

ESG determinants of SCR

Table 3: Regression of Vigeo SCR

Variable	Coefficient	St.Errors
ELECT	0.003***	0.001
CO2EM	0.014	0.020
RENTS	-6.863***	1.133
PROTE	0.112***	0.025
SOEXP	0.617***	0.060
FEMAL	0.547***	0.062
HLEXP	-2.827***	0.230
RDEXP	0.250	0.395
IDH	0.268***	0.062
RULES	0.249***	0.084
REGUL	0.169***	0.067
EFFEC	-0.071	0.097
CORRU	-0.357***	0.079
VOICE	0.216***	0.100
POLIT	0.0358**	0.018
Intercept	-1.410	7.295
R-sq	84.59	
Observations	138	

***,**,* significant respectively at 1%, 5%, 10%

Variables: bond spreads and controls

Countries borrowing cost measured by yield spread = difference between the interest rate the government pays on its external US dollar denominated debt and the rate offered by US Treasury on debt of comparable maturity.

2, 5 and 10 year maturity

7 country specific controls:

Table 5: Distribution of the variables

Variable	Mean	SD	Min	Max
Government Bond spread				
two-year maturity	1.66	2.31	-2.32	15.25
five-year maturity	1.43	2.21	-2.41	16.14
ten-year maturity	1.12	1.94	-2.54	11.68
Vigeo SCR[a]	77.75	4.85	67.21	88.71
$\Delta GDP/GDP$[b]	0.93	2.89	-8.54	6.78
$\Delta P/P$[c]	2.33	1.94	-2.75	12.40
$G.GV.Debt/GDP$[d]	66.02	41.53	-1.00	236.56
$Fis./GDP$[e]	1.028	21.479	141.024	-138.857
$Reserves/imports$[f]	2.936	3.360	0.032	18.251
$X + M/GDP$[g]	85.54	36.43	25.02	188.90
$S\&P$[h]	9.10	2.61	1	11

[a] = Our variable of interest: Sustainability country rating.
[b] = GDP growth.
[c] = Inflation rate.
[d] = Gross debt to GDP ratio.
[e] = Country's fiscal balance to GDP.
[f] = Ratio of reserves to imports.
[g] = Trade openness ratio.
[h] = Numerical variable assigning 1 to AAA rating, 2 to AA, 3 to A and so on.

Financial and extra-financial ratings

A high level of correlation is found between extra-financial (Vigeo) and financial ratings (S&P).
Countries with the highest ESG scores also boast the best credit ratings

Table 6: Pearson Correlation matrix

		1	2	3	4	5	6	7	
1	Vigeo SCR	1							
2	$\Delta GDP/GDP$	-0.04[a]	1						
3	$\Delta P/P$	-0.00	0.15	1					
4	$G.GV.Debt/GDP$	-0.32	-0.23	-0.20	1				
5	$Fis./GDP$	-0.164	0.169	-0.04	-0.042	1			
6	$Reserves/import$	-0.24	0.00	-0.053	0.45	0.08	1		
7	$X+M/GDP$	0.23	0.01	0.01	-0.11	-0.05	-0.34	1	
8	$S\&P$	0.41	0.02	-0.29	-0.26	0.28	-0.17	-0.03	1

[a] = Correlation coefficient between the GDP growth variable and the Vigeo SCR variable.

Bond spreads and sustainability ratings

Table 7: Mean spread by Vigeo SCR per country over the period 2007-2012

		Bond spreads		
Country	Vigeo (SCR)	2 years	5 years	10 years
Australia	75.15	3.146	2.592	1.946
Austria	79.13	0.693	0.706	0.551
Belgium	75.79	0.912	0.932	0.848
Canada	71.87	0.647	0.364	0.028
Czech Republic	79.90	1.297	1.104	0.901
Denmark	81.92	0.662	0.326	0.091
Finland	83	0.366	0.308	0.276
France	78.18	0.345	0.090	-0.039
Germany	79.41	0.492	0.478	0.489
Iceland	77.88	6.473	5.642	4.985
Ireland	77.23	3.169	3.106	3.181
Italy	72.37	2.117	2.132	2.073
Japan	71.46	-0.730	-1.350	-1.688
Korea	68.71	2.864	2.303	1.659
Netherlands	80.46	0.291	0.296	0.220
New Zealand	74.69	3.155	2.797	2.245
Norway	86.96	1.348	0.958	0.600
Poland	78.07	3.910	3.363	2.720
Portugal	71.04	4.220	4.593	3.794
Spain	75.15	1.920	2.038	1.840
Sweden	86.50	0.809	0.472	-0.068
Switzerland	81.91	-0.252	-0.663	-1.131
United Kingdom	80.99	0.395	0.441	0.307

High ESG countries have low sovereign bond spreads.

Longer maturity is associated with lower bond spreads.
(higher yields on loans with longer maturities, to cover the risk of lending over longer periods.)

Methodology & Results

- Model specification

$$Y_{it} = \beta_0 + \beta_1(VigeoSCR)_{it} + \beta_2(\frac{\Delta GDP}{GDP})_{it} + \beta_3(\frac{\Delta P}{P})_{it} + \beta_4(\frac{G.GV.Debt}{GDP})_{it} + \beta_5(\frac{Fis}{GDP})_{it} +$$

$$\beta_6(\frac{Reserves}{Import})_{it} + \beta_7(\frac{X+M}{GDP})_{it} + +\beta_8(S\&P)_{it} + \alpha_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where $i = 1$ to n (the number of countries) and $t = 1$ to T (the number of periods).

Fixed-effect panel model
Robustness checks (S&P rating and residuals from SCR estimates)

Results

Table 8: Regression of bond spreads (with country and time fixed effects)

	Bond Spreads		
	2 years	5 years	10 years
Intercept	32.093***	31.309***	22.531***
	(9.404)[s]	(8.456)	(6.148)
Vigeo SCR[a]	-0.308***	-0.279***	-0.189***
	(0.112)	(0.101)	(0.073)
$\Delta GDP/GDP$[b]	0.025	-0.012	-0.019
	(0.093)	(0.084)	(0.061)
$\Delta P/P$[c]	0.286***	0.162***	0.102
	(0.123)	(0.110)	(0.080)
$G.GV.Debt/GDP$[d]	-0.015	-0.012	-0.006
	(0.013)	(0.012)	(0.008)
$Fis./GDP$[e]	0.030	0.039	-0.011
	(0.064)	(0.058)	(0.042)
$Reserves/import$[f]	0.535***	0.459***	0.302***
	(0.147)	(0.132)	(0.096)
$X + M/GDP$[g]	-0.012	-0.010	-0.004
	(0.017)	(0.016)	(0.011)
$S\&P$[h]	-0.611***	-0.725***	-0.667**
	(0.160)	(0.144)	(0.105)
R-sq	70.09	73.77	82.02
F Test for no fixed effects	2.76***	3.22***	4.63***

***,**,* significant respectively at 1%, 5%, 10%

[a] = Our variable of interest: Sustainability country rating.
[b] = GDP growth.
[c] = Inflation rate.
[d] = Gross debt to GDP ratio.
[e] = Country's fiscal balance to GDP.
[f] = Ratio of reserves to imports.
[g] = Trade openness ratio.
[h] = Numerical variable assigning 1 to AAA rating, 2 to AA, 3 to A and so on.
[s] = standard error.

Results

Table .10: FE regression using Vigeo SCR Residuals

	Bond Spreads		
	2 year	5 year	10 year
Intercept	6.957***	8.630***	7.090***
	(2.684)[s]	(2.579)	(1.811)
Vigeo SCR Residuals [a]	0.091	0.049	0.010
	(0.102)	(0.098)	(0.069)
$\Delta GDP/GDP$[b]	-0.138	-0.152	-0.123*
	(0.104)	(0.100)	(0.071)
$\Delta P/P$[c]	0.191	0.120	0.118
	(0.155)	(0.149)	(0.105)
$G.GV.Debt/GDP$[d]	-0.006	-0.006	-0.004
	(0.013)	(0.012)	(0.008)
$Fis./GDP$[e]	-0.007	0.018	-0.031
	(0.062)	(0.060)	(0.042)
$Reserves/import$[f]	0.239	0.192	0.127
	(0.251)	(0.241)	(0.170)
$X+M/GDP$[g]	-0.008	-0.794	-0.708
	(0.017)	(0.016)	(0.011)
$S\&P$[h]	-0.699***	-0.794***	-0.708**
	(0.148)	(0.142)	(0.100)
R^2	78.49	78.30	85.04
F-Test for no fixed effects	3.86***	3.45***	4.66***

***,**,* significant respectively at 1%, 5%, 10%

[a] = The part of sustainability country rating not correlated to quantitative variables used on the first stage regression
[b] = GDP growth.
[c] = Inflation rate.
[d] = Gross debt to GDP ratio.
[e] = Country's fiscal balance to GDP.
[f] = Ratio of reserves to imports.
[g] = Trade openness ratio.
[h] = Numerical variable assigning 1 to BB, 2 to BB+ and so on through 11 to AAA.
[s] = standard error.

The variables in the first stage regression (not shown) are: electricity generation, Co2 emissions, Forest rents as GDP ratio, protected areas as a total of territorial area, social expenditure per GDP, Female to male labor force participation rate, health expenditure per GDP, R&D expenditure per GDP, Human development index, regulatory quality, rule of law, government effectiveness, political stability, voice and accountability and corruption control.

Results

- Inflation and reserves to imports ratio significantly increase sovereign borrowing cost, while S&P credit ratings significantly lowers spreads.
- The coefficient associated with the sustainability rating is negative and significant. Thus, there is a negative correlation between the countries' socially responsible performances and the cost of sovereign borrowing (bonds spread).
- Countries displaying higher ESG indicators are rewarded by paying lower sovereign borrowing costs.
- Results robust to alternative specifications.
- The impact of ESG indicators on the cost of sovereign borrowing is more pronounced for bonds with shorter maturities

Discussion

Marginal effects

A unit rise in Vigeo SCR is associated with a marginal decrease of about 0.3 in the 2-year bond spreads, of 0.28 in the 5-year bond spreads and of 0.19 in the 10-year bond spreads.

This result implies that ESG ratings could be seen as a potential risk-reducing, return-enhancing tool when added to the traditional mix of financial and economic data and political risk (Kohut and Beeching, 2013).

Results consistent with existing literature

Discussion

Short run vs long run

ESG factors have a higher impact on the cost of sovereign borrowing for bonds of shorter maturities => Qualitative factors more prone to arise in the short run

Consistent with Bellas et al (2010): in the long run, debt and debt-related variables, trade openness, and a set of risk-free rates, primarily determine sovereign bond spreads, while in the short run, it is rather the degree of political risk, corruption, and financial stability in a country that plays the key role in the valuation of sovereign debt.

Discussion

The informational content of Sustainability ratings:
A number of variables seem to play an important role in determining a country's ESG performance :

Electricity generation, Forest rents per GDP, Protected areas as a total of territorial area, Social expenditure per GDP, Female to male labor force participation rate, Health expenditure per GDP, Human development index, Regulatory quality, Rule of law, Government effectiveness, Political stability, Voice and accountability, and Corruption control.

Both investors and agencies may assign substantial
weight to these variables in determining ESG rating assignments.

Conclusion

- This paper is among the first to examine the impact of government ESG performance on the cost of sovereign borrowing.
- We show that higher ESG ratings are associated with lower borrowing cost.
- Efforts to take qualitative factors into account in the investment decision would decrease government bond spreads, an effect which is more pronounced in bonds of shorter maturities.
- Avenues for future research:
  - Study how the sub-ratings affect the cost of sovereign borrowing
  - Extend the analysis and test for the robustness of the results with a wider panel (more than 6 years)