Sovereign Bond Spreads and Extra-Financial Information: An Empirical Analysis of Emerging Markets

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Objective and Method

- Study the influence of environmental, social and governance (**ESG**) issues on **sovereign bond spreads**
- **Empirical** methodology based on multiple data sources:
  - Sovereign bond spreads
  - Macro-finance performance
  - Sovereign credit risk ratings
  - Extra-financial variables
- Focus on **emerging markets** (EMs)

Why it is interesting

- As corporate bonds, **government bonds** bear a **default risk** in case of **bad economic conditions**
- But government bonds bear another type of default risk because of the **sovereignty of the issuer**
  - A sovereign country can repudiate its debt
  - Examples: Russia, in 1918 and 1998, Ecuador in 2008
- **ESG factors** can **affect** these **two risks**
  - Good ESG performance may be beneficial for economic performance
  - Good ESG performance may be a sign of credible commitment to repay

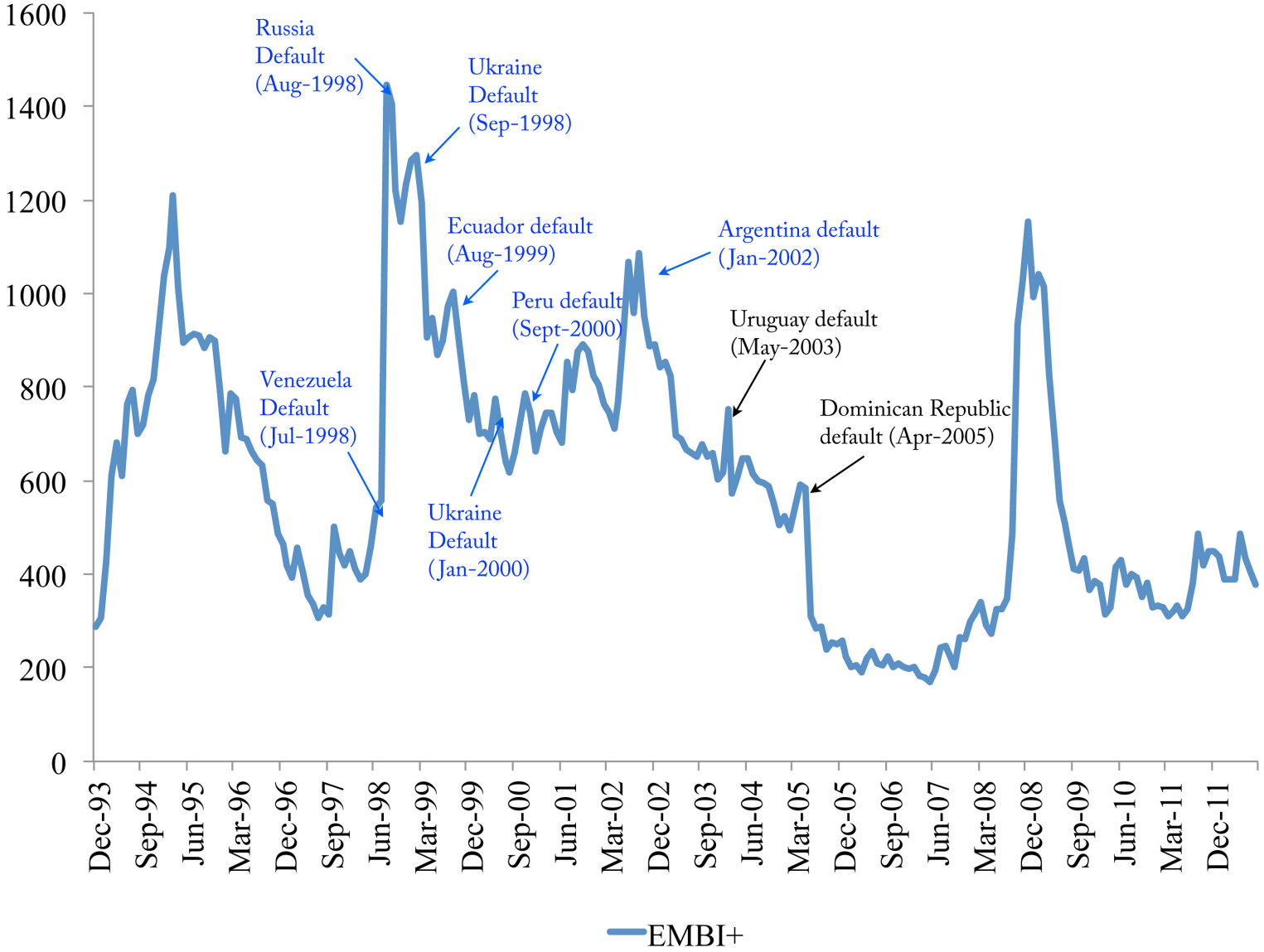
Link between ESG and Govies?

- **Finding a link** between government bond spreads and extra-financial information is **challenging**
- Wouldn't this information be **incorporated into credit ratings**?
- Maybe not because of
  - **Cultural issues** that lead credit rating agencies to focus on "hard" info
  - **Empirical difficulties** in establishing the link between ESG signals and defaults (rare events)
- Focusing on spreads, i.e. market prices, enables to study investors' **expectations regarding potential default** and whether they **depend on ESG factors**

Why focusing on emerging markets?

- Emerging bond markets are an **important segment**: total debt of emerging countries is trillion$ 7 (IMF, 2011)
- **More frequent default** events in emerging countries
- **More acute** ESG challenges for emerging countries
- **More cross-sectional** variations in ESG performance across emerging countries

More frequent defaults in EMs



ESG challenges for EMs and cross-sectional variations: EPI

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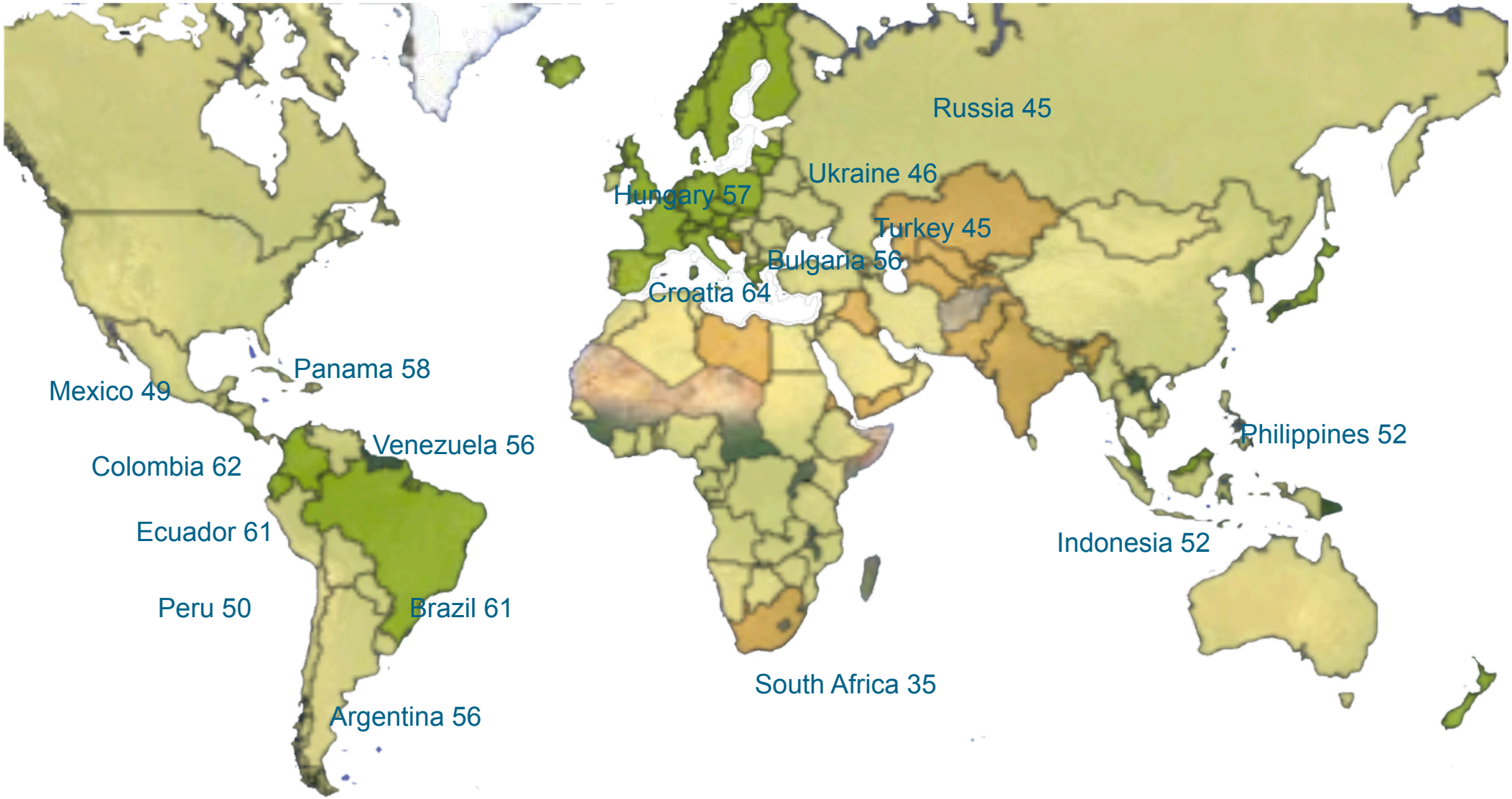

Preview of the results

- **Average** government bond **spreads** do depend on **extra-financial** information
- This result is **robust** to controlling for credit ratings and macro fundamentals, to introducing moving-average and auto-regressive effects, GMM and to considering different time periods
- We also detect an impact of a country **extra-financial** performance on the **volatility of spreads**

Results on ESG in bond markets

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- Several papers on **corporate** bonds and ESG factors:
  - Bauer, Derwall, and Hann (2010): Firms with good employee relations have a lower cost of capital
  - Bauer and Hann (2011): Green firms have a lower cost of capital
  - Chava (2013): Green firms benefit enjoy larger bank syndicates
  - Oikonomou, Brooks, and Pavelin (2013): higher CSR means lower spreads, especially for long-term bonds
  - Kölbel and Busch (2013): concerns on CSR as reported by media associated with higher credit risk
- One paper on **sovereign** bonds and ESG factors from the Chaire:
  - Crifo, Diaye, and Oueghlissi (2013) : focus on OECD countries

Variables and databases

- **EMBI+ blended spread**: Yearly average (*blendedspreads*) and yearly average volatility (*stdspreads*), 17 countries, 1996-2012
  - EMBI+ tracks total returns for traded foreign currency denominated, debt instruments in EMs. It covers U.S.dollar-denominated brady bonds, loans and Eurobonds. Instruments in the EMBI+ must have a minimum face value outstanding of m$500
  - Blended spread, in USD, shows the yield difference over US Treasuries of an EM bond index
  - Source: JPMorgan in DataStream
- **Fitch**' s long term credit ratings (*yearly_ratings*)
  - Estimates of ratings range from 1 (riskiest, D) to 23 (AAA)
  - Source: DataStream

Variables and databases (2)

- **World Governance Indicators** (*WGIT*): 1996-2011
  - Government Effectiveness; Regulatory Quality; Rule of Law; Control of Corruption; Voice and Accountability; Political Stability and No Violence
  - Estimates of WGI range from 0 (weak) to 5 (strong).
  - Source: World Bank

- **Environmental Performance Index** (*epi*): 2000-2010
  - Environmental health (containing as sub-categories, environmental burden of disease; effects on humans of air pollution, water, diversity, etc); Ecosystem vitality (effects on ecosystem of air pollution, water, diversity..)
  - EPI scores range from 0 (worst) to 100 (best)
  - Source: Official Website EPI (Yale)

World Governance Indicators

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Table 1: WGI Data Sources

Code	Source	Type*	Public	Country Coverage	Represe -ntative	1996	1998	2000	2002	2003	2004	2005	2006	2007	2008	2009
ADB	African Development Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	53			x	x	x	x	x	x	x	x	x	x
AFR	Afrobarometer	Survey	Yes	19				x	x	x	x	x	x	x	x	x
ASD	Asian Development Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	29				x	x	x	x	x	x	x	x	x
BPS	Business Enterprise Environment Survey	Survey	Yes	27				x	x	x	x	x	x	x	x	x
BTI	Bertelsmann Transformation Index	Expert (NGO)	Yes	125					x	x	x	x	x	x	x	x
CCR	Freedom House Countries at the Crossroads	Expert (NGO)	Yes	62							x	x	x	x	x	x
DRI	Global Insight Global Risk Service	Expert (CBIP)	Yes	144	x	x	x	x	x	x	x	x	x	x	x	x
EBR	European Bank for Reconstruction and Development Transition Report	Expert (GOV)	Yes	29		x	x	x	x	x	x	x	x	x	x	x
EIU	Economist Intelligence Unit Riskw ire & Democracy Index	Expert (CBIP)	Yes	181	x	x	x	x	x	x	x	x	x	x	x	x
FRH	Freedom House	Expert (NGO)	Yes	197	x	x	x	x	x	x	x	x	x	x	x	x
GCB	Transparency International Global Corruption Barometer Survey	Survey	Yes	80					x	x	x	x	x	x	x	x
GCS	World Economic Forum Global Competitiveness Report	Survey	Yes	134	x	x	x	x	x	x	x	x	x	x	x	x
GII	Global Integrity Index	Expert (NGO)	Yes	79						x	x	x	x	x	x	x
GWP	Gallup World Poll	Survey	Yes	130	x								x	x	x	x
HER	Heritage Foundation Index of Economic Freedom	Expert (NGO)	Yes	179	x	x	x	x	x	x	x	x	x	x	x	x
HUM	Cingranelli Richards Human Rights Database and Political Terror Scale	Expert (GOV)	Yes	192	x	x	x	x	x	x	x	x	x	x	x	x
IFD	IFAD Rural Sector Performance Assessments	Expert (GOV)	Yes	90							x	x	x	x	x	x
IJT	iJET Country Security Risk Ratings	Expert (CBIP)	Yes	185	x						x	x	x	x	x	x
IPD	Institutional Profiles Database	Expert (GOV)	Yes	85	x								x	x	x	x
IRP	IREEP African Electoral Index	Expert (NGO)	Yes	53				x	x	x	x	x	x	x	x	x
LBO	Latinobarometro	Survey	Yes	18		x	x	x	x	x	x	x	x	x	x	x
MSI	International Research and Exchanges Board Media Sustainability Index	Expert (NGO)	Yes	76					x	x	x	x	x	x	x	x
OBI	International Budget Project Open Budget Index	Expert (NGO)	Yes	85								x	x	x	x	x
PIA	World Bank Country Policy and Institutional Assessments	Expert (GOV)	Partial	142		x	x	x	x	x	x	x	x	x	x	x
PRC	Political Economic Risk Consultancy Corruption in Asia Survey	Survey	Yes	15			x	x	x	x	x	x	x	x	x	x
PRS	Political Risk Services International Country Risk Guide	Expert (CBIP)	Yes	140	x	x	x	x	x	x	x	x	x	x	x	x
RSF	Reporters Without Borders Press Freedom Index	Expert (NGO)	Yes	170	x				x	x	x	x	x	x	x	x
TPR	US State Department Trafficking in People report	Expert (GOV)	Yes	153	x			x	x	x	x	x	x	x	x	x
VAB	Vanderbilt University Americas Barometer	Survey	Yes	23							x	x	x	x	x	x
WCY	Institute for Management and Development World Competitiveness Yearbook	Survey	Yes	55		x	x	x	x	x	x	x	x	x	x	x
WMO	Global Insight Business Conditions and Risk Indicators	Expert (CBIP)	Yes	203	x		x	x	x	x	x	x	x	x	x	x

*Types of Expert Assessments: CBIP -- Commercial Business Information Provider, GOV -- Public Sector Data Provider, NGO -- Nongovernmental Organization Data Provider

Source: Kaufmann, Kraay, and Mastruzzi (2010)

Environmental Performance Index

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Appendix I: Indicator Profiles

The following indicator profiles provide metadata on data sources, methods, transformations, and targets. The profiles are organized alphabetically by indicator code as follows:

Objective	Policy Category	Indicator	Indicator code
Environmental Health	Air pollution (effects on human health)	Indoor air pollution	INDOOR
		Particulate matter	PM25
	Water (effects on human health)	Access to drinking water	WATSUP
		Access to sanitation	ACSAT
	Environmental burden of disease	Child mortality	CHMORT
Ecosystem Vitality	Air pollution (effects on ecosystem)	Sulfur dioxide emissions per capita	SO2CAP
		Sulfur dioxide emissions per GDP	SO2GDP
	Water (effects on ecosystem)	Change in water quantity	WATUSE
	Biodiversity and habitat	Biome protection	PACOV
		Marine protection	MPAEEZ
		Critical habitat protection	AZE
	Forests	Forest loss	FORLOSS
		Forest cover change	FORCOV
		Growing stock change	FORGROW
	Fisheries	Coastal shelf fishing pressure	TCEEZ
		Fish stocks overexploited	FSOC
	Agriculture	Agricultural subsidies	AGSUB
		Pesticide regulation	POPs
	Climate change	CO2 emissions per capita	CO2CAP
		CO2 emissions per GDP	CO2GDP
		CO2 emissions per electricity generation	CO2KWH
		Renewable electricity	RENEW

Source: Emerson, Hsu, Levy, de Sherbinin, Mara, Esty, and Jaiteh (2012)

Variables and databases (3)

- **Macroeconomic variables**:
  - Real GDP
  - Exports and imports, as % of GDP
  - Private Investment, as % of GDP
  - Foreign exchange reserves
  - Fiscal balance, as % of GDP
  - Current account as % of GDP(*currentaccountbalancegdp*)
  - Government debt as % of GDP (*ggov_gross_debt_imf*)
  - Source: IMF / National Central Banks

Empirical model

- Regressions on the **average spread**:
  - Mean Spread = f(epi, WGIT, D_{Crisis}, epi*D_{Crisis}, WGIT*D_{Crisis}, Ratings)
  - Mean Spread = f(epi, WGIT, D_{Crisis}, epi*D_{Crisis}, WGIT*D_{Crisis}, Macro)
- Regressions on the **volatility of spread**:
  - St Dev of Spread = f(epi, WGIT, D_{Crisis}, epi*D_{Crisis}, WGIT*D_{Crisis}, Ratings)
  - St Dev of Spread = f(epi, WGIT, D_{Crisis}, epi*D_{Crisis}, WGIT*D_{Crisis}, Macro)
- **Robustness** regressions consider year fixed effects, different subsamples, and ARMA effects

Empirical results: Average spread

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	**ncountry**	Number of obs =	**142**
Time variable:	**year**	Number of groups =	**15**
Panels:	**correlated (unbalanced)**	Obs per group: min =	**5**
Autocorrelation:	**common AR(1)**	avg =	**9.466667**
Sigma computed by	**pairwise selection**	max =	**10**
Estimated covariances =	**120**	R-squared =	**0.5680**
Estimated autocorrelations =	**1**	Wald chi2(4) =	**47.27**
Estimated coefficients =	**5**	Prob > chi2 =	**0.0000**

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-91.38223	28.76384	-3.18	0.001	-147.7583	-35.00613
ggov_gross_debt_imf	12.08695	3.962059	3.05	0.002	4.32146	19.85245
WGIT	-62.58647	24.87168	-2.52	0.012	-111.3341	-13.83887
epi	-8.431504	3.993728	-2.11	0.035	-16.25907	-.6039415
_cons	1365.168	461.8593	2.96	0.003	459.9404	2270.396
rho	.5600808					

- WGIT and EPI reduce average spread

Empirical results: Spread elasticity

- Elasticity: a 1% variation in a variable of interest yields an x% variation in average spread

Empirical results: Average spreads

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Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	ncountry	Number of obs =	142
Time variable:	year	Number of groups =	15
Panels:	correlated (unbalanced)	Obs per group: min =	5
Autocorrelation:	common AR(1)	avg =	9.466667
Sigma computed by	pairwise selection	max =	10
Estimated covariances =	120	R-squared =	0.6361
Estimated autocorrelations =	1	Wald chi2(7) =	203.77
Estimated coefficients =	8	Prob > chi2 =	0.0000

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-89.08184	27.07284	-3.29	0.001	-142.1436	-36.02004
ggov_gross_debt_imf	12.65827	3.572844	3.54	0.000	5.655628	19.66092
WGIT	-53.09347	23.99433	-2.21	0.027	-100.1215	-6.065441
epi	-8.88717	3.81494	-2.33	0.020	-16.36431	-1.410026
dum_2008_2009	332.5561	248.9798	1.34	0.182	-155.4352	820.5475
dum_epi	-3.658378	5.454389	-0.67	0.502	-14.34879	7.032028
dum_WGIT	-46.96102	15.52716	-3.02	0.002	-77.39369	-16.52835
_cons	1318.795	403.3632	3.27	0.001	528.2182	2109.373
rho	.5095263					

- Impact of good governance stronger during crisis

Empirical results: Average spreads

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Before 2006

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	**ncountry**	Number of obs =	**82**
Time variable:	**year**	Number of groups =	**15**
Panels:	**correlated (unbalanced)**	Obs per group: min =	**1**
Autocorrelation:	**common AR(1)**	avg =	**5.466667**
Sigma computed by	**pairwise selection**	max =	**6**
Estimated covariances =	**120**	R-squared =	**0.6635**
Estimated autocorrelations =	**1**	Wald chi2(4) =	**28.91**
Estimated coefficients =	**5**	Prob > chi2 =	**0.0000**

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	**-95.43738**	**43.10821**	**-2.21**	**0.027**	**-179.9279**	**-10.94683**
ggov_gross_debt_imf	**14.83378**	**4.953062**	**2.99**	**0.003**	**5.12596**	**24.54161**
epi	**-9.580708**	**5.262924**	**-1.82**	**0.069**	**-19.89585**	**.7344331**
WGIT	**-53.52756**	**36.3785**	**-1.47**	**0.141**	**-124.8281**	**17.77299**
_cons	**1306.744**	**614.6978**	**2.13**	**0.034**	**101.958**	**2511.529**
rho	**.4380775**					

After 2006

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	**ncountry**	Number of obs =	**60**
Time variable:	**year**	Number of groups =	**15**
Panels:	**correlated (balanced)**	Obs per group: min =	**4**
Autocorrelation:	**common AR(1)**	avg =	**4**
		max =	**4**
Estimated covariances =	**120**	R-squared =	**0.6147**
Estimated autocorrelations =	**1**	Wald chi2(7) =	**2587.49**
Estimated coefficients =	**8**	Prob > chi2 =	**0.0000**

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	**-61.40758**	**23.3787**	**-2.63**	**0.009**	**-107.229**	**-15.58617**
ggov_gross_debt_imf	**-.2493893**	**2.702525**	**-0.09**	**0.926**	**-5.546241**	**5.047463**
epi	**-4.426404**	**2.426133**	**-1.82**	**0.068**	**-9.181538**	**.3287304**
WGIT	**-30.76424**	**18.33303**	**-1.68**	**0.093**	**-66.69632**	**5.167848**
dum_2008_2009	**271.9526**	**33.88331**	**8.03**	**0.000**	**205.5425**	**338.3626**
dum_epi	**-1.894687**	**.9392604**	**-2.02**	**0.044**	**-3.735604**	**-.0537709**
dum_WGIT	**-46.46459**	**14.55584**	**-3.19**	**0.001**	**-74.99351**	**-17.93566**
_cons	**1208.272**	**474.5174**	**2.55**	**0.011**	**278.235**	**2138.309**
rho	**.5195954**					

- Same results for the two periods: more significant in recent times

Empirical results: Average spreads

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After 2006

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	**ncountry**	Number of obs =	**60**
Time variable:	**year**	Number of groups =	**15**
Panels:	**correlated (balanced)**	Obs per group: min =	**4**
Autocorrelation:	**common AR(1)**	avg =	**4**
		max =	**4**
Estimated covariances =	**120**	R-squared =	**0.6147**
Estimated autocorrelations =	**1**	Wald chi2(7) =	**2587.49**
Estimated coefficients =	**8**	Prob > chi2 =	**0.0000**

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-61.40758	23.3787	-2.63	0.009	-107.229	-15.58617
ggov_gross_debt_imf	-.2493893	2.702525	-0.09	0.926	-5.546241	5.047463
epi	-4.426404	2.426133	-1.82	0.068	-9.181538	.3287304
WGIT	-30.76424	18.33303	-1.68	0.093	-66.69632	5.167848
dum_2008_2009	271.9526	33.88331	8.03	0.000	205.5425	338.3626
dum_epi	-1.894687	.9392604	-2.02	0.044	-3.735604	-.0537709
dum_WGIT	-46.46459	14.55584	-3.19	0.001	-74.99351	-17.93566
_cons	1208.272	474.5174	2.55	0.011	278.235	2138.309
rho	.5195954					

- Stronger influence of EPI and WGIT during crisis

Empirical results: Average spreads

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	ncountry	Number of obs =	116
Time variable:	year	Number of groups =	15
Panels:	correlated (unbalanced)	Obs per group: min =	4
Autocorrelation:	common AR(1)	avg =	7.733333
Sigma computed by	pairwise selection	max =	8
Estimated covariances	= 120	R-squared =	0.6889
Estimated autocorrelations	= 1	Wald chi2(6) =	80.30
Estimated coefficients	= 7	Prob > chi2 =	0.0000

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-11.14029	26.52009	-0.42	0.674	-63.11871	40.83812
ggov_gross_debt_imf	6.341585	3.828746	1.66	0.098	-1.162619	13.84579
WGIT	-40.71476	15.34977	-2.65	0.008	-70.79977	-10.62976
epi	-5.089234	2.754922	-1.85	0.065	-10.48878	.3103141
lresid	1.821218	1.306719	1.39	0.163	-.7399036	4.382339
l1spread	.4314821	.1996536	2.16	0.031	.0401682	.8227961
_cons	72.43233	523.6826	0.14	0.890	-953.9667	1098.831
rho	.3298264					

- Robust if we use MA and AR components

Empirical results: Average spreads

```
. xtabond2 blendedspread (l.blendedspread yearly_rating ggov_gross_debt_imf WGIT epi year), gmm(l.ble
> ating ggov_gross_debt_imf, lag(3 3) collapse) ivstyle(WGIT epi year) robust
Favoring speed over space. To switch, type or click on mata: mata set matafavor space, perm.

Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: ncountry                        Number of obs      =       140
Time variable : year                            Number of groups   =        15
Number of instruments = 10                      Obs per group: min =         4
Wald chi2(6)  =    230.92                                      avg =      9.33
Prob > chi2   =     0.000                                      max =        10
------------------------------------------------------------------------------
             |               Robust
blendedspread|      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
blendedspread|
         L1. |   .1016971   .1355082     0.75   0.453    -.1638941    .3672883
             |
yearly_rating|  -108.6375   28.90772    -3.76   0.000    -165.2955   -51.97937
ggov_gross_~f|   23.73967   4.414294     5.38   0.000     15.08781    32.39153
        WGIT |  -70.35155   44.51683    -1.58   0.114    -157.6029    16.89983
         epi |  -24.59641    14.1379    -1.74   0.082    -52.30619    3.113367
        year |   54.07643   6.763511     8.00   0.000     40.82019    67.33267
       _cons |  -106614.9   13811.37    -7.72   0.000    -133684.7   -79545.09
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(WGIT epi year)
```

- Robust if we use GMM

Empirical results: Average spreads

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	ncountry	Number of obs =	116
Time variable:	year	Number of groups =	15
Panels:	correlated (unbalanced)	Obs per group: min =	4
Autocorrelation:	common AR(1)	avg =	7.733333
Sigma computed by	pairwise selection	max =	8
Estimated covariances =	120	R-squared =	0.7399
Estimated autocorrelations =	1	Wald chi2(6) =	120.09
Estimated coefficients =	7	Prob > chi2 =	0.0000

blendedspread	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
currentaccountbalancegdp	-10.17454	6.567071	-1.55	0.121	-23.04576	2.696683
ggov_gross_debt_imf	7.357431	2.674024	2.75	0.006	2.11644	12.59842
WGIT	-62.25514	23.993	-2.59	0.009	-109.2806	-15.22973
epi	-9.987576	3.082936	-3.24	0.001	-16.03002	-3.945133
l1spread	.3540501	.1423306	2.49	0.013	.0750873	.6330129
lresid	5.366343	1.34735	3.98	0.000	2.725587	8.0071
_cons	-192.7293	118.9767	-1.62	0.105	-425.9195	40.4608
rho	.3735737					

- Robust if we use macro variables as controls

Empirical results: Volatility of spreads

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```
. xtpcse stdspreads yearly_rating dum_2008_2009 epi WGIT lresid lstdspreads, pairwise correlation(ar1)

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:    ncountry                    Number of obs      =       116
Time variable:     year                        Number of groups   =        15
Panels:            correlated (unbalanced)     Obs per group: min =         4
Autocorrelation:   common AR(1)                               avg =  7.733333
Sigma computed by pairwise selection                          max =         8
Estimated covariances      =       120         R-squared          =    0.3884
Estimated autocorrelations =         1         Wald chi2(6)       =     56.16
Estimated coefficients     =         7         Prob > chi2        =    0.0000
```

stdspreads	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-44.67482	12.76459	-3.50	0.000	-69.69296	-19.65668
dum_2008_2009	238.1248	35.44645	6.72	0.000	168.6511	307.5986
epi	-3.764073	1.495941	-2.52	0.012	-6.696064	-.8320824
WGIT	-1.104315	9.583005	-0.12	0.908	-19.88666	17.67803
lresid	.1761033	1.768418	0.10	0.921	-3.289931	3.642138
lstdspreads	-.0631249	.2110127	-0.30	0.765	-.4767023	.3504524
_cons	783.7575	232.786	3.37	0.001	327.5052	1240.01
rho	.2338655					

- EPI reduces volatility of spreads

Empirical results: Volatility of spreads

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Up to 2006

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	ncountry	Number of obs	= 82
Time variable:	year	Number of groups	= 15
Panels:	correlated (unbalanced)	Obs per group: min	= 1
Autocorrelation:	common AR(1)	avg	= 5.466667
Sigma computed by	pairwise selection	max	= 6
Estimated covariances	= 120	R-squared	= 0.2784
Estimated autocorrelations	= 1	Wald chi2(3)	= 5.85
Estimated coefficients	= 4	Prob > chi2	= 0.1192

stdspreads	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-44.54649	21.43267	-2.08	0.038	-86.55375	-2.539231
epi	-1.418963	2.373647	-0.60	0.550	-6.071226	3.233301
WGIT	10.78057	12.24394	0.88	0.379	-13.21711	34.77826
_cons	693.5339	315.2011	2.20	0.028	75.75104	1311.317
rho	.3028167					

After 2006

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	ncountry	Number of obs	= 60
Time variable:	year	Number of groups	= 15
Panels:	correlated (balanced)	Obs per group: min	= 4
Autocorrelation:	common AR(1)	avg	= 4
		max	= 4
Estimated covariances	= 120	R-squared	= 0.5169
Estimated autocorrelations	= 1	Wald chi2(6)	= 113.87
Estimated coefficients	= 7	Prob > chi2	= 0.0000

stdspreads	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-31.93016	16.37833	-1.95	0.051	-64.03109	.1707654
epi	-4.146893	2.374427	-1.75	0.081	-8.800685	.5068992
WGIT	5.427772	8.957575	0.61	0.545	-12.12875	22.9843
dum_2008_2009	24.77616	29.25707	0.85	0.397	-32.56664	82.11895
dum_epi	2.142661	.7014521	3.05	0.002	.7678403	3.517482
dum_WGIT	-52.1871	8.254214	-6.32	0.000	-68.36507	-36.00914
_cons	658.7067	334.6024	1.97	0.049	2.897963	1314.515
rho	.2405607					

- EPI reduces volatility of spreads after 2006

Empirical results: Volatility of spreads

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After 2006

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

Group variable:	**ncountry**	Number of obs =	**60**
Time variable:	**year**	Number of groups =	**15**
Panels:	**correlated (balanced)**	Obs per group: min =	**4**
Autocorrelation:	**common AR(1)**	avg =	**4**
		max =	**4**
Estimated covariances =	**120**	R-squared =	**0.5169**
Estimated autocorrelations =	**1**	Wald chi2(6) =	**113.87**
Estimated coefficients =	**7**	Prob > chi2 =	**0.0000**

stdspreads	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
yearly_rating	-31.93016	16.37833	-1.95	0.051	-64.03109	.1707654
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rho	.2405607					

- EPI and WGIT decreases volatility in normal and crisis times, respectively

Practical implications

- Using ESG information enables to **better assess** the expected value and the volatility of sovereign bond spreads in emerging markets
- Useful for designing **asset allocations** that better reflect the actual level of risk
- Useful for designing **dynamic fixed-income investment** strategies based on predictions regarding ESG factors: tactical allocations to countries about to improve their ESG performance
- **Next step**: social factors (inequalities, education, innovation…)

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More on variables and databases

EMBI+

- EMBI+ blended spread: yearly average and yearly average volatility (from monthly data)
  - EMBI+ tracks total returns for traded external debt instruments (external meaning foreign currency denominated fixed income) in EMs. It covers U.S.dollar-denominated brady bonds, loans and Eurobonds. Instruments in the EMBI+ must have a minimum face value outstanding of $500 and must meet strict criteria for secondary market trading liquidity.
  - Blended spread, in USD, shows the yield difference over US Treasuries of a JPMorgan EM bond index (EMBI), including any credit enhancements such as principal and/or interest collateral.

WGIT

- WGIT= ruleoflaw +regquality +goveffect +corruption +voiceaccount +polstabil

- Rule of Law (rule of law): Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

- Regulatory Quality (regqual) : Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

- Government Effectiveness (goveffect): Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

WGIT (2)

- WGIT= ruleoflaw +regquality +goveffect +corruption +voiceaccount +polstabil
- Corruption (corruption): Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.
- Voice and Accountability (voiceaccount): Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
- Political stability and no violence (polstabil): Reflects perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

Government gross debt over GDP

- Government gross debt:
  - According to IMF definition, Gross debt consists of all liabilities that require payment or payments of interest and/or principal by the debtor to the creditor at a date or dates in the future.
  - This includes debt liabilities in the form of SDRs, currency and deposits, debt securities, loans, insurance, pensions and standardized guarantee schemes, and other accounts payable.