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Nice but cautious guys: The cost of responsible investing in the bond markets

B. Drut

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Université Libre de Bruxelles - Solvay Brussels School of Economics and Management
Centre Emile Bernheim
ULB CP145/01 50, avenue F.D. Roosevelt 1050 Brussels BELGIUM
e-mail: ceb@admin.ulb.ac.be Tel. : +32 (0)2/650.48.64 Fax : +32 (0)2/650.41.88

ULB

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Bastien Drut

Credit Agricole Asset Management
90 bd Pasteur, Paris 75015, France

Centre Emile Bernheim,
Solvay Brussels School of Economics and Management, Université Libre de Bruxelles,
Av F.D. Roosevelt, 50, CP 145/1, 1050 Brussels, Belgium

EconomiX-CNRS, Paris Ouest University
200 Avenue de la République, Nanterre 92001, France

This version: February 2010

Abstract

The aim of this paper is to measure the cost of investing responsibly for different risk aversion levels by taking the example of green sovereign bond portfolios. We show that for developed markets, the cost of being a nice guy is lower if you are cautious (i.e. a higher level of risk aversion) while this is the contrary for emerging markets. It implies that managers of Socially Responsible Investment (SRI) funds should gauge investor's risk aversion prior to evaluating the "SRI cost". The SRI cost is zero in some cases.

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Comments can be sent to bastien.drut@gmail.com

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Introduction

With the spread of Socially Responsible Investment (SRI), a growing share of investors take into account non-financial criteria in their portfolio allocation. In practice, SRI[1] objectives appear as investors' motivations next to mean-variance optimization, thus adding complexity to asset allocation. Beal *et al.* (2005) identify three reasons for investing ethically: the hope of superior financial returns, non-wealth returns, and contribution to social change. Landier and Nair (2009) – henceforth LN - introduce an original colour code: "*red investors' sole goal is to maximize returns*", "*yellow investors want their portfolios to be exempt from wrongly earned money*", "*blue investors typically want to know how much it will cost to them to invest responsibly*". The latter consider SRI only if the financial cost is small.

An intensive stream of research[2] is devoted to the following question: is it possible to "do well by doing good"? That is to say: do socially responsible entities, companies and governments achieve superior financial returns?[3] Unfortunately, the link between socially responsible and financial performances is often difficult to identify mainly because of the lack of reliable and historic measures of SRI performances (LN, 2009). Nevertheless, it is feasible to evaluate the expected cost of a portfolio taking into account socially responsible indicators (Drut, 2009, Galema *et al.*, 2009). Surprisingly, the investor's level of risk aversion, a major parameter in portfolio management, is generally left out of the story. This note aims at filling this gap.

Contrasting with existing methodologies, this paper estimates the "SRI cost", that is the cost of investing responsibly. Estimating this cost matters because if it is low, then LN blue investors may decide to invest in SRI funds. Basically, there is no reason to expect SRI cost to be the same for every risk aversion level. To document this assertion, we take the example of sovereign bond portfolios and estimate "SRI cost" faced by investors with different risk aversion levels but all concerned by environmental issues (e.g., public policies against climate change). The Environmental Performance Index (EPI) provided by the Universities of Yale and Columbia is used to measure the countries' SRI performance.

[1] SRI is defined by the European Social Investment Forum (2008) as "*a generic term covering ethical investments, responsible investments, sustainable investments, and any other investment process that combines investors' financial objectives with their concerns about environmental, social and governance (ESG) issues*".
[2] See Derwall et *al.* (2005) and Statman and Glushkov (2008) among others.
[3] If this statement holds, then all three Landier and Nair (2009) categories of investors should opt for SRI.

The main results are that the "SRI cost" decreases with the investor's level of risk aversion for developed market bonds but increases with the investor's risk aversion in emerging bond markets: the cost of being a nice guy is lower if you are cautious for developed markets while this is the contrary for emerging markets.

The paper is organized as follows. Section 2 presents the sovereign bond data and the EPI index. Section 3 exposes the estimation methodology. Sector 4 reports the empirical results. Section 5 concludes.

1) Data

We consider sovereign bond indices obtained from Datastream for the period from January 1995 to June 2009. More precisely, we use World Government Bond Index (WGBI) indices of Citigroup in All Maturities[4] for the developed markets and Emerging Markets Bonds Index Global (EMBI Global) of JP Morgan for emerging markets[5]. The indices are considered in US dollars and unhedged for FX variation. Descriptive statistics are given in Tables 1 to 4 in Appendix 1.

The Environmental Performance Index[6] (EPI) is computed jointly by the Universities of Yale and Columbia, in collaboration with the World Economic Forum and the Joint Research Centre of the European Commission. EPI is a typical SRI indicator, in particular for the environmental (E) aspect of the traditional ESG (Environmental, Society and Governance concerns) criteria. We use here EPI values for year 2008 (see Table 5).

[4] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.
[5] Argentina, Brazil, Bulgaria, China, Ecuador, Mexico, Panama, Peru, Philippines, Poland, Russia, South Africa, Venezuela.
[6] EPI focuses on two overarching environmental objectives: reduction of environmental stresses to human health, and promotion of the ecosystem vitality and sound natural resource management. These two objectives are gauged using 25 performance indicators tracked in six well-established policy categories, which are then combined to create a final score. The values of EPI are downloaded from the EPI website: http://epi.yale.edu

Table 5 2008 EPI scores for the sample countries

Switzerland	95.51	**Japan**	84.54	**Poland**	80.49
Sweden	93.12	**Ecuador**	84.36	**Venezuela**	80.05
Norway	93.12	**Italy**	84.22	**Australia**	79.83
Finland	91.44	**Denmark**	83.99	**Mexico**	79.80
Austria	89.43	**Russia**	83.85	**Netherlands**	78.73
New Zealand	88.90	**Spain**	83.14	**Bulgaria**	78.47
France	87.75	**Panama**	83.06	**Belgium**	78.41
Canada	86.64	**Ireland**	82.74	**Peru**	78.08
Germany	86.31	**Brazil**	82.65	**Philippines**	77.94
United Kingdom	86.31	**Argentina**	81.78	**South Africa**	68.98
Portugal	85.75	**United States**	81.03	**China**	65.08

Switzerland and the Scandinavian Countries obtain the best EPI scores, China and South Africa the worse. On average, developed markets obtain better scores than emerging markets, but some developed markets (Belgium, the Netherlands, Australia and the US) exhibit relatively low scores.

2) Methodology

Consider a market of n securities and a portfolio p of securities defined by the vector of portfolio weights $\omega_p = \begin{bmatrix} \omega_{p1} & \omega_{p2} & \dots & \omega_{pn} \end{bmatrix}'$, where $\omega' \iota = 1$ and $\iota = \begin{bmatrix} 1 & \dots & 1 \end{bmatrix}'$. Following the notation of Lo (2008), the vector of expected returns of the securities is denoted by μ and Σ is the return covariance matrix of the securities while $\phi = \begin{bmatrix} \phi_1 & \phi_2 & \dots & \phi_n \end{bmatrix}'$ is the vector of EPI scores of the countries. Then a natural definition of the EPI score ϕ_p of the portfolio p *is:*

$$\phi_p = \sum_{i=1}^{n} \omega_{pi} \phi_i$$

As proposed by Drut (2009), the socially responsible criterion is introduced in the standard mean-variance optimization by means of an additional linear constraint[7] requiring the EPI score of the portfolio to be above a given threshold ϕ_0:

$$\begin{aligned} \min_{\{\omega\}} \quad & \frac{1}{2} \omega' \Sigma \omega \\ \textit{subject to} \quad & \mu_p = \omega' \mu \\ & \omega' \iota = 1 \\ & \phi_p = \omega' \phi \geq \phi_0 \end{aligned}$$

[7] From a theoretical point of view, this problem is similar to the general mean-variance approach subject to linear constraints addressed by Best and Grauer (1990), Best and Grauer (1991), Lo *et al.* (2003), Alexander and Baptista (2006), for example.

For an investor ready to bear a volatility $V = \omega' \sum \omega$ and requiring an EPI score ϕ_p above a threshold ϕ_0, the "SRI cost" $C(V, \phi_0)$ is defined as the difference between the expected return on the efficient EPI-unconstrained portfolio corresponding to the volatility V and its EPI-constrained counterpart. We estimate the "SRI cost" $C(V, \phi_0)$ for several volatilities and levels of constraints on the EPI portfolio score ϕ_p.

3) Application to sovereign bonds

In this section, we show that the "SRI cost" decreases with the investor's risk aversion for developed market bonds but increases with the investor's risk aversion for emerging market bonds. Table 6 reports the "SRI cost" at different levels of average EPI on the portfolio for both developed and emerging markets.

Table 6 Annualized returns reduction due to SRI constraint
for developed and emerging markets

			Level of constraint on the portfolio EPI				Annualized return without EPI constraint
			65	**75**	**85**	**95**	
Developed Markets	**Annualized Volatility**	5.0%	0.00%	0.04%	0.15%	0.33%	9.40%
		7.5%	0.16%	0.28%	0.43%	0.61%	12.46%
		10.0%	0.36%	0.50%	0.66%	0.84%	14.99%
		12.5%	0.57%	0.72%	0.88%	1.06%	17.39%
			65	**75**	**85**	**95**	
Emerging Markets	**Annualized Volatility**	15.0%	0.00%	0.00%	0.33%	3.08%	19.57%
		17.5%	0.00%	0.00%	0.11%	1.55%	21.72%
		20.0%	0.00%	0.00%	0.02%	0.88%	23.83%
		22.5%	0.00%	0.00%	0.00%	0.50%	25.92%

Note: 0.88% corresponds to $C(V = 12.5\%, \phi_0 = 85)$ and indicates that an investor accepting an annualized volatility of 12.5%/year and requiring a portfolio EPI above 85 incurs an expected annualized return loss of 0.88% compared to the case without EPI constraint.

Holding annualised volatility constant, the higher the portfolio average EPI, the more important the "SRI" cost in both the developed and the emerging markets contexts. In other words, and consistent with modern portfolio theory, returns are lower for a given level of risk when the portfolio average EPI constraint is stronger.

However, the "SRI cost" increases with the level of risk for a given EPI constraint for developed markets while a contrary pattern is observed for emerging markets. Figures 1 and 2 demonstrate how the the efficient frontier is modified by the EPI constraint. The effect of the EPI constraint appears at the top of the efficient frontier for developed markets and at bottom for emerging markets. In the case of emerging markets, EPI constraints induce important changes to the level of minimum variance.

Figure 1 Efficient frontiers for developed markets

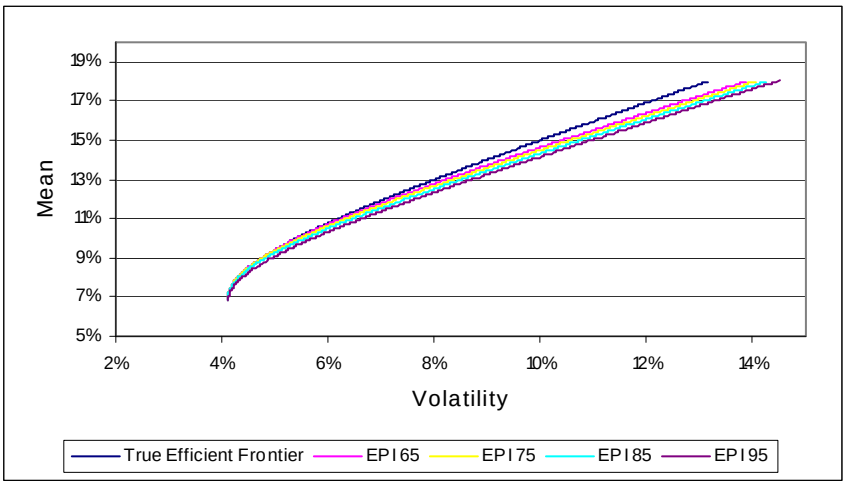
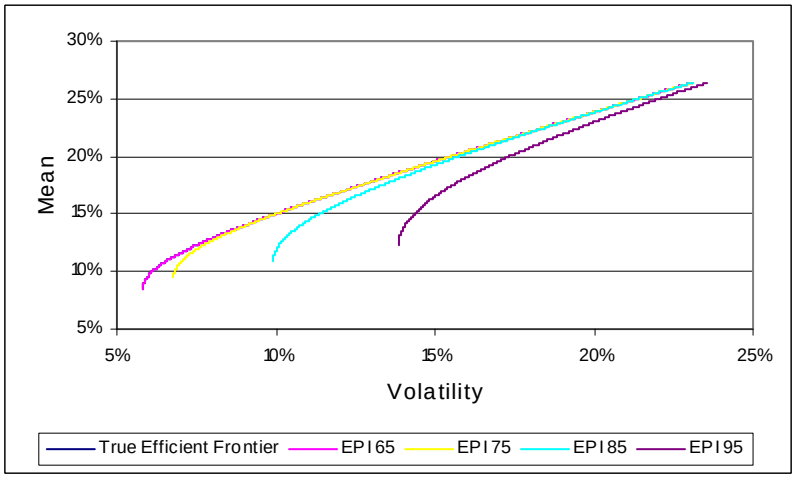


Figure 2 Efficient frontiers for emerging markets



This difference between developed and emerging markets finds can be explained by the link between EPI scores and sovereign bonds' characteristics (see Appendix 2). Links between EPI scores and returns are weak while links between EPI scores and annualized volatilities are positive and more significant (this link being stronger for the EMBI Global indices). Examining the pattern for emerging markets, one can get the intuition that is it

difficult to build portfolios with high average EPI and low volatility as the highest rated countries have, at the same time, higher returns and higher volatilities. An example is provided by China, which has both the lowest EPI score and the lowest volatility.[8] In the case of developed markets, the difficulty in building portfolios with high average EPI and high returns may be the result of the negative but insignificant link between annualized returns and EPI scores. Moreover, markets with the highest annualized returns (Italy, Canada, Spain, Australia) are not the greenest according to the EPI.

It is also noteworthy that the "SRI cost" is zero in some cases: for example, an investor in emerging market bonds accepting a 22.5% per year annualized volatility achieve a portfolio EPI score up to 85 with no SRI cost (see Table 6). For emerging markets, there is a threshold on the EPI weighted-average below which the SRI cost is zero at each given level of risk. This threshold increases or decreases with the level of volatility. The SRI cost in developed markets increases with volatility and the strength of the SRI constraint.

4) Conclusion

The purpose of this paper was to investigate the impact of risk aversion on "SRI cost" by building green sovereign bond portfolios. Three conclusions can be drawn. First, the cost of being a nice guy depends on how cautious you are and SRI fund managers should first gauge investors' risk aversion before addressing the question of the cost of investing responsibly?. Second, the fact that "SRI cost" increases or decreases with risk aversion is data-driven and depends on the link between socially responsible and financial performances. Third, when considering SRI as an additional linear constraint, there is no expected "SRI cost" in some circumstances.

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[8] One reason is that the renminbi was pegged to the US dollar for the majority of the sample period.

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Appendix 1 Descriptive statistics of the WGBI and EMBI in US dollars for the period January 1995-June 2009

Table 1 *WGBI indices monthly returns in US dollars*

	Ann. Mean	Ann. Std. Dev.	Skewness	Kurtosis	Maximum	Minimum
AUS	8.58%	12.12%	-0.41	4.64	10.28%	-14.64%
AUT	7.24%	11.04%	0.22	4.03	10.83%	-9.73%
BEL	7.75%	10.95%	0.29	4.00	11.18%	-9.26%
CAN	9.19%	9.04%	-0.44	5.67	7.86%	-11.88%
CHE	6.55%	12.05%	0.85	4.54	15.40%	-7.86%
DEU	7.28%	10.89%	0.36	3.94	11.54%	-8.80%
DNK	8.04%	10.91%	0.30	5.51	14.17%	-10.39%
ESP	8.73%	10.80%	0.05	4.10	10.92%	-10.20%
FIN	8.06%	10.84%	0.26	3.61	10.70%	-8.58%
FRA	7.94%	10.86%	0.30	4.10	11.81%	-9.18%
GBR	8.05%	9.15%	-0.10	3.56	7.73%	-9.08%
IRL	8.10%	11.30%	-0.29	5.40	9.39%	-13.80%
ITA	9.14%	10.87%	0.06	3.79	10.37%	-10.01%
JPN	4.08%	12.23%	0.89	7.36	16.62%	-11.22%
NLD	7.49%	10.98%	0.29	4.03	11.07%	-9.22%
NOR	7.48%	11.06%	-0.01	4.01	9.89%	-11.31%
NZL	8.24%	12.93%	-0.21	4.49	11.32%	-13.81%
PRT	8.55%	10.84%	0.09	4.05	10.98%	-9.89%
SWE	7.62%	11.43%	0.18	3.20	9.73%	-8.77%
USA	6.65%	4.76%	-0.18	4.27	5.41%	-4.38%

Note : AUS stands for Australia, AUT Austria, BEL Belgium, CAN Canada, CHE Switzerland, DEU Germany, DNK Denmark, ESP Spain, FIN Finland, FRA France, GBR United Kingdom, IRL Ireland, ITA Italy, JPN Japan, NLD Netherlands, NOR Norway, NZL New Zealand, PRT Portugal, SWE Sweden and USA United States.

Table 2 *WGBI correlation matrix*

	AUS	AUT	BEL	CAN	CHE	DEU	DNK	ESP	FIN	FRA	GBR	IRL	ITA	JPN	NLD	NOR	NZL	PRT	SWE	USA
AUS	100.0%	60.0%	60.0%	68.4%	45.1%	57.7%	62.4%	62.4%	60.7%	59.1%	46.8%	64.3%	63.5%	18.3%	59.0%	57.2%	80.3%	61.9%	65.4%	25.1%
AUT	60.0%	100.0%	99.6%	44.4%	89.9%	99.6%	98.6%	95.1%	96.5%	99.0%	69.5%	93.3%	86.7%	40.7%	99.7%	75.5%	67.7%	98.1%	79.9%	44.8%
BEL	60.0%	99.6%	100.0%	44.6%	90.0%	99.6%	98.8%	95.6%	97.1%	99.1%	69.8%	93.4%	87.1%	40.6%	99.8%	75.1%	67.6%	98.3%	80.3%	45.1%
CAN	68.4%	44.4%	44.6%	100.0%	28.7%	42.5%	46.7%	47.6%	48.0%	43.0%	38.8%	50.4%	46.8%	7.1%	43.9%	51.9%	55.5%	45.9%	51.8%	34.1%
CHE	45.1%	89.9%	90.0%	28.7%	100.0%	91.1%	90.0%	83.7%	86.9%	89.2%	57.6%	78.4%	73.0%	49.4%	90.0%	64.4%	57.1%	87.3%	67.1%	38.3%
DEU	57.7%	99.6%	99.6%	42.5%	91.1%	100.0%	98.7%	94.8%	96.7%	98.9%	68.7%	92.2%	85.6%	41.4%	99.8%	74.2%	66.1%	97.6%	78.9%	45.0%
DNK	62.4%	98.6%	98.8%	46.7%	90.0%	98.7%	100.0%	96.3%	96.9%	98.5%	68.1%	93.5%	88.2%	39.2%	98.8%	74.3%	69.2%	97.8%	81.5%	45.6%
ESP	62.4%	95.1%	95.6%	47.6%	83.7%	94.8%	96.3%	100.0%	95.5%	95.9%	69.0%	94.6%	94.3%	32.3%	95.1%	72.2%	66.9%	98.0%	84.8%	46.7%
FIN	60.7%	96.5%	97.1%	48.0%	86.9%	96.7%	96.9%	95.5%	100.0%	95.8%	68.9%	92.3%	86.8%	38.1%	97.0%	74.9%	66.6%	96.1%	82.8%	43.6%
FRA	59.1%	99.0%	99.1%	43.0%	89.2%	98.9%	98.5%	95.9%	95.8%	100.0%	70.0%	93.7%	88.5%	38.7%	99.0%	73.8%	66.1%	98.5%	79.8%	46.3%
GBR	46.8%	69.5%	69.8%	38.8%	57.6%	68.7%	68.1%	69.0%	68.9%	70.0%	100.0%	74.2%	68.6%	21.6%	69.4%	57.5%	52.3%	69.0%	63.7%	40.7%
IRL	64.3%	93.3%	93.4%	50.4%	78.4%	92.2%	93.5%	94.6%	92.3%	93.7%	74.2%	100.0%	92.1%	30.0%	93.1%	70.7%	66.9%	94.1%	81.9%	49.5%
ITA	63.5%	86.7%	87.1%	46.8%	73.0%	85.6%	88.2%	94.3%	86.8%	88.5%	68.6%	92.1%	100.0%	23.7%	86.2%	68.5%	64.7%	91.4%	82.4%	44.5%
JPN	18.3%	40.7%	40.6%	7.1%	49.4%	41.4%	39.2%	32.3%	38.1%	38.7%	21.6%	30.0%	23.7%	100.0%	40.6%	26.4%	28.5%	35.3%	25.9%	24.2%
NLD	59.0%	99.7%	99.8%	43.9%	90.0%	99.8%	98.8%	95.1%	97.0%	99.0%	69.4%	93.1%	86.2%	40.6%	100.0%	74.8%	67.0%	97.9%	79.7%	45.5%
NOR	57.2%	75.5%	75.1%	51.9%	64.4%	74.2%	74.3%	72.2%	74.9%	73.8%	57.5%	70.7%	68.5%	26.4%	74.8%	100.0%	56.0%	74.8%	76.5%	22.1%
NZL	80.3%	67.7%	67.6%	55.5%	57.1%	66.1%	69.2%	66.9%	66.6%	66.1%	52.3%	66.9%	64.7%	28.5%	67.0%	56.0%	100.0%	68.2%	64.7%	26.5%
PRT	61.9%	98.1%	98.3%	45.9%	87.3%	97.6%	97.8%	98.0%	96.1%	98.5%	69.0%	94.1%	91.4%	35.3%	97.9%	74.8%	68.2%	100.0%	82.6%	43.9%
SWE	65.4%	79.9%	80.3%	51.8%	67.1%	78.9%	81.5%	84.8%	82.8%	79.8%	63.7%	81.9%	82.4%	25.9%	79.7%	76.5%	64.7%	82.6%	100.0%	34.8%
USA	25.1%	44.8%	45.1%	34.1%	38.3%	45.0%	45.6%	46.7%	43.6%	46.3%	40.7%	49.5%	44.5%	24.2%	45.5%	22.1%	26.5%	43.9%	34.8%	100.0%

Table 3 *EMBI Global indices monthly returns in US dollars*

	Ann. Mean	Ann. Std. Dev.	Skewness	Kurtosis	Maximum	Minimum
ARG	4.36%	29.15%	-1.14	9.55	33.80%	-43.91%
BGR	15.26%	19.60%	-1.12	16.60	25.77%	-36.38%
BRA	16.35%	20.93%	-0.54	8.87	26.76%	-27.39%
CHN	8.34%	6.75%	0.81	16.45	13.05%	-9.45%
ECU	15.43%	33.14%	-1.71	10.89	24.45%	-55.78%
MEX	11.94%	10.80%	-0.66	7.58	12.39%	-14.75%
PAN	16.24%	16.63%	0.06	7.32	21.80%	-16.81%
PER	16.43%	18.29%	-1.23	7.41	14.09%	-25.39%
PHL	11.57%	10.84%	-1.63	14.03	11.90%	-19.58%
POL	11.03%	10.09%	0.72	12.48	17.18%	-11.87%
RUS	23.54%	32.09%	-2.50	25.89	35.19%	-71.62%
VEN	15.65%	21.46%	-1.11	15.34	31.57%	-37.96%
ZAF	10.19%	10.01%	-1.88	17.19	12.03%	-17.78%

Note : ARG stands for Argentina, BGR Bulgaria, BRA Brazil, CHN China, ECU Ecuador, MEX Mexico, PAN Panama, PER Peru, PHL Philipinnes, POL Poland, RUS Russia, VEN Venezuela, ZAF South Africa.

Table 4 *EMBI Global correlation matrix*

	ARG	BRA	BGR	CHN	ECU	MEX	PAN	PER	PHL	POL	RUS	VEN	ZAF
ARG	100.0%	43.5%	40.0%	39.4%	46.7%	49.7%	50.5%	43.9%	42.9%	42.2%	27.6%	53.1%	50.1%
BRA	43.5%	100.0%	57.9%	25.7%	56.2%	69.1%	63.9%	72.6%	56.8%	48.2%	50.4%	54.8%	50.7%
BGR	40.0%	57.9%	100.0%	46.9%	55.0%	67.2%	65.3%	68.3%	63.8%	67.5%	56.1%	65.1%	66.5%
CHN	39.4%	25.7%	46.9%	100.0%	31.0%	50.2%	40.5%	38.2%	37.8%	64.4%	24.7%	46.9%	71.5%
ECU	46.7%	56.2%	55.0%	31.0%	100.0%	53.1%	53.6%	59.6%	54.3%	52.1%	52.1%	58.2%	51.6%
MEX	49.7%	69.1%	67.2%	50.2%	53.1%	100.0%	75.3%	68.2%	68.2%	75.7%	55.3%	59.1%	67.9%
PAN	50.5%	63.9%	65.3%	40.5%	53.6%	75.3%	100.0%	63.9%	57.6%	66.7%	45.8%	59.5%	60.3%
PER	43.9%	72.6%	68.3%	38.2%	59.6%	68.2%	63.9%	100.0%	69.7%	58.2%	51.8%	58.7%	62.9%
PHL	42.9%	56.8%	63.8%	37.8%	54.3%	68.2%	57.6%	69.7%	100.0%	60.3%	58.9%	53.0%	63.7%
POL	42.2%	48.2%	67.5%	64.4%	52.1%	75.7%	66.7%	58.2%	60.3%	100.0%	40.6%	52.6%	65.9%
RUS	27.6%	50.4%	56.1%	24.7%	52.1%	55.3%	45.8%	51.8%	58.9%	40.6%	100.0%	47.1%	52.8%
VEN	53.1%	54.8%	65.1%	46.9%	58.2%	59.1%	59.5%	58.7%	53.0%	52.6%	47.1%	100.0%	68.3%
ZAF	50.1%	50.7%	66.5%	71.5%	51.6%	67.9%	60.3%	62.9%	63.7%	65.9%	52.8%	68.3%	100.0%

Appendix 2 Relationships between EPI scores and financial characteristics

Figure 3 *Relationship between indices' annualized returns and EPI scores*

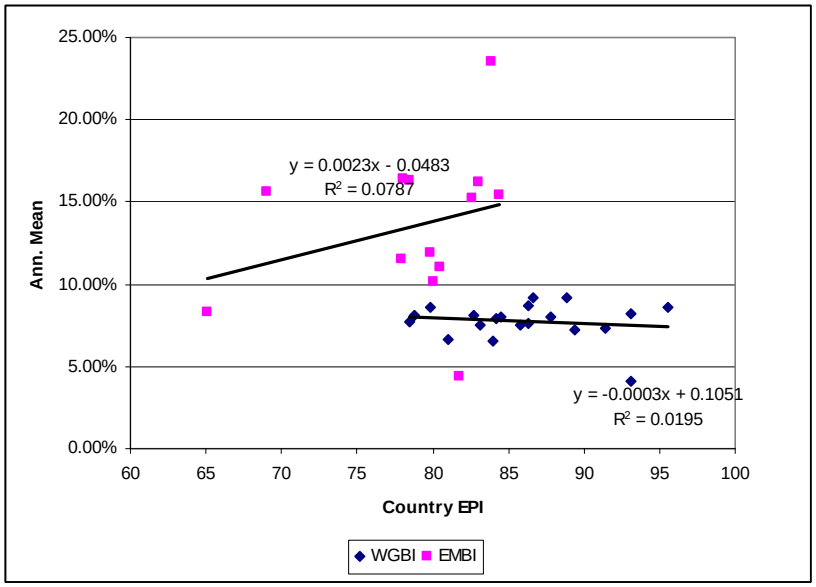

Figure 4 *Relationship between indices' annualized volatilities and EPI scores*