COMOVEMENT OR SAFE HAVEN?
THE EFFECT OF CORRUPTION ON THE MARKET RISK OF SOVEREIGN BONDS OF EMERGING ECONOMIES DURING FINANCIAL CRISES

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Agenda

- Introduction
- Hypothesis
- Experimental Evidence
- Theoretical Framework
- Conclusions

Introduction

Corruption and Default Risk

- Corruption drives unofficial economic activity (Johnson et al., 1997), and is associated with resource misallocation (Depken et al., 2006).
- Corruption is an immoral and unethical phenomenon of dishonest or illegal behaviour, especially of people in the authority. Redeeming a country's debt is largely a political decision and depends on the people in the authority's willingness to repay it (Seldadyo and Haan, 2006).

Corruption and Default Risk during Crises

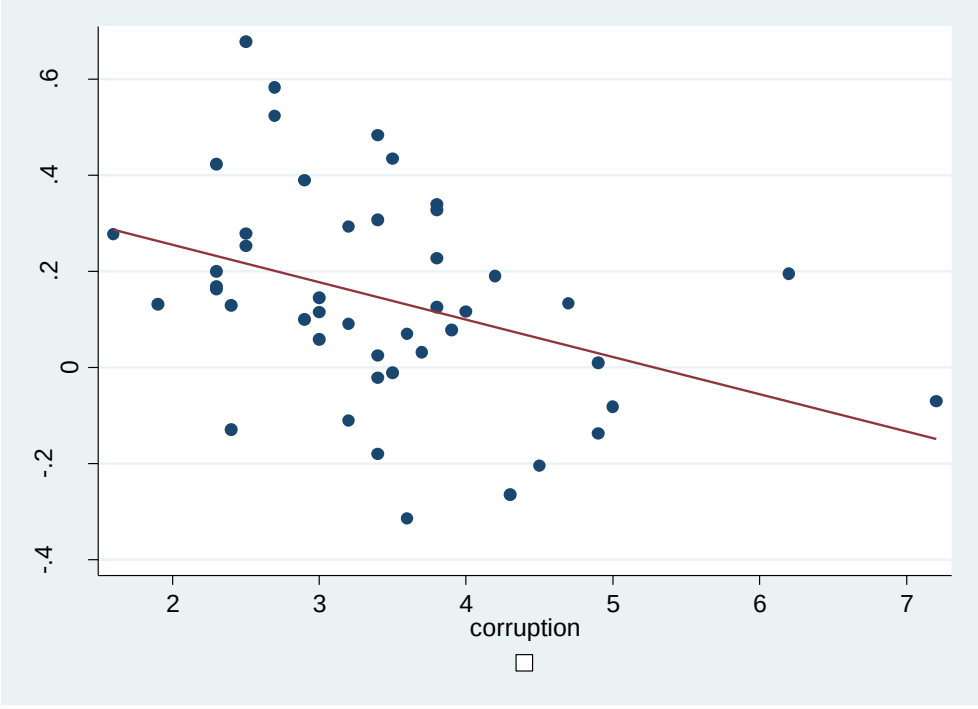
- The level of corruption affects borrowing and default decisions, together with business cycle fluctuations. Corruption amplifies the effect of negative shocks. (Shleifer and Vishny, 1993, Ciocchini et al., 2003 and Adama 2013).

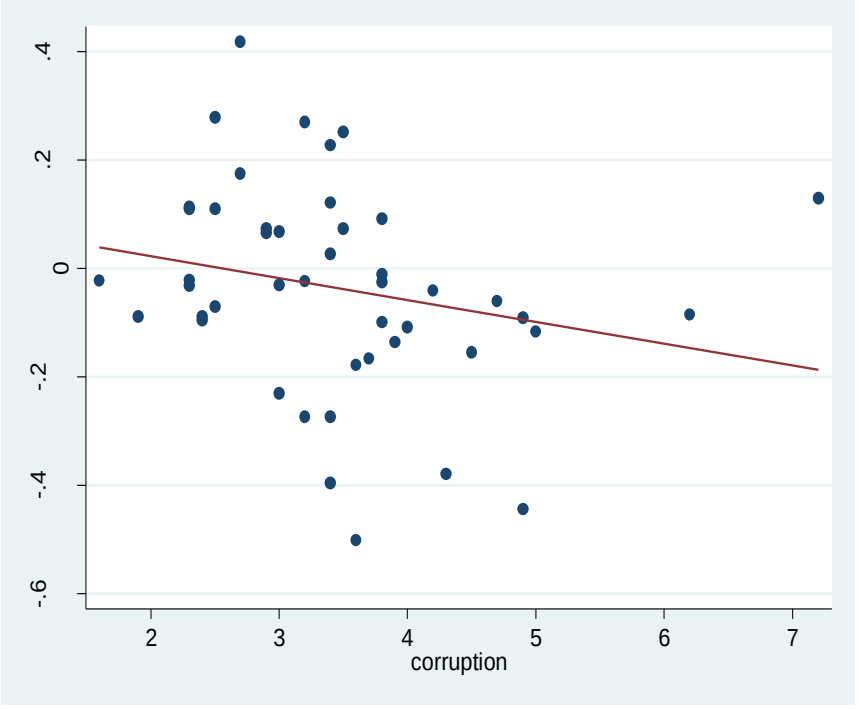
Hypothesis

Prices of sovereign bonds issued by EMs perceived as more corrupt move more closely with global markets during crises.

Data

- Weekly returns on international sovereign bonds (EMBI).
- Corruption Perception Index (TI)
- VIX
- S&P 500





Correlations with S&P, by Corruption Level

	correlation			crisis correlation			
	average	90% confidence interval		average	90% confidence interval		n
full sample	**0.17**	**0.14**	**0.21**	**0.14**	**0.09**	**0.20**	**46**
10% least corrupt	0.08	-0.08	0.24	-0.02	-0.14	0.11	5
25% least corrupt	0.11	0.04	0.18	0.03	-0.07	0.12	12
50% least corrupt	0.15	0.10	0.20	0.09	0.01	0.16	23
50% most corrupt	0.20	0.15	0.25	0.20	0.12	0.28	23
25% most corrupt	0.26	0.18	0.34	0.28	0.18	0.39	13
10% most corrupt	0.22	0.15	0.29	0.23	0.14	0.32	5

Note: Data are calculated weekly. Countries within sub-group are equally weighted.

The Empirical Models

Panel

$$r_{i,t} = \alpha_i + \tau_t + \delta' X_{i,t} + S\&P_t * \left[\eta Corr_i + \theta' X_{i,t}\right] + VIX_t * \left[\mu Corr_i + \pi' X_{i,t}\right] + S\&P_t * VIX_t * \left[\varphi + \psi Corr_i + \omega' X_{i,t}\right] + \varepsilon_{i,t}$$

ARCH

$$r_{i,t} = \alpha + \gamma Corr_i + \delta' X_{i,t} + S\&P_t * \left[\zeta + \eta Corr_i + \theta' X_{i,t}\right] + VIX_{i,t} * \left[\vartheta + \mu Corr_i + \pi' X_{i,t}\right] + S\&P_t * VIX_t * \left[\varphi + \psi Corr_i + \omega' X_{i,t}\right] + \varepsilon_{i,t}$$

$$h_{i,t} = a + bCorr_i + S\&P_t * [c + dCorr_i] + VIX_t * [f + gCorr_i] + S\&P_t * VIX_t * [j + kCorr_i] + lh_{i,t-1}$$

$$Hypothesis: \qquad \psi < 0$$

Panel Regression

	(1) 2nd order	(2) 3rd order	(3) Speculative	(4) All Crises	(5) US originated crises	(6) EM originated crises	(7) Asia
S&P*VIX	**0.205*** **	0.149**	-0.128	-0.088	-0.035	-3.935*	-0.234
	(6.460)	(2.120)	(-0.930)	(-0.460)	(-0.190)	(-1.960)	(-1.600)
S&P*Corruption	**-0.308*** **	-0.055	0.078	0.179	0.051	5.901	-0.044
	(-3.820)	(-0.970)	(0.650)	(0.620)	(0.180)	(1.600)	(-0.330)
S&P*Rating	-0.088	-0.212***	-0.207**	-0.191	-0.011	-2.486	-0.199
	(-0.920)	(-2.800)	(-2.020)	(-0.680)	(-0.040)	(-0.730)	(-0.770)
VIX*Corruption	-0.016	-0.028*	-0.036**	-0.043	-0.040	-0.059	-0.033
	(-0.820)	(-1.670)	(-2.400)	(-1.480)	(-1.310)	(-0.430)	(-0.700)
VIX*Rating	0.042*	0.053***	0.062***	0.081***	0.079***	-0.049	0.016
	(1.820)	(2.720)	(2.730)	(3.040)	(2.850)	(-0.380)	(0.250)
S&P*VIX*Corruption		**-0.225*** **	**-0.449*** **	**-0.273*** **	**-0.241** **	**-3.096**	**-0.525*** **
		(-4.740)	(-5.000)	(-2.700)	(-2.500)	(-1.490)	(-4.690)
S&P*VIX*Rating		0.181***	0.199***	0.158**	0.117	1.025	0.140
		(6.020)	(5.440)	(2.150)	(1.440)	(0.550)	(1.260)
S&P*VIX*Debt		0.087***	0.096***	0.035	0.009	0.234	-0.212
		(3.490)	(3.330)	(1.390)	(0.330)	(0.380)	(-1.500)
S&P*VIX*GDP		-0.038	-0.018	-0.026	-0.036	1.868*	-0.203***
		(-1.370)	(-0.570)	(-0.240)	(-0.340)	(2.060)	(-3.830)
S&P*VIX*default		0.156**	0.048	0.240	0.151	-4.768	0.025
		(1.930)	(0.660)	(1.170)	(0.740)	(-1.480)	(0.170)
N	18,708	18,708	12,688	1,304	1,136	168	4,426

country). *p<0.10, **p<0.05, ***p<0.01.

Robustness with Political Regime

	Base model	With Polity
S&P*VIX*Corr	-0.225***	-0.206***
	(-4.740)	(-4.240)
S&P*VIX*Polity		-0.036
		(-1.300)
S&P*VIX*Rating	0.181***	0.173***
	(6.020)	(5.510)
S&P*VIX*Debt	0.087***	0.085***
	(3.490)	(3.420)
S&P*VIX*GDP	-0.038	-0.020
	(-1.370)	(-0.690)
S&P*VIX*default	0.156**	0.154*
	(1.930)	(1.850)
Constant	0.008**	0.007*
	(1.830)	(1.730)
N	18,708	18,490
R^2	0.027	0.029

Additional Robustness Tests

Institutions, political regime and development variables

- Law and Order (ICRG)
- Bureaucracy Quality (ICRG)
- Rule of Law (ICRG)
- Quality of Institutions (ICRG)
- Democratic Accountability (ICRG)
- Legal Origin (LLSV, 1997)
- Accounting Opacity (LLSV, 1998)
- Voice and Accountability (WB)
- Government Effectiveness (WB)
- Regulatory Quality (WB)
- Rule of Law (WB)
- Political Stability and Absence of Violence/Terrorism (the WB)
- SDDS (IMF)
- O- Factor Composite (Gelos and Wei, 2005)
- Macrodata Opacity (Gelos and Wei, 2005)
- Macropolicy Opacity I (Gelos and Wei, 2005)
- Macropolicy Opacity II (Gelos and Wei, 2005)
- Corporate Opacity II (Gelos and Wei, 2005)
- Full range of authority characteristics (Polity IV project)
- Property rights index (Holmes, Johnson and Krkpatrick, 1997)
- Business regulation index (Holmes, Johnson and Krkpatrick, 1997)
- Democracy score (LLSV)
- Freedom indices for political rights and civil liberties (Freedom House)
- GDP pc, infrastructure quality (BERI's Operation Risk Index)
- Adult illiteracy rate (WB)
- Infant mortality rates (WB).

ARCH - Mean

	(1) Full sample	(2) Speculative	(3) All Crises	(4) Asia	(5) With Polity
Mean equation					
S&P*VIX*Corr	-0.082***	-0.576***	-0.022	-0.135	-0.054**
	(-3.140)	(-6.850)	(-0.180)	(-1.420)	(-2.180)
S&P*VIX*Polity					0.006
					(0.180)
S&P*VIX*Rating	-0.046*	0.135*	-0.025	-0.089	-0.068***
	(-1.780)	(1.800)	(-0.180)	(-1.250)	(-2.870)
S&P*VIX*Reserves	0.012	-0.007	-0.068*	0.006	0.026***
	(1.300)	(-0.410)	(-1.650)	(0.380)	(2.680)
S&P*VIX*Debt	0.090***	0.174***	0.006	0.043	0.096***
	(5.550)	(7.910)	(0.120)	(0.800)	(5.970)
S&P*VIX*GDP	-0.123***	-0.060***	0.086	-0.139***	-0.105***
	(-10.840)	(-2.940)	(0.920)	(-5.710)	(-9.040)
S&P*VIX*default	-0.046	-0.076	0.189	-0.139	-0.097*
	(-0.840)	(-1.050)	(0.910)	(-1.300)	(-1.670)
Constant	0.025***	0.016	0.240**	0.015	0.030***
	(3.530)	(1.620)	(2.360)	(0.610)	(4.140)

*Notes: The dependent variable is returns on EM. The table presents only indicators to which results were significant. Z-Statistics are given in parentheses. *p<0.10, **p<0.05, ***p<0.01*

Theoretical Framework

(Built on Barberis et al., 2005)

2 categories of risky assets:

X – "The Market" (Sharpe, 1964)

Y - EM sovereign bonds

$$\Delta P_{k,t} \equiv P_{k,t} - P_{k,t-1}$$

$$\Delta P_{i,t} = \varepsilon_{i,t} + \Delta u_{Xt} \qquad i \in X$$

$$\Delta P_{j,t} = \varepsilon_{j,t} + \Delta u_{Xt} \qquad j \in Y$$

$u_{Xt} \sim N(0, \sigma_u^2)$, i.i.d. over time

$$\varepsilon_{j,t} = \psi_{M,j,i} f_{M,t} + \psi_{S,j} f_{Y,t} + \sqrt{\left(1 - \psi_{M,j,i}^2 - \psi_{S,j}^2\right)} f_{j,t}$$

The OLS estimate of $\beta_{j,i}$ of an individual bond in the regression:

$$\Delta P_{j,t} = \alpha_j + \beta_{j,i}\Delta P_{X,t} + \upsilon_{j,t}$$

Is given by:

$$\beta_{j,i} = \frac{\psi_{M,j,i}^2 + 2\sigma_u^2}{\psi_{M,j,i}^2 + \psi_{S,j}^2 + 2\sigma_u^2}$$

During periods of crises, $\psi_{M,j}$, increases: $\psi_{M,j,C} > \psi_{M,j,N}$
Then, $\beta_{j,i}$ increases with $\psi_{M,j}$:

$$\frac{d\beta_{j,i}}{d\psi_{M,j}} = \frac{2\psi_{M,j,i}\psi_{S,j}^2}{\left(\psi_{M,j,i}^2 + \psi_{S,j}^2 + 2\sigma_u^2\right)^2} > 0$$

The increase from $\psi_{M,j,N}$ to $\psi_{M,j,C}$ is conditional on the issuer's corruption level:

- The load of world-wide news on cash-flow shock raises with corruption during market turmoil.
- Consequently, a relatively greater increase in the country's market risk is evident.

The Role of Corruption in the Changing $\psi_{M,j}$ during Crises

- More corrupt countries are associated with weaker institutions, less complete information and greater ambiguity.

- During turbulent times, an issuer's corruption level which had been hard-coded by investors over the years, is used as a signal to the unknown completeness of information.

Additional Effects of Corruption on β during Crises

1. Market-Dependent Probability Distribution

Corruption objectively amplifies the effect of negative shocks if it affects the borrowing and default decisions of the country.

Probability Distributions

normal
crisis

clean

corrupt

Two Distributions

Figure 6a

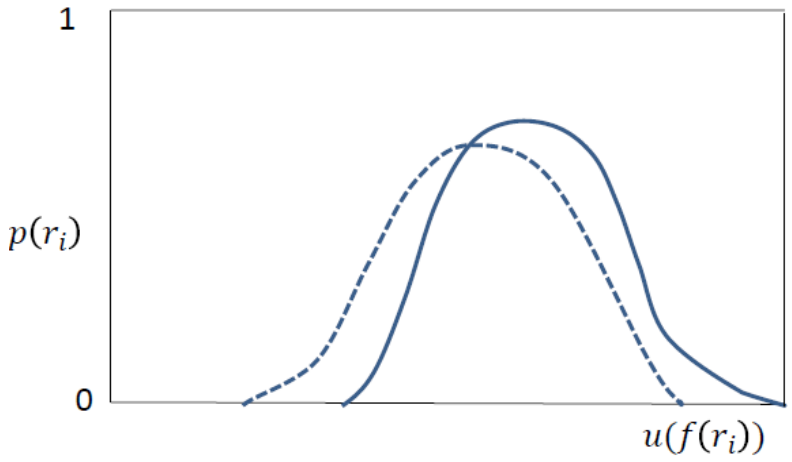
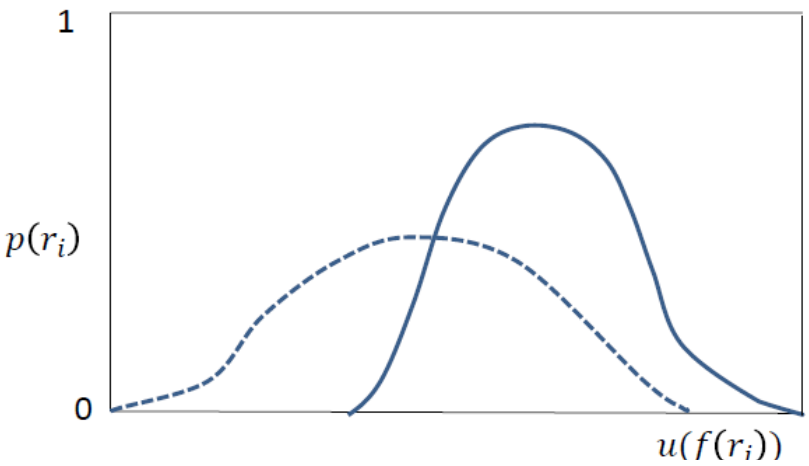


Figure 6b



Ambiguity Aversion

Figure 6c

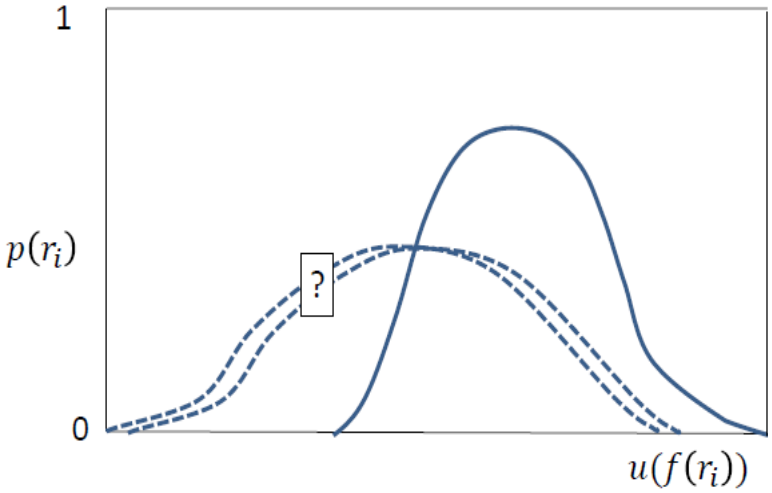
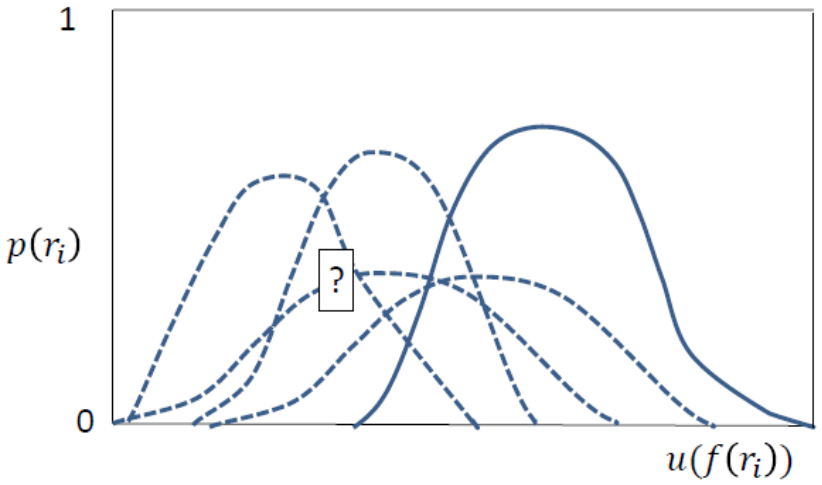


Figure 6d



2. Adaptive Decision-Making under Pressure

I. When faced with a complex environment of a crisis, given human limited cognitive capacity, investors shift strategy from expected utility maximization to simplifying heuristics. They then process only part of the relevant data.

Coates and Herbert (2008): trader cortisol levels rise with both the variance of trading results and the volatility of the market.

II. Corruption acts as a bond aspect, on which investors focus under pressure.

Paserman (2015):

- Artefactual field experiment (Harrison and List, 2004). A computerized investment game played by 53 financial professionals in Geneva, London, Tel Aviv, Zurich and Lugano.

- 3 “crisis” treatments:
  I. Time pressure
  II. Data drawn from financial crises
  III. Cognitive load

Results

- During financial crises investors shift from strategies consistent with expected utility maximization to ones in which they reduce information processing, even when they have enough time to search all relevant information.

- Corruption is an aspect on which investors systematically focus during crises.

Conclusions

During financial crises market risk of bonds rises with the issuing country’s corruption level.

The findings have implications for bond pricing, global financial market stability, portfolio management and for policy:

By reducing corruption, EMs could benefit from global integration while decreasing potential side effects of sudden capital outflows during crises.

Thank you ☺