Academy of Economic Studies
Doctoral School of Finance and Banking - DOFIN

An empirical study on comovement between sovereign bonds and CDS spreads in European emerging markets

M.Sc. Student: GABAROI MIRELA ANDREEA

Supervisor Professor: MOISĂ ALTĂR

Content

Main topics

- Main drivers of the CDS and bond spreads;
- Long-term relationship between CDS and bond spreads;
- Primary market of the price discovery of EEM countries' credit risk;
- Main determinants of the CDS-bond basis after 2008;
- Comovement and spillover effects between EEM CDS.

Literature review

Perfect arbitrage opportunity-Studies made by Duffie(1999), Blanco et al.(2003), Hull (2004), Ammer and Cai (2007).

The two credit spreads as part of different markets generate exposure to the **same sovereign debt and default risk**.In what concerns the **benckmark assumption**, some authors like Beber (2009), Fontana (2010) used the 10-year swap rate as a proxy for the risk free rate.Other opinions (Hull, Predescu and White(2004)) suggest the use of repo rate as risk-free rate or Haugh(2009), Salvador et al.(2009) who applied for 10-year German Bunds as benchmark bonds.

Credit spreads decomposition is made based on three main factors: global risk, liquidity risk and other specific country factors. In this case, we have studies made by Campbell and Taksler (2003), Achrya and Johnson (2007), Tang and Yan (2007), Beber(2009), Haugh et al. (2009), Sgherri and Zoli (2009), Barrios, Iversen and Lewandowska (2009).

Literature review

So similar to Blanco et al(2003) , ECB(2004), Wit(2006), Ammer and Cai (2007) , we apply a cointegration method to examine how close the connection between these two markets is. The analyse of the two markets' role in the price discovery process is made with the error correction method introduced by Gonzalo and Granger (1995) and applied by Blanco(2003), ECB(2004, 2007).

According to JP Morgan, (2009), any differences between the bond market and the CDS market can provide information on the potential existence and size of arbitrage opportunities which should typically be very small if credit markets are functioning normally.

Empirical analysis on the basis during the crisis were made by Fontana(2010) and Barot and Guo(2010)

Data

Countries : 6 European Emerging Countries (Romania, Bulgaria, Poland, Croatia, Hungary, Czech Republic)

Sample: January 2006 – March 2012 (2 periods separated by Lehman Brothers' Default)

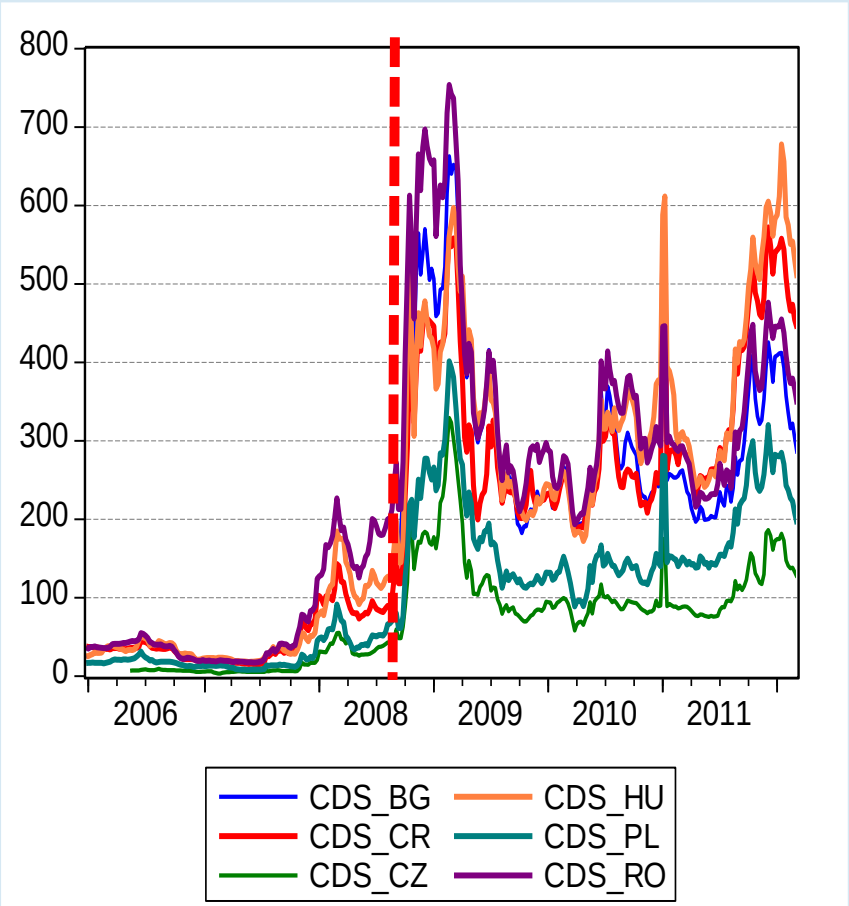
Frequency : weekly average and daily data (in the case of comovement and spillover effects

Economic variables:

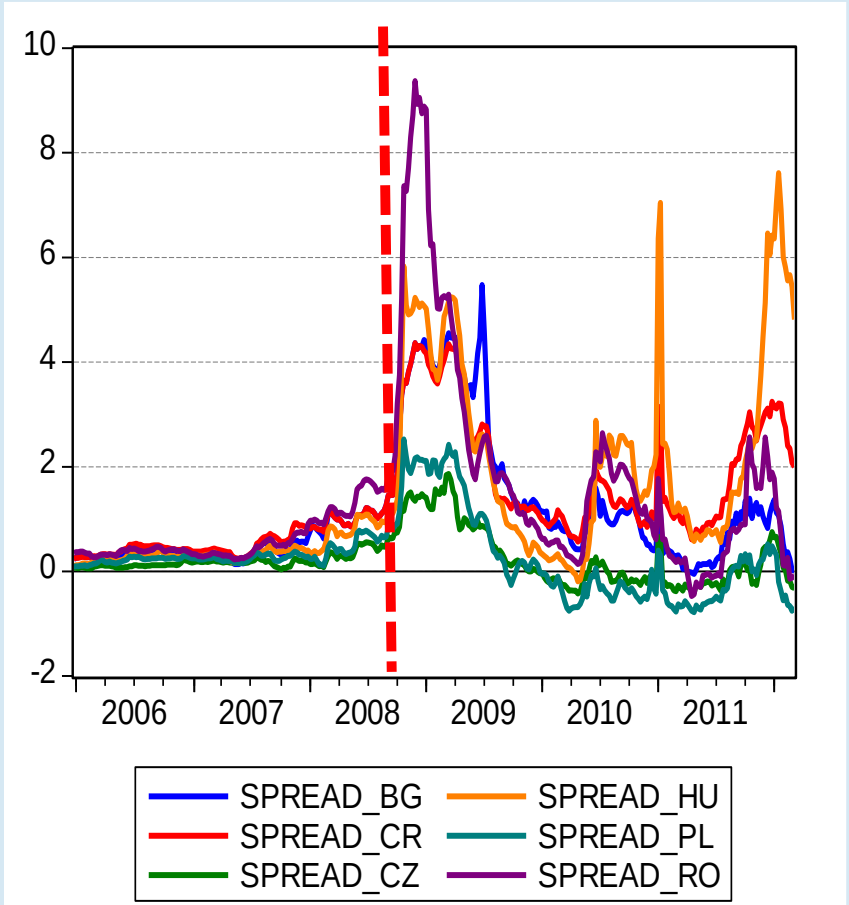
- 5y denominated in EUR **Bond spreads** (build on a German 5y Benchmark bond)(mid yield to maturity)
- 5y denominated in USD **CDS spreads** (mid quotes)
- Proxy for risk-free rate: 5y EUR swap rate, Euribor 3 M, Eonia
- Market equity indices: MSCI EMEE,BET, BUX, SOFIX, WIG20, CRO,PX, DAX Index (denom inated in EUR)
- Liquidity indicators: On-Off US government bond yields
- Slope of the term structure: US 2y-10y slope, German 2y-10y slope
- Exchange rate uncertainty: EVZ Index
- Risk aversion indicators: VIX Index, VDAX Index

Data

5Y CDS spreads for EEM sovereigns

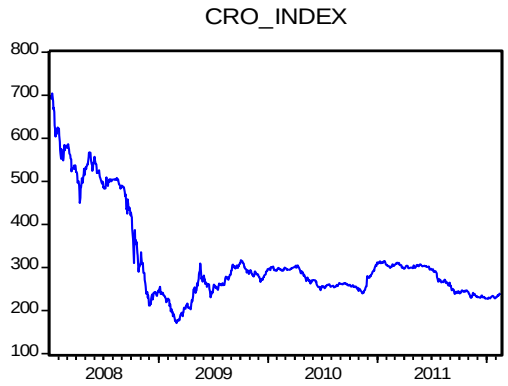


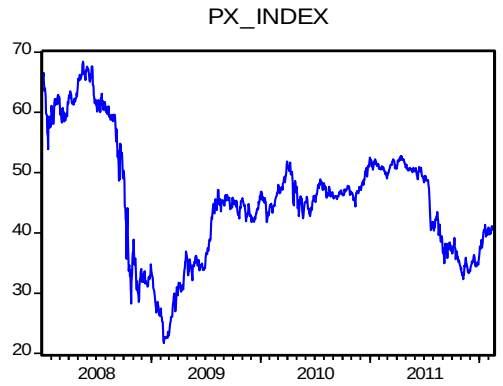
5Y Bond spreads for EEM sovereigns

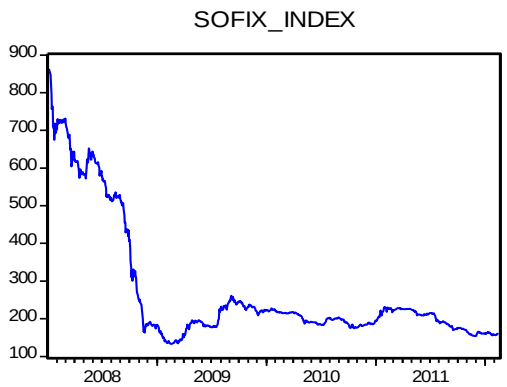


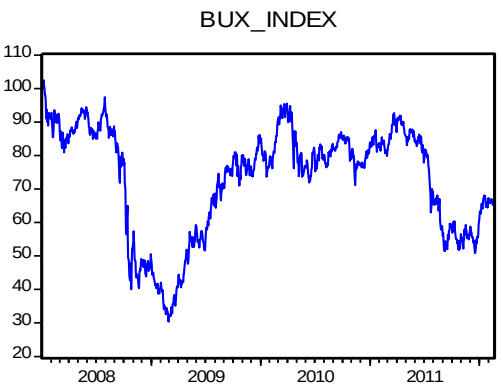
Data

EM EQUITY INDEX



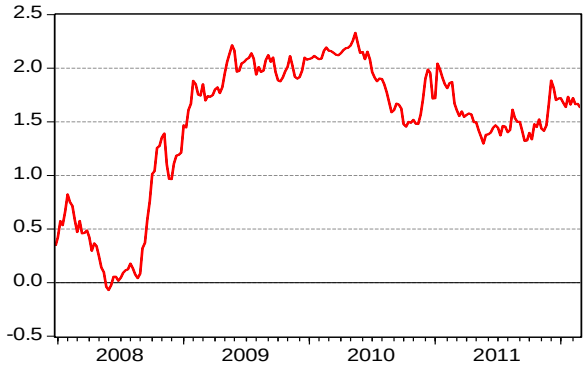




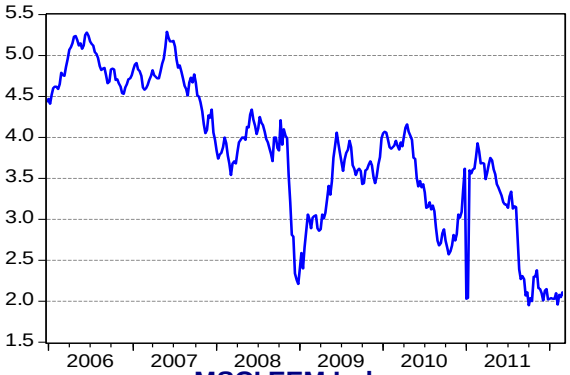


Data

10y-2y German Bunds spread



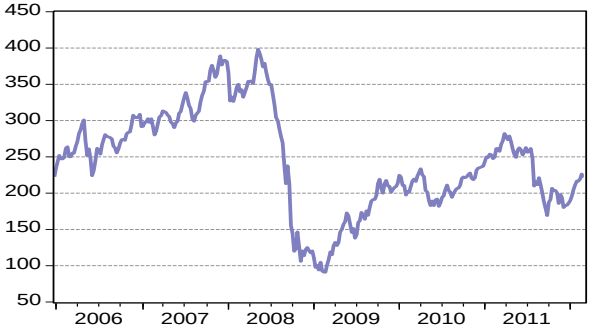
On-the-run and off-the-run US bonds



LIQUIDITY INDICATORS

VIX Index

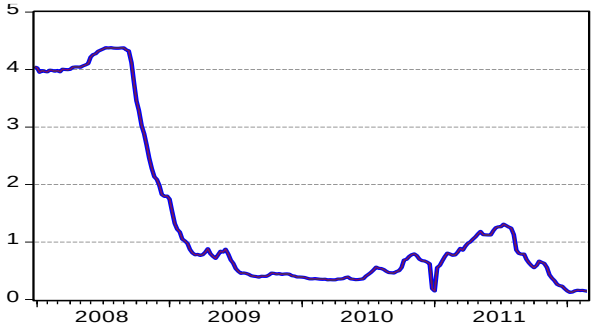
MSCI EEM Index



RISK AVERSION AND SENTIMENT INDICATORS

5-year EUR Swap Rate

EURIBOR 3 Months Rate



RISK FREE RATES

Methodology

Determinants of CDS and bonds spreads

- According to Beck and Katz (1995), we used a panel corrected standard errors (PCSE) or Prais – Winsten model with panel –corrected standard errors.
- We integrated country fixed effects
- Fixed effects panel estimated with GLS cross section SUR in order to account for cross sectional heteroskedasticity and correlation.
- To avoid spurious regression, the model is estimated in first differenced and set as follows:

$$\Delta sov\_spread_{it} = C + \beta_1 \Delta EQ\_index_{it} + \beta_2 \Delta EURIBOR\_3M_t + \beta_3 \Delta VIX\_INDEX_t + \beta_4 \Delta ON\_OFF\_USD_t + \beta_5 \Delta EUR\_SWAP_t + \beta_6 \Delta MSCI\_INDEX_t + \beta_7 \Delta SLOPE\_GER_t + u_{it}$$

$$\Delta CDS_{it} = C + \beta_1 \Delta EQ\_index_{it} + \beta_2 \Delta EURIBOR\_3M_t + \beta_3 \Delta VIX\_INDEX_t + \beta_4 \Delta ON\_OFF\_USD_t + u_{it}$$

Methodology

Testing for long-run relationship between CDS and Bond spreads

- The **first step** is to check if the variables in question are non-stationary.In this case , the Augmented Dickey –Fuller (ADF) unit-root –stationarity tests are performed and for robustness purposes, Philips –Perron (PP) tests are performed to confirm the non-stationarity of CDS and bond spreads.

- In the **second step** we used Johansen Cointegration Tests(no restriction on the coefficients) under the null hypothesis that the two series are not cointegrated.In this step, we use the trace statistics.

- We relied on SBIC(Schwarz's Bayesian Information Criterion) in lag length selection criteria for the ADF and Cointegration Tests.If the variables are not cointegrated, we can perform Granger Causality tests using first differences.

Methodology

Primary market of the price discovery of European emerging country's credit

- If cointegrated variables move together in the long run , but may deviate from each otherin the short run, means they follow an adjustment process towards equilibrium.In this step we can apply for a model that considers this adjustment process known as VECM.The analysis of the two markets' role in the price discovery process is made with the error correction method introduced by Gonzalo and Granger (1995) , applied by Blanco(2003) , ECB(2004, 2007).
- The VECM is specified as follows:

$$\Delta p_{CDS,t} = a_1 + \lambda_1 Z_{t-1} + r_{1,j} \Delta p_{CDS,t-i} + k_{1,j} \Delta p_{CS,t-i} + \varepsilon_{1t} \quad (1.1)$$

$$\Delta p_{CS,t} = a_2 + \lambda_2 Z_{t-1} + r_{2,j} \Delta p_{CDS,t-i} + k_{2,j} \Delta p_{CS,t-i} + \varepsilon_{2t} \quad (1.2)$$

$$p_{CDS,t} + \beta p_{CS,t} + \mu = Z_t = I(0) \quad (1.3)$$

where $p_{CDS,t}$ implies the sovereign CDS spread and $p_{CS,t}$ implies the bond spread.

- Equation (**1.1**) and (**1.2**) express the short term dynamics of CDS and bond spread changes . Z_{t-1} is the error correction term given by the long run equation **(1.3)** that describes deviations of CDS and bond spreads from their approximate non-arbitrage relation.

Methodology

Primary market of the price discovery of European emerging country's credit risk

- If the cash bond market is contributing significantly to price discovery , then **λ1 <0** and statiscally significant as the CDS market adjusts to incorporate this information.Similarly , if the CDS market has an important role in price discovery, then **λ2 >0** and statistically significant.If both coefficients are significant , then both markets contribute to price discovery.The existence of cointegration between CDS and bond spreads implies that at least one of the markets contributes to price discovery and the other one has to adjust.
- In order to investigate the mechanics of price discovery, we use the measures proposed by Gonzalo and Granger(1995), and Hasbrouck(1995);

$$GG = \frac{\lambda_2}{\lambda_2 - \lambda_1} \qquad HAS_1 = \frac{\lambda_2^2\left(\sigma_1^2 - \frac{\sigma_{12}^2}{\sigma_2^2}\right)}{\lambda_2^2\sigma_1^2 - 2\lambda_1\lambda_2\sigma_{12} + \lambda_1^2\sigma_2^2} \qquad HAS_2 = \frac{\left(\lambda_2\sigma_1 - \lambda_1\frac{\sigma_{12}}{\sigma_1}\right)^2}{\lambda_2^2\sigma_1^2 - 2\lambda_1\lambda_2\sigma_{12} + \lambda_1^2\sigma_2^2}$$

Methodology

Determinants of the basis between CDS spreads and yield spreads

- The effects of the factors are evaluated by means of a standard panel regression approach where we integrated country fixed effects.
- Fixed effects panel estimated with GLS cross section SUR in order to account for cross sectional heteroskedasticity and correlation.
- We estimate the regression as given below:

$$BASIS_{it} = C + \beta_1 * BASIS(-1)_{it} + \beta_2 * log(RA)_t + \beta_4 * log(ON\_OFF\_USD)_t + \beta_5 * LOG(EVZ\_INDEX)_t + \beta_6 * LOG(CP\_FIN\_OUT)_t + \beta_7 * LOG(SLOPE\_GER)_t + \beta_8 * LOG(TERM\_REPO\_OUT)_t + u_{it}$$

where the error term uit thus comprises a random term εt and a component ψi which captures (unobservable) time-invariant country i-specific effects. The effects of the factors are evaluated by means of a standard panel regression approach using the basis as the dependent variable and also incorporating country fixed effects.

Results

Main drivers of the CDS spreads

Dependent Variable: D(CDS)

Method: Panel EGLS (Cross-section SUR)

Linear estimation after one-step weighting matrix

Cross-section SUR (PCSE) standard errors & covariance (d.f.corrected)

	period I		period II		
Variable	Coefficient	*t-Statistic*	Coefficient	*t-Statistic*	expected sign
Intercept	0.38	1.31	-0.1	-0.17	
DLOG(EQ_INDEX)	-6.95	-1.59	-46.1	-4.23***	-
DLOG(VIX_INDEX)	33.75	10.48***	210.7	23.34***	+
D(ON_OFF_USD)	-8.18	-2.55**	-19.4	-4.71***	-
D(EURIBOR_3M)	-5.41	-0.88	-25.7	-2.67***	-
Adjusted R-squared		0.16		0.52	

Note : The asterisks ***,**,* indicate significance at the 1%, 5%, 10% respectively.

Results

Main drivers of the bond spreads

Dependent Variable: D(SPREAD)

Method: Panel EGLS (Cross-section SUR)

Linear estimation after one-step weighting matrix

Cross-section SUR (PCSE) standard errors & covariance (d.f.corrected)

	period I		period II		
Variable	Coefficient	*t-Statistic*	Coefficient	*t-Statistic*	expected sign
Intercept	-0.1	-0.33	-1.11	-1.44	-
DLOG(EQ_INDEX)	-15.6	-3.57***	-32.21	-2.05**	+
DLOG(VIX_INDEX)	11.41	3.50***	69.12	7.22***	-
D(ON_OFF_USD)	-17.21	-3.57***	-43.13	-8.90***	-
D(SLOPE_GER)	-12.14	-2.48**	-8.33	-0.87	-
DLOG(MSCI_INDEX)	-21.27	-2.38**	4.78	0.32	-
D(EUR_SWAP)	27.01	4.37***	15.36	1.65*	-
D(EURIBOR_3M)	23.61	3.80***	-16.73	-1.78*	-
Adjusted R-squared		0.12		0.27	

Note:The asterics ***,**,* indicate significance at the 1%, 5%, 10% respectively.

Results

Long-term relationship between sovereign bond market and sovereign CDS market

PERIOD I (2006M01-2008M09)				
	Stationarity tests		*Number of cointegrating vectors*	
Country	**ADF**	**PP**	**None**	**At most 1**
Romania	**I(1)**	**I(1)**	**25.22***	5.17
Bulgaria	**I(1)**	**I(1)**	**24.14***	4.48
Croatia	**I(1)**	**I(1)**	**22.71***	7.15
Czech Republic	**I(1)**	**I(1)**	**26.02***	4.79
Poland	**I(1)**	**I(1)**	**25.13***	4.85
Hungary	**I(1)**	**I(1)**	**23.76***	4.69

Note: * shows the rejection of the null hypothesis in the header of the table

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

PERIOD II (2009M09-2012M03)				
	Stationarity tests		*Number of cointegrating vectors*	
Country	**ADF**	**PP**	**None**	**At most 1**
Romania	**I(1)**	**I(1)**	**20.26***	9.16
Bulgaria	**I(1)**	**I(1)**	**37.48***	4.50
Croatia	**I(1)**	**I(1)**	**26.55***	4.18
Czech Republic	**I(1)**	**I(1)**	**14.65***	4.05
Poland	**I(1)**	**I(1)**	**26.63***	4.31
Hungary	**I(1)**	**I(1)**	**21.41***	3.90

Note: * shows the rejection of the null hypothesis in the header of the table

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Results

Long-term relationship between sovereign bond market and sovereign CDS market

PERIOD I (2006M01-2008M09)		
Country	*Cointegration relation*	
	constant	**β**
Romania	-17.28	**-1.02*** **
Bulgaria	-15.78	**-0.77*** **
Croatia	34.57	**-1.3*** **
Czech Republic	-2.96	**-0.26*** **
Poland	-9.14	**-0.5*** **
Hungary	-0.18	**-1.09*** **

Note:The asterics ***,**,* indicate significance at the 1%, 5%, 10% respectively.

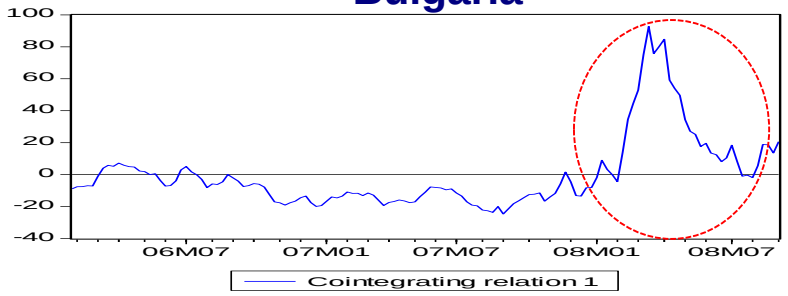
PERIOD II (2008M09-2012M03)		
Country	*Cointegration relation*	
	constant	**β**
Romania	-181.73	**-1.13*** **
Bulgaria	-189.88	**-0.62*** **
Croatia	-144.61	**-1.24*** **
Czech Republic	-101.53	**-0.78*** **
Poland	-157.67	**-1.06*** **
Hungary	-210.29	**-0.61*** **

Note:The asterics ***,**,* indicate significance at the 1%, 5%, 10% respectively.

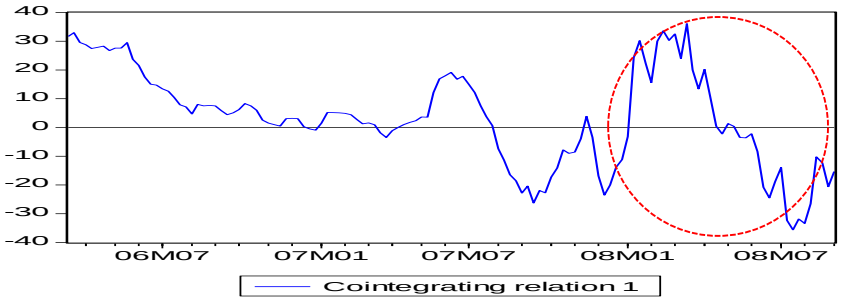
Results

Period I 2006M01-2008M09

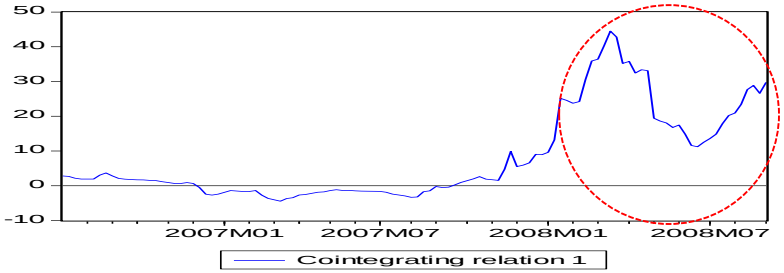
Bulgaria



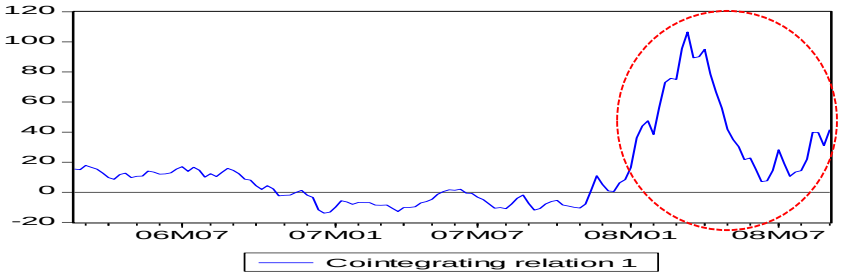
Croatia



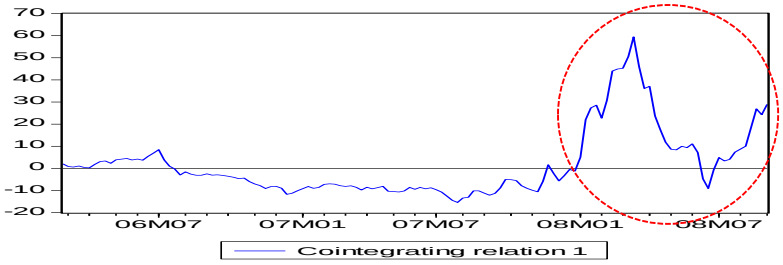
Czech republic



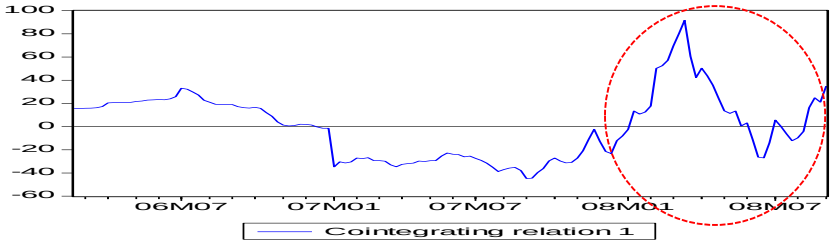
Hungary



Poland



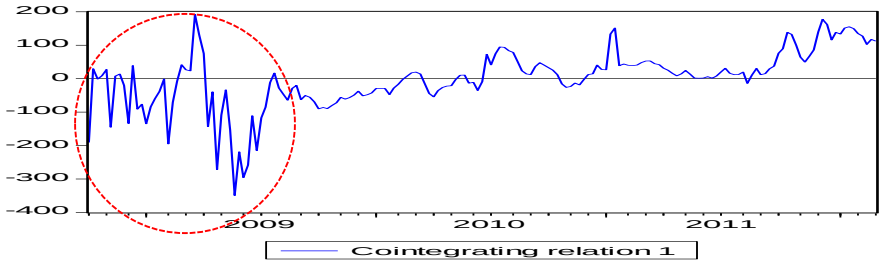
Romania



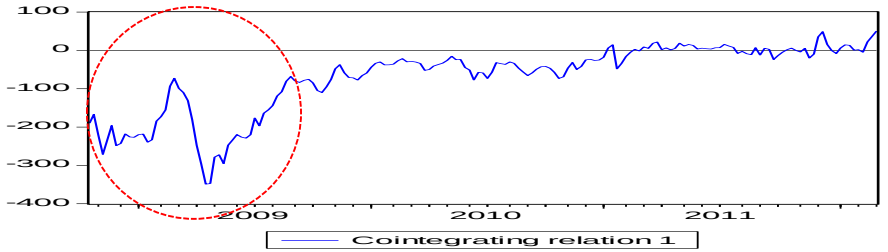
Results

Period II 2008M09-2012M03

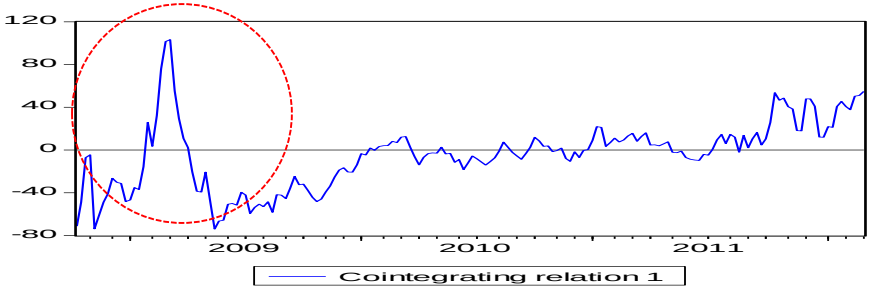
Bulgaria



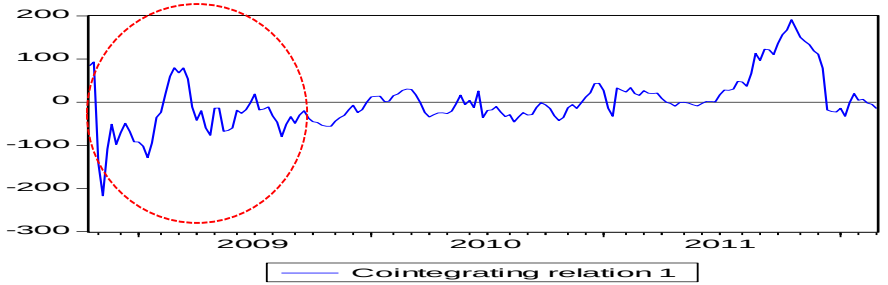
Croatia



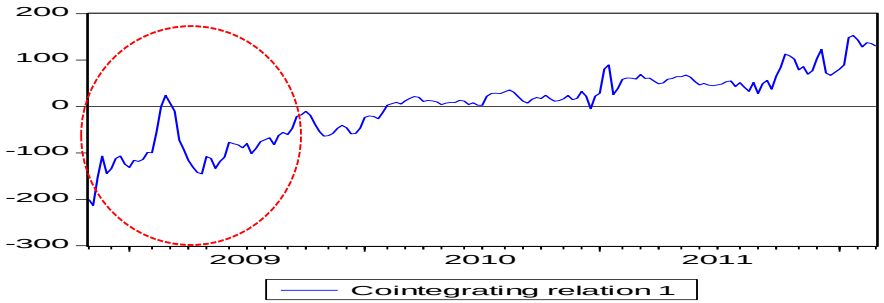
Czech republic



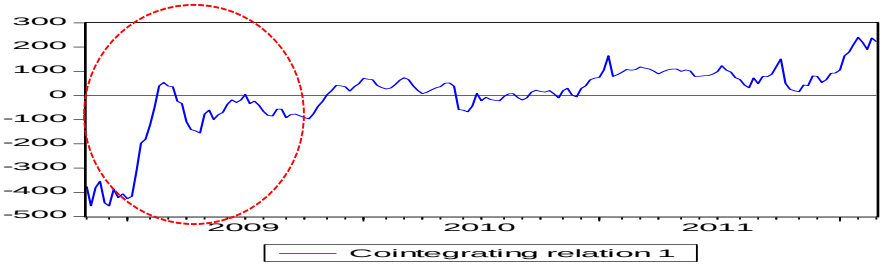
Hungary



Poland



Romania



Results

Primary market of the price discovery of European emerging country's credit risk

PERIOD I (2006M01-2008M09)				Gonzalo Granger	Hasbrouck			Appropiate error correction
Country		VECM						
		λ1	λ2	GG	HAS 1	HAS2	MID	AEC
Romania	**coefficient**	-0.074**	0.068**	**0.48**	**0.36**	**0.60**	**0.48**	**0.14**
	t-statistic	[-2.37274]	[2.24998]					
Bulgaria	**coefficient**	-0.098***	0.03	**0.21**	**0.07**	**0.44**	**0.25**	**0.12**
	t-statistic	[-3.13850]	[1.13383]					
Croatia	**coefficient**	-0.04**	0.03	**0.40**	**0.26**	**0.56**	**0.41**	**0.08**
	t-statistic	[-2.09756]	[1.60508]					
Czech Republic	**coefficient**	-0.136***	0.25***	**0.65**	**0.44**	**0.81**	**0.63**	**0.39**
	t-statistic	[-3.08249]	[4.71396]					
Poland	**coefficient**	-0.11***	0.14***	**0.57**	**0.32**	**0.65**	**0.48**	**0.25**
	t-statistic	[-3.15229]	[3.00875]					
Hungary	**coefficient**	0.00	0.098***	**1.01**	**0.77**	**1.00**	**0.88**	**0.10**
	t-statistic	[0.03605]	[4.12609]					

Note:The asterics ***,**,* indicate significance at the 1%, 5%, 10% respectively.

Results

Primary market of the price discovery of European emerging country's credit risk

PERIOD II (2008M09-2012M03)				Gonzalo Granger	Hasbrouck			Appropiate error correction
Country		VECM		GG	HAS 1	HAS2	MID	AEC
		λ1	λ2					
Romania	**coefficient**	-0.003	0.169***	**0.98**	**0.94**	**1.00**	**0.97**	**0.17**
	t-statistic	[-0.19483]	[6.61784]					
Bulgaria	**coefficient**	-0.02	0.118*	**0.84**	**0.54**	**0.57**	**0.56**	**0.14**
	t-statistic	[-1.62599]	[1.83003]					
Croatia	coefficient	-0.006227	0.016*	**0.73**	**0.42**	**0.96**	**0.69**	**0.02**
	t-statistic	[-0.53454]	[1.84662]					
Czech Republic	**coefficient**	-0.04	0.060*	**0.59**	**0.53**	**0.76**	**0.65**	**0.10**
	t-statistic	[-1.64886]	[2.45972]					
Poland	**coefficient**	-0.01	0.026**	**0.77**	**0.79**	**0.93**	**0.86**	**0.03**
	t-statistic	[-0.66442]	[2.20514]					
Hungary	**coefficient**	-0.0029	0.1811***	**0.98**	**0.90**	**1.00**	**0.95**	**0.18**
	t-statistic	[-0.09370]	[3.16116]					

Note:The asterics *,**,* indicate significance at the 1%, 5%, 10% respectively.**

Results

Primary market of the price discovery of European emerging country's credit risk

Country	Period I	Period II
Bulgaria	cointegrated-Bond leads	cointegrated-CDS leads
Croatia	cointegrated-Bond leads	cointegrated-CDS leads
Czech Republic	cointegrated-CDS leads	cointegrated-CDS leads
Poland	cointegrated-Bond leads	cointegrated-CDS leads
Hungary	cointegrated-CDS leads	cointegrated-CDS leads
Romania	cointegrated-Bond leads	cointegrated-CDS leads

Results

Determinants of the basis between CDS spreads and yield spreads

Dependent Variable: BASIS

Method: Panel EGLS (Cross-section SUR)

Linear estimation after one-step weighting matrix

Cross-section SUR (PCSE) standard errors & covariance (d.f.corrected)

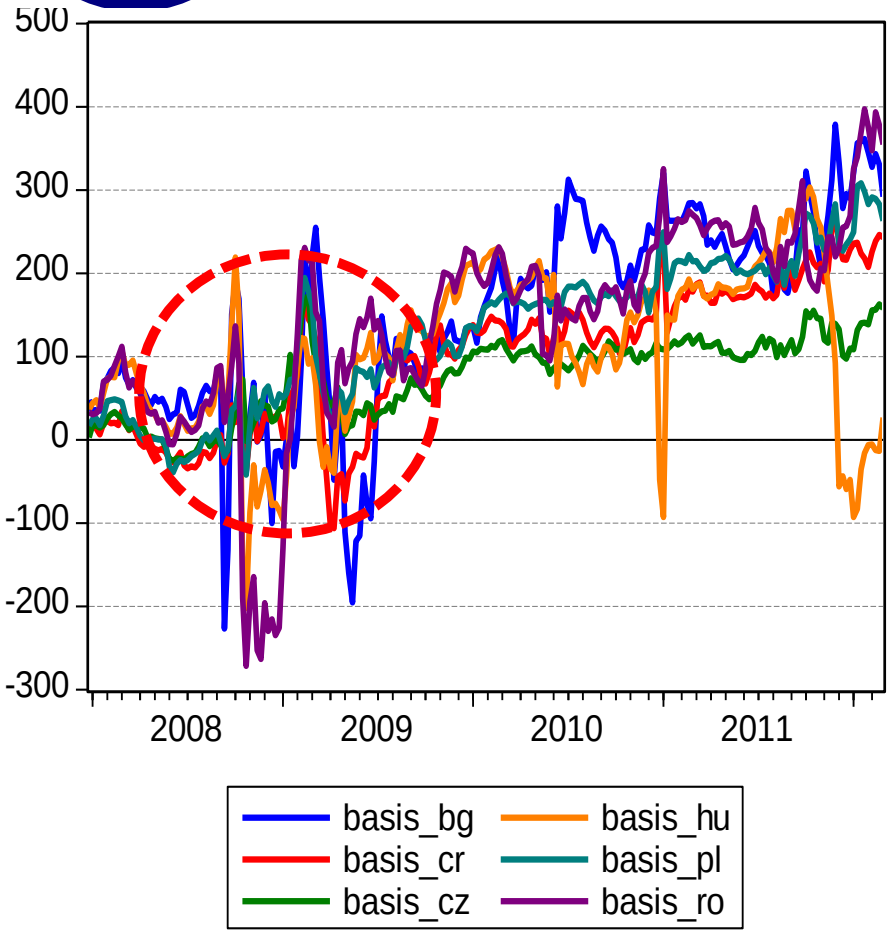
Variable	Coefficient	t-Statistic	expected sign
Intercept	41.92513	0.403	
BASIS(-1)	0.890933	74.54***	
RA	279.5831	2.349**	+
LOG(ON_OFF_USD)	-23.48863	-4.752***	-
LOG(EVZ_INDEX)	-13.78534	-2.876***	-
LOG(CP_FIN_OUT)	21.28137	4.303***	+
LOG(SLOPE_GER)	3.895983	2.378**	+
LOG(TERM_REPO_OUT)	16.29298	2.222**	+
Adjusted R-squared	**0.91**		

Note:The asterics *,**,* indicate significance at the 1%, 5%, 10% respectively.**

Results

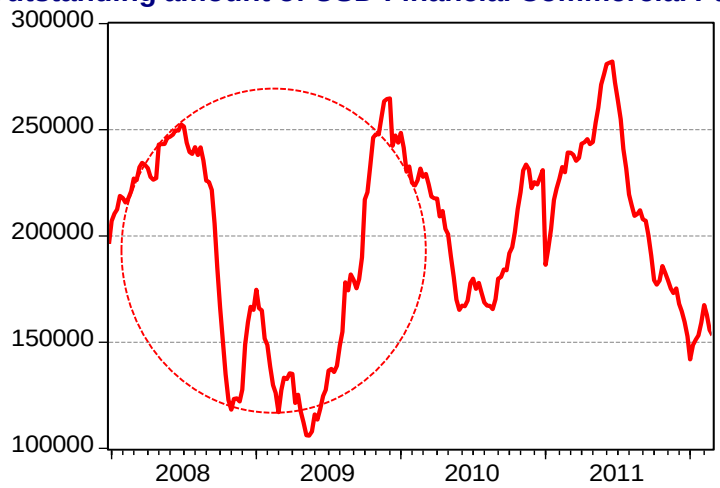
Determinants of the basis between CDS spreads and yield spreads

5Y Basis for EEM sovereigns



Volume of term repos*

Outstanding amount of USD Financial Commercial Papers*



***Due to a lack of comparable data for Europe we use data from the Federal Reserve Bank of New York**

Results

Comovement and Spillover effects in daily CDS returns of EEM sovereign bonds

- In this part of the paper we are testing for the existence of a comovement in the CDS of sovereign bonds and for the existence of spillover effects between the European Emerging countries.The previous results have indicated that common determinants affect the spreads and the VIX Index is the main risk aversion indicator that has an important impact on the CDS.The countries included in the analysis are Poland, Hungary, Croatia, Bulgaria, Romania, and Czech Republic.In order to perform such an analysis, we consider in this case daily CDS returns from **January 2008 until March 2012.**

- In order to find a comovement between CDS spreads volatility across EEM countries we used a Component GARCH model (CGARCH) as the one indicated by Engle and Lee (1993).The model decomposes conditional variance of the daily return series into a stochastic permanent or long run trend and a transitory or short run component.The model is specified as follows :

$$dlog(CDS)_t = c * dlog(VIX)_t + [d*MA(1)] + \varepsilon_t \quad \varepsilon_t / I_{t-1} \, N(0, \sigma_t^2) \qquad (4)$$

$$\sigma_t^2 = q_t + a_1 * (\varepsilon_t^2 - q_{t-1}) + a_2 * (\sigma_{t-1}^2 - q_{t-1}) + a_3 * (\varepsilon_{t-1}^2 - q_{t-1}) * D_{t-1} \qquad (5)$$

$$q_t = \omega + b_1 * (q_{t-1} - \omega) + b_2 * (\varepsilon_{t-1}^2 - \sigma_{t-1}^2) \qquad (6)$$

Results

Comovement and Spillover effects in daily CDS returns of EEM sovereigns

GARCH Results (01.01.2008-05.03.2012)-evidence from daily data

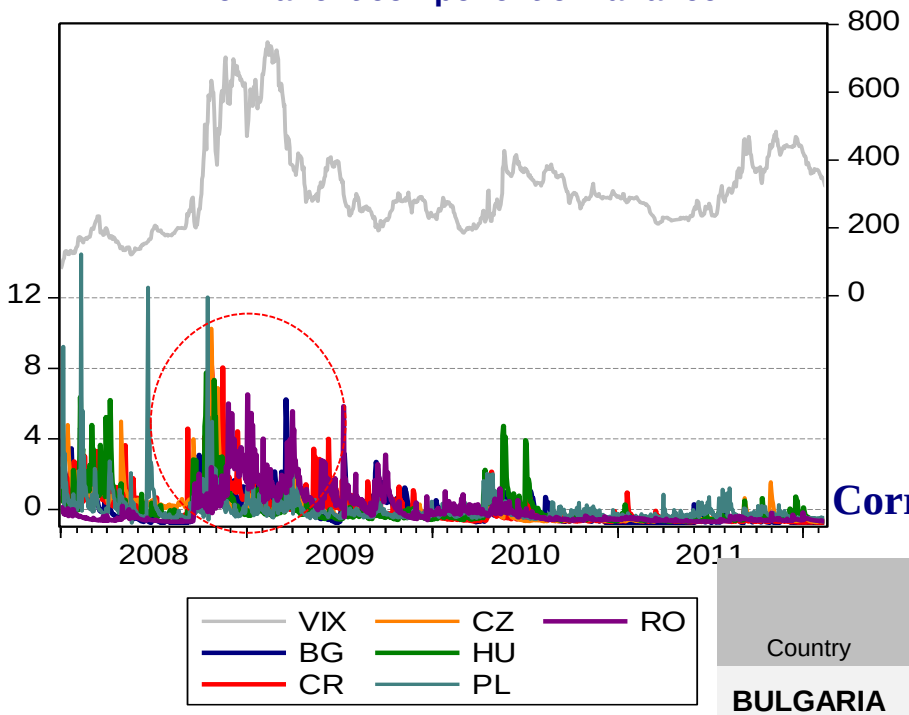
Country		BULGARIA	CROATIA	CZECH REPUBLIC	HUNGARY	POLAND	ROMANIA
VIX	C	0.862***	0.708***	0.687***	0.680***	0.804***	0.987***
MA(1)	D	-0.238***	-0.095***	-0.075**	-	-	-0.757***
TREND INTERCEPT	ω	0.0003***	0.02	0.0002***	0.0008***	0.0014***	0.0006***
TREND AR TERM	B1	0.989***	0.999***	0.9965***	0.986***	0.9319***	0.9998***
FORECAST ERROR	B2	0.055***	0.047***	0.0142***	0.0797***	0.1417***	0.10408***
ARCH Term	A1	0.095***	0.215***	0.1923***	0.141***	0.2291***	0.1784***
ASYMETRIC TERM	A3	-0.03	0.05	-0.090***	0.07	-0.1716***	0.04
GARCH TERM	A2	0.778***	0.414***	0.7381***	0.363***	-0.0468***	-0.0378***
A1+A2		0.8730	0.6290	0.9305	0.5050	0.1823	0.1406

Note:The asterics *,**,* indicate significance at the 1%, 5%, 10% respectively.**

Results

Comovement and Spillover effects in daily CDS returns of EEM sovereign bonds

Permanent component of variance



Correlation coefficients between permanent components of variance

Country	BULGARIA	CROATIA	CZECH REPUBLIC	HUNGARY	POLAND	ROMANIA
BULGARIA		0.60	0.63	0.51	0.43	0.53
CROATIA	0.60		0.63	0.53	0.38	0.39
CZECH REPUBLIC	0.63	0.63		0.56	0.46	0.21
HUNGARY	0.51	0.53	0.56		0.43	0.12
POLAND	0.43	0.38	0.46	0.43		0.09
ROMANIA	0.53	0.39	0.21	0.12	0.09	

Results

Comovement and Spillover effects in daily CDS returns of EEM sovereign bonds

Results of principal components analysis for the permanent conditional standard deviations

A.All Countries

Included observations: 1076 after adjustments

Correlation of PCV_BG PCV _CR PCV _CZ PCV _HU PCV _PL PCV _RO

	Comp 1	Comp 2	Comp 3	Comp 4	Comp 5	Comp 6
Variance Prop.	0.543051	0.175078	0.102207	0.074201	0.063950	0.041512
Cumulative Prop.	0.543051	0.718130	0.820337	0.894538	0.958488	1.000000

B.Romania and Bulgaria

Included observations: 1076 after adjustments

Correlation of GARCH_BG GARCH_RO

	Comp 1	Comp 2
Variance Prop.	0.765175	0.234825
Cumulative Prop.	0.765175	1.000000

Results

Comovement and Spillover effects in daily CDS returns of EEM sovereign bonds

In order to test for spillover effects towards and from a country (Romania) we reestimate the CGARCH model by inserting in the equation for the permanent component of variance for a country the lagged estimated permanent components of the other countries.The model is specified as follows:

$$dlog(CDS)_t = c * dlog(VIX)_t + [d*MA(1)] + \varepsilon_t \quad \varepsilon_t / I_{t-1} \, N(0, \sigma_t^2) \qquad (4)$$

$$\sigma_t^2 = q_t + a_1 *(\varepsilon_t^2 - q_{t-1}) + a_2 *(\sigma_{t-1}^2 - q_{t-1}) + a_3 *(\varepsilon_{t-1}^2 - q_{t-1}) * D_{t-1} \qquad (5)$$

$$q_t = \omega + b_1 *(q_{t-1} - \omega) + b_2 *(\varepsilon_{t-1}^2 - \sigma_{t-1}^2) + b_{3\,i} * q_{j,t-1} \qquad (6)$$

Results

Comovement and Spillover effects in daily CDS returns of EEM sovereign bonds

GRANGER CAUSALITY FROM LINE TO COLUMN	BULGARIA	CROATIA	CZECH REPUBLIC	HUNGARY	POLAND	ROMANIA
BULGARIA		***	***	X	***	**
CROATIA	***		***	***	***	***
CZECH REPUBLIC	**	***		***	***	**
HUNGARY	X	***	***		**	X
POLAND	***	***	***	X		X
ROMANIA	***	***	X	X	X	

From country j to Romania	b3	Standard Error	Z-statistics	Prob.
BULGARIA	0.0087	0.0019	4.57	0.00
CROATIA	0.0022	0.0008	2.85	0.00
CZECH REPUBLIC	0.0001	0.0002	0.41	0.68
HUNGARY	0.0007	0.0003	2.25	0.02
POLAND	0.005	0.001	8.44	0.00

From Romania to country i	b3	Standard Error	Z-statistics	Prob.
BULGARIA	0.6556	0.21	3.16	0.00
CROATIA	0.3956	0.18	2.19	0.03
CZECH REPUBLIC	0.0203	0.71	0.03	0.00
HUNGARY	0.0929	0.07	1.25	0.21
POLAND	0.0243	0.03	0.96	0.34

Conclusions

- Recent repricing of sovereign credit risk price evaluated in the CDS and bond market seems mostly due to common factors.

- Given the no-arbitrage condition between the two markets, we tested for a long-run relationship.We find evidence of a co-integration relationship between CDS spreads and sovereign bond spreads,
- Second we observe that for most EEM countries the CDS spread exceeds the spread on the corresponding government bond relative to the benchmark bond.

- The exceptions were registered in 2008-2009 where we find a temporary negative basis; meaning that it would have been cheaper to take credit risk in the cash market.During the crisis traders could not exploit arbitrage opportunities such as the large negative basis in EEM sovereign due to restrictions in the availability of funding capital.

- Since the start of the crisis period the sovereign bases are mean reverting and significantly linked to the cost of short-selling bonds, to proxies for global risk appetite and to country-specific factors.

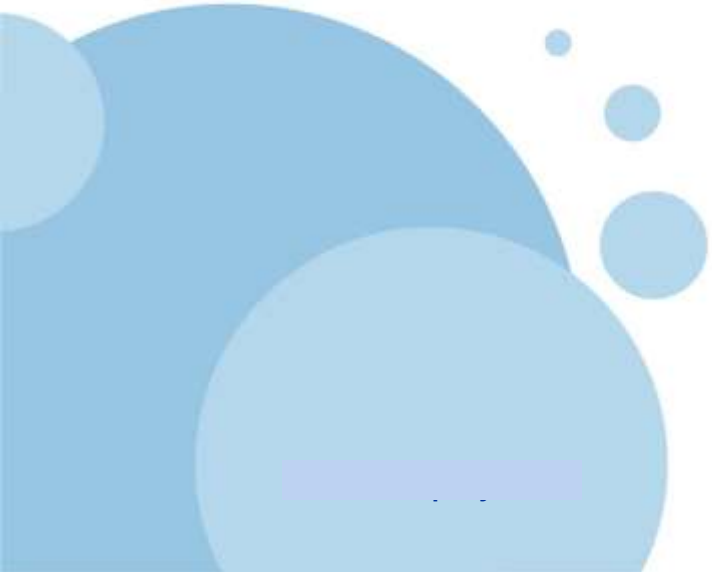
Conclusions

- In the pre-crisis period of the sample countries, price discovery takes place mostly in the bond market and in during the crisis, price discovery is observed in the CDS market.

- We also find evidence of comovement in the volatility of daily returns of EEM CDS sovereign with spillover effects especially between Bulgaria, Romania and Croatia.

- This study leaves several open paths to further analysis. Most obviously, since the credit derivatives market is still small in the case of EEM, these results are not necessarily representative in the case of developed countries.Second, we have only analysed fundamental indicators, risk aversion and liquidity indicators, without including indicators relevant for the public finance, current account deficits or other important domestic factors which are published on a monthly or quarterly basis.

Thank you for your attention!



References

- Acharya, V., and T. Johnson, 2007, „Insider Trading in Credit Derivatives", Journal of Financial Econometrics 84, 110–141.
- Alexopoulu I.,Andersson M., Georgescu O. M.(2009),"An empirical study on decoupling movements between corporate bonds and cds spreads", ECB working paper 1085.
- Altman, E. (2010), „Sovereign Default Risk Assessment from the Bottom-Up, NYU Stern School of Business, http://pages.stern.nyu.edu/~ealtman"
- Ammer J., Cai F.(2007),"Sovereign CDS and bond pricing dynamics in emerging markets:does cheapest-to-deliver option matter?", International Finance Discussion Papers 912, Board og Governors of the Federal Reserve System.
- Anderson R, (2010), „Credit Default Swaps: What are the social benefits and costs?, Financial Stability Review, No. 14 Banque de France"
- Andrizky J, Singh M. (2006), „The Pricing of Credit Default Swaps During Distress, IMF Working Paper 254"
- Arghyrou M.G.,Alexandros K.(2011),"The EMU sovereign –debt crisis:Fundamentals, expectations and contagion",European Commission, Economic Papers 436.
- Beber, A., M.W. Brandt and K. A. Kavavejc (2009), „Flight-to-Quality or Flight-to-Liquidity? Evidence from the Euro-Area Bond Market". Review of Financial Studies 22, 925 - 957.
- Blanco R., Brennan S.,Marsh I.W.(2005),"An empirical analysis ofthe dynamic relationship between investment grade bonds and credit default swap", Journal of Finance 60, 2255-2281.
- Buiter W.(2010)" Sovereign Debt Problems in Advanced Industrial Countries".Citi Global Economics View, April 2010.
- Campbell, John Y. and Taksler, Glen B. (2003)."Equity volatility and corporate bond yields", Journal of Finance 58, 6, 2321-2349.
- Chan-Lau J, Kim Y.,(2004), „Equity Prices, Credit Default Swaps, and Bond Spreads in Emerging Markets", International Monetary Fund Working Paper No. 27
- Duffie, D(1999), „Credit swap valuation", Financial Analysts Journal, January/February, 73-87.
- Fontana A., Scheider M.(2010),"An analysis of the euro are sovereign cds and their relation with government bonds", ECB working papers.
- Gonzalo J. and C. W.J. Granger (1995). „Estimation of common long-memory components in cointegrated systems". Journal of Business and Economic Statistics 13, 27-25.
- Hull J.,Predescu M.,White A.,(2004),"The relationship between credit default swap spreads, bonds yields, and credit rating announcements", Journal of Banking & Finance, Elsevier, vol 28(11).
- Longstaff F., Pan J., Pederson L., Singleton K.(2008), "How Sovereign Is Sovereign Credit Risk?", NBER Working Paper Series, Working Paper 13658.
- Norden, L. , and Weber, M.(2004) ,"Informational effciency of credit default swap and stock markets: The impact of credit rating announcements", Journal of Banking and Finance 28, 2813-2843.
- Salvador B.,Per I., Lewandowska M., Setzer R.(2009),"Determinants of intra-euro area government bond spreads during the financial crisis", European Commission, Economic Papers 388.
- Singh, M. and J. Andritzky (2005), "Overpricing in Emerging Market Credit- Default-Swap Contracts: Some evidence from Recent Distress Cases", IMF Working Paper, WP/05/125.
- Tang, D.Y. and H. Yan (2007), "Liquidity and Credit Default Swap Spreads", NBER Working Paper Series.
- Varga L.(2009),"The information content of Hungarian sovereign CDS spreads, Occasional Papers No.78, Central Bank og Hungary.
- Wit, J. (2006), "Exploring the CDS – Bond Basis", National Bank of Belgium Working Paper Research.
- Zhu H. (2004), "An Empirical Comparison of Credit Spreads between the Bond Market and the Credit Default Swap Market", Journal of Financial Services Research, 29, 211-235.