Credit Derivatives Market During Recent Financial Crisis

DISSERTATION PRE-DEFENSE

PETRA BUZKOVÁ

15/02/2017, IES FSV UK

Contents of the Dissertation

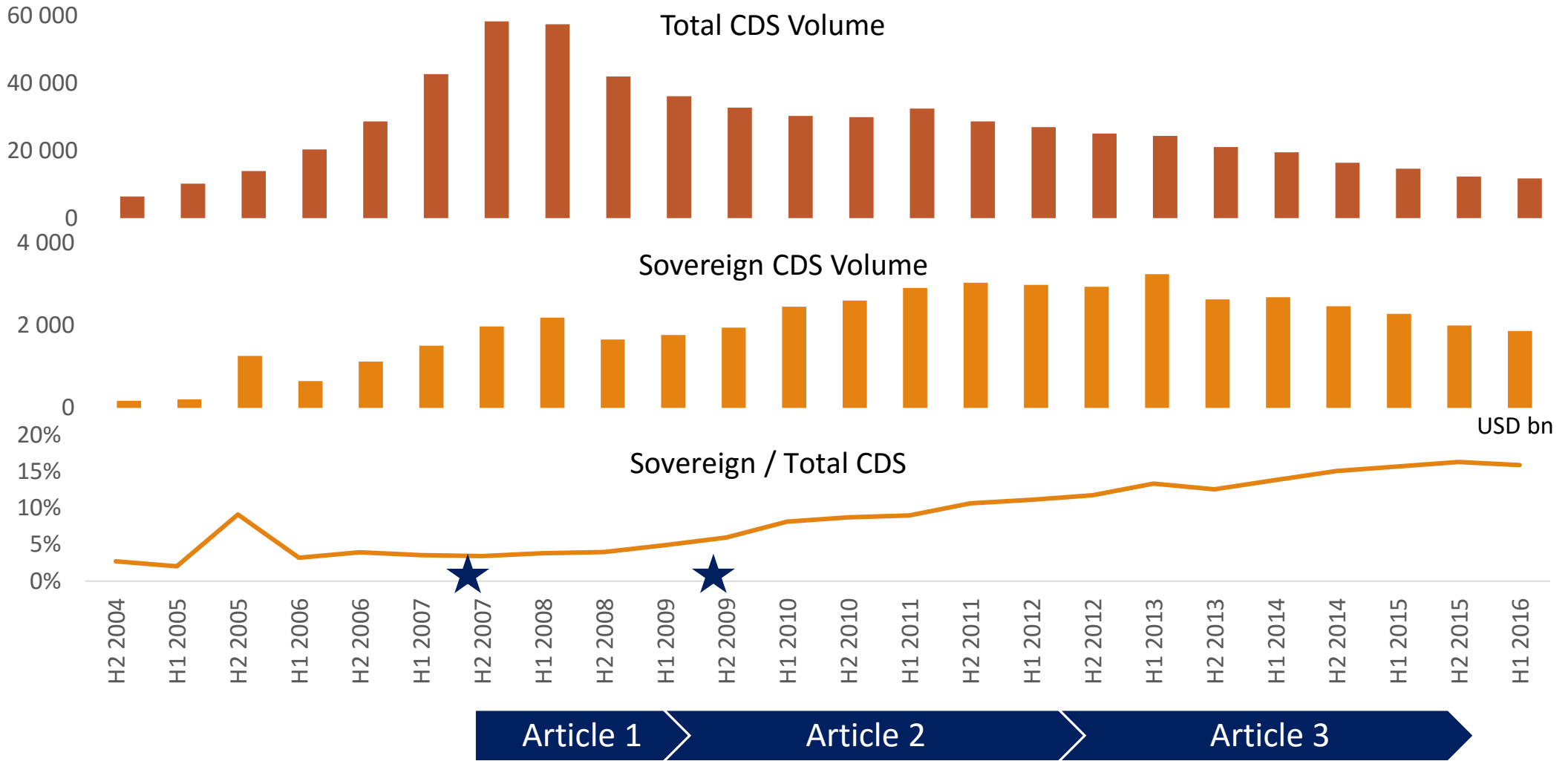
3 original research papers

- **Article 1**: Collateralized Debt Obligation Valuation Using the One Factor Gaussian Copula Model
- **Article 2**: On the Reliability of a Credit Default Swap Contract during the EMU Debt Crisis
- **Article 3**: Impact of the 2014 Change in ISDA Credit Derivatives Definitions on Sovereign CDS Market

Publication progress:

- **Article 1**: published as Benešová (Buzková), P., Teplý, P. (2012): Collateralized Debt Obligations' Valuation Using the One Factor Gaussian Copula Model. Prague Economic Papers, 2012(1), p. 30-49.
- **Article 2**: published as Buzková, P., Kopa, M. (2016): On Reliability of a Credit Default Swap Contract during the EMU Debt Crisis. Czech Journal of Economics and Finance, 66 (6), p. 510-538.
- **Article 3**: to be sent to the Czech Journal of Economics and Finance in 2017

Contents of the Dissertation



Source: BIS Statistics webpage, http://stats.bis.org/statx/srs/table/d10.4?p=20061&c=

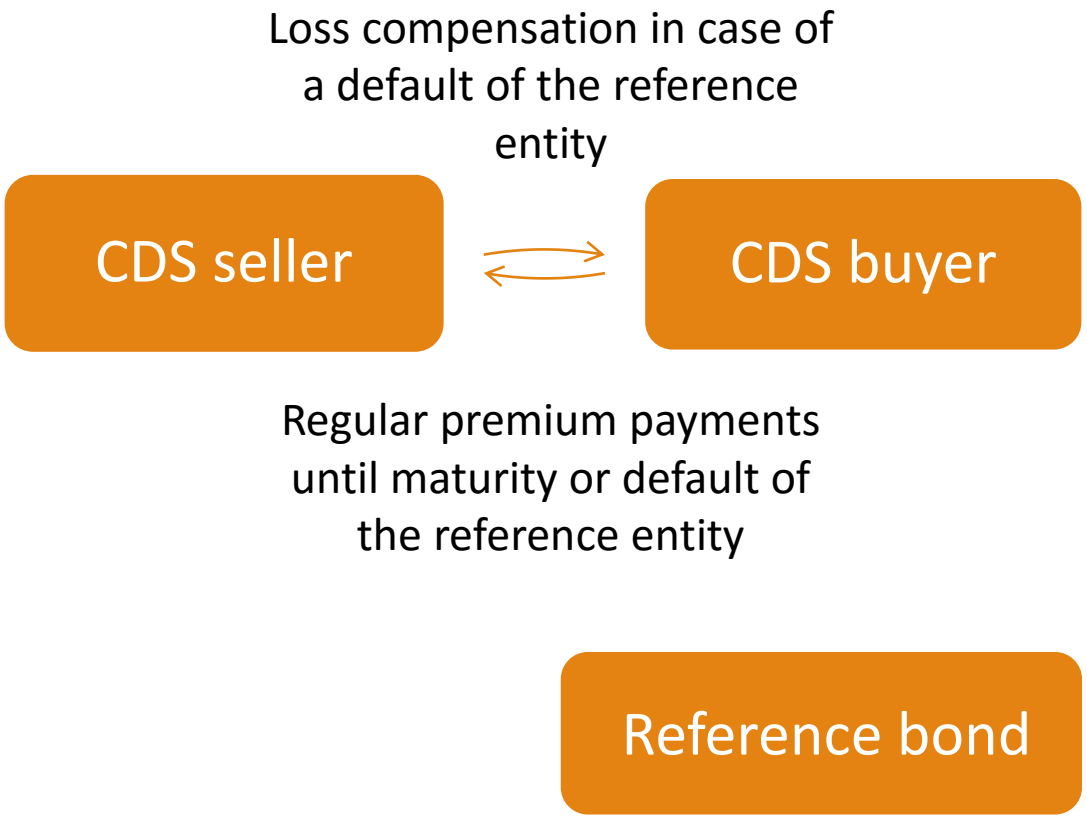
Contents of the Dissertation

	Article 1	Article 2	Article 3
Time period	2007-2009	2009-2013	2013-2015
Instrument	CDO	CDS	CDS
Main Research Question	Did the markets understand the CDO construction properly?	Did the trust in CDS contracts decrease while experiencing a sovereign default?	Did the change in ISDA Definitions in 2014 increase efficiency of CDS markets?
Method	One Factor Gaussian Copula	Reduced form CDS valuation model	SUR
		SUR	ARFIMA-FIGARCH

On the Reliability of a Credit Default Swap Contract during the EMU Debt Crisis

ARTICLE 2

CDS Contract



- CDS maturity: agreed between the buyer and the seller, not necessarily equal to the maturity of the reference entity
- CDS nominal: the volume of the reference bond that is covered by the CDS contract
- CDS administration: done by International Swaps and Derivatives Association (ISDA), existence of central clearinghouses, international standardization of the CDS contract terms

Motivation – the Greek Case

- Two indicators to assess efficiency of the CDS contract:
  1. Does a credit event really trigger the CDS settlement? Is the credit event correctly defined?
  2. If the credit event occurs, is the CDS buyer fully compensated for her/his losses?

- CDS efficiency was questioned with Greek default in 2012:
  1. Partial and voluntary restructuring of Greek bonds did not trigger CDS settlement. Retroactive insertion of collective action clauses (CACs) did not trigger CDS settlement. Finally, activation of the CACs triggered the CDS settlement.
  2. At the time of CDS settlement Greek bonds had been already exchanged for a new package of bonds consisting of new Greek bonds (with higher maturity and lower coupon) and low risk European bonds (issued by the European Financial Stability Fund, EFSF). The CDS settlement price was derived from the new Greek bonds value and did not consider the whole package structure.

→ Both of these forms of efficiency have been questioned in past years. Our aim is to evaluate the impact of this recent development on market prices of CDS.

Our Presumption: If there are no uncertainties about the CDS contract conditions, market price of a CDS should be closely related to its modelled risk-neutral fair price.

Our Hypothesis: A relationship between market CDS price and model CDS price relaxed at the end of 2011 when first uncertainties about Greek debt restructuring and CDS settlement trigger appeared.

Data

BENCHMARK GOVERNMENT BOND YIELDS	SOVEREIGN AND BANK CDS SPREADS
maturity from 3 months to 10 years ➢ to calculate model CDS spreads	5 and 10 years maturity ➢ to compare with model CDS

- Eurozone countries: Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain
- Daily frequency
- From Dec 1 2009 to Jan 31 2013 (i.e. 828 observations)
- Source: Bloomberg

Calculation (1/2)

1. Model CDS price calculation: no-arbitrage Hull and White valuation model (Hull and White, 2000) – based on a construction of implied risk neutral probability of default
2. Single equation OLS model

$$\Delta marketCDS\_5Y_{t_i,C} = \alpha_{1,C}\Delta modelCDS\_5Y_{t_i,C} + \alpha_{2,C}\Delta cpty\_5Y_{t_i,C} + \alpha_{3,C}\Delta liq\_5Y_{t_i,C} + \varepsilon_{t_i,C}$$

$$\Delta marketCDS\_10Y_{t_i,C} = \beta_{1,C}\Delta modelCDS\_10Y_{t_i,C} + \beta_{2,C}\Delta cpty\_10Y_{t_i,C} + \beta_{3,C}\Delta liq\_10Y_{t_i,C} + \eta_{t_i,C}$$

$\Delta marketCDS_{t_i,C}$ - daily change of mid-market CDS spread of country *C* on day *ti*

$\Delta modelCDS_{t_i,C}$ - daily change of model CDS of country *C* on day *ti*

$\Delta liq_{t_i,C}$ - daily change in bid-ask sovereign bond yield spread of country *C* on day *ti*

$\Delta cpty_{t_i,C}$ - daily change in U.S. CDS spread of country *C* on day *ti*

I = 3, t_1 = 1, 2, … 828; t_2 = 1, 2, …, T_C ; $t_3 = T_C + 1, T_C + 2, \ldots, 828$

Tc – break-point specific for each country determined by a Chow test

3. Chow break-point test to determine whether there was a change in the above equation and when.

Calculation (2/2)

4. Seemingly unrelated regression

$$\boldsymbol{\Delta marketCDS\_5Y_C} = \alpha_1 \boldsymbol{\Delta modelCDS\_5Y_C} + \alpha_2 \boldsymbol{\Delta cpty\_5Y_C} + \alpha_3 \boldsymbol{\Delta liq\_5Y_C} + \boldsymbol{\varepsilon_1}$$

$$\boldsymbol{\Delta marketCDS\_10Y_C} = \beta_1 \boldsymbol{\Delta modelCDS\_10Y_C} + \beta_2 \boldsymbol{\Delta cpty\_10Y_C} + \beta_3 \boldsymbol{\Delta liq\_10Y_C} + \boldsymbol{\varepsilon_2}$$

$$var\begin{pmatrix}\boldsymbol{\varepsilon_1}\\ \boldsymbol{\varepsilon_2}\end{pmatrix} = \boldsymbol{\Omega} = \begin{pmatrix}\sigma_{11}\boldsymbol{I} & \sigma_{12}\boldsymbol{I}\\ \sigma_{21}\boldsymbol{I} & \sigma_{22}\boldsymbol{I}\end{pmatrix}$$

$\boldsymbol{\Delta marketCDS\_5Y_C}$ and $\boldsymbol{\Delta marketCDS\_10Y_C}$ - ($T_{i,C}$ x 1) vectors of the dependent variable

$\boldsymbol{\Delta modelCDS\_5Y_C}$, $\boldsymbol{\Delta cpty\_5Y_C}$, $\boldsymbol{\Delta modelCDS\_10Y_C}$ and $\boldsymbol{\Delta cpty\_10Y_C}$ – ($T_{i,C}$ x 1) vectors of the independent variables

α_1, α_2, α_3, β_1, β_2 and β_3 - scalar regression parameters

$\boldsymbol{\varepsilon_1}$ and $\boldsymbol{\varepsilon_2}$ - ($T_{i,C}$ x 1) vectors of residuals

σ_{jk}, j = 1, 2 and k = 1, 2 - the covariance between the residual term of the j-th and the k-th equation

$\boldsymbol{I}$ - unit (T x T) matrix

$\boldsymbol{\Omega}$ - ($2T$ x $2T$) variance matrix of the vector of residual terms

Key Findings

- **Change point location is in line with our expectations only in case of riskier countries** (Italy, Ireland, Portugal, Spain). The change occurred earlier in case of less risky countries (Austria, Belgium, France, Finland, the Netherlands) and it has a different motivation.
- In the case of all riskier countries (Italy, Ireland, Portugal and Spain), **the value of coefficients** of the model CDS price **decreased** after the break point and **the adjusted R-squared coefficient decreased** after the break point in almost all these cases, too.
- On the other hand, our **hypothesis is not confirmed in the case of all less risky countries**, such Austria, Belgium, Finland, France and the Netherlands.

Conclusions

- **The correctness of the sovereign CDS quotes is of high importance**. Indicating market perception of indebtedness, sovereign CDSs are in the spotlight. Unlike the debt-to-GDP ratio, the CDS quote – as a financial market instrument - is influenced by factors other than indebtedness alone.
- Based on our analysis, we conclude that **there has been a need for a change in the setting of the CDS terms since 2011** pointing to a better formulation of CDS contract terms and conditions to better protect CDS buyers.
- The development commented upon in this article started discussions about the correct functioning of CDSs as a hedging instrument and it resulted in some reactions of international authorities aimed at improving the CDS market. In October 2014 ISDA:
  1. Better specified the credit even restructuring
  2. Included new asset package delivery provisions in standard CDS contract terms and conditions

  - The impact of these changes is investigated in the third article of the dissertation

Main Sources

- Adopted reduced form model used for CDS valuation:

Duffie, Darrell (1999): Credit swap valuation. *Financial Analysts Journal*, 55: 73–87.

Hull, John C., and Alan White (2000): Valuing credit default swaps I: No counterparty default risk. *Journal of Derivatives*, 8 (1): 29–40.

- Analysis of Eurozone CDS data during recent crisis:

Calice, G., Chen, J., Williams, J. (2013): Liquidity spillovers in sovereign bond and CDS markets: An analysis of the eurozone sovereign debt crisis. *Journal of Economic Behavior & Organization*, 85 (1): 122-143.

O'Kane, D. (2012): The Link between eurozone Sovereign Debt and CDS Prices. [online] available at: <http://docs.edhec-risk.com/mrk/000000/Press/EDHEC-Risk_Working_Paper_Link_Sovereign_Debt_CDS.pdf> [Accessed 22 November 2013].

Annaert, J., De Ceuster, M., Van Roy, P., Vespro, C. (2013): What determines Euro area bank CDS spreads? *Journal of International Money and Finance*, 32: 444-461.

Thank you for your attention. Questions?