

GAI International Academic Conferences Proceedings



June 11-13, 2017
New York, United States



GAI International Academic Conferences
Proceedings

2017 New York International Academic
Conference

June 11-13, 2017

New York, United States

Hosted by
Global Academic Institute

ISBN: 978-0-9965808-7-8

Market Variables and CDS Spreads: Evidences on the Eurozone Banks

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Abstract

The paper investigates empirically credit risk perception in Eurozone CDS banking sector, during the period of the sovereign crisis 2009-2014. As CDS spreads represent the cost to ensure from credit risk, their level is an interesting variable in order to evaluate the riskiness of banks. We first verify the lacking ability of balance sheet ratios as indicators of banks' creditworthiness: our finding are consistent with recent literature. Then we focus on the impact of market factors as explanatory variables for banks CDS spread. Our results significant for *Euribor* and *Trading Volume* and are strengthened adding *EIU Overall Country Risk Rating*, as dummy variable. The latter has a strong impact on CDS spreads, confirming the spillovers of sovereign risk rating on banking credit risk evaluation. In light of our findings, we suggest to proceed studying the impact of systemic risk as trigger of banking CDS spread during periods of distress.

Keywords: CDS spreads, Eurozone, Banking sector, Market variables , Country rating

Introduction

As CDS spreads represent the cost to ensure from credit risk, their level is an interesting variable in order to evaluate the riskiness of banks. Notwithstanding the recent financial and Eurozone crises, on the other hand, have shown how speculation on the financial and the sovereign sectors, has twisted the informational efficiency of the CDS market. The uprising of the aforementioned crises, seems to have changed the way market looks to the banking sector and has induced a speculative process on the sector itself. Since banks are the institutions that exchange CDSs, their weakness has established a situation of widespread counterparty risk, that has evolved itself into a form of systemic risk, because of the interconnections of the financial market

Recent literature has shown how markets are focusing on different variables than the past. Specifically the attention on balance sheet ratios is getting lower, even though is growing on *Leverage Ratio*, previously neglected. At the same time importance of macroeconomic and market variables, as triggers of banking credit risk, is rising. In more detail, the recent Eurozone crisis has shown the impact of sovereign debt risk on the perception of creditworthiness for banks.

The paper investigates empirically credit risk perception in Eurozone CDS banking sector, during the period of the sovereign crisis 2009-2014. We first verify the lacking ability of balance sheet ratios as indicators of banks' creditworthiness: our finding are consistent with recent literature. Then we focus on the impact of market factors as explanatory variables for banks CDS spread. Our results significant for *Euribor* and *Trading Volume* and are strengthened adding *EIU Overall Country Risk Rating*, as dummy variable. The latter has a strong impact on CDS spreads, confirming the spillovers of sovereign risk rating on banking credit risk evaluation.

The paper is organized as follows: there's the "Literature Review", where we show the most important studies in terms of evaluation of credit risk, especially with regard to the banking sector; in the paragraph entitled "Methodology and Data", we present our sample and the analysis conducted; in the section "Results", are shown a commented the outputs of the study; the last paragraph, "Conclusions", deals with our final considerations.

Literature Review

The analysis of credit risk during last decades, has been conducted through several works inspired by the seminal work of Merton (1974) on structural models. The variables adopted are balance sheet ratios, but also macroeconomic factors, like interest rates and volatility. These models have been developed, in order to measure credit risk perception through CDS spreads.

An interesting study based on the balance-sheet indicators, made by Chiaramonte and Casu (2013), focus on a panel data of 89 international banks from 1 January 2005 to 30 June 2011, dividing the period into three segments: the pre-crisis, the crisis and the aftermath. The main results are that, even if banks record very high levels of leverage, CDS spreads aren't high as well, until the outbreak of the crisis: this means that before this event, market hasn't evaluated leverage as a significant factor of riskiness for banks, unlike the other sectors. Furthermore, in this study, emerges the significance of the indicator of the quality of the assets portfolio, as predictor of a default. The finding for Leverage Ratio is consistent with Demirguc-Kunt, Detragiache E. and Merrouche O. (2010)

Raunig and Scheicher (2009), compare CDS spreads of 41 banks with 162 non-banks' ones, for a period from January 2003 to December 2007. They show that, if before the outbreak of the financial turmoil, banks' CDS spreads are on average lower than the other firms' ones, as they are perceived less risky because of their heavy regulation and public sector support, after the onset of the crisis, the difference between the two sectors shrunk considerably, as both kinds of CDS spreads raise sharply, because of the perception of the riskiness also for banks.

Annaert et al. (2010) examine CDS spread changes for euro area financial institutions, over the period 2004-2008, identifying three kinds of spread determinants: credit risk factors, trading liquidity and market wide factors. These macro-variables are significant both in the pre-crisis and during the crisis period, but their effect becomes stronger during times of distress, especially as concerns liquidity and, with regard to credit risk factors, leverage; the effect of business cycle, instead, is less clear, as it could incorporate both credit risk and liquidity factors.

Calice, Ioannidis and Williams (2011), focus their work on large complex financial institutions and, in a section of the paper, state the relevance of the volatility of the assets, respect to the risk of default. They furthermore show the interconnection between CDS market and banking sector, in a systemic risk perspective.

After the Eurozone crisis, the importance of market variables and sovereign rating has grown in terms of inputs of credit risk perception for the banks. This issue is due to the interdependence of banking and sovereign sectors.

In this field Yu (2017), analyzing CDS market, shows a risk transfer between the two sectors, as bailouts made by governments have temporally reduced banking riskiness, but, at the same time, sovereign fiscal burden has caused riskiness for both sectors. ECB Vergote (2016), always with observing CDS spreads, find that the peak of spillovers from sovereigns to financials occurs in the second half of 2011.

Georgoutsos, Moratis (2017) , always referring to the correlation between the aforementioned sectors, state that for the period 2007-2009 European banking sector react homogenously to financial and Eurozone crisis but after 2010, Eurozone periphery became more idiosyncratic.

Alexandre H., Guillemin F., Refait-Alexandre C. (2015) study the impact of banks disclosure on the evolution of the related CDS spreads during the Eurozone sovereign debt crisis. Taking into account the reaction of CDS spreads changes after sovereign credit rating downgrades, they demonstrate the positive relationship between CASC (cumulative abnormal CDS spread change) and banking exposure to sovereign debt risk; at the same time, they show the importance of information in terms of reduction of risk premium, as specific disclosure about sovereign exposure has a negative impact on CASC; otherwise, they demonstrate that broad information influence positively CASC.

Bank of Italy's Li and Zinna (2014), referring sovereign and bank CDS term structures, distinguish between the influence of systemic and sovereign risk on the banking one, finding the highest level of systemic risk for Spain and Italy in absolute value; in a relative sense, otherwise, the most important component of risk for the banks of these countries, is their respective sovereign one, since their assets

are mostly related to their home countries. As concerns Germany and France, instead, the authors find out the opposite situation, as the assets of their banks, are cross-border.

Peters and Pirotte (2014), analyzing 16 European Banks for the period 2006-2011, state the irrelevance of the variables dealing with the structural models, and show the importance of macro-variables especially in times of distress.

Alter and Schöler (2011), explain the phenomenon of the private-to-public risk transfer in Europe: before government interventions, bank credit spreads disperse to sovereign CDS market, but after the bailouts, because of the changes on the composition of both governments and banks' balance-sheets, there's an increased influence of sovereign CDS spreads on the banking ones; Portugal and Italy are exceptions, as their country risk, seems to affect their respective banking sectors, even before Lehman Brothers event.

Analogous conclusions can be found Caruana and Avdjiev (2012), who argue that government rescue to financial sector, in September and October 2008 caused a decline of banks' CDS spreads, with the exceptions of Greece and Italy and a rise of the sovereign ones; but after the fourth quarter of 2009, as emerge fiscal problems, bank and sovereign CDSs become more positive correlated, inducing international active banks, to move their portfolios away, from riskiest euro area countries.

Acharya et al. (2011), observing CDS market over the period 2007-2010, underline a two-way feedback between sovereign and financial credit risk in the Eurozone, also showing an association between the increase in the sovereign CDS and a decrease in banks' stock returns, in the post-bailout period

Data and Methodology

We focus the analysis on a sample composed by a panel data of Eurozone 51 banks, observed during the period of the sovereign debt crisis 2009-2014. The yearly spreads are calculated making the average of monthly values, obtained by the mean between the highest and the lowest spread recorded each month¹.

¹ Both CDS and ratios data, are provided by the database Bankscope. We refer the study to banks indicated by the database as U1 or U2, namely firms that aren't holdings

Figure 1: Sample of Eurozone Banks

BANK	COUNTRY	SPECIALISATION
Erste Group Bank AG	AT	Bank Holding & Holding Companies
BKS Bank AG	AT	Commercial Banks
Dexia SA	BE	Bank Holding & Holding Companies
USB Bank Plc	CY	Savings Banks
Deutsche Bank AG	DE	Commercial Banks
Commerzbank AG	DE	Commercial Banks
Deutsche Postbank AG	DE	Commercial Banks
Aareal Bank AG	DE	Real Estate & Mortgage banks
DVB Bank SE	DE	Investment & Trust corporations
IKB Deutsche Industriebank AG	DE	Investment banks
Wüstenrot & Württembergische	DE	Investment & Trust corporations
Bausparkasse Mainz AG BKM	DE	Real Estate & Mortgage banks
Banco Santander SA	ES	Commercial Banks
Banco Bilbao Vizcaya Argentaria SA	ES	Commercial Banks
Banco Popular Espanol SA	ES	Commercial Banks
Bankinter SA	ES	Commercial Banks
Alandsbanken Abp-Bank of Aland Plc	FI	Commercial Banks
BNP Paribas	FR	Commercial Banks
Société Générale SA	FR	Commercial Banks
Crédit Agricole S.A.	FR	Cooperative Banks
Natixis SA	FR	Commercial Banks
Crédit Industriel et Commercial SA - CIC	FR	Commercial Banks
Caisse régionale de crédit agricole mutuel Nord de France SC-Crédit Agricole Nord de France	FR	Cooperative Banks
Caisse régionale de crédit agricole mutuel Sud Rhône -Alpes SC-Crédit Agricole Sud Rhône Alpes	FR	Cooperative Banks
Caisse régionale de crédit agricole mutuel de l'Ille-et-Vilaine SA-Crédit Agricole de l'Ille-et-Vilaine	FR	Cooperative Banks
Caisse régionale de crédit agricole mutuel Loire Haute-Loire SC-Crédit Agricole Loire Haute-Loire	FR	Cooperative Banks
Boursorama SA	FR	Commercial Banks
Banque de la Réunion SA	FR	Commercial Banks
Piraeus Bank SA	GR	Commercial Banks
National Bank of Greece SA	GR	Commercial Banks
Alpha Bank AE	GR	Commercial Banks
Attica Bank SA-Bank of Attica SA	GR	Commercial Banks
Bank of Ireland-Governor and Company of the Bank of Ireland	IE	Commercial Banks
UmCredit SpA	IT	Commercial Banks
Intesa Sanpaolo	IT	Commercial Banks
Credito Emiliano SpA-CREDEM	IT	Commercial Banks
Banca Intermobiliare di Investimenti e Gestioni	IT	Investment banks
Banca Fimat Euramerica SpA	IT	Commercial Banks
Siauliu Bankas	LT	Commercial Banks
HSBC Bank Malta Plc	MT	Commercial Banks
FIMBank Plc	MT	Finance companies
Lombard Bank (Malta) Plc	MT	Commercial Banks
Kas Bank NV	NL	Securities firms
BinckBank NV	NL	Commercial Banks
Van Lanschot NV	NL	Bank Holding & Holding Companies
Banco Comercial Português, SA-Millennium bcp	PT	Commercial Banks
Banco Espirito Santo SA	PT	Commercial Banks
Banco BPI SA	PT	Bank Holding & Holding Companies
Nova Kreditna Banka Maribor d.d.	SI	Commercial Banks
Prima banka Slovensko a.s.	SK	Commercial Banks
OTP Banka Slovensko, as	SK	Commercial Banks

These are the measures of positions of the CDS spreads analyzed.

CDS SPREADS					
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
99.0	173.2	222.0	268.0	286.0	2736.0

Figure 2: Yearly average Eurozone banks' CDS spreads – Period 2009-2014

We adopt the random effect regression for panel data, in order to implement the following models:

- a regression on the relationship between CDS spreads and balance sheet ratios
- a regression on the relationship between CDS spreads and market variables.

In order to calculate the elasticity of CDS spread with respect to the regressors, we use “log-log regressions”; these models are also useful to remove the unit of measurement of the variables.

Below we indicate the original regressors, highlighting that CDS spread is as higher as much there's credit risk perception, with regard to the reference entity. In the equations below, both dependent and independent variables have been converted into logarithmic ones through a “log-modulus transformation” (John and Draper, 1980).

In the first part of the analysis, we assume that banking credit risk is lower if there is good creditworthiness of the assets, a strong capital structure, good levels of liquidity and profitability; consequently, in these cases low levels of CDS spreads are reasonable.

Ratios chosen are the following ones:

- 1) *Equity to Liabilities (Leverage Ratio) (LEV)*
- 2) *Return On Average Assets (ROAA)*
- 3) *Return On Average Equity (ROAE)*
- 4) *Liquid Assets to Total Deposits and Borrowing (LA/TDB)*

The relative model of regression equation is the following one:

$$\log CDS_{i,t} = \alpha_i + \log \beta_1 (LEV)_{i,t} + \log \beta_2 (ROAA)_{i,t} + \log \beta_3 (ROAE)_{i,t} + \log \beta_4 (LA/TDB)_{i,t} + \varepsilon_{i,t} \quad (\text{Model 1})$$

The second part of the study is composed by the relationship between CDS spreads and market variables. We suppose that market liquidity, both in systemic and idiosyncratic meaning, has a positive influence to creditworthiness, while variance has the opposite impact.

Market variables chosen are the following ones:

- 1) *Euribor rate (EURIBOR)*
- 2) *Trading volume (TV)*
- 3) *Volatility (VOL)*²

The relative model of regression equation is the following one:

$$\log CDS_{i,t} = \alpha_i + \log \beta_1 (EURIBOR)_{i,t} + \log \beta_2 (TV)_{i,t} + \log \beta_3 (VOL)_{i,t} + \varepsilon_{i,t} \quad (\text{Model 2a})$$

Successively we add the *EIU Country Risk Rating (CR)*² as dummy variable, in order to evaluate the impact of country rating to banking risk perception.

$$\log CDS_{i,t} = \alpha_i + \log \beta_1 (EURIBOR)_{i,t} + \log \beta_2 (TV)_{i,t} + \log \beta_3 (VOL)_{i,t} + \log \delta CR_{i,t} + \varepsilon_{i,t} \quad (\text{Model 2b})$$

Results

The results obtained by Models 1,2,3, are respectively presented as follows and shown in details in **Table 1, Tables 2a and 2b**³.

As concerns Model 1, the output dealing with Leverage ratio is significant (p-value: 0.027127 *) and the related coefficient has the expected negative sign. This result is quite interesting, since the attention for this ratio in the banking sector has grown after the financial crisis, as stated by recent literature (e.g. Drago, Di Caterina, Thornton (2017)). More significant is the expected negative sign of *Liquid Assets to Total Deposits and Borrowing* (p-value: 0.004134 **) : this result shows the attention of the market during the Eurozone sovereign debt crisis. The not really high R-squared (0.32345) and Adjusted R-squared (0.31361), demonstrate the low adequacy balance sheet ratios in order to explain CDS spreads, namely credit risk perception.

² The EIU Overall Country Risk Rating is a quantitative assessment of the risk of financial exposure in each country. It includes individual ratings of political risk, economic policy risk, economic structure and liquidity risk.

For Malta we refer to Moody's Sovereign Rating

³ The Estimate, represents the value of the intercept and of coefficients of the regression equations, the standard errors are given in parenthesis. Tables also show t- statistics, the R-squared and Adjusted R-squared and the Fisher test. The levels of significance are expressed by the p-value: *, ** and *** denote significance at 10%, 5% and 1%.

Table 1 REGRESSIONS RESULTS: LogCDS SPREADS-LogRATIOS			
	Estimate	t-value	Pr(> t)
Intercept	5.964789 (0.137940)	43.2418	< 2.2e-16 ***
LogLEV	-0.085271 (0.038383)	-2.2216	0.027127 *
LogROAA	-0.062160 (0.052359)	-1.1872	0.236174
LogROAE	0.018763 (0.017831)	1.0523	0.293585
LogLA/TDB	-0.105271 (0.036401)	-2.8920	0.004134 **
Observations: 1224 R-squared: 0.32345 Adj. R-Squared: 0.31361 F-statistic: 32.7794 on 4 and 275 DF p-value: < 2.22e-16			

Looking to Model 2a our results are definitely stronger, as suggested by R-Squared and Adjusted R-Squared values (respectively 0.50334 and 0.498) and by the significant ANOVA test (p-value: < 2.22e-16).

Focusing on the coefficients, we note a very significant (p-value: 1.129e-06***) positive relationship with the *Euribor rate*: this result could be expected as a high (low) level of rate decreases (increases) market liquidity. The high significance of the output (p-value: 1.129e-06***) is consistent with the importance that have assumed the policy of ECB in terms low interest rates in the Eurozone. Quite significant (p-value: 0.05935) is the negative sign of the *Trading Volume*: this result could be expected, as high trading volumes, should indicate market's confidence. The positive sign of banking stock price *Volatility* is consistent with a higher perception of credit risk; anyway the insignificance of the result suggest that this variable had not a heavy influence in the aforementioned sense. This could be explained by the fact that in the period considered, Eurozone banks have been supported by public and ECB interventions.

Model 2b strengthens our previous significant findings (p-values for *Euribor rate* and *Trading Volume* are respectively 2.491e-09 *** and 0.003846 **) and the significance of the dummy variable is very high (p-value: 3.793e-07 ***). The negative sign was expected, since higher rating for a bank's country could mean a lower credit risk for the bank itself.

CR variable is quite interesting, as it attests the correlation between banking sector and sovereign risk in Eurozone for the period analyzed.

Table 2a REGRESSIONS RESULTS: CDS SPREADS-MARKET VARIABLES			
	Estimate	t value	Pr(> t)
Intercept	5.4595749 (0.1237832)	44.1060	< 2.2e-16 ***
LogEURIBOR	0.2709578 (0.0544367)	4.9775	1.129e-06***
LogTV	-0.0149550 (0.0078988)	-1.8933	0.05935.
LogVOL	0.0026174 (0.0267227)	0.0979	0.92205

Observations: 918
R-Squared: 0.50334 Adjusted R-squared: 0.498
F-statistic: 88.3283 on 3 and 279 DF, p-value: : < 2.22e⁻¹⁶

Table 2b REGRESSIONS RESULTS:CDS SPREADS-MARKET VARIABLES AND COUNTRY RATING			
	Estimate	t value	Pr(> t)
Intercept	5.6787012	47.6780	< 2.2e-16 ***
LogEURIBOR	0.3421694	6.1637	2.491e-09 ***
LogTV	-0.0210155	-2.9151	0.003846 **
LogVOL	-0.0148876	-0.5598	0.576068
LogCR	-0.3578944	-5.2041	3.793e-07 ***

Observations: 918
R-Squared: 0.55849 Adjusted R-squared: 0.55213 F-statistic 84.3594 on 4 and 278 DF, p-value: < 2.22e-16

Conclusions

Our study shows the importance of market variables as triggers of credit risk perception in the Eurozone banking sector, during the period of the sovereign debt crisis. We referred to CDS spreads, in order to measure market's evaluation of banks creditworthiness. After showing the low relationship between CDS and balance sheet ratios, we obtain stronger results regressing the dependent variable on market factors. This is specifically true for *Euribor* and *Trading Volume*, confirming market focus on macroeconomic and liquidity elements during the Eurozone crisis. Our finding have been strengthened by adding *EIU Overall Country Risk Rating* as dummy variable. The latter has a high significance, that confirms the interconnections between sovereign risk evaluation and banking credit risk perception.

Our study has some common points with Hasan I., Liu L., Zhang G., (2014), who demonstrate, with relation to CDS spreads, the relevance of some CAMELS indicators and sensitivity to market risk.

In light of our results and consistently to recent literature (e.g. Giglio (2016)), we suggest to proceed studying the impact of systemic risk as determinant of the banking CDS spread, during periods of distress.

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