

Fundamental determinants of credit default risk for European and American banks

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Abstract. The aim of the paper is to identify the fundamental variables driving banks' credit default swaps. Quarterly data from 2004 to 2015 for European and American banks have been used. The analysis has been prepared through static panel data models. The following hypothesis has been put forward: the earnings potential, and economic uncertainty significantly influence credit risk. The independent variables used are CAMELS factors – Capital Adequacy, Asset Quality, Management Quality, Earnings Potential, Liquidity, and Sensitivity to Market Risk. The CDS spreads are most sensitive to the market risk factors whereas capital adequacy, earnings and liquidity indicators have weaker impact.

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1. INTRODUCTION

The aim of credit derivatives is to protect against financial losses related to credit default risk. One of the mentioned instruments are credit default swaps (CDS), that are bilateral contracts in which buyer pays a periodic fee or premium in exchange for a contingent payment by counterparty (seller) if a credit event occurs (Silva & Wanderlei, 2015). During the most recent financial crisis of 2007-2009 a strong interest in the mentioned instruments was observed, because they are regarded to be among the major causes of this crisis. The literature contains some works related to credit default swaps, especially connected with spillover effects, liquidity and the factors influencing CDS spreads. The presented study can be classified to the last group of research. One of the most important institutions that issue CDS are banks. Therefore, the aim of this paper is to identify the fundamental variables that drive banks' credit default swaps.

The paper has been organized as follows. In the second section previous research on the factors influencing CDS spreads have been described. The third chapter is the description of data and methodology that has been used in this paper. The last paper is a presentation of the findings received and conclusions.

2. LITERATURE REVIEW

The analysis of CDS spreads is based on the theory for corporate bond credit spreads prepared by Merton (1974). One of the first research who took the mentioned model into consideration to analyse the CDS market was Benkert (2004). The presented Merton model relies on the analysis of three groups of factors including: the debt-to-firm value, a variance of the companies' value, and a risk-free term premium. Ericsson et al. (2009) take into consideration the impact of the determinants of default risk on CDS spreads, while Benkert (2004) studies the influence of volatility on CDS premia, just as Zhang et al. did (2009). The current research is intended by additional factors. The first of them are stock returns (Alexander & Kaeck, 2008). Credit ratings are taken into consideration in the current researches (Aunon-Nerin et al., 2002; Hull et al. 2004, Norden & Weber, 2004; Avramov et al., 2009; Tang & Yan, 2013; Chodnicka-Jaworska, 2017) to analyse CDS spreads. To estimate credit ratings macroeconomic factors, financial indicators, business strategy, organization, and management quality are used. In the presented studies the negative impact of downgrades on CDS spreads are emphasised.

The next group of factors that are taken into consideration in the current research analysing the factors influencing the CDS markets are the financial indicators called CAMELS (Capital Adequacy, Asset Quality, Management Quality, Earnings Potential, Liquidity, and Sensitivity to Market Risk). The mentioned group of determinants includes those connected with the financial condition of the entity and macroeconomic environment (Ötoker-Robe & Podpiera, 2010). To verify the factors influencing CDS spreads Pires et al. (2015) use the implied volatility, historical stock returns, leverage, profitability, but also illiquidity costs. Also the liquidity of the financial market (Meine et al., 2015; Arakelyan et al., 2015; Tang & Yan, 2008; Bongaerts et al., 2011; Longstaff et al., 2005; Qiu & Yu, 2012) has also been taken for the analysis. If the liquidity is higher, the spreads on CDS rise. Heinz and Sun (2014) analysed the impact of investor sentiments, macroeconomic fundamentals, and liquidity conditions on the CDS spreads in Europe. The condition of the financial system during the crisis has also a strong influence on CDS spreads.

The analysis has been prepared for different subsamples, i.e. Eurozone (Alexander & Kaeck, 2008; Annaert et al., 2010), Europe (Ötoker-Robe & Podpiera, 2010; Kapar & Olmo, 2011; Angelini & Di Febo, 2014; Samaniego-Medina et al., 2016), emerging economies (Hilscher & Nosbusch, 2010), United States (Di Cesare & Guazzarotti, 2010; Galil et al., 2014; Di Tommaso & Drago, 2016), China (Eyssell et al., 2013), and United Kingdom (Benbouzid & Mallick, 2013). One of the most popular divisions is the one based on the period of the financial crisis (Annaert et al., 2010; Kapar & Olmo, 2011; Chiaramonte & Casu, 2013; Angelini & Di Febo, 2014; Doshi et al., 2017). The presented researches suggest that during the mentioned period credit risk and liquidity have the most significant impact are on CDS instruments. On the other hand, Kapar and Olmo (2011) put attention to the counterpart risk. Chiaramonte and Casu (2013) found that in the pre-crisis period and the crisis period itself the risk captured by banks' balance sheet ratios is the most significant. TIER 1 ratio and leverage in turn appear insignificant in all the three periods considered, whereas liquidity indicators become significant only during the crisis and in the post-crisis period. Angelini and Di Febo (2014) suggest that during a crisis the most important is the leverage ratio.

A wider literature research has been presented in Table 1.

Table 1

Literature research about the determinants of CDS spreads

Author	Findings
Alexander & Kaeck (2008)	2004 – 2007, Euro zone, equity hedge ratios are three or four times larger during the turbulent period, which explains why previous research on single-regime models finds stock positions to be ineffective hedges for default swaps; interest rate movements do not affect the financial sector iTraxx indices and they only have a significant effect on the other indices when the spreads are not excessively volatile.
Ericsson <i>et al.</i> (2009)	Estimated coefficients for a minimal set of theoretical determinants of default risk are consistent with theory and are significant statistically and economically; volatility and leverage have substantial explanatory power in univariate and multivariate regressions.
Hilscher & Nosbusch (2010)	1994 – 2006; 32 emerging countries; macroeconomic variables; volatility of terms of trade in particular has a statistically and economically significant effect on spreads; this is robust to instrumenting terms of trade with a country specific commodity price index; model implied spreads capture a significant part of the variation in observed spreads out-of-sample; the fit is better for lower credit quality borrowers.
Di Cesare & Guazzarotti (2010)	2002 – 2009; US non-financial companies; variables (theoretical spread, volatility, leverage, interest rate, stock return, slope of yield curve, corporate spreads, S&P credit ratings, VIX) is able to explain more than 50% of CDS spread variations both before and after July 2007; CDS spreads have become much more sensitive to the level of leverage while volatility has lost its importance; the beginning of the crisis CDS spread changes have been increasingly driven by a common factor, which cannot be explained by indicators of economic activity, uncertainty, and risk aversion.
Ötker-Robe & Podpiera (2010)	2004 – 2008, 29 Large Complex Financial Institutions, 29 European; business models, earnings potential, economic uncertainty are the most significant determinants of credit risk; CAMEL factors influence on the CDS spreads.
Annaert <i>et al.</i> (2010)	2004 -2008, 31 listed euro area banks highly changing dynamics in the credit, liquidity, business cycle and market wide components; the steeply rising CDS spreads are due to increased credit risk; individual CDS liquidity and market wide liquidity premia played a dominant role.
Kapar & Olmo (2011)	2005 – 2010; European CDS spreads; iTraxx, VIX index, implied volatility, stock prices; before and after the recent crisis; before the crisis, the underlying credit risk in the overall CDS market is sufficient to explain credit risk; during the crisis investors have a differing view on the risk of financial and non-financial contracts; non-financial CDS contracts reflect the credit risk of the counterparty, financial contracts do not; in case of default of financial firms, investors expect the government to intervene to alleviate credit risk of the counterparty and fears of systemic risk.
Peltonen <i>et al.</i> (2013)	191 entities; CDS network shows topological similarities with the interbank network; there is considerable heterogeneity in the network structures across reference entities; the outstanding debt volume and its structure (maturity, collateralization), the riskiness, the type and the location of entities significantly influence the size, the activity and the concentration of the CDS exposure network; network on a high-volatility reference entity is typically more active, larger in size and less concentrated
Chiaromonte & Casu (2013)	2005 – 2011; 5-year senior banks CDS, three time periods: a pre-crisis period (1 January 2005–30 June 2007), a crisis period (1 July 2007–31 March 2009) and a post-crisis period (1 April 2009–30 June 2011), bank-specific balance sheet ratios; in pre-crisis period and the crisis period the risk captured by bank balance sheet ratios; TIER 1 ratio and leverage appear insignificant in all of the three periods considered; liquidity indicators become significant only during the crisis and post crisis period.
Eyssel <i>et al.</i> (2013)	2001 – 2010, China; country-specific factors (China stock market index, real interest rate) and global factors (U.S. S&P 500 stock option volatilities, default spreads, non-North America global stock market factor) have significant explanatory power; China's domestic economic factors were more relevant in explaining the CDS spread levels and changes in the earlier years; China sovereign CDS spread changes lead stock returns.
Benbouzid & Mallick (2013)	2004 – 2011; UK banking; house price dynamics are a key driving factor behind the increase in credit spreads as reflected in CDS prices; stock prices increase, both bank capital and bank borrowing capacity increase that in turn decreases credit risk; banking sector liquidity increases

	banks tend to lend to less credit-worthy (subprime) borrowers that in turn increases credit risk in the banking sector.
Galil <i>et al.</i> (2014)	2002 – 2013; CDS spreads and CDS spread changes; 718 US firms; three explanatory variables appear to overshadow the other variables examined in this paper: Stock Return, change in stock return volatility; change in the median CDS spread in the rating class; ratings explain cross-section variation in CDS spreads even after controlling for structural model variables.
Angelini & Di Febo (2014)	2005 – 2011; 18 European corporate listed on the Stock Exchange, five-year CDS spreads; period before the financial crisis and after it; the loss of significance of the "leverage" variable, as it is not consistent with the finding of the Merton's Model.
Pires <i>et al.</i> (2014)	CDS premiums are strongly determined by CDS illiquidity costs, measured by absolute bid-ask spreads; high-risk firms are more sensitive to changes in the explanatory variables than low-risk firms; the goodness-of-fit of the model increases with CDS premiums, which is consistent with the credit spread puzzle.
Doshi <i>et al.</i> (2014)	28 countries, CDS spreads increase as a function of stock market and exchange rate, risk premiums are high during the Eurozone debt and 2008 financial crises; the increase in market risk aversion is even larger than the increase in default probabilities.
Silva & Wanderlei (2015)	2009-2014; Brazil; S&P 500 has a greater effect on the CDSs Brazil, followed by the factors Bovespa index, iTraxx index, European index CDS, FX volatility and CDS USA; CDSs Brazil has a positive relationship with the stock indexes.
Kim <i>et al.</i> (2017)	2004 – 2012, 641 firms, business cycle variables are strongly significant and their explanatory power are greater for investment-grade firms than for non-investment-grade firms; the macroeconomic conditions variables have weak effects
Hasan <i>et al.</i> (2016)	161 banks, 23 countries, CAMELS, no evidence in favor of one model over the other, while the combined structural and CAMELS model performs better than each individual model; leverage and asset quality have had a stronger impact on bank CDS since the onset of the recent financial crisis; banks in countries with lower stock market volatility, fewer entry barriers, and/or more financial conglomerate restrictions tend to have lower credit risk; deposit insurance appears to have an adverse effect on bank CDS spreads, indicating a moral hazard problem
Samaniego-Medina <i>et al.</i> (2016)	2004 – 2010; 45 listed European banks; financial, liquidity and macroeconomic factors, crisis period; market variables strongly influence on the CDS spreads; the explanatory power of the model is considerably higher during the crisis period than it is during the pre-crisis period.
Pelster & Vilsmeier (2016)	2001 – 2014; Volatility of daily CDS spreads, liquidity of individual CDS spreads, daily stock market returns, volatility of daily stock market prices, stock price beta, current share price, leverage ratio; dynamic copula based measures of tail dependence incorporate almost all essential pricing information making other potential determinants such as Merton-type factors or variables measuring the systematic market evolution - based on simple means or principal component analysis - negligible
Blommestein <i>et al.</i> (2016)	five Euro area countries (Greece, Ireland, Italy, Portugal, Spain), macroeconomic factors are the main drivers of changes in the sovereign CDS spreads; domestic economic and financial indicators have little impact on the pricing of sovereign credit risk in all sample countries except Italy; changes in the sovereign credit risk have significant impacts on domestic economic and financial indicators.
Di Tommaso & Drago (2016)	2007 – 2015, 497 US companies, leverage, option implied volatility and yield-curve slope, impact of the financial crisis overall and sector by sector; structural change in pricing the credit risk due to the financial crisis; financial crisis shifted the price of credit risk from an idiosyncratic to a systematic perspective.
Galariotis <i>et al.</i> (2016)	potential spillover effects for Eurozone countries, Panel Vector Autoregressive (PVAR) model; determinants of CDS variance are neither uniform nor stable during different periods and different countries; CDS spread variance is increasing for peripheral countries such as Spain, Portugal, Italy, Greece, Ireland, and decreasing Germany, France, Netherlands, Belgium and Austria; investor sentiment was an important CDS spread determinant during the subprime crisis, along with other factors, while spillover effects run from larger peripheral economies such as Spain and Italy to core countries; spillover effects from Portugal, Greece, and Ireland are of minor importance.

Source: own elaboration.

The prepared literature review suggests that there are different opinions about the factors influencing CDS spreads. In the presented studies differentiated factors that can influence the mentioned financial instrument are analysed. The received results also vary, especially due to the significance of particular indicators. For the purpose of the analysis both financial and nonfinancial institutions have been taken into account. In the mentioned research the CAMEL factors were taken into consideration in two cases only, but the presented sample was small (below 40 institutions) or did not comprise the banking sector in Europe. Hence, the aim of the paper is to identify the fundamental variables that drive credit default swaps. The following hypothesis has been put: The earnings potential, and economic uncertainty significantly influence credit risk. The analysis has been prepared by taking into consideration the moment of the financial crisis in Europe. A detailed description of the data and methodology used has been presented in the next section.

3. METHODOLOGY

3.1. Data description

To verify the presented hypothesis, quarterly data from Thomson Reuters Database for the period between 2004 to 2015 has been collected. As mentioned before, banks' credit default swaps daily last price quotes represent swaps on senior debt with a maturity of five years have been used. The mentioned type of CDS has the highest liquidity. CAMEL variables have been used as dependent variables. A list of variables and their construction has been presented in the table below.

Table 2

List of independent variables

Name of the variable	Construction of the variable	Abbreviation	Correlation with credit risk
Capital adequacy			
Tier I ratio	the ratio of capital divided by risk-weighted assets	$tier1_{i,t}$	-
Tier II ratio	(undisclosed reserves, revaluation reserves, general provisions, hybrid instruments and subordinated term debt) to risk weighted assets	$tier2_{i,t}$	-
Leverage ratio	Average Total Assets relative to Average Total Common Equity	$lev_{i,t}$	+
Quality of assets			
Loan - loss provisions to total loans		$llp_{i,t}$	+
Non - performing loans to total loans		$npl_{i,t}$	+
Loan-loss reserves to nonperforming loans		$llr_{i,t}$	-
Quality of management			
Efficiency ratio	Operating expenses to total revenues	$ef_{i,t}$	+
Trading income	Percentage of total revenues accounts for the differences in banks' business model	$ti_{i,t}$	+
Earnings			
Net Interest Income ratio	Percentage interest yield of interest bearing assets	$nii_{i,t}$	+
Return on Equity	Net Income divided by Total Common Equity	$roe_{i,t}$	-
Return on Assets	Net Income divided by Total Assets	$roa_{i,t}$	-
Liquidity			
Loan to Deposit		$ld_{i,t}$	+
Short-term Borrowing to Total Liabilities		$sht_{i,t}$	+
Liquid Assets to Total Assets		$liq_{i,t}$	-
Market risk			
Equity Price		$ep_{i,t}$	-
Cost of Funds	Interest Expense to Total Liabilities	$ie_{i,t}$	+

GDP growth	$gdp_{i,t}$	-
Euro 50 stocks index or S&P 500 stocks index	$es_{i,t}$	+
Rates of return on 10 year government bonds	$bond_{i,t}$	-
Overnight interbank market rate	$on_{i,t}$	-

Source: own elaboration.

3.2. Methodology description

To analyse the fundamental variables that drive credit default swaps a static panel data model has been used. It is connected with the unit root and heteroscedasticity in credit spreads (Pedrosa, Roll, 1998; Bierens *et al.*, 2003). To verify the presented phenomenon a lagged dependent variable (Blanco *et al.*, 2005) has been used. As a result, the final model used for the analysis is:

$$\Delta CDS_{i,t} = \beta \Delta X_{i,t} + \gamma \Delta Z_t + \Delta u_{i,t},$$

Where:

$CDS_{i,t}$ – is the CDS spread value for bank i at the time t ;

$X_{i,t}$ – vector of independent variables for bank i at the time t

$$X_{i,t} = [tier1_{i,t}, tier2_{i,t}, lev_{i,t}, llp_{i,t}, npl_{i,t}, llr_{i,t}, ef_{i,t}, ti_{i,t}, nii_{i,t}, roe_{i,t}, roa_{i,t}, ld_{i,t}, sht_{i,t}, \\ liq_{i,t}, ep_{i,t}, ie_{i,t}, gdp_{i,t}, es_{i,t}, bond_{i,t}, on_{i,t}]$$

β contains corresponding sensitivities to particular explanatory variables.

The composite error term $u_{i,t}$ is composed of a white noise component and a bank-specific credit risk factor (Windmeijer, 2005).

4. EMPIRICAL RESULTS

The analysis of the impact of the fundamental variables that drive credit default swaps has been prepared on a sample of American and European banks. A list of the entities constitutes Appendix 1 hereto. Table 3 contains summary statistics of the variables used in the research.

The result of estimating summary descriptive statistics presented in Table 3 suggests that there exists a lack of data for some banks, and as a result we could not prepare a study on all variables at the same moment. As a result, the analysis was prepared separately for particular groups of determinants. The results of the estimation were presented in Table 4.

The first group of factors taken for the analysis were market indicators. The equity price has a negative influence on the CDS spread value. The mentioned relationship is consistent with the assumption. The presented impact has been differentiated. A stronger influence has been noticed for the sample of European banks than for the American ones (0.53 versus 0.27). It can be connected with the level of the differentiation of the market conditions.

Table 3

Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
cds	1,613	237.7928	312.7697	8	3104.89
tier1	2,006	10.37963	3.230116	3.39	27
tier2	323	2.990437	2.208091	.00697	16.99738
lev	66	6.126515	2.746377	3	21
llp	426	2.30e-10	3.31e-09	-2.21e-10	4.95e-08
npl	286	1.79e-10	1.37e-09	-7.50e-09	1.38e-08
llr	521	1.12e+09	2.06e+09	22707.81	1.73e+10
ef	453	55.5695	81.52046	-1358.437	751.0965
ti	3,023	65.96444	1093.34	.367998	52484.57
nii	323	2.672542	1.528819	-1.27	8.511
roa	1,908	.4548998	3.392501	-69.895	92.8
roe	2,158	6.867938	17.02212	-405.13	425.09
ld	2,964	1.36075	3.440918	-.0313426	147.4677
sht	1,489	.101543	.1131596	0	.6857306
liq	2,951	.3244724	.1380079	.0436995	.9395638
ep	3,201	3.297334	2.089803	-3.575551	10.10166
ie	2,597	.0076333	.0077372	-.0001372	.1545063
gdp	3,497	1.570449	2.90423	-9.869784	9.362807
es	3,523	7.74127	.420676	6.681946	8.528946
bond	3,222	4.424164	2.651899	-.056	35.488
on	3,548	3.400722	7.533586	-1	85

Source: own elaboration.

The next factor taken for the analysis is the cost of funds. It has been measured as a value of interest expenses to total liabilities. According to the prepared analysis, this variable is statistically insignificant. The presented results can be an effect of low interest rates during last years. The presented cost of funds are differentiated in particular regions. The analysed institutions have got also the similar access to funds. The GDP growth has got a small significant impact on CDS spreads. If the mentioned factors are higher, CDS spreads are lower. No significant differences have been observed between banks from Europe and the United States. It suggests that even if macroeconomic development measured by GDP growth has been taken by banks to analyse the CDS spreads behaviour, the mentioned variable are not significant. Also the condition of the capital market, measured by the changes in the index of the stock exchanges has been verified in the analysis. The Euro 50 stocks index for European banks and the S&P 500 stocks index for American entities have been taken for the analysis. In both cases the mentioned determinant influences statistically significantly CDS spreads. A stronger reaction is observed for CDS spreads of European banks. If the stock indexes rise by one percentage point, CDS spreads are decreased by 1.52 and 1.35 percentage points respectively. It can be connected with the different level of the capital market development in particular European countries. Next an analysis has been prepared of the influence of the rates of return on 10-year government bonds and the overnight interbank market rate on CDS spreads. In both cases the mentioned relation is weak. The rates of return on 10-year government bonds influence insignificantly the CDS spreads of both American and European banks. The overnight interbank market rate is especially important for American banks. If the mentioned variable rises by one percentage point, CDS spreads increase by 0.2 percentage point.

The next group of indicators are capital adequacy factors. This group includes Tier 1 and Tier 2 indicators and the leverage ratio. All significantly influence CDS spreads. The Tier 1 ratio has a stronger

influence on CDS spreads for the sample of American banks than for the European ones. If Tier 1 rises by one percentage point, CDS spreads decrease by 0.03 percentage point for European and by 0.1 percentage point for American entities. If the Tier 1, Tier 2 and leverage ratios rise, CDS spreads decrease. The described results confirm the previous analyses. The mentioned variables have got the low statistically significant impact, that can be caused by high sample homogeneity in capital adequacy measures that remain rather stable during the initial crisis years (Ötoker-Robe & Podpiera, 2010).

The indicators related to the quality of assets comprise the loan-loss provisions to total loans ratio, the non-performing loans to total loans ratio and the loan-loss reserves to nonperforming loans ratio. None of the mentioned variables influence CDS spreads. It can be connected with a lack of data and a smaller number of observations. The insignificance of the loan-loss reserves ratio is again most likely caused by the homogeneity and stability of reserves and the rating during the outbreak of the crisis.

As the quality of management indicators are taken the efficiency ratio (measure as the operating expenses to total revenues) and the trading income (threaten as the percentage of total revenues accounts for the differences in banks' business model). The prepared analysis suggests that for the CDS spreads of both American and European banks the second of the described variables is unimportant. The efficiency ratio has an impact on the described variable but the strength of it is weak, because if the efficiency ratio rises by one percentage point, the CDS spreads are increased by 0.002 percentage point.

Table 4

Analysis of fundamental determinants influencing the CDS spreads of European and American banks

Independent variables	Total																Europe		USA	
	Coef.	P>t	Coef.	P>t	Coef.	P>t	Coef.	P>z	Coef.	P>t	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z		
Δcp	-0,3305	0,0000	0,1668	0,6720	-0,4321	0,0070	-0,1966	0,0430	-0,0447	0,7130	-0,1541	0,3380	-0,3085	0,0000	-0,3240	0,0010	-0,5323	0,0470	-0,2789	0,0080
Δie	-5,2062	0,2880	-11,0822	0,9160	-5,3257	0,9230	-20,1749	0,2120	5,0428	0,6970	-6,7236	0,6900	5,5687	0,4700	5,4406	0,5450	-0,1791	0,9850	71,3372	0,1290
Δgdp	0,0157	0,0760	0,0712	0,6900	-0,1046	0,0290	-0,0009	0,9690	0,0293	0,3810	-0,0688	0,0800	-0,0110	0,3340	-0,0136	0,4100	0,0417	0,2700	-0,0389	0,0510
Δcs	-1,7656	0,0000	-2,8879	0,0050	-0,2806	0,4950	-1,0505	0,0000	-1,2194	0,0000	-1,1984	0,0000	-1,6048	0,0000	-1,5212	0,0000	-1,5773	0,0090	-1,3519	0,0000
$\Delta bond$	0,0134	0,0210	-0,0025	0,9790	0,0664	0,0460	0,0853	0,0000	0,0822	0,0040	0,0619	0,0410	0,0329	0,0030	0,0223	0,2140	-0,0150	0,6230	0,0059	0,9010
Δon	0,0196	0,1550	1,2185	0,0200	-0,0534	0,1880	0,0041	0,8970	-0,0130	0,7550	-0,0216	0,6130	0,0075	0,6650	-0,0421	0,1960	0,0332	0,4280	-0,1863	0,0010
$\Delta tier1$			-0,0365	0,0950											-0,0825	0,0010	-0,0328	0,4280	-0,1008	0,0010
$\Delta tier2$			-0,0058	0,0240																
Δlev			-0,0246	0,0070																
Δnpl					-0,3120	0,1230														
Δllr					0,0000	0,2850														
Δllp							0,3147	0,4050												
Δef									0,0020	0,0000										
Δu									0,0012	0,2040										
Δni											-0,0274	0,1960								
Δroe											-0,0055	0,6930			0,1606	0,0380	-0,0488	0,7630	0,1982	0,0350
Δroa											0,0615	0,6090			-0,0053	0,4730	0,0105	0,4150	-0,0031	0,7530
Δlid													0,1833	0,0500	-0,2003	0,1440	0,1314	0,6880	0,7558	0,3500
Δht													-2,1100	0,0430	2,4391	0,1440	-1,7343	0,6780	2,5546	0,1830
Δhq													0,0134	0,9760	-0,5700	0,6180	1,0452	0,7030	0,8648	0,5810
$\Delta cons$	0,0111	0,2380	0,0398	0,1240	-0,0151	0,5810	-0,0079	0,5140	-0,0116	0,3380	-0,0023	0,8750	0,0195	0,0970	0,0448	0,0100	0,0954	0,0210	0,0313	0,1390
no obs	759		21		56		217		186		125		480		275		64		211	
no group	47		5		16		36		34		22		35		23		12		11	
test F	0,0000		0,0082		0,0000		0,0000		0,0000		0,0000		0,0000		0,0000		0,0000		0,0000	
R sq ov	0,4115		0,6885		0,5048		0,2236		0,2563		0,2426		0,3805		0,4272		0,5609		0,4398	
Hausman	0,6075		0,0000		0,2393		0,5652		0,0299		0,4769		0,9659		0,5506		0,0000		0,9991	

The next group of indicators are earnings factors. In this research the significance of their impact was measured by taking into consideration the net interest income ratio, the return on assets, and the return on equity. The net interest income and the return on assets are irrelevant for the estimation of CDS spreads. The return on equity has a statistically significant impact on the mentioned variable. If the ROE rises by one percentage point, CDS spreads are decreased by 0.2. In the case of ROA, its insignificance is a result of its subordinate information content compared to ROE.

The last group of determinants are liquidity indicators. The mentioned factors include the loan to deposit ratio, the short-term borrowing to total liabilities ratio and the liquid assets to total assets ratio. From the mentioned variables only the first two have a significant impact. If the loan to deposit ratio increases by

one percentage point, the CDS spreads rise by 0.18. A growth of the short-term borrowing as a percentage of the total liabilities causes a decrease of 2.11 of CDS spreads.

5. DISCUSSION AND POLITICAL RECOMMENDATIONS

The key finding of the paper is that banks' business models, earnings potential, and economic uncertainty are among the most significant determinants of credit risk. The analysed institutions that have got higher CDS spreads, tend to exhibit a higher share of trading income, a higher cost efficiency ratio, a higher share of short-term borrowing in total liabilities, and higher ROE, compared to banks with lower CDS spreads. The prepared research suggests also that economic uncertainty also influence on the CDS spreads, but results are strictly connected the cross-sectional variability in the CDS spread during the last crisis. The received results are broadly consistent with those of the literature. Although, the banks' default risk appears not to be explicitly connected with the capital adequacy and assets quality, the market view on economic growth contain expectations about the value of banks measured by equity capital and impact on asset quality. The received results suggest that the default risk is strictly connected with the structure of CAMELS indicators.

The comparison the received results with the bank distress literature, the similar conclusions have been received. The sample of European banks that were working from 1990 to 2008 has been tested by Poghosyan and Cihak (2009). They found that bank distress is connected with the stock market risk and microeconomic indicators like capitalization, assets quality, earnings and liquidity indicators. They also suggests that the cost of funds have the significant impact on banks failure. The analysis on German banks during 1995 – 2004 has been prepared by Kick and Koetter (2007). The significant impact on the banks default risk have got: capital adequacy, assets quality, cost efficiency, liquidity, earnings indicators and the market risk. The market indicators that have got the statistically significant impact on the CDS spreads are the slope of the yield curve and implied volatility from in previous literature (Ericsson et al., 2009; Blanco et al., 2005). The leverage ratio has got the small or insignificant impact on the CDS spreads, because its high persistence and little variation.

The presented paper offer a potential tool for monitoring the banks' CDS spreads and their default risk. The mentioned tools have been needed to verify the potential systemic risk of big banks. It also shows the differences between the European and American market. The CDS spread analyse the probability of default, it can also be a solution to provide information about banks' vulnerability, as an early warning tool.

6. CONCLUSION

This paper exclusively focuses on analysing the determinants of the CDS spreads of the European and American banks, which has never been described in the literature before. The key finding of the paper is that banks' CDS spreads are strictly connected with business models, earnings potential and especially macroeconomic conditions to analyse the CDS spreads determinants.

The findings of the paper are broadly consistent with those of the literature on bank failure. CAMELS indicators have been taken into consideration in the analysis. While the banks' default risk appears to be weakly linked in the estimations to banks' capital adequacy, and insensitive to the assets quality indicators, market expectations about the market views concerning economic growth prospects (overnight interbank market rate) are statistically significant, and contain expectations about the future value of banks (banks' capitalization and value of the main indexes). The fact of the weak impact of the capital adequacy indicators can be connected with the period of the analysis. The asset quality indicators reveal credit risk with a lag. The same situation has been observed for management quality factors. Earnings and liquidity factors have

a more significant impact. Therefore, the default risk of banks seems to be related to the entire structure of the CAMELS.

By establishing a relationship between the financial and market determinants of banks and their CDS spreads, the paper offers a potential tool for monitoring banks based on fundamentals. The described results can also constitute useful information for investors and supervisors. They can be potentially used for vulnerability assessment and as an early warning tool. In the future the presented research shall be expanded on the level of the business cycle.

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APPENDIX

Appendix 1

List of banks that are issuer of CDS

Company Name	Region of Headquarters	Country of Headquarters
Alpha Bank SA	Europe	Greece
Akbank TAS	Asia	Turkey
Allied Irish Banks PLC	Europe	Ireland
Irish Bank Resolution Corporation Ltd	Europe	Ireland
Bank of America Corp	Americas	United States of America
UniCredit Bank Austria AG	Europe	Austria
Banco BPI SA	Europe	Portugal
BB&T Corp	Americas	United States of America
Banco Bilbao Vizcaya Argentaria S.A.	Europe	Spain
Banco Comercial Portugues SA	Europe	Portugal
BNP Paribas Fortis SA	Europe	Belgium
Banco Espirito Santo SA	Europe	Portugal
Bankia SA	Europe	Spain
Bank of Ireland	Europe	Ireland
Bankinter SA	Europe	Spain
Banca Lombarda e Piemontese SpA	Europe	Italy
Bayerische Landesbank	Europe	Germany
Banca Monte dei Paschi di Siena SpA	Europe	Italy
BNP Paribas SA	Europe	France
Piraeus Bank SA	Europe	Greece
Capitalia SpA	Europe	Italy
Bank of Scotland PLC	Europe	United Kingdom
Banco Espanol de Credito SA	Europe	Spain
Citigroup Inc	Americas	United States of America
Credit Agricole SA	Europe	France
Fundacion Caja Mediterraneo	Europe	Spain
Commerzbank AG	Europe	Germany
CIT Group Inc	Americas	United States of America
Comerica Inc	Americas	United States of America
Co-Operative Bank PLC	Europe	United Kingdom
UniCredit SpA	Europe	Italy
Banca Carige SpA Cassa di Risparmio di Genova e Imperia	Europe	Italy
Danske Bank A/S	Europe	Denmark
Deutsche Bank AG	Europe	Germany
DNB ASA	Europe	Norway
Hypothesenbank Frankfurt AG	Europe	Germany
Erste Group Bank AG	Europe	Austria
Eurobank Ergasias SA	Europe	Greece
Finansbank AS	Asia	Turkey
Federal National Mortgage Association	Americas	United States of America
Goldman Sachs Group Inc	Americas	United States of America
Business Property Lending Inc	Americas	United States of America
HSBC Holdings PLC	Europe	United Kingdom
ING Groep NV	Europe	Netherlands
Dexia Bank Belgium SA	Europe	Belgium
Turkiye Is Bankasi AS	Asia	Turkey
Intesa Sanpaolo SpA	Europe	Italy

JPMorgan Chase & Co	Americas	United States of America
KeyCorp	Americas	United States of America
Mediobanca Banca di Credito Finanziario SpA	Europe	Italy
BM-Bank PAO	Europe	Russia
Morgan Stanley	Americas	United States of America
National Bank of Greece SA	Europe	Greece
Nordea Bank AB	Europe	Sweden
National Westminster Bank PLC	Europe	United Kingdom
OTP Bank Nyrt	Europe	Hungary
Banco Pastor SA	Europe	Spain
Banca Popolare di Milano Scarl	Europe	Italy
PNC Financial Services Group Inc	Americas	United States of America
Banco Popular Espanol SA	Europe	Spain
Raiffeisen Bank International AG	Europe	Austria
Royal Bank of Scotland Group PLC	Europe	United Kingdom
Regions Financial Corp	Americas	United States of America
Banco de Sabadell SA	Europe	Spain
Banco Santander SA	Europe	Spain
Santander UK PLC	Europe	United Kingdom
Sberbank Rossii PAO	Europe	Russia
Charles Schwab Corp	Americas	United States of America
Skandinaviska Enskilda Banken AB	Europe	Sweden
Svenska Handelsbanken AB	Europe	Sweden
Societe Generale	Europe	France
Sanpaolo Imi SpA	Europe	Italy
Standard Chartered PLC	Europe	United Kingdom
Swedbank AB	Europe	Sweden
Unione di Banche Italiane SpA	Europe	Italy
UBS AG	Europe	Switzerland
U.S. Bancorp	Americas	United States of America
UkrSybbank PAT	Europe	Ukraine
Bank VTB PAO	Europe	Russia
Wachovia Corp	Americas	United States of America
Wells Fargo & Co	Americas	United States of America
Yorkshire Building Society	Europe	United Kingdom
Yapi ve Kredi Bankasi AS	Asia	Turkey

Source: own elaboration.