Equilibrium. Quarterly Journal of Economics and Economic Policy
Volume 15 Issue 3 September 2020
p-ISSN 1689-765X, e-ISSN 2353-3293
www.economic-policy.pl

ORIGINAL ARTICLE

Citation: Dopierała, Ł., Ilczuk, D., & Wojciechowski, L. (2020). Sovereign credit ratings and CDS spreads in Emerging Europe. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *15*(3), 419–438. doi: 10.24136/eq.2020.019

Contact to corresponding author: lukasz.dopierala@ug.edu.pl; Faculty of Economics, University of Gdansk, Armii Krajowej 119/121, 81-824 Sopot, Poland

Received: 15.02.2020; Revised: 04.07.2020; Accepted: 07.08.2020; Published online: 15.09.2020

Łukasz Dopierała
University of Gdansk, Poland
orcid.org/0000-0002-8515-7642

Daria Ilczuk
University of Gdansk, Poland
orcid.org/0000-0001-9542-9720

Liwiusz Wojciechowski
Cracow University of Economics, Poland
orcid.org/0000-0002-1592-7947

Sovereign credit ratings and CDS spreads in Emerging Europe

JEL Classification: *G14; G15; G23*

Keywords: *credit rating agencies; Emerging Europe; CDS; event study*

Abstract

Research background: Sovereign credit ratings play an important role in determining any country's access to the international debt market. During the global financial crisis and the European debt crisis, credit rating agencies were harshly criticized for the timing of their announcements regarding ratings downgrades and the ranges of those downgrades. Therefore, it is worth considering whether the sovereign credit rating is still a useful benchmark for investors.
Purpose of the article: This article examines whether credit rating agencies still provide financial markets with new information about the solvency of governments in Emerging Europe countries. In addition, it describes the differences in the effect of particular types of rating events on financial markets and the impact of individual agencies on the market situation. Our study also focuses on evaluating these occurrences at different stages of the business cycle.
Methods: This article uses data about ratings events that took place between 2008 and 2018 in 17 Emerging Europe economies. We took into consideration positive, neutral, and negative events related to ratings changes and the outlooks reported by Fitch Ratings, Moody's, and Standard & Poor's. We used a methodology based on event studies. In addition, we performed Wilcoxon signed-ranks test and used a logit model to determine the usefulness of cumulative adjusted credit default swap (CDS) spread changes in predicting the direction of ratings changes.

Findings & Value added: Our research provides evidence that the CDS market reflects information regarding government issuers up to three months before ratings downgrades are announced. Information reported to the market by ratings agencies is only relevant in the short timeframe surrounding ratings downgrades and upgrades. However, positive credit rating changes convey more information to the market. We also found strong evidence that, in the post-crisis period, credit ratings provide markets with less information.

Introduction

A sovereign credit rating is a measure of a country‘s solvency given by credit rating agencies (CRAs) and is based on quantitative and qualitative factors. The sovereign credit rating plays an important role in determining any country’s access to the international debt market as well as the conditions of such access. Many objective economic and fiscal variables go into calculating credit ratings. However, determining the final rating level also depends on a subjective creditworthiness assessment carried out by the credit rating committee, which aims to be forward-looking in its final rating decision. The three main rating agencies, namely Fitch Ratings, Moody‘s, and Standard & Poor‘s (S&P), do not provide information on their methodologies explicitly, so various studies have tried to identify and model them. However, while the objective factors are quite clearly defined, the impact of subjective factors is still not fully known (De Moor *et al.*, 2018). During the global financial crisis and the European debt crisis, CRAs met with harsh criticism, primarily related to the timing of their announcements and the range of their ratings downgrades (Alsakka & Ap Gwilym, 2013; Dziawgo, 2013; Haspolat, 2015; Manso, 2013). It is, therefore, worth considering whether the sovereign credit rating is still useful to investors as a source of reliable and current information on a country’s solvency.

The main purpose of this article is to examine whether CRAs provide financial markets with new information about the solvency of Emerging Europe governments, or whether the financial markets more quickly obtain more complete information. In addition, this article focuses on the differences in the effect of particular types of rating events on the situation of financial markets and the impact of individual CRAs on the market situation.

We conducted our analysis on the basis of the credit default swaps (CDS) market. For the buyer, CDS is a form of protection against the risk of debtor default; therefore, valuation of the CDS spread is widely used in the literature to study the reaction of markets to changes in the credit ratings of governments as well as private entities. However, most of the existing research is based on an analysis of large economies, especially those of developed countries prior to the global financial crisis. One of the most

important aspects of this research is that our sample includes a group of relatively small economies, for example, those in Central Europe, which to the best of our knowledge have rarely been the subject of economic analysis (Afonso *et al.*, 2012). It is important first to assess CRAs‘ behaviour in relation to Emerging Europe economies, because some previous works indicate that their behaviour differs in relation to developed countries versus emerging countries, primarily by taking quantitative factors affecting the rating level into account to a greater or lesser degree, depending on the country's status (Afonso, 2003; Amstad & Packer, 2015).

In addition, our study includes a long period of analysis covering the global financial crisis, the European debt crisis, and the subsequent period of stabilization, which allows the evaluation of this occurrence in each stage of the business cycle and the changes in the way that CRAs operate after the crisis.

In this paper, we used a methodology based on event studies. We performed Wilcoxon signed-ranks test, finding that the CDS market reflects information on government issuers up to three months before the ratings downgrade by the CRAs is announced. We also used a logit model to determine the usefulness of the cumulative adjusted spread change of CDS in predicting the direction of ratings changes by CRAs.

The paper is organized as follows. The next section provides an overview of the empirical literature on the influence of ratings events on markets. The following section describes the research methodology in detail, including our data collection method, the construction of variables, and the estimation technique. In the final part of the paper, we present the results and discussion section, as well as some conclusions.

Literature review

The financial and economic literature has devoted a lot of attention to the impact of CRAs on financial markets. However, papers on this subject differ both in terms of methodologies used and the markets researched.

Among the works related to the sovereign credit ratings, one of the first and most important examples is a paper by Ismailescu and Kazemi (2010). They examined the effect of sovereign credit rating change announcements on the CDS spreads of the event countries, as well as spill-over effects on other emerging economies‘ CDS premiums. The authors found that positive events have a greater impact on CDS markets in the two-day period surrounding the event and are more likely to spill over to other emerging countries. They reported that CDS markets anticipate negative events, and that

previous changes in CDS premiums can be used to estimate the probability of a negative credit event. However, their research has tended to focus only on Asian and South American emerging countries. More recent evidence (Afonso *et al.*, 2012) suggests that government bond yield spreads significantly in response to changes in rating notations and outlook, particularly in the case of negative announcements. Announcements are not anticipated one to two months in advance, but there is bi-directional causality between ratings and spreads within a one to two-week period. This analysis was carried out for 24 European Union (EU) countries, based on data spanning 1995 to 2010. Blau and Roseman (2014) investigated the reaction of European CDS spreads to the U.S. credit rating downgrade. They came to the conclusion that the U.S. downgrade significantly affected the likelihood of default in European countries. European countries with some of the smallest GDP per capita rates and countries that had not recently been downgraded showed the largest increase in CDS spreads. Countries that use the euro also had the largest increases in CDS spreads. Drago and Gallo (2016) described the impact and spill-over effect of a sovereign rating announcement on the euro area CDS market. They used event study techniques to demonstrate that the CDS market does not react significantly to ratings warning announcements. They also found evidence of spill-over effects only after downgrade announcements. Their results showed that the size of the spill-over effect is influenced by the economic and financial conditions of the countries that were analysed. Chodnicka-Jaworska (2017) conducted research on the value of the credit rating information of 35 European countries. She used data on the ratings assigned by S&P and Moody's. However, she recognised developed and emerging countries as one group and performed the analysis using a short time interval. She reached the conclusion that the European CDS market is sensitive to changes in countries' credit ratings, while the scale of impact of these changes is different depending on the credit rating agency involved. Binici and Hutchison (2018) found that watch and outlook status plays a critical role in accurately determining the value of information on credit rating changes, analysing data from the period 2005–2012. Van de Ven *et al.* (2018) assigned Eurozone sovereign credit ratings using CDS spreads. They developed a regression-based model using CDS data, alongside data on financial and macroeconomic variables, to estimate sovereign CDS spreads. They suggested that the default probabilities of sovereign ratings can be estimated using these spreads. The new ratings scheme was then used in conjunction with these default probabilities to assign credit ratings to countries.

As previously mentioned, there is not much empirical evidence on the sovereign CDS markets in Emerging Europe countries, with most of the existing research focusing on the Eurozone (Aizenman *et al.,* 2013; Arce *et al.*, 2013; Broto & Pérez-Quirós, 2014; Chiarella *et al.*, 2014; Fontana & Scheicher, 2016; Kalbaska & Gatkowski, 2012; Manasse & Zavalloni, 2013). However, Kliber (2011) investigated linkages among sovereign CDS instruments in Central Europe and emphasised the change in causality patterns during the Hungarian and Greek crises. Moreover, she revealed that expectations do play a role in determining contract prices, and that there are regional causality relationships between such instruments. In more recent studies, Kliber (2014, 2019) pointed out that the Hungarian and Greek crises both caused a rise in volatility for the CDS market in Central Europe. In addition, she claimed that the Central European markets used to be more prone to volatility transmission than the Western ones, and that, in most cases, the impact of the CDS market on other financial markets diminished after imposing a trade ban on non-covered sovereign CDS in Europe. It is also worth mentioning that several studies (Christopher *et al.*, 2012; de Vries & de Haan, 2016; Klimavičienė, 2011; Klimaviciene & Pilinkus, 2011; Steiner & Heinke, 2001) have been carried out on the impact of sovereign credit ratings on bond and stock markets. These studies indicate that the reaction of the stock and bond markets to positive and negative rating events is asymmetric. There are also differences in the reactions of the markets in different countries and regions.

In recent years, many attempts have been made to examine the dependencies between credit rating announcements and corporate instruments. The results when investigating private entity markets differ from those on sovereign instruments. For example, Norden and Weber (2004) found that both stock and CDS markets anticipate not only ratings downgrades, but also reviews for downgrade. They used a combined analysis of different rating events within and across agencies to reveal that reviews for downgrade by S&P and Moody's had the largest impact on both markets. Micu *et al.* (2004) reported that credit ratings for private entities do convey information to market participants and that even announcements that are anticipated by earlier movements in spreads seem to contain additional pricing-relevant information. Finnerty *et al.* (2013) revealed that corporate rating upgrades do have a significant impact on CDS spreads even though they are still not as well anticipated as downgrades. They also came to the conclusion that positive credit watch and outlook announcements significantly impact CDS markets. More recent studies (Lee *et al.,* 2018) have provided evidence that CDS prices contain unique firm credit risk information that is not captured by the prices of other related securities, such as stocks and

bonds tied to the same firm. They argue that CDS returns significantly predict stock returns.

The literature examining different issues related to CRAs and CDS markets is ever-growing. However, the results of various studies are often inconsistent. These differences may result from the methodology used, the period of analysis, or the markets chosen for analysis. Our research makes a contribution to the existing literature by analysing the impact of sovereign credit ratings on CDS markets in Emerging Europe during the crisis and post-crisis periods — something which, to the best of our knowledge, has received scant attention elsewhere.

Research methodology

In this article, we used two sets of data obtained from Refinitiv. The first set included information about the rating events from 2008 to 2018 regarding seventeen economies classified by Refinitiv in the group of Emerging Europe: Belarus, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Israel, Latvia, Lithuania, Poland, Romania, the Russian Federation, Serbia, Slovakia, Slovenia, Turkey, and Ukraine. We took into consideration the positive, neutral, and negative events related to rating change, and outlook, reported by the three main CRAs: Fitch, Moody's, and S&P (only the S&P agency diverge from this scheme, because in this case there were no neutral events in the analysed set). The entire sample consisted of 516 rating events. The second set of data included daily observations of USD-denominated five-year maturity CDS spreads. The final sample covered 62,611 daily observations from October 9, 2008 to October 9, 2018. Our datasets end in 2018, as our aim was to get a relatively similar number of observations for the crisis and post-crisis period. It's worth mentioning that there were 15 ratings downgrades below the investment grade for different countries during the research period, but we did not observe unusual impacts of these events.

Given the findings of the existing literature described above, we formulated the following research hypothesis:

H1: *Changes in credit rating levels and rating outlooks for Emerging European countries have a significant impact on the valuation of sovereign CDS markets.*

H2: *The influence of positive rating events on the CDS market is stronger than that of negative events.*

H3: *The cumulative adjusted spread change (CASC) of CDS demonstrates a predictive ability in relation to forecasting the direction of ratings changes.*

The economic justification for the above hypotheses is as follows. If rating changes or outlook changes provide new information to the market, a significant negative or positive reaction of the CDS market will occur after the event. Moreover, the existing literature suggests that changes in the markets caused by negative and positive events are asymmetric. Based on it, we assumed that the positive events are more surprising for the market. As the CDS market responds faster to macroeconomic data than CRAs, it is also possible that indicators based on CDS market could be useful in forecasting the direction of rating events.

Our methodology follows Norden and Weber (2004). We adjusted the daily changes of CDS by the value of the index consisting of the average CDS change in the region on the same day to consider the general market situation. We calculated the adjusted spread change of the country *i* at the date *t* in the time window from 120 days before the rating event to 60 days after the rating event [-120,60] as:

$$ASC_{it} = (Spread_{it} - Spread_{it-1}) - (Index_t - Index_{t-1}) \qquad (1)$$

where $Spread_{it}$ is daily five-year maturity CDS spread of the country *i* at date *t*, and $Index_t$ is the average spread for all the countries in the region with the exception of Ukraine[1] at date *t*. To assess the total impact of an event on the CDS market, we calculated the cumulative adjusted spread change for country *i* from day t_1 to t_2 as follows:

$$CASC_{i,[t_1,t_2]} = \sum_{t=t_1}^{t_2} ASC_{it} \qquad (2)$$

To verify the impact of rating events on CASC, we analysed the proportion of positive and negative CASC in the time windows before, after, and during the period surrounding all rating events, credit rating changes, and outlook changes. In addition, we performed a non-parametric Wilcoxon signed-ranks test (Wilcoxon, 1945). Due to the strong influence of outliers and non-normal distribution of CASC, we did not conduct parametric tests.

[1] Ukraine was excluded from the index due to the political and economic situation, which made the CDS spread extremely high.

The following hypotheses are formulated in Wilcoxon signed-ranks test:

$$H_0: \theta = 0$$

$$H_1: \theta \neq 0$$

where θ is the median of CASC in the population represented by the examined sample.

The test statistic Z is given by the following formula:

$$Z = \frac{T - \frac{n(n+1)}{4}}{\sqrt{\frac{n(n+1)(2n+1)}{24} - \frac{\sum t^3 - \sum t}{48}}} \tag{3}$$

where $T = \min(\sum R_-, \sum R_+)$, $\sum R_-$ and $\sum R_+$ are the sums of negative and positive ranks, respectively, n represents the number of ranks, and t is the number of cases included in the tied rank.

To determine the usefulness of CASC to predict the direction of rating changes by CRAs, we used a logit model in which the probability of rating change in a specific direction is defined as:

$$P(Y = 1 | X_1 = x_1, X_2 = x_2, \ldots, X_k = x_k) = \frac{\exp(\beta_0 + \sum_{i=1}^{k} \beta_i X_i)}{1 + \exp(\beta_0 + \sum_{i=1}^{k} \beta_i X_i)} \tag{4}$$

We estimated the model parameters with the maximum likelihood method. The explained variable takes the value 1 if there has been a downgrade (upgrade) of the rating and the value 0 if there has been an upgrade or confirmation (downgrade or confirmation) of the rating, respectively. In our model, we included the following explanatory variables: CASC in particular time windows and a binary variable *investment*, which indicates the information about a credit rating at the moment the rating event appears and allows to capture the impact of the initial rating level on the direction of its change. The variable *investment* took the value 1 for rating levels equal to and above BBB- (for Fitch and S&P) or Baa3 (for Moody's) and the value 0 for all other rating levels. The estimation of the logit model can also be considered as a robustness check of the results obtained with the Wilcoxon signed-ranks test.

According to Norden and Weber (2004), a study of the sovereign credit ratings impact based on data from the CDS market is more justified than a study based on data from the bond market because bond prices reflect not only issuer risk, but also several aspects of issue risk. It should also be not-

ed that the nonparametric test we used is robust to unusual CASC deviations. However, there are also limitations to our methodology. The main one is that the sovereign CDS data may be influenced by risk premiums and liquidity premiums (Ordoñez-Callamand *et al.,* 2017). It should also be noted that in this study we assumed that the CDS market almost immediately reflects the changes of the public data regarding for example the state of finances of the countries surveyed.

Results and discussion

The results of the proportion of CASC and Wilcoxon signed-ranks test for statistically significant events and time windows are presented in Table 1. The CDS market is ahead of rating events. This especially applies to credit rating downgrades which are predicted earlier by changes to the CDS spread. This agrees with the Finnerty *et al.* (2013) surveys. In addition, the CASC median takes positive values and significantly differs from zero at 1% up to 90 days before downgrades. This indicates that in the case of Emerging Europe countries, the CDS market previously foresees credit rating downgrades in contrast to earlier findings reported by Ismailescu and Kazemi (2010) as well as Afonso *et al.* (2012).

Research based on the whole sample available suggests that in short term i.e., a two-day time window around the events [-1, 1], both negative and positive ratings events result in changes to the CDS spread. The impact of credit rating changes on the CDS market is clearly observable, but there is no conclusive evidence of the impact of outlook changes. However, a detailed analysis of the sub-periods of 2008–2012 and 2013–2018 (Table 2) indicates that the median of CASC significantly different from zero (at the 5% level) occurred only during the crisis. Analysis of the time windows [-1, 0] and [0, 1] also highlights the fact that the CDS market was more strongly impacted by ratings upgrades. Therefore, we believe that, in the case of Emerging Europe, positive events have a stronger impact on CDS markets than negative events. This finding is in line with the results from Ismailescu and Kazemi's (2010) study of emerging economies in Asia and South America between 2001–2009, but in contradiction with the results of Afonso *et al.* (2012) for EU countries during the period 1995–2010 and Chodnicka-Jaworska's findings (2017) for 35 European countries between 2005–2015.

Our results also confirm to some extent the allegations against CRAs regarding late reactions to the deterioration of the issuers' situation during the crisis. At the same time, there is no conclusive evidence suggesting that

it is possible to predict credit rating upgrades by the CDS market. Previous research based on data from before the European debt crisis revealed a higher predictability of positive rating events by the CDS market. Moreover, our analysis provides strong evidence that ratings events during the sub-period of 2013–2018 had an even smaller impact on CDS markets. This clearly demonstrates that, after the economic crisis, sovereign ratings are more predictable by the market, and that modifications to the methodology used by CRAs did not result in more information being conveyed to the markets, and may even have had the opposite effect. Our tests revealed that, in the post-crisis period, the CDS market was even further ahead of the negative ratings change. This observation would seem to suggest a more cautious CRAs approach to upgrade rating after the crisis. In some cases, the CDS market indicates a significant reduction in the risk of issuers' insolvency, and yet the credit rating has not returned to the pre-crisis level. This is clearly observable in Figure 1. For example, in the case of Croatia, the average rating of the three main CRAs (red line) still remained speculative, although the CDS market (blue line) indicates a decrease in the risk of insolvency. This occurrence is also observed in the bond market (de Vries & de Haan, 2016).

The lower impact of credit ratings in the post-crisis period may also be related to the EU regulations that entered into force in 2013. These regulations limited the publication of unsolicited country ratings in the EU. Such ratings may henceforth be published up to three times a year. In addition, CRAs have to provide the publication dates prior to the beginning of every year. The introduced regulations make it impossible for the CRAs to react dynamically to changes in the financial situation of issuers. A comparison of the reaction to ratings upgrades and downgrades in the EU and non-EU countries shows that the rating provides less information in the EU (Table 3).

Parameters of the logit model estimation are presented in Table 4, confirming the results obtained earlier. The CASC variable shows predictive ability in relation to forecasting the direction of rating changes, mainly for the rating downgrade. Signs of the model parameters are correct, which means that positive CASCs increase the probability of rating downgrades, and negative CASCs increase the probability of rating upgrades. For the sample based on the rating downgrades for all CRAs, the statistical significance of 1% was CASC [-90, -61] [-60, -2]. In the case of Fitch, an investment rating significantly reduces the probability of rating upgrade. However, it has no effect on the probability of rating downgrade.

The results obtained for the whole sample are consistent with those received for each CRA. Moreover, there is strong evidence that positive

CASC changes over the following three months significantly increased the rating downgrade probability for all three CRAs. The rating downgrades carried out by Fitch are most accurately predicted by the CDS market, which is in line with the results from Norden and Weber (2004) study. On the other hand, it is difficult to predict rating upgrades by analysing the CDS market.

Conclusions

In this paper, we analysed the relationship between credit ratings of Emerging Europe governments and the CDS market. Our research provides strong evidence that in the group of countries examined, the CDS market recognizes information regarding government issuers up to three months before the rating downgrade by CRAs. Therefore, it is possible that the long-term growth of the CDS spread has a predictive function in relation to the rating downgrades (which partially supports the H3 research hypothesis). The relation between the CDS market and positive rating changes is not as clear. Information reported to the market by CRAs is only relevant in the short time window surrounding rating downgrades and upgrades (which is partially consistent with the H1 hypothesis). However, positive credit rating changes conveyed more information to the market. Thus, the H2 research hypothesis may be positively verified. Moreover, we have found strong evidence that, in the post-crisis period, the rating provided markets with less information and the modifications to the rating methodology introduced by CRAs have not improved its usefulness as a yardstick.

We believe that our results may be particularly useful for individual investors who often make their decisions based on the opinions of external agencies. Our findings suggest that they should rely even less on sovereign ratings from the three main CRAs after the crisis. The analysis of market data, for example CDS spreads, is more useful in assessing the solvency of governments.

We are also aware of limitations to our research. The main one is that the sovereign CDS data we used may be influenced by risk premiums and liquidity premiums. Further studies of post-crisis changes in CRA behaviour are needed, and must be based on other instruments, markets, or groups of countries. In addition, a detailed country by country or region by region analysis should be carried out. It is worth emphasizing that the methodology can be developed in future research by adding macroeconomic control variables to the models.

References

Afonso, A. (2003). Understanding the determinants of sovereign debt ratings: evidence for the two leading agencies. *Journal of Economics and Finance*, *27*(1). doi: 10.1007/BF02751590.

Afonso, A., Furceri, D., & Gomes, P. (2012). Sovereign credit ratings and financial markets linkages: application to European data. *Journal of International Money and Finance*, *31*(3). doi: 10.1016/j.jimonfin.2012.01.016.

Aizenman, J., Hutchison, M., & Jinjarak, Y. (2013). What is the risk of European sovereign debt defaults? Fiscal space, CDS spreads and market pricing of risk. *Journal of International Money and Finance*, *34*. doi: 10.1016/j.jimonfin.2012.11.011.

Alsakka, R., & Ap Gwilym, O. (2013). Rating agencies' signals during the European sovereign debt crisis: market impact and spillovers. *Journal of Economic Behavior and Organization*, *85*(1). doi: 10.1016/j.jebo.2011.12.007.

Amstad, M., & Packer, F. (2015). Sovereign ratings of advanced and emerging economies after the crisis. *BIS Quarterly Review*, (December).

Arce, O., Mayordomo, S., & Peña, J. I. (2013). Credit-risk valuation in the sovereign CDS and bonds markets: evidence from the euro area crisis. *Journal of International Money and Finance*, *35*. doi: 10.1016/j.jimonfin.2013.01.006.

Binici, M., & Hutchison, M. (2018). Do credit rating agencies provide valuable information in market evaluation of sovereign default risk? *Journal of International Money and Finance*, *85*. doi: 10.1016/j.jimonfin.2018.04.001.

Blau, B. M., & Roseman, B. S. (2014). The reaction of European credit default swap spreads to the U.S. credit rating downgrade. *International Review of Economics and Finance*, *34*. doi: 10.1016/j.iref.2014.07.009.

Broto, C., & Pérez-Quirós, G. (2014). Disentangling contagion among sovereign CDS spreads during the European debt crisis. *Journal of Empirical Finance*, *32*. doi: 10.1016/j.jempfin.2015.03.010.

Chiarella, C., ter Ellen, S., He, X. Z., & Wu, E. (2014). Fear or fundamentals? Heterogeneous beliefs in the European sovereign CDS market. *Journal of Empirical Finance*, *32*. doi: 10.1016/j.jempfin.2014.11.003.

Chodnicka-Jaworska, P. (2017). Information value of the credit rating on the credit default swaps market. *Metody Ilościowe w Badaniach Ekonomicznych / Szkoła Główna Gospodarstwa Wiejskiego*, *18(XVIII)*(3). doi: 10.22630/MIBE.2017.18.3.39.

Christopher, R., Kim, S. J., & Wu, E. (2012). Do sovereign credit ratings influence regional stock and bond market interdependencies in emerging countries? *Journal of International Financial Markets, Institutions and Money*, *22*(4). doi: 10.1016/j.intfin.2012.01.003.

De Moor, L., Luitel, P., Sercu, P., & Vanpée, R. (2018). Subjectivity in sovereign credit ratings. *Journal of Banking and Finance*, *88*. doi: 10.1016/j.jbankfin.2017.12.014.

de Vries, T., & de Haan, J. (2016). Credit ratings and bond spreads of the GIIPS. *Applied Economics Letters*, *23*(2). doi: 10.1080/13504851.2015.1054063.

Drago, D., & Gallo, R. (2016). The impact and the spillover effect of a sovereign rating announcement on the euro area CDS market. *Journal of International Money and Finance*, *67*. doi: 10.1016/j.jimonfin.2016.06.004.

Dziawgo, D. (2013). Present and future position of credit rating. *Folia Oeconomica Stetinensia*, *12*(2). doi: 10.2478/v10031-012-0026-5.

Finnerty, J. D., Miller, C. D., & Chen, R. R. (2013). The impact of credit rating announcements on credit default swap spreads. *Journal of Banking and Finance*, *37*(6). doi: 10.1016/j.jbankfin.2013.01.028.

Fontana, A., & Scheicher, M. (2016). An analysis of euro area sovereign CDS and their relation with government bonds. *Journal of Banking and Finance*, *62*. doi: 10.1016/j.jbankfin.2015.10.010.

Haspolat, F. B. (2015). Analysis of Moody's sovereign creditratings: criticisms towards rating agencies are still valid? *Procedia Economics and Finance*, *30*. doi: 10.1016/s2212-5671(15)01296-4.

Ismailescu, I., & Kazemi, H. (2010). The reaction of emerging market credit default swap spreads to sovereign credit rating changes. *Journal of Banking and Finance*, *34*(12). doi: 10.1016/j.jbankfin.2010.05.014.

Kalbaska, A., & Gatkowski, M. (2012). Eurozone sovereign contagion: evidence from the CDS market (2005-2010). *Journal of Economic Behavior and Organization*, *83*(3). doi: 10.1016/j.jebo.2012.05.010.

Kliber, A. (2011). Sovereign CDS instruments in central Europe – linkages and interdependence. *Dynamic Econometric Models*, *11*(0). doi: 10.12775/dem. 2011.008.

Kliber, A. (2014). The dynamics of sovereign credit default swaps and the evolution of the financial crisis in selected central European economies. *Finance a Uver - Czech Journal of Economics and Finance*, *64*(4).

Kliber, A. (2019). The sovereign credit default swap market – is there anything to be afraid of? A comparison of selected central and western european economies. *Argumenta Oeconomica*, *2*(43). doi: 10.15611/aoe.2019.2.06.

Klimavičienė, A. (2011). Sovereign credit rating announcements and Baltic stock markets. *Organizations and Markets in Emerging Economies*, *2*(1). doi: 10.15388/omee.2011.2.1.14289.

Klimaviciene, A., & Pilinkus, D. (2011). The impact of sovereign credit rating changes on the stock markets in Central and Eastern Europe. *Transformations in Business and Economics*, *10*(3).

Lee, J., Naranjo, A., & Velioglu, G. (2018). When do CDS spreads lead? Rating events, private entities, and firm-specific information flows. *Journal of Financial Economics*, *130*(3). doi: 10.1016/j.jfineco.2018.07.011.

Manasse, P., & Zavalloni, L. (2013). Sovereign contagion in Europe: evidence from the CDS market. *SSRN Electronic Journal*. doi: 10.2139/ssrn.2205029.

Manso, G. (2013). Feedback effects of credit ratings. *Journal of Financial Economics*, *109*(2). doi: 10.1016/j.jfineco.2013.03.007.

Micu, M., Remolona, E. M., & Wooldridge, P. D. (2004). The price impact of rating announcements: evidence from the credit default swap market. *BIS Quarterly Review, part 5, June.*

Norden, L., & Weber, M. (2004). Informational efficiency of credit default swap and stock markets: the impact of credit rating announcements. *Journal of Banking and Finance*, *28*(11). doi: 10.1016/j.jbankfin.2004.06.011.

Ordoñez-Callamand, D., Gomez-Gonzalez, J. E., & Melo-Velandia, L. F. (2017). Sovereign default risk in OECD countries: do global factors matter? *North American Journal of Economics and Finance*, *42*. doi: 10.1016/j.najef.2017 .09.008.

Steiner, M., & Heinke, V. G. (2001). Event study concerning international bond price effects of credit rating actions. *International Journal of Finance & Economics*, *6*(2). doi: 10.1002/ijfe.148.

van de Ven, R., Dabadghao, S., & Chockalingam, A. (2018). Assigning Eurozone sovereign credit ratings using CDS spreads. *Journal of Risk Finance*, *19*(5). doi: 10.1108/JRF-06-2017-0096.

Wilcoxon, F. (1945). Individual comparisons by ranking methods. *Biometrics Bulletin*, *1*(6). doi: 10.2307/3001968.

Acknowledgments

We would like to thank anonymous referees for their valuable comments.

This work was supported by the Polish Ministry of Science and Higher Education for Young Researchers under Grant no. 538-3300-B013-18. Data for the study was obtained from Refinitiv under the Partnership Agreement between the University of Gdansk and the Refinitiv.

Annex

Table 1. The proportion of CASC and Wilcoxon signed-ranks test results before and in the period surrounding a rating event

Time window	**[-120,-91]**		**[-90,-61]**		**[-60,-31]**		**[-30,-2]**		**[-1,1]**	
Event type	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade
					All rating events					
No. of observations	132	150	132	150	136	151	138	151	138	151
Positive	53.78%	43.33%	59.09%	38.67%	55.88%	44.37%	59.42%	42.38%	61.59%	37.75%
Negative	46.21%	56.67%	40.91%	61.33%	44.12%	55.63%	40.58%	57.62%	38.41%	62.25%
Median	2.43	-2.07	7.40	-3.73	6.26	-2.24	6.55	-1.57	2.26	-1.13
Z	0.965	-1.699*	3.071***	-3.091***	2.702***	-1.978**	3.049***	-1.570	3.818***	-4.068***
					Credit rating changes					
No. of observations	88	62	88	62	91	63	92	63	92	63
Positive	57.95%	45.16%	60.23%	46.77%	60.44%	44.44%	63.04%	47.62%	65.22%	36.51%
Negative	42.05%	54.84%	39.77%	53.23%	39.56%	55.56%	36.96%	52.38%	34.78%	63.49%
Median	7.96	-0.93	9.84	-1.40	17.15	-2.52	12.34	-0.46	3.19	-1.05
Z	1.708*	-0.414	2.844***	-0.961	2.939***	-1.797*	2.860***	-0.798	3.676***	-3.533***
					Outlook changes					
No. of observations	44	88	44	88	45	88	46	88	46	88
Positive	41.86%	43.18%	56.82%	31.82%	48.89%	45.45%	52.17%	40.91%	54.35%	38.64%
Negative	58.14%	56.82%	43.18%	68.18%	51.11%	54.55%	47.83%	59.09%	45.65%	61.36%
Median	-4.85	-2.07	5.66	-5.33	-0.57	-0.87	2.48	-1.71	0.48	-1.19
Z	-1.044	-1.313	1.348	-3.048***	-0.316	-0.863	1.027	-1.159	1.153	-2.318**

Notes: The last row in every section represents value of Z-statistics of Wilcoxon signed-ranks test. The hypothesis about median equal zero is rejected at the level of significance: *** (1%), ** (5%), and * (10%). The results for time windows [2,30] and [31,60] are not reported in this table because of insignificance.

Source: own calculation based on Refinitiv data.

Table 2. The proportion of CASC and Wilcoxon signed-ranks test results before and in the period surrounding a rating change event in the sub-periods 2008–2012 and 2013–2018

Time window	**[-90,-61]**		**[-60,-31]**		**[-30,-2]**		**[-1,1]**		**[-1,0]**		**[0,1]**	
Event type	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade
2008–2012												
No. of observations	54	23	57	24	58	24	58	24	58	24	58	24
Positive	55.56%	34.78%	61.40%	33.33%	60.34%	41.67%	67.24%	16.67%	55.17%	20.83%	56.89%	29.17%
Negative	44.44%	65.22%	40.91%	66.67%	39.66%	58.33%	32.76%	83.33%	44.83%	79.17%	43.10%	70.83%
Median	6.40	-4.06	19.33	-5.36	26.38	-3.25	4.27	-7.60	0.74	-3.80	1.52	-2.43
Z	1.769*	-1.338	2.570**	-2.229**	2.443**	-0.571	3.380***	-3.343***	1.150	-3.015***	2.249**	-3.015***
2013–2018												
No. of observations	34	39	34	39	34	39	34	39	34	39	34	39
Positive	67.65%	53.85%	58.82%	48.72%	67.65%	46.15%	61.76%	48.72%	61.76%	48.72%	52.94%	48.72%
Negative	32.35%	46.15%	41.18%	51.28%	32.35%	53.85%	38.24%	51.28%	38.24%	51.28%	47.05%	51.28%
Median	16.14	0.34	9.97	-1.22	5.07	-1.09	0.72	-0.23	2.39	-0.04	0.37	-0.06
Z	2.505**	0.042	1.428	-1.200	1.906*	-0.865	1.701*	-1.144	1.701*	-0.837	0.949	0.014

Notes: The last row in every section represents value of Z-statistics of Wilcoxon signed-ranks test. The hypothesis about median equal zero is rejected at the level of significance: *** (1%), ** (5%), and * (10%). The results for time windows [-120.-91] [2,30] and [31,60] are not reported in this table because of insignificance.

Source: own calculation based on Refinitiv data.

Table 3. The proportion of CASC and Wilcoxon signed-ranks test results before and in the period surrounding a rating change event in the EU and non-EU countries in the period 2008–2018

Time window	**[-90,-61]**		**[-60,-31]**		**[-30,-2]**		**[-1,1]**		**[-1,0]**		**[0,1]**	
Event type	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade
EU countries												
No. of observations	48	38	50	39	51	39	51	39	51	39	51	39
Positive	54.17%	47.37%	62.00%	48.72%	50.98%	41.03%	64.71%	38.46%	50.98%	38.46%	49.02%	46.15%
Negative	45.83%	52.63%	38.00%	51.28%	49.02%	58.97%	35.29%	61.54%	49.02%	61.54%	50.98%	51.28%
Median	6.31	-0.82	14.02	-1.22	1.52	-1.14	2.47	-0.64	0.27	-0.35	-0.14	-0.06
Z	1.333	-0.384	2.351**	-1.019	1.078	-1.423	2.165**	-2.107**	0.844	-2.275**	0.844	-0.844
Non-EU countries												
No. of observations	40	23	41	23	41	23	41	23	41	23	41	23
Positive	67.50%	47.83%	58.54%	30.43%	78.05%	47.83%	65.85%	34.78%	65.85%	39.13%	63.41%	30.43%
Negative	32.50%	52.17%	41.46%	69.57%	21.95%	52.17%	34.15%	65.22%	34.15%	60.87%	36.59%	69.57%
Median	21.60	-3.46	12.62	-7.16	19.30	-1.46	10.47	-3.19	2.98	-1.03	5.24	-2.17
Z	2.782***	-0.882	1.730*	-2.585***	2.961***	-0.365	3.065***	-2.677***	1.782*	-1.688*	2.248**	-2.525**

Notes: The last row in every section represents value of Z-statistics of Wilcoxon signed-ranks test. The hypothesis about median equal zero is rejected at the level of significance: *** (1%), ** (5%), and * (10%). The results for time windows [-120.-91] [2,30] and [31,60] are not reported in this table because of insignificance.

Source: own calculation based on Refinitiv data.

Table 4. Logit models of credit rating change direction

Model	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**
Sample	**All agencies**		**Fitch**		**Moody's**		**S&P**	
Rating direction/ Variable	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade	Downgrade	Upgrade
const	-1.085***	-0.759***	-2.916***	-0.972**	-1,006***	-1.190***	-0.110	0.110
	(0.140)	(0.219)	(0.401)	(0.392)	(0.284)	(0.432)	(0.322)	(0.322)
investment (binary)	-	-0.991***	-	-1.318***	-	-0.847	-	-
		(0.295)		(0.506)		(0.612)		
CASC[-30,-2]	-	-	0.051***	-0.020*	-	-	0.042***	-0,042***
			(0.015)	(0.011)			(0.017)	(0.017)
CASC[-60,-31]	-	-	0.047***	-0.122	0.004*	-	0.150*	-0,150*
			(0.011)	(0.008)	(0.002)		(0.008)	(0.008)
CASC[-90,-61]	0.024***	-0.003	0.047***	-	0.024***	-	0.042**	-0,042**
	(0.005)	(0.002)	(0.014)		(0.008)		(0.017)	(0.017)
CASC[-120,-91]	0,007*	-	0,014**	-	0.018**	-	-	-
	(0.004)		(0.006)		(0.008)			
CASC[-60,-2]	0.002***	-	-	-	-	-	-	-
	(0.001)							
No. of observations	305	305	161	161	81	81	63	63
LR Chi2 p-value	0.000	0.001	0.000	0.013	0.002	0.166	0.000	0.000
Pseudo R2	11.24%	5.69%	47.33%	10.13%	16.57%	2.67%	31.63%	31.63%
Sensitivity	26.14%	4.84%	56.00%	0,00%	53.57%	0.00%	74.29%	82.14%
Specificity	99.08%	99.18%	97.79%	99.29%	96.23%	100.00%	82.14%	74.29%
Correctly classified	78.03%	80.00%	91.30%	86.42%	81.48%	84.15%	77.78%	77.78%

Notes: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Standard errors are reported in parentheses.

Source: own calculation based on Refinitiv data.

Figure 1. Average credit rating and CDS spread in selected Emerging Europe countries, representative for different market situations, 2008–2018.

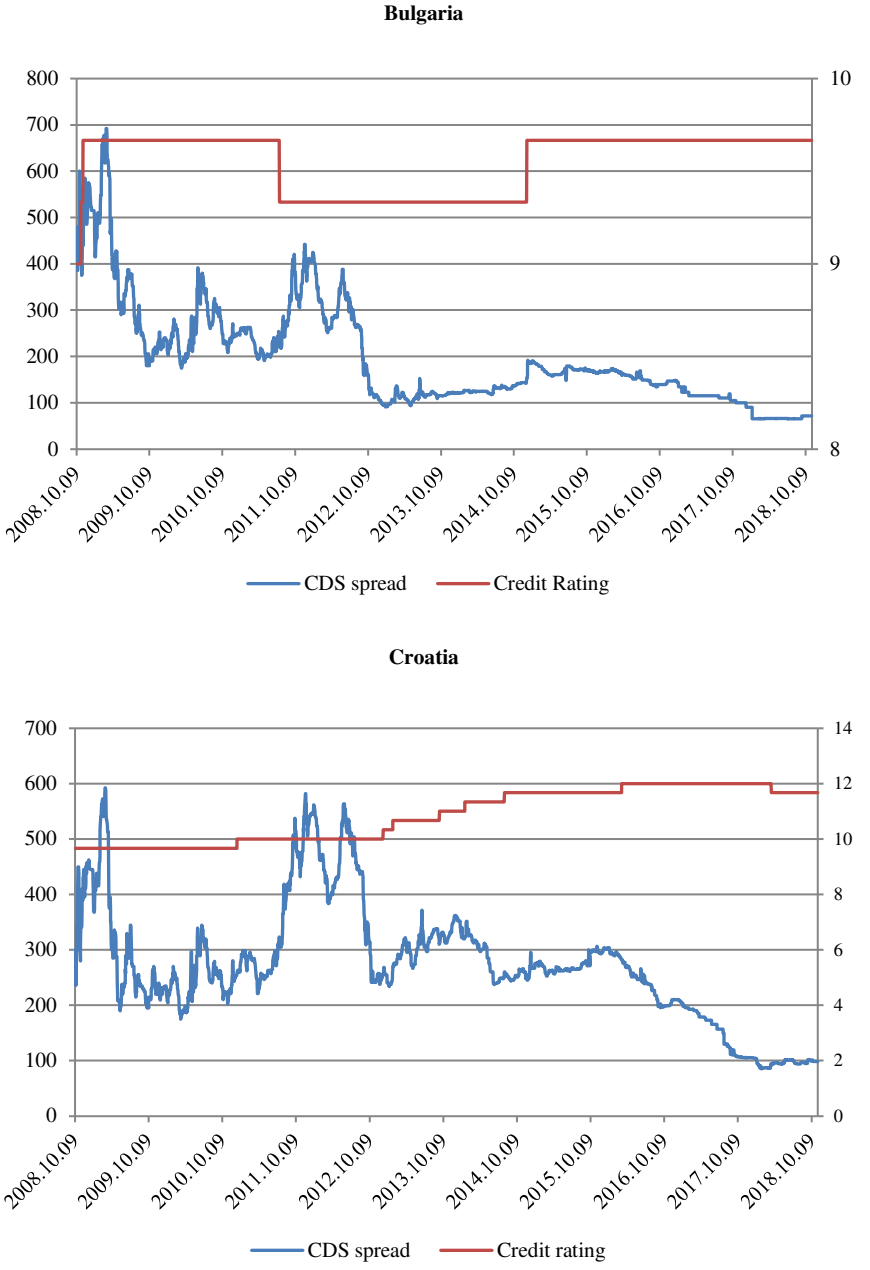
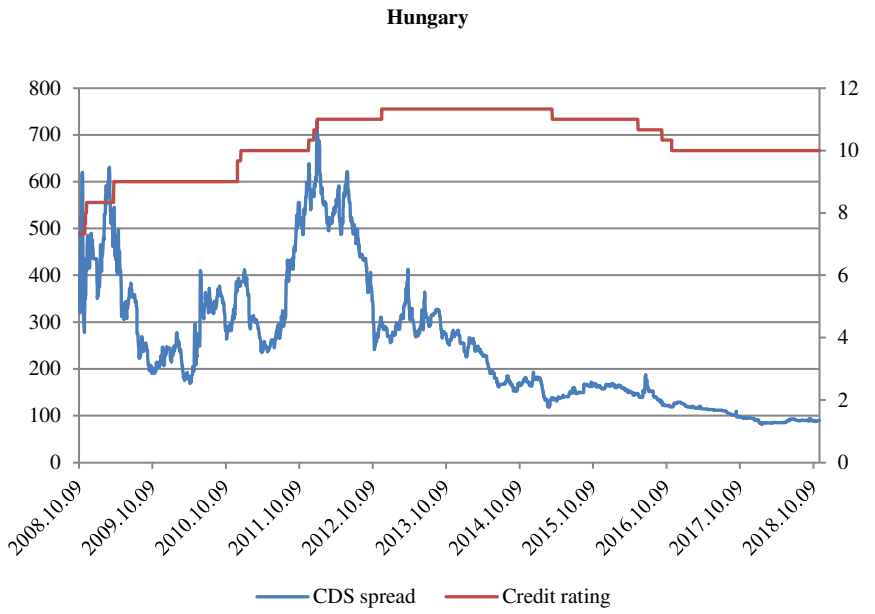


Figure 1. Continued



Notes: Left-hand side of the y-axis represents CDS spread (bps). Right-hand side of the y-axis represents the average credit ratings of Fitch, Moody's, S&P transformed on a numerical scale (1-20), where AAA=1; CC,C,D=20.

Source: own elaboration based on Refinitiv data.