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An Analysis of Insider Trading in the Credit Derivatives Market Using the Event Study Methodology

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Abstract

Purpose: In this paper I investigate the information flow between the credit default swap market and the stock market as well as insider trading in the credit default swap market.

Methodology: For my analysis I use the event study methodology. Using the event study methodology I calculate abnormal stock returns and abnormal credit default swap premium changes. The analysis is based on 175,874 observations collected for 92 companies between the years 2001 and 2010.

Findings: The results show that the information flow from the credit default swap market to the stock market is the most significant in terms of negative rating outlooks. The information flow is much less significant in relation to negative surprises during announcements of annual financial results and rating upgrades. Evidence of insider trading is also most evident with reference to negative rating outlooks. Additionally, a distinctive feature of the credit default swap market and the stock market is the asymmetric response to negative and positive credit information.

Research limitations: The event study methodology does not consider other potentially important reasons for the information flow between markets than the ones actually investigated. The credit events and credit risk information used in this research are just a proposal and can be extended by future researchers.

Originality: This paper discusses a new research area. The main research area in terms of insider trading is still the stock market, with special focus on the US market. I decided to explore the insider trading phenomenon in the credit default swap market. I only considered contracts that are quoted with reference to European underlying assets. This part of the financial market is attractive in terms of economic research as credit derivatives are more commonly used not only in North America but also in Europe.

Keywords: insider trading, information flow, event study, credit derivatives

JEL: G14, G21, G24

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Introduction

In the literature on the subject there is a rather widely accepted definition of the phenomenon of insider trading. Insider trading per se is obtaining information from non-public sources and using it for purposes of enhancing one's financial advantage (Machan, 1996). Entities that are in the possession of such information exploit the difference between the economically justified value of the company (or financial instrument) and its market value (Avgouleas, 2005). In this paper, I will also refer to the phenomenon of insider trading as insider transactions. Any information that concerns a given company and that has not yet been made public and has a potentially material impact on the price of the financial instruments issued by the given entity or its associated derivative instruments, such as options, should be treated with confidentiality. Confidential and material information can include, for example, information about planned mergers, acquisitions, announcement of interim results (Skaife, Veenman and Wangerin, 2013), or information about changes in financial forecasts. Insider transactions are therefore based on information asymmetry between entities operating within the organization and external stakeholders[2].

In the financial market the phenomenon of insider trading has been analyzed for many years, mainly in terms of the stock market. It was not until the emergence of innovative financial instruments, which allowed investors to buy protection against credit risk, such as credit derivatives, that researchers started showing interest in the considered phenomenon also in other segments of the financial market.

One of the methods of researching the occurrence of the phenomenon of insider trading in the credit derivatives market and the flow of information between the market of the considered derivative instruments, the stock market and the bond market is the event study methodology.

The purpose of this paper is to examine the incidence and severity of the phenomenon of insider trading in the credit derivatives market for European companies, as well as an analysis of the flow of information between the market of the considered derivative instruments and the stock market. My main focus is the response time of the stock market and the credit default swap (CDS) market to occurring credit risk events and credit risk information. The in this paper presented analysis is of particular significance in terms of the existing gap in the literature on the subject. While the phenomenon of insider trading is described in terms of credit derivatives in the U.S. market, there are no research studies concerning the European market. The analysis is based on 175,874 observations collected for 92 companies between the years 2001 and 2010.

The main hypothesis of this paper has been formulated as follows: the credit derivatives market is particularly susceptible to insider transactions based on confidential information by virtue of its features, which include, in particular:

[2] For more on information asymmetry see, among others: Massa and Schmidt (2012).

- unequal access to information;
- a high degree of complexity of the instruments;
- ineffective mechanisms of separating credit functions from trading in financial instrument in financial institutions.

The set aim has determined the structure of the paper, which consists of five parts. In the first part, I conduct a review of the literature on the subject. The second part focuses on the characteristics of the study sample. The research method is described in the third part, while in the fourth part I discuss the obtained research results. In the first place, I focus on credit risk events as well as events carrying negative information on credit risk concerning credit ratings. Subsequently, I discuss the research results in relation to events with positive credit information, and I present the research findings in terms of information on credit risk associated with the announcement of annual financial results. The paper is concluded with a summary.

| Literature Review

Basically, two research areas associated with using the event study methodology can be identified. The first one is the identification of the phenomenon of insider trading. The second area of interest to authors that use the event study methodology is the information flow between the respective segments of the financial market.

Analyses of the literature on the subject in terms of using the event study methodology for the identification of the phenomenon of insider trading generally focus on three areas:

- offering abnormal returns in the stock market through transactions based on confidential information;
- the impact of information asymmetry within the organization on the phenomenon of insider trading;
- structuring insider transactions.

The most widely discussed issue in the literature on insider transactions is the study of achieving abnormal returns as a result of such transactions. Generally speaking, insider trading activity is associated with abnormal returns (Lakonishok and Lee, 1998; Del Brio, Miguel and Perote, 2002; Wiśniewski, 2004; Jeng, Metrick and Zeckhauser 1999), while it represents only a small proportion of all the transactions in relation to the values of the company. Del Brio, Miguel and Perote (2002) demonstrate, based on the example of internal trading in the Spanish market, that other investors are not able to achieve the same rate of return as those that have access to confidential information. Additionally they claim that, in the long term, insider transactions do not provide valuable information from the point of view of external investors.

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The research conducted by Etebari, Tourani-Rad and Gilbert (2004) on a sample of trades by insiders in New Zealand provides interesting insights. Based on this study it should be concluded that both in the case of purchase and sale transactions the initiators of insider transactions are able to achieve higher rates of return on stock by considerably shifting the time of disclosing information on the by them concluded transactions. When comparing purchase and sale transactions, it can be concluded that the rate of return is greater for the first category.

Another area that the analyses of researchers studying insider transactions focus on is the information asymmetry present within the organization. The results obtained by Etebari, Tourani-Rad and Gilbert (2004) demonstrate that the position of the entity that has access to confidential information within the organization determines the scale of information asymmetry. An analysis of cumulative abnormal returns suggests that those with the least access to confidential information – independent directors of the Board of Directors – achieve the lowest rates of return on insider transactions.

Jeng, Metrick and Zeckhauser claim that in the case of the number of transactions of sale as well as purchase, transactions conducted by independent members of the Board of Directors and Managers are dominant. However, there is a certain tendency in terms of the size of the transactions, expressed by their market value. Transactions conducted by top-level managers are on average two times bigger than those conducted by others. This group dominates also in terms of the number of conducted large purchase transactions. This demonstrates the existence of information advantage on the side of top-level management.

In summary, it can be concluded that insider trading occurs on a larger scale, both in terms of the number of concluded transactions and the financial results of the transactions, in the upper echelons of management. This is confirmed by the existence of information asymmetry not only between investors operating within the organization and external ones, but also within the organization itself. This information asymmetry is manifested by the fact that executive directors are better informed than directors at lower levels within the organizational structure.

The third issue in terms of identifying the phenomenon of insider trading are the strategic activities of internal entities while concluding transactions. According to the earlier mentioned authors, Etebari, Tourani-Rad and Gilbert (2004), entities that have access to confidential information achieve abnormal rates of return on stock by making a number of small transactions, gradually selling their financial instruments. This points to a strategic division of insider transactions into many small transactions. Such conduct is difficult to detect for external investors or supervisory authorities, thus allowing for a higher rate of return. Planning transactions in terms of their size is additionally aided by the flawed regulations of the market in question, in which there is no obligation for all the initiators of insider transactions to inform about the concluded transactions within a short period of time.

The second area of interest to authors that use the event study methodology, as already mentioned, is the information flow between the respective segments of the financial market.

Researchers focus on the flow of information regarding the financial situation of a given company from the stock market to the bond market and the impact of information on ratings on the stock, bond and credit default swap markets.

Datta and Iskandar-Datta (1996) in their research on companies in the U.S. market, observed a flow of information from transactions concluded in the stock market by entities operating within organizations to the bond market. The research results indicate that there is a certain amount of information in the stock market that has significant economic importance for the bond market. They also examined the response of the stock market to the publication of information on the purchases and sales of bonds by well-informed entities. The results suggest that the response of the bond market is more significant in economic terms than the response of the stock market, which can be explained by a greater informational efficiency of the stock market.

Norden and Weber (2004) considered changes in returns on stocks and CDS premium changes of European companies as a result of information on changes in ratings as well as changes in rating outlooks made by three rating agencies: Standard & Poor's, Moody's and Fitch. The results of the analysis indicated the presence of negative and statistically significant abnormal rates of return on stock in relation to rating downgrades in windows prior to the event. Whereas no statistically significant abnormal rates of return were observed in the periods after rating downgrades. When analyzing credit default swaps, a statistically significant, positive change of CDS premiums was noted in all the analyzed windows prior to the event in the form of rating downgrades as well as in the event window (-1, 1). Just as in the case of the stock market, no statistically significant high premium changes in terms of CDS premiums were noted in most periods after the event. No statistically significant response was noted in the credit default swap market in the periods after announcing negative rating outlooks. Furthermore, the response to the announcement of negative rating outlooks was stronger than in the case of the announcement of rating downgrades.

Hull, Predescu and White (2004) analyzed the impact that positive and negative changes in credit ratings, the announcement of positive and negative rating outlooks, as well as credit quality reviews for downgrades or for upgrades conducted by the company Moody's have on CDS premium changes. In the case of negative credit risk events it should be noted that all three types of events were anticipated by the credit default swap market. The strongest response was observed in the case of rating downgrades.

According to Daniels and Jansen (2005), changes in risk premiums in the CDS market and the bond market after downgrades occur not only within one day after the event, but also several days before and after the event. This could suggest that the response of CDS premiums and bonds does not occur until some time after the event. The aforementioned authors also observed that the credit default swap market surpassed the corporate bond market in terms of disclosure of the information contained in ratings. Using the event study methodology they investigated whether rating changes are, within a short period after their occurrence, reflected in changes of CDS contract or corporate bond pricing. The results of the

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event study concerning the rating upgrades and downgrades indicate that in the case of rating upgrades a statistically significant CDS premium change occurred only in the period from 1 to 15 days after the event. A different situation occurred with respect to downgrades, where statistically significant changes in credit default swap premiums were observed in all the event windows. Changes in ratings had a greater impact on CDS premiums than on credit premiums. This could be the result of the greater liquidity of the CDS market. This means that the information contained in the ratings is reflected more quickly in CDS contract pricing than in bond credit risk premiums.

According to M. Micu, E. Remolona and P. Wooldridge (1996) information on ratings given by several rating agencies has a greater impact on the market of CDS contracts than information given by one institution assessing the credit risk of a given company. They also observed a stronger response of CDS premiums to information related to the credit rating for small companies compared to larger companies, where the size was measured based on stock market capitalization. With regard to small and medium-sized companies future credit rating outlooks turned out to be statistically insignificant. This analysis result is associated with the number of analysts who study the financial situation of small companies. Due to the fact that in the market there is more information available concerning large companies, information that appears for a small company usually leads to a greater change in market prices. Taking into account the breakdown by rating level, the greatest impact on changes in CDS premiums were observed for the rating class on the border between investment and speculative grade ratings. Similar results were observed in the group of positive information about ratings.

Credit quality reviews for future downgrades or for upgrades had the biggest impact on CDS contract pricing. Both in terms of negative and positive events, the greatest impact on CDS premiums was observed in the sub-sample of entities with a non-investment grade rating or with the highest investment grade rating.

Research results concerning the flow of information between markets indicate a flow of information from the stock market to the corporate bond market. No information flow in the opposite direction was observed. Negative credit risk events have a greater impact on stock prices, credit default swap premiums and bond yields than positive events. The CDS market is more responsive to events concerning ratings than the bond market, which could be the result of the greater liquidity of the CDS market. The response of the credit default swap market is also faster than the response of the stock market. Particularly the changes of CDS premiums occur faster than changes of the rates of return on stock in relation to credit quality reviews for future downgrades.

| Characteristics of the Study Sample

To investigate the phenomenon of insider trading I used a sample of 92 European companies, for which the Bloomberg system contained stock price quotes and credit default swap quotes[3] with

[3] More information on credit default swaps can be found in: Jackowicz (2001a).

a term to maturity of five years in the *iTraxx Europe Index*[4]. This index includes 125 companies with an investment grade rating from six sectors: automotive, consumer goods, energy, financial, telecommunications and other sectors of the economy. In the studied sample the largest number of companies came from the financial sector (22), telecommunications (11), and energy (9). The composition of the index is reviewed every six months, i.e. in March and in September of each year, according to the principles established by the *International Index Company*.

From the initial number of 125 companies selected for analysis on the basis of belonging to that index I discarded 33 companies for which there were no stock price quotes, credit default swap quotes or the time series for one of the considered financial instruments was too short. I analyzed the data from the years 2001-2010. The average length of the time series – in the case of credit default swap contracts and stocks – amounted to 1912 observations, with a minimum value of 1582 and a maximum value of 2349 (Table 1).

Table 1 | Descriptive statistics concerning the number of CDS quotes and the number of stock quotes in the research sample

	Minimum value	The first quartile	Median	Mean	The third quartile	Maximum value	Standard deviation
Number of quotes	1,582	1,749.	1,938	1,912	2,001	2,349	170

Source: own elaboration.

For the study I applied mid prices from working days. For 89 of the analyzed companies the last price observation is from 30 August 2010, and in the case of the remaining 3 companies slightly different time series for the data were recorded[5]. The average value of the premium paid for credit risk protection in the sample was 73.4 bps, the minimum value was 3.3 bps, and the maximum value was 1,950 bps. The median value was lower than the mean value and amounted to 47.0 bps. (Table 2).

Table 2 | Descriptive statistics concerning the level of prices of credit default swaps and rates of return on stock

	Minimum value	The first quartile	Median	Mean	The third quartile	Maximum value	Standard deviation
Credit default swap contracts (in bps)	3.3	26.4	47.0	73.4	85.1	1,950	94.4
Stock – rate of return (in%)	- 71.5	- 0.9	0.0	0.03	0.9	283.5	2.3

Source: own elaboration.

In the analyzed group of entities I singled out four types of events:

1) an event carrying negative information concerning a negative outlook on ratings;

[4] As on 30 October 2010.

[5] The end of the analysis period fell on: 5 March 2010, 9 September 2009 and 4 September 2009.

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2) a rating downgrade;
3) a negative surprise in terms of financial results – the announced annual financial results were at least 5% lower than expected by market analysts;
4) a rating upgrade.

For each of the above-mentioned events I analyzed the response of the stock market and the credit default swap market using the event study methodology.

Research Method

I use the event study methodology by applying the following market model:

$$R_{i,t} = \alpha_i + \beta_i * R_{m,t} + \varepsilon_{i,t} \quad (1)$$

where:
$R_{i,t}$ – realized rate of return on stock of company *i* on day *t*;
α_i – absolute term;
β_i – sensitivity coefficient of stock price changes of company *i* in relation to rate of return of the stock market index;
$R_{m,t}$ – realized rate of return on the market index *m* on day *t*;
$\varepsilon_{i,t}$ – random factor.

The market model residuals described as (Kowalewski 2006):

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \quad (2)$$

where:
$AR_{i,t}$ – model residuals for company *i* on day *t*;
$E(R_{i,t})$ – expected rate of return on stock of company *i* on day *t*;
constitute the abnormal return (AR).

The market model assumes that abnormal return on stock is defined as follows (Kowalewski 2006):

$$AR_{i,t} = R_{i,t} - \alpha - \beta * R_{m,t} \quad (3)$$

I use a similar method for estimating abnormal CDS premium changes:

$$A\Delta CDS_{i,t} = \Delta CDSi,t - \alpha - \beta * \Delta CDS_{avg,t} \quad (4)$$

where:
$A\Delta CDS_{i,t}$ – abnormal CDS premium change for company *i* on day *t*;
$\Delta CDS_{i,t}$ – realised CDS premium change for company *i* on day *t*;
$\Delta CDS_{avg,t}$ – realised average CDS premium change in the research sample.

To calculate the abnormal return on stock and abnormal CDS premium changes I use an event window of 41 days, where the window includes the following:

- the day of the event;
- 20 days prior to the event;
- 20 days after the event;

and an estimation window of 150 days. The event window is 79 days away from the estimation window[6]. For each of the considered credit risk events or events carrying information on credit risk, i.e. a negative outlook on ratings, rating downgrades, rating upgrades or the announcement of annual financial results that are worse than expected by the market, I calculate the average abnormal returns on stock ($\overline{AR}$) and the average abnormal CDS premium changes ($\overline{AP}$) as well as the average cumulative abnormal returns on stock ($CAR_{i,\tau}$) and the average cumulative abnormal CDS premium changes ($CAP_{i,\tau}$), and subsequently I analyze their statistical significance. For analyzing the statistical significance I use the parametric Student's *t*-test as well as non-parametric tests: the Corrado rank test for average rates and the sign test for cumulative rates (MacKinlay, 1997; Alexakis, Kolomitsini and Xanthakis, 2008; Serra, 2002).

Results

The results of the event study I will present per type of event. I will first present the findings with respect to events concerning ratings. Subsequently, I will focus on events associated with rating upgrades. The entire presentation of the research findings will be concluded with an overview of the response of the CDS market and the stock market to the announcement of a negative surprise regarding annual financial results.

Credit Risk Events and Events Carrying Negative Information on Credit Risk Concerning Credit Ratings

As regards negative information on credit risk appearing in the market, when rating agencies set a negative outlook on a rating, one can observe the anticipation of setting the negative outlook

[6] The used length of the event windows, estimation windows and the distance between them are based on the standards that I encountered in the literature on the subject.

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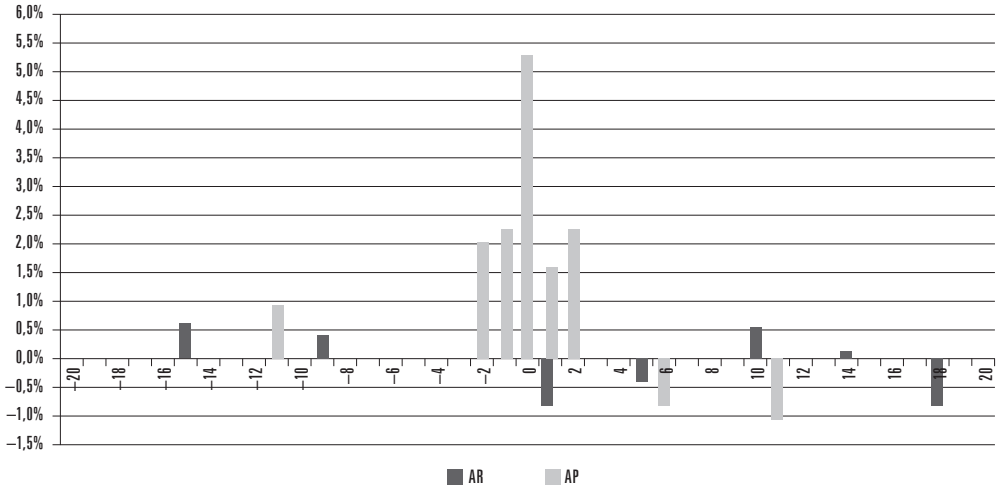
Figure 1 | Statistically significant average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from setting a negative outlook on ratings



Source: own elaboration.

on the rating of entities that have access to confidential information in the CDS market. This regularity is illustrated in Figure 1.

An analysis of the average abnormal CDS premium changes on days t=-2, -1, 0, +1, +2 indicates that there are investors in the market that have access to confidential information and who use this information to gain additional financial benefits. During the second and first day prior to the event occurring in the credit default swap market, statistically significant, positive average abnormal CDS premium changes can be observed. Also during the three subsequent days statistically significant, positive average abnormal CDS premium changes can be observed. While in the stock market a negative response can be observed not until 1 day after the event. The exact values of $\overline{AR}$ and $\overline{AP}$ are presented in Table 3.

The highest statistically significant, positive average abnormal CDS premium change can be observed on the day of setting a negative outlook on ratings (5,2%), and in particular a high level of significance of 1%, based on which the null hypothesis can be rejected, according to which on the day of the event the average abnormal premium is zero. Players that are better informed react before day t=0, and on the day itself or after it – those that do not have access to confidential information. What should be noted here are certain signs of an anticipatory response of CDS contract pricing compared to stock prices. While the first statistically significant, positive average abnormal CDS premium change occurred on the second and first day before setting a negative outlook on ratings, the statistically significant, negative abnormal rate of return on stock does not occur until the first day after the event. Further statistically significant, negative average abnormal returns on stock can be observed on the fifth and eighteenth day after the event, while

in the CDS market statistically significant, positive average credit risk premiums occur still for two days after the event. This indicates a faster discounting of information in the prices of credit default swap contracts compared to the stock market. In the stock market, on the first day after the appearance of negative information regarding credit risk resulting from a negative outlook on ratings in the market, a statistically significant, negative average abnormal rate of return on stock (-0.8%) can be observed.

Table 3 | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from setting a negative outlook on ratings

Day in the event window	Setting a negative outlook on ratings					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AP}$	Value of the Student's t-test statistic	Value of the Corrado statistic
-20	-0.002	-0.678	0.457	0.006	0.646	-0.826
-19	0.003	1.351	1.063	0.003	0.584	-0.539
-18	-0.001	-0.498	-0.413	-0.002	-0.191	-0.333
-17	-0.001	-0.221	0.280	0.008	1.515	0.252
-16	0.002	0.739	0.841	0.005	1.051	-0.069
-15	0.006	1.940*	2.110**	-0.004	-0.839	-0.092
-14	0.003	1.194	0.930	0.004	1.222	0.493
-13	-0.003	-1.549	-0.295	0.002	0.361	-0.367
-12	-0.001	-0.467	-0.221	0.006	1.325	0.413
-11	-0.004	-1.320	-1.727	0.009	1.667	1.560*
-10	0.001	0.249	0.236	-0.005	-0.813	-0.275
-9	0.004	1.479	1.682**	-0.005	-0.756	-0.482
-8	-0.003	-1.512	-0.694	-0.007	-0.793	-0.803
-7	0.000	-0.096	0.030	0.011	1.400	0.436
-6	-0.003	-1.542	-2.464	0.005	0.964	0.241
-5	-0.001	-0.314	-0.192	0.002	0.256	-0.906
-4	-0.005	-1.383	-0.812	0.012	1.460	0.046
-3	0.001	0.235	-0.059	0.001	0.125	0.837
-2	-0.002	-0.545	0.472	0.020	2.065**	1.457*
-1	0.000	0.111	-0.044	0.022	1.561	1.480*
0	-0.005	-0.615	0.162	0.052	2.916***	3.349***
1	-0.008	-2.565**	-1.520	0.016	1.527	1.330*

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Table 3 – continuation | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from setting a negative outlook on ratings

Day in the event window	Setting a negative outlook on ratings					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AP}$	Value of the Student's t-test statistic	Value of the Corrado statistic
2	-0.004	-0.697	-1.623	0.022	2.447**	1.801**
3	0.001	0.280	0.561	0.003	0.438	1.239
4	-0.004	-1.052	-0.398	0.001	0.144	-0.596
5	-0.004	-1.864*	-0.576	0.001	0.133	0.126
6	0.003	1.012	1.151	-0.008	-1.767*	-1.285
7	0.000	0.152	0.944	-0.003	-0.427	-1.537
8	-0.001	-0.413	0.280	0.003	0.354	-0.551
9	-0.004	-1.514	-0.782	-0.002	-0.371	-0.619
10	0.005	1.814*	1.240	0.003	0.624	-0.356
11	-0.001	-0.220	-0.339	-0.010	-1.970*	-1.560
12	0.000	0.147	-0.590	-0.001	-0.146	-0.642
13	-0.001	-0.281	0.635	0.005	0.651	0.218
14	0.000	0.104	1.712**	-0.006	-0.556	-0.803
15	0.000	-0.003	-0.103	0.000	0.027	-0.780
16	-0.001	-0.286	0.502	0.010	1.535	0.505
17	0.002	0.518	-0.310	-0.008	-1.395	-1.285
18	-0.008	-2.065**	-2.287	-0.010	-0.852	-0.413
19	0.002	0.487	0.457	-0.010	-1.071	-0.791
20	-0.001	-0.153	-0.295	-0.005	-0.378	0.126

*, **, *** – in the Corrado rank test indicates a rejection of the null hypothesis H0: on the given day the average abnormal rate of return is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

The negative response of the stock market to the appearance of negative information regarding credit risk resulting from setting a negative outlook on ratings is also reflected in the cumulative average abnormal rates of return on stock. Table 4 and Figure 2 demonstrate the cumulative average abnormal rates of return on stock and the CDS premium changes resulting from setting a negative outlook on ratings. In three windows, i.e. [-20; -1], [-10; -1] and [-5; -1], the cumulative

Table 4 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from setting a negative outlook on ratings

Event window	Setting a negative outlook on ratings					
	$CAR_{i,\tau}$	Value of the Student's t-test statistic	Value of the sign test statistic	$CAP_{i,\tau}$	Value of the Student's t-test statistic	Value of the sign test statistic
[-20; +20]	-0.034	-8.983***	-2.030	0.147	11.725***	6.403***
[-10; +10]	-0.030	-10.597***	-2.837	0.143	31.460***	2.400**
[-5; +5]	-0.031	-15.020***	-3.317	0.152	21.225***	3.317***
[-1; +1]	-0.013	-3.961***	-0.577	0.090	8.810***	1.732*
[-20; -1]	-0.005	-1.795*	1.789*	0.093	6.573***	4.472***
[-10; -1]	-0.008	-2.694**	-0.632	0.055	3.905***	0.000
[-5; -1]	-0.007	-2.149**	-2.236	0.056	4.013***	2.236**
[-1; 0]	-0.004	-0.572	0.000	0.074	4.137***	1.414
[0; +1]	-0.013	-4.066***	-1.414	0.068	6.661***	1.414
[+1; +5]	-0.020	-9.565***	-2.236	0.043	6.034***	2.236**
[+1; +10]	-0.017	-5.940***	-3.162	0.036	7.857***	3.162***
[+1; +20]	-0.024	-6.253***	-4.472	0.002	0.186	4.472***

*, **, *** – in the sign test indicates a rejection of the null hypothesis H0: in the given event window CAR/ CAP the cumulative abnormal rates of return associated with setting a negative outlook on ratings is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

average abnormal rates of return on stock are negative and statistically significant, indicating that the stock market anticipated the negative outlook on ratings[7].

In the case of the CDS market we can also observe the effect of anticipating a negative outlook on ratings. Cumulative average abnormal CDS premium changes at first grow rapidly and then decrease in subsequent windows as the day of the event moves away, which could suggest that the information regarding setting a negative outlook on ratings has already been discounted earlier in CDS contract pricing. With respect to the stock market an opposite tendency can be observed, i.e. increasing, in terms of absolute negative values, cumulative abnormal rates of return on stock.

[7] The occurrence of the phenomenon of insider trading 25 days prior to the disclosure of sensitive information in the stock market is indicated by: Olmo, Pilbeam and Pouliot (2011); while Korczak, Korczak and Traczykowski (2012) argue that in the European market abnormal returns on stock vary significantly between countries depending on the level of investor protection in the given country.

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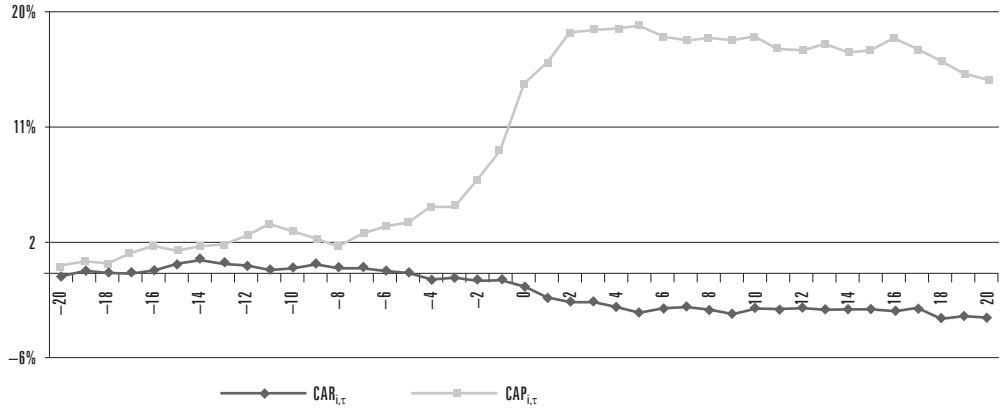
Figure 2 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from setting a negative outlook on ratings



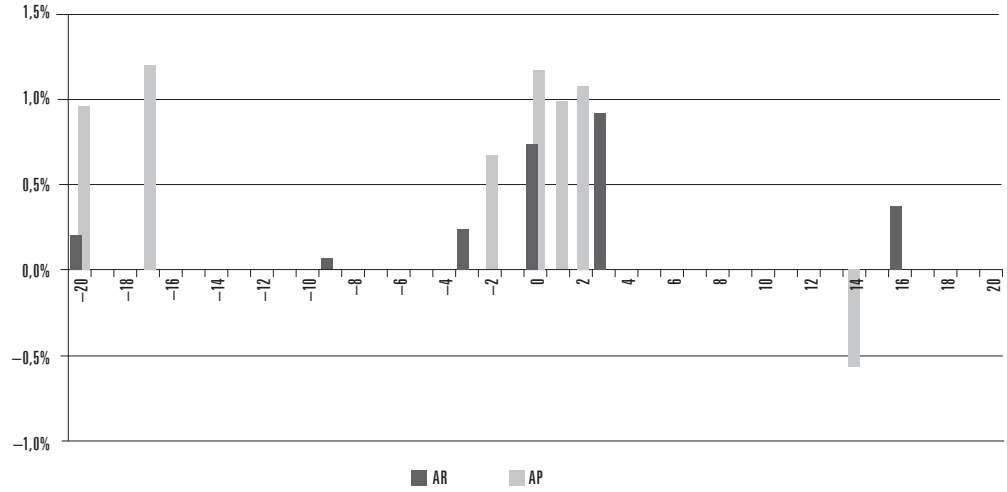
Source: own elaboration.

All the conclusions drawn from the analysis of the average abnormal and cumulative average abnormal changes of CDS contract pricing speak in favor of the hypothesis regarding the occurrence of the phenomenon of insider trading in the credit default swap market in relation to an event carrying information on credit risk regarding setting a negative outlook on ratings. Statistically significant, positive average abnormal and cumulative average abnormal CDS premium changes prior to the day of the event indicate the presence of inward investors that have access to confidential information in relation to the event in question. Another probable scenario is a flow of information from the CDS market to the stock market given the delayed response of the average abnormal rates of return on stock.

Figure 3 presents statistically significant average abnormal rates of return on stock and CDS premium changes associated with rating downgrades. The first statistically significant, positive abnormal CDS premium changes already occur on the twentieth and seventeenth day before the rating downgrade. The subsequent CDS premium change that we are currently interested in occurred two days before the event. It is also evident that not all inward investors are equally well-informed, because some of them conduct transactions only after the information about the rating downgrade appears in the market, i.e. on the day of the event, and two days after the event. As shown in Table 5, on days t=0, +1, +2 statistically significant, positive average abnormal CDS premium changes can be observed.

The stock market responds to rating downgrades with average abnormal rates of return of an opposite sign than expected. Statistically significant, positive average abnormal returns on stock can be observed on the twentieth, the ninth and the third day prior to the event, continuing still on the day of the event and on the third day after the event. In view of the response of stock prices to rating

Figure 3 | Statistically significant average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from rating downgrades



Source: own elaboration.

downgrades, which is contrary to the expected, it is difficult to conclude based on the obtained results whether or not there is an anticipatory response of one of the markets of the analyzed financial instruments to the occurrence of a credit risk event involving a rating downgrade.

Anticipation of rating downgrades and the activity of investors that have access to confidential information in the credit default swap market is confirmed by an analysis of the cumulative average abnormal CDS premium changes presented in Table 6. Statistically significant, positive cumulative average abnormal CDS premium changes occurred, for example, in the period from the twentieth up to one day prior to the rating downgrade and they reached the level of 6.5%. In the period from the tenth up to one day prior to the rating downgrade also statistically significant, positive cumulative average abnormal CDS premium changes can be observed (2,3%).

Certain signs of the stock market anticipating rating downgrades are provided by an analysis of the cumulative average abnormal rates of return on stock, which are presented in Figure 4. In the period from the twentieth up to one day prior to the rating downgrade I observed the occurrence of a statistically significant, negative cumulative average abnormal return on stock equal to 0.9% at a significance level of 0.05. It should be noted that the anticipation in the CDS market of a rating downgrade in that same period is stronger – a statistically significant, positive cumulative average abnormal CDS premium change of 6.5% occurred at a significance level of 0.05. The last conclusion could suggest that the information contained in credit risk events involving rating downgrades is more important from the point of view of inward investors in the CDS market than in the stock market. Furthermore, in other event windows, which ended before the time of the event, the cumulative average abnormal rates of return on stock are equal to zero, instead of the expected negative values.

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Table 5 | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from rating downgrades

Day in the event window	Rating downgrade					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AP}$	Value of the Student's t-test statistic	Value of the Corrado
-20	0.002	0.627	1.623*	0.009	1.521	1.300*
-19	-0.001	-0.333	0.461	0.008	1.330	1.094
-18	-0.014	-1.595	-2.306	0.010	1.579	0.555
-17	-0.002	-0.353	-0.034	0.012	1.880*	0.888
-16	0.002	0.638	0.307	0.005	0.755	-0.285
-15	0.003	0.974	-0.017	0.000	-0.004	-1.411
-14	0.011	1.056	0.325	-0.001	-0.198	-0.602
-13	-0.010	-1.157	-0.564	-0.001	-0.278	-0.206
-12	-0.001	-0.293	-1.025	0.005	0.807	0.476
-11	0.000	0.021	0.273	-0.005	-0.795	-0.856
-10	0.002	0.620	0.017	-0.001	-0.153	-1.284
-9	0.001	0.145	1.418*	0.005	0.886	0.143
-8	0.003	0.697	0.700	0.004	0.812	-0.159
-7	-0.003	-0.804	-1.332	-0.005	-1.535	-2.093
-6	-0.003	-0.411	-0.974	0.005	1.025	0.602
-5	0.000	-0.103	-0.564	-0.001	-0.198	-0.935
-4	-0.001	-0.205	-0.342	0.001	0.142	0.238
-3	0.002	0.743	1.384*	0.005	0.739	-0.301
-2	0.001	0.290	-0.769	0.007	1.247	1.379*
-1	-0.001	-0.333	-0.991	0.004	0.909	0.238
0	0.007	1.450	1.384*	0.011	1.755*	2.346***
1	0.005	1.076	0.939	0.010	0.978	2.061**
2	-0.004	-1.195	-0.376	0.011	1.691	1.348*
3	0.009	2.311**	2.306**	0.004	0.946	0.365
4	0.000	-0.127	0.700	-0.002	-0.460	-1.015
5	-0.003	-0.922	-0.957	0.003	0.953	0.999
6	-0.003	-1.034	-0.427	0.004	1.187	0.650
7	-0.004	-1.317	-1.281	0.007	1.288	0.079

Table 5 – continuation | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from rating downgrades

Day in the event window	Rating downgrade					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AP}$	Value of the Student's t-test statistic	Value of the Corrado
8	0.001	0.413	-0.735	0.009	1.236	0.666
9	0.001	0.271	-0.085	0.003	0.671	-0.888
10	0.002	0.556	1.179	0.000	0.025	-1.237
11	0.000	0.003	-0.376	-0.004	-0.739	-0.143
12	0.004	0.926	0.649	0.002	0.488	-0.698
13	0.003	0.824	-0.102	0.005	1.288	0.824
14	0.002	0.918	0.495	-0.006	-1.851*	-1.744
15	-0.003	-0.649	-0.530	0.004	0.946	0.206
16	0.004	1.410	1.367*	-0.006	-1.302	-1.554
17	0.002	0.586	0.325	-0.004	-0.842	-0.143
18	0.000	-0.022	-2.238	-0.004	-0.854	0.079
19	0.001	0.303	0.085	-0.001	-0.195	-0.333
20	0.001	0.304	0.735	-0.002	-0.449	-0.650

*, **, *** – in the Corrado rank test indicates a rejection of the null hypothesis H0: on the given day the average abnormal rate of return is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

All the conclusions drawn from the analysis of the average abnormal and cumulative average abnormal changes of CDS contract pricing in relation to credit risk events involving rating downgrades indicate that rating downgrades are anticipated and point to the occurrence of the phenomenon of insider trading in the credit default swap market with respect to the analyzed European companies. In terms of the stock market rating downgrades are anticipated only in the case of an event window [-20; -1].

In the subsequent part of this section I would like to compare the response of the CDS market and the stock market to setting a negative outlook on ratings and rating downgrades. What should be noted here is the stronger response of investors in the CDS market to setting a negative outlook on ratings than to rating downgrades. On the first and second day prior to the event as well as after the event higher statistically significant, positive average abnormal CDS premium changes can be observed as a result of setting a negative outlook on ratings than in the case of rating downgrades. An analysis of the cumulative average abnormal CDS premium changes

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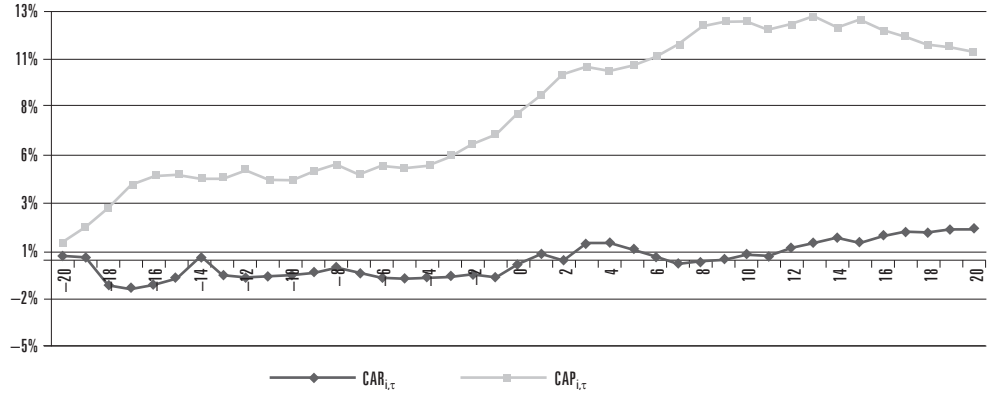
Table 6 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from rating downgrades

Event window	Rating downgrade					
	CARi,τ	Value of the Student's t-test statistic	Value of the sign test statistic	CAPi,τ	Value of the Student's t-test statistic	Value of the sign test statistic
[-20; +20]	0.017	5.762***	-0.156	0.109	24.429***	6.403***
[-10; +10]	0.011	2.918***	2.837***	0.082	16.183***	4.146***
[-5; +5]	0.015	4.824***	2.111**	0.053	16.255***	2.111**
[-1; +1]	0.011	2.242**	0.577	0.026	2.563**	1.732*
[-20; -1]	-0.009	-2.040**	-3.130	0.065	13.651***	4.472***
[-10; -1]	0.000	-0.026	0.632	0.023	4.791***	2.530**
[-5; -1]	0.000	0.078	0.447	0.016	3.295***	0.447
[-1; 0]	0.006	1.157	0.000	0.016	2.415**	1.414
[0; +1]	0.012	2.537**	1.414	0.021	2.130*	1.414
[+1; +5]	0.007	2.391**	2.236**	0.025	7.864***	2.236**
[+1; +10]	0.004	1.099	2.530**	0.048	9.443***	3.162***
[+1; +20]	0.018	6.345***	4.025***	0.033	7.304***	4.472***

*, **, *** – in the sign test indicates a rejection of the null hypothesis H0: in the given event window CAR/ CAP the cumulative abnormal rates of return associated with the given event (rating downgrade) is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

Figure 4 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from rating downgrades



Source: own elaboration.

confirms the conclusion regarding the stronger response of CDS premiums to setting a negative outlook on ratings than to rating downgrades. While in all the analyzed event windows statistically significant, positive cumulative average CDS premium changes in relation to rating downgrades as well as in relation to setting a negative outlook on ratings can be observed, in the case of the appearance of negative information regarding credit risk resulting from a negative outlook on ratings the cumulative average abnormal CDS premium changes are higher (with the exception of two windows: [+1; +10] and [+1; +20]) than in the case of rating downgrades and in all the cases there is a statistical significance at a significance level of 0.01.

In the case of rating downgrades a statistically significant, negative response of the stock market only occurred in window [-20; -1]. With regard to the response of the rates of return on stock to setting a negative outlook on ratings the evidence that investors having access to confidential information anticipate this event is provided by an analysis of the cumulative average abnormal rates of return on stock. In three event windows ending one day prior to the event statistically significant cumulative average abnormal returns on stock can be observed. This means that there is a stronger response of the stock market to setting a negative outlook on ratings than to rating downgrades.

Generally it can be said that the response of both the stock market and the CDS market is stronger in the case of setting a negative outlook on ratings than in the case of rating downgrades. In the stock market this is evident based on the cumulative average abnormal rates of return and in the credit default swap market based on the average abnormal and cumulative average abnormal CDS premium changes.

| Events Carrying Positive Information on Credit Risk

The credit default swap market responded with high, positive average CDS premium changes to rating downgrades and setting a negative outlook on ratings. With regard to events carrying positive information on credit risk, such as rating upgrades, an asymmetric response occurs. As shown in Figure 5, the statistically significant average abnormal CDS premium changes are lower in absolute value than before. Statistically significant, negative average CDS premium changes occur on the fifth, third and second day prior to the rating upgrade, and on the first day after this event, and are as follows: 1%; 1.1%; 1.2% and 1.6%

The values of the average abnormal rates of return on stock and CDS premium changes resulting from rating upgrades are presented in Table 7. Compared to the statistically significant, positive average abnormal CDS premium changes, which I observed in the case of setting a negative outlook on ratings – on days t = -2 (2%), t = -1 (2.2%), t = 0 (5.2%) – statistically significant, negative average abnormal CDS premium changes occurred with a considerably lower absolute value. This shows that the response of the investors of the CDS market to an event carrying negative information on credit risk involving setting a negative outlook on ratings becomes stronger as the

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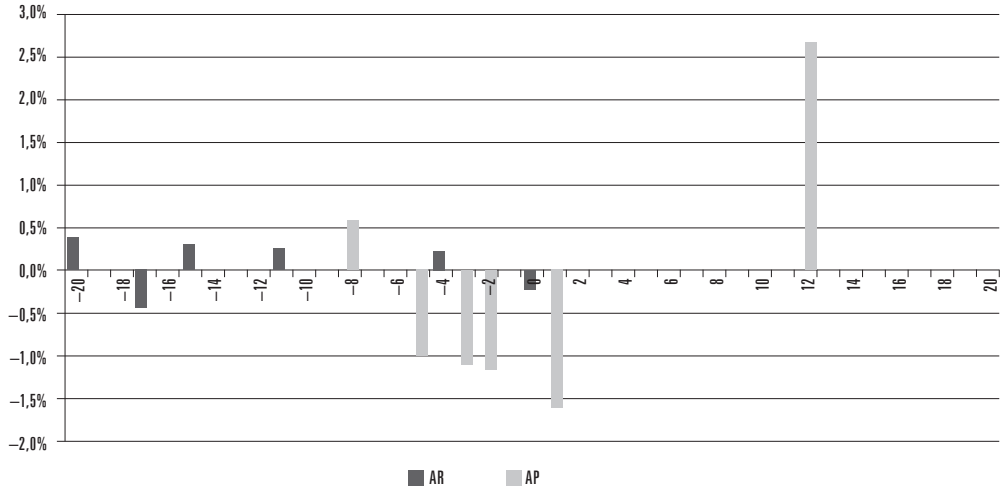
Figure 5 | Statistically significant average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from rating upgrades



Source: own elaboration.

day of the event approaches, while in case of an event carrying positive information on credit risk, such as a rating upgrade, it remains at a similar level.

The conclusion regarding the asymmetric response of the CDS market to negative and positive events is also confirmed by an analysis of cumulative average abnormal CDS premium changes, as shown in Table 8. Statistically significant, negative cumulative average abnormal CDS premium changes in relation to rating upgrades occur in windows: [-20; -1], [-10; -1] and [-5; -1] and are in the range of 2% to 3%. In the case of setting a negative outlook on ratings, statistically significant, positive cumulative average CDS premium changes occur in the amount of: 9.3%; 5.5% and 5.6% respectively in the three above-mentioned windows. Higher absolute values of cumulative average CDS premium changes prior to the day of the event only occurred in window [-20; -1] and amounted to 6.5% for rating downgrades and -1.7% for rating upgrades. This shows that events carrying negative information on credit risk are more interesting from the standpoint of external investors, particularly when it concerns setting a negative outlook on ratings, than events carrying positive information on credit risk.

In general the stock market responds poorly to rating upgrades. Statistically significant average abnormal rates of return on stock assume small values and their sign is variable. After the day of the event no statistically significant average abnormal rates of return on stock occur at all. A certain degree of anticipation of rating upgrades in the stock market is suggested by the statistically significant, positive average abnormal rate of return on day t = -4 in the amount of 0.2% (significance level 0.1). A similar situation occurs when we take the cumulative average abnormal returns on stock that are presented in Figure 6 and Table 8 as the basis for our considerations.

Table 7 | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from rating upgrades

Day in the event window	Rating upgrade					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AP}$	Value of the Student's t-test statistic	Value of the Corrado
-20	0.004	1.328	1.933**	0.000	0.152	-0.014
-19	-0.003	-1.534	-1.429	0.000	-0.020	0.445
-18	0.002	0.664	0.693	0.005	1.271	0.918
-17	-0.004	-1.860*	-2.185	-0.006	-1.599	-0.732
-16	0.002	0.871	0.756	0.006	0.742	0.947
-15	0.003	0.991	1.786**	0.007	1.244	-0.043
-14	0.000	0.054	0.315	-0.003	-0.924	-0.717
-13	0.001	0.711	1.176	0.000	0.087	0.172
-12	-0.001	-0.462	-0.189	-0.003	-0.537	-0.947
-11	0.002	1.610	1.702**	0.005	1.006	1.133
-10	0.000	-0.241	0.063	-0.001	-0.143	-0.014
-9	-0.001	-0.682	-0.567	0.006	1.271	1.004
-8	0.000	-0.132	-0.168	0.006	1.116	1.836**
-7	-0.001	-0.342	-0.315	0.000	0.029	-0.818
-6	-0.002	-0.779	-1.723	-0.007	-0.903	-0.990
-5	-0.003	-1.660	-1.702	-0.010	-1.743*	-2.022
-4	0.002	1.180	1.450*	0.003	0.600	0.158
-3	0.002	0.716	0.315	-0.011	-1.775*	-2.080
-2	0.002	0.937	0.672	-0.012	-2.115**	-1.420
-1	-0.001	-0.268	-1.218	-0.001	-0.235	-0.316
0	-0.002	-0.364	1.324*	-0.005	-0.784	-1.090
1	0.000	0.204	-0.819	-0.016	-2.226**	-1.865
2	0.001	0.514	0.126	-0.002	-0.307	0.459
3	-0.003	-0.911	0.000	0.049	1.005	0.502
4	-0.003	-1.190	-1.113	-0.020	-0.878	-0.201
5	-0.001	-0.568	0.315	0.004	0.743	0.387
6	0.001	0.466	0.399	0.010	1.246	0.459

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Table 7 – continuation | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from rating upgrades

Day in the event window	Rating upgrade					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AP}$	Value of the Student's t-test statistic	Value of the Corrado
7	0.000	-0.066	-0.084	-0.002	-0.371	-0.129
8	0.000	0.041	-0.294	-0.001	-0.163	-0.430
9	-0.001	-0.659	-0.147	0.011	0.877	0.072
10	0.000	-0.094	-0.609	0.003	0.491	0.617
11	0.002	0.851	0.609	0.007	1.277	0.889
12	-0.002	-0.926	-0.483	0.027	1.969*	2.725***
13	-0.001	-0.342	-0.273	0.006	0.456	-0.602
14	0.001	0.165	-0.105	0.011	0.952	0.947
15	-0.003	-1.047	-1.408	-0.009	-1.124	0.258
16	-0.002	-0.843	-1.050	-0.001	-0.371	-0.043
17	0.001	0.271	0.840	0.003	0.560	0.602
18	0.000	0.160	0.777	0.005	1.137	1.219
19	0.001	0.355	1.218	0.002	0.273	0.029
20	-0.002	-0.808	-0.588	-0.010	-1.440	-1.305

*, **, *** – in the Corrado rank test indicates a rejection of the null hypothesis H0: on the given day the average abnormal rate of return is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

In window [-20; -1] a statistically significant, positive cumulative abnormal rate of return on stock occurs in the amount of 0.4% at a significance level of 0.1.

In the case of cumulative rates of return, also an asymmetric response of the stock market can be observed to events carrying positive information on credit risk in relation to the response to credit risk events and events carrying negative information on credit risk. In event window [-20; -1] a statistically significant, negative cumulative abnormal rate of return on stock in relation to setting a negative outlook on ratings occurs in the amount of 0.5% at a significance level of 0.1, and in the case of a rating downgrade in the amount of 0.9% at a significance level of 0.05. These figures suggest that the value of information concerning a rating upgrade is lower in comparison to a credit risk event involving a rating downgrade. We can also observe a certain degree of information flow from the CDS market to the stock market. This is suggested by statistically significant average abnormal CDS premium changes, which occur earlier than statistically significant average abnormal rates of return on stock.

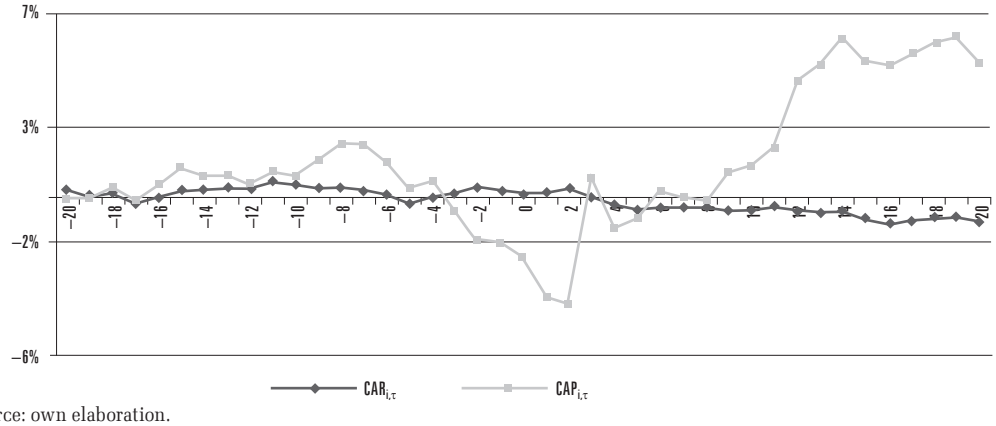
Table 8 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from rating upgrades

Event window	Rating upgrade					
	$CAR_{i,\tau}$	Value of the Student's t-test statistic	Value of the sign test statistic	$CAP_{i,\tau}$	Value of the Student's t-test statistic	Value of the sign test statistic
[-20; +20]	-0.009	-4.687***	0.469	0.052	7.213***	3.280***
[-10; +10]	-0.011	-7.154***	-4.583	0.003	0.480	-2.400
[-5; +5]	-0.006	-2.891***	-0.302	-0.022	-4.101***	-3.317
[-1; +1]	-0.002	-1.056	-1.732	-0.023	-3.129***	-1.732
[-20; -1]	0.004	1.781*	3.578***	-0.017	-3.220***	2.683***
[-10; -1]	-0.003	-1.157	-3.162	-0.027	-5.192***	-0.632
[-5; -1]	0.002	0.894	0.447	-0.031	-5.891***	-2.236
[-1; 0]	-0.003	-0.472	-1.414	-0.007	-0.968	-1.414
[0; +1]	-0.002	-0.767	-1.414	-0.021	-2.958***	-1.414
[+1; +5]	-0.006	-2.883***	-0.447	0.015	2.822***	0.447
[+1; +10]	-0.006	-4.169***	-1.897	0.035	6.096***	1.897*
[+1; +20]	-0.011	-5.730***	-3.578	0.074	10.295***	3.578***

*, **, *** – in the sign test indicates a rejection of the null hypothesis H0: in the given event window CAR/ CAP the cumulative abnormal rates of return associated with the given event (rating upgrade) is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

Figure 6 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from rating upgrades



Source: own elaboration.

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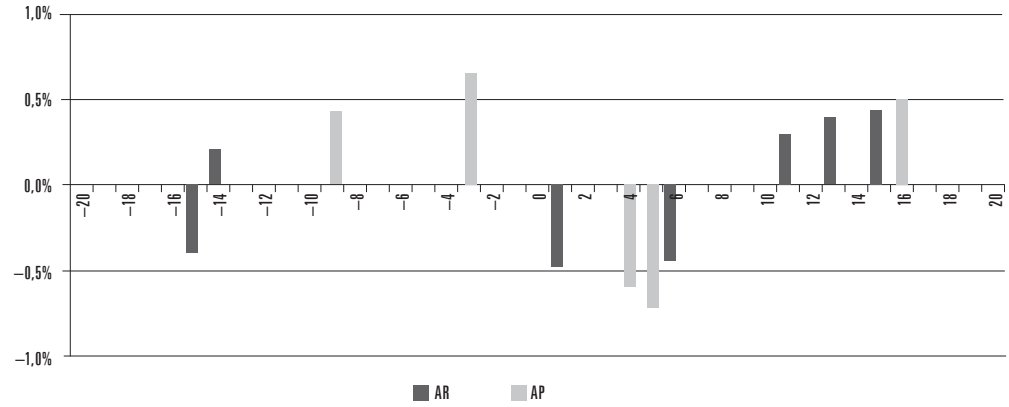
To sum up the considerations on the response of the stock market and the credit default swap market to credit risk events, negative as well as positive information on credit risk associated with credit rating, a number of aspects should be considered. Firstly, an information flow from the CDS market to the stock market can be observed in the market of the analyzed companies. Statistically significant, positive average abnormal and cumulative average abnormal rates of return on stock occur in the first instance in the market of the considered credit derivatives, and in the case of rating downgrades as well as in the case of setting a negative outlook on ratings the response of the CDS market is stronger than that of the stock market. Therefore, it can be concluded that in the CDS market of the analyzed European companies there is an anticipation of setting a negative outlook on ratings as well as the phenomenon of insider trading in relation to this event. Anticipating rating downgrades and the occurrence of insider transactions concerning this event I observed to a lesser extent than in the case of setting a negative outlook on ratings. Secondly, with regard to the stock market, an anticipation of rating downgrades can be observed. The response of stock prices to setting a negative outlook on ratings is negative, while the stock market responds with unexpected statistically significant, positive abnormal rates of return, both average and cumulative, to rating downgrades. Thirdly, the markets of both types of financial instruments respond asymmetrically to credit risk events and to events carrying negative and positive information on credit risk, which is evident based on the amounts of the average abnormal and cumulative average abnormal rates of return on stock and CDS premium changes. Finally, we can observe an information flow from the CDS market to the stock market in relation to setting a negative outlook on ratings and rating upgrades.

Information on Credit Risk Associated with the Announcement of Annual Financial Results

The flow of information from the CDS market to the stock market and the occurrence of the phenomenon of insider trading in the European CDS market in the event of announcing a negative surprise regarding annual financial results are not as evident as in the previously described credit risk events and events carrying negative information on credit risk. As shown in Figure 7 and Table 9, in the first instance statistically significant average abnormal rates of return on stock can be observed on the fifteenth and the fourteenth day prior to the event, with the first average abnormal rate of return being negative (-0.4%) and the second one positive (0.2%). The response of the CDS market to the announcement of a negative surprise regarding annual financial results occurs a little later, i.e. on the ninth and the third day prior to the event. Both average abnormal CDS premium changes have the expected sign. They are positive and amount to: 0.4% and 0. 6% respectively for the ninth and the third day prior to the event.

On the day of the event I did not observe a statistically significant response of either of the markets in the analyzed financial instruments. On the first day after the event a delayed response of the stock market occurs. The abnormal rate of return has the expected negative sign and

Figure 7 | Statistically significant average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from a negative surprise associated with the announcement of annual financial results



Source: own elaboration.

amounts to -0.5%. The only statistically significant, negative average abnormal rate of return on stock prior to the announcement of a negative surprise regarding annual financial results occurs on the fifteenth day prior to the event (-0.4%). Based on one statistically significant, negative average abnormal rate of return on stock it is difficult to conclude whether or not the stock market anticipates the event in question. The last statistically significant, negative average abnormal rate of return on stock occurs on the sixth day after the event (-0.4%). Also the analysis of cumulative average abnormal rates of return does not confirm that investors of the stock market anticipate worse than expected financial results.

The occurrence of a statistically significant, negative stock price change after the day of the event can also be observed in cumulative average abnormal rates of return. As shown on Figure 8 and in Table 10, in event windows [+1; +5] and [+1; +10] negative, cumulative average abnormal rates of return on stock occurred, which are statistically significant at a significance level of 0.01. It is worth noting that the cumulative average abnormal returns on stock in all the event windows ending one day prior to the event have a, contrary to the expected, positive sign. A similar regularity also occurred in other event windows: [-1; +1], [-10; +10] and [-20; +20]. In the case of the credit default swap market, directly after the day of the event no statistically significant, positive average abnormal CDS premium changes can be observed. Evidence for the existence of the phenomenon of insider trading in relation to a negative surprise appearing in the market regarding annual financial results is weaker than in the case of setting a negative outlook on ratings. Average abnormal CDS premium changes indicate the presence of groups of inward investors that are informed to various degrees – well-informed investors execute transactions already on the ninth day prior to the event, while less-informed investors only on the third day prior to the event, which leads to the occurrence of statistically significant, positive average abnormal CDS premium changes.

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Table 9 | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from a negative surprise associated with the announcement of annual financial results

Day of event	Negative surprise associated with the announcement of annual financial results					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic
-20	-0.001	-0.489	-0.994	0.001	0.397	-1.240
-19	0.000	-0.209	-0.470	0.000	-0.150	-1.540
-18	-0.001	-0.408	0.070	0.000	0.088	-1.038
-17	-0.003	-1.564	-0.344	-0.002	-1.034	-2.025
-16	-0.002	-0.633	-0.196	-0.001	-0.469	-1.231
-15	-0.004	-1.861*	-1.182	0.003	0.981	-1.558
-14	0.002	0.822	1.526*	0.004	1.217	-0.622
-13	0.000	0.142	1.033	0.003	0.978	-0.991
-12	-0.002	-0.963	-0.384	-0.002	-0.647	-2.175
-11	-0.003	-0.934	-1.597	0.003	0.994	-0.828
-10	0.007	1.163	0.384	-0.004	-1.633	-1.292
-9	0.001	0.660	0.219	0.004	1.788*	-0.502
-8	0.002	0.711	0.008	0.001	0.377	-1.146
-7	0.000	0.068	-0.650	0.003	1.124	-0.292
-6	0.003	1.355	0.806	0.005	1.159	-0.283
-5	-0.001	-0.267	-0.665	-0.002	-0.786	-1.373
-4	0.001	0.475	0.180	0.001	0.682	-0.820
-3	-0.001	-0.334	0.697	0.006	1.807*	0.275
-2	0.000	-0.137	0.086	0.000	-0.085	-1.678
-1	0.002	0.914	0.884	0.000	-0.076	-0.433
0	0.003	0.805	-0.431	-0.003	-0.896	-0.914
1	-0.005	-1.778*	-2.066	0.001	0.247	-0.755
2	-0.001	-0.570	-0.211	-0.001	-0.489	-1.030
3	-0.001	-0.496	-0.462	0.000	-0.075	-0.755
4	0.000	-0.145	0.094	-0.006	-2.506**	-1.721
5	0.001	0.620	-0.571	-0.007	-2.983***	-1.772
6	-0.004	-2.410**	-1.644	0.001	0.250	-0.584

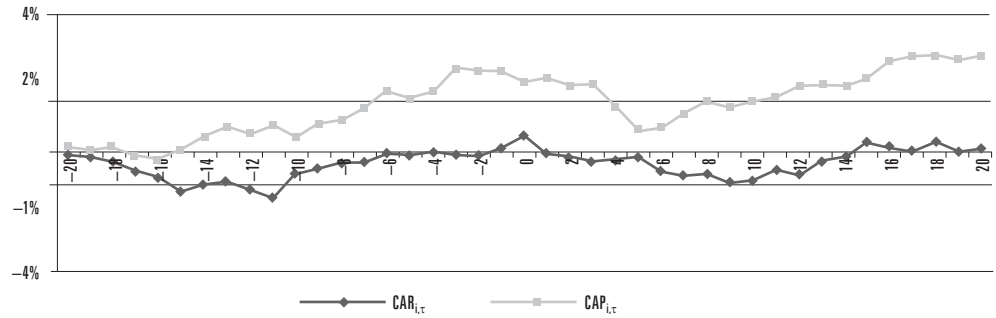
Table 9 – continuation | Average abnormal rates of return on stock ($\overline{AR}$) and CDS premium changes ($\overline{AP}$) resulting from a negative surprise associated with the announcement of annual financial results

Day of event	Negative surprise associated with the announcement of annual financial results					
	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic	$\overline{AR}$	Value of the Student's t-test statistic	Value of the Corrado statistic
7	-0.001	-0.529	-0.376	0.004	1.439	0.390
8	0.000	0.271	0.368	0.003	1.086	0.275
9	-0.002	-1.395	-1.292	-0.001	-0.465	-0.562
10	0.001	0.416	-0.211	0.001	0.456	-0.682
11	0.003	1.822*	2.254	0.001	0.578	-0.575
12	-0.001	-0.420	0.141	0.004	1.027	0.142
13	0.004	2.118**	1.315	0.000	0.168	-0.626
14	0.001	0.562	0.884	0.000	-0.044	0.073
15	0.004	2.301**	1.393	0.002	0.709	-0.429
16	-0.001	-0.809	-1.119	0.005	2.066**	0.657
17	-0.001	-0.470	-0.141	0.001	0.554	0.403
18	0.002	0.921	2.372	0.001	0.324	-0.223
19	-0.003	-1.524	-1.057	-0.002	-0.578	-0.236
20	0.001	0.474	1.346	0.002	0.614	0.163

*, **, *** – in the Corrado rank test indicates a rejection of the null hypothesis H0: on the given day the average abnormal rate of return is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

Figure 8 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from a negative surprise associated with the announcement of annual financial results



Source: own elaboration.

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An analysis of cumulative average abnormal CDS premium changes suggests a flow of information from the CDS market to the stock market. In event windows [-20; -1], [-10; -1] and [-5; -1] statistically significant, positive cumulative average CDS premium changes can be observed (2.3%; 1.6% and 0.6%). However, these are considerably lower than the positive cumulative average CDS premium changes in the case of rating downgrades (6.5%; 2.3% and 1.6%), especially in relation to setting a negative outlook on ratings (9.3%; 5.5% and 5.6%).

Table 10 | Cumulative average abnormal rates of return on stock ($CAR_{i,\tau}$) and CDS premium changes ($CAP_{i,\tau}$) resulting from a negative surprise associated with the announcement of annual financial results

Event window	Negative surprise associated with the announcement of annual financial results					
	$CAR_{i,\tau}$	Value of the Student's t-test statistic	Value of the sign test statistic	$CAP_{i,\tau}$	Value of the Student's t-test statistic	Value of the sign test statistic
[-20; +20]	0.001	0.376	-3.904	0.028	10.554***	5.778***
[-10; +10]	0.005	3.430***	4.690***	0.006	2.523**	3.411***
[-5; +5]	-0.001	-0.635	-1.732	-0.011	-4.696***	0.577
[-1; +1]	0.001	0.238	2.000**	-0.003	-0.763	-2.000
[-20; -1]	0.001	0.460	-3.273	0.023	7.594***	3.710***
[-10; -1]	0.014	6.129***	3.317***	0.016	5.037***	2.714***
[-5; -1]	0.001	0.515	0.000	0.006	1.872*	0.816
[-1; 0]	0.005	1.333	1.732*	-0.003	-0.962	-1.732
[0; +1]	-0.002	-0.561	-0.577	-0.002	-0.694	-1.732
[+1; +5]	-0.006	-2.700***	-2.449	-0.014	-5.768***	-1.633
[+1; +10]	-0.013	-8.264***	-3.317	-0.006	-2.346**	-2.714
[+1; +20]	-0.004	-1.694	-4.472	0.008	2.996***	-1.342

*, **, *** – in the sign test indicates a rejection of the null hypothesis H0: in the given event window CAR/ CAP the cumulative abnormal rates of return associated with the announcement of a negative surprise regarding annual financial results is zero with significance levels of, respectively: 10%, 5% and 1%; in the Student's t-test indicates the statistical significance of the given abnormal rate of return with significance levels of, respectively: 10%, 5% and 1%.

Source: own elaboration.

The difference in the values of positive cumulative average abnormal CDS premium changes confirms that for investors that initiate insider transactions the occurrence of an event involving the announcement of annual financial results that are worse than expected is less significant compared to negative information on credit risk associated with setting a negative outlook on ratings or a credit risk event involving a rating downgrade. This is largely due to the fact that inward investors have access to knowledge concerning negative surprises as to financial results well before the information about this event appears in the market. This means that they can spread their transactions over time.

Conclusions

The results of the event study indicate that there is a flow of information from the credit default swap market to the stock market and point to the occurrence of the phenomenon of insider trading in the mentioned credit derivatives market as regards the analyzed European companies. Evidence of entities having access to confidential information can be found mainly in the case of setting a negative outlook on ratings.

As regards rating downgrades the response is considerably weaker, both in terms of absolute values and in terms of the number of statistically significant, average abnormal and cumulative average abnormal CDS premium changes on the respective event days and event windows. The conclusions drawn from the analysis of the average abnormal and cumulative average abnormal returns in the stock market indicate that in the market of the currently considered financial instruments the phenomenon of anticipation of rating downgrades can be observed. In case information appears in the market regarding annual financial results that are worse than expected, an even weaker – compared to events and information associated with credit rating – response can be observed of CDS contract pricing and stock prices. In this respect, the analysis results are less conclusive than in the case of credit risk events or negative information on credit risk involving ratings. This could be due to the fact that internal stakeholders have access to information on these results well before the negative surprise regarding the annual financial results is announced in the market. Therefore, we should rather speak of a gradual response to negative information associated with annual financial results. Among the group of analyzed companies we can also observe an asymmetric response to credit risk events and negative information on credit risk as well as to positive events. Stock markets and CDS markets respond with lower in terms of absolute values changes in prices and premiums to rating upgrades compared to credit risk events or events carrying negative information on credit risk. The asymmetry of the response is evident in the markets of both considered financial instruments, especially compared to the case of setting a negative outlook on ratings. When comparing the response of both types of considered financial instruments to rating downgrades and to setting a negative outlook on ratings, it should be concluded that in the case of the stock market as well as the CDS market a stronger response can be observed to information contained in announcements regarding setting a negative outlook on ratings.

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