Intra-Industry Spillover Effect on the US CDS Market

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Abstract

This paper uses Event Study Methodology to ascertain if credit rating events from the *S&P Global* credit rating agency have an impact on Credit Default Swap (CDS) spreads of companies included in the *S&P 500* index for the period ranging from June 2013 to May 2017. The study incorporates an industry segmentation to quantify the spillover effect a credit event may have on non-event competing firms. 127 upgrades and 124 downgrades are analyzed. Findings indicate that the CDS markets do not systematically experience abnormal spread changes for downgrades while upgrades are not more anticipated. The credit default swap markets should not be simplified on a market level, industries must be considered as there are signs of heterogenous reactions to rating changes from said industries. There is tentative evidence for intra-industry spillover to non-event firms, but support is not unequivocal.

Este estudo utiliza a Metodologia de Estudo de Eventos para verificar se os eventos de classificação de crédito da agência de classificação de crédito *S&P Global* têm impacto nos spreads de *Credit Default Swap* (CDS) das empresas incluídas no índice *S&P 500* entre junho de 2013 e maio de 2017. O estudo incorpora uma segmentação da indústria para quantificar o efeito de transbordamento que um evento de crédito pode ter em empresas concorrentes não relacionadas a esses mesmos eventos. São analisados 127 melhoramentos e 124 rebaixamentos. Os resultados indicam que os mercados de CDS não experimentam sistematicamente mudanças anormais de spread para rebaixamentos, enquanto que os melhoramentos não são mais antecipados. Os mercados de Credit Default Swap não devem ser simplificados ao nível de mercado, as indústrias devem ser consideradas, pois há sinais de reações heterogéneas às mudanças de classificação de crédito das referidas indústrias. Há evidências provisórias de repercussões intraindustriais para empresas não relacionadas com os eventos, mas o apoio não é inequívoco.

Keywords: credit rating, credit event, event study, credit default swap, industry, spillover effect, US

Introduction

Creditworthiness has long been an important determinant to the solvency and, more importantly, the long-term health of any organization. Through their work in bridging the gap of informational asymmetry between market participants, rating agencies have become an integral part for transparent dealings to all parties involved. In light of their work, much energy has been put into furthering the understanding of credit ratings and their interactions with the markets at large. Indeed, numerous studies have done tremendous work in establishing the link between credit announcements and the traditional stock and bond markets. The rapid rise of fledgling credit default swap derivatives has opened the door to a whole new set of research into the effects of credit publications. The tight knit relationship between creditworthiness – effectively quantified through credit ratings – and credit default swaps has more recently been studied by examining the market reactions to rating events on CDS markets. Groundbreaking papers by Hull et al. (2004) and Norden & Weber (2004) have paved the way for a host of new research in this specific field. Indeed, all these initial studies had the distinguishing characteristic of looking into the specific impact of credit events. Ismailescu & Kazemi (2010) took this baseline and ran with it. They put their own twist on the research by delving into the previously unexplored effect on non-event entities through analysis of sovereign credit ratings. They identified that credit rating announcements exhibited infiltration outside of the event country and contaminated other economies, aptly naming the phenomenon “spillover effect”. Through this discovery, Wengner et al. (2015) had the right idea and went searching for a comparable outcome on the industry scale. They unearthed a comparable influence when analyzing global portfolio and industry portfolios separately. The following study builds upon the inroads made by previous researchers by implementing the methodology presented in the work of Wengner et al. (2015) but attempting to characterize the credit event impact and spillover effect on CDS spreads ahead of the event date while also using exclusively European market data.

For future reference, section I provides insights into the abovementioned developments in the research through the literature review, section II justifies the motivations and hypotheses for the study, section III characterizes the dataset, section IV clarifies the methodology, Section V presents the results and section VI concludes the study.

I. Literature Review

The following literature review will focus on first introducing past work that have identified the relevant relations between credit events and credit default swaps. These papers were the backbone for subsequent research into the issue. Next, the first intra-industry spillover analysis will be presented as this paper is the core on which the methodology is built. Lastly, the paper credited with the discovery of the spillover effect will be outlined to understand the origin of this impact.

1.1 Relationship between credit rating events and credit default swap spreads

Hull et al. (2004) set out to examine the relationship between credit default swaps, bond yields and credit rating announcements. The authors achieve this analysis by firstly diving into the connection between credit default spreads and bond yields. This is done to reach conclusions regarding the benchmark risk-free rate associated with market participants in the credit derivatives market. They subsequently study the magnitude to which credit default swap market participants anticipate credit rating announcements by *Moody's*. Their analysis is built on 233,620 CDS spreads collected over a 5-year period spanning from January 1998 to May 2002. The reference entities range from corporations, sovereign states and quasi-sovereign organizations encompassing North America, Europe, Asia, Africa, South America, and Oceania. The paper uses a traditional event study format to explore the association between credit default swap spreads and rating announcements. Two types of analyses are applied to unearth the inherent relationship between spreads and announcements surrounding downgrades/upgrades, reviews, and outlooks. The first analysis investigates credit default swap changes conditional on ratings announcements. The study concludes that reviews for downgrades contain significant information while outlooks and actual downgrades do not. However, all three types of negative announcements are anticipated by credit default swap markets. The second analysis does exactly the opposite, it investigates rating announcements conditional on credit spread levels and changes. The report illustrates that both, credit spread levels and changes, offer supportive data in approximating the probability of future negative credit rating changes. Indeed, 42.6% of downgrades, 39.8% of reviews, and 50.9% of reviews originate from the leading quartile of credit default swap changes. All aforementioned results concern negative credit rating events, findings for positive credit rating events were less encouraging. Results were much less significant for these events. The authors theorized that this was the result of credit rating agencies putting much less emphasis on positive changes compared to negative changes. The study also indicates that positive changes were far less

numerous than their counterparty in the dataset leading to lack of data points to make significant inferences.

More recently, Finnerty et al. (2013) build upon the work of Hull et al. (2004) by incorporating non-investment grade entities into their research. Indeed, most prior research only focused on investment grade ratings. This makes for a more comprehensive analysis to the relationship between credit rating events and credit default swap spreads as the data set incorporates a larger scope of entities. This study uses two datasets for their analysis, both of which ranging from January 2001 to May 2009. The credit rating event information was compiled by *Standard & Poor's* and contains issuer credit ratings, as well as CreditWatch and Outlook announcements. The event sample includes many more observations for positive credit rating events than prior studies, this enables the authors to examine their effect more thoroughly. Ultimately, this dataset includes 21,481,367 observations from 14,248 entities across all geographies. The credit default swap spread data was compiled by Markit Group Limited and accounts to 1,500,735 daily CDS spreads. However, the authors choose to exclusively use the 5-year maturities as these are the most liquid. Ultimately, the authors were able to confirm prior results regarding to negative rating events mentioned in the Hull et al. (2004) study however they were able to make further inferences regarding the previously weakly significant to insignificant results associated to positive rating events. Indeed, findings illustrate that positive event, including rating changes, CreditWatch, and Outlooks, have significant market effects which contradict prior studies. Rating change upgrade announcements have displayed consistently significant effects on credit default swap spreads since 2003. It may be interesting to point out that Hull et al. (2004) closed their study horizon in 2002, thus not analyzing past this date. Results reveal that market participants examine weakening credits more comprehensively than the opposite however, the trend shows that they are consciously paying more attention to improving credits. Building upon the results of Hull et al. (2004), Finnerty et al. (2013) find that changes in credit default swap spreads for non-investment grade entities contain data beneficial to the estimation of probabilities of negative credit rating events. This collaborates the prior work as spread changes for investment grade entities had a similar relation to negative credit rating events. Inversely, spread changes did not seem to be useful in estimating probabilities for positive credit rating events.

Norden & Weber (2004) analyze the interrelation between the stock market, the credit default swap market and rating announcements made by three rating agencies, namely *Standard and Poor's*, *Moody's*, and *Fitch*. All credit default swap data is proprietary and was

provided by a large European bank. Working with traditional event study methodology, the authors use the period between 2000 and 2002 as the analyzed timeframe. By comparing the effects of announcements of all three major credit rating agencies, they mostly confirm the work done by Hull et al. (2004) where credit spread changes anticipate negative credit rating events. Conversely to the previously mentioned study, findings show that rating change downgrade announcements do indeed have a significant impact on credit default swap spreads. Furthermore, results show that negative reviews have a stronger impact on credit default swap spreads than rating change announcements. Following the conclusion of Hull et al. (2004), this study does not find significant reaction to positive rating change events but also theorize that the lack of data on positive events may distort the results found.

1.2 Intra-Industry Analysis

Wengner et al. (2015) is the basis for which this paper is developed in terms of methodology. As with prior papers, the authors research the impact of credit rating events on CDS spreads. What sets this study apart is the incorporation of the inherent spillover effect event entities have on non-event entities at the industry level. The authors reason that market reactions for event firms do not reveal the portion of the information in the rating announcement that is firm-specific and how much is industry-wide. They also argue that credit rating events do not reveal to what extent, if at all, competitors' profit or suffer from upgrades or downgrades (e.g., positive or negative credit events). Using data from *Standard & Poor's* rating announcements and daily CDS spreads ranging from 2004 to 2011, they analyze the impact of rating announcements for event firms for a global portfolio and industry specific portfolios separately. Furthermore, the spillover effect is quantified for competitors around the event date. Lastly, a cross-sectional analysis via regression is utilized to examine the factors that determine the market reaction of competitors. Following the work done in the past, Wengner et al. (2015) find asymmetric information around downgrades. Remarkably, they find the same relationship for upgrades which contradicts early literature from Hull et al. (2004) and Norden & Weber (2004), however this phenomenon is successfully captured in more recent work done by Ismailescu & Kazemi (2010), Galil & Soffer (2011) and Micu et al. (2006). Moreover, the authors find evidence that rating changes have an asymmetric information spillover effect within industries. While downgrades are associated with a positive competitive effect, upgrades are associated with a negative competitive effect.

1.3 Emerging Market Spillover Effect

Ismailescu & Kazemi (2010) were the first to uncover the spillover effect that was examined by Wengner et al. (2015). The authors investigate the effect that sovereign rating change announcements have on CDS spreads of event countries and their spillover effect on other emerging markets CDS premiums. They work with CDS data compiled by the *Markit* database and employ 43,436 daily observations on 22 national entities on a range from January 2001 to April 2009. The credit rating data was collected from *Standard & Poor's* over the same period. Ismailescu & Kazemi (2010) find evidence for asymmetric reaction of CDS markets to rating events. Indeed, positive rating announcements have an immediate impact while negative announcements have no impact on sovereign CDS. With the results provided by the logistic model, they uncover that CDS spreads provide useful information when estimating the probability of a negative event while the information is not useful in estimating the eventuality of positive events. Similar findings regarding estimation probabilities were reported for both Hull et al. (2004) and Finnerty et al. (2013). Lastly, they uncover that positive rating announcements have a higher propensity to spillover into other emerging CDS markets than negative announcements.

II. Motivation and Hypotheses

The main motivation of this study is to determine if credit rating events (credit rating announcements/outlook/review) have any significant impact on credit default swap spreads. This relationship will be analyzed using US firm data in the form of S&P 500. Furthermore, all firms will be classified by industry type to uncover any interaction between non-event competitor firms and the event firm within a given industry. This is done to uncover any type of "spillover" effect firms may experience through credit rating events of other firms.

Based on the research done by Wengner et al. (2015), firms have the incentive to themselves publicize positive news whilst negative news is simply disclosed. Therefore, credit rating downgrades represent information that has not reached the market while credit rating upgrades confirm information that is already available and reflected in market prices. The authors theorize that this unbalanced reaction to positive and negative news could be partly explained through information-processing biases (Dichev & Piotroski, 2001) and a disciplinary effect on the firm's management (Ederington & Goh, 1998; Vassalou & Xing, 2003). As seen in the literature review, most studies find that negative credit rating events have a greater impact on the credit default swap market than positive credit rating events. Thus, the first hypothesis is stated as follows:

Hypothesis 1

The Credit default swap spread increases significantly around negative credit rating events while the opposite is not true. The credit default swap spread decreases are insignificant around positive credit rating events.

As mentioned above, Wengner et al. (2015) explain that firms have greater interest in publicizing positive news therefore meaning that market participants expect future positive changes in credit rating. Leading to the second hypothesis:

Hypothesis 2

Credit default swap spreads tighten before upgrades meaning the market is able to better anticipate upgrades as opposed to downgrades.

Findings in the study done by Daniels & Jensen (2005) illustrate that credit default swap spread reactions to credit rating events vary according to industry type. The study done

by Wengner et al. (2015) substantiate this claim thus demonstrating that this condition should be considered.

Hypothesis 3

Credit default swap market reaction differs according to industry type within the dataset.

Findings by Ismailescu & Kazemi (2010)interactions between the credit default swap markets and sovereign credit rating events have repercussions outside of the studied event. They refer to this as the spillover effect. The authors suggest that certain spreads can have common factors such as a common economic environment. When sorting by industry type, one could assume that firms within the same industry are competing for resources and are subject to similar common factors. Indeed, Wengner et al. (2015) discover that the same type of spillover effect is present within an industry type. The logic being that non-event firms (competitor firms) profit from the downgrade of the event firm through a tightening of their credit default swap spread due to the competing nature of the industry environment. Consequently, leading to the final hypothesis:

Hypothesis 4

Competing firms benefit from downgrades through decreasing credit default swap spreads while competing firms suffer from upgrades through increasing credit default swap spreads.

III. Data

The analysis is based on two separate data sets, one including the credit rating information and the other containing the credit default swap spread quotes. Both sets are taken over a 4-year period ranging from June 2013 to May 2017

3.1 Credit Rating

Credit rating announcement data is retrieved from *Compustat – Capital IQ*. As done by Ismailescu & Kazemi (2010) and Ferreira & Gama (2007), rating events in this study are defined as actual rating changes. Due to data restrictions, Review announcements and Outlook announcements are treated according to Hull et al. (2004) and, therefore, are not analyzed. The analysis will focus on a major credit rating agency, namely *S&P Global*. All companies are assigned an industry type using the methodology applied by Wengner et al. (2015). The Global Industry Classification Standard (GICS) is utilized to designate the industry of each entity thus leading to the creation of distinct industry portfolios. Details into the distribution of rating events within each industry and year is available in Table 1. Panel A depicts the number of upgrades and downgrades for each year. Panel B gives further insights into the segmentation of upgrades within each industry for every year. Panel C provides the same information as Panel B but for downgrades.

All entities in the raw data set that do not have credit ratings during the period under review were omitted in conjunction with their CDS spread quotes. Following Galil & Soffer (2011), all rating events whose event window overlaps with that of another, are kept within the dataset. Controls for contamination are implemented later in the analysis and will be further discussed in the methodology section. Furthermore, all companies with a credit rating of B- or less were also omitted due to the lack of a large enough sample for these low credit ratings. Indeed, according to Table 2, firms with B-, CCC+ and CCC ratings are either a very large minority or nonexistent within the sample. Moreover, this would make the construction of the rating class index models, discussed in the methodology, for these specific ratings at best highly unreliable and at worst equal to 0 throughout the sample. After the removal of problematic observations, the dataset includes 127 upgrades and 124 downgrades.

Table 1. Distribution of Rating Events per Industry and Year.

Panel A: Type of rating events	2013	2014	2015	2016	2017	Total
Upgrade	31	31	26	25	14	**127**
Downgrade	6	19	45	44	10	**124**
Total	**37**	**50**	**71**	**69**	**24**	**251**
Panel B: Upgrades per Industry	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Energy	3	2	0	1	3	**9**
Materials	1	2	0	2	0	**5**
Industries	6	5	6	1	0	**18**
Consumer Discretionary	7	4	5	7	2	**25**
Consumer Staples	2	4	1	6	2	**15**
Healthcare	2	3	4	1	1	**11**
Financials	2	2	1	0	0	**5**
IT	3	3	1	0	1	**8**
Communication Services	0	1	1	0	2	**4**
Utilities	1	2	3	4	2	**12**
Real Estate	4	3	4	3	1	**15**
Total	**31**	**31**	**26**	**25**	**14**	**127**
Panel C: Downgrades per Industry	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Energy	1	3	2	16	1	**23**
Materials	1	2	8	8	1	**20**
Industries	0	0	3	5	0	**8**
Consumer Discretionary	1	4	6	4	2	**17**
Consumer Staples	0	1	6	3	0	**10**
Healthcare	1	4	4	1	2	**12**
Financials	0	2	10	3	2	**17**
IT	0	2	3	1	1	**7**
Communication Services	2	0	2	0	1	**5**
Utilities	0	0	1	1	0	**2**
Real Estate	0	1	0	2	0	**3**
Total	**6**	**19**	**45**	**44**	**10**	**124**

Table 2. Distribution of Credit Ratings (S&P Global)

Ratings	observations
AAA	3071
AA+	2270
AA	7163
AA-	12070
A+	19712
A	45716
A-	44041
BBB+	58957
BBB	59119
BBB-	30194
BB+	14761
BB	10810
BB-	9162
B+	1499
B	3685
B-	0
CCC+	218
CCC	0
NR (no rating)	2854
blank space	6373
Total	**331675**

3.2 Credit Default Swap

Credit default swap spread quotes are based on daily quotes taken on a 5-year basis as is traditionally done in prior studies mentioned in the literature review. These tend to be most liquid in the markets. Credit default swap spread quotes are retrieved from *Thomson Reuters DataStream*. All entities in the raw data set that do not have credit default swap data are omitted in conjunction with their credit rating events also being disregarded. The dataset includes 330802 observations. Table 3 displays the number of firms and CDS spread quotes within each industry.

Table 3. Descriptive Statistics of the Firms per Industry and their CDS Spreads.

Industries	Firms	CDS spread observations
Energy	26	26972
Materials	23	23954
Industries	44	46061
Consumer Discretionary	48	50250
Consumer Staples	29	30358
Healthcare	34	35593
Financials	36	37932
IT	23	24077
Communicatio n Services	11	11638
Utilities	26	27264
Real Estate	16	16703
Total	**316**	**330802**

IV. Methodology

4.1 Event Study

Following the methodology implemented in the work of Wengner et al. (2015), which was developed upon that of Norden & Weber (2004) and Galil & Soffer (2011), rating class indices are applied to calculate abnormal credit default swap spread changes $ARCDS_{i,t}$ for firm i at time t.

$$ARCDS_{i,t} = \begin{cases} (CDS_{i,t} - CDS_{i,t-1}) - (RICDS_{i,o,t} - RICDS_{i,o,t-1}) \; for \; t < date \; of \; rating \; change \\ (CDS_{i,t} - CDS_{i,t-1}) - (RICDS_{i,n,t} - RICDS_{i,n,t-1}) \; for \; t \geq date \; of \; rating \; change \end{cases} \quad (1)$$

As illustrated in equation 1, the rating class index $RICDS_{i,t}$ is determined with regards to the original credit rating $RICDS_{i,o,t}$ and the credit rating after the change $RICDS_{i,n,t}$. The index is

determined by equally weighted CDS changes for firms in a specific rating class. For the overall sample, the market portfolio includes all firms. When analyzing the industry effect, firms are aggregated in separate industry portfolios.

Subsequently, cumulative abnormal CDS spread changes CAS_{i,t_1,t_2} for firm i over $t_1$to t_2 periods. This is done by adding the daily $ARCDS_{i,t}$ over the desired time period as depicted in equation 2. This paper will use a 30-day window ranging from (-30, -1) and a 2-day window ranging from (0, +1).

$$CAS_{i,t_1,t_2} = \sum_{t=t_1}^{t_2} ARCDS_{i,t} \quad (2)$$

Next, the median abnormal returns are calculated for each time interval. Tests must then be completed to determine if the findings are significantly different from zero. Parametric t-test and non-parametric Wilcoxon signed-rank test are applied with significance levels of 99 percent, 95 percent and 90 percent. Due to the abnormal distribution of changes, the Wilcoxon signed-rank test is included and privileged as a significance test.

4.2 Intra-Industry Spillover Effect

The aptly named spillover effect is defined as the impact of credit rating announcements on competitors. Event firms are directly affected by the credit rating event while, their counterpart, competitor firms (or non-event firms) are not affected at the specific time period t. Controls are put in place to only keep events that do not overlap with other events. This is done to fully grasp the effect of this singular event on non-event firms within the same industry.

Following the logic identified by Wengner et al. (2015), negative credit events should impact non-event firms positively while positive credit events should impact non-event firms negatively. This would manifest itself through tightening and widening of the CDS spreads of competing firms around event period for downgrades and upgrades, respectively.

Using equation 1, the rating-adjusted CAS changes for a 2-day and 30-day windows are computed to quantify abnormal market reactions of competitor firms at the announcement date. Lastly, similar robustness test done in the previous event study are applied to assess if the data is significantly different from zero.

V. Results

This next section presents the findings of this paper according to the methodology outlined in the previous chapter. The structure will follow that of the segments above, namely

report the results associated to the event study and the intra-industry spillover effect. Firstly, the relationship between the rating announcements and CDS spreads is established. Furthermore, results are presented for the whole market, while also, subdividing the results for the initial event study into different industries according to the Global Industry Classification Standard (GICS). Lastly, this paper will delve into the intra-industry spillover effect. This will establish the basis to highlighting the industry wide market reaction to upgrades and downgrades of firms undergoing an event, in this case, a credit rating change. In other words, this analysis will study the market reaction of non-event competing firms when an event occurs.

5.1 Event study

The main motivation for the event study is to discern if an event leads to abnormal market reactions. In the context of the following study, this would entail perceiving significantly abnormal reactions in CDS spread changes to the news of a credit rating announcement. When accepting an efficient market environment, market prices should, in theory, reflect all available and relevant information. This would entail all information to be incorporated into the pricing of assets. Therefore, significant abnormal changes to CDS spreads should not be present within this setting. In a broad sense, credit rating agencies build a quantified assessment of the creditworthiness of entities within public markets.
This assessment is colloquially known as credit ratings. This process is in constant motion, credit ratings are updated regularly depending on the financial health of an entity. Due to the nature of the work done by these agencies, such as *S&P Global*, it can be assumed that they are in possession of more information than is publicly available (Wengner et al. 2015). Therefore, significant market reactions can be expected around the date of rating announcements.

The following tables (Tables 4 and 5) display the results of the event study at market level and at industry level. Both, the mean and median of cumulative abnormal CDS spread changes (CAS) in basis points are presented for the total sample, as well as 11 different industries comprised of firms rated by *S&P Global*. For the analysis, median values will be taken into consideration. Corresponding p-values for the parametric t-test and p-values for the non-parametric Wilcoxon signed-rank test are made available, confidence levels of 99 percent, 95 percent and 90 percent are applied. As mentioned in the methodology, CDS spreads are adjusted using the rating class index model. N represents the number of observations within each category. Panels A and B each depict the cumulative abnormal CDS

spread changes for the 30-day (-30, -1) and 2-day (0, +1) event windows respectively, where 0 is defined as the event date. While Table 4 focuses on downgrades, Table 5 focuses on upgrades.

5.1.1 Analysis of downgrades using the Rating Class Index Model

Results for downgrades in the total sample and industry portfolios are presented in Table 4 below. For the total sample, median CAS values for both windows are positive. This coincides with prior assumptions made, downgrades should affect the abnormal CDS spreads positively.

The findings for the event window (-30, -1) are not significant on any test, however, the subsequent window (0, +1) displays significance at a 90 percent confidence level on the Wilcoxon signed-rank test. This positive cumulative abnormal CDS spread change is significant. Therefore, the market reacts abnormally to downgrades at the event announcement date in the 2-day (0, +1) window. This conclusion is in line with the work of previous researchers. More former research papers from Norden & Weber (2004), Hull et al. (2004), Daniels & Jensen (2005), Micu et al. (2006) report similar findings as their more contemporary counterparts, papers by Norden & Wagner (2008), Galil & Soffer (2011), Finnerty et al. (2013), Wengner et al. (2015) for this specific 2-day event window.

When examining the cumulative abnormal CDS spread changes for downgrades in the 11 industry portfolios, results are more homogenous when compared to the subsequently analyzed upgrade scenarios in Table 5. Most cumulative abnormal spread changes are positive within both, (-30, -1) and (0, +1), windows. For the Industry portfolios, the (-30, -1) window includes 7 positive median CAS values and 4 negative median CAS values. The (0, +1) window includes 9 positive median CAS values and 2 negative median CAS values. Although not perfect, this approaches the initial assumptions made regarding the effect of downgrades on abnormal CDS spread changes. Wengner et al. (2015) observe similar homogeneity within their study sample for downgrades as opposed to their sample for upgrades.

Table 4. Market Reaction to downgrades (Rating Class Index Model))

Panel A: CDS spread changes before downgrade (-30,-1)	**All Industries**	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**
N	124	23	20	8	17	10	12	17	7	5	2	3
CASC (mean)	23.357	52.896	17.892	7.674	15.311	4.432	3.352	46.601	8.901	8.284	-2.562	8.268
CASC (median)	0.860	0.560	2.696	3.459	9.175	-0.066	3.010	-3.539	1.564	10.020	-2.562	-6.615
t-test	0.237	0.315	0.125	0.769	0.338	0.077 *	0.983	0.533	0.588	0.291	0.792	0.183
Wilcoxon sign rank test	0.635	0.665	0.202	0.461	0.190	0.960	0.850	0.027 **	1.063	0.548	1.000	0.700

Panel B: CDS spread changes during downgrade (0,+1)	**All Industries**	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**
N	124	23	20	8	17	10	12	17	7	5	2	3
CASC (mean)	-4.777	5.996	-25.333	1.796	1.816	-11.336	2.162	12.168	6.008	-32.629	5.112	-92.468
CASC (median)	1.274	2.298	2.416	2.170	0.460	-0.869	1.822	2.103	0.321	1.224	5.112	-36.549
t-test	0.670	0.679	0.906	0.364	1.183	0.183	0.748	0.507	0.988	0.428	0.823	0.964
Wilcoxon sign rank test	0.103 *	0.315	0.182	0.078 *	0.159	0.922	0.009 ***	0.487	0.469	0.813	1.000	0.700

***, **, and * denote 99 %, 95 % and 90 % confidence levels respectively.

They encounter positive median CAS in the downgrade scenarios for both event windows for 5 of the 6 industries they analyze in their sample. Industry portfolios for Financials and Consumer Staples present contradictory results to the initially assumed abnormal market reaction. Indeed, both portfolios present with statistically significant negative cumulative abnormal spread changes in the (-30, -1) window at 95 percent confidence level on the Wilcoxon signed-rank test and 90 percent confidence level on the parametric t-test, respectively. Interestingly, these results anticipate the rating change, but opposite to what may be expected. This does not coincide with previously made assumptions. The industry portfolios Healthcare and Industries both present significant positive CAS values. The Healthcare portfolio displays significance at a 99 percent confidence level on the Wilcoxon signed-rank test, while the Industries portfolio exhibits significance at a 90 percent confidence level on the same test. These positive significant CAS observations support the assumption of abnormal market reaction at the 2-day event window (0, +1). Market participants react to the relevant news regarding the rating change announcement. Rating agencies may bring relevant information to the market at the time of announcement and participants price this new information into the asset class.

Analyzing the effects of a negative rating event, at and before the event date, has brought about speculation from researchers. Findings by Wengner et al. (2015) support the claim that abnormal market reactions are present for negative rating events throughout both windows. As mentioned above, they encounter a rather homogenous significant abnormal reaction to credit downgrade events throughout their sample. In 40 percent of cases, the downgrades are anticipated, meaning significant abnormal reactions materializing in the (-30, -1) window. This anticipation is more or less strong depending on the sector analyzed. These findings point towards private information leakage ahead of the event date 0. On the other hand, research by Norden & Weber (2004) do not corroborate the above made findings by Wengner et al. (2015). In their analysis, actual downgrades do not experience market reaction around the event date for the big three agencies, namely *S&P Global*, *Moody's* and *Fitch*. They only find significant abnormal reactions for reviews for downgrades, which are not a credit rating downgrade. The event study applied in this paper follow the findings of Norden & Weber (2004) more closely than Wengner et al. (2015). As significant market reaction to negative events is only discernible during the 2-day event period (0, +1) and no significant abnormal reactions are detected in the prior window (-30, -1). Even though these results are evident for the total sample, as well as 2 industry portfolios; this does not constitute a homogenous reaction by all industries in anticipation to negative events. The presented results do not support hypothesis 1 made in this paper.

5.1.2 Analysis of upgrades using the Rating Class Index Model

Results for upgrades in the total sample and industry portfolios are presented in Table 5 below. For the total sample, median cumulative abnormal CDS spread changes are 0.00 for the (-30, -1) window and positive for the (0, +1) window. The positive result goes against previous assumptions made regarding the tightening of CDS spreads around upgrades. While the Wilcoxon signed-rank test does not find any significance in the results, the parametric t-test is significant at the 90 percent level for the (-30, -1) window for the median CAS of 0. Significant abnormal cumulative spread changes are discernible. There seems to be anticipation to positive events, but they lack direction, the CAS of 0 does not specify its sign.

Table 5. Market Reaction to Upgrades (Rating Class Index Model)

Panel A: CDS spread changes before upgrade (-30,-1)	**All Industries**	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**
N	127	9	5	18	25	15	11	5	8	4	12	15
CASC (mean)	1.230	-6.718	5.353	-0.107	2.097	21.632	-6.118	0.306	3.576	0.275	-11.522	-1.267
CASC (median)	0.000	-1.609	0.000	-2.922	1.892	1.930	-3.860	1.224	1.027	0.085	0.554	1.534
t-test	0.073 *	0.293	0.072 *	0.350	0.112	0.788	0.559	0.450	0.358	0.383	0.203	0.288
Wilcoxon sign rank test	0.303	0.426	0.625	0.393	0.367	0.806	0.535	0.222	0.195	0.686	0.265	0.653

Panel B: CDS spread changes during upgrade (0,+1)	**All Industries**	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**
N	127	9	5	18	25	15	11	5	8	4	12	15
CASC (mean)	-2.229	0.007	8.219	-6.943	-2.845	-1.866	0.021	-0.402	-1.196	-3.557	-14.562	5.283
CASC (median)	0.146	-0.104	2.286	-0.649	-0.213	0.644	0.127	-0.036	0.119	-2.447	1.465	1.364
t-test	0.404	0.803	0.126	0.066 *	0.057 *	0.880	0.348	0.146	0.160	0.087 *	0.374	0.411
Wilcoxon sign rank test	0.409	0.496	0.063 *	0.832	0.182	0.121	0.131	0.548	0.945	0.886	0.791	0.252

***, **, and * denote 99 %, 95 % and 90 % confidence levels respectively.

Considering upgrades for all industries in the total sample, these results do not support significant negative cumulative abnormal spread changes within this study. These findings are in line with earlier research done by Steiner & Heinke (2001), Norden & Weber (2004), Hull et al. (2004), and Daniel & Jensen (2005). However, recent research by Micu et al. (2006), Ismailescu & Kazemi (2010), Galil & Soffer (2011), Finnerty et al. (2013), and Wengner et al. (2015) suggest otherwise. These studies have generally found significant cumulative abnormal CDS spread changes for upgrades, specifically in anticipation of positive event.

Wengner et al. (2015) explain their findings regarding significant results for upgrades as a result of upgrades being less frequent and, therefore, including more information not publicly available at the time. While this stands true in their research, the current event study has evidence to the contrary. Indeed, Wengner et al. (2015) observe 406 downgrades and 229 upgrades amounting to 77 percent more downgrades than upgrades.

The present study, as described in Table 1, observes 124 downgrades to 127 upgrades accounting for an approximately equal share between both types of events. The study period applied by Wengner et al. (2015) ranges from 2004 to 2011, this coincides with the financial crisis of 2007-2008 and the aftermath that affected markets worldwide. Indeed, the authors chose to exclude all observations from 2009 due to high market volatility. The current study focuses its efforts on a tamer period ranging from 2013 to 2017. External factors, such as the crisis, may have played a part in the prevalence of downgrades in the research of Wengner et al. (2015).

When examining the cumulative abnormal CDS spread changes for upgrades in the industry portfolios, findings suggest differences in market reactions. For both windows, median cumulative abnormal CDS spread changes vary from negative values to positive values depending on the industry. For the (-30, +1) window, 7 have positive median CAS values, 3 have negative median CAS values and 1 has a 0 median CAS value. For the (0, +1) window, 6 have positive median CAS values and 5 have negative median CAS values. Market reactions are heterogenous among industries. From the 7 observed positive median CAS values in the (-30, -1) window, 3 turn negative in (0, +1). 2 of the 3 mentioned cases, namely the Consumer Discretionary and Communication Services industry portfolios, present with a 90 percent significance level on the parametric t-test for the (0, +1) window. These findings may indicate that the events contribute new relevant information to the markets. Participants react on this information during the 2-day upgrade event announcement window (0, +1). Additionally, 2 industries retain their negative median CAS before and after the event date 0. One presents significant CAS values at the 90 percent significance level for the (0, +1) window, namely the Industries segment. Although both, (-30, -1) and (0, +1), CAS values don a negative sign, only the latter is significant. Thus, once again, this implies that participants react on this information around the event window (0, +1). They do not anticipate the event. Surprisingly, the Materials industry portfolio presents significant positive median CAS values at the (0, +1) window at 90 percent on the Wilcoxon signed-rank test. As this sample is still relatively small (5 observations), it is assumed that an accurate output is not optimal, specifically for this type of non-parametric test. Although further study of this phenomena would be of interest to fully understand the mechanics at work here. Some industry portfolios simply lack significant reactions to upgrade announcements. This includes the Energy, Consumer Staples, Healthcare, Financials, Utilities and Real Estate industries.

In conclusion, this event study reveals several key findings that bring about a better understanding of the relationship between CDS spreads and credit rating events in

conjunction with the hypotheses made at the start of the paper. So far, findings for downgrades have not supported hypothesis 1 at the industry level. However, a partial link can be created through the lack of significant market performance towards upgrade event announcements prior to the event. Indeed, significant abnormal negative spreads are only discernible for 2 industry portfolios. These significant reactions are localized around the event date 0 in the (0, +1) window. This does not constitute systematic significance for all positive event reactions. The majority of positive event reactions are insignificant. Thus, on this basis, there is partial evidence in support of hypothesis 1. Building upon this discovery, the lack of significance of market performance in anticipation of the positive events in the (-30, -1) window do not support Hypothesis 2. Lastly, instances of remarkable market performance are displayed within industry portfolios, namely Financials and Consumer Staples in the negative event analysis. Moreover, heterogenous market performance is displayed in reaction to downgrades and upgrades throughout different industry segmentations. Specifically in the case of positive events. These provide support for hypothesis 3 and lend credence to the motivation to analyze market performance at the industry level. These findings are similar to the work of Wengner et al. (2015).

5.2 Intra-Industry Spillover Effect

This section will distinguish the impact of credit rating announcements on competitors within a given industry. Event firms, as the name states, are solely affected by a credit event as defined in this paper, namely an upgrade or downgrade, while non-event firms within the same industry are not directly affected by an event of their own. This implicitly indicates controlling for events at time *t*.

Previous studies have established different types of spillover effects. As mentioned in the literary review, Ismailescu & Kazemi (2010) have identified spillover on an international level through sovereign rating change announcements and its effect on surrounding emerging sovereign CDS markets. Studies have found interactions between stock returns and bankruptcy announcements, specifically relevant here is the work by Lang et al. (1992). Specifically, the authors uncover a relationship between stock returns of non-event firms and their competing counterparts during bankruptcy declarations. Competitors profit from the misfortune of the event firm. Wengner et al. (2015) follow the precedent set by the previous authors and attempt to verify if credit rating events may influence the access to financing by means of the competitive nature within industries. The assumption is made that downgrades on event firms should positively affect the competing firms, while the opposite is also true.

Upgrades to event firms should negatively affect the competing firms. This should translate into non-event firms should see tighter spreads during downgrades and larger spreads during upgrades.

The following tables (Tables 6 and 7) display the results of the event study at industry level to observe the levels of intra-industry spillover to competing firms. Both, the mean and median of cumulative abnormal CDS spread changes in basis points (CAS) are presented for the 11 different industries comprised of firms rated by *S&P Global*. For the analysis, median values will be taken into consideration. Corresponding p-values for the non-parametric Wilcoxon signed-rank test are made available, confidence levels of 99 percent, 95 percent and 90 percent are applied. CDS spreads are adjusted using the rating class index model. N represents the number of observations within each segment. Panels A and B each depict the cumulative abnormal CDS spread changes for the 30-day (-30, -1) and 2-day (0, +1) event windows respectively, where 0 is defined as the event date. While Table 6 focuses on downgrades, Table 7 focuses on upgrades.

5.2.1 Analysis of intra-industry spillover on competing firms for downgrades

Results for the intra-industry effect on competing firms during downgrades are displayed in Table 6 below. As expected, the number of observations *N* is much lower than in the previous event study analysis. This reflects the controls implemented to use uncontaminated events that are singular between time t_1 and t_2. This objectively means only events were chosen where no other competing firm had events of their own within the 30-day (-30, -1) and 2-day (0, +1) windows thus reducing the resulting pool of events to be analyzed. Observations *N* vary between 2 and 8 for this analysis. The median CAS values range between negative and positive values within both windows.

Table 6. Market Reaction to downgrades for Non-event Competitors within a given Industry (Rating Class Index Model)

Panel A: CDs spread changes before downgrade (-30,-1)	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**	**Total**
N	8	7	4	6	4	4	8	4	3	2	2	52
CASC (mean)	1.290	1.232	-0.418	-1.342	0.113	0.456	0.516	0.136	-0.189	0.331	1.427	
CASC (median)	0.001	0.926	0.059	-1.469	0.199	0.344	0.539	0.031	-0.294	0.331	1.427	
Wilcoxon sign rank test	0.000 ***	0.538	0.973	0.738	0.104	0.000 ***	0.436	0.244	0.700	0.000 ***	0.727	

Panel B: CDS spread changes during downgrade (0,+1)	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**	**Total**
N	8	7	4	6	4	4	8	4	3	2	2	52
CASC (mean)	0.115	-0.137	0.118	-0.138	0.038	-0.270	-0.021	0.079	-0.081	0.483	-0.180	
CASC (median)	-0.046	-0.085	0.143	-0.116	0.047	-0.261	-0.023	0.072	-0.050	0.483	-0.180	
Wilcoxon sign rank test	0.751	0.407	0.004 ***	0.005 ***	0.040 **	0.342	0.103 *	0.134	0.855	0.001 ***	0.050 **	

***, **, and * denote 99 %, 95 % and 90 % confidence levels respectively.

For 2 industries, CAS values are negative within the (-30, -1) window, 8 industries experience positive CAS performances, and 1 industry displays a value of 0 for CAS. Of the 8 industries with positive CAS, 4 experience a reversal of sign to negative once the event is at hand in window (0, +1). 2 of which present with significant abnormal performances within the 2-day window, namely Real Estate and the Financials industries. Using the Wilcoxon signed-rank test, the first holds a significance of 95 percent confidence level while the latter has a 90 percent significance. Both these industries experience positive competitive effect on competing firms for downgrades of the event firms solely around the event date.

The Consumer Discretionary segment experiences a positive competitive effect for non-event firms during downgrades as well. The result is significant at the 99 percent confidence level at the 2-day event window. This reflects the conclusions made for the Real Estate and Financials industries. Positive competitive effects arise around the event date and not before.

Remarkably, the Healthcare industry experiences positive significant CAS performance for non-event firms before the event. This translates to the downgrade event widening the competitors CDS spreads. This result is significant at a 99% confidence level. Similarly, the Utilities industry experiences positive CAS values for non-event firms in both windows. Both results are significant at a 99% confidence level. Additionally, the Industries and Consumer Staples segments display positive significant performance for non-event firms, this time during the 2-day event window.

These results do not follow the assumption made by Wengner et al. (2015). The main takeaway for these contradictory results is that they coincide with some of the lowest number of observation *N*. Smaller samples may disrupt the accuracy of the significance output. Lastly, the Energy sector experience significant performance before the event but the median is at 0. This does not give any sign to the direction of the competitive effect in this industry. The significant median seems to not reject the assumption that the median abnormal spread changes are 0. For the events that hold larger numbers of observations *N*, the positive competitive effect to non-event firms seems to arise during the event date 0 and not before. While this is in line with the work of Wengner et al. (2015), the authors find sufficient evidence for the same competitive effect within the period prior to the event as well. CDS spreads of non-event firms are significantly reduced before and around event dates for all industries. Wengner et al. (2015) retrieved a much larger time series sample reaching different geographies and, therefore, had access to a greater extent of non-contaminated events observations *N*. This has led to a more comprehensive analysis.

5.2.2 Analysis of intra-industry spillover on competing firms for upgrades

Results for the intra-industry effect on competing firms during upgrades are displayed in Table 7 below. Again, Observations numbers *N* are relatively low due to the aforementioned controls. Observations vary between 2 and 8 here as well.

Table 7. Market reaction to upgrades for non-event competitors within a given industry (Rating Class Index Model)

Panel A: CDs spread changes before upgrade (-30,-1)	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**	**Total**
N	1	2	7	7	7	5	2	4	3	8	3	49
CASC (mean)	4.208	0.682	-0.316	1.146	0.429	-0.541	1.029	0.193	0.105	0.442	0.176	
CASC (median)	4.208	0.682	-0.045	1.291	0.557	-0.755	1.029	0.152	-0.265	0.616	0.246	
Wilcoxon sign rank test	0.603	0.012 **	0.000 ***	0.179	0.977	0.149	0.008 ***	0.412	0.529	0.845	0.302	

Panel B: CDS spread changes during upgrade (0,+1)	**Energy**	**Materials**	**Industries**	**Consumer Discretionary**	**Consumer Staples**	**Healthcare**	**Financials**	**IT**	**Communication Services**	**Utilities**	**Real Estate**	**Total**
N	1	2	7	7	7	5	2	4	3	8	3	49
CASC (mean)	0.400	-0.792	-0.001	0.039	-0.098	0.202	0.151	0.013	-0.153	-0.795	-0.213	
CASC (median)	0.400	-0.792	0.021	0.101	-0.017	0.124	0.151	-0.005	-0.165	-0.111	-0.119	
Wilcoxon sign rank test	0.390	0.131	0.082 *	0.028 **	0.323	0.201	0.225	0.172	0.411	0.731	0.160	

***, **, and * denote 99 %, 95 % and 90 % confidence levels respectively.

Different industries seem to display more significant heterogenous results during upgrades. Indeed, positive significant CAS values are present in both windows thus leading credence to more segmentation of market reactions than for downgrades. The Financials and Materials industries experience significant positive CAS levels before the event date 0. This translates to a negative competitive effect to non-event firms for upgrades to the event firm although only preceding the event announcement. Significance levels for the first lie at 90 percent while the latter is significant to 99 percent confidence levels. Remarkably, the Industries sector displays a significant negative CAS at 99 percent confidence levels before the event. During the event, in the 2-day event window, its CAS performance returns to the positive range at a 90 percent confidence level.

The Consumer Discretionary industry presents significant positive CAS during the 2-day event period. This entails negative competitive effects on competitors during the event date 0.

While the negative competitive effects are present in both windows, no industry displays this effect systematically during the (-30, -1) and (0, +1) period. Industries seem to react differently to rating news. While this study uncovers significant results that loosely support the intra-industry spillover effect, the findings are not as substantial as work done by Wengner et al. (2015) or Ismailescu & Kazemi (2010). Factor such as low numbers of observations may have played a part in these findings. Therefore, there is not enough support for hypothesis 4 within the parameters of this study.

5.3 Limitations and Further Research

This paper contains limitations that need to be taken into account when evaluating further avenues of research. On a practical level, credit ratings events consist solely of upgrades and downgrades. Reviews and outlooks have been reported to reveal new information to market participants. The inclusion of these types of events should bring greater understanding to the dynamics at play when contemplating market reactions. The use of credit ratings only supplied by *S&P Global* does not give a full view of all the participants acting within the credit rating world. Rating events from other agencies may precede one another or help build a mosaic of information from these different sources for better understanding of a firm's credit risk profile. Single movements are evaluated at the same importance as movements up or down several rating classes. There may interesting conclusion to make from incorporating this into future research. Companies going through crises periods, represented by relatively regular downgrades, is also a possible avenue of research as downgrades have been shown to increase the probability in a future downgrade. Trying to quantify the Over/under reaction of market participants could also help further the research field. An important limitation encountered within this paper was the lack of uncontaminated events, a larger geographical scope or a longer time series would have prevented this issue. The incorporation of events from other rating agencies would also have remedied this issue. However, due to data restrictions on data bases, only S&P Global ratings are available. Similarly, credit rating information was only available for US firms. Lastly, cross sectional regression analysis could be performed to uncover the variables that affect the CAS for firms. Variables for bankruptcy risk and credit class could be used.

VI. Conclusion

The effect of credit rating events on financial markets is a topic that has been widely analyzed throughout the years passed and many inroads have been made to quantify this relationship. Indeed, numerous studies have established the link between these types of credit announcements with the traditional stock and bond markets. The nascent nature of credit default swaps has opened up a new avenue of research in the last 20 years. The exploration of this field of study is quite attractive due to the inherent association between creditworthiness and credit default swaps.

This research paper investigates this relationship and ascertains if credit upgrades, and downgrades, abnormally affect CDS spreads. Event study methodology is employed using credit rating announcements from the *S&P Global* credit rating agency and CDS data for 316 firms in the S&P 500 index. The period under review ranges from June 2013 to May 2017 and includes 253 relevant events. Furthermore, based on research previously done by Wengner et al. (2015), an interesting matter has been uncovered. Do competitors' profit (suffer) from downgrades (upgrades) to event firms through the competitive effect for additional financing within the same industry? This study attempts to bring forth further understanding in the intra-industry spillover to non-event firms from credit rating announcement that do not directly affect them. Following the logic put forth by 4 hypotheses, the following results were uncovered.

Based on the research of Wengner et al. (2015), firms are incentivized to publish positive news while only disclosing negative news. Furthermore, based on earlier research done on the subject, downgrades have a prevalence to cause significant abnormal market reaction while upgrades are left with insignificant market reactions. This translates into significant positive cumulative abnormal returns for downgrades and insignificant negative abnormal returns for upgrades around the event day. This paper uncovers partial support for hypothesis 1 as positive events are not accompanied by significant negative abnormal changes in spreads for the industries under review. However, significant positive abnormal performance is not uncovered for downgrades. Hypothesis 2 indicates that since firms publicize positive developments, spread changes should anticipate the upcoming upgrade and price the announcement before the event date 0. This study displays significant negative abnormal performance solely during the event in the 2-day window thus not supporting hypothesis 2. Work by Daniel & Jensen (2005) lead credence to the possibility of CDS spread changes reacting to events in varying degrees according to industry. Wengner et al. (2015) substantiate

this claim through their analysis. This contributes to the hypothesis 3 that market reactions differ for industry type. The findings in this paper support this claim through significant abnormal performance displaying segmentation from an industry to another. Hypothesis 4 is formulated on the idea that firms within an industry compete for financing. This claim is substantiated by the work of Ismailescu & Kazemi (2010) that exposes the relationship between CDS and sovereign credit ratings have effects outside the studied event. Therefore, competing firms should benefit (suffer) from downgrades to event firms through decreasing (increasing) spread changes. While experiencing encouraging signs through significant results within certain industries, this paper does not gather enough support for hypothesis 4. Reasons for these results are hypothesized in the discussion in section 5.2.2.

In conclusion, the findings within this study may not unequivocally support the intra-industry spillover effect, however, there is clear support for segmentation within industries regarding spread changes in conjunction with credit events. Asymmetric market reactions to credit rating announcements must be considered. CDS spread changes to rating events should not be simplified on a market level but should be considered when acting at the industry level. Future investors may use the conclusions in the numerous research papers mentioned above, as well as this one to incorporate the findings in market models. The economic relevance of this paper clarifies the reason for integration of industry level events in the evaluation of future credit events and thus help achieve better capacities in hedging activities.

VII. References

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