# Intra-Industry Contagion or Competitive effect in Europe: Evidence from the Credit Default Swap Market

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**Abstract:**

Using 134,064 daily CDS spread observations and 89 bankruptcy filings this papers investigates the effect of bankruptcy filing of a firm on the value of its industry rivals. On average, there is a significantly negative abnormal spread changes in CDS of 0.137%.. Subsamples are created to measure the interaction between leverage and competition, and contagion and competitive effect. Low-leverage sample has a cumulative CDS spread change of -3.22%. High-leverage sample has a cumulative CDS spread of -0.68%. In both subsamples the change in CDS spreads are negative but for the high-leverage industries the change is smaller than for low-leverage industries. Overall, this research paper finds evidence that suggest that the competitive-effect dominates the contagion-effect in the European market.

**Keywords:** Credit default swaps, Bankruptcy, Contagion, Event study

**JEL Classifications:** G14, G33

This draft: 17 November 2014

## Table of contents



## List of Tables



## Appendix

## 1. Introduction

After the world economy was hit by the financial crisis there were so many bankruptcy filings on the news. In times of crisis companies may face difficult time and in some cases eventually go bankrupt. Researchers and academics have, on average, reached a consensus that a Chapter 11 bankruptcy announcement lead to a decrease in equity value of the industry rivals. Most of the papers that investigate credit contagion use the stock market to measure the effect. However, Jorion and Zhang (2007) use Credit Default Swaps and state in their paper that there was no empirical evidence on credit spread correlations across firms yet. This makes sense as the market for credit derivatives has been growing substantially the past decade.

This paper investigates the effect of a bankruptcy announcement of firm on its industry competitors' value by using credit spreads. More specifically, the main research question is: *'Is there an effect of bankruptcy announcement on the equity value of its industry rivals?'* Lang and Stulz (1992) stated that a bankruptcy filing could influence the competitors' value via two channels: contagion-effect and competition-effect. Subsequently, the next question is: '*Is this a contagion or competitive-effect?*'. It is expected that the contagion-effect have a negative influence on the equity value of its industry competitors.

Most of the existing literature uses stock prices to determine the effect on the value of competitors. Also most of the papers are based on the US stock market. Jorion and Zhang (2007) use the Credit Default Swap (CDS) market. The CDS market contains all the information needed to directly calculate the change default risk while, as Jorion and Zhang (2007) state, stock prices can be noisy since it is difficult to determine whether other shocks can cause for changes in stock prices when an event of default occurs. Additionally, the CDS spread is also more ideal compared to bond yield spread as the CDS index will focus solely on pure spread total return and not, like the bond index, on other things such as yield curves, swap spreads and credit spreads. Hence, as the CDS market is a very liquid market, CDSs are an excellent source to directly measure the default risk (e.g. Jorion and Zhang, 2002; Longstaff et al., 2004).

One of the first papers investigating the effect of a bankruptcy filing on the equity value of competitors was written by Lang and Stulz (1992). They find that bankruptcy announcements decrease the value-weighted industry portfolio by 1%. In their study the contagion and competitive effect is introduced and investigated by creating two subsamples: 1) leverage and 2) competition. Lang and Stulz (1992) find that the contagion-effect is larger for industries that exceed the median level of industry leverage. The competitive-effect is significantly positive in highly concentrated industries with low leverage. Lang and Stulz (1992) state that overall contagion-effect has a negative affect on the value of competitors as bankruptcy filing reveal negative information. Lang and Stulz (1992) find that a firm with market power, and thus less competition, experience positive price reactions. This effect is the so-called competitive-effect. Competition and leverage also interact with each other. Lang and Stulz (1992) find that low degree of competition and low degree of leverage in an industry can result in a positive return for the competitors after a bankruptcy announcement. The contagion-effect is expected to be strongest if there is high competition and high leverage in the industry. Next to this research paper there are also other papers about this. Haensly et al. (2001) replicated the study of Lang and Stulz but adjusted the methodology and sampling methods to reduce bias. However, this study does not show significant results and hence there is no evidence a bankruptcy filing causes either a contagion or competitive effect. Ferris et al. (1997) investigated the contagion and competitive effect by dividing the sample into small and large firms. They find contagion-effect for both small and large firm filings. Jorion and Zhang (2007) find that for both the 3-day and 11-day event window the cumulative CDS spread changes are significantly positive. Hence, the contagion-effects are dominant to competitive-effects for Chapter 11 bankruptcies, which is in line with Lang and Stulz (1992).

This study uses different databases and these will be combined to create the total sample dataset. The CDS data for this research is collected from the Thomson Reuters Datastream CDS Sector Indices. This research study uses the 5-year maturity CDS as they are the most liquid (Jorion and Zhang, 2007). There are 134,064 daily

CDS observations. The bankruptcy filings data sample is collected from Orbis. Companies that went bankrupt between 2008 and 2013 are collected and include the following countries: Austria, Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, the UK, and Sweden, and Switzerland. Leverage and competition data are obtained from Compustat. Leverage is calculated as the ration of the book value of long-term debt to value of assets. Competition is calculated by using the Herfindahl-Hirschmann Index, defined as the sum of the squared market shares of all existing companies in an industry. SIC codes are used to combine these different datasets. After these datasets are combined equally-weighted industry portfolios are created.

This paper shows empirically evidence that in the full sample the abnormal relative CDS spread changes are negative and significant during the event window [-5,5]. This means that the competitive-effect seems to dominate the contagion-effect. Next, subsamples are created based on the two industry characteristics: leverage and competition. This papers shows that the low-leverage sample has a cumulative CDS spread change of -3.22 which is significant at the 1% -level. The high-leverage sample has a cumulative CDS spread of -0.68 which is significant at the 5%-level. In both subsamples the change in CDS spreads are negative but for the high-leverage industries the change is smaller than for low-leverage industries. At the end we perform a cross-sectional regression is performed. It is expected that the competitive-effects are higher for industries with a high HHI which means that the coefficient of the HHI should be positive. It is expected that the contagion-effect are higher for highly leveraged industries and hence, the coefficient on leverage should be negative. This paper is in line with this expectation as the coefficient of leverage is negative (-2.428), however, this is not significant. The same shows for competition as, although the coefficient is positive, it is not significant.

The remainder of this paper proceeds as follows. Chapter 2 discusses the literature background about the contagion and competitive effect when there is a bankruptcy filing. In addition, empirical evidence this relation will be given. Then

chapter 3 introduces the data sample, variables and methodology. Chapter 4 presents the main results and finally, chapter 5 concludes.

## 2. Literature Review

The existing research on the contagion-effect focuses mostly on the stock market (e.g. Aharony and Swary, 1983; Lang and Stulz, 1992 and Polonchek and Miller, 1999) and bond market (Collin-Dufresne et al., 2002). This paper will follow the research methodology of Jorion and Zhang (2007) where Credit Default Swaps (CDS) are used to measure the change in credit risk. In short, a CDS buyer agrees to compensate the seller by making periodic payments over the maturity period of the CDS in exchange for a guarantee against default from the seller. Thus, the CDS spread is the periodic payment, expressed as a percentage of the value of the contract. The CDS market contains all the information needed to directly calculate the change default risk while, as Jorion and Zhang (2007) state, stock prices can be noisy since it is difficult to determine whether other shocks can cause for changes in stock prices when an event of default occurs. Additionally, the CDS spread is also more ideal compared to bond yield spread as the CDS index will focus solely on pure spread total return and not, like the bond index, on other things such as yield curves, swap spreads and credit spreads. Hence, as the CDS market is a very liquid market, CDSs are an excellent source to directly measure the default risk (e.g. Jorion and Zhang, 2002; Longstaff et al., 2004).

In this study the CDS spread will measure the changes in value when a credit event occurs. A bankruptcy announcement contains information about the cash flow of the filing firm. According to Lang and Stulz (1992) the effect of a bankruptcy announcement is the sum of the contagion-effect and competitive-effect. Before investigating whether there is contagion-effect or competitive-effect in the European market literature background and empirical evidence will be discussed.

### 2.1 The contagion-effect

The contagion-effect hypothesis implies the change in value of competitors that cannot be attributed to wealth redistribution from the bankrupt firm (Lang and Stulz, 1992). Bankruptcies can be classified to credit events. It seems that credit events

cluster and hence, when positively correlated, these can be defined as credit contagion. Credit contagion can have major consequences for the construction of credit- sensitive portfolios for the banking and investment management industry (Jorion and Zhang, 2007). Giesecke and Weber (2004) define credit contagion as the risk that can be transferred during financial distress to other firms in the industry when there is a linkage between the firms. Research has shown that a filing firm will decrease the value of its competitors (e.g. Lang and Stulz, 1992 & Ferris et al., 1997). In an industry there are, to some extent, external factors that are common for all the firms in the industry. A bankruptcy announcement often reveals information that was not generally known before. This negative information about the filing firm affects the value of its competitors due to the same cash flow characteristics. As a result, one expects the same problems and hence the value of competitors will decrease. That is, the higher the correlation of cash flows between competitors the more likely the information will affect the value of competitors (Lang and Stulz, 1992). In addition, a bankruptcy filing may also reveal information about the assets of the firm. As assets of the filing firm can be overvalued both the filing firm and competitors will experience a decrease in value as these assets are often the same types of assets. Same with the correlated cash flows, these decreases in value of assets can stimulate contagion.

### 2.2 The competitive-effect

The competitive-effect hypothesis implies that in an industry with imperfect competition competitors may expect an increase in demand as customers will move from the filing firm to the competitors. This is the positive effect of the bankruptcy announcement. Not only a shift in demand can have a positive affect on the competitors of the filing firm but also efficiency can have a positive impact. In case there is a great decrease in production efficiency for the filing firm it could increase marginal costs and hence increase prices and lower output (Lang and Stulz, 1992). This will create opportunities for the competitors as their products could be substitutes for the more expensive products of the filing firm. Moreover, a bankruptcy announcement reveals information that could make the filing firm look weak. Competitors can take advantage of the weak status as it will be hard for the

filing firm to respond to predatory moves that require additional investments as raising funds quickly may be difficult (Lang and Stulz, 1992).

### 2.3 Interaction with leverage and competition

Many papers have been written about the contagion and competitive effect but there are still some different results due to different methodology and industry subsamples. However, most papers believe that the following two industry characteristics greatly interact with contagion and competitive effect: leverage and competition. In this section these interactions are discussed.

*Leverage.* The level of leverage is tested on its interaction with the contagion-effect. Leverage should be taken into consideration in order to understand how the value of a firm's equity is reduced. The contagion-effect affects the total value of a firm and the total value of a firm consists of equity and leverage. Lang and Stulz (1992) argue that if a bankruptcy announcement reveals negative information the percentage fall in equity value of the competitor will increase with their leverage. This is due to the relation between leverage and equity; the greater the level of leverage, the greater the elasticity of the value of equity regarding the total value of a firm. In addition, the higher the leverage the greater the increase in the present value of direct bankruptcy costs (Lang and Stulz, 1992). Next to contagion-effect, there is also an interaction between leverage and the competitive-effect. The competitive-effect should be strong on the value of a firm in a high-leveraged industry due to the elasticity of the equity value to cash flows (Lang and Stulz, 1992). However, there is also a negative effect of leverage as it might reduces the ability of a firm to invest. A high level of leverage might limit the financial flexibility of a firm and hence, it becomes hard to exploit changes in the firm's competitive position and to adjust to the market conditions. Moreover, Bolton and Scharfstein (1990) show that firms that have a low level of leverage can prey on highly leveraged firm. Hence, there is a clear negative interaction between leverage and contagion-effect, however, the interaction with competitive-effect can be both negative as positive.

*Competition*. The degree of competition relates inversely to the competitive-effect (Lang and Stulz, 1992) as there could be a shift in demand when a firms filing

for bankruptcy. As discussed before, the products of rival firms' could easily act as substitutes in case the filing firm's production becomes inefficient. Also the shift in demand can also be due to the weak status of the filing firm. Therefore, it is expected that competitors in an industry with a high level of competition experience lower abnormal returns. This is in line with the results of Lang and Stulz (1992) research.

Competition and leverage also interact with each other. Lang and Stulz (1992) find that low degree of competition and low degree of leverage in an industry can result in a positive return for the competitors after a bankruptcy announcement. That is, we expect that with low competition and low leverage, the competitive-effect is the strongest. Hence, the contagion-effect is expected to be strongest if there is high competition and high leverage in the industry.

### 2.4 Empirical evidence

One of the first papers investigating the effect of a bankruptcy filing on the equity value of competitors was written by Lang and Stulz (1992). They conducted an event study to investigate the effect of Chapter 11 filings on the value of competitors based on 59 filings over the period 1970–1989. Lang and Stulz (1992) find that bankruptcy announcements decrease the value-weighted industry portfolio by 1%. In their study the contagion and competitive effect is introduced and investigated by creating two subsamples: 1) leverage and 2) competition. Lang and Stulz (1992) find that the contagion-effect is larger (3%) for industries that exceed the median level of industry leverage. The competitive-effect is significantly positive (2.2%) in highly concentrated industries with low leverage. This implies that competitors can indeed benefit from the filing firm's weak position as customers move to competitors because there is reluctance to buy from a bankrupt firm (Titman, 1984). Although Lang and Stulz (1992) find that a firm with market power, and thus less competition, experience positive price reactions, this result is not significant. Overall, Lang and Stulz (1992) conclude that the contagion-effect dominates the competitive-effect as they provide significant evidence for the contagion-effect where leverage is high and competition is low.

Haensly et al. (2001) replicated the study of Lang and Stulz but adjusted the methodology and sampling methods to reduce bias. A potential bias that Haensly et al. (2001) pointed out was the change in the bankruptcy law in 1979 as this change in law significantly changed the bankruptcy costs (Boyes and Faith, 1986). Another bias that Haensly et al. (2001) considered to reduce is the restriction of debt (120$ million) that Lang and Stulz (1992) incorporated in their study. However, this study does not show significant results and hence there is no evidence a bankruptcy filing causes either a contagion or competitive effect.

Ferris et al. (1997) investigated the contagion and competitive effect by dividing the sample into small and large firms. They find contagion-effect for both small and large firm filings. Ferris et al. (1997) created also subsamples that tried to separate firms that might be candidates for contagion or competitive effect. Competitors who filled a Chapter 11 filing within three years of the original filing were considered to be candidates for contagion-effect (Ferris et al., 1997). Candidates for the competitive-effect are those who are still active after these three years. Ferris et al. (1997) find that both contagion and competitive candidates show negative stock price reactions around the announcement date. The negative reactions for competitive candidates were less expected as it implies that the competitive-effect is non-existing. An explanation of this result is that the competitive-effect already has been incorporated in the stock price prior to the Chapter 11 filing (Ferris et al., 1997). Ferris et al. proved this argument by looking at the price reactions by competitors for the hundred days prior to the Chapter 11 filing and found that these price reactions were significant positive.

Lastly, Jorion and Zhang (2007) extended the research of Lang and Stulz (1992). Instead of solely looking at the reaction of stock prices after a Chapter 11 filing, Jorion and Zhang (2007) research consisted of a sample of 512,292 daily observations on 5-year CDS spreads. CDS spreads are used to capture the changes in credit risk of industry competitors around credit events. This means that an increase in the CDS spread implies that there is a negative affect on the value of the firm. Notice that the reaction to CDS spreads changes is opposite to the industry stock price reaction. Jorion and Zhang (2007) find that for both the 3-day and 11-day event window the cumulative CDS spread changes are significantly positive. Hence, the

contagion-effects are dominant to competitive-effects for Chapter 11 bankruptcies, which is in line with Lang and Stulz (1992). Jorion and Zhang (2007) also compare the contagion-effects between the CDS market and stock market. Overall, the results are as expected as the reactions of the stock market systematically have the opposite sign to the CDS market (Jorion & Zhang, 2007). However, the reactions to the stock market are insignificant.

# 3. Data and Methodology

In this chapter the data collection and research methodology are explained. This research study focuses on the European market in the time-period 2008-2013.

## 3.1 Data collection

### 3.1.1 Credit Default Swaps (CDS)

A credit default swap is the most used type of credit derivative. It is a contract between two parties where the buyer agrees to compensate the seller by making periodic payments over the maturity period of the CDS in exchange for a guarantee against default from the seller. Generally, buyers use credit default swaps as insurance against defaults but can also use it to speculate on the potential for default. Basically, one can go short on credit risk by buying the CDS and go long by selling it.

The data sample consists of European CDS data. The CDS data for this research is collected from the Thomson Reuters Datastream CDS Sector Indices. As Thomson Reuters CDS database available at Tilburg University only provides CDS data from 2008, the research period is 2008-2013. Compared to studies with only stock data, the CDS dataset is fairly small as not all companies have CDS data. This research study uses the 5-year maturity CDS as they are the most liquid (Jorion and Zhang, 2007). There are 134,064 daily CDS observations in the total data sample. Table 1 presents the descriptive statistics for the CDS spread changes per year. The CDS spread varies widely across industry portfolios, ranging from -1.53 to 3.24 with a standard deviation of 0.82. The table also shows that is a decreasing trend over time for the CDS spread, from a mean of 1.61 in 2008 to a mean of -0.18 in 2013.

*<Insert Table 1>*

### 3.1.2 Bankruptcy filings

The bankruptcy filings data sample is collected from Orbis. Companies that went bankrupt between 2008 and 2013 in West-Europe are collected and include the following countries: Austria, Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, the UK, and Sweden, and Switzerland. Companies that do not have an exact filing date are excluded from the sample. Google was used to find the exact filing date. Next to this, the accompanied 4-digit SIC codes of the bankrupt companies are extracted from the database. Banks and financial institutes with SIC codes between 6000-6799 are not included in the sample as regulatory factors are involved. A bankrupt firm is eliminated from the sample if it does not have a SIC code and if there are no CDS data of competitors available in Thomson Reuters Datastream. The current sample for the event study includes 89 bankruptcies in 40 industries.

### 3.1.3 Industry characteristics

As existing literature regarding contagion-effects state that some industry characteristics have an effect on the contagion of competitive effect. Two of these characteristics are leverage and competition. These leverage and competition data are obtained from Compustat. Leverage is calculated as the ration of the book value of long-term debt to value of assets. In Compustat leverage is obtained quarterly for the period 2008-2013. Competition is calculated by using the Herfindahl-Hirschmann Index, defined as the sum of the squared market shares of all existing companies in an industry.

Table 2 shows the statistical information about the industry characteristics of the sample period. If the leverage subsample is below the sample median the industry is considered low-leveraged. Table 2 shows that the median in 2008 was fairly high (62.55%) while for 2009-2013 the median is between 19%-25%. If the HHI subsample is below the sample median the industry is considered to be highly competitive. The median of the HHI shows a small decline of the years 2008-2012. This means that the every year more firms entered the industry which resulted in a

less concentrated firm. In 2013 there is a small increase in HHI implying that firms have left the industry.

*<Insert table 2>*

### 3.2 Data assembly

As different databases are used to collect the appropriate data for this study, a new total dataset is created from scratch. For each bankruptcy event an industry portfolio of rival firms is created only if they have 1) the same four-digit SIC code as the filing firm, 2) CDS spread data in the CDS dataset, and 3) accounting data in Compustat. In case the industry does not fulfil either one of these conditions they are eliminated from the dataset.

The equally-weighted portfolios are created to measure the reactions of rivals in the industry. The equally-weighted portfolios are calculated as follows:

$$P_{er_t} = \sum_{i=1}^{N} w_{e_{i,t}} \cdot RC_{i,t}$$

where RC is the daily relative change in CDS spread, w is the equal-weight and P is the equally-weighted industry portfolio.

### 3.3 Methodology

The total dataset is defined and completed. The next step is the conduct an event study. The estimation window is set for 185 days beginning 200 days before the event date until 15 days before the event date; [-200, -15]. The event window is set for 11 days [-5,5] as any kind of unreported information about the filing firms will be captures in the CDS spread changes.

The daily (t) relative CDS spread change of each firm i is calculated as follows:

$$RC_{it} = \frac{S_{it} - S_{it-1}}{S_{it-1}}$$

Then we calculate the daily (t) abnormal relative changes in CDS spread (ARC) for each firm i:

$$ARC_{it} = RC_{it} - (\widehat{\alpha_\iota} + \widehat{\beta_\iota}(RC_{mt})$$

The betas and alphas are estimated in a standard OLS regression and the t-Statistics are computed in the standard way. The cumulative abnormal relative change (CARC) is calculated by taking the summation of ARC for each day in the event window:

$$CARC_{(t_1,t_2)} = \sum_{t=t_1}^{t_2} \overline{ARC_t}$$

## 4. Empirical findings and interpretations

### 4.1 Full Sample

The abnormal relative changes (ARC) in CDS spreads per event day are calculated over all 89 bankruptcies. The industry portfolios are equally-weighted portfolios. Table 3 provides the daily abnormal relative changes in CDS in the 11-day event window. It shows that over the 11-day event window there is a negative abnormal spread changes in CDS of 0.137 which is significant at the 1% level. Moreover, for all event days the abnormal relative spread changes are negative and for 9 days these are significant at the 1% level. However, only for +5-event day the negatively abnormal spread change is not significant. Table 1 shows that the competitive-effect seems to dominate the contagion-effect due to the narrower CDS spreads, which means higher stock prices. That is, industry stock prices reactions have the opposite signs to the CDS spread changes.

*<Insert Table 3>*

### 4.2 Industry characteristics: leverage and competition

Existing research in the US already provided indicators that could have an effect on the contagion or competitive effect (e.g. Heansly et al., 2001; Lang and Stulz, 1992). These indicators are leverage and competition. In this study we test whether leverage and competition are relevant in determining the magnitude of intra-industry contagion or competitive effect. The sample is split according to the sample median. The median is more appropriate that the mean as it is not sensitive to outliers. For every subsample, the CSC is calculated for the [-1,1] and [-5,5] event

window. It is expected that for the subsample with high HHI and a leverage the competitive-effect will be the strongest while for the subsample with low HHI and high leverage the contagion-effect will be the strongest. Table 4 presents the results of the industry characteristics.

*Leverage.* As stated before, it is expected that leverage interacts with the contagion-effect. Hence, it is expected that the changes in CDS spreads of competitors in a highly leveraged industry increase more than those of competitors in a less leveraged industry. The median leverage of this sample is 0.22 which suggest that the majority of industries in the sample are not highly leveraged. Table 4 shows that the low-leverage sample has a cumulative CDS spread change of -3.22 which is significant at the 1% -level. The high-leverage sample has a cumulative CDS spread of -0.68 which is significant at the 5%-level. In both subsamples the change in CDS spreads are negative but for the high-leverage industries the change is smaller than for low-leverage industries.

*Competition*. As mentioned in the previous chapters, competition is measured by the Herfindahl-Hirschmann Index (HHI). A high HHI means that there is low level of competition. Table 4 shows that there is a negative change in CDS spread in low-competitive industries, although, these results are not significant. Hence, this indicates that the competitors experience a competitive-effect which is in line with the expectation. Furthermore, table 4 shows that high-competitive industries (low HHI) also experience a negative change in CDS spreads and these are significant at the 1%-level. This suggests that the competitive-effect is dominant for the competitors in an industry with a high degree of competition. However, this is not in line with the expectation that a higher the degree of competition will lead to a negative effect on the firms' value, meaning that the change in CDS spread should increase.

*<Insert table 4>*

### 4.3 Cross-sectional reactions

This section measures the extent to which contagion and competitive effects are related to industry characteristics. To do so, an estimate cross-sectional

regression is performed by using the following:

$$CARC_j = \alpha_0 + \beta_1 HHI_j + \beta_2 Leverage_j + \varepsilon_j$$

It is expected that the competitive-effects are higher for industries with a high HHI which means that the coefficient of the HHI should be positive. It is expected that the contagion-effect are higher for highly leveraged industries and hence, the coefficient on leverage should be negative. Table 5 presents the results.

As expected, the coefficient of leverage is negative (-2.428), however, this is not significant. The same can be concluded for competition as, although the coefficient is positive, it is not significant. Even though it is not significant, it suggests that the results are in line with the expectation.

*<Insert table 5>*

## 5. Conclusion and discussion

As researchers have been investigating the relation between a bankruptcy announcement and contagion-effect where different methods and samples are used. Certainly is that a bankruptcy announcement does have an impact on the value of competitors. Whether this impact is negative or positive depends on the methods used to measure the credit risk and the data samples that are used.

This paper shows empirically evidence that in the full sample the abnormal relative CDS spread changes are negative and significant during the event window [-5,5]. This means that the competitive-effect seems to dominate the contagion-effect. This is not in line with Lang and Stulz (1992) and Jorion and Zhang (2007) as they find empirical evidence that overall the contagion-effect dominates the competitive-effect.

Next, subsamples are created based on the two industry characteristics: leverage and competition. This papers shows empirical evidence that the low-leverage sample has a cumulative CDS spread change of -3.22 which is significant at the 1% -level. The high-leverage sample has a cumulative CDS spread of -0.68 which is significant at the 5%-level. In both subsamples the change in CDS spreads are

negative but for the high-leverage industries the change is smaller than for low-leverage industries.

At the end a cross-sectional regression is performed. It is expected that the competitive-effects are higher for industries with a high HHI which means that the coefficient of the HHI should be positive. It is expected that the contagion-effect are higher for highly leveraged industries and hence, the coefficient on leverage should be negative. This paper is in line with this expectation as the coefficient of leverage is negative (-2.428), however, this is not significant. The same shows for competition as, although the coefficient is positive, it is not significant.

Overall, this study show that the competitive-effect dominates the contagion-effect in the European market. This is very interesting because the paper of Jorion and Zhang (2007) that was used as the main reference paper for this study have a different conclusion. For the subsamples, the empirical results are as was expected, however not significant at any significance level. Thus, the (positive of negative) interaction between leverage, competition and the contagion or competitive effect cannot be empirically stated in this research study.

This research study could be improved. One of the biggest limitations of this study was the availability to the data. The CDS data was only available from the year 2008 which made it impossible to check what happened in the years before the financial crisis e.g 2002 and onwards. The bankruptcies data was also difficult to compile because it was hard to match them with the other data.

For further research it would be an idea to compare stock prices with credit spread for the European market (following Jorion and Zhang (2007)).

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**Table 1**

**Descriptive statistics for CDS spread changes per year**

This table contains statistical information about the CDS spread changes for each year.

| Year | Mean | Std Dev | Median | Min | Max |
|---|---|---|---|---|---|
| 2008 | 1.61 | .70 | 1.54 | .30 | 3.24 |
| 2009 | -.71 | .42 | -.74 | -1.53 | .18 |
| 2010 | .21 | .31 | .13 | -.27 | 1.09 |
| 2011 | .43 | .29 | .42 | -.13 | 1.14 |
| 2012 | -.30 | .20 | -.26 | -.86 | .05 |
| 2013 | -.18 | .23 | -.13 | -.74 | .56 |
| Total | .15 | .82 | -.01 | -1.53 | 3.24 |

**Table 2**

**Descriptive Statistics of Industry Characteristics**

The table presents the descriptive statistics of the two industry characteristics for each year in the sample period. Leverage and HHI data are obtained from Compustat.

| Descriptive Statistics | Leverage per industry | HHI per industry |
|---|---|---|
| 2008 | | |
| Mean | .2625 | 911.9603 |
| Median | .6255 | 690.8673 |
| Min | .0834 | 1839.124 |
| Max | .6256 | 4985.014 |
| 2009 | | |
| Mean | .2770 | 749.1536 |
| Median | .2476 | 647.3135 |
| Min | .1124 | 180.7746 |
| Max | .5915 | 1581.484 |
| 2010 | | |
| Mean | .2584 | 689.47 |
| Median | .2305 | 640.2795 |
| Min | .0372 | 171.3135 |
| Max | .6335 | 1518.663 |
| 2011 | | |
| Mean | .2452 | 677.3587 |
| Median | .2050 | 529.5553 |
| Min | .0372 | 153.0142 |
| Max | .5751 | 1635.434 |
| 2012 | | |
| Mean | .2521 | 706.2258 |
| Median | .1990 | 559.9669 |
| Min | .0667 | 161.1456 |
| Max | .6482 | 2435.033 |
| 2013 | | |
| Mean | .2282 | 731.9073 |
| Median | .1964 | 634.0588 |
| Min | .0022 | 165.0137 |
| Max | .7376 | 1821.157 |

**Table 3**

**Industry Rival's CDS Spread Reactions to Bankruptcy Announcements**

ARC is the abnormal relative changes in CDS spread of an industry portfolio for the time interval [T1,T2]. The sample consists of all the bankruptcies between January 2008 and December 2013 of West-European firms (89 bankruptcies). The industry portfolios are equally-weighted portfolios of firms with the same four-digit SIC codes as the filing firm. T-stat is the standardized t-test. ***, ** and * indicate a significance at the 0.01, 0.05 and 0.10, respectively.

| Event Day | ARC | T-stat |
|---|---|---|
| -5 | -.15 | -2.18*** |
| -4 | -.14 | -2.13*** |
| -3 | -.15 | -2.16*** |
| -2 | -.13 | -1.98* |
| -1 | -.15 | -2.22*** |
| 0 | -.13 | -2.05*** |
| 1 | -.13 | -2.14*** |
| 2 | -.16 | -2.30*** |
| 3 | -.13 | -2.11*** |
| 4 | -.14 | -2.65*** |
| 5 | -.11 | -1.41 |
| | | |
| [-1,1] | -.139 | -3.73*** |
| [-5,5] | -.137 | -7.01*** |

**Table 4**

**Industry Rivals CDS Spread Reactions to Bankruptcy Announcements by Industry Characteristics**

This table splits the industry rival's reactions to bankruptcy announcements by industry characteristic defined by Leverage and HHI. CARC is the cumulative abnormal relative changes in CDS spreads. The sample consists of all the bankruptcies between January 2008 and December 2013 of West-European firms (89 bankruptcies). The industry portfolios are equally-weighted portfolios of firms with the same four-digit SIC codes as the filing firm. The industry characteristics are obtained from Compustat. ***, ** and * indicate a significance at the 0.01, 0.05 and 0.10, respectively.

| | | | **CARC for the subsample of industry portfolios with a value of the industry characteristic below/above the median** | |
|---|---|---|---|---|
| **Industry characteristics** | **Event window** | **# of industry portfolios with industry characteristics below/above the median** | *Below* | *Above* |
| **Leverage** | [-5,5] | 7/33 | -3.22 | -.68 |
| | | | (-14.07)*** | (-2.04)** |
| | [-1,1] | 7/33 | -3.22 | -.73 |
| | | | (-7.28)*** | (-1.26) |
| **HHI** | [-5,5] | 12/28 | -3.32 | -.31 |
| | | | (-15.16)*** | (-0.83) |
| | [-1,1] | 12/28 | -3.32 | -.31 |
| | | | (-7.90)*** | (-0.43) |

**Table 5**

**The Effect of Industry Characteristics on Industry Rival's CDS Spread Reaction**

This table presents the coefficient estimates of cross-sectional regressions where CARC is calculated as follows:

$$CARC_j = \alpha_0 + \beta_1 HHI_j + \beta_2 Leverage_j + \varepsilon_j$$

CARC is the cumulative abnormal relative changes in CDS spreads and the dependent variable for [-5,5] daily interval. HHI is the industry Herfindahl-Hirschmann index and Leverage is the average leverage ratio of the industry portfolio. ***, ** and * indicate a significance at the 0.01, 0.05 and 0.10, respectively.

| **Independent variables** | **Expected Sign** | **Cumulative relative CDS Spread Changes (CARCC)** |
|---|---|---|
| | | Coefficient (t-statistic) |
| **Constant** | | -2.965 (-3.11)*** |
| **HHI** | + | .0014 (1.61) |
| **LEV** | - | -2.428 (-1.05) |
| **R-squared** | | .0151 |
| **P-value for F-stat** | | (.1016) |
| **No. of Obs.** | | 267 |

**Appendix 1 – List of Industries and Distribution of Events and Firms.**

| Industry | SIC Code | No. of Events | No. of Firms |
|---|---|---|---|
| Heavy construction other than building construction | 1600 | 1 | 4 |
| Wines, brandy, and brandy spirits | 2084 | 1 | 1 |
| Distilled and blended liquors | 2085 | 2 | 2 |
| Cigarettes | 2111 | 1 | 3 |
| Paper mills | 2621 | 2 | 5 |
| Printing, publishing, and allied industries | 2700 | 1 | 3 |
| Newspapers: publishing, or publishing and printing | 2711 | 3 | 1 |
| Books: publishing, or publishing and printing | 2731 | 2 | 2 |
| Miscellaneous publishing | 2741 | 4 | 1 |
| Pharmaceutical preparations | 2834 | 3 | 6 |
| Perfumes, cosmetics, and other toilet preparations | 2844 | 4 | 2 |
| Paints, varnishes, lacquers, enamels | 2851 | 1 | 1 |
| Tires and inner tubes | 3011 | 1 | 2 |
| Rubber and plastics footwear | 3021 | 1 | 1 |
| Steel works, blast furnaces (including coke ovens) | 3312 | 1 | 2 |
| Metal cans | 3411 | 1 | 1 |
| Metal doors, sash, frames, molding, and trim | 3442 | 4 | 1 |
| Ball and roller bearings | 3562 | 1 | 1 |
| Power, distribution, and specialty transformers | 3612 | 1 | 1 |
| Motor vehicles and passenger car bodies | 3711 | 4 | 10 |
| Motor vehicle parts and accessories | 3714 | 4 | 3 |
| Aircraft | 3721 | 2 | 2 |
| Search, detection, navigation, guidance, aeronautical | 3812 | 1 | 2 |
| Railroads, line-haul operating | 4011 | 2 | 1 |
| Air transportation, scheduled | 4512 | 3 | 2 |
| Telephone communications, except radiotelephone | 4813 | 1 | 9 |
| Television broadcasting stations | 4833 | 1 | 3 |
| Communications services, not elsewhere classified | 4899 | 6 | 3 |
| Electric services | 4911 | 3 | 15 |
| Water supply | 4941 | 1 | 4 |
| Electrical apparatus and equipment, wiring supplies | 5063 | 3 | 1 |
| Department stores | 5311 | 3 | 3 |
| Grocery stores | 5411 | 2 | 5 |
| Family clothing stores | 5651 | 1 | 1 |
| Radio, television, and consumer electronics stores | 5731 | 1 | 1 |
| Eating places | 5812 | 4 | 2 |
| Hotels and motels | 7011 | 2 | 3 |
| Advertising agencies | 7311 | 6 | 3 |
| Automotive rental and leasing, without drivers | 7510 | 1 | 1 |
| Engineering services | 8711 | 3 | 1 |
| No. of Events | 89 | | |
| No. of Industries | 40 | | |